VALIDATION OF WIDEBAND OCEAN EMISSIVITY RADIATIVE TRANSFER MODEL

by

SONYA CROFTON
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Major Professor: W. Linwood Jones

ABSTRACT

Radiative Transfer Models (RTM) have many applications in the satellite microwave remote sensing field, such as the retrieval of oceanic and atmospheric environmental parameters, including surface wind vectors and sea surface temperatures, integrated water vapor, cloud liquid, and precipitation. A key component of the ocean RTM is the emissivity model used to determine the brightness temperature (Tb) at the ocean's surface. A new wideband ocean emissivity RTM developed by the Central Florida Remote Sensing Laboratory (CFRSL) calculates ocean emissivity over a wide range of frequencies, incidence angles, sea surface temperatures (SST), and wind speed. This thesis presents the validation of this CFRSL model using independent WindSat Tb measurements collocated with Global Data Assimilation System (GDAS) Numerical weather model environmental parameters for frequencies between 6.8 to 37 GHz and wind speeds between 0 – 20 m/s over the July 2005 – June 2006 year. In addition, the CFRSL emissivity model is validated using WindSat derived ocean wind speeds and SST that are contained in the Environmental Data Record (EDR) and combined with the GDAS environmental parameters. Finally, the validation includes comparisons to the well-established XCAL ocean emissivity RTM. The focus of this validation and comparison is to assess performance of the emissivity model results with respect to a wide range of frequency and wind speeds but limited to a narrow range of incidence angles between approximately 50° - 55°.

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LIST OF ACRONYMS/ABBREVIATIONS

CFRSL	Central Florida Remote Sensing Laboratory
CLW	Cloud Liquid Water
EDR	Environmental Data Record
GDAS	Global Data Assimilation System
ICWG	Intersatellite Calibration Working Group
NCEP	National Centers for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
NRL	Naval Research Laboratory
RTM	Radiative Transfer Model
SDR	Sensor Data Record
SST	Sea Surface Temperature
TOA	Top-of-the-Atmosphere
WS	Wind Speed
XCAL	Alternate name for ICWG

CHAPTER 1: INTRODUCTION

1.1 Motivation

El-Nimri [1,2] recently developed an improved ocean surface emissivity radiative transfer model (RTM) that calculates ocean emissivity over a wide range of electromagnetic frequencies, surface wind speeds, sea surface temperature (SST) and incidence angles. The physics-based CFRSL RTM results compare well with the independent Tb observations available from the journal literature that were used as the training data set; however, an independent validation had not occurred over a full range of parameter space. This thesis presents the effort towards validating the CFRSL model using the WindSat satellite radiometer ocean measurements for one year and other independent sources as described in the following sections.

1.2 Description of Data Sources

1.2.1 WindSat L1C Data

The WindSat radiometer developed by the Naval Research Laboratory (NRL), which flies on the Coriolis satellite, was designed to demonstrate the passive microwave measurement of ocean surface wind vector from space [3]. WindSat collected brightness temperatures (Tb) for five operating frequencies, 6.8, 10.7, 18.7, 23.8, and 37 GHz over a conical arc at incidence angles between 50º - 54º. The WindSat Level 1C (L-1C) brightness temperature data (provided by Colorado State University [5]) is

a subset of the Sensor Data Record (SDR) product from WindSat and contains the channels shown in. The L1C data used for this thesis was collected from July 2005 through June 2006 and was earth gridded into 1º x 1º boxes.

Table 1.1 WindSat L1C Channels.

Channel Order	Frequency (GHz)	Polarization	Incidence Angle
1	6.8	Vertical	53.5°
2	6.8	Horizontal	
3	10.7	Vertical	49.9°
4	10.7	Horizontal	
5	18.7	Vertical	55.3°
6	18.7	Horizontal	
7	23.8	Vertical	53.0°
8	23.8	Horizontal	
9	37.0	Vertical	53.0°
10	37.0	Horizontal	

1.2.2 GDAS Environmental Data

Global Data Assimilation System (GDAS) from the National Oceanic and Atmospheric Administration's National Centers for Environmental Prediction (NCEP) provided gridded environmental data collected from a variety of platforms such as buoys, ships, planes, radiosondes, weather radars, and earth orbiting satellites. Parameters including temperature, surface pressure, sea level pressure, geopotential height, humidity, cloud liquid water, sea surface temperature, and u- and v- winds were gridded for every 6 hours for 00Z, 06Z, 12Z, and 18Z on a global 1 degree latitude/longitude grid.

Out of the large collection of parameters, this paper presents results as a function of four primary GDAS parameters: Cloud Liquid Water (CLW), Water Vapor (WV), Sea Surface Temperature (SST), and Wind Speed (WS), which were used in the validation analysis. CLW, SST, and WS are taken directly

from the GDAS data set while WV is calculated using the GDAS relative humidity and temperature profiles. These parameters were chosen due to their impact on the RTM modeled Tb [6,7].

1.2.3 WindSat Environmental Data Record

In Addition to using the wind speeds from GDAS for the validation process, wind retrievals from WindSat were used in the final set of analysis. The advantage of the EDR wind speed is that it is spatially and temporally collocated with the WindSat Tb's used to derive ocean emissivity. A comparison of EDR wind speeds with GDAS wind speeds shown in Fig. 1.1 demonstrates that on average the values are quite similar; however at the high wind speed end the GDAS winds are slightly low because of spatial smoothing that reduces the peak winds. The WindSat EDR was retrieved with the same temporal and spatial resolution as the WindSat SDR and then averaged to a common spatial resolution. For this analysis, the EDR wind speeds were combined with the WindSat L1C brightness temperatures and GDAS environmental parameters (pressure, temperature profile, humidity, cloud liquid water, salinity).

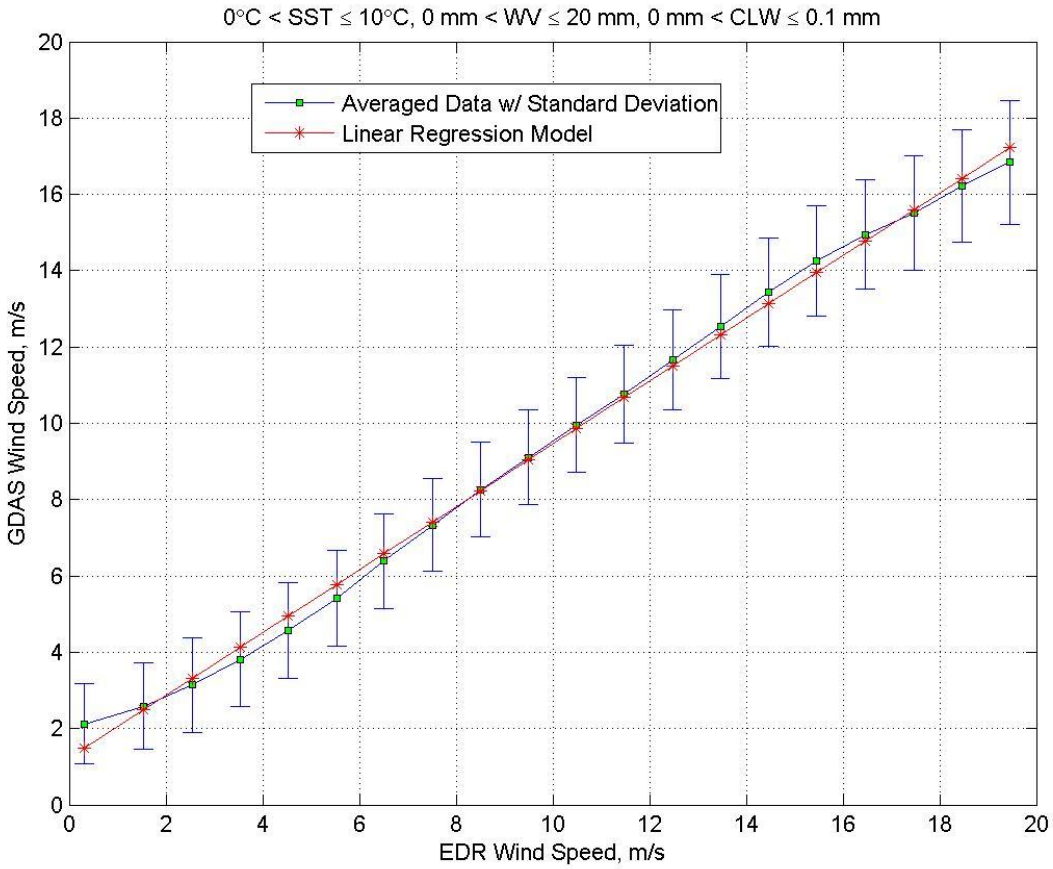


Fig. 1.1 GDAS Wind Speed versus EDR Wind Speed with fitted regression.

1.3 Description of Radiative Transfer Models

1.3.1 XCAL Radiative Transfer Model

The Inter-Calibration Working Group (ICWG) radiative transfer model, also referred to as XCAL, is used to generate an independent surface emissivity data set for comparison with the CFRSL RTM in this thesis. The XCAL RTM uses the Elsaesser model for the ocean isotropic emissivity [5,6].

1.3.2 CFRSL Radiative Transfer Model

The CFRSL emissivity model [1,2] calculates ocean emissivity over a wide range of frequencies (1 – 90 GHz), incidence angles (nadir – 75º) and the full dynamic range of observed ocean sea surface temperatures and salinity, and wind speed. The model is physically based with empirically tuned coefficients using an approach based on Stogryn [8], where the coefficients are a linear sum of foam and foam-free sea water emissivities. The coefficients are in part tuned to Uhlhorn and Wentz [9] ocean emissivities in their range of applicability and are further tuned using off nadir Tb measurements from across the literature so that an iterative process is applied to provide a weighted least mean squares fit to the empirical Tb data.

CHAPTER 2: METHODOLOGY

This thesis presents the validation of the CFRSL model using independent WindSat ocean Tb measurements collocated with the National Oceanic and Atmospheric Administration's Global Data Assimilation System (GDAS) Numerical weather model environmental parameters. Results are presented for five frequencies between 6.8 to 37 GHz and wind speeds between 0 – 20 m/s over a one-year period: July 2005 – June 2006. In addition, the CFRSL emissivity model is validated using WindSat derived ocean wind speeds that are contained in the Environmental Data Record (EDR) and combined with the GDAS environmental parameters, such as SST. Finally, the validation includes comparisons to the well-established XCAL ocean emissivity RTM [7]. The focus of this validation and comparison is to assess performance of the emissivity model results with respect to a wide range of frequency and ocean surface wind speeds but limited to a narrow range of incidence angles between approximately 50° - 55°.

2.1 Processing Issues

All validation analysis was conducted in a student version of MATLAB 7.7.0 on a 32-bit Windows Operating System with 4.00 GB RAM and a 2.50 GHz processor. The limitations of the computing resources influenced the initial processing methods in order to be able to work with a full year of collocated data. For example, in order to combine a whole year of collocated data from two separate files of data for six months each, a subset of the parameters of interest was extracted from one of the six month files and saved. Then, the first six months of data file was closed and cleared from local memory. The second set of the parameters of interest was extracted for six months of data and saved followed by closure of the source file and cleared from the local memory. Finally, the complete year of data for a particular set of parameters could be combined and considered the starting point for the remainder of the validation analysis. Throughout the validation process careful attention was given to the code

development so as not to overload the memory resources. There were several circumstances where the initial version of the processing code had to be rewritten due to this issue.

2.2 Collocation and Formatting Process

The measured WindSat brightness temperatures at the "Top-of-the-Atmosphere (TOA)" (L1C data) were earth gridded into 1° longitude by 1° latitude boxes on the earth's surface and over oceans as shown in Fig. 1.1Fig. 2.1. For each 1° box, the WindSat TOA Tb's were quality checked and bogus data deleted, and then the means and standard deviations were calculated. Finally, GDAS environmental parameters were "matched-up" both spatially and temporally within ±3 hours corresponding to the nearest GDAS analysis times. The match-ups parameters, shown in Table 2.1, were written to a *.ws file, which contains all valid collocations for a single day.

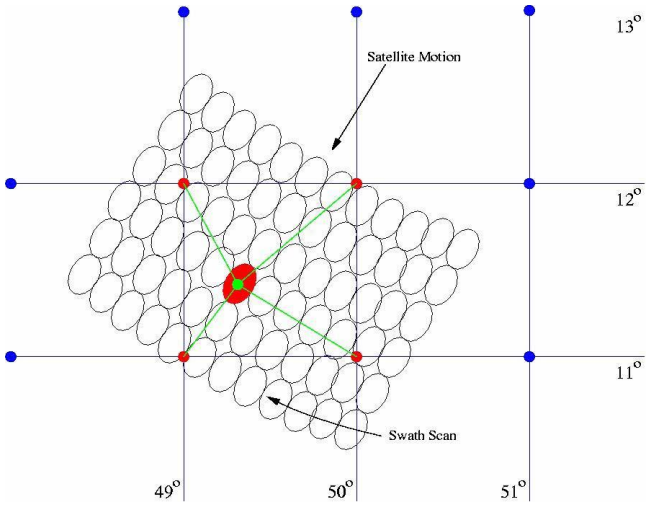


Fig. 2.1 WindSat L1C swath measurements overlayed on GDAS 1° grid. Four surrounding points are interpolated to WindSAT L1C location. Diagram from [10].

This collocated data file was used as the input file to the main function for running the XCAL and CFRSL RTMs. The overview of the "main function" for running the XCAL RTM is shown in Fig. 2.2.

The same function was used for running the CFRSL RTM with the exception that the ocean surface emissivity models were different, also shown in Fig. 2.2.

Table 2.1 Output from collocation of WindSat L1C data with GDAS data *and EDR wind speeds.

Data Element	Description
col 001	WindSat asc/desc flag (asc-0,dsc-1)
col 002	Latitude
col 003	Longitude
col 004	WindSat GMT in minutes
col 005-014	WindSat TOA Tb mean observations (10 channels)
col 015-024	WindSat TOA Tb standard deviations (10 channels)
col 025-029	WindSat incident angles for 5 frequencies
col 030	WindSat counts
col 031	GDAS surface pressure
col 032	GDAS surface temperature
col 033	GDAS temperature at 2m from sfc
col 034	GDAS u-wind
col 035	GDAS v-wind
col 036 - 056	GDAS Temperature profile
col 057 - 077	GDAS Relative humidity profile
col 078 - 098	GDAS Height profile
col 099	GDAS Cloud Liquid Water
col 100	Salinity
col 101*	Collocated latitude
col 102*	Collocated longitude
col 103*	Time difference between EDR and ASKII
col 104*	EDR wind speed
col 105*	EDR wind direction
col 106*	EDR time JD2000

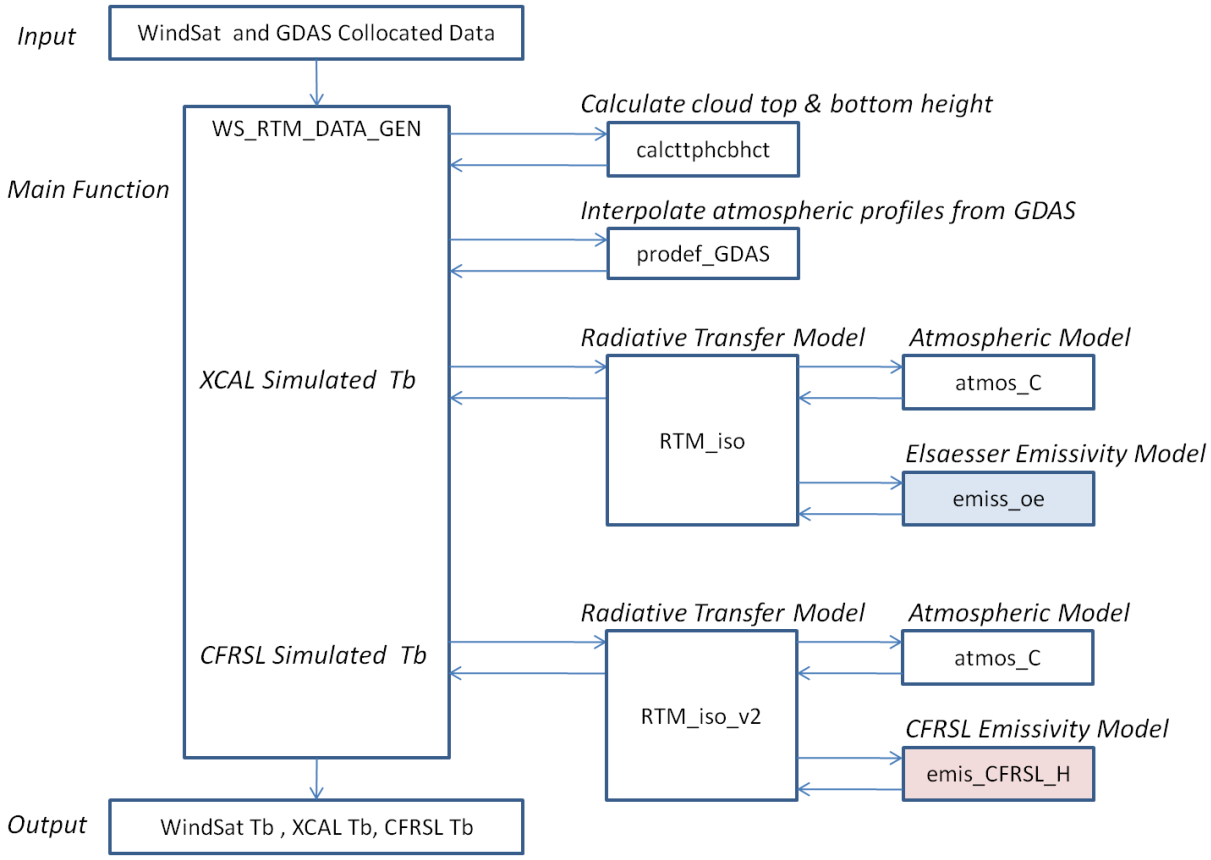


Fig. 2.2 Main function process for running XCAL and CFRSL RTM to generate TOA Tb's.

As part of the pre-processing function that runs the RTMs, only valid data points were kept according to a conservative land mask and thresholds against a set of input parameters. The 1° boxes were used only if they had a salinity between 0 and 40, sea surface temperature > 0 C, wind speed > 0 m/s, cloud liquid water < 0.1 mm. Also, another filter was applied to TOA Tb's to assure that the ocean scenes were homogenous environmental parameters over the 1° Boxes, whereby the maximum Tb standard deviation of collocated Tb's for WindSat L1C was < 2 K for the V pol and < 3 K for the H pol. In addition, 1° Boxes were removed where the TOA Tb for any one channel exceeded the max threshold as shown in Table 2.2. The results of running the pre-processing and RTM function was a *.dat file comprising the data vectors for the 1° Boxes that contained GDAS environmental parameters; the WindSat TOA Tb;

XCAL RTM TOA Tb, and CFRSL RTM TOA Tb. There were two such output files produced, one for each 6 month period from July to December of 2005 and January to June of 2006. The dataset included the 10 channels for each set of TOA Tb in addition to key environmental parameters as shown in Table 2.3.

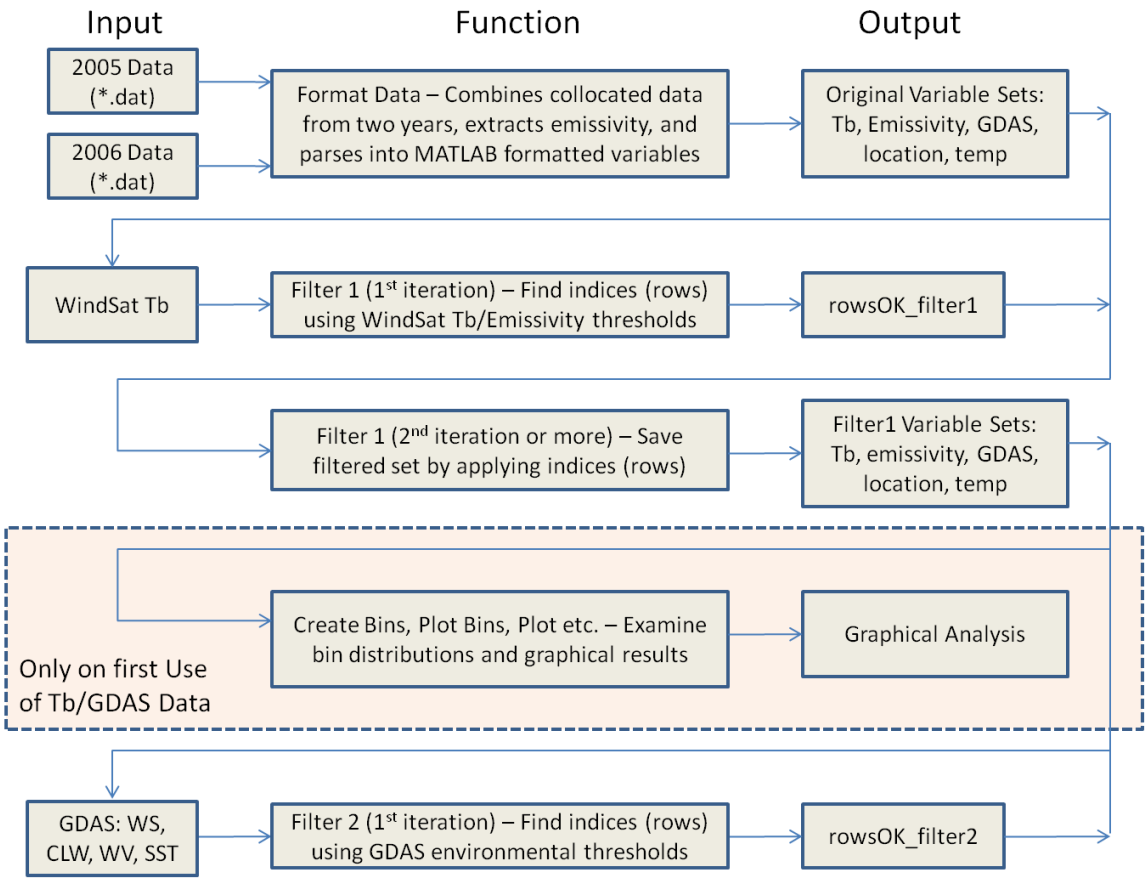
Table 2.2 Maximum WindSat TOA brightness temperatures for each channel

Frequency (GHz) and Polarization	6.8 V	6.8 H	10.7 V	10.7 H	18.7 V	18.7 H	23.8 V	23.8 H	37.0 V	37.0 H
Max Tb (K)	200	120	200	150	250	200	260	230	250	200

Table 2.3: Output from RTM process

Data Element	Description
col 001	WindSat asc/desc flag (asc-0,dsc-1)
col 002	Latitude
col 003	Longitude
col 004	WindSat GMT in minutes
col 005-014	WindSat TOA Tb mean observations (10 channels)
col 015-024	WindSat TOA Tb standard deviations (10 channels)
col 025-029	WindSat incident angles for 5 frequencies
col 030	WindSat counts
col 031-035	Tup
col 036-040	Tdn
col 041-045	tau
col 046-050	XCAL RTM TOA Tb V-pol
col 051-055	XCAL RTM TOA Tb H-pol
col 056-060	CFRSL RTM TOA Tb V-pol
col 061-065	CFRSL RTM TOA Tb H-pol
col 066	GDAS u-wind component
col 067	GDAS v-wind component
col 068	GDAS cloud liquid water
col 069	GDAS or EDR Wind Speed (depending on version)
col 070	GDAS Water Vapor
col 071	GDAS Sea Surface Temperature
col 072	Salinity
col 073	Day
col 074	Month

The *.dat files from the RTM process were combined into a full year of data and reformatted into *.mat files so that they could be more easily processed within MATLAB. This is illustrated as the first line of Fig. 2.3. At first all parameters were combined into a single MATLAB file for processing; however, this method of storing the data slowed down the processing time when it came to generating plots and running operations for a select group of variables. Due to these processing issues as also discussed in section CHAPTER 2, the files had to be separated by parameter types in order to more efficiently conduct analysis for the complete year of data at once. For example, one *.mat file contained measured WindSat TOA Tb for 10 channels, XCAL simulated TOA Tb for 10 channels, and CFRSL simulated TOA Tb for 10 channels. Another *.mat file contained GDAS Wind Speed, Water Vapor, Sea Surface Temperature, and Cloud Liquid Water. At any point that only a portion of the variables were needed for processing, the parameter group was loaded into the MATLAB workspace and the rest of the remaining variables not needed were cleared to increase processing speed. However, if any set of variables were modified as part of the filtering process, the changes made to the one variable set were saved in a separate file and then applied to the remaining variables so that there was always a complete set of collocated ocean surface Tb values (WindSat, XCAL, and CFRSL) and GDAS environmental parameters. The file with the saved changes also allowed new parameters from the original collocated data set to be included at a later stage, such as the latitude and longitude for each collocated set of Tb values and environmental data. The filtering process is described in more detail in Section 2.4.


Input
Function
Output
2005 Data (*.dat)
2006 Data (*.dat)
Format Data – Combines collocated data from two years, extracts emissivity, and parses into MATLAB formatted variables
Original Variable Sets: Tb, Emissivity, GDAS, location, temp
WindSat Tb
Filter 1 (1st iteration) – Find indices (rows) using WindSat Tb/Emissivity thresholds
rowsOK_filter1
Filter 1 (2nd iteration or more) – Save filtered set by applying indices (rows)
Filter1 Variable Sets: Tb, emissivity, GDAS, location, temp
Create Bins, Plot Bins, Plot etc. – Examine bin distributions and graphical results
Graphical Analysis
Only on first Use of Tb/GDAS Data
GDAS: WS, CLW, WV, SST
Filter 2 (1st iteration) – Find indices (rows) using GDAS environmental thresholds
rowsOK_filter2

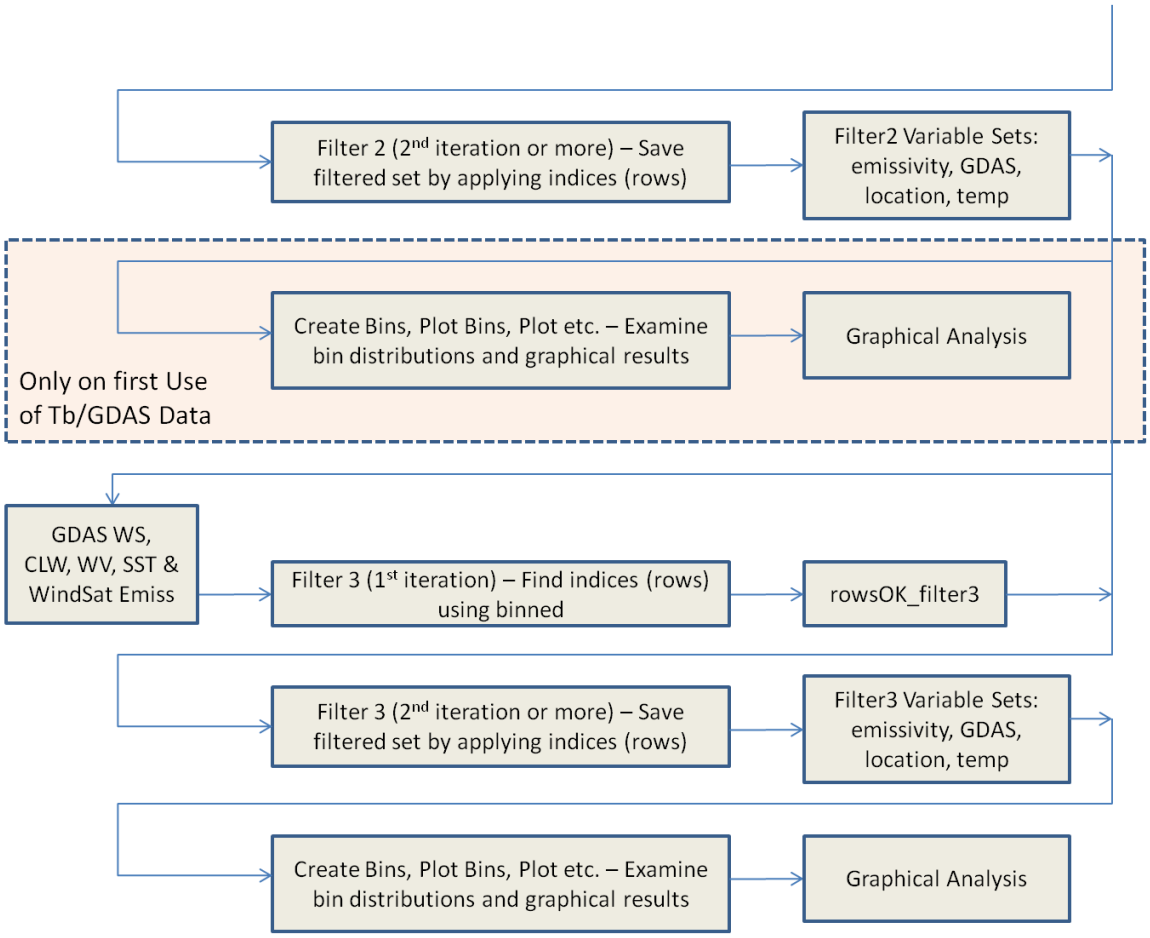


Fig. 2.3 Iterative filtering process of collocated data.

After an initial comparison between WindSat, XCAL, and CFRSL TOA brightness temperatures, it appeared that it would be more useful to compare the emissivity from WindSat and the two models directly. The "main function" was modified to directly calculate XCAL and CFRSL emissivity, but did not include the calculation for the WindSat emissivity as shown in Fig. 2.4. In order to make this comparison, the ocean surface emissivity component had to be extracted from the measured TOA WindSat Tb using the XCAL RTM upwelling (Tup) and downwelling (Tdown) brightness temperature atmospheric components using the GDAS environmental parameters according to

$$e_{WindSat} = \left(\frac{T_{ant(WindSat)} - T_{up}}{e^{-\tau}} - T_{down} \right) / \left(SST - T_{down} \right) \tag{2.1}$$

where T_{ant} is the measured Tb from the WindSat L1C product,

T_{up} is the upwelling brightness temperature,

T_{down} is the down welling brightness temperature,

(including the cosmic contribution of $2.7K*e^{-\tau}$), and

τ is the atmospheric power transmissivity.

Once the emissivity values were extracted from WindSat measured TOA Tb, and modeled by the XCAL and CFRSL emissivity RTMs, the formatting and analysis process as seen in Fig. 2.3 was repeated for the emissivity results. However, graphical analysis was limited for filter 1 and filter 2 since it was already apparent that filter 3 would be applied.

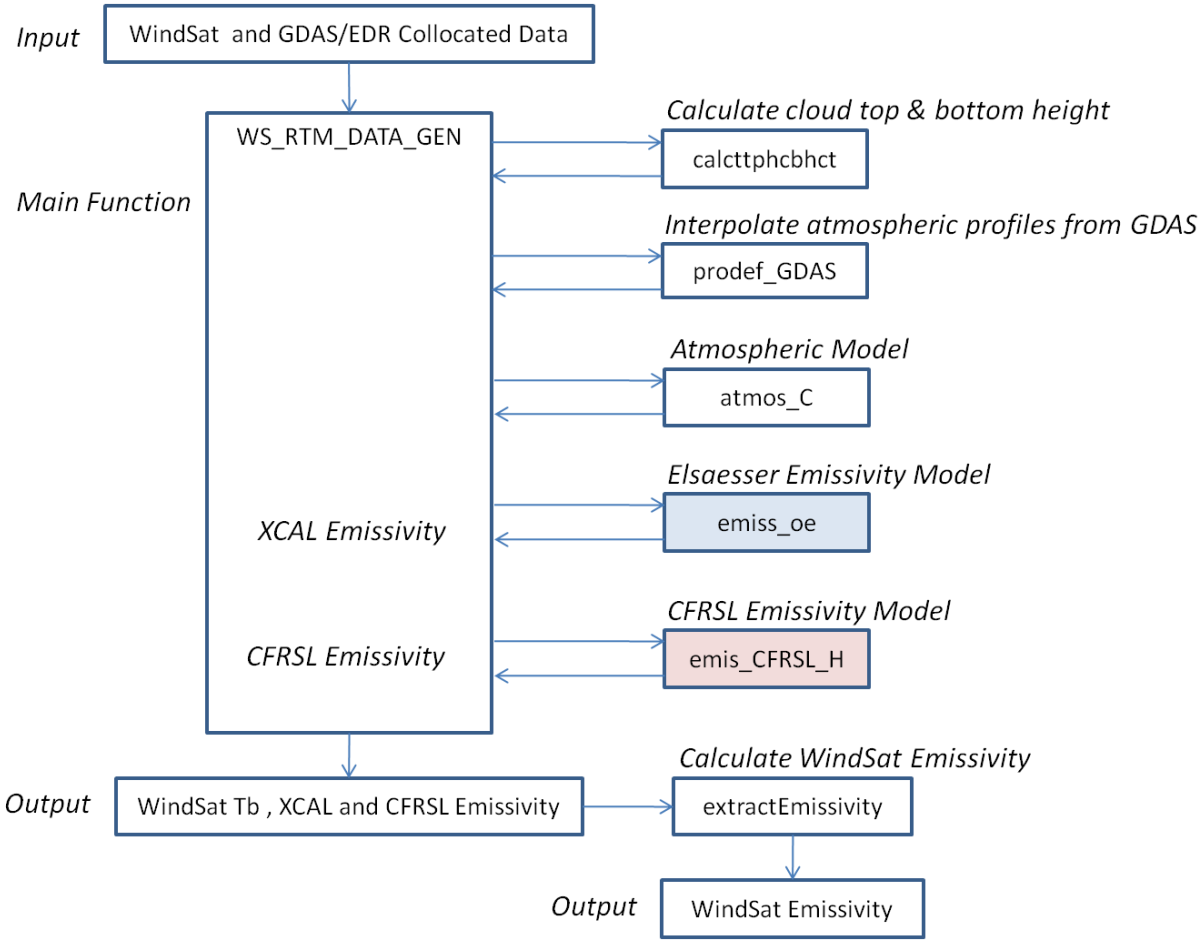


Fig. 2.4 Main function process for running XCAL and CFRSL RTM to generate ocean surface emissivities followed by calculation to generate ocean surface emissivity from WindSat TOA Tb.

2.3 Creation of Binned Data

Scripts were created to divide the collocated data into bins based on five ranges of sea surface temperature as shown in Table 2.4. The bins were also based on thresholds of the GDAS environmental data according to the water vapor and cloud liquid water thresholds used in [11,12], which are designated by low, med, and high in Table 2.4 and explained in Table 2.5.

Table 2.4. Matrix of the bins divided up by specific ranges of geophysical parameters.

	0 ≤ CLW ≤ 0.1	0.1 < CLW ≤ 0.2	0.2 < CLW ≤ 0.5
	0 < SST ≤ 10		
0 < WV ≤ 20	bin_111	no data	no data
20 < WV ≤ 40	bin_121	no data	no data
40 < WV ≤ 70	bin_131	no data	no data
	10 <SST≤ 20		
0 < WV ≤ 20	bin_211	no data	no data
20 < WV ≤ 40	bin_221	no data	no data
40 < WV ≤ 70	bin_231	no data	no data
	20 <SST≤ 25		
0 < WV ≤ 20	bin_311	no data	no data
20 < WV ≤ 40	bin_321	no data	no data
40 < WV ≤ 70	bin_331	no data	no data
	25 <SST≤ 30		
0 < WV ≤ 20	bin_411	no data	no data
20 < WV ≤ 40	bin_421	no data	no data
40 < WV ≤ 70	bin_431	no data	no data
	30 < SST ≤ 35		
0 < WV ≤ 20	bin_511	no data	no data
20 < WV ≤ 40	bin_521	no data	no data
40 < WV ≤ 70	bin_531	no data	no data

Table 2.5: Classification of geophysical parameters.

Geophysical Parameter Classifications	Water Vapor (mm)	Cloud Liquid Water (mm)
Low	0 < WV ≤ 20	0 ≤ CLW ≤ 0.1
Medium	20 < WV ≤ 40	0.1 < CLW ≤ 0.2
High	40 < WV ≤ 70	0.2 < CLW ≤ 0.5

Within each environmental bin, brightness temperature and emissivity were sub-divided into 1 m/s wind speed bins in order to calculate the mean and standard deviation as seen in CHAPTER 3 plots.

2.4 Filters Applied to Bins

As previously discussed, for each 1º Box, there were three keys of quality control filters based on aspects of the collocated data. The first filter removed collocations containing observed TOA brightness temperatures above or below reasonable ocean Tb thresholds (75 K - 285 K). The second filter removed collocations corresponding to unreasonable GDAS parameter values for sea surface temperature, cloud liquid water, water vapor, and wind speed. The third filter removed Tb outliers, which were beyond three standard deviations of the mean of 2 m/s wind speed bins, which were created within each of the fifteen environmental bin distributions shown in Table 2.4.

The first filter proved to be partially redundant to the initial thresholds applied to the measured TOA WindSat Tb values prior to the XCAL and CFRSL RTM generation.

The second filter was applied after it was noticed that there were unreasonable simulated Tb values generated in several plots of bins where no maximum had been set for one of the GDAS parameters. The second filter was a direct result of the thresholds shown in Table 2.5, which at first did not have absolute lower and upper limits, which is how they were specified in reference [11, 12]. In addition to applying filter 2, the thresholds were modified as a redundant effort to ensure that lower and upper limits of reasonable values for WV and CLW were taken into account given the GDAS dataset that was provided. Without the lower and upper limits for each of the environmental parameters, both the XCAL and CFRSL RTMs would have generated abnormal ranges of Tb values as seen in Fig. 2.5. For example, the upper limit was set to 70 for water vapor since it was discovered that there existed bogus GDAS data that needed to be eliminated. Unusually high levels of WS, SST, and WV can be seen in Fig. 2.6 as well as extremely low values CLW.

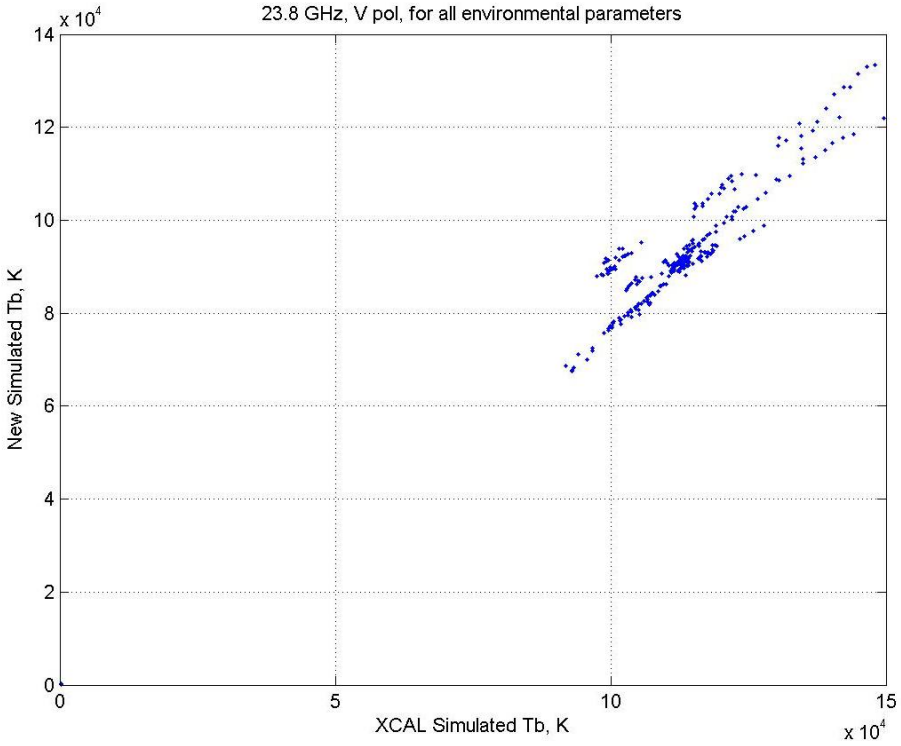


Fig. 2.5: Example of erroneous Tb values due to erroneous GDAS parameters.

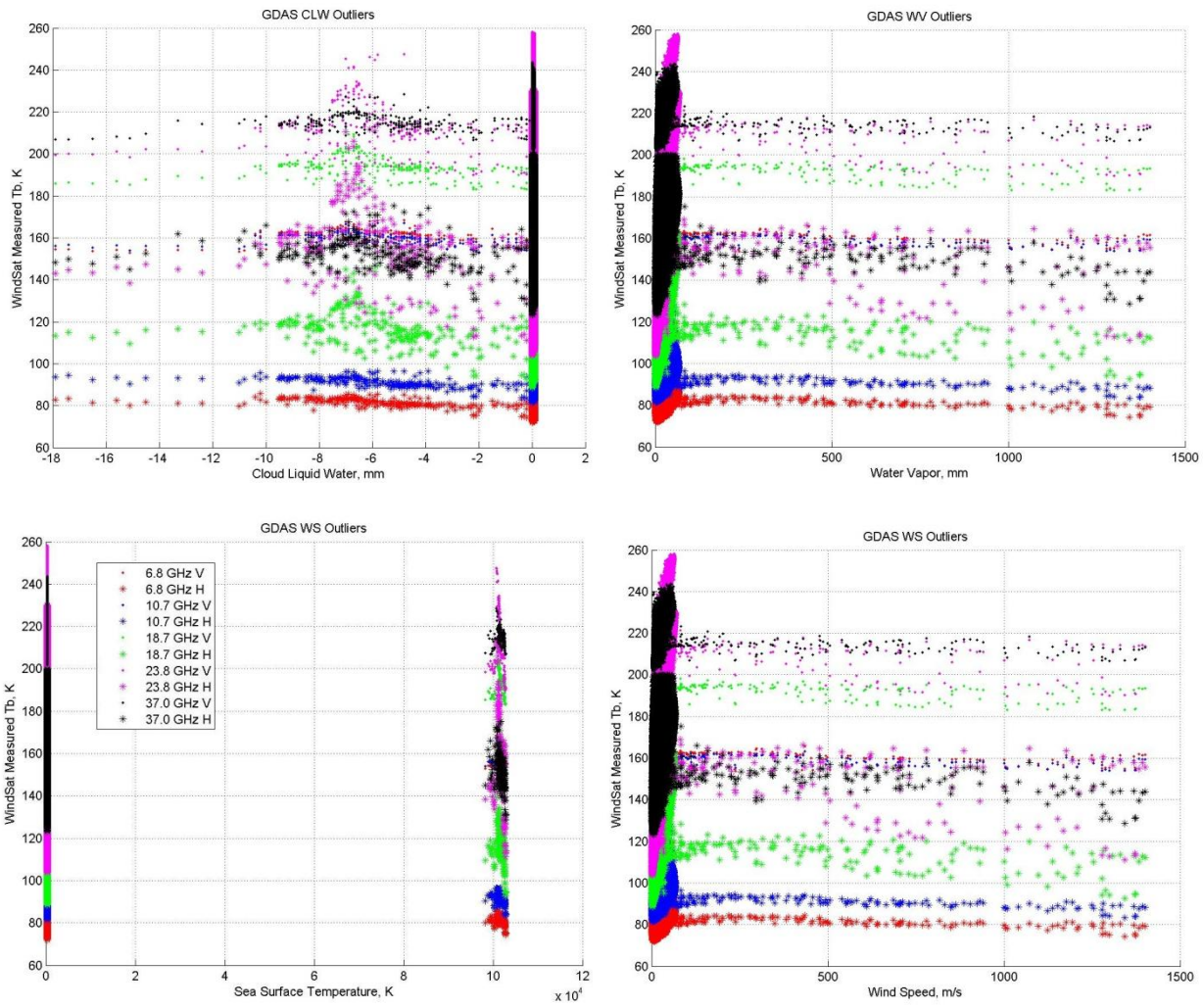
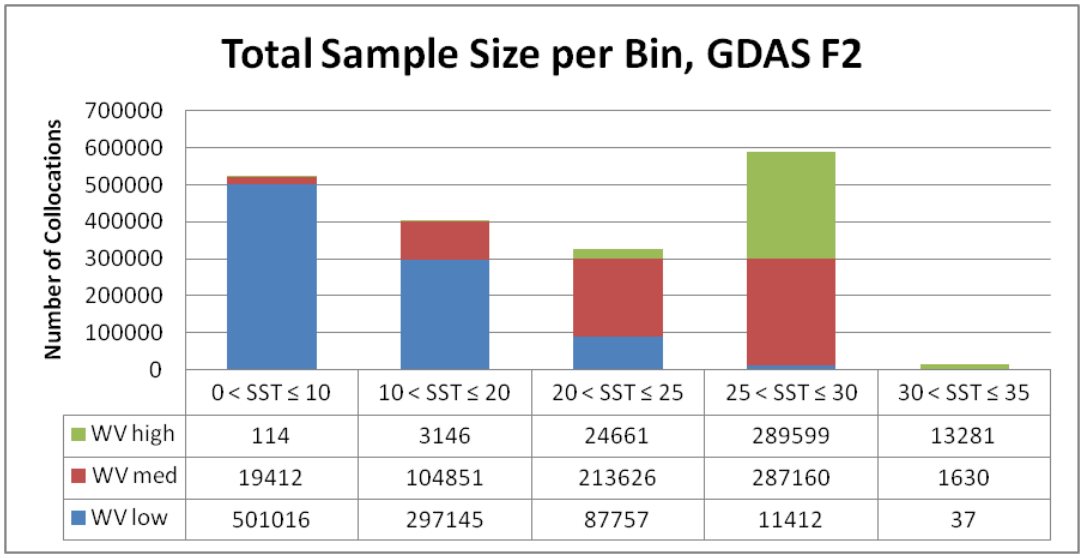


Fig. 2.6: Example of extreme outliers in GDAS environmental data.

Due to the filters that were applied to the WindSat data set prior to generating the simulated Tb values, there were no bins populated corresponding to medium and high CLW ranges. All of the measured and simulated Tb values corresponded to $0 \leq \text{CLW} \leq 0.1$ mm and therefore no data was available for higher levels of CLW as was noted in Table 2.4. The remaining distribution of the bins after filter 2 was applied is shown in Fig. 2.7 for the data set using GDAS wind speeds. The location of the

removed GDAS parameters is shown in Fig. 2.8, which shows that the erroneous data mainly came from one particular orbit.



	0 < SST ≤ 10	10 < SST ≤ 20	20 < SST ≤ 25	25 < SST ≤ 30	30 < SST ≤ 35
WV high	114	3146	24661	289599	13281
WV med	19412	104851	213626	287160	1630
WV low	501016	297145	87757	11412	37

Fig. 2.7: Distribution of bins for filter 2 using GDAS wind speed.

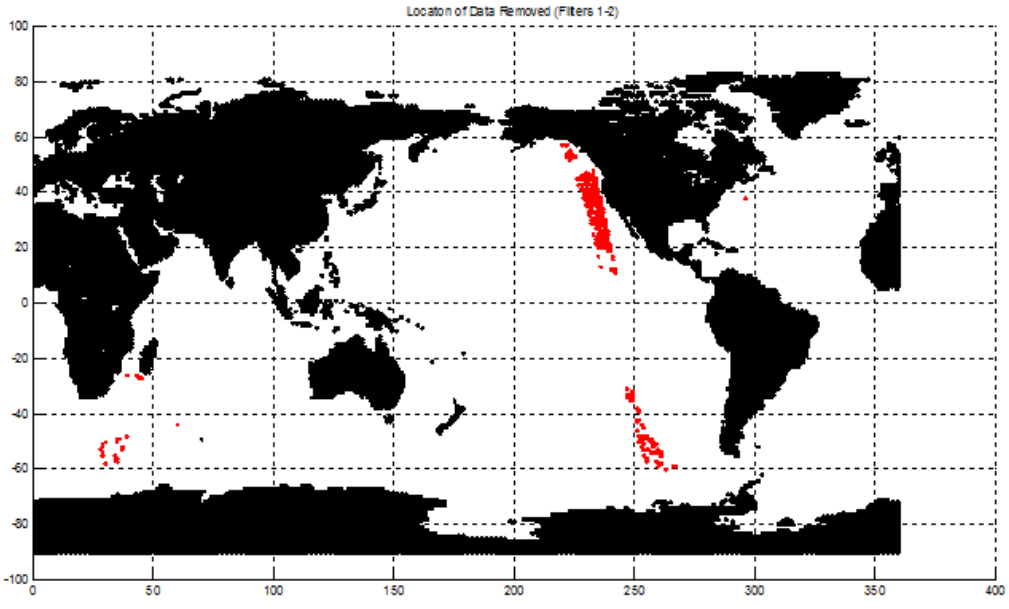


Fig. 2.8: Location of removed data corresponding to erroneous GDAS data.

For the third filter, each bin was further broken down into 2 m/s wind speed bins. The third filter was applied based on the WindSat emissivity distribution within each wind speed sub-bin. All 1° Boxes were removed if they were associated with WindSat emissivity values outside three standard deviations. In other words, the data set (in addition to Filter1 and Filter2) for which |Binned WindSat Emissivity| < 3 std deviations was kept. The reduction in noisy data points can be seen in Fig. 2.9. The distribution of bins after filter 3 was applied is shown in Fig. 2.10 for the data set using GDAS wind speeds and in Fig. 2.11 for the data set using EDR wind speeds. Filter 3 reduced the total sample population by 140,311 out of the total 1,928,332 samples for the collocated data set using GDAS wind speeds. For the same collocated data set using GDAS wind speeds, filter 3 reduced the sample population by 66,826 out of the 1,854,847 samples that had filter 2 applied. In general, the distribution of bin sizes was very similar between the data set using the EDR wind speeds and the data set using the GDAS wind speeds even though the data set with the EDR wind speeds was smaller than the data set with GDAS wind speeds.

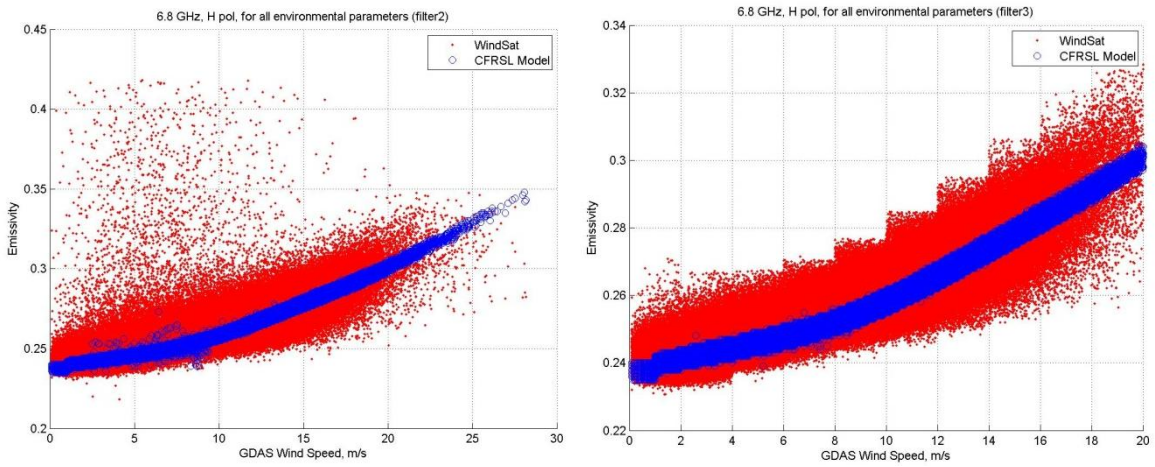


Fig. 2.9. The plot on the right shows the reduction in noise of the data set due to the application of the third filter.

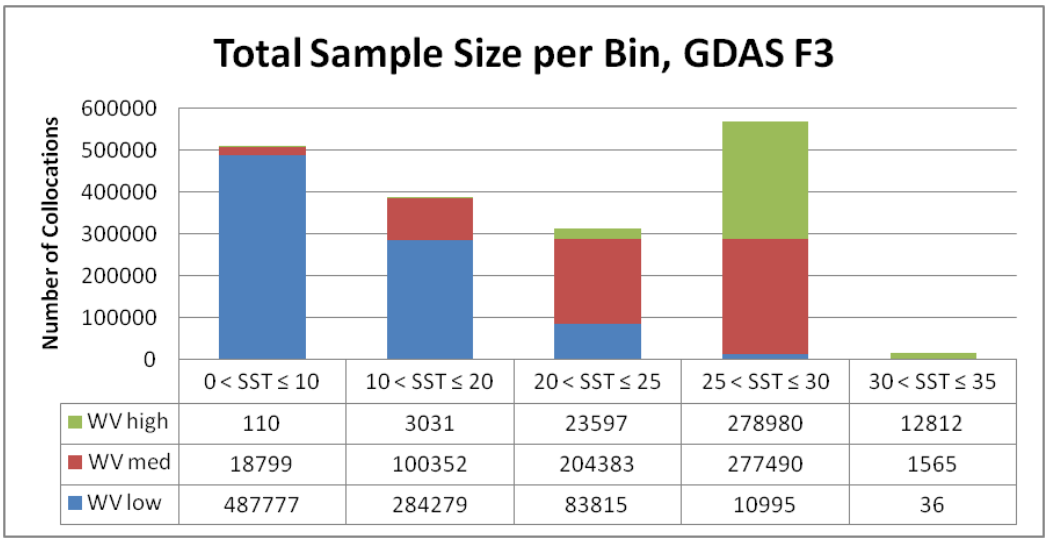


Fig. 2.10 Distribution of bins for filter 3 using GDAS wind speeds.

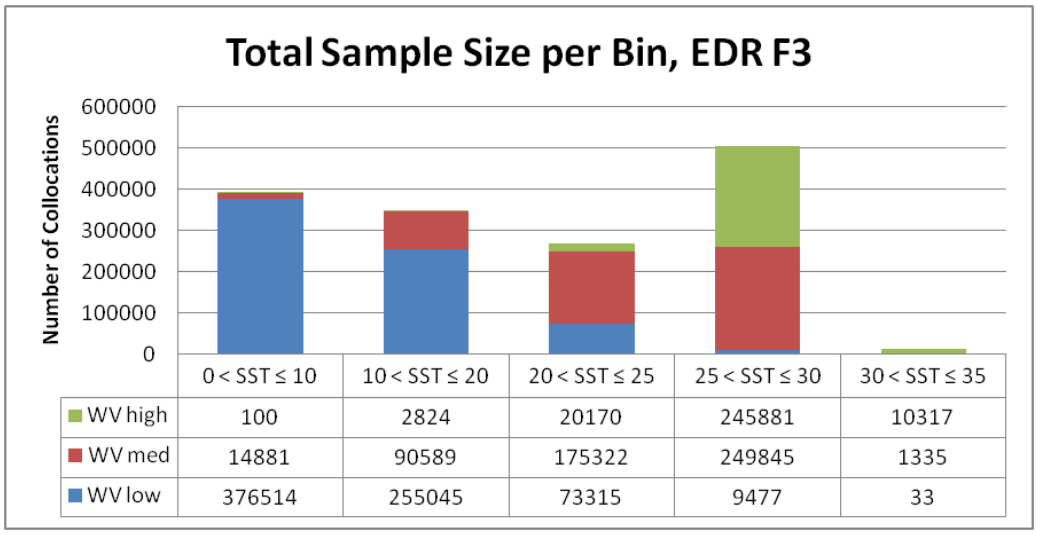
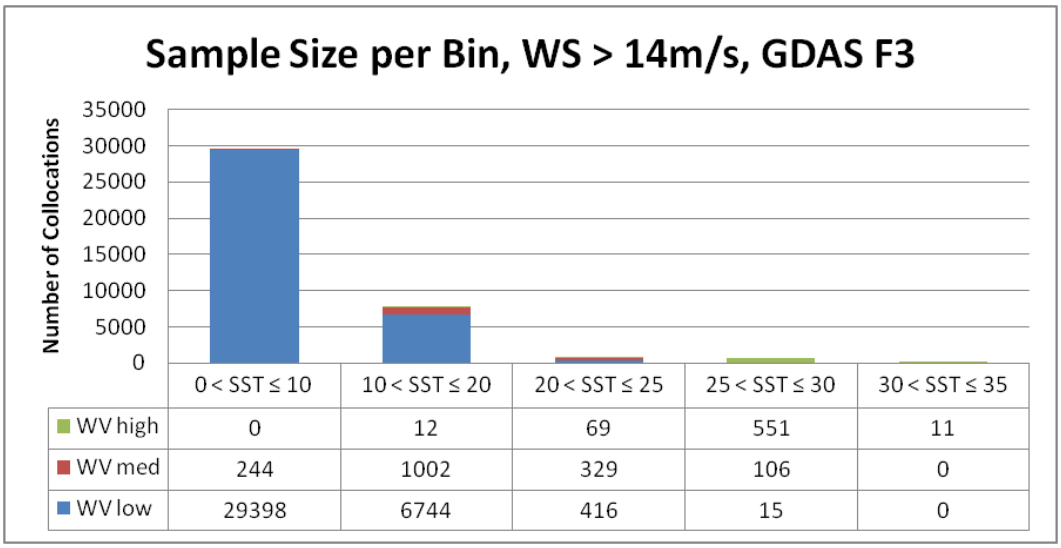


Fig. 2.11 Distribution of bins for filter 3 using EDR wind speeds.

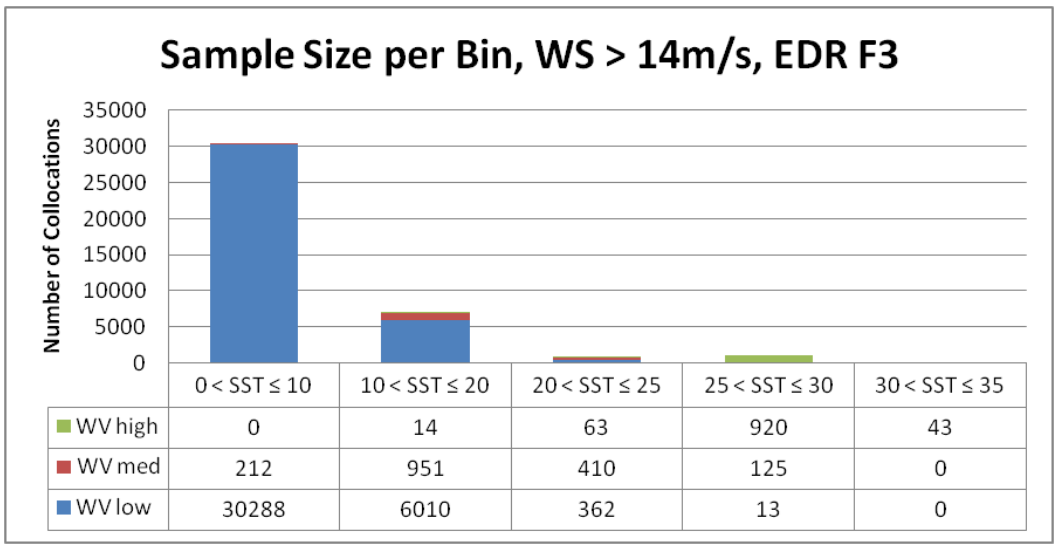
It was also useful to note the distribution of bins as related to high wind speeds so that the most significant bins for analysis were chosen to have a good distribution of wind speeds. Fig. 2.12 and Fig. 2.13 show that the $0 < SST \leq 10$ and low WV bin is the most populated bin with high wind speeds in

addition to being one of the most populated bins overall. As a result, the $0 < SST \leq 10$ and low WV bin was chosen to demonstrate the results shown in CHAPTER 3. Results for additional populated bins are shown in APPENDIX A: ADDITIONAL EMISSIVITY PLOTS.



	0 < SST ≤ 10	10 < SST ≤ 20	20 < SST ≤ 25	25 < SST ≤ 30	30 < SST ≤ 35
WV high	0	12	69	551	11
WV med	244	1002	329	106	0
WV low	29398	6744	416	15	0

Fig. 2.12 Distribution of bins for filter 3 using GDAS wind speed > 14 m/s.



	0 < SST ≤ 10	10 < SST ≤ 20	20 < SST ≤ 25	25 < SST ≤ 30	30 < SST ≤ 35
WV high	0	14	63	920	43
WV med	212	951	410	125	0
WV low	30288	6010	362	13	0

Fig. 2.13 Distribution of bins for filter 3 using EDR wind speed > 14 m/s.

2.5 Assessment of Bins of Interest

The histograms of the WindSat measured Tb and emissivity, XCAL modeled Tb and emissivity, and CFRSL modeled Tb and emissivity were plotted for all the channels. The histograms were divided up into bins according to SST, CLW, and WV values as shown in Table 2.4 and were furthered divided into 2 m/s wind speed ranges. For each histogram, the-x axis values were divided into 500 evenly spaced bins to show the distribution. The Tb count generally follows a Gaussian distribution, especially for highly populated bins. The wind speed bin with the highest count and a good Gaussian distribution is in the 6 to 8 m/s range. An example is shown in Fig. 2.14.

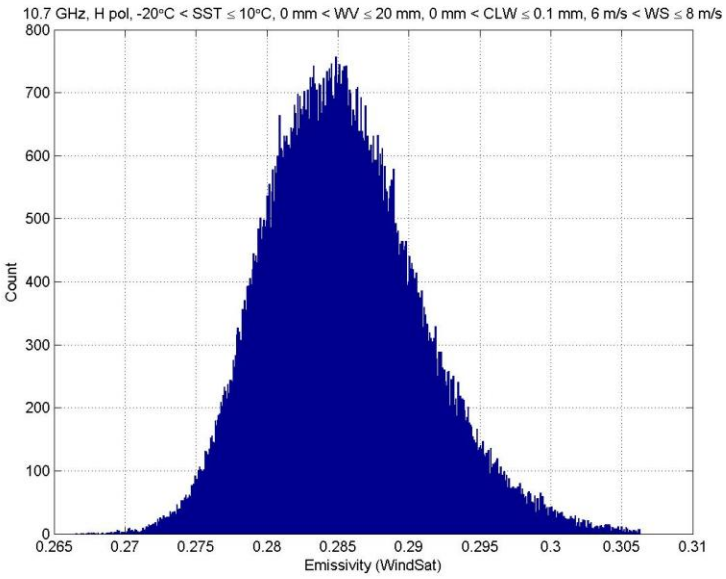


Fig. 2.14: Histogram of WindSat brightness temperature bin.

CHAPTER 3: RESULTS AND DISCUSSION

3.1 Comparison of Brightness Temperature

The following figures show the comparison between the WindSat TOA brightness temperature and the RTM brightness temperatures using the XCAL and the CFRSL models, after applying the three filters discussed above in section 2.4. We selected the most populated environmental parameter bin of: 0 C < SST < 10 C and low water vapor, because these results have the least atmospheric effects, which affect the calculated WindSat results. Overall the comparisons among the three methods are excellent with small dc offsets of a few Kelvin; but the most important metric is how well the Tb's track with the change in surface wind speed and SST. The H-pol results are the best with the curves being nearly identical after the means are removed; however, for the V-pol comparisons, there are significant differences in the wind speed dependence that varies with frequency. This is clearly illustrated in Fig. 3.6 - Fig. 3.10, where the difference (delta Tb) between the simulated Tb and the measured WindSat Tb for the XCAL model and the CFRSL model are plotted after the bias has been removed. Clearly, the V polarization consistently shows a larger range of delta Tb between the two models.

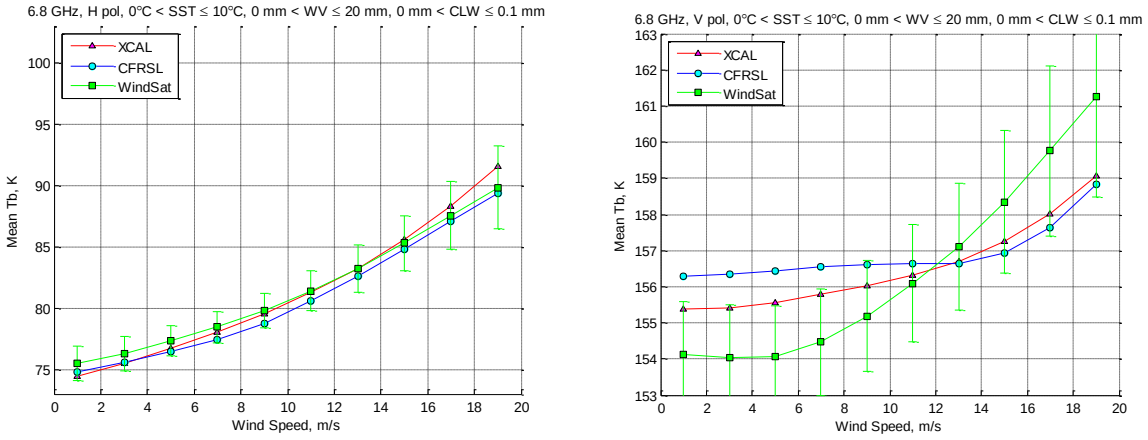


Fig. 3.1: Brightness Temperature comparison versus GDAS wind speeds at 6.8 GHz for h-pol and v-pol.

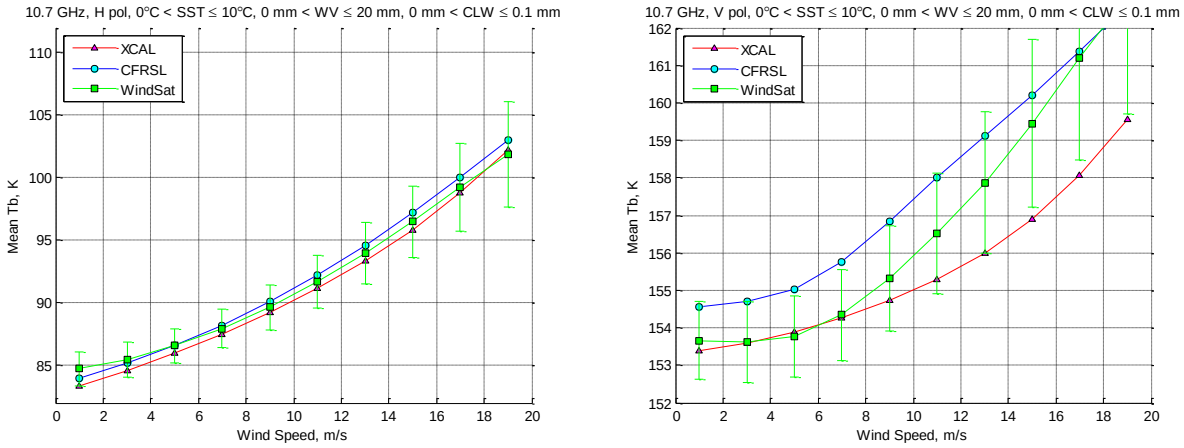


Fig. 3.2: Brightness Temperature comparison versus GDAS wind speeds at 10.7 GHz for h-pol and v-pol.

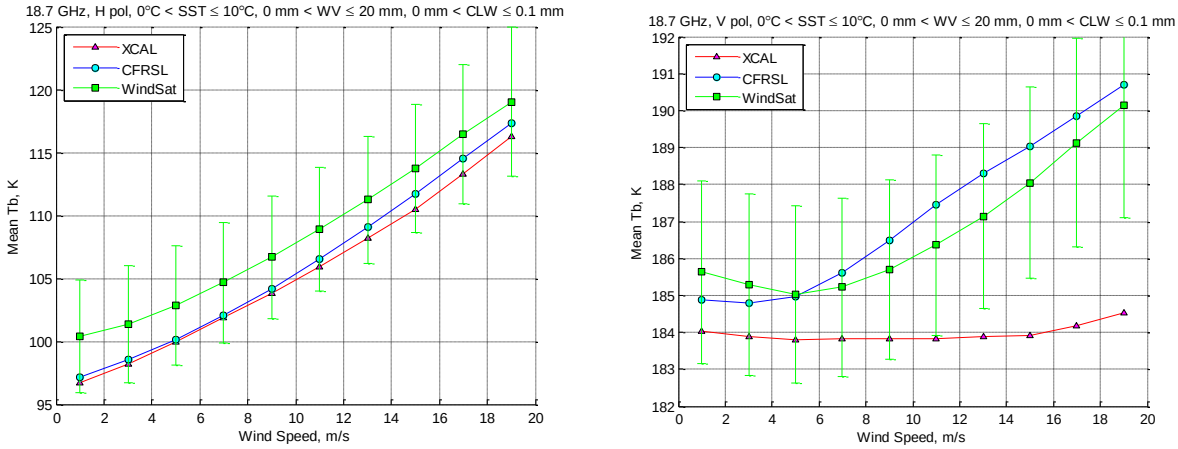


Fig. 3.3: Brightness Temperature comparison versus GDAS wind speeds at 18.7 GHz for h-pol and v-pol.

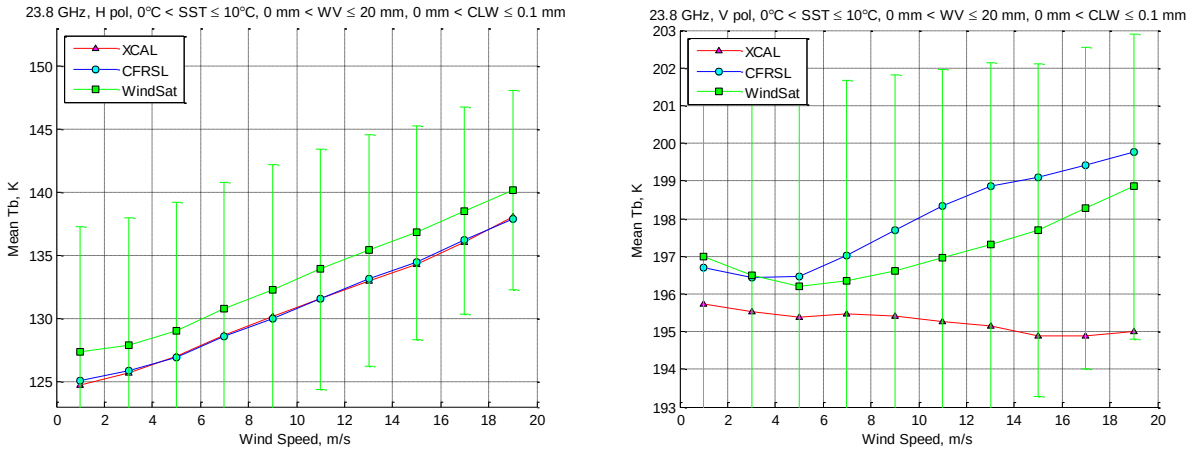


Fig. 3.4: Brightness Temperature comparison versus GDAS wind speeds at 23.8 GHz for h-pol and v-pol.

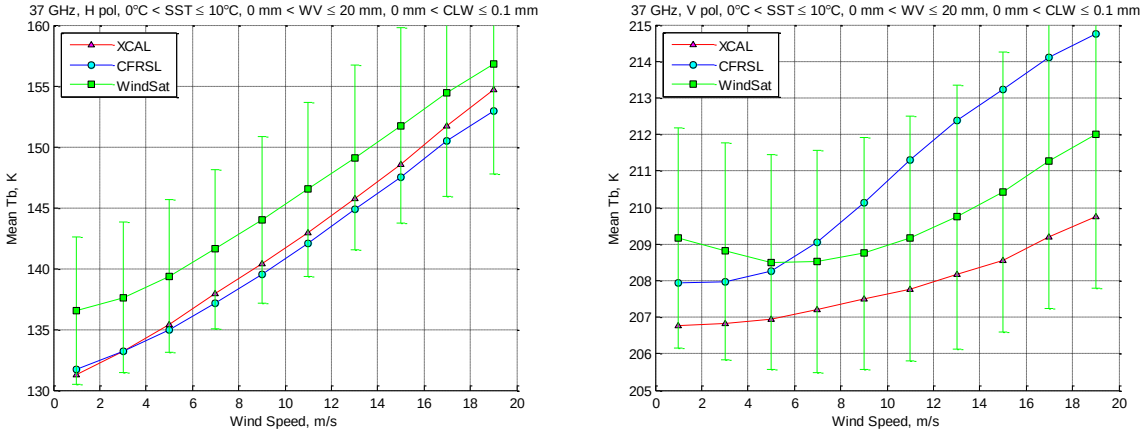


Fig. 3.5: Brightness Temperature comparison versus GDAS wind speeds at 37.0 GHz for h-pol and v-pol.

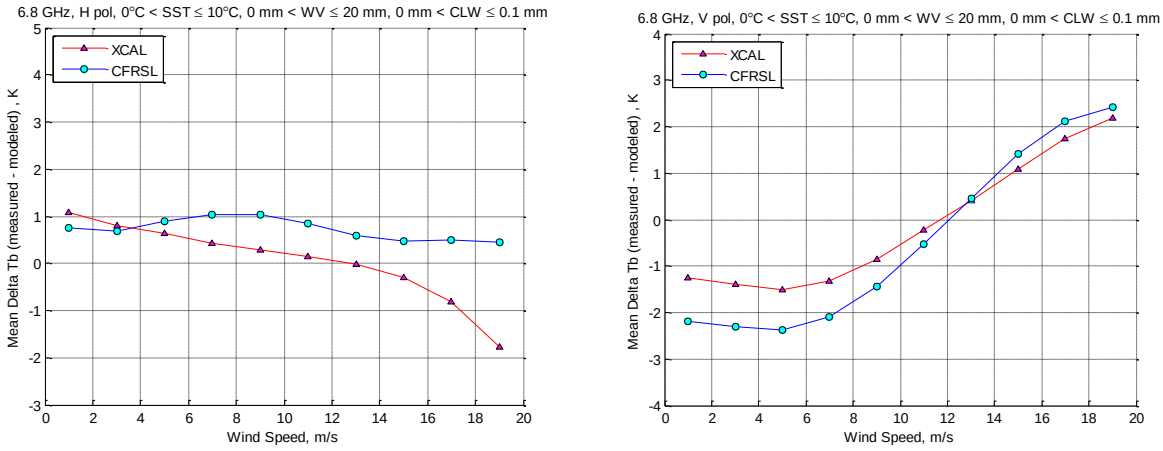


Fig. 3.6: Delta Tb comparison versus GDAS wind speeds at 6.8 GHz for h-pol and v-pol.

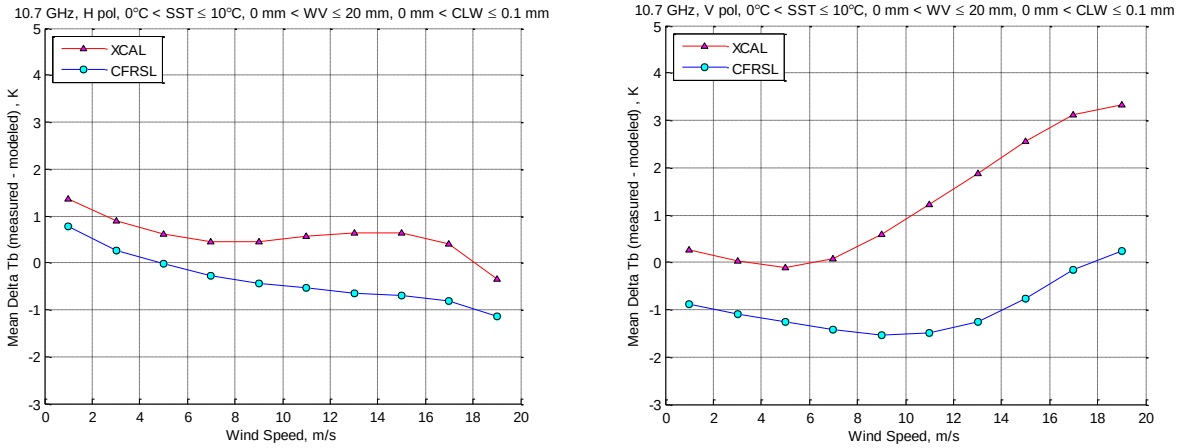


Fig. 3.7: Delta Tb comparison versus GDAS wind speeds at 10.7 GHz for h-pol and v-pol.

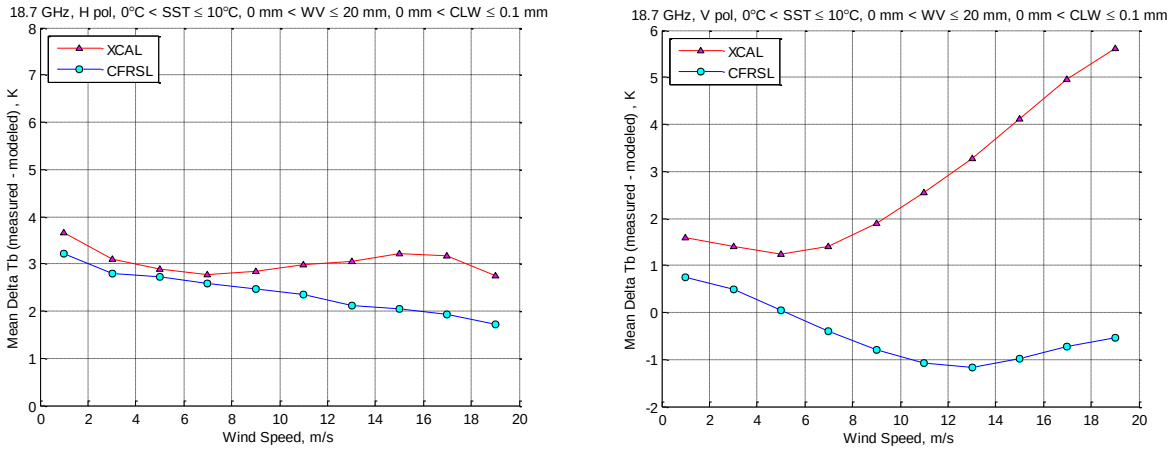


Fig. 3.8: Delta Tb comparison versus GDAS wind speeds at 18.7 GHz for h-pol and v-pol.

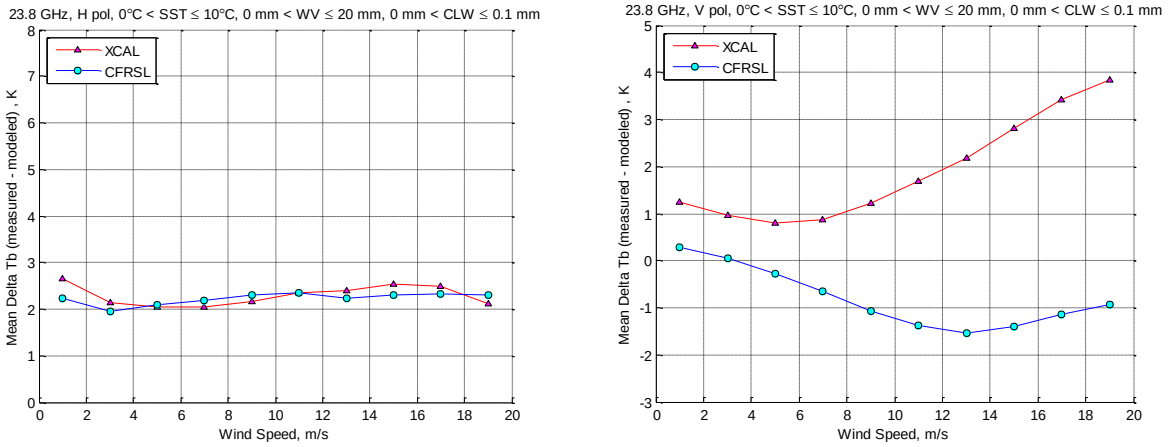


Fig. 3.9: Delta Tb comparison versus GDAS wind speeds at 23.8 GHz for h-pol and v-pol.

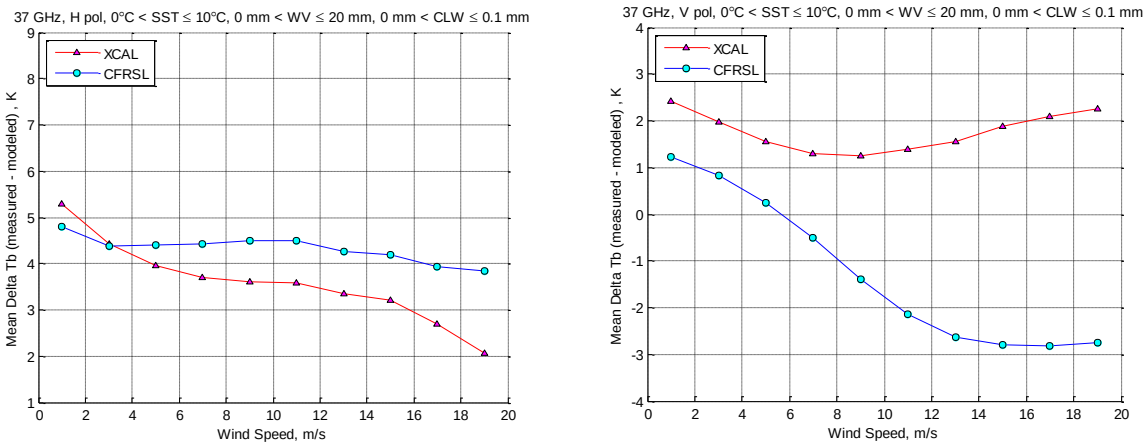


Fig. 3.10: Delta Tb comparison versus GDAS wind speeds at 37.0 GHz for h-pol and v-pol.

3.2 Comparison of Emissivity as a Function of GDAS Wind Speeds

The following results show comparison of WindSat derived emissivity and the modeled emissivity for XCAL and CFRSL against GDAS wind speed. The WindSat emissivity for the following plots was extracted from the measured TOA WindSat Tb using the XCAL RTM upwelling (Tup) and downwelling (Tdown) brightness temperature atmospheric components using the GDAS environmental parameters according to

$$e_{WindSat} = \left(\frac{T_{ant(WindSat)} - T_{up}}{e^{-\tau}} - T_{down} \right) / \left(SST - T_{down} \right) \qquad (3.1)$$

where T_{ant} is the measured Tb from the WindSat L1C product,

T_{up} is the upwelling brightness temperature,

T_{down} is the down welling brightness temperature,

(including the cosmic contribution of $2.7K*e^{-\tau}$), and

τ is the atmospheric power transmissivity.

The XCAL and CFRSL models generated emissivity for the same collocated GDAS environmental parameters (wind speed, cloud liquid water, and water vapor) in addition to frequency, polarization, salinity, and frequency-dependent earth incidence angle. The emissivity comparisons are more consistent and have better tracking in the H pol as also seen with the Tb comparisons. The results for the V pol show a greater range of fluctuation even after a bias is removed to compare the delta Tb's as shown in Fig. 3.16 - Fig. 3.20.

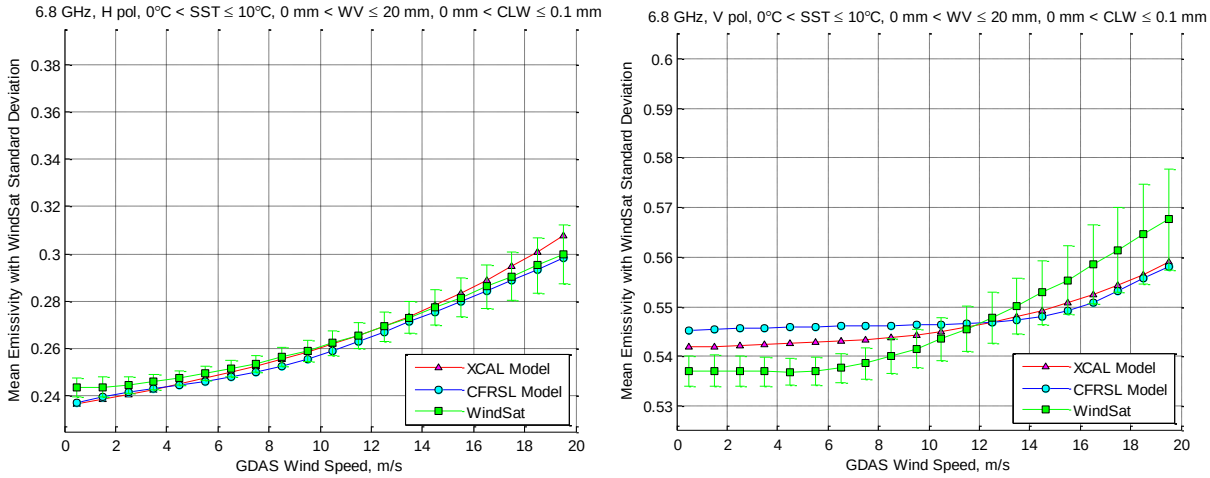


Fig. 3.11: Emissivity comparison versus GDAS wind speeds at 6.8 GHz for h-pol and v-pol.

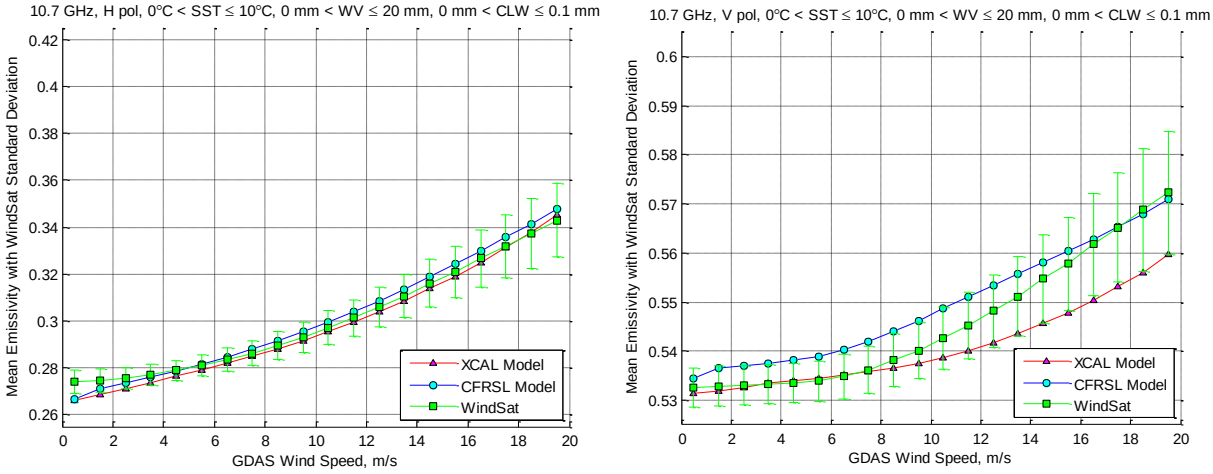


Fig. 3.12: Emissivity comparison versus GDAS wind speeds at 10.7 GHz for h-pol and v-pol.

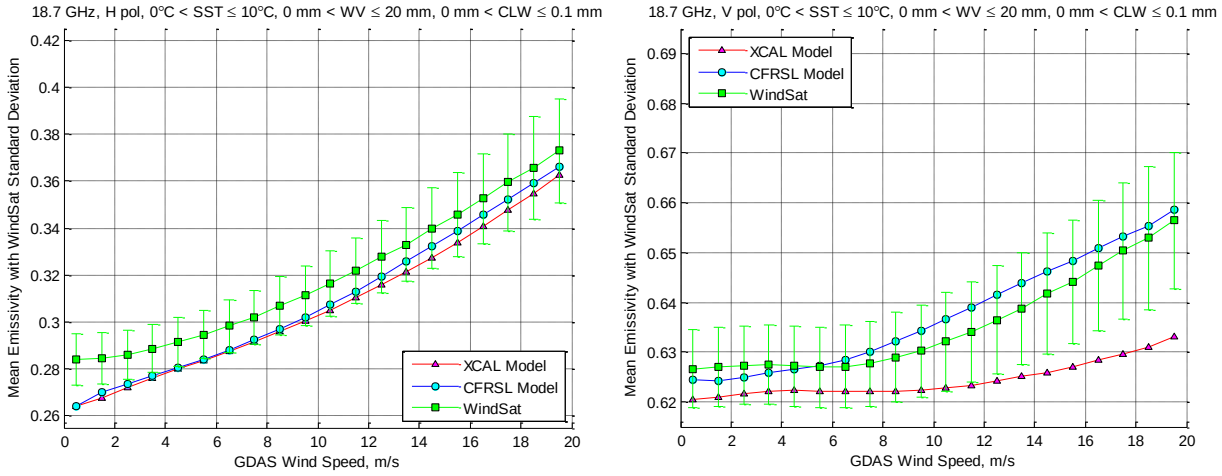


Fig. 3.13: Emissivity comparison versus GDAS wind speeds at 18.7 GHz for h-pol and v-pol.

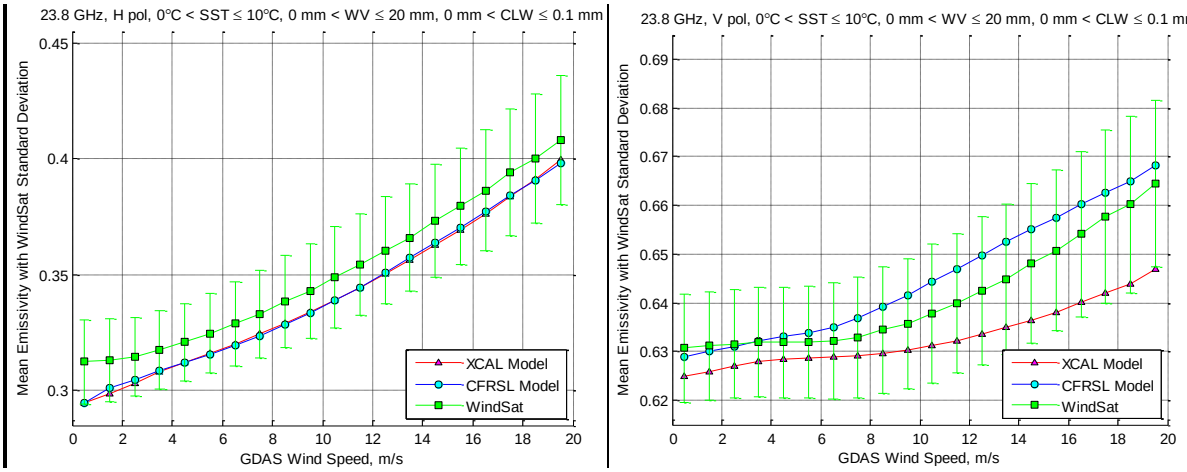


Fig. 3.14: Emissivity comparison versus GDAS wind speeds at 23.8 GHz for h-pol and v-pol.

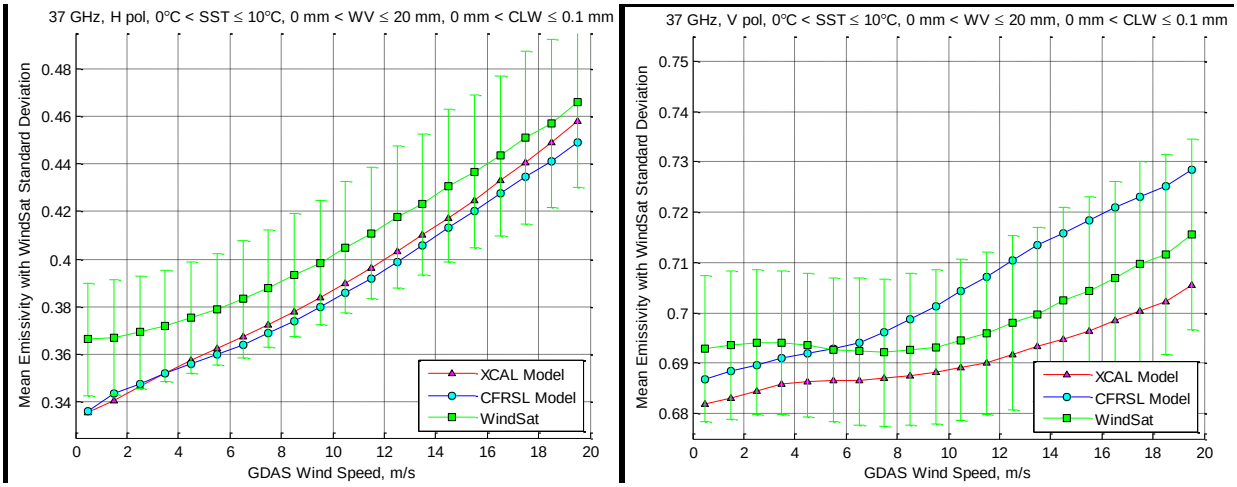


Fig. 3.15: Emissivity comparison versus GDAS wind speeds at 37 GHz for h-pol and v-pol

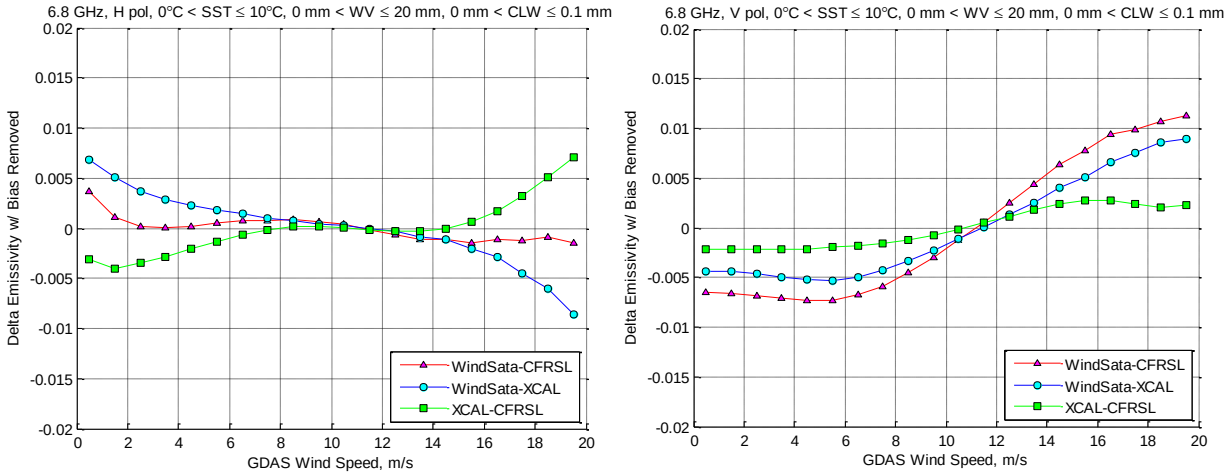


Fig. 3.16: Delta emissivity comparison versus GDAS wind speeds at 6.8 GHz for h-pol and v-pol.

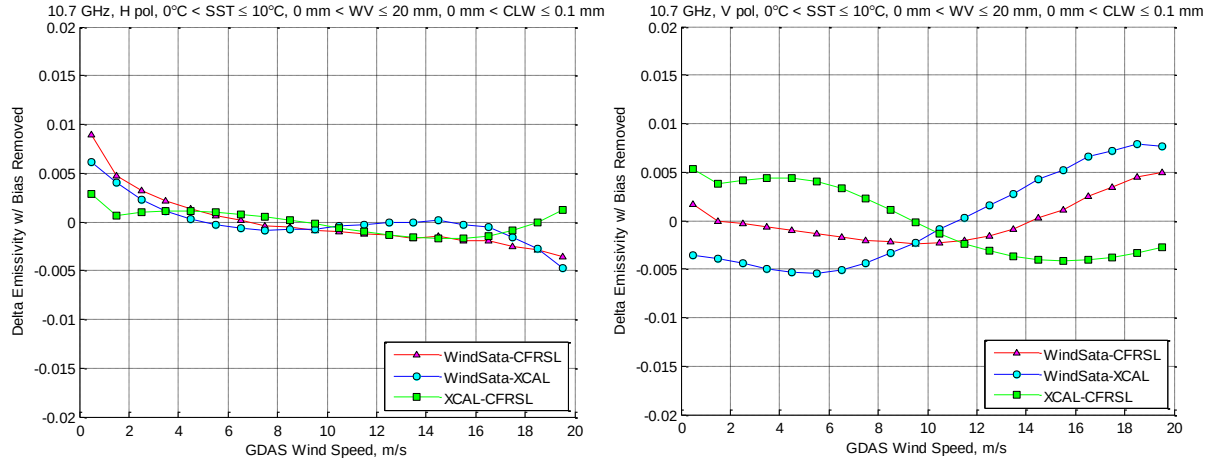


Fig. 3.17: Delta emissivity comparison versus GDAS wind speeds at 10.7 GHz for h-pol and v-pol.

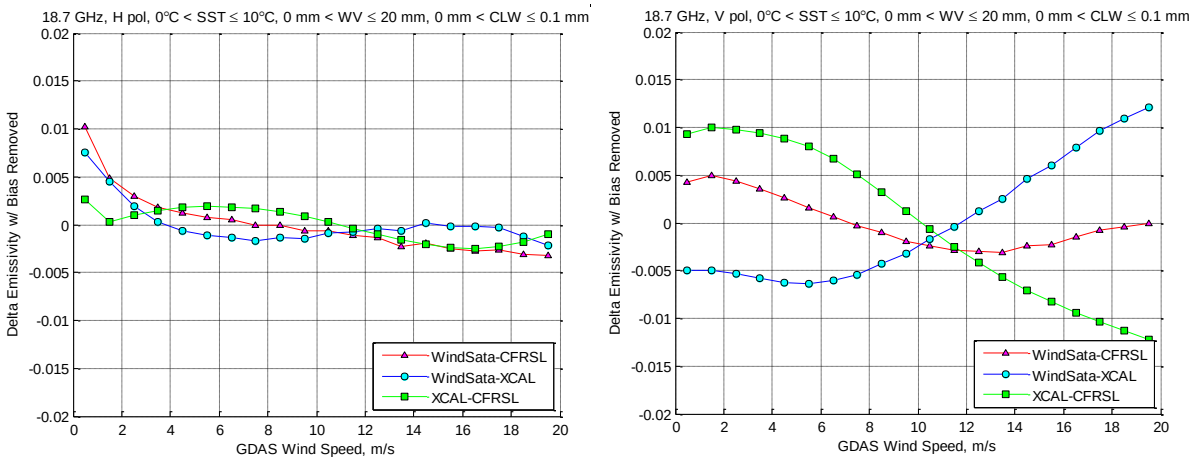


Fig. 3.18: Delta emissivity comparison versus GDAS wind speeds at 18.7 GHz for h-pol and v-pol.

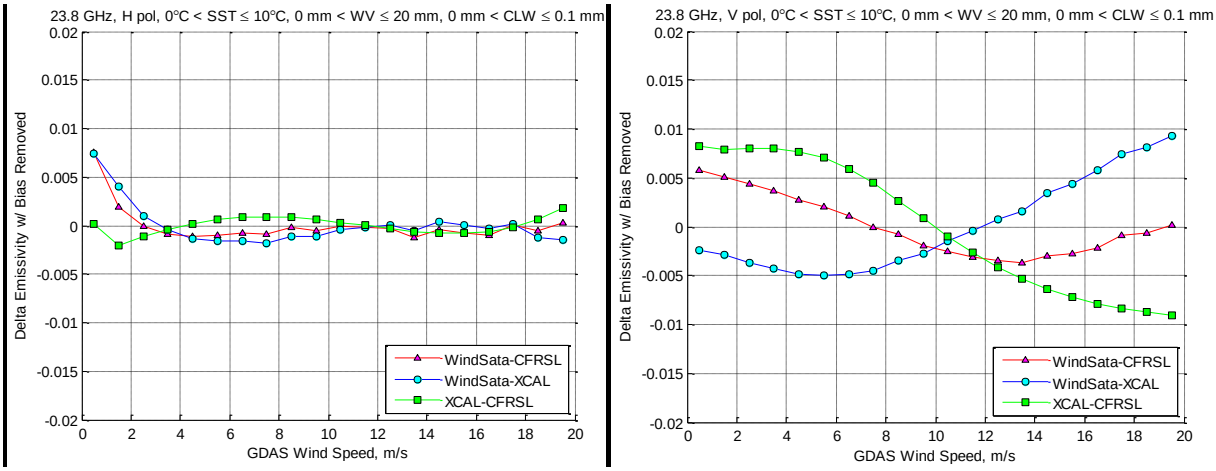


Fig. 3.19: Delta emissivity comparison versus GDAS wind speeds at 23.8 GHz for h-pol and v-pol.

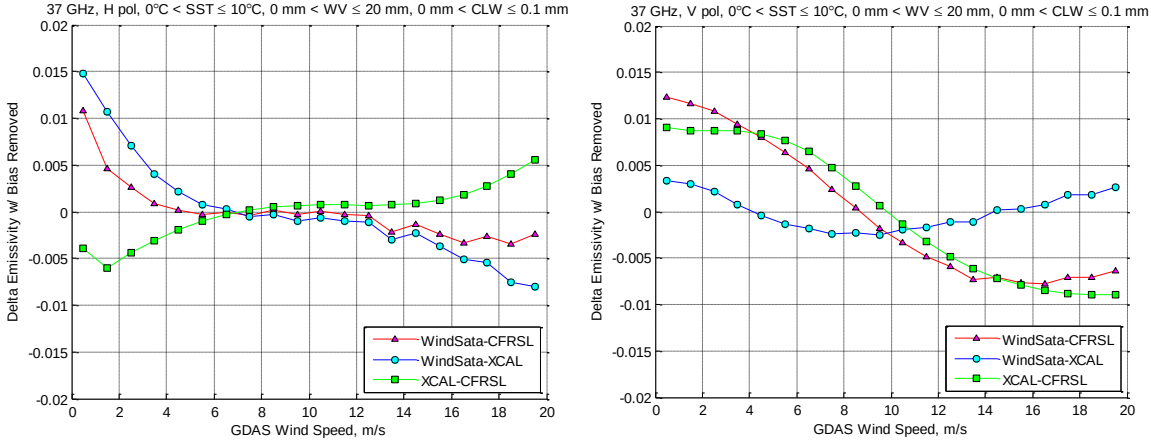


Fig. 3.20: Delta emissivity comparison versus GDAS wind speeds at 37.0 GHz for h-pol and v-pol.

3.3 Comparison of Emissivity as a Function of EDR Wind Speeds

The following results show comparison of WindSat derived emissivity and the modeled emissivity for XCAL and CFRSL against wind speeds retrieved from WindSat. The WindSat emissivity for the following plots was extracted from the measured TOA WindSat Tb using the XCAL RTM upwelling (Tup) and downwelling (Tdown) brightness temperature atmospheric components using the GDAS environmental parameters according to the same process shown in section 3.2. As done for the previous section, the XCAL and CFRSL simulated emissivity is generated for the collocated GDAS environmental parameters (cloud liquid water and water vapor) in addition to frequency, polarization, salinity, and frequency-dependent earth incidence angle, but with the WindSat EDR wind speeds being utilized as opposed to the GDAS wind speeds. There is excellent tracking between the XCAL and CFRSL emissivity models and the WindSat calculated emissivity, especially for all frequencies of the H polarization. On the other hand, there are larger differences for the V polarization comparisons.

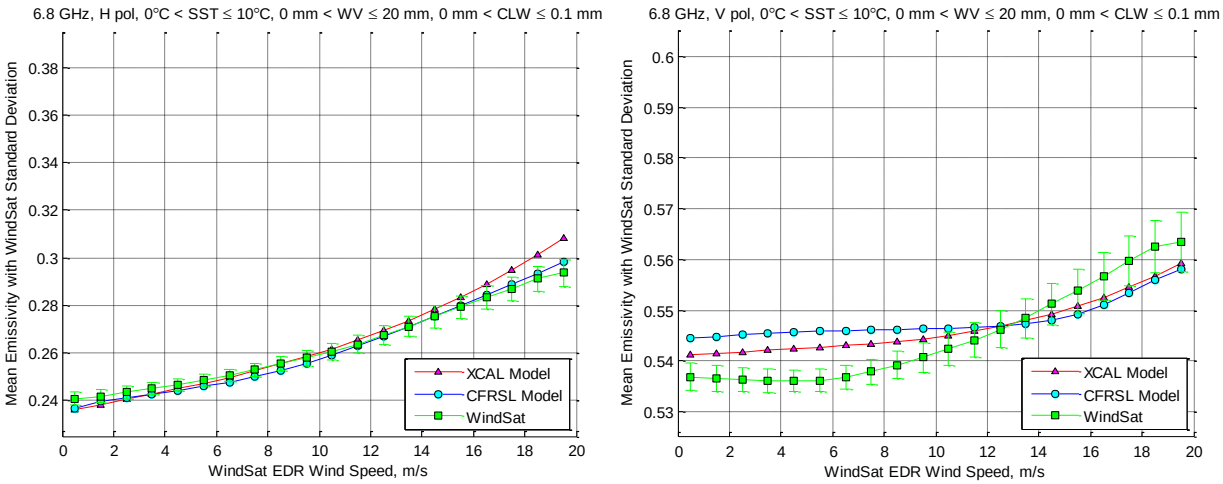


Fig. 3.21: Emissivity comparison versus EDR wind speeds at 6.8 GHz for h-pol and v-pol.

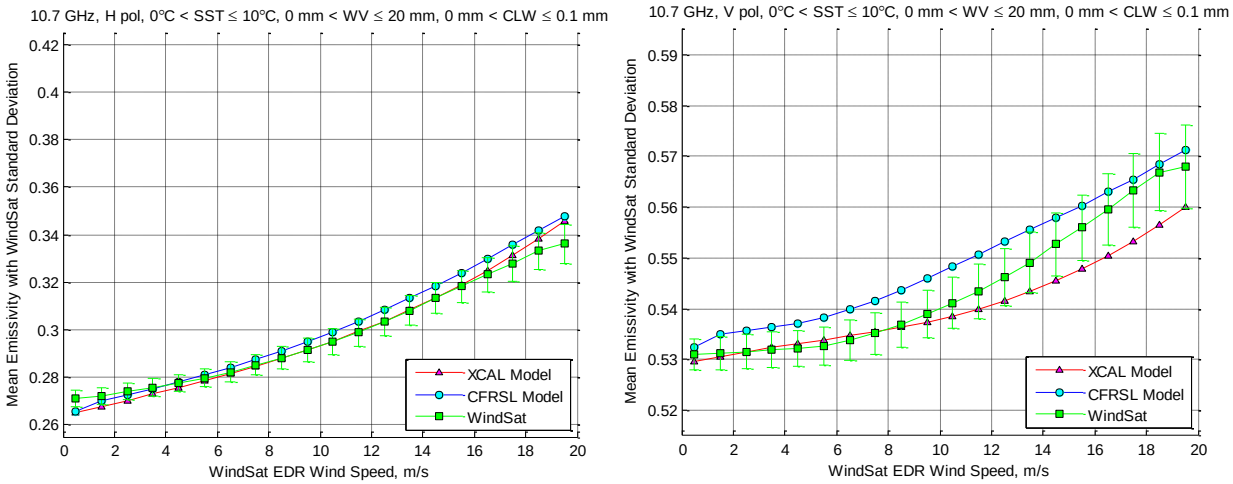


Fig. 3.22: Emissivity comparison versus EDR wind speeds at 10.7 GHz for h-pol and v-pol.

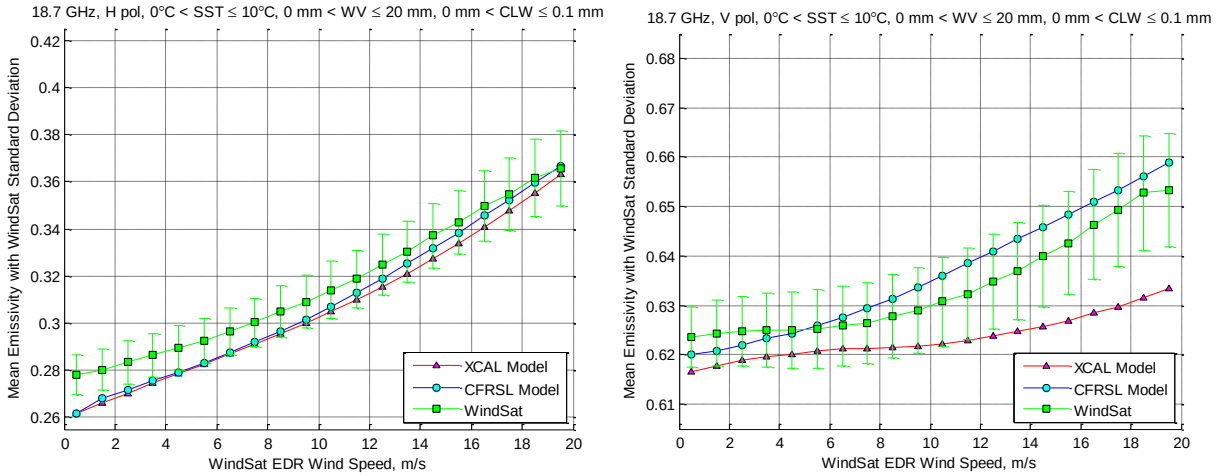


Fig. 3.23: Emissivity comparison versus EDR wind speeds at 18.7GHz for h-pol and v-pol.

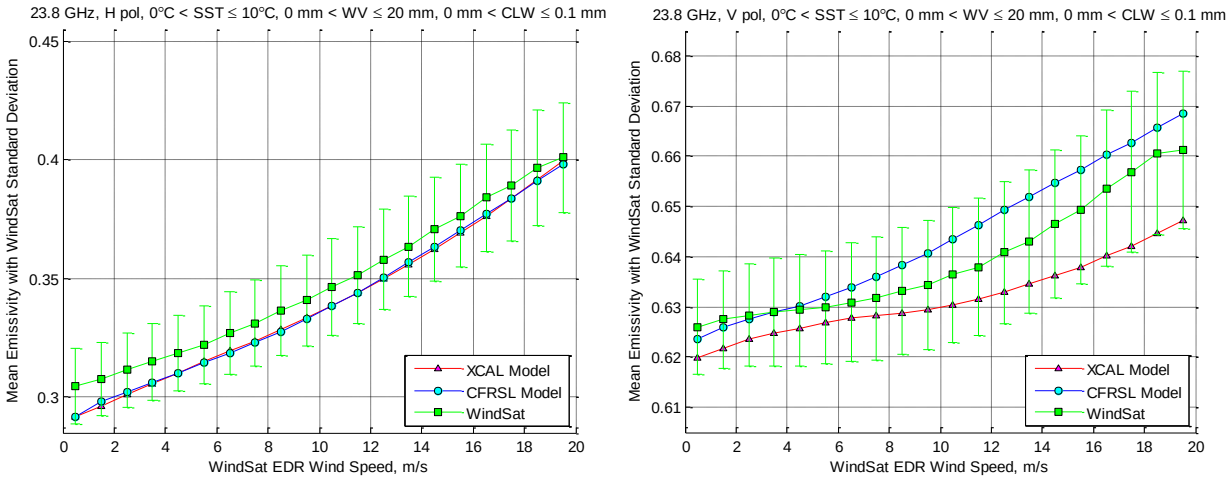


Fig. 3.24: Emissivity comparison versus EDR wind speeds at 23.8 GHz for h-pol and v-pol.

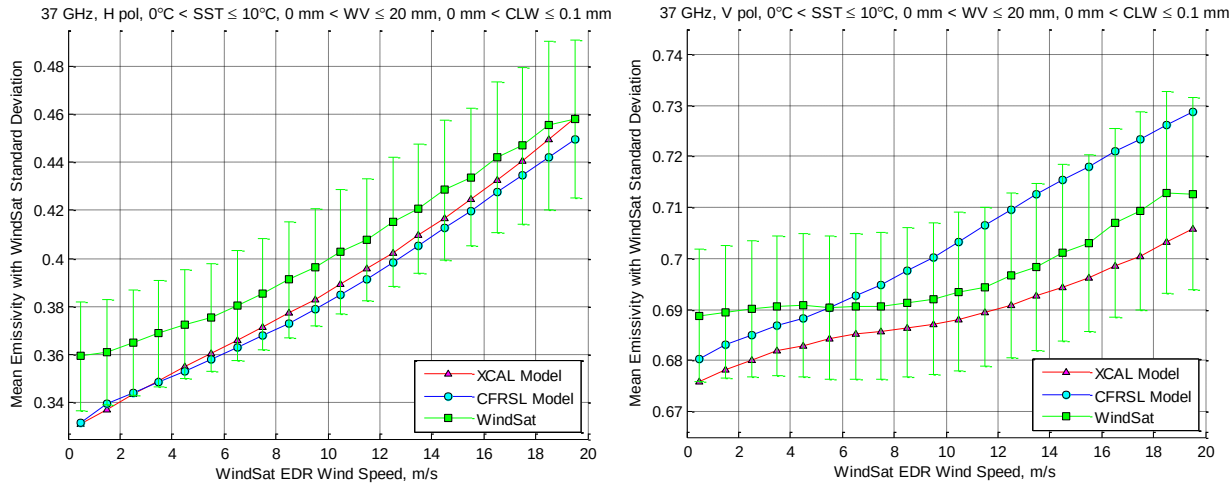


Fig. 3.25: Emissivity comparison versus EDR wind speeds at 37.0 GHz for h-pol and v-pol.

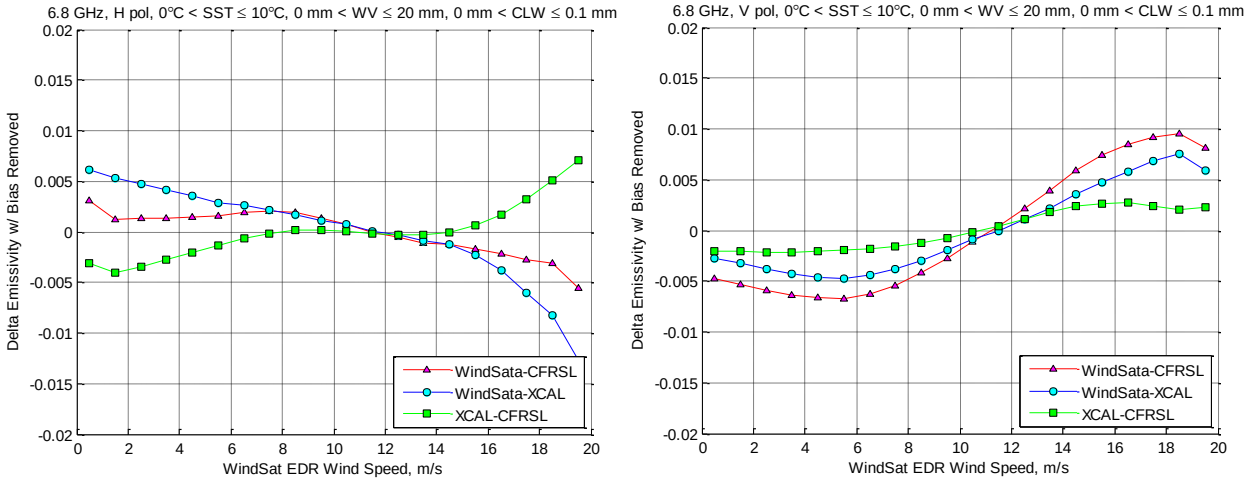


Fig. 3.26: Delta Emissivity comparison versus EDR wind speeds at 6.8 GHz for h-pol and v-pol.

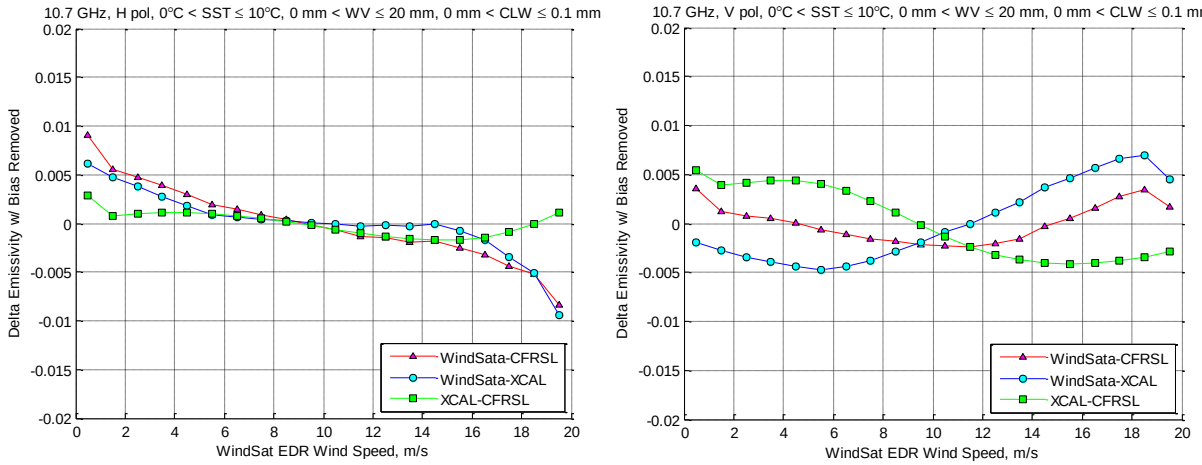


Fig. 3.27: Delta Emissivity comparison versus EDR wind speeds at 10.7 GHz for h-pol and v-pol.

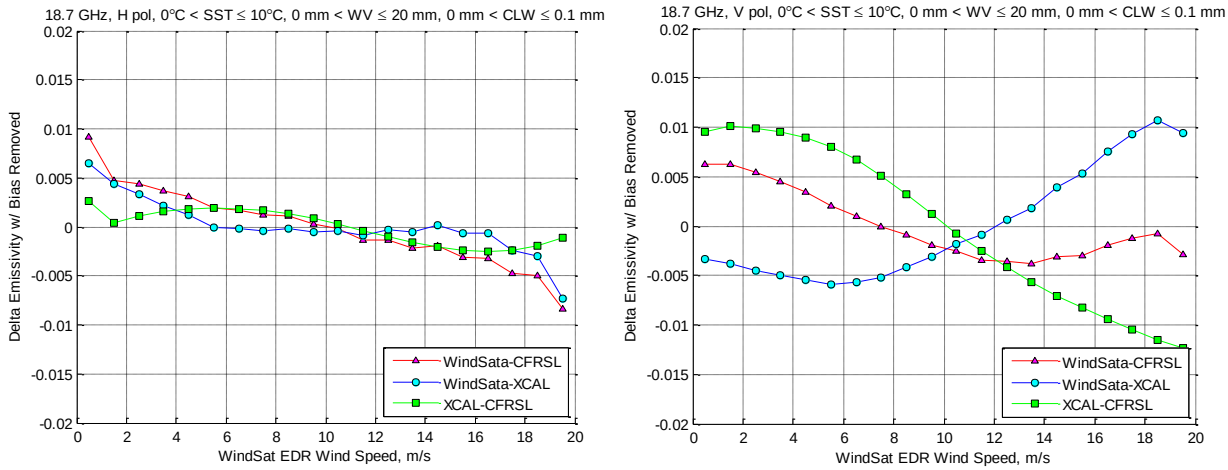


Fig. 3.28: Delta Emissivity comparison versus EDR wind speeds at 18.7 GHz for h-pol and v-pol.

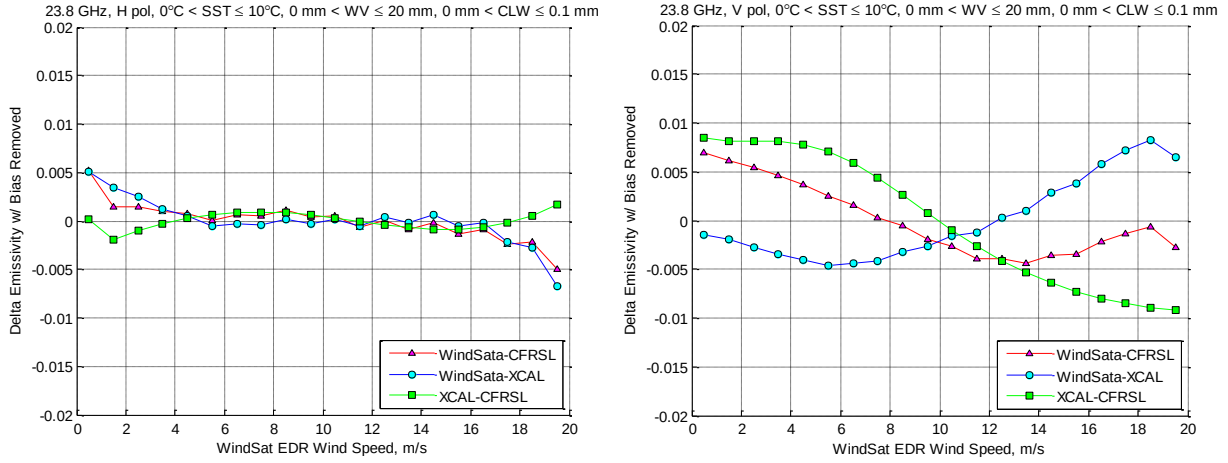


Fig. 3.29: Delta Emissivity comparison versus EDR wind speeds at 23.8 GHz for h-pol and v-pol.

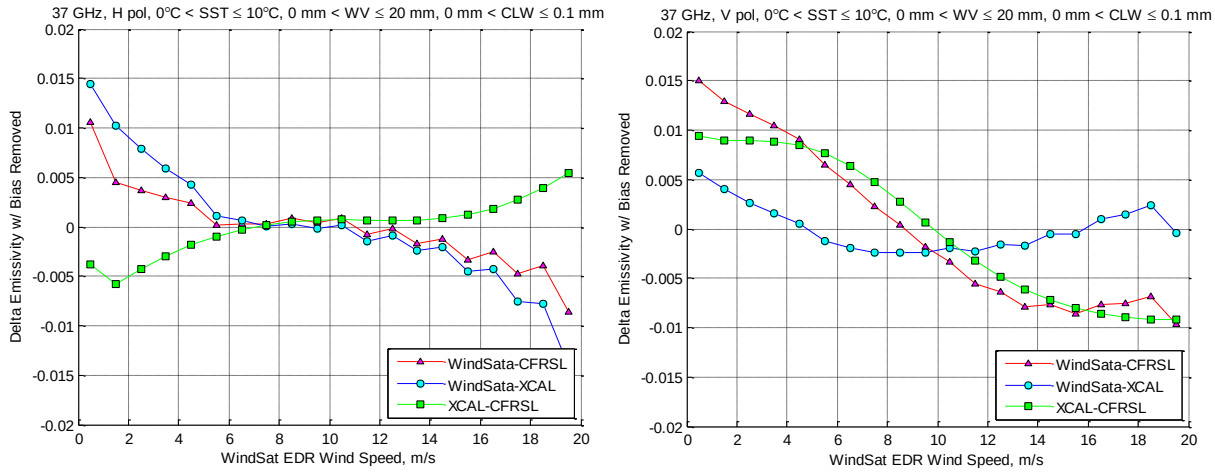


Fig. 3.30: Delta Emissivity comparison versus EDR wind speeds at 37.0 GHz for h-pol and v-pol.

3.4 Comparison of Emissivity as a Function of Sea Surface Temperature

The following results show the XCAL and CFRSL simulated emissivity compared to the calculated WindSat emissivity across sea surface temperatures from 0 to 30 C, averaged in 5 C sea surface temperature bins. The emissivity for these bins is limited to 0 mm < WV ≤ 20 mm, 0 mm ≤ CLW ≤ 0.1 mm, and 4 m/s < WS ≤ 8 m/s for each comparison plot. There are two sets of results; Fig. 3.31-Fig. 3.35 uses GDAS Wind Speeds and Fig. 3.36-Fig. 3.40 uses EDR wind speeds. For each set of data, the range of emissivity across sea surface temperatures increases with frequency, so that you see there is much less dependency on sea surface temperatures at 6.8 GHz than there is at 37.0 GHz. In general, the emissivity from WindSat tracks very well with the XCAL and CFRSL emissivities with only a DC bias separating the curves. Between the two polarizations, the V pol has more consistent tracking since the H pol WindSat emissivity starts to increase its separation from the simulated emissivities at higher sea surface temperatures for the 18.7 GHz and 23.8 GHz frequencies.

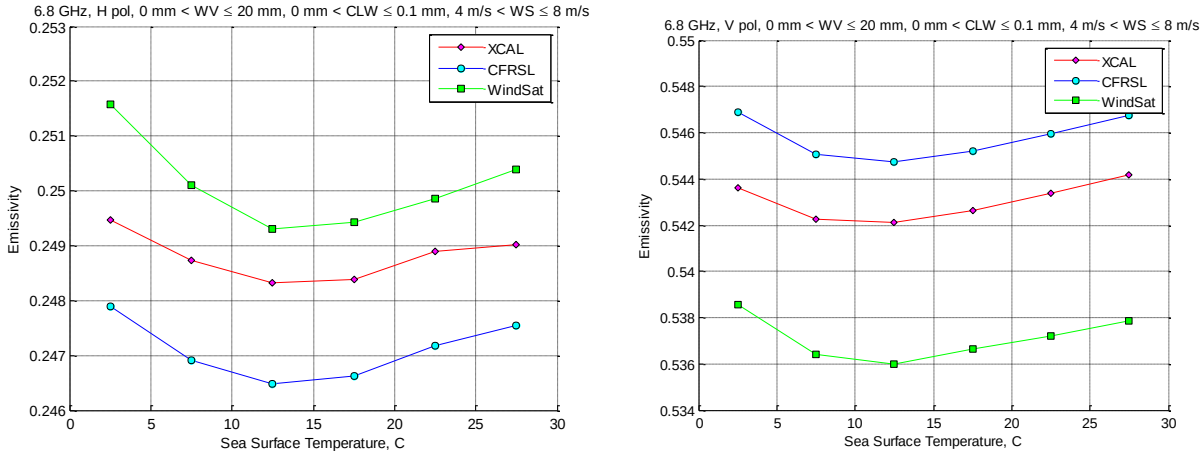


Fig. 3.31: Emissivity comparison versus SST using GDAS wind speeds at 6.8 GHz for h-pol and v-pol.

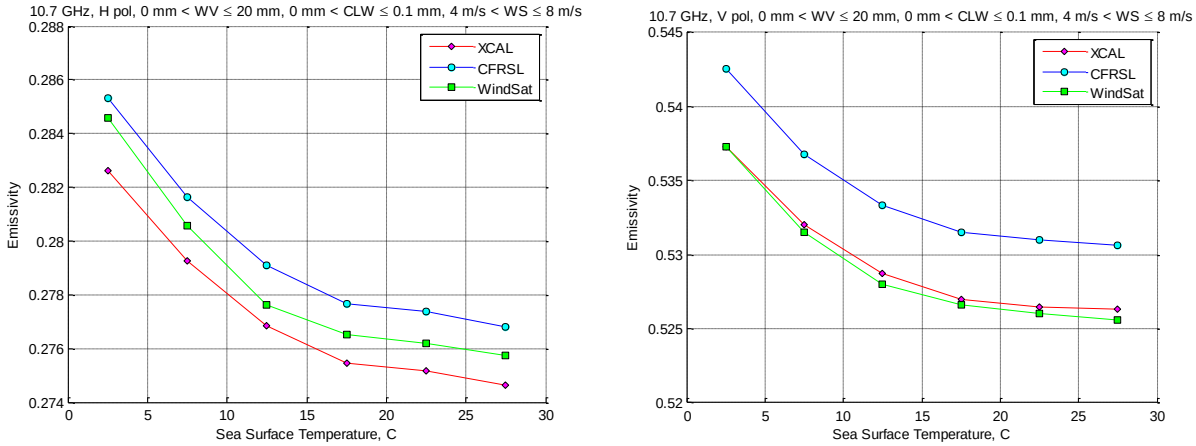


Fig. 3.32: Emissivity comparison versus SST using GDAS wind speeds at 10.7 GHz for h-pol and v-pol.

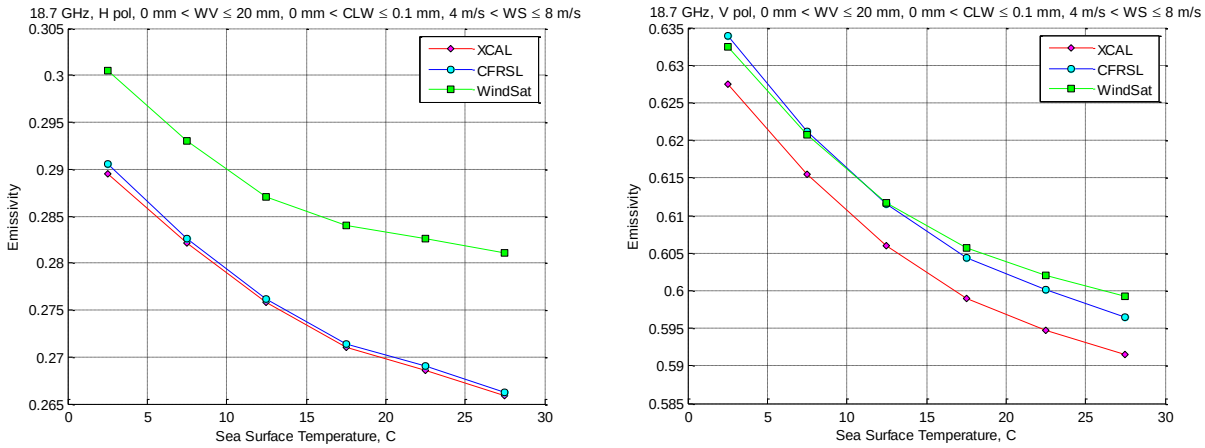


Fig. 3.33: Emissivity comparison versus SST using GDAS wind speeds at 18.7 GHz for h-pol and v-pol.

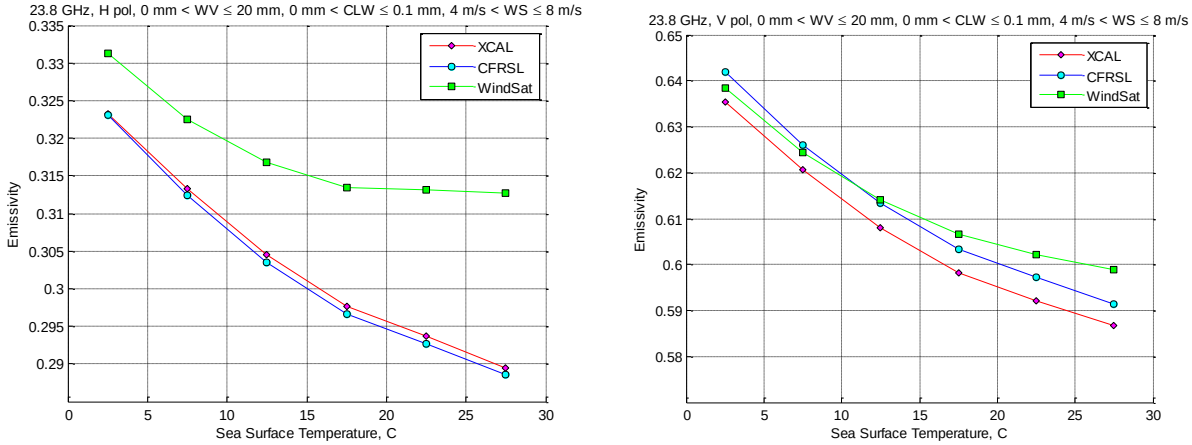


Fig. 3.34: Emissivity comparison versus SST using GDAS wind speeds at 23.8 GHz for h-pol and v-pol.

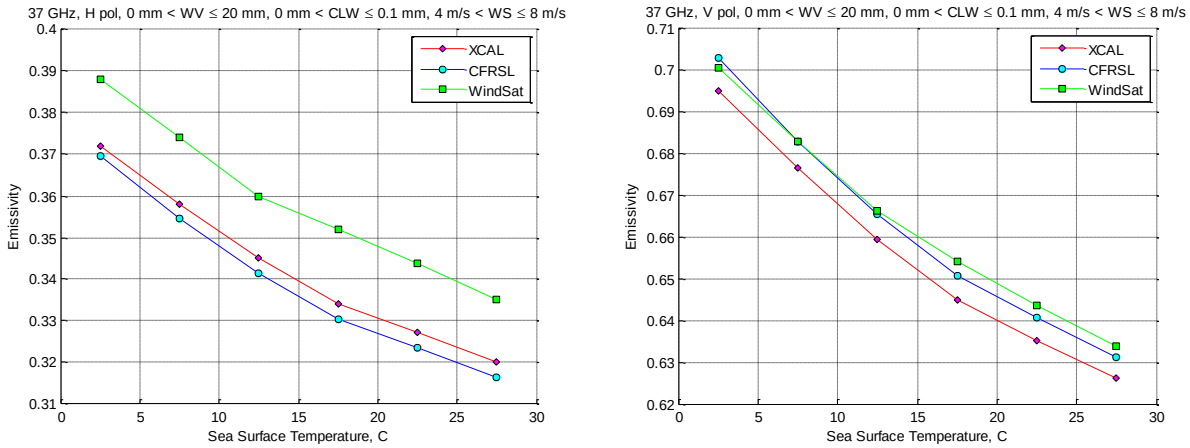


Fig. 3.35: Emissivity comparison versus SST using GDAS wind speeds at 37.0 GHz for h-pol and v-pol.

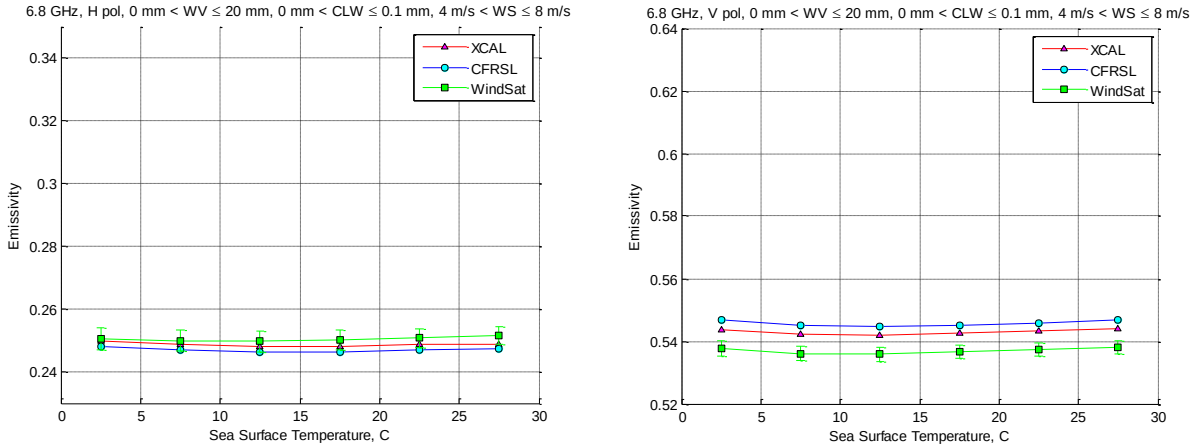


Fig. 3.36: Emissivity comparison versus SST using EDR wind speeds at 6.8 GHz for h-pol and v-pol.

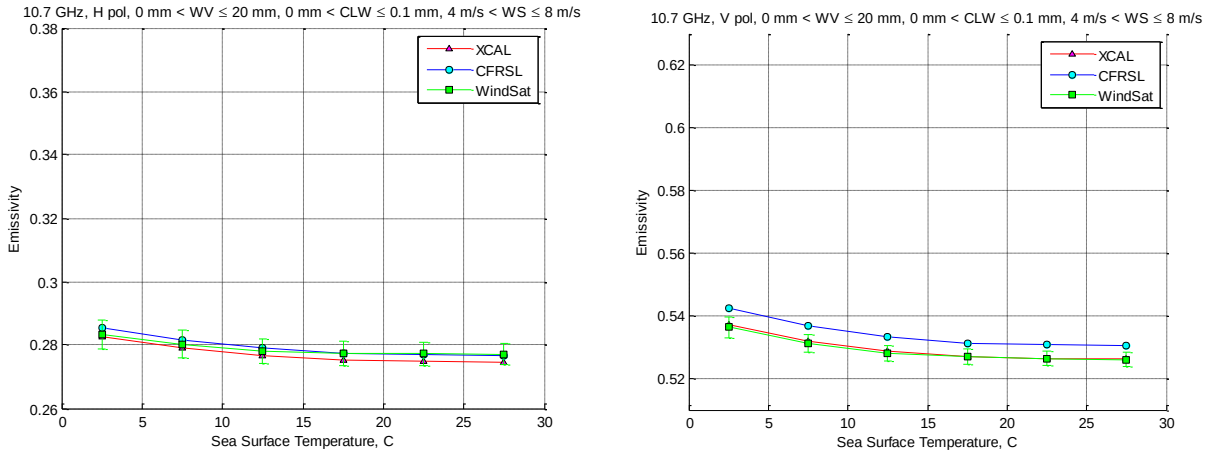


Fig. 3.37: Emissivity comparison versus SST using EDR wind speeds at 10.7 GHz for h-pol and v-pol.

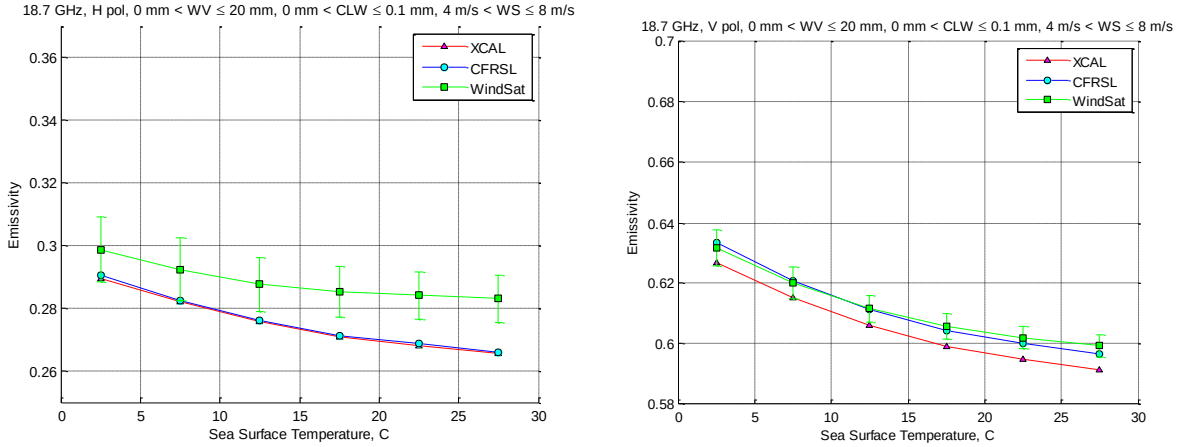


Fig. 3.38: Emissivity comparison versus SST using EDR wind speeds at 18.7 GHz for h-pol and v-pol.

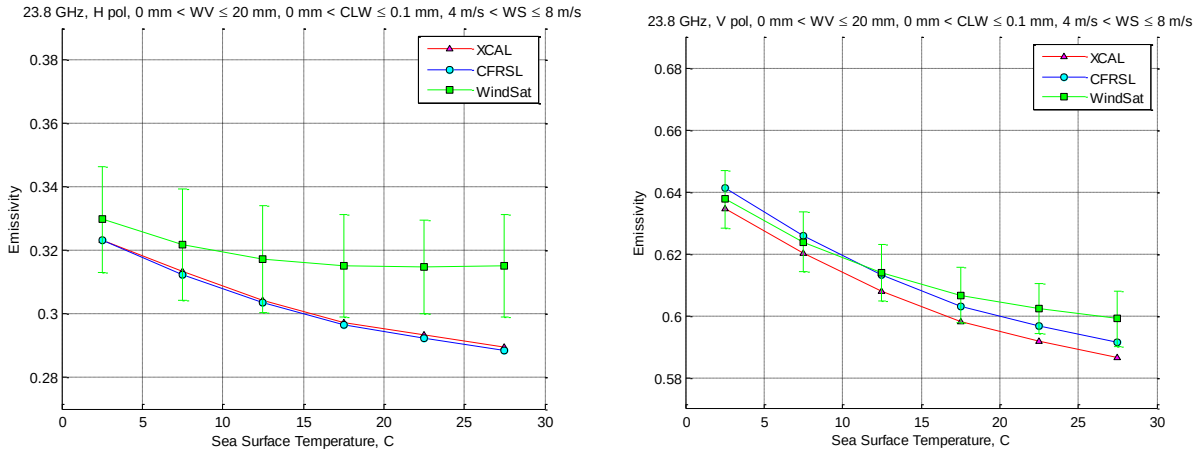


Fig. 3.39: Emissivity comparison versus SST using EDR wind speeds at 23.8 GHz for h-pol and v-pol.

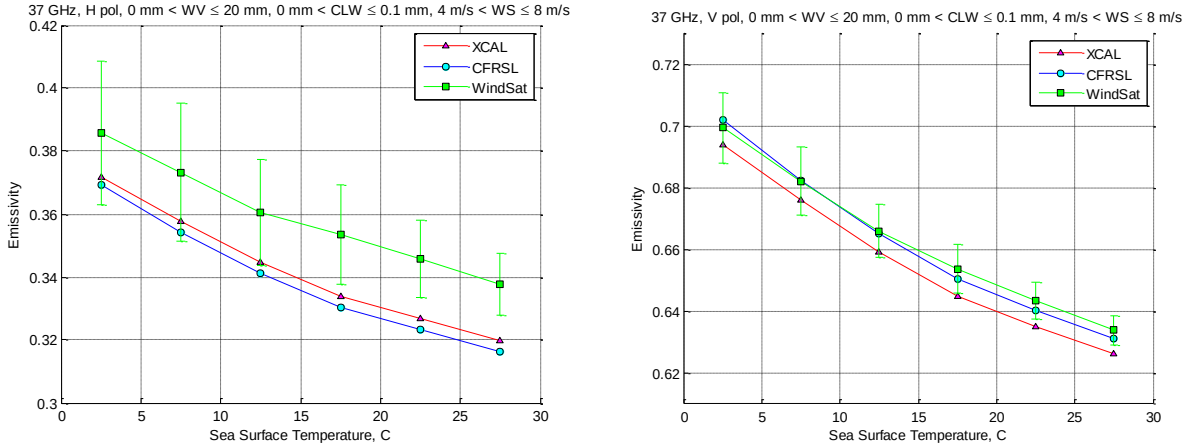


Fig. 3.40: Emissivity comparison versus SST using EDR wind speeds at 37.0 GHz for h-pol and v-pol.

CHAPTER 4: CONCLUSION

An experimental data set of one-year WindSat brightness temperatures were earth gridded into 1° latitude x 1° longitude boxes by orbit. Using this set of approximately 1.5 million observations, the corresponding NOAA GDAS numerical weather analysis parameters for the atmosphere and ocean were spatially and temporally collocated to the "matched-up" data set used in this thesis.

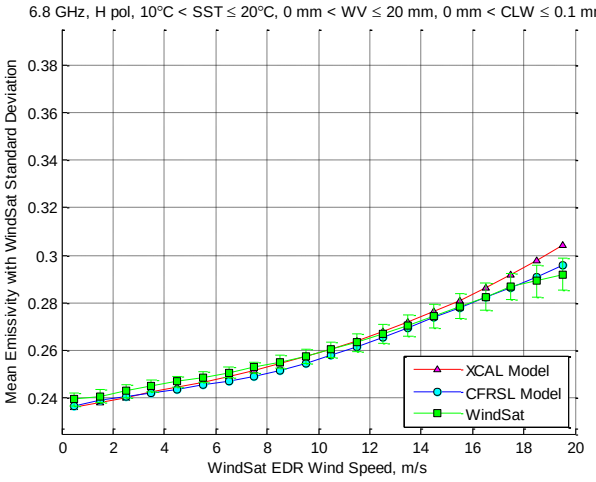
Two RTM's (XCAL and CFRSL) were used to calculate the TOA brightness temperature and ocean surface emissivity using collocated GDAS atmosphere and ocean environmental parameters. These theoretical results were compared to measured TOA WindSat brightness temperatures that were transformed to the ocean surface emissivity. The comparisons used GDAS environmental parameters that had been collocated with the WindSat L1C data and EDR wind speeds.

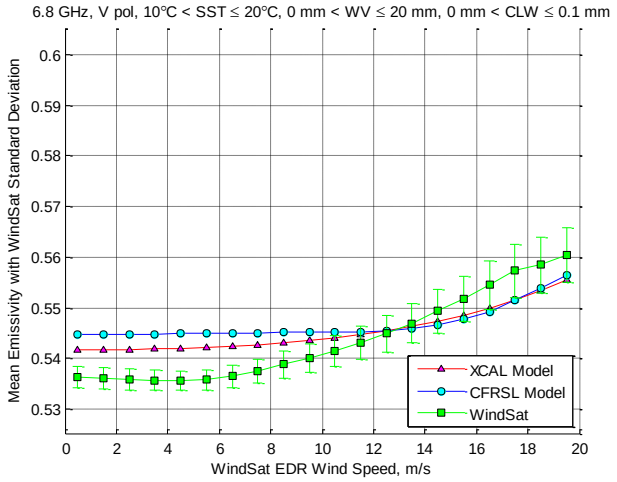
The results indicate that there is excellent comparison between the CFRSL and XCAL RTM modeled Tb's and emissivities and the corresponding WindSat parameters. The results consistently showed that the simulated XCAL and CFRSL ocean surface emissivity closely tracked the WindSat calculated surface emissivity, except for a small dc bias over a range of wind speeds from 0-20m/s. However, for the wind speed comparisons, the results were best for the H pol. On the other hand, when considering the modeled versus WindSat surface emissivities tracking with SST, the V pol appeared to perform slightly better than the H pol across a range of 0-35 C, especially for the 18.7 GHz and 23.8 GHz frequencies.

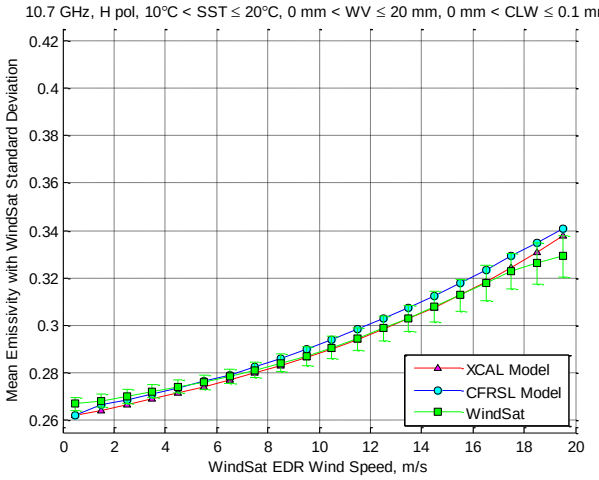
Although, excellent results have been shown through the comparisons in this thesis, the validation of the CFRSL model was not performed over the full design range in incidence angles, wind speeds, and frequencies. Future recommendations include completing comparisons for additional incidence angles from nadir to 50°, wind speeds > 20 m/s, and higher (e.g., 87 GHz) and lower (1.4 GHz) frequency bands for satellite radiometers.

Finally, for future studies, the MATLAB code used in the process presented in this thesis is included in the APPENDIX N of this thesis.

APPENDIX A: ADDITIONAL EMISSIVITY PLOTS


6.8 GHz, H pol, 10°C < SST ≤ 20°C, 0 mm < WV ≤ 20 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat


6.8 GHz, V pol, 10°C < SST ≤ 20°C, 0 mm < WV ≤ 20 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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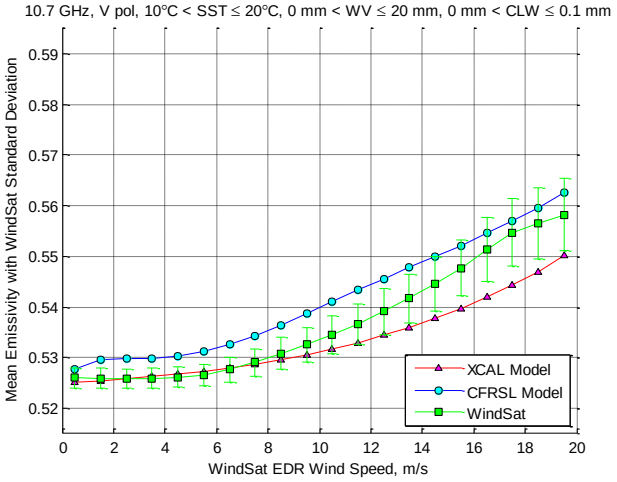
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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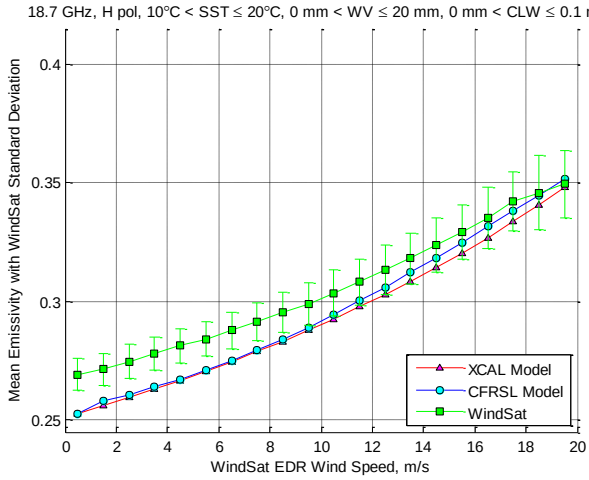
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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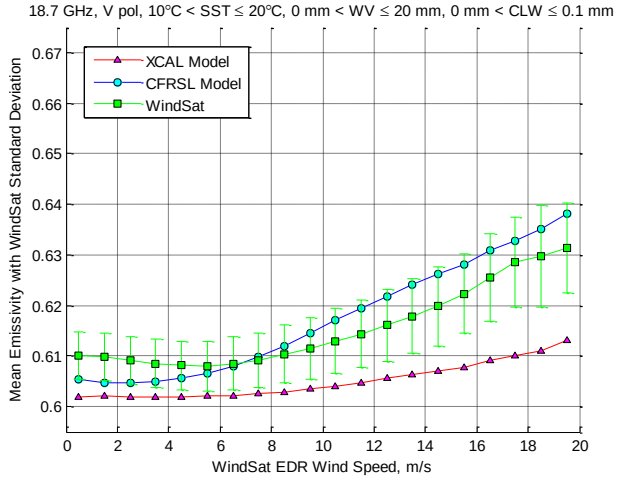
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
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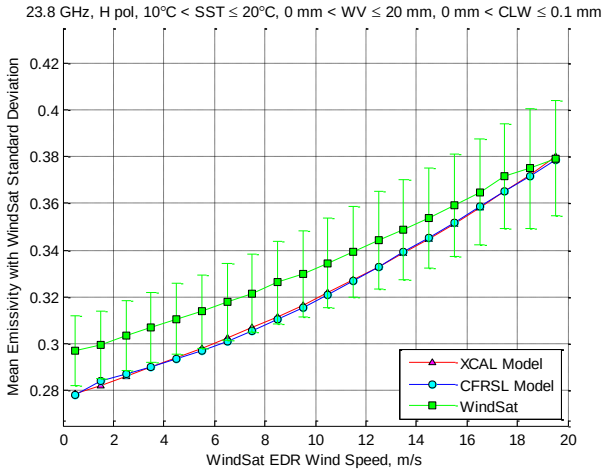
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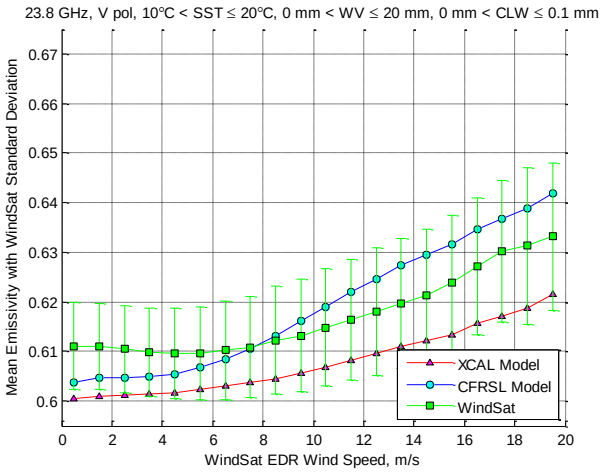
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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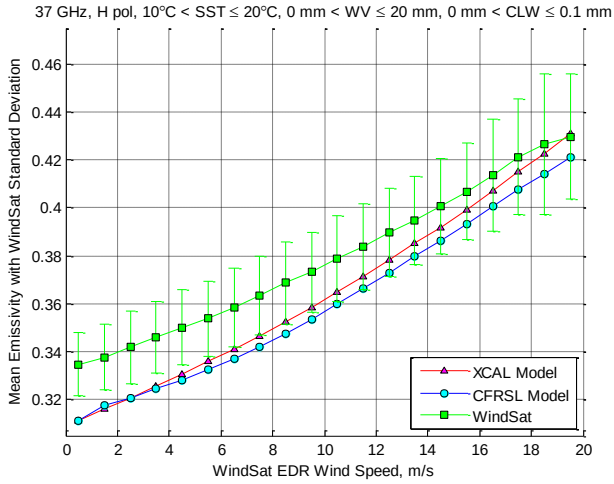
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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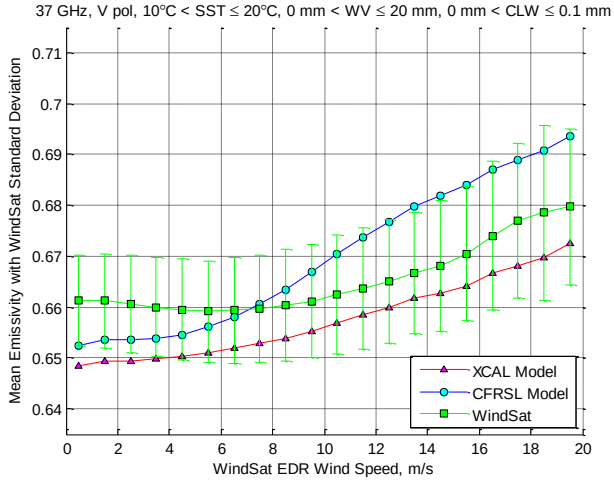
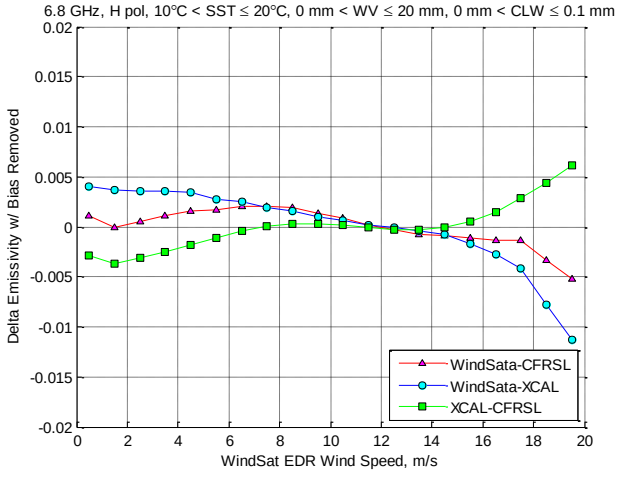
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat


37 GHz, V pol, 10°C < SST ≤ 20°C, 0 mm < WV ≤ 20 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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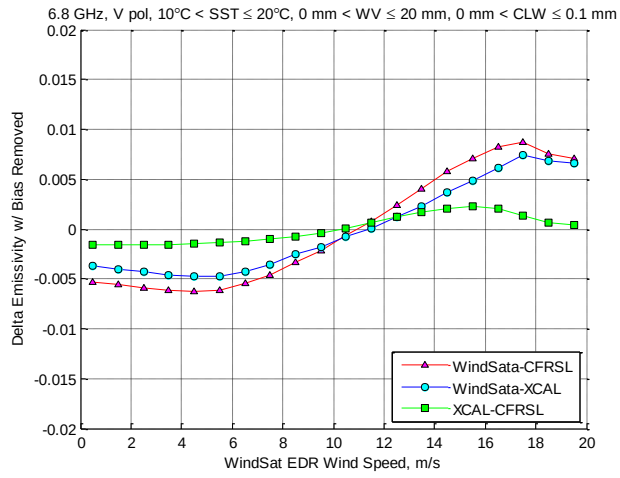
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL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Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
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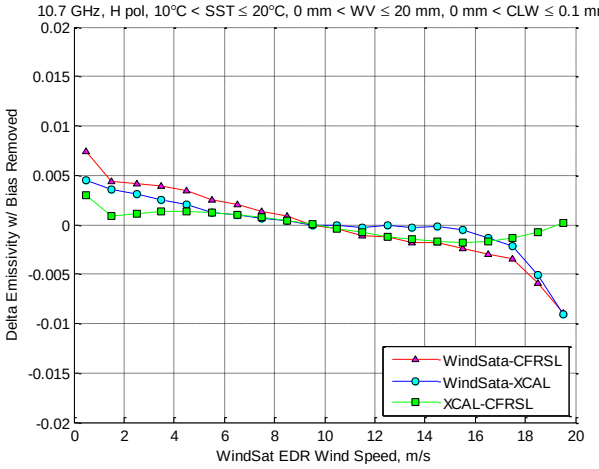
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Delta Emissivity w/ Bias Removed
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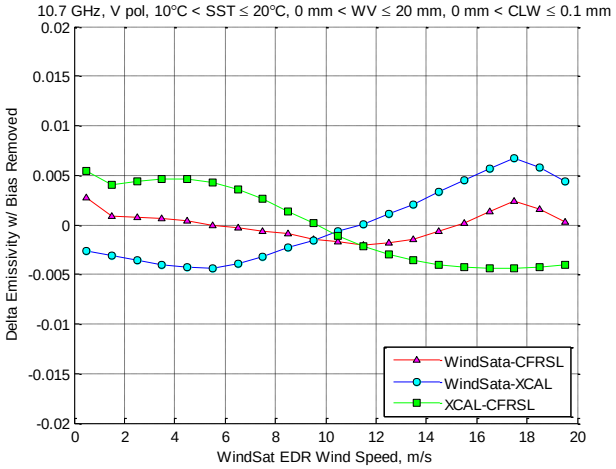
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Delta Emissivity w/ Bias Removed
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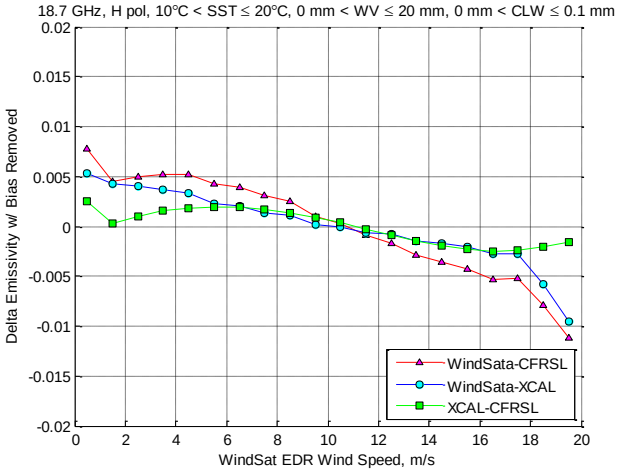
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Delta Emissivity w/ Bias Removed
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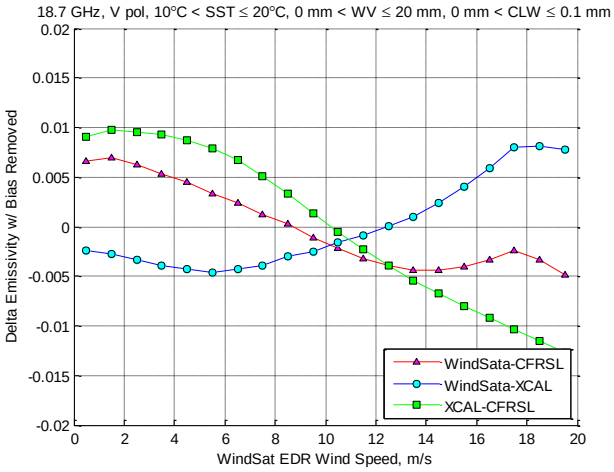
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Delta Emissivity w/ Bias Removed
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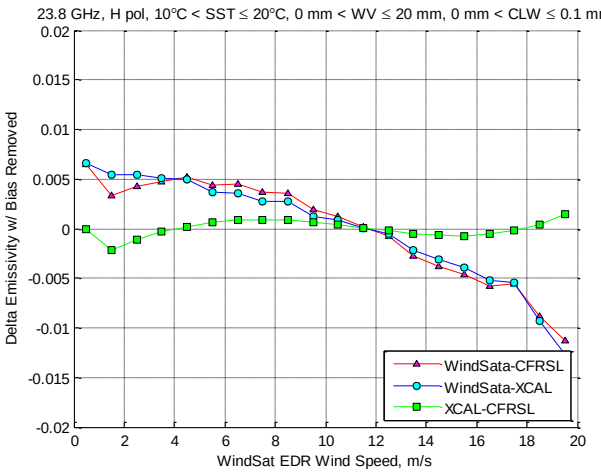
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Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
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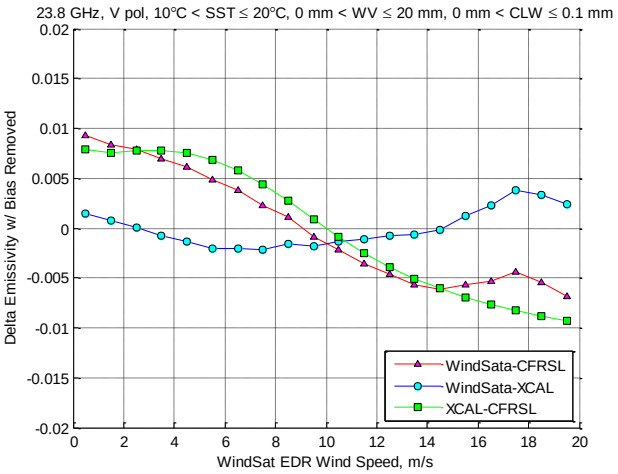
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Delta Emissivity w/ Bias Removed
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WindSata-CFRSL
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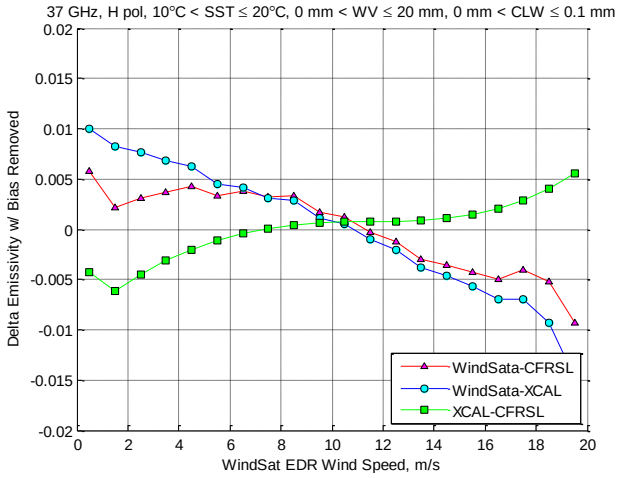
XCAL-CFRSL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Delta Emissivity w/ Bias Removed
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WindSata-XCAL
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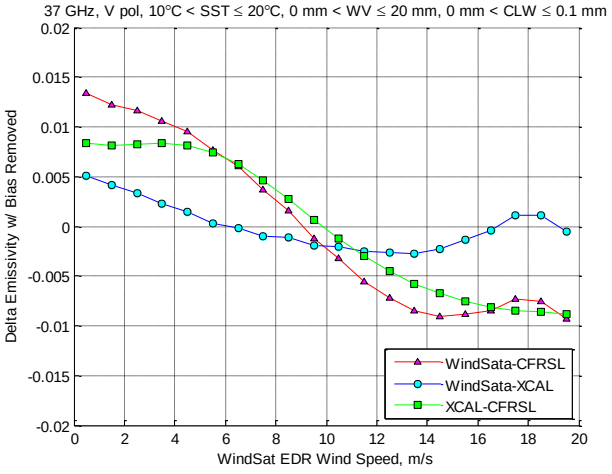
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Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
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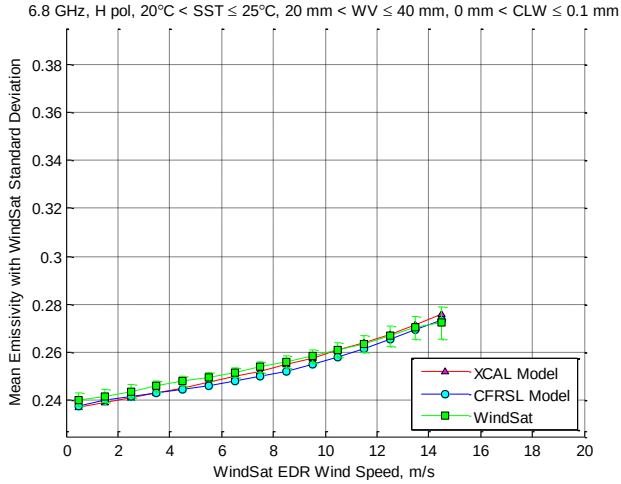
WindSata-XCAL
XCAL-CFRSL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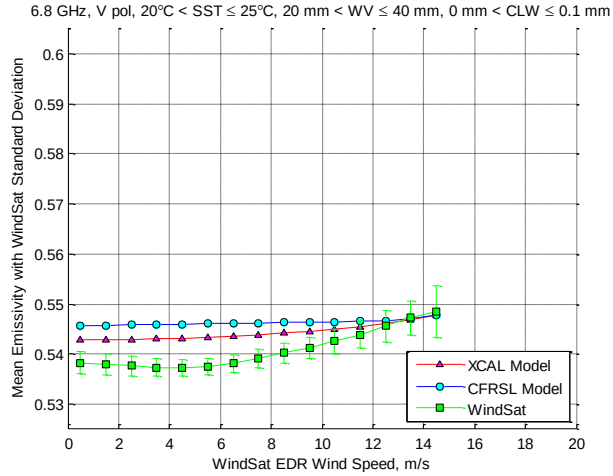
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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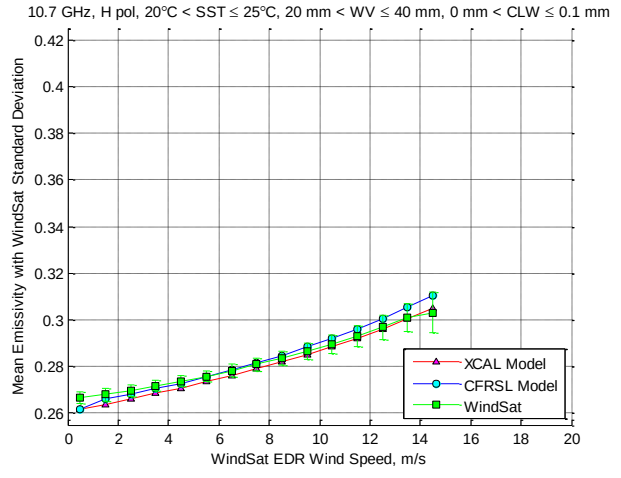
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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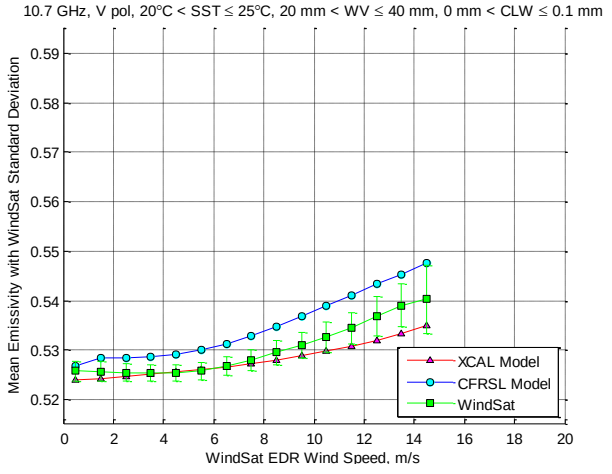
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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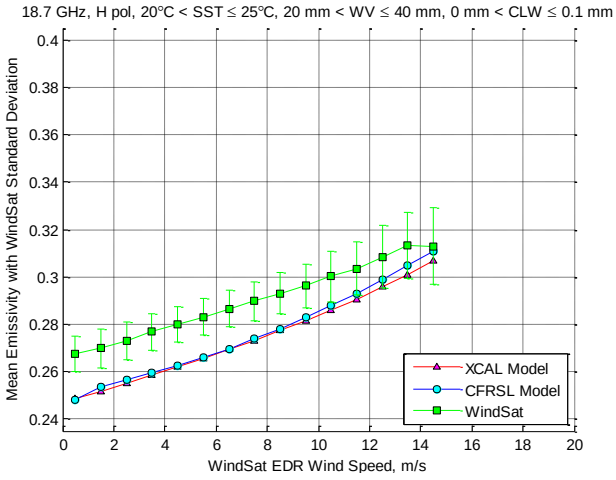
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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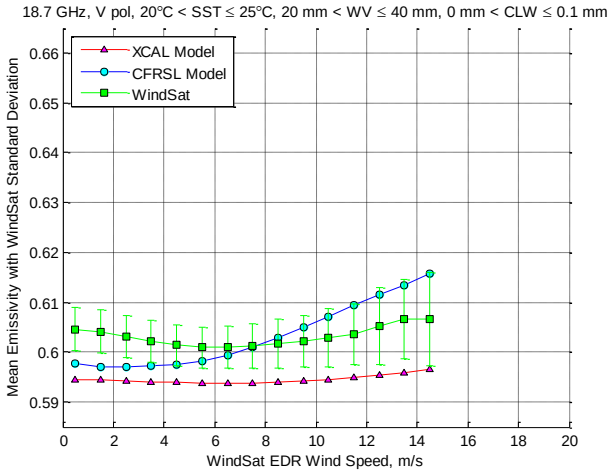
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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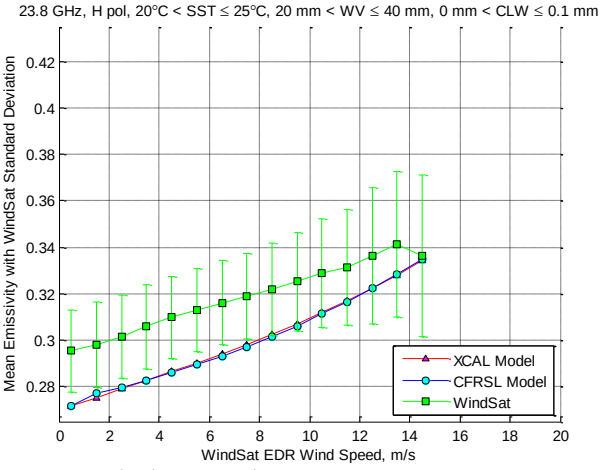
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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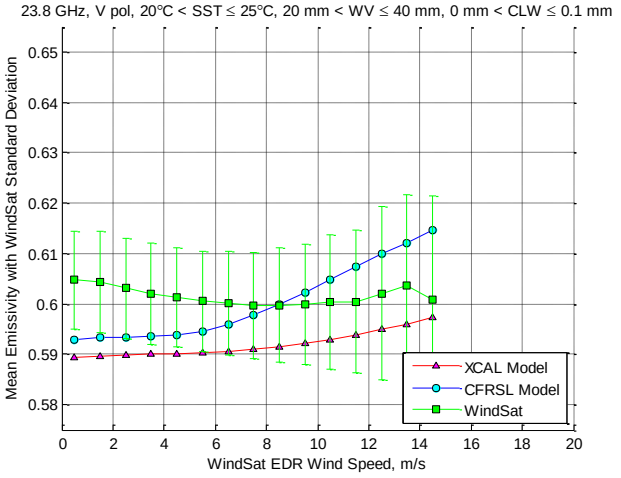
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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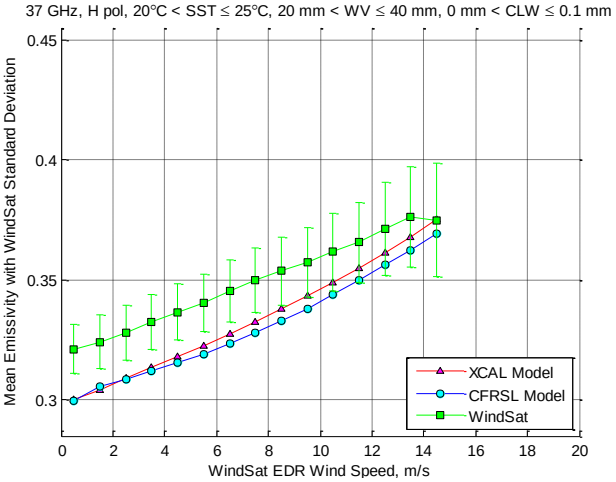
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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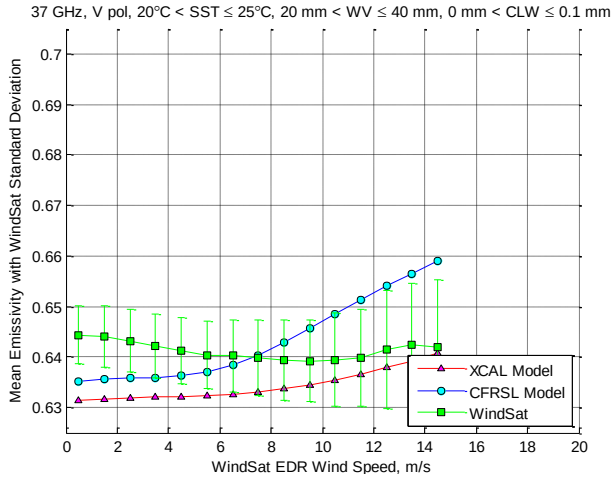
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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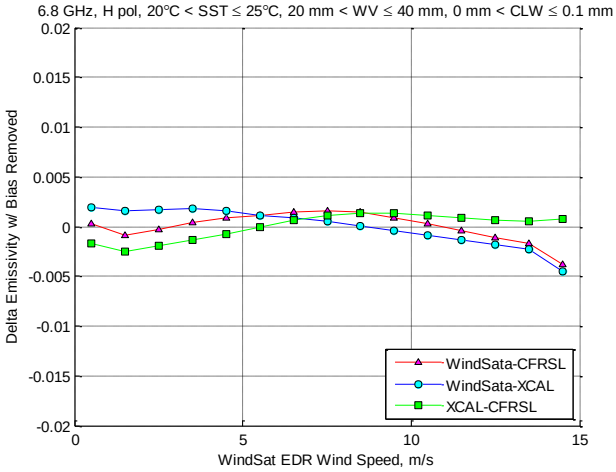
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat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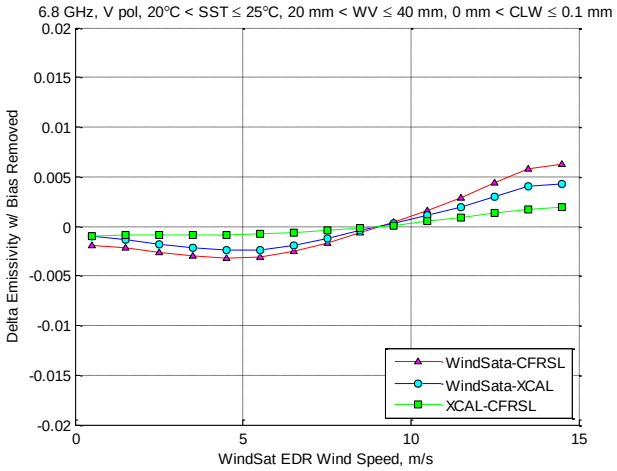
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL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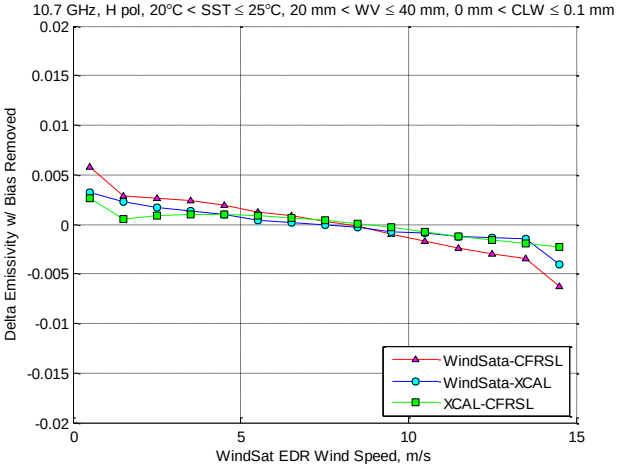
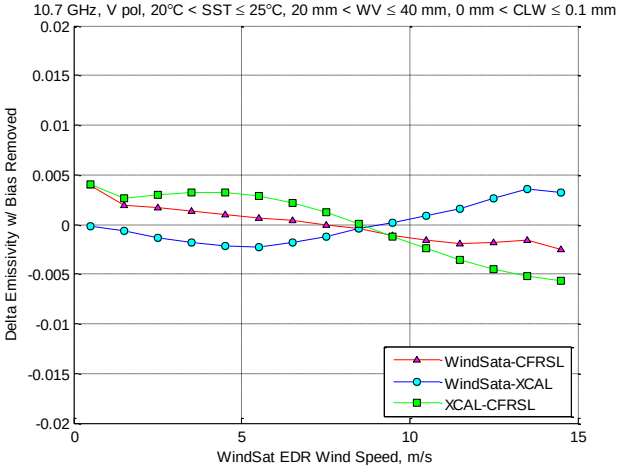
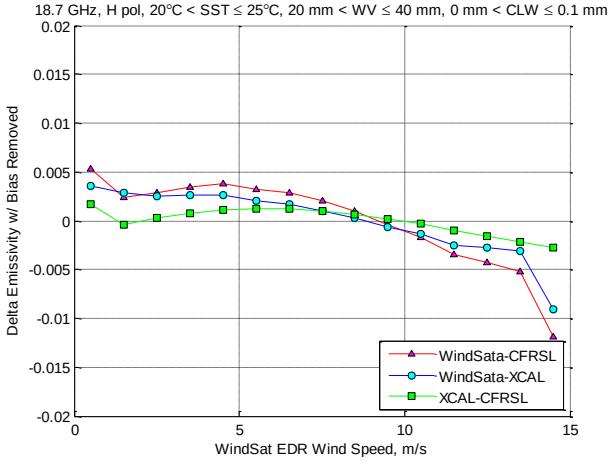
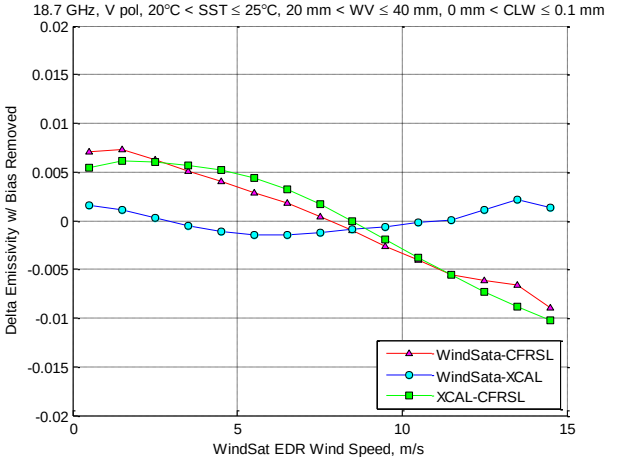
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


10.7 GHz, H pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


10.7 GHz, V pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


18.7 GHz, H pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


18.7 GHz, V pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
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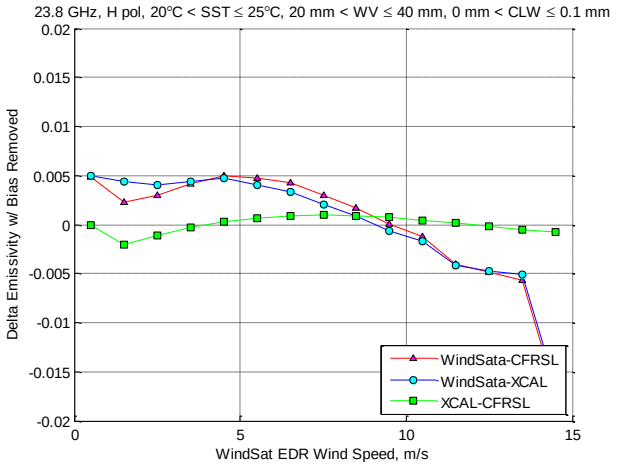
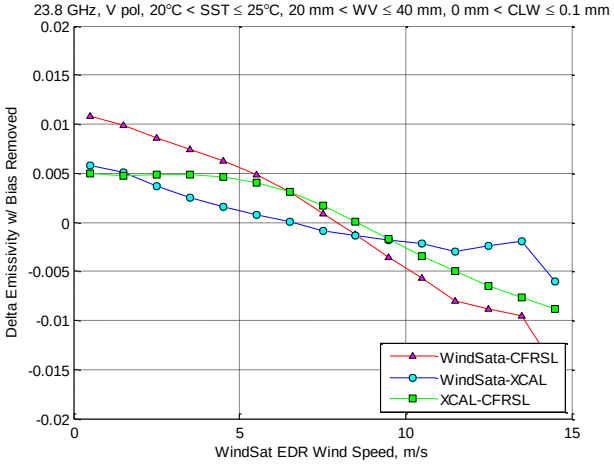
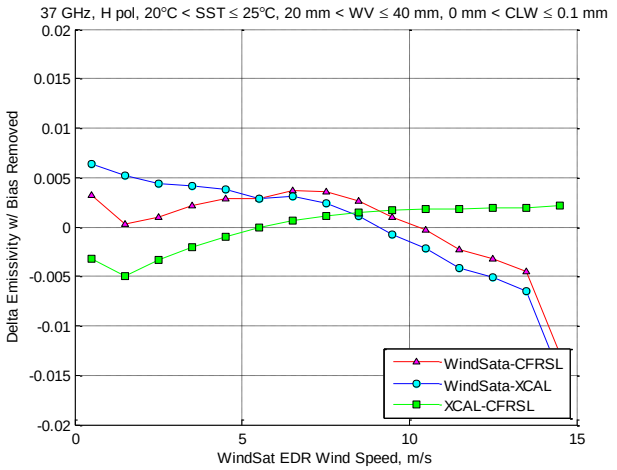
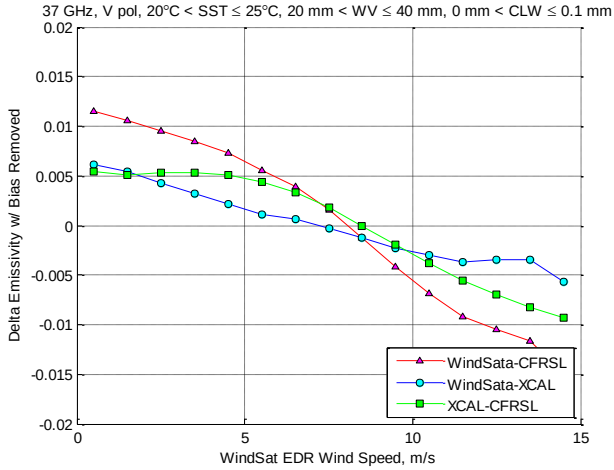
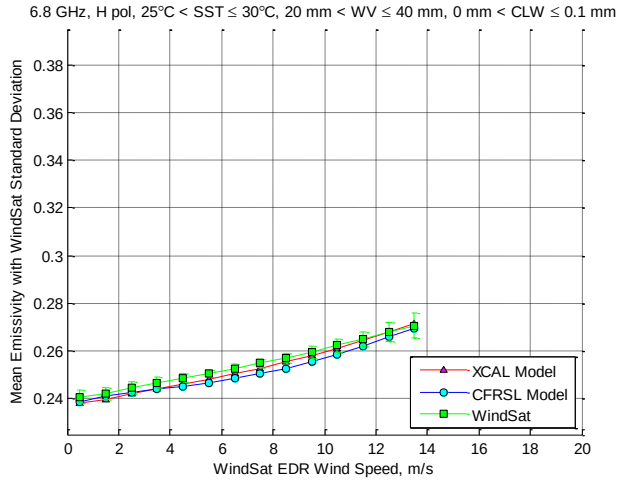
XCAL-CFRSL

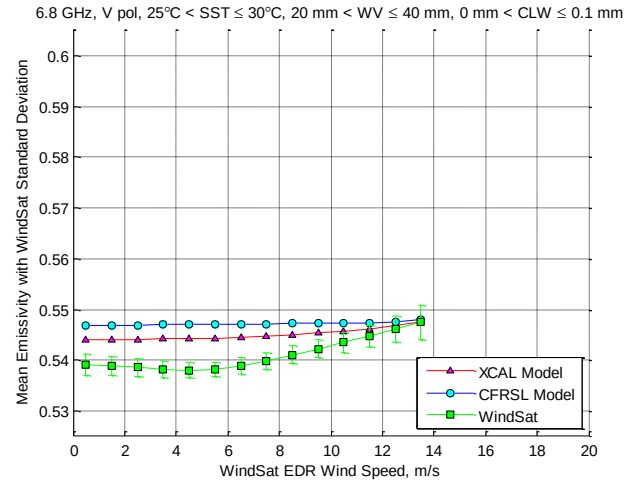

23.8 GHz, H pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL

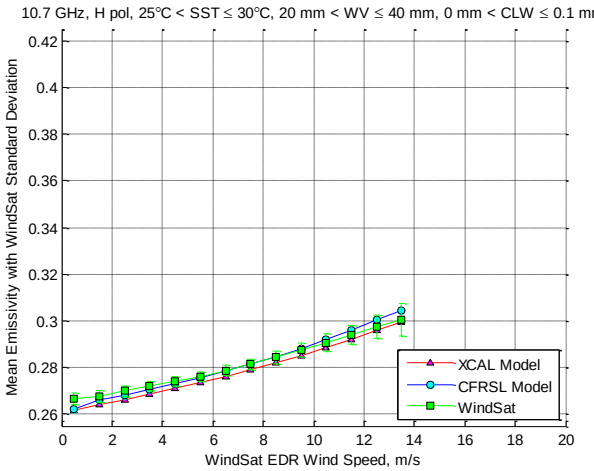

23.8 GHz, V pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL

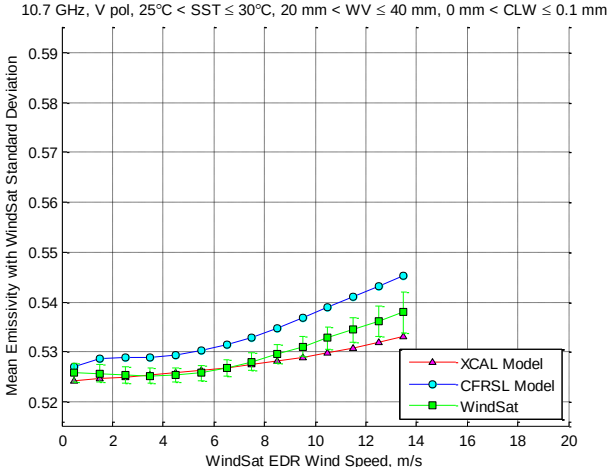

37 GHz, H pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


37 GHz, V pol, 20°C < SST ≤ 25°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


6.8 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat


6.8 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat


10.7 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat


10.7 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
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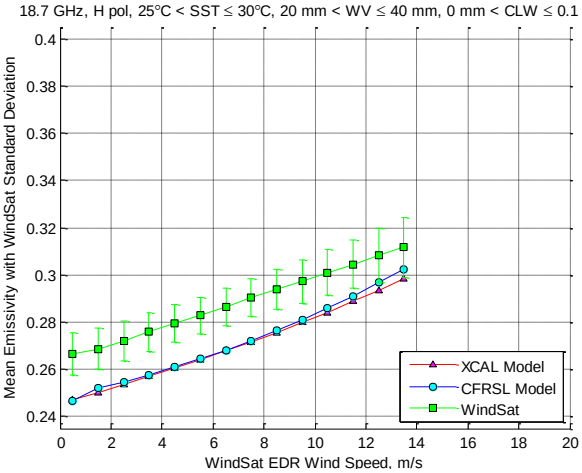
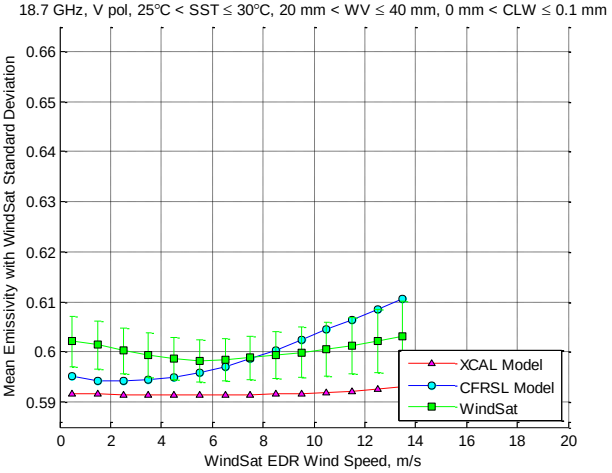
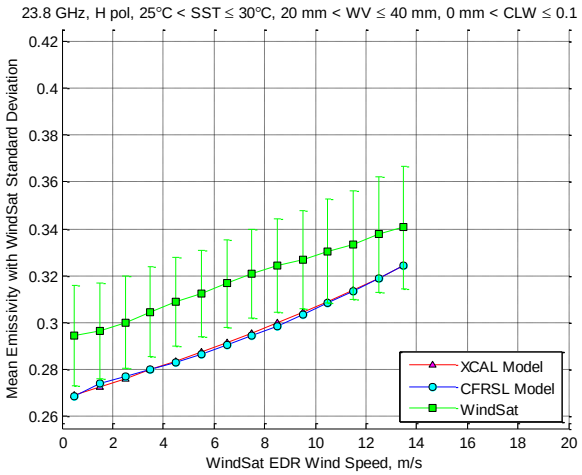
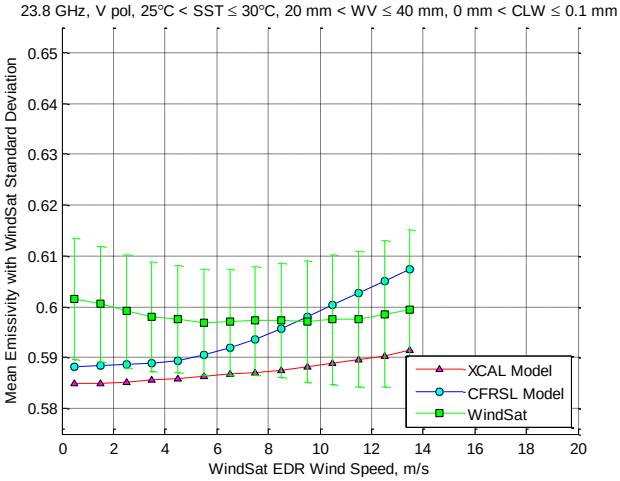
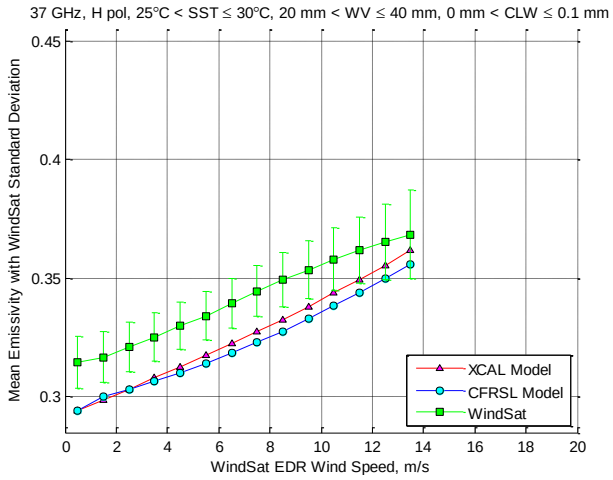
WindSat

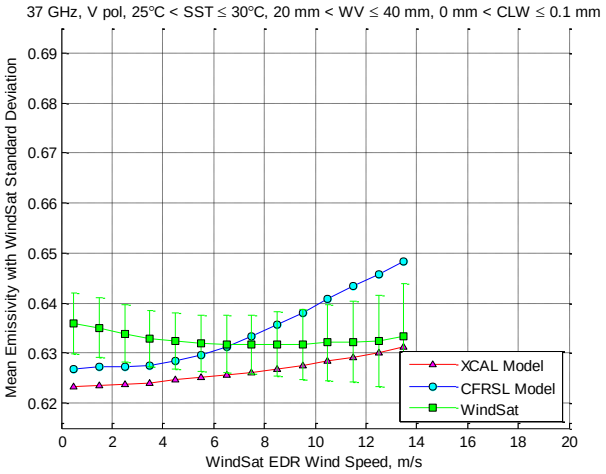

18.7 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

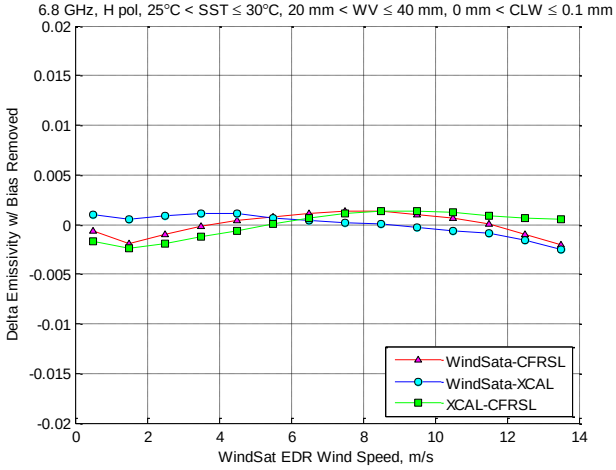

18.7 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

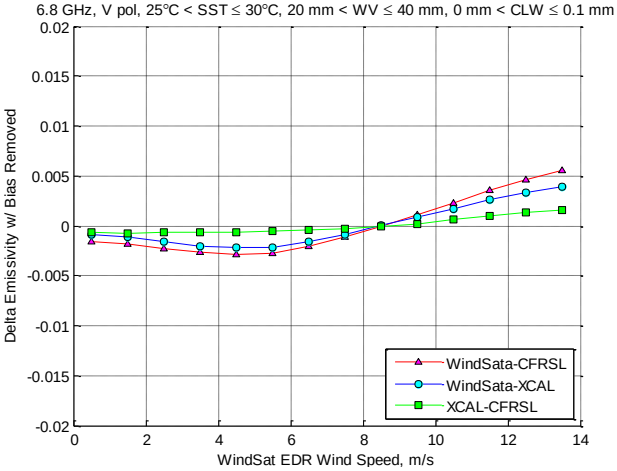

23.8 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

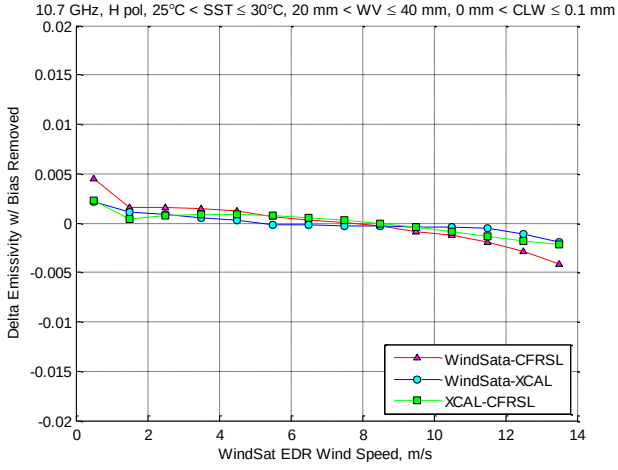

23.8 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

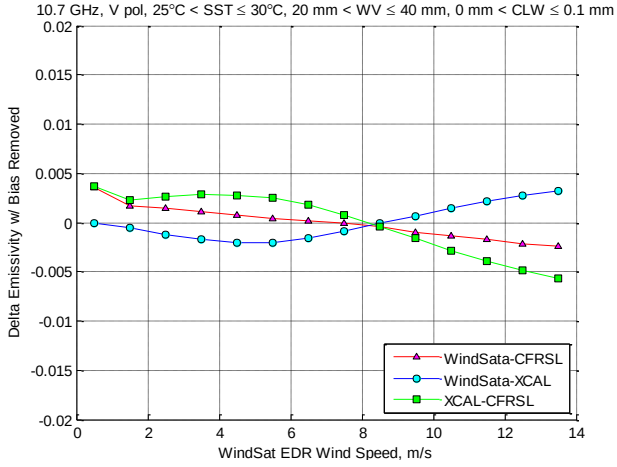

37 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

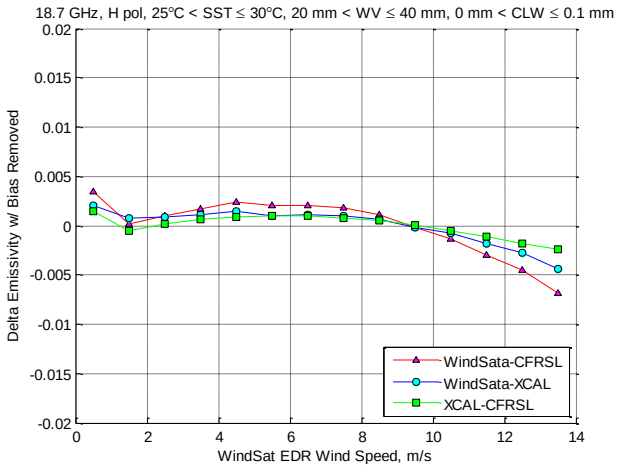

37 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Mean Emissivity with WindSat Standard Deviation
WindSat EDR Wind Speed, m/s
XCAL Model
CFRSL Model
WindSat

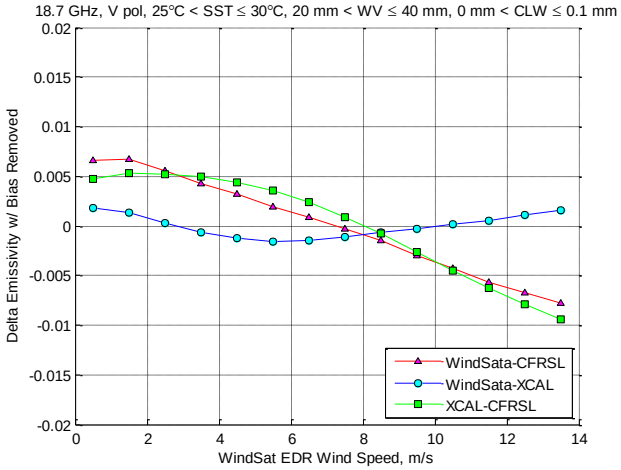

6.8 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL
WindSat EDR Wind Speed, m/s

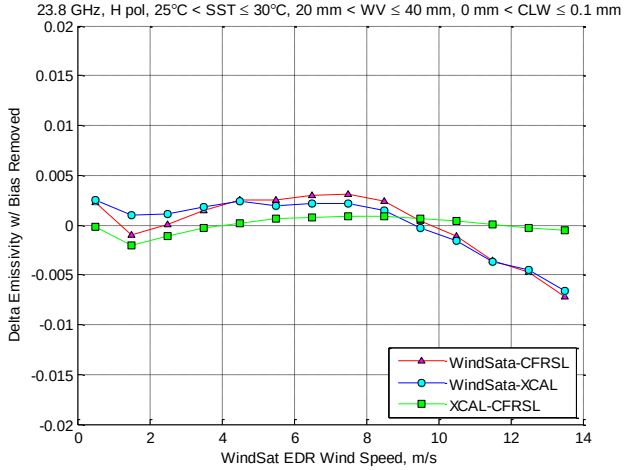

6.8 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL
WindSat EDR Wind Speed, m/s

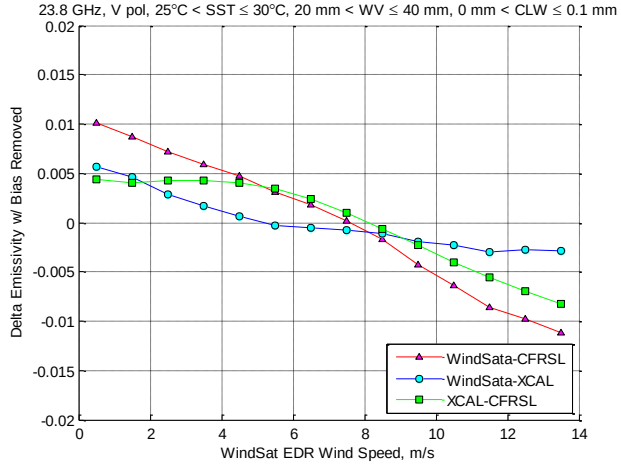

10.7 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL
WindSat EDR Wind Speed, m/s

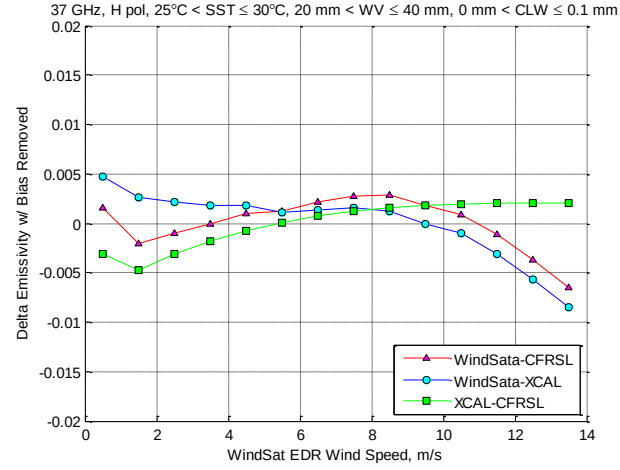

10.7 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL
WindSat EDR Wind Speed, m/s

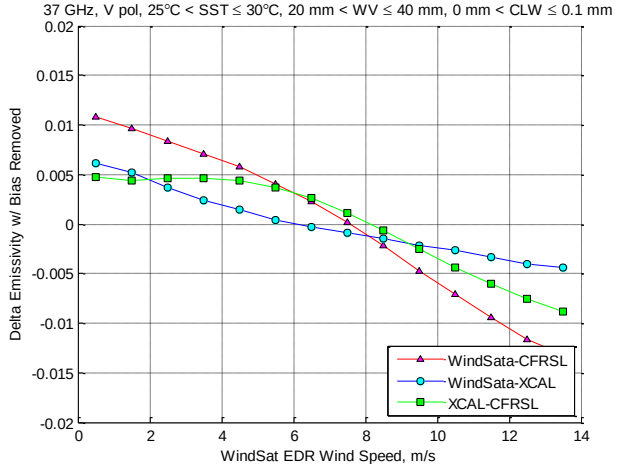

18.7 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


18.7 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


23.8 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


23.8 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


37 GHz, H pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL


37 GHz, V pol, 25°C < SST ≤ 30°C, 20 mm < WV ≤ 40 mm, 0 mm < CLW ≤ 0.1 mm
Delta Emissivity w/ Bias Removed
WindSat EDR Wind Speed, m/s
WindSata-CFRSL
WindSata-XCAL
XCAL-CFRSL

APPENDIX B: ENVIRONMENTAL PARAMETERS BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	766	280.11	2.10	12.44	4.01	0.01	0.02	0.63	0.30	33.44	1.97
111_2	3564	279.59	2.32	11.36	3.89	0.01	0.02	1.56	0.29	33.66	1.64
111_3	7939	279.11	2.49	10.64	3.84	0.02	0.02	2.56	0.28	33.76	1.34
111_4	13513	278.76	2.62	10.29	3.80	0.02	0.03	3.55	0.28	33.80	1.10
111_5	22265	278.56	2.69	10.09	3.83	0.02	0.03	4.53	0.29	33.85	0.97
111_6	34989	278.31	2.75	9.86	3.73	0.02	0.03	5.54	0.29	33.89	0.89
111_7	44339	278.17	2.77	9.81	3.67	0.02	0.03	6.51	0.29	33.93	0.84
111_8	41684	278.17	2.76	9.82	3.62	0.02	0.03	7.51	0.29	33.95	0.78
111_9	39543	278.14	2.75	9.77	3.60	0.02	0.03	8.50	0.29	33.96	0.75
111_10	35280	278.14	2.72	9.67	3.56	0.03	0.03	9.50	0.29	33.97	0.69
111_11	32704	278.07	2.74	9.59	3.53	0.03	0.03	10.49	0.29	33.99	0.70
111_12	28544	277.95	2.72	9.45	3.49	0.03	0.03	11.48	0.29	34.00	0.58
111_13	23433	277.80	2.73	9.20	3.40	0.03	0.03	12.48	0.29	34.01	0.60
111_14	17678	277.64	2.67	8.94	3.34	0.03	0.03	13.46	0.29	34.01	0.55
111_15	12515	277.51	2.67	8.53	3.18	0.03	0.03	14.46	0.29	34.02	0.55
111_16	7588	277.38	2.67	8.17	3.06	0.03	0.03	15.46	0.29	34.02	0.59
111_17	4526	277.16	2.64	7.80	2.95	0.04	0.03	16.46	0.29	34.00	0.55
111_18	2718	277.14	2.61	7.39	2.75	0.04	0.03	17.46	0.29	34.00	0.60
111_19	1719	276.93	2.60	7.14	2.62	0.04	0.03	18.46	0.29	33.99	0.59
111_20	1207	276.81	2.58	6.82	2.57	0.04	0.03	19.46	0.29	33.95	0.60
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	157	281.10	1.56	25.01	4.21	0.03	0.03	0.58	0.31	33.10	1.00
121_2	465	280.88	1.68	24.46	3.61	0.03	0.03	1.54	0.28	33.11	1.40
121_3	708	280.91	1.72	24.24	3.73	0.03	0.03	2.53	0.28	33.10	1.48
121_4	1066	280.95	1.57	24.28	3.61	0.03	0.03	3.53	0.28	33.18	1.25
121_5	1565	280.78	1.73	24.13	3.57	0.03	0.03	4.52	0.29	33.32	0.99
121_6	1884	280.66	1.89	24.02	3.54	0.03	0.03	5.52	0.28	33.40	1.00
121_7	2044	280.64	1.85	24.11	3.68	0.04	0.03	6.49	0.29	33.56	0.99
121_8	1702	280.67	1.88	24.05	3.61	0.04	0.03	7.50	0.29	33.67	0.98
121_9	1512	280.60	2.02	23.86	3.62	0.04	0.03	8.48	0.30	33.83	0.90
121_10	1167	280.69	1.99	23.72	3.74	0.04	0.03	9.49	0.29	33.81	1.02
121_11	940	280.74	1.90	23.58	3.61	0.05	0.03	10.48	0.29	33.88	0.85
121_12	673	280.85	1.80	23.12	3.30	0.05	0.03	11.45	0.30	33.92	1.01
121_13	476	280.51	2.03	22.63	2.52	0.05	0.03	12.48	0.30	34.09	0.61
121_14	313	280.61	2.12	22.46	2.31	0.05	0.03	13.46	0.30	34.15	0.50

121_15	127	280.85	1.95	22.50	2.47	0.06	0.03	14.43	0.29	34.06	0.53
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	1933	288.89	2.77	14.11	3.40	0.01	0.01	0.64	0.28	34.76	1.49
211_2	6840	288.68	2.83	14.08	3.39	0.01	0.02	1.53	0.29	34.71	1.65
211_3	12452	288.71	2.85	14.10	3.38	0.01	0.02	2.54	0.29	34.75	1.51
211_4	18804	288.66	2.88	14.05	3.41	0.01	0.02	3.55	0.29	34.75	1.46
211_5	26599	288.64	2.91	14.07	3.40	0.01	0.02	4.51	0.28	34.78	1.32
211_6	32919	288.47	2.93	14.02	3.41	0.01	0.02	5.52	0.28	34.80	1.16
211_7	35801	288.36	2.95	14.04	3.37	0.01	0.02	6.49	0.29	34.81	1.09
211_8	29670	288.18	2.97	13.96	3.38	0.01	0.02	7.49	0.29	34.80	1.04
211_9	25490	288.00	2.96	13.91	3.42	0.01	0.02	8.49	0.29	34.78	1.01
211_10	20080	287.72	2.96	13.74	3.47	0.01	0.02	9.48	0.29	34.74	1.02
211_11	15426	287.48	2.91	13.54	3.44	0.01	0.02	10.48	0.28	34.73	0.95
211_12	11060	287.20	2.86	13.38	3.50	0.01	0.02	11.47	0.29	34.71	0.93
211_13	7423	287.00	2.81	13.16	3.51	0.01	0.03	12.46	0.29	34.70	0.95
211_14	4547	286.77	2.67	13.00	3.53	0.02	0.03	13.45	0.28	34.69	0.90
211_15	2839	286.86	2.74	12.69	3.62	0.02	0.03	14.44	0.28	34.72	0.85
211_16	1566	286.86	2.69	12.39	3.46	0.02	0.03	15.45	0.28	34.72	0.79
211_17	807	286.54	2.60	12.03	3.50	0.02	0.03	16.44	0.29	34.70	0.78
211_18	406	286.66	2.60	12.01	3.21	0.02	0.03	17.45	0.28	34.73	0.75
211_19	218	286.81	2.77	11.91	3.48	0.02	0.03	18.45	0.28	34.74	0.86
211_20	165	286.72	2.78	11.88	3.40	0.02	0.03	19.45	0.29	34.85	0.89
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	601	289.09	2.97	25.22	4.63	0.01	0.02	0.60	0.31	34.17	1.86
221_2	2546	289.37	2.84	25.14	4.51	0.01	0.02	1.54	0.29	34.21	2.09
221_3	4534	289.58	2.77	25.20	4.53	0.01	0.02	2.54	0.29	34.40	1.73
221_4	6899	289.68	2.73	25.34	4.60	0.01	0.02	3.55	0.29	34.47	1.66
221_5	10360	289.69	2.71	25.50	4.72	0.01	0.02	4.51	0.28	34.55	1.46
221_6	13037	289.71	2.66	25.57	4.70	0.02	0.02	5.52	0.29	34.63	1.40
221_7	13818	289.59	2.69	25.51	4.63	0.02	0.03	6.49	0.29	34.68	1.34
221_8	11080	289.42	2.73	25.53	4.62	0.02	0.03	7.49	0.29	34.74	1.33
221_9	9294	289.34	2.76	25.39	4.58	0.02	0.03	8.49	0.29	34.81	1.22
221_10	6676	289.16	2.82	25.13	4.43	0.02	0.03	9.48	0.29	34.84	1.08
221_11	4818	288.91	2.86	25.07	4.30	0.02	0.03	10.47	0.29	34.84	1.16
221_12	3186	288.74	2.89	24.87	4.31	0.03	0.03	11.47	0.29	34.86	1.17
221_13	1817	288.57	2.88	24.89	4.27	0.03	0.03	12.45	0.29	34.95	0.84

221_14	974	288.42	2.90	24.82	4.12	0.03	0.03	13.44	0.29	34.91	0.83
221_15	525	288.30	2.90	24.16	4.02	0.03	0.03	14.44	0.29	34.90	0.84
221_16	221	288.75	2.74	24.08	3.66	0.03	0.03	15.45	0.27	34.97	0.93
221_17	110	289.02	2.88	24.22	4.02	0.04	0.04	16.46	0.28	34.73	1.24
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	162	289.61	2.87	44.76	3.97	0.02	0.03	2.57	0.28	33.74	0.80
231_4	246	289.59	2.97	44.98	4.00	0.03	0.03	3.58	0.27	33.72	0.83
231_5	434	289.93	2.64	45.04	4.03	0.02	0.03	4.51	0.30	33.88	0.88
231_6	495	290.15	2.70	44.54	3.70	0.03	0.03	5.51	0.28	34.09	0.90
231_7	478	290.20	2.46	44.30	3.88	0.03	0.03	6.47	0.28	34.20	0.94
231_8	323	290.19	2.49	44.40	3.78	0.03	0.03	7.48	0.30	34.28	1.03
231_9	247	290.42	2.47	44.77	3.86	0.03	0.03	8.50	0.28	34.27	1.01
231_10	137	290.42	2.25	44.34	4.13	0.03	0.03	9.41	0.29	34.50	0.88
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	706	295.20	1.42	16.34	2.63	0.00	0.01	0.66	0.28	35.72	1.39
311_2	2390	295.05	1.33	16.37	2.63	0.00	0.01	1.52	0.29	35.71	1.13
311_3	4350	295.03	1.34	16.38	2.66	0.00	0.01	2.55	0.28	35.61	1.04
311_4	6702	295.07	1.31	16.55	2.58	0.00	0.01	3.55	0.29	35.61	1.05
311_5	8889	295.05	1.31	16.61	2.56	0.00	0.01	4.51	0.29	35.62	0.92
311_6	10602	295.04	1.29	16.51	2.57	0.00	0.01	5.52	0.28	35.59	0.85
311_7	11039	295.01	1.30	16.52	2.57	0.00	0.01	6.49	0.29	35.55	0.85
311_8	9137	295.03	1.30	16.49	2.56	0.00	0.01	7.49	0.28	35.57	0.81
311_9	7582	295.05	1.30	16.39	2.64	0.00	0.01	8.48	0.29	35.54	0.81
311_10	5257	295.10	1.31	16.28	2.65	0.01	0.01	9.46	0.29	35.54	0.75
311_11	3176	295.02	1.29	15.97	2.83	0.01	0.02	10.45	0.28	35.56	0.72
311_12	1804	294.99	1.32	15.53	2.92	0.01	0.02	11.43	0.28	35.53	0.71
311_13	868	294.83	1.24	15.37	2.97	0.01	0.02	12.41	0.27	35.46	0.65
311_14	452	294.89	1.32	14.94	3.15	0.01	0.02	13.43	0.27	35.41	0.66
311_15	186	294.67	1.20	14.25	3.51	0.01	0.02	14.42	0.28	35.45	0.80
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	1140	295.94	1.39	27.14	5.19	0.00	0.01	0.63	0.30	35.59	1.47
321_2	4651	295.90	1.40	27.20	5.21	0.00	0.01	1.53	0.29	35.52	1.68
321_3	8597	295.88	1.38	27.45	5.33	0.00	0.01	2.55	0.28	35.56	1.32
321_4	15405	295.96	1.39	27.67	5.32	0.00	0.01	3.55	0.29	35.58	1.18
321_5	23255	296.06	1.38	28.07	5.43	0.01	0.01	4.52	0.28	35.60	1.00

321_6	30138	296.15	1.37	28.23	5.34	0.01	0.01	5.52	0.28	35.61	0.90
321_7	32074	296.20	1.38	27.97	5.24	0.01	0.02	6.49	0.29	35.60	0.87
321_8	23990	296.24	1.40	27.84	5.18	0.01	0.02	7.48	0.29	35.62	0.84
321_9	16471	296.20	1.40	27.48	5.14	0.01	0.02	8.46	0.29	35.62	0.86
321_10	9553	296.11	1.43	27.08	5.17	0.01	0.02	9.45	0.29	35.57	0.83
321_11	5454	296.03	1.46	27.12	5.25	0.01	0.02	10.45	0.29	35.49	0.83
321_12	2570	295.89	1.46	27.35	5.47	0.01	0.02	11.42	0.28	35.51	0.76
321_13	1152	295.70	1.48	27.90	5.49	0.02	0.03	12.42	0.28	35.58	0.80
321_14	462	295.70	1.41	27.39	5.73	0.02	0.03	13.41	0.28	35.56	0.75
321_15	222	295.53	1.51	27.81	5.84	0.02	0.03	14.44	0.28	35.41	1.94
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	103	296.61	1.27	46.31	4.62	0.02	0.02	0.61	0.33	34.66	0.96
331_2	488	296.54	1.34	45.32	4.00	0.01	0.02	1.57	0.29	34.70	1.12
331_3	1036	296.46	1.33	45.40	4.10	0.02	0.02	2.56	0.28	34.80	0.86
331_4	1775	296.48	1.31	44.93	3.97	0.01	0.02	3.55	0.29	34.89	0.84
331_5	3036	296.49	1.32	44.77	3.95	0.01	0.02	4.53	0.28	34.94	0.84
331_6	3915	296.55	1.32	44.90	3.98	0.02	0.02	5.51	0.29	35.06	0.81
331_7	3752	296.68	1.25	44.98	4.03	0.02	0.03	6.48	0.29	35.18	0.81
331_8	2535	296.78	1.22	44.70	3.95	0.02	0.03	7.46	0.29	35.25	0.82
331_9	1531	296.80	1.26	44.91	4.12	0.02	0.03	8.46	0.29	35.33	0.84
331_10	915	296.78	1.27	44.71	4.06	0.02	0.03	9.45	0.29	35.39	0.85
331_11	472	296.63	1.35	44.67	4.02	0.02	0.03	10.47	0.30	35.28	0.85
331_12	319	296.58	1.35	45.12	4.31	0.03	0.03	11.48	0.29	35.35	0.69
331_13	154	296.51	1.38	45.74	4.82	0.02	0.03	12.42	0.27	35.43	0.64
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	243	$299.72	$1.01	$16.16	$2.86	$0.00	$0.01	$0.65	$0.26	$35.46	$2.02
411_2	510	$299.73	$1.09	$16.53	$2.70	$0.00	$0.00	$1.51	$0.29	$35.21	$2.18
411_3	968	$299.63	$1.04	$16.75	$2.62	$0.00	$0.01	$2.55	$0.28	$35.34	$1.90
411_4	1358	$299.60	$1.04	$16.81	$2.55	$0.00	$0.00	$3.54	$0.28	$35.68	$1.44
411_5	1371	$299.56	$1.01	$17.02	$2.50	$0.00	$0.01	$4.48	$0.28	$35.66	$1.39
411_6	1352	$299.53	$0.97	$17.14	$2.45	$0.00	$0.01	$5.49	$0.28	$35.63	$1.27
411_7	1207	$299.43	$0.95	$16.84	$2.63	$0.00	$0.01	$6.47	$0.29	$35.56	$1.25
411_8	911	$299.31	$0.86	$16.73	$2.61	$0.00	$0.00	$7.47	$0.28	$35.53	$0.96
411_9	681	$299.21	$0.88	$16.77	$2.86	$0.00	$0.01	$8.48	$0.28	$35.44	$1.02
411_10	401	$299.15	$0.83	$17.22	$2.62	$0.00	$0.01	$9.48	$0.29	$35.34	$1.14
411_11	267	$299.05	$0.75	$17.37	$2.25	$0.00	$0.01	$10.45	$0.26	$35.26	$0.85

411_12	115	$299.21	$0.79	$17.44	$2.10	$0.01	$0.02	$11.42	$0.26	$35.12	$0.58
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	1246	300.38	1.41	31.42	5.60	0.00	0.01	0.61	0.31	35.32	1.49
421_2	5332	300.40	1.35	31.62	5.58	0.00	0.01	1.54	0.28	35.30	1.20
421_3	10168	300.39	1.33	31.67	5.49	0.00	0.01	2.55	0.29	35.33	1.22
421_4	17728	300.33	1.29	31.78	5.29	0.00	0.01	3.56	0.29	35.37	1.05
421_5	28649	300.19	1.23	32.18	5.11	0.00	0.01	4.52	0.28	35.42	0.98
421_6	41299	300.08	1.16	32.48	4.95	0.00	0.01	5.52	0.29	35.45	0.89
421_7	48505	300.00	1.11	32.58	4.82	0.00	0.01	6.50	0.29	35.45	0.85
421_8	41658	299.96	1.07	32.53	4.72	0.00	0.01	7.48	0.29	35.42	0.84
421_9	29911	299.94	1.05	32.46	4.76	0.00	0.01	8.46	0.29	35.36	0.84
421_10	15135	299.90	1.03	32.21	4.88	0.01	0.01	9.44	0.28	35.30	0.85
421_11	6668	299.80	1.04	31.77	5.11	0.01	0.02	10.43	0.28	35.22	0.79
421_12	2485	299.74	1.02	31.50	5.22	0.01	0.02	11.40	0.28	35.13	0.77
421_13	720	299.79	1.01	31.82	5.33	0.01	0.02	12.40	0.28	35.08	0.77
421_14	216	299.74	1.08	31.93	5.21	0.02	0.03	13.35	0.28	35.07	0.80
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	2247	301.81	1.14	49.54	5.46	0.01	0.02	0.60	0.31	34.60	1.07
431_2	7872	301.75	1.14	49.54	5.52	0.01	0.02	1.54	0.28	34.65	1.11
431_3	13897	301.70	1.14	49.46	5.60	0.01	0.02	2.55	0.29	34.67	1.12
431_4	21035	301.55	1.18	49.09	5.60	0.01	0.02	3.54	0.29	34.74	1.10
431_5	33353	301.42	1.18	48.82	5.58	0.01	0.02	4.53	0.29	34.82	1.07
431_6	44075	301.23	1.19	48.40	5.53	0.01	0.02	5.52	0.29	34.95	0.99
431_7	44384	301.06	1.19	47.89	5.45	0.01	0.02	6.49	0.29	35.03	0.99
431_8	32188	300.97	1.16	47.53	5.37	0.01	0.02	7.47	0.29	35.06	1.02
431_9	22101	300.88	1.15	47.44	5.39	0.01	0.02	8.47	0.29	35.03	1.03
431_10	12467	300.80	1.14	47.66	5.45	0.01	0.02	9.45	0.29	34.99	1.02
431_11	6323	300.69	1.18	48.15	5.58	0.02	0.02	10.44	0.29	34.97	1.03
431_12	2764	300.64	1.23	48.65	5.42	0.02	0.03	11.43	0.28	35.07	0.97
431_13	1428	300.61	1.34	49.52	5.42	0.02	0.03	12.44	0.29	35.21	1.07
431_14	828	300.44	1.34	50.03	4.79	0.02	0.03	13.47	0.28	35.44	0.95
431_15	490	300.63	1.36	50.66	4.75	0.02	0.03	14.45	0.27	35.46	0.90
431_16	212	301.02	1.33	51.16	5.15	0.02	0.02	15.46	0.27	35.29	0.99
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1											
Bin ID	**Bin Size**	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	133	303.56	0.52	35.38	4.29	0.00	0.01	1.55	0.28	35.53	1.07

521_3	197	303.54	0.51	35.77	3.77	0.00	0.01	2.53	0.29	35.46	1.22
521_4	249	303.46	0.41	36.08	3.49	0.00	0.01	3.49	0.29	35.32	1.27
521_5	213	303.59	0.59	36.19	3.20	0.00	0.01	4.44	0.28	35.60	1.51
521_6	221	303.59	0.52	35.48	4.08	0.00	0.01	5.52	0.28	35.58	1.24
521_7	159	303.71	0.74	34.95	4.44	0.00	0.01	6.48	0.29	35.69	1.83
531_1	364	303.43	0.24	51.52	5.37	0.01	0.02	0.61	0.31	34.50	0.74
531_2	1042	303.44	0.26	51.67	5.72	0.01	0.02	1.53	0.28	34.60	0.72
531_3	1592	303.45	0.28	51.43	5.70	0.01	0.02	2.53	0.29	34.56	0.81
531_4	1809	303.44	0.26	51.46	5.83	0.01	0.02	3.51	0.29	34.58	0.80
531_5	1865	303.42	0.25	51.88	5.74	0.01	0.02	4.48	0.29	34.61	0.77
531_6	1389	303.41	0.25	52.05	5.96	0.01	0.02	5.48	0.29	34.62	0.84
531_7	944	303.40	0.24	52.40	5.92	0.02	0.02	6.46	0.29	34.64	0.88
531_8	479	303.40	0.24	52.72	6.23	0.02	0.02	7.47	0.29	34.55	0.83
531_9	325	303.42	0.25	51.39	6.13	0.02	0.03	8.49	0.28	34.68	0.96
531_10	197	303.44	0.24	52.75	6.84	0.02	0.03	9.51	0.29	34.72	0.74
531_11	120	303.42	0.22	50.49	6.18	0.02	0.03	10.46	0.29	34.97	1.05

APPENDIX C: XCAL V POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.5412	0.0010	0.5295	0.0020	0.6165	0.0048	0.6200	0.0060	0.6758	0.0077
111_2	0.5416	0.0011	0.5305	0.0023	0.6178	0.0054	0.6218	0.0067	0.6781	0.0085
111_3	0.5418	0.0012	0.5315	0.0026	0.6188	0.0060	0.6235	0.0074	0.6802	0.0093
111_4	0.5421	0.0013	0.5323	0.0028	0.6197	0.0064	0.6249	0.0079	0.6819	0.0099
111_5	0.5424	0.0013	0.5331	0.0030	0.6202	0.0067	0.6258	0.0082	0.6830	0.0102
111_6	0.5427	0.0013	0.5339	0.0031	0.6208	0.0069	0.6269	0.0084	0.6843	0.0105
111_7	0.5430	0.0014	0.5348	0.0032	0.6212	0.0070	0.6277	0.0085	0.6853	0.0106
111_8	0.5434	0.0014	0.5355	0.0032	0.6213	0.0069	0.6282	0.0085	0.6858	0.0106
111_9	0.5438	0.0014	0.5364	0.0032	0.6215	0.0069	0.6288	0.0084	0.6865	0.0105
111_10	0.5444	0.0014	0.5374	0.0031	0.6217	0.0068	0.6294	0.0083	0.6871	0.0104
111_11	0.5451	0.0014	0.5386	0.0032	0.6222	0.0068	0.6304	0.0084	0.6881	0.0104
111_12	0.5459	0.0014	0.5400	0.0032	0.6228	0.0068	0.6315	0.0084	0.6894	0.0104
111_13	0.5469	0.0014	0.5416	0.0033	0.6237	0.0068	0.6330	0.0084	0.6909	0.0104
111_14	0.5480	0.0014	0.5435	0.0033	0.6247	0.0067	0.6345	0.0082	0.6926	0.0102
111_15	0.5493	0.0015	0.5455	0.0033	0.6257	0.0067	0.6361	0.0082	0.6943	0.0102
111_16	0.5508	0.0016	0.5478	0.0034	0.6269	0.0068	0.6379	0.0083	0.6962	0.0102
111_17	0.5526	0.0017	0.5505	0.0035	0.6285	0.0068	0.6402	0.0082	0.6987	0.0101
111_18	0.5545	0.0017	0.5533	0.0035	0.6297	0.0067	0.6421	0.0081	0.7005	0.0099
111_19	0.5568	0.0018	0.5565	0.0036	0.6316	0.0067	0.6447	0.0081	0.7032	0.0099
111_20	0.5593	0.0020	0.5600	0.0037	0.6335	0.0067	0.6473	0.0081	0.7058	0.0098
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.5414	0.0008	0.5289	0.0015	0.6147	0.0035	0.6175	0.0044	0.6727	0.0057
121_2	0.5415	0.0008	0.5294	0.0016	0.6150	0.0038	0.6183	0.0048	0.6736	0.0061
121_3	0.5416	0.0008	0.5298	0.0017	0.6149	0.0039	0.6185	0.0049	0.6738	0.0063
121_4	0.5417	0.0008	0.5302	0.0016	0.6147	0.0036	0.6186	0.0045	0.6739	0.0057
121_5	0.5419	0.0009	0.5309	0.0018	0.6150	0.0041	0.6193	0.0050	0.6749	0.0064
121_6	0.5420	0.0009	0.5315	0.0019	0.6152	0.0045	0.6200	0.0055	0.6756	0.0070
121_7	0.5423	0.0009	0.5321	0.0019	0.6152	0.0044	0.6204	0.0054	0.6761	0.0068
121_8	0.5426	0.0010	0.5328	0.0019	0.6152	0.0044	0.6207	0.0054	0.6764	0.0070
121_9	0.5431	0.0010	0.5337	0.0021	0.6156	0.0047	0.6215	0.0058	0.6772	0.0074
121_10	0.5436	0.0010	0.5346	0.0020	0.6156	0.0046	0.6219	0.0057	0.6776	0.0073
121_11	0.5442	0.0010	0.5357	0.0020	0.6157	0.0044	0.6224	0.0055	0.6781	0.0070
121_12	0.5449	0.0010	0.5368	0.0019	0.6159	0.0041	0.6229	0.0051	0.6785	0.0066
121_13	0.5459	0.0011	0.5386	0.0022	0.6171	0.0047	0.6248	0.0059	0.6807	0.0074
121_14	0.5469	0.0011	0.5402	0.0022	0.6175	0.0048	0.6256	0.0060	0.6815	0.0076

121_15	0.5483	0.0011	0.5420	0.0020	0.6179	0.0043	0.6263	0.0054	0.6821	0.0070
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.5418	0.0011	0.5251	0.0011	0.6020	0.0038	0.6004	0.0052	0.6485	0.0077
211_2	0.5418	0.0011	0.5255	0.0012	0.6021	0.0039	0.6010	0.0054	0.6493	0.0079
211_3	0.5418	0.0011	0.5259	0.0012	0.6019	0.0040	0.6011	0.0054	0.6495	0.0080
211_4	0.5419	0.0010	0.5263	0.0012	0.6019	0.0040	0.6015	0.0055	0.6499	0.0081
211_5	0.5421	0.0010	0.5268	0.0012	0.6019	0.0041	0.6018	0.0056	0.6503	0.0082
211_6	0.5422	0.0010	0.5274	0.0013	0.6021	0.0041	0.6024	0.0056	0.6511	0.0082
211_7	0.5425	0.0010	0.5280	0.0013	0.6022	0.0042	0.6030	0.0057	0.6518	0.0083
211_8	0.5427	0.0010	0.5288	0.0013	0.6025	0.0042	0.6037	0.0058	0.6528	0.0084
211_9	0.5431	0.0010	0.5296	0.0013	0.6029	0.0042	0.6046	0.0058	0.6539	0.0084
211_10	0.5435	0.0010	0.5306	0.0014	0.6035	0.0042	0.6057	0.0058	0.6553	0.0084
211_11	0.5440	0.0010	0.5317	0.0014	0.6041	0.0042	0.6069	0.0057	0.6568	0.0083
211_12	0.5447	0.0010	0.5330	0.0014	0.6048	0.0042	0.6082	0.0057	0.6584	0.0082
211_13	0.5454	0.0009	0.5344	0.0015	0.6055	0.0042	0.6096	0.0056	0.6599	0.0081
211_14	0.5463	0.0009	0.5360	0.0015	0.6064	0.0040	0.6110	0.0054	0.6617	0.0077
211_15	0.5474	0.0009	0.5377	0.0016	0.6069	0.0041	0.6121	0.0056	0.6627	0.0079
211_16	0.5486	0.0009	0.5397	0.0016	0.6077	0.0041	0.6135	0.0055	0.6641	0.0078
211_17	0.5500	0.0010	0.5420	0.0017	0.6091	0.0040	0.6157	0.0054	0.6667	0.0075
211_18	0.5516	0.0011	0.5444	0.0018	0.6101	0.0041	0.6172	0.0054	0.6681	0.0076
211_19	0.5533	0.0011	0.5470	0.0018	0.6111	0.0043	0.6188	0.0056	0.6697	0.0079
211_20	0.5556	0.0012	0.5503	0.0021	0.6130	0.0044	0.6214	0.0058	0.6725	0.0080
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.5416	0.0010	0.5249	0.0011	0.6015	0.0040	0.5999	0.0055	0.6479	0.0082
221_2	0.5417	0.0010	0.5251	0.0011	0.6010	0.0038	0.5995	0.0053	0.6473	0.0079
221_3	0.5418	0.0010	0.5255	0.0011	0.6006	0.0037	0.5994	0.0051	0.6470	0.0076
221_4	0.5419	0.0010	0.5259	0.0011	0.6004	0.0037	0.5994	0.0051	0.6470	0.0075
221_5	0.5421	0.0010	0.5264	0.0011	0.6003	0.0036	0.5997	0.0050	0.6473	0.0075
221_6	0.5422	0.0010	0.5269	0.0011	0.6002	0.0036	0.5999	0.0049	0.6476	0.0073
221_7	0.5425	0.0010	0.5275	0.0011	0.6004	0.0036	0.6005	0.0050	0.6483	0.0074
221_8	0.5428	0.0010	0.5283	0.0011	0.6008	0.0037	0.6013	0.0051	0.6493	0.0075
221_9	0.5431	0.0010	0.5291	0.0012	0.6010	0.0038	0.6020	0.0052	0.6501	0.0076
221_10	0.5435	0.0010	0.5300	0.0012	0.6014	0.0039	0.6029	0.0053	0.6513	0.0078
221_11	0.5440	0.0009	0.5311	0.0013	0.6020	0.0040	0.6041	0.0055	0.6527	0.0080
221_12	0.5447	0.0009	0.5324	0.0014	0.6026	0.0041	0.6052	0.0056	0.6540	0.0081
221_13	0.5454	0.0009	0.5337	0.0014	0.6032	0.0040	0.6064	0.0056	0.6554	0.0080

221_14	0.5463	0.0009	0.5353	0.0014	0.6040	0.0041	0.6078	0.0056	0.6570	0.0081
221_15	0.5473	0.0009	0.5371	0.0015	0.6049	0.0042	0.6092	0.0057	0.6586	0.0082
221_16	0.5486	0.0009	0.5388	0.0015	0.6051	0.0040	0.6098	0.0053	0.6588	0.0076
221_17	0.5498	0.0008	0.5408	0.0015	0.6056	0.0041	0.6107	0.0056	0.6597	0.0080
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.5416	0.0009	0.5253	0.0010	0.6002	0.0038	0.5991	0.0053	0.6468	0.0079
231_4	0.5418	0.0009	0.5258	0.0010	0.6003	0.0039	0.5995	0.0054	0.6472	0.0081
231_5	0.5420	0.0009	0.5262	0.0010	0.5998	0.0035	0.5991	0.0049	0.6466	0.0072
231_6	0.5423	0.0008	0.5268	0.0010	0.5997	0.0036	0.5992	0.0049	0.6465	0.0073
231_7	0.5425	0.0008	0.5272	0.0010	0.5995	0.0033	0.5993	0.0045	0.6466	0.0067
231_8	0.5427	0.0008	0.5279	0.0010	0.5995	0.0033	0.5997	0.0046	0.6471	0.0069
231_9	0.5431	0.0009	0.5287	0.0010	0.5994	0.0033	0.5999	0.0045	0.6471	0.0067
231_10	0.5434	0.0009	0.5294	0.0009	0.5995	0.0028	0.6003	0.0040	0.6476	0.0059
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.5427	0.0010	0.5240	0.0008	0.5950	0.0017	0.5904	0.0021	0.6329	0.0032
311_2	0.5428	0.0010	0.5244	0.0008	0.5951	0.0016	0.5908	0.0020	0.6335	0.0030
311_3	0.5429	0.0010	0.5248	0.0008	0.5950	0.0016	0.5910	0.0020	0.6338	0.0030
311_4	0.5429	0.0010	0.5252	0.0008	0.5948	0.0015	0.5912	0.0019	0.6340	0.0029
311_5	0.5430	0.0010	0.5256	0.0008	0.5948	0.0015	0.5914	0.0019	0.6343	0.0029
311_6	0.5432	0.0010	0.5261	0.0008	0.5947	0.0015	0.5918	0.0019	0.6347	0.0028
311_7	0.5434	0.0010	0.5267	0.0008	0.5948	0.0015	0.5922	0.0019	0.6352	0.0029
311_8	0.5437	0.0010	0.5273	0.0008	0.5948	0.0015	0.5925	0.0019	0.6356	0.0029
311_9	0.5440	0.0010	0.5280	0.0008	0.5949	0.0014	0.5930	0.0018	0.6361	0.0028
311_10	0.5444	0.0010	0.5289	0.0008	0.5950	0.0014	0.5935	0.0018	0.6366	0.0028
311_11	0.5449	0.0010	0.5298	0.0008	0.5953	0.0014	0.5943	0.0018	0.6376	0.0028
311_12	0.5454	0.0010	0.5309	0.0008	0.5957	0.0015	0.5951	0.0019	0.6385	0.0029
311_13	0.5461	0.0010	0.5322	0.0008	0.5962	0.0014	0.5962	0.0018	0.6398	0.0027
311_14	0.5468	0.0010	0.5335	0.0008	0.5966	0.0014	0.5971	0.0019	0.6408	0.0029
311_15	0.5476	0.0009	0.5351	0.0008	0.5972	0.0014	0.5984	0.0018	0.6424	0.0027
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.5429	0.0009	0.5240	0.0007	0.5944	0.0015	0.5894	0.0019	0.6314	0.0030
321_2	0.5429	0.0010	0.5243	0.0007	0.5944	0.0015	0.5897	0.0019	0.6317	0.0030
321_3	0.5430	0.0010	0.5247	0.0008	0.5942	0.0015	0.5899	0.0019	0.6320	0.0030
321_4	0.5431	0.0010	0.5251	0.0007	0.5941	0.0015	0.5900	0.0019	0.6321	0.0030
321_5	0.5432	0.0010	0.5255	0.0007	0.5939	0.0014	0.5901	0.0019	0.6322	0.0029

321_6	0.5434	0.0009	0.5261	0.0007	0.5938	0.0014	0.5903	0.0019	0.6323	0.0029
321_7	0.5436	0.0009	0.5266	0.0007	0.5938	0.0014	0.5906	0.0019	0.6327	0.0029
321_8	0.5439	0.0009	0.5273	0.0007	0.5938	0.0014	0.5910	0.0019	0.6331	0.0030
321_9	0.5442	0.0009	0.5280	0.0007	0.5940	0.0014	0.5915	0.0019	0.6337	0.0030
321_10	0.5446	0.0009	0.5288	0.0007	0.5942	0.0014	0.5922	0.0019	0.6346	0.0030
321_11	0.5450	0.0009	0.5298	0.0008	0.5945	0.0014	0.5930	0.0020	0.6355	0.0031
321_12	0.5456	0.0010	0.5308	0.0008	0.5949	0.0015	0.5939	0.0020	0.6366	0.0031
321_13	0.5461	0.0010	0.5321	0.0008	0.5954	0.0015	0.5951	0.0020	0.6380	0.0031
321_14	0.5469	0.0009	0.5334	0.0008	0.5959	0.0015	0.5960	0.0019	0.6390	0.0030
321_15	0.5478	0.0010	0.5351	0.0010	0.5966	0.0015	0.5974	0.0021	0.6407	0.0033
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.5431	0.0009	0.5240	0.0007	0.5939	0.0014	0.5887	0.0018	0.6300	0.0028
331_2	0.5430	0.0009	0.5242	0.0007	0.5937	0.0014	0.5887	0.0018	0.6303	0.0029
331_3	0.5430	0.0009	0.5246	0.0006	0.5936	0.0013	0.5890	0.0017	0.6307	0.0028
331_4	0.5432	0.0009	0.5251	0.0007	0.5936	0.0013	0.5893	0.0017	0.6310	0.0027
331_5	0.5433	0.0009	0.5255	0.0007	0.5935	0.0013	0.5895	0.0018	0.6313	0.0028
331_6	0.5435	0.0009	0.5260	0.0007	0.5935	0.0013	0.5898	0.0017	0.6315	0.0028
331_7	0.5437	0.0009	0.5266	0.0007	0.5934	0.0013	0.5900	0.0017	0.6317	0.0026
331_8	0.5440	0.0009	0.5272	0.0007	0.5934	0.0013	0.5903	0.0016	0.6319	0.0026
331_9	0.5443	0.0009	0.5279	0.0007	0.5935	0.0013	0.5908	0.0017	0.6325	0.0027
331_10	0.5446	0.0009	0.5287	0.0007	0.5935	0.0013	0.5913	0.0017	0.6331	0.0027
331_11	0.5450	0.0009	0.5296	0.0007	0.5938	0.0014	0.5921	0.0018	0.6341	0.0029
331_12	0.5456	0.0009	0.5308	0.0008	0.5943	0.0013	0.5930	0.0018	0.6351	0.0028
331_13	0.5463	0.0009	0.5320	0.0007	0.5947	0.0013	0.5940	0.0017	0.6363	0.0028
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.5435	0.0009	0.5241	0.0007	0.5918	0.0011	0.5852	0.0012	0.6241	0.0019
411_2	0.5436	0.0009	0.5244	0.0007	0.5916	0.0010	0.5854	0.0012	0.6243	0.0019
411_3	0.5437	0.0009	0.5247	0.0008	0.5915	0.0011	0.5856	0.0012	0.6247	0.0019
411_4	0.5437	0.0010	0.5251	0.0008	0.5915	0.0011	0.5859	0.0012	0.6250	0.0019
411_5	0.5439	0.0010	0.5256	0.0008	0.5915	0.0012	0.5863	0.0013	0.6255	0.0019
411_6	0.5440	0.0009	0.5261	0.0008	0.5915	0.0012	0.5866	0.0013	0.6259	0.0019
411_7	0.5442	0.0010	0.5266	0.0008	0.5916	0.0011	0.5870	0.0013	0.6265	0.0019
411_8	0.5445	0.0011	0.5273	0.0008	0.5917	0.0012	0.5876	0.0012	0.6272	0.0017
411_9	0.5448	0.0011	0.5280	0.0008	0.5919	0.0011	0.5882	0.0012	0.6279	0.0016
411_10	0.5452	0.0010	0.5288	0.0008	0.5921	0.0011	0.5888	0.0011	0.6287	0.0016
411_11	0.5456	0.0010	0.5298	0.0008	0.5923	0.0011	0.5896	0.0012	0.6296	0.0016

411_12	0.5461	0.0007	0.5307	0.0007	0.5925	0.0010	0.5901	0.0011	0.6301	0.0016
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.5440	0.0010	0.5243	0.0008	0.5918	0.0013	0.5849	0.0015	0.6233	0.0025
421_2	0.5441	0.0010	0.5247	0.0007	0.5916	0.0012	0.5851	0.0015	0.6235	0.0024
421_3	0.5442	0.0010	0.5250	0.0007	0.5915	0.0012	0.5853	0.0014	0.6237	0.0023
421_4	0.5442	0.0010	0.5254	0.0008	0.5914	0.0012	0.5855	0.0014	0.6241	0.0023
421_5	0.5443	0.0010	0.5259	0.0007	0.5914	0.0011	0.5859	0.0013	0.6246	0.0022
421_6	0.5444	0.0009	0.5263	0.0007	0.5914	0.0011	0.5863	0.0013	0.6252	0.0021
421_7	0.5446	0.0009	0.5268	0.0007	0.5915	0.0011	0.5867	0.0012	0.6257	0.0020
421_8	0.5448	0.0009	0.5274	0.0007	0.5915	0.0010	0.5871	0.0012	0.6262	0.0019
421_9	0.5451	0.0009	0.5281	0.0007	0.5916	0.0010	0.5876	0.0012	0.6268	0.0019
421_10	0.5454	0.0009	0.5289	0.0007	0.5917	0.0011	0.5881	0.0013	0.6274	0.0019
421_11	0.5458	0.0009	0.5298	0.0007	0.5920	0.0011	0.5889	0.0013	0.6283	0.0020
421_12	0.5463	0.0009	0.5307	0.0008	0.5922	0.0011	0.5896	0.0013	0.6292	0.0020
421_13	0.5468	0.0009	0.5319	0.0008	0.5925	0.0011	0.5904	0.0013	0.6301	0.0019
421_14	0.5476	0.0009	0.5332	0.0008	0.5931	0.0011	0.5915	0.0014	0.6313	0.0020
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.5446	0.0010	0.5246	0.0008	0.5911	0.0011	0.5837	0.0012	0.6210	0.0019
431_2	0.5446	0.0010	0.5249	0.0008	0.5910	0.0011	0.5840	0.0012	0.6214	0.0019
431_3	0.5447	0.0010	0.5253	0.0007	0.5909	0.0011	0.5842	0.0012	0.6217	0.0019
431_4	0.5447	0.0010	0.5257	0.0007	0.5909	0.0011	0.5845	0.0012	0.6222	0.0020
431_5	0.5448	0.0009	0.5261	0.0007	0.5909	0.0011	0.5849	0.0012	0.6227	0.0020
431_6	0.5448	0.0009	0.5265	0.0007	0.5909	0.0010	0.5853	0.0012	0.6233	0.0020
431_7	0.5450	0.0009	0.5270	0.0007	0.5910	0.0010	0.5858	0.0012	0.6240	0.0020
431_8	0.5451	0.0009	0.5276	0.0007	0.5911	0.0010	0.5863	0.0012	0.6246	0.0020
431_9	0.5454	0.0009	0.5283	0.0007	0.5912	0.0010	0.5868	0.0012	0.6253	0.0019
431_10	0.5457	0.0009	0.5290	0.0007	0.5913	0.0010	0.5874	0.0012	0.6260	0.0020
431_11	0.5461	0.0009	0.5299	0.0007	0.5915	0.0010	0.5881	0.0013	0.6269	0.0020
431_12	0.5465	0.0009	0.5309	0.0008	0.5918	0.0010	0.5889	0.0013	0.6278	0.0021
431_13	0.5472	0.0009	0.5321	0.0008	0.5923	0.0011	0.5898	0.0014	0.6289	0.0023
431_14	0.5478	0.0009	0.5335	0.0008	0.5929	0.0011	0.5910	0.0014	0.6303	0.0023
431_15	0.5487	0.0008	0.5349	0.0008	0.5934	0.0012	0.5920	0.0016	0.6313	0.0025
431_16	0.5498	0.0008	0.5367	0.0008	0.5939	0.0011	0.5930	0.0015	0.6322	0.0024
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.5450	0.0009	0.5253	0.0007	0.5904	0.0009	0.5826	0.0008	0.6187	0.0010

521_3	0.5451	0.0009	0.5256	0.0007	0.5904	0.0009	0.5829	0.0009	0.6191	0.0011
521_4	0.5452	0.0008	0.5259	0.0006	0.5904	0.0009	0.5833	0.0008	0.6194	0.0009
521_5	0.5454	0.0009	0.5265	0.0007	0.5903	0.0010	0.5834	0.0009	0.6196	0.0012
521_6	0.5454	0.0008	0.5269	0.0006	0.5901	0.0009	0.5836	0.0009	0.6199	0.0011
521_7	0.5453	0.0009	0.5273	0.0006	0.5899	0.0009	0.5837	0.0009	0.6199	0.0012
531_1	0.5451	0.0009	0.5249	0.0007	0.5905	0.0010	0.5825	0.0009	0.6187	0.0009
531_2	0.5452	0.0008	0.5253	0.0007	0.5905	0.0009	0.5828	0.0008	0.6190	0.0009
531_3	0.5453	0.0008	0.5256	0.0007	0.5904	0.0009	0.5830	0.0008	0.6192	0.0009
531_4	0.5453	0.0008	0.5261	0.0007	0.5903	0.0009	0.5832	0.0008	0.6194	0.0009
531_5	0.5455	0.0008	0.5265	0.0007	0.5903	0.0009	0.5835	0.0008	0.6198	0.0009
531_6	0.5456	0.0008	0.5269	0.0007	0.5902	0.0009	0.5837	0.0008	0.6201	0.0008
531_7	0.5457	0.0008	0.5274	0.0006	0.5902	0.0009	0.5841	0.0008	0.6205	0.0008
531_8	0.5460	0.0008	0.5281	0.0007	0.5902	0.0008	0.5845	0.0007	0.6210	0.0008
531_9	0.5462	0.0008	0.5287	0.0007	0.5902	0.0008	0.5849	0.0008	0.6215	0.0007
531_10	0.5464	0.0007	0.5294	0.0006	0.5902	0.0007	0.5853	0.0006	0.6220	0.0007
531_11	0.5468	0.0008	0.5303	0.0006	0.5906	0.0008	0.5861	0.0008	0.6228	0.0008

APPENDIX D: XCAL H POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.2363	0.0009	0.2650	0.0016	0.2620	0.0033	0.2917	0.0044	0.3314	0.0061
111_2	0.2383	0.0009	0.2676	0.0018	0.2660	0.0037	0.2962	0.0049	0.3373	0.0068
111_3	0.2405	0.0010	0.2704	0.0019	0.2703	0.0039	0.3011	0.0052	0.3434	0.0072
111_4	0.2427	0.0010	0.2731	0.0020	0.2745	0.0041	0.3058	0.0055	0.3493	0.0076
111_5	0.2449	0.0010	0.2759	0.0021	0.2785	0.0043	0.3102	0.0057	0.3549	0.0079
111_6	0.2474	0.0010	0.2788	0.0021	0.2828	0.0044	0.3149	0.0058	0.3607	0.0081
111_7	0.2498	0.0011	0.2817	0.0022	0.2869	0.0045	0.3193	0.0059	0.3662	0.0082
111_8	0.2525	0.0011	0.2848	0.0022	0.2910	0.0045	0.3238	0.0059	0.3716	0.0082
111_9	0.2553	0.0012	0.2880	0.0023	0.2954	0.0045	0.3284	0.0059	0.3772	0.0082
111_10	0.2584	0.0012	0.2915	0.0023	0.2999	0.0045	0.3333	0.0059	0.3830	0.0082
111_11	0.2617	0.0013	0.2952	0.0024	0.3047	0.0046	0.3384	0.0060	0.3891	0.0083
111_12	0.2653	0.0014	0.2993	0.0025	0.3098	0.0047	0.3439	0.0061	0.3956	0.0083
111_13	0.2693	0.0015	0.3037	0.0026	0.3153	0.0048	0.3498	0.0062	0.4025	0.0084
111_14	0.2735	0.0016	0.3084	0.0026	0.3211	0.0048	0.3559	0.0061	0.4096	0.0083
111_15	0.2782	0.0017	0.3135	0.0027	0.3272	0.0048	0.3623	0.0061	0.4170	0.0083
111_16	0.2832	0.0018	0.3190	0.0028	0.3336	0.0049	0.3690	0.0062	0.4246	0.0083
111_17	0.2888	0.0020	0.3250	0.0030	0.3405	0.0050	0.3763	0.0063	0.4328	0.0084
111_18	0.2947	0.0021	0.3313	0.0031	0.3475	0.0050	0.3836	0.0063	0.4408	0.0083
111_19	0.3011	0.0022	0.3382	0.0032	0.3551	0.0050	0.3915	0.0062	0.4496	0.0082
111_20	0.3081	0.0025	0.3455	0.0033	0.3630	0.0051	0.3997	0.0063	0.4584	0.0082
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.2360	0.0008	0.2642	0.0013	0.2603	0.0026	0.2895	0.0033	0.3284	0.0047
121_2	0.2380	0.0008	0.2666	0.0012	0.2640	0.0025	0.2936	0.0033	0.3336	0.0046
121_3	0.2401	0.0008	0.2691	0.0013	0.2675	0.0026	0.2975	0.0034	0.3384	0.0048
121_4	0.2423	0.0008	0.2716	0.0012	0.2712	0.0024	0.3013	0.0031	0.3432	0.0044
121_5	0.2446	0.0009	0.2744	0.0013	0.2752	0.0027	0.3057	0.0035	0.3486	0.0049
121_6	0.2470	0.0009	0.2772	0.0014	0.2792	0.0029	0.3101	0.0039	0.3541	0.0054
121_7	0.2494	0.0010	0.2800	0.0015	0.2831	0.0029	0.3143	0.0038	0.3592	0.0053
121_8	0.2521	0.0010	0.2831	0.0015	0.2872	0.0030	0.3187	0.0039	0.3645	0.0055
121_9	0.2549	0.0011	0.2863	0.0018	0.2915	0.0034	0.3233	0.0044	0.3701	0.0060
121_10	0.2579	0.0011	0.2897	0.0017	0.2959	0.0032	0.3280	0.0042	0.3756	0.0058
121_11	0.2612	0.0012	0.2933	0.0017	0.3005	0.0032	0.3329	0.0041	0.3814	0.0056
121_12	0.2647	0.0013	0.2971	0.0018	0.3052	0.0031	0.3377	0.0040	0.3871	0.0054
121_13	0.2687	0.0015	0.3017	0.0021	0.3111	0.0036	0.3441	0.0046	0.3946	0.0062
121_14	0.2728	0.0015	0.3062	0.0021	0.3164	0.0036	0.3496	0.0046	0.4009	0.0063

121_15	0.2770	0.0016	0.3106	0.0021	0.3215	0.0035	0.3549	0.0044	0.4068	0.0059
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.2363	0.0008	0.2620	0.0010	0.2528	0.0025	0.2786	0.0036	0.3115	0.0056
211_2	0.2382	0.0009	0.2642	0.0010	0.2561	0.0026	0.2822	0.0037	0.3161	0.0058
211_3	0.2403	0.0009	0.2666	0.0011	0.2597	0.0027	0.2861	0.0038	0.3209	0.0059
211_4	0.2424	0.0009	0.2691	0.0011	0.2633	0.0027	0.2900	0.0038	0.3258	0.0059
211_5	0.2445	0.0009	0.2716	0.0011	0.2669	0.0028	0.2939	0.0039	0.3305	0.0061
211_6	0.2469	0.0009	0.2744	0.0012	0.2708	0.0028	0.2982	0.0040	0.3359	0.0062
211_7	0.2492	0.0009	0.2771	0.0012	0.2747	0.0029	0.3024	0.0041	0.3411	0.0063
211_8	0.2518	0.0010	0.2801	0.0013	0.2789	0.0030	0.3069	0.0041	0.3467	0.0064
211_9	0.2545	0.0010	0.2833	0.0013	0.2832	0.0031	0.3116	0.0042	0.3525	0.0064
211_10	0.2575	0.0011	0.2866	0.0014	0.2878	0.0031	0.3167	0.0043	0.3587	0.0065
211_11	0.2606	0.0011	0.2903	0.0015	0.2927	0.0032	0.3219	0.0043	0.3650	0.0065
211_12	0.2641	0.0012	0.2942	0.0016	0.2977	0.0032	0.3274	0.0043	0.3716	0.0065
211_13	0.2678	0.0013	0.2984	0.0017	0.3030	0.0032	0.3330	0.0043	0.3783	0.0064
211_14	0.2719	0.0014	0.3029	0.0017	0.3086	0.0032	0.3390	0.0042	0.3853	0.0063
211_15	0.2762	0.0015	0.3076	0.0019	0.3142	0.0033	0.3448	0.0044	0.3920	0.0064
211_16	0.2810	0.0016	0.3128	0.0019	0.3202	0.0034	0.3512	0.0044	0.3992	0.0063
211_17	0.2862	0.0017	0.3185	0.0021	0.3269	0.0034	0.3583	0.0044	0.4073	0.0062
211_18	0.2920	0.0018	0.3245	0.0022	0.3336	0.0036	0.3652	0.0045	0.4149	0.0064
211_19	0.2979	0.0019	0.3308	0.0023	0.3405	0.0036	0.3724	0.0046	0.4226	0.0065
211_20	0.3043	0.0022	0.3377	0.0026	0.3479	0.0038	0.3802	0.0048	0.4312	0.0067
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.2364	0.0009	0.2619	0.0010	0.2527	0.0026	0.2784	0.0037	0.3111	0.0059
221_2	0.2384	0.0009	0.2642	0.0010	0.2558	0.0026	0.2816	0.0037	0.3150	0.0058
221_3	0.2404	0.0008	0.2665	0.0010	0.2591	0.0026	0.2851	0.0036	0.3193	0.0057
221_4	0.2426	0.0009	0.2690	0.0010	0.2626	0.0025	0.2889	0.0035	0.3240	0.0055
221_5	0.2447	0.0009	0.2715	0.0011	0.2661	0.0026	0.2927	0.0036	0.3286	0.0056
221_6	0.2470	0.0009	0.2742	0.0011	0.2699	0.0026	0.2967	0.0036	0.3336	0.0056
221_7	0.2493	0.0009	0.2769	0.0012	0.2737	0.0027	0.3009	0.0037	0.3387	0.0057
221_8	0.2519	0.0010	0.2798	0.0012	0.2778	0.0027	0.3053	0.0038	0.3442	0.0058
221_9	0.2546	0.0010	0.2829	0.0013	0.2821	0.0028	0.3099	0.0039	0.3498	0.0059
221_10	0.2575	0.0011	0.2863	0.0014	0.2866	0.0030	0.3148	0.0040	0.3557	0.0061
221_11	0.2607	0.0011	0.2899	0.0014	0.2914	0.0031	0.3200	0.0041	0.3620	0.0063
221_12	0.2641	0.0012	0.2937	0.0016	0.2963	0.0032	0.3253	0.0043	0.3684	0.0064
221_13	0.2677	0.0013	0.2978	0.0017	0.3015	0.0033	0.3308	0.0043	0.3749	0.0065

221_14	0.2718	0.0014	0.3023	0.0018	0.3070	0.0034	0.3367	0.0045	0.3818	0.0066
221_15	0.2761	0.0014	0.3071	0.0017	0.3127	0.0032	0.3428	0.0043	0.3888	0.0064
221_16	0.2809	0.0015	0.3121	0.0019	0.3183	0.0032	0.3485	0.0042	0.3950	0.0062
221_17	0.2861	0.0017	0.3176	0.0021	0.3245	0.0035	0.3549	0.0046	0.4021	0.0066
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.2407	0.0008	0.2667	0.0010	0.2594	0.0026	0.2854	0.0037	0.3197	0.0059
231_4	0.2428	0.0007	0.2693	0.0010	0.2630	0.0027	0.2893	0.0039	0.3246	0.0061
231_5	0.2449	0.0009	0.2715	0.0010	0.2660	0.0024	0.2925	0.0034	0.3283	0.0053
231_6	0.2471	0.0008	0.2740	0.0010	0.2695	0.0025	0.2962	0.0035	0.3327	0.0055
231_7	0.2494	0.0008	0.2767	0.0010	0.2732	0.0024	0.3001	0.0032	0.3375	0.0051
231_8	0.2520	0.0010	0.2797	0.0012	0.2773	0.0026	0.3045	0.0035	0.3429	0.0054
231_9	0.2547	0.0010	0.2828	0.0012	0.2813	0.0025	0.3087	0.0034	0.3478	0.0052
231_10	0.2574	0.0009	0.2858	0.0012	0.2852	0.0024	0.3129	0.0033	0.3529	0.0049
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.2372	0.0009	0.2615	0.0008	0.2490	0.0013	0.2725	0.0015	0.3010	0.0024
311_2	0.2389	0.0009	0.2635	0.0009	0.2520	0.0013	0.2757	0.0016	0.3052	0.0024
311_3	0.2410	0.0009	0.2660	0.0009	0.2556	0.0014	0.2796	0.0016	0.3100	0.0024
311_4	0.2431	0.0009	0.2684	0.0009	0.2591	0.0014	0.2834	0.0016	0.3147	0.0024
311_5	0.2451	0.0009	0.2709	0.0009	0.2626	0.0014	0.2871	0.0017	0.3193	0.0024
311_6	0.2474	0.0009	0.2735	0.0009	0.2663	0.0014	0.2911	0.0017	0.3243	0.0025
311_7	0.2497	0.0009	0.2761	0.0010	0.2700	0.0014	0.2951	0.0017	0.3291	0.0025
311_8	0.2522	0.0010	0.2790	0.0010	0.2739	0.0015	0.2993	0.0017	0.3342	0.0025
311_9	0.2549	0.0010	0.2820	0.0011	0.2779	0.0015	0.3037	0.0018	0.3395	0.0026
311_10	0.2577	0.0011	0.2852	0.0011	0.2822	0.0016	0.3081	0.0019	0.3448	0.0027
311_11	0.2607	0.0011	0.2886	0.0011	0.2866	0.0017	0.3129	0.0019	0.3505	0.0027
311_12	0.2640	0.0011	0.2923	0.0012	0.2912	0.0017	0.3179	0.0020	0.3564	0.0028
311_13	0.2675	0.0012	0.2961	0.0013	0.2962	0.0018	0.3231	0.0021	0.3627	0.0028
311_14	0.2715	0.0013	0.3005	0.0014	0.3015	0.0018	0.3288	0.0021	0.3692	0.0029
311_15	0.2758	0.0014	0.3052	0.0015	0.3072	0.0019	0.3349	0.0022	0.3763	0.0029
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.2373	0.0009	0.2615	0.0009	0.2486	0.0014	0.2719	0.0017	0.2999	0.0025
321_2	0.2391	0.0008	0.2636	0.0008	0.2518	0.0013	0.2752	0.0016	0.3041	0.0024
321_3	0.2412	0.0008	0.2660	0.0009	0.2553	0.0013	0.2790	0.0016	0.3089	0.0024
321_4	0.2432	0.0009	0.2685	0.0009	0.2588	0.0013	0.2828	0.0016	0.3135	0.0024
321_5	0.2453	0.0009	0.2709	0.0009	0.2622	0.0014	0.2864	0.0016	0.3179	0.0024

321_6	0.2476	0.0009	0.2735	0.0009	0.2658	0.0014	0.2903	0.0017	0.3227	0.0025
321_7	0.2499	0.0009	0.2761	0.0009	0.2694	0.0014	0.2942	0.0017	0.3274	0.0025
321_8	0.2523	0.0009	0.2789	0.0010	0.2733	0.0015	0.2983	0.0018	0.3324	0.0026
321_9	0.2550	0.0010	0.2819	0.0010	0.2773	0.0015	0.3026	0.0018	0.3377	0.0027
321_10	0.2577	0.0010	0.2851	0.0011	0.2815	0.0016	0.3072	0.0019	0.3432	0.0028
321_11	0.2608	0.0011	0.2885	0.0012	0.2860	0.0017	0.3120	0.0020	0.3490	0.0029
321_12	0.2640	0.0011	0.2921	0.0012	0.2907	0.0018	0.3170	0.0021	0.3550	0.0030
321_13	0.2676	0.0012	0.2961	0.0013	0.2958	0.0018	0.3224	0.0022	0.3615	0.0030
321_14	0.2715	0.0013	0.3004	0.0014	0.3010	0.0019	0.3280	0.0022	0.3679	0.0030
321_15	0.2758	0.0015	0.3051	0.0016	0.3067	0.0021	0.3341	0.0025	0.3750	0.0033
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.2374	0.0009	0.2615	0.0009	0.2483	0.0015	0.2713	0.0017	0.2990	0.0025
331_2	0.2395	0.0008	0.2638	0.0008	0.2517	0.0012	0.2750	0.0015	0.3036	0.0023
331_3	0.2414	0.0008	0.2662	0.0008	0.2551	0.0013	0.2787	0.0016	0.3083	0.0024
331_4	0.2434	0.0008	0.2686	0.0009	0.2586	0.0013	0.2824	0.0015	0.3129	0.0023
331_5	0.2455	0.0008	0.2710	0.0009	0.2621	0.0013	0.2862	0.0016	0.3175	0.0024
331_6	0.2477	0.0009	0.2735	0.0009	0.2656	0.0013	0.2900	0.0016	0.3221	0.0024
331_7	0.2500	0.0009	0.2761	0.0009	0.2692	0.0014	0.2938	0.0016	0.3268	0.0024
331_8	0.2524	0.0009	0.2789	0.0010	0.2730	0.0014	0.2978	0.0017	0.3316	0.0024
331_9	0.2551	0.0010	0.2819	0.0011	0.2771	0.0015	0.3022	0.0017	0.3369	0.0025
331_10	0.2579	0.0010	0.2851	0.0011	0.2813	0.0016	0.3067	0.0019	0.3424	0.0026
331_11	0.2611	0.0011	0.2886	0.0012	0.2859	0.0017	0.3117	0.0020	0.3484	0.0028
331_12	0.2643	0.0012	0.2923	0.0013	0.2907	0.0017	0.3168	0.0020	0.3544	0.0028
331_13	0.2676	0.0012	0.2960	0.0013	0.2953	0.0017	0.3217	0.0019	0.3602	0.0027
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.2381	0.0008	0.2620	0.0008	0.2476	0.0011	0.2696	0.0012	0.2955	0.0017
411_2	0.2399	0.0008	0.2639	0.0008	0.2505	0.0012	0.2728	0.0014	0.2994	0.0019
411_3	0.2419	0.0008	0.2664	0.0008	0.2541	0.0012	0.2767	0.0013	0.3043	0.0019
411_4	0.2439	0.0008	0.2687	0.0008	0.2575	0.0012	0.2804	0.0013	0.3089	0.0019
411_5	0.2459	0.0009	0.2710	0.0009	0.2608	0.0013	0.2840	0.0014	0.3133	0.0019
411_6	0.2481	0.0009	0.2736	0.0009	0.2644	0.0012	0.2879	0.0014	0.3182	0.0019
411_7	0.2503	0.0009	0.2762	0.0010	0.2681	0.0013	0.2919	0.0015	0.3232	0.0020
411_8	0.2528	0.0010	0.2790	0.0010	0.2720	0.0014	0.2961	0.0015	0.3283	0.0020
411_9	0.2554	0.0010	0.2820	0.0010	0.2761	0.0014	0.3005	0.0015	0.3338	0.0020
411_10	0.2582	0.0010	0.2852	0.0011	0.2803	0.0015	0.3051	0.0016	0.3393	0.0020
411_11	0.2612	0.0010	0.2885	0.0011	0.2847	0.0014	0.3097	0.0015	0.3448	0.0019

411_12	0.2643	0.0010	0.2920	0.0011	0.2891	0.0014	0.3144	0.0015	0.3503	0.0020
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.2380	0.0009	0.2618	0.0009	0.2471	0.0013	0.2690	0.0015	0.2944	0.0022
421_2	0.2399	0.0009	0.2640	0.0008	0.2503	0.0012	0.2724	0.0014	0.2987	0.0020
421_3	0.2419	0.0008	0.2663	0.0008	0.2537	0.0012	0.2761	0.0014	0.3033	0.0021
421_4	0.2440	0.0008	0.2687	0.0009	0.2572	0.0012	0.2799	0.0014	0.3080	0.0021
421_5	0.2460	0.0008	0.2711	0.0009	0.2606	0.0013	0.2836	0.0014	0.3127	0.0021
421_6	0.2482	0.0009	0.2736	0.0009	0.2643	0.0013	0.2876	0.0015	0.3177	0.0020
421_7	0.2504	0.0009	0.2762	0.0009	0.2679	0.0013	0.2916	0.0015	0.3225	0.0020
421_8	0.2528	0.0009	0.2790	0.0010	0.2717	0.0013	0.2957	0.0015	0.3276	0.0020
421_9	0.2554	0.0010	0.2819	0.0010	0.2757	0.0014	0.2999	0.0015	0.3327	0.0021
421_10	0.2582	0.0010	0.2850	0.0011	0.2798	0.0014	0.3044	0.0016	0.3381	0.0021
421_11	0.2611	0.0011	0.2884	0.0011	0.2842	0.0015	0.3091	0.0016	0.3437	0.0022
421_12	0.2643	0.0011	0.2919	0.0012	0.2888	0.0015	0.3139	0.0017	0.3495	0.0022
421_13	0.2678	0.0012	0.2958	0.0013	0.2936	0.0016	0.3191	0.0018	0.3555	0.0023
421_14	0.2714	0.0013	0.2997	0.0013	0.2984	0.0016	0.3242	0.0018	0.3616	0.0023
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.2384	0.0008	0.2619	0.0009	0.2467	0.0012	0.2683	0.0014	0.2929	0.0020
431_2	0.2402	0.0008	0.2641	0.0008	0.2499	0.0012	0.2717	0.0013	0.2973	0.0019
431_3	0.2422	0.0008	0.2664	0.0008	0.2533	0.0012	0.2754	0.0014	0.3019	0.0019
431_4	0.2442	0.0008	0.2688	0.0009	0.2568	0.0012	0.2792	0.0014	0.3066	0.0020
431_5	0.2462	0.0008	0.2712	0.0009	0.2603	0.0012	0.2830	0.0014	0.3114	0.0020
431_6	0.2484	0.0009	0.2737	0.0009	0.2639	0.0013	0.2869	0.0014	0.3163	0.0021
431_7	0.2506	0.0009	0.2762	0.0009	0.2675	0.0013	0.2909	0.0015	0.3212	0.0021
431_8	0.2530	0.0009	0.2790	0.0010	0.2714	0.0014	0.2950	0.0015	0.3263	0.0021
431_9	0.2556	0.0010	0.2820	0.0010	0.2754	0.0014	0.2994	0.0016	0.3316	0.0022
431_10	0.2583	0.0010	0.2851	0.0011	0.2795	0.0014	0.3038	0.0016	0.3370	0.0022
431_11	0.2613	0.0010	0.2884	0.0011	0.2839	0.0015	0.3085	0.0017	0.3427	0.0023
431_12	0.2645	0.0011	0.2920	0.0012	0.2885	0.0015	0.3134	0.0017	0.3486	0.0024
431_13	0.2680	0.0012	0.2959	0.0012	0.2934	0.0016	0.3187	0.0019	0.3547	0.0025
431_14	0.2718	0.0012	0.3001	0.0013	0.2987	0.0017	0.3243	0.0019	0.3614	0.0026
431_15	0.2758	0.0013	0.3045	0.0013	0.3039	0.0016	0.3298	0.0019	0.3676	0.0025
431_16	0.2802	0.0014	0.3092	0.0015	0.3093	0.0018	0.3355	0.0020	0.3740	0.0025
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.2404	0.0008	0.2643	0.0008	0.2496	0.0011	0.2709	0.0012	0.2955	0.0015

521_3	0.2424	0.0007	0.2666	0.0008	0.2529	0.0011	0.2745	0.0012	0.3000	0.0014
521_4	0.2443	0.0008	0.2688	0.0008	0.2562	0.0011	0.2781	0.0012	0.3044	0.0015
521_5	0.2462	0.0008	0.2711	0.0009	0.2594	0.0012	0.2815	0.0012	0.3087	0.0016
521_6	0.2486	0.0009	0.2739	0.0009	0.2633	0.0012	0.2858	0.0012	0.3139	0.0015
521_7	0.2509	0.0008	0.2765	0.0010	0.2669	0.0012	0.2896	0.0013	0.3185	0.0016
531_1	0.2387	0.0008	0.2622	0.0009	0.2465	0.0012	0.2676	0.0013	0.2914	0.0015
531_2	0.2405	0.0008	0.2643	0.0008	0.2495	0.0011	0.2709	0.0012	0.2955	0.0014
531_3	0.2424	0.0008	0.2666	0.0008	0.2528	0.0011	0.2745	0.0012	0.3000	0.0014
531_4	0.2444	0.0008	0.2689	0.0008	0.2562	0.0011	0.2781	0.0012	0.3045	0.0015
531_5	0.2464	0.0008	0.2712	0.0009	0.2595	0.0012	0.2818	0.0012	0.3090	0.0015
531_6	0.2486	0.0008	0.2738	0.0009	0.2632	0.0012	0.2856	0.0012	0.3138	0.0015
531_7	0.2508	0.0009	0.2763	0.0009	0.2667	0.0012	0.2895	0.0013	0.3186	0.0015
531_8	0.2533	0.0009	0.2791	0.0010	0.2706	0.0012	0.2936	0.0013	0.3236	0.0015
531_9	0.2559	0.0010	0.2821	0.0010	0.2747	0.0013	0.2980	0.0014	0.3289	0.0016
531_10	0.2589	0.0009	0.2854	0.0010	0.2790	0.0013	0.3026	0.0014	0.3344	0.0016
531_11	0.2615	0.0010	0.2885	0.0010	0.2830	0.0014	0.3069	0.0014	0.3396	0.0017

APPENDIX E: CFRSL V POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.5445	0.0011	0.5325	0.0022	0.6201	0.0051	0.6236	0.0063	0.6803	0.0081
111_2	0.5448	0.0012	0.5350	0.0025	0.6207	0.0057	0.6258	0.0070	0.6830	0.0090
111_3	0.5452	0.0013	0.5357	0.0029	0.6221	0.0063	0.6275	0.0078	0.6850	0.0099
111_4	0.5454	0.0014	0.5363	0.0031	0.6233	0.0068	0.6289	0.0084	0.6868	0.0106
111_5	0.5456	0.0015	0.5371	0.0033	0.6243	0.0071	0.6301	0.0087	0.6883	0.0110
111_6	0.5458	0.0015	0.5383	0.0034	0.6259	0.0073	0.6320	0.0090	0.6904	0.0113
111_7	0.5460	0.0016	0.5399	0.0035	0.6276	0.0075	0.6339	0.0091	0.6927	0.0115
111_8	0.5462	0.0016	0.5416	0.0035	0.6293	0.0075	0.6359	0.0091	0.6949	0.0115
111_9	0.5463	0.0015	0.5437	0.0035	0.6314	0.0074	0.6383	0.0091	0.6975	0.0114
111_10	0.5463	0.0015	0.5460	0.0035	0.6336	0.0074	0.6408	0.0090	0.7003	0.0113
111_11	0.5464	0.0015	0.5484	0.0036	0.6360	0.0074	0.6435	0.0091	0.7033	0.0114
111_12	0.5466	0.0015	0.5508	0.0036	0.6385	0.0075	0.6463	0.0091	0.7064	0.0114
111_13	0.5469	0.0015	0.5532	0.0036	0.6410	0.0075	0.6492	0.0091	0.7096	0.0114
111_14	0.5474	0.0015	0.5556	0.0036	0.6435	0.0074	0.6520	0.0090	0.7126	0.0112
111_15	0.5482	0.0015	0.5579	0.0036	0.6459	0.0074	0.6547	0.0090	0.7154	0.0112
111_16	0.5493	0.0016	0.5604	0.0036	0.6483	0.0074	0.6573	0.0090	0.7181	0.0113
111_17	0.5511	0.0017	0.5630	0.0037	0.6511	0.0074	0.6603	0.0090	0.7211	0.0112
111_18	0.5534	0.0018	0.5655	0.0036	0.6533	0.0073	0.6627	0.0089	0.7233	0.0110
111_19	0.5559	0.0017	0.5684	0.0037	0.6562	0.0073	0.6658	0.0089	0.7262	0.0110
111_20	0.5582	0.0018	0.5713	0.0037	0.6590	0.0073	0.6686	0.0088	0.7288	0.0109
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.5445	0.0009	0.5318	0.0016	0.6181	0.0037	0.6210	0.0045	0.6768	0.0059
121_2	0.5446	0.0010	0.5337	0.0018	0.6178	0.0040	0.6221	0.0049	0.6781	0.0064
121_3	0.5447	0.0009	0.5338	0.0018	0.6178	0.0041	0.6221	0.0051	0.6781	0.0066
121_4	0.5447	0.0009	0.5340	0.0017	0.6179	0.0037	0.6222	0.0046	0.6782	0.0060
121_5	0.5449	0.0010	0.5346	0.0019	0.6187	0.0043	0.6232	0.0052	0.6794	0.0067
121_6	0.5449	0.0010	0.5356	0.0021	0.6199	0.0047	0.6245	0.0058	0.6810	0.0074
121_7	0.5451	0.0010	0.5369	0.0021	0.6212	0.0046	0.6260	0.0056	0.6827	0.0072
121_8	0.5451	0.0010	0.5387	0.0022	0.6228	0.0047	0.6279	0.0058	0.6847	0.0074
121_9	0.5453	0.0011	0.5408	0.0024	0.6250	0.0050	0.6304	0.0062	0.6875	0.0080
121_10	0.5454	0.0011	0.5430	0.0023	0.6270	0.0049	0.6326	0.0061	0.6899	0.0078
121_11	0.5454	0.0011	0.5452	0.0022	0.6290	0.0047	0.6349	0.0058	0.6924	0.0075
121_12	0.5455	0.0011	0.5473	0.0021	0.6309	0.0045	0.6370	0.0055	0.6946	0.0070
121_13	0.5458	0.0011	0.5499	0.0024	0.6338	0.0051	0.6404	0.0063	0.6985	0.0080
121_14	0.5463	0.0011	0.5520	0.0024	0.6357	0.0052	0.6424	0.0065	0.7005	0.0082

121_15	0.5471	0.0011	0.5541	0.0020	0.6374	0.0046	0.6441	0.0057	0.7020	0.0074
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.5447	0.0011	0.5279	0.0011	0.6054	0.0038	0.6038	0.0052	0.6525	0.0077
211_2	0.5447	0.0011	0.5297	0.0012	0.6048	0.0039	0.6046	0.0054	0.6535	0.0079
211_3	0.5447	0.0011	0.5297	0.0012	0.6048	0.0040	0.6046	0.0054	0.6535	0.0080
211_4	0.5448	0.0010	0.5300	0.0012	0.6051	0.0040	0.6049	0.0055	0.6539	0.0081
211_5	0.5449	0.0010	0.5304	0.0013	0.6055	0.0041	0.6055	0.0056	0.6545	0.0082
211_6	0.5449	0.0010	0.5313	0.0013	0.6066	0.0042	0.6068	0.0057	0.6561	0.0083
211_7	0.5450	0.0010	0.5326	0.0014	0.6080	0.0042	0.6084	0.0058	0.6580	0.0085
211_8	0.5451	0.0010	0.5344	0.0014	0.6099	0.0043	0.6106	0.0059	0.6606	0.0085
211_9	0.5451	0.0010	0.5364	0.0015	0.6120	0.0043	0.6131	0.0059	0.6635	0.0086
211_10	0.5452	0.0010	0.5387	0.0015	0.6145	0.0044	0.6161	0.0059	0.6670	0.0086
211_11	0.5452	0.0010	0.5410	0.0015	0.6170	0.0044	0.6190	0.0059	0.6704	0.0085
211_12	0.5453	0.0010	0.5433	0.0015	0.6195	0.0043	0.6219	0.0058	0.6738	0.0084
211_13	0.5456	0.0010	0.5456	0.0016	0.6219	0.0043	0.6247	0.0058	0.6768	0.0083
211_14	0.5459	0.0010	0.5478	0.0015	0.6242	0.0042	0.6273	0.0056	0.6798	0.0080
211_15	0.5466	0.0010	0.5500	0.0016	0.6261	0.0042	0.6294	0.0057	0.6818	0.0082
211_16	0.5477	0.0010	0.5522	0.0016	0.6282	0.0042	0.6316	0.0056	0.6840	0.0081
211_17	0.5492	0.0011	0.5546	0.0016	0.6308	0.0041	0.6345	0.0055	0.6871	0.0078
211_18	0.5516	0.0013	0.5570	0.0017	0.6329	0.0042	0.6367	0.0055	0.6889	0.0078
211_19	0.5540	0.0011	0.5595	0.0016	0.6350	0.0043	0.6389	0.0057	0.6907	0.0081
211_20	0.5565	0.0011	0.5626	0.0017	0.6381	0.0043	0.6420	0.0057	0.6936	0.0082
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.5444	0.0011	0.5276	0.0011	0.6048	0.0039	0.6032	0.0055	0.6517	0.0082
221_2	0.5445	0.0011	0.5293	0.0011	0.6036	0.0038	0.6031	0.0053	0.6514	0.0079
221_3	0.5446	0.0010	0.5293	0.0011	0.6034	0.0037	0.6028	0.0051	0.6510	0.0076
221_4	0.5447	0.0010	0.5295	0.0011	0.6035	0.0036	0.6028	0.0050	0.6509	0.0075
221_5	0.5448	0.0010	0.5299	0.0011	0.6039	0.0036	0.6033	0.0050	0.6515	0.0075
221_6	0.5449	0.0010	0.5308	0.0011	0.6047	0.0036	0.6042	0.0050	0.6525	0.0074
221_7	0.5450	0.0010	0.5321	0.0012	0.6061	0.0037	0.6059	0.0051	0.6544	0.0075
221_8	0.5451	0.0010	0.5339	0.0013	0.6080	0.0038	0.6081	0.0052	0.6569	0.0077
221_9	0.5452	0.0010	0.5359	0.0013	0.6101	0.0039	0.6105	0.0053	0.6596	0.0078
221_10	0.5452	0.0010	0.5381	0.0014	0.6124	0.0040	0.6132	0.0055	0.6628	0.0080
221_11	0.5453	0.0010	0.5404	0.0014	0.6149	0.0041	0.6161	0.0056	0.6661	0.0082
221_12	0.5454	0.0010	0.5427	0.0015	0.6172	0.0042	0.6188	0.0057	0.6692	0.0084
221_13	0.5456	0.0010	0.5449	0.0015	0.6195	0.0042	0.6215	0.0057	0.6722	0.0083

221_14	0.5460	0.0009	0.5471	0.0015	0.6218	0.0042	0.6240	0.0058	0.6750	0.0084
221_15	0.5467	0.0010	0.5493	0.0015	0.6240	0.0043	0.6265	0.0058	0.6776	0.0084
221_16	0.5479	0.0010	0.5514	0.0014	0.6255	0.0040	0.6279	0.0054	0.6786	0.0079
221_17	0.5494	0.0010	0.5535	0.0014	0.6272	0.0041	0.6296	0.0056	0.6799	0.0082
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.5444	0.0009	0.5290	0.0011	0.6030	0.0038	0.6025	0.0053	0.6506	0.0079
231_4	0.5445	0.0010	0.5293	0.0010	0.6033	0.0038	0.6028	0.0054	0.6510	0.0081
231_5	0.5446	0.0009	0.5296	0.0010	0.6033	0.0035	0.6026	0.0048	0.6506	0.0072
231_6	0.5449	0.0009	0.5306	0.0010	0.6040	0.0035	0.6034	0.0049	0.6512	0.0074
231_7	0.5449	0.0009	0.5317	0.0011	0.6051	0.0033	0.6046	0.0046	0.6525	0.0068
231_8	0.5449	0.0008	0.5334	0.0012	0.6067	0.0034	0.6064	0.0047	0.6546	0.0070
231_9	0.5451	0.0009	0.5354	0.0012	0.6084	0.0034	0.6083	0.0046	0.6565	0.0068
231_10	0.5452	0.0009	0.5373	0.0012	0.6103	0.0030	0.6104	0.0041	0.6588	0.0062
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.5456	0.0010	0.5268	0.0008	0.5985	0.0017	0.5938	0.0021	0.6368	0.0032
311_2	0.5457	0.0010	0.5286	0.0008	0.5979	0.0016	0.5944	0.0019	0.6376	0.0030
311_3	0.5457	0.0010	0.5287	0.0008	0.5979	0.0016	0.5945	0.0020	0.6377	0.0030
311_4	0.5458	0.0010	0.5288	0.0008	0.5980	0.0015	0.5947	0.0019	0.6378	0.0030
311_5	0.5458	0.0010	0.5292	0.0008	0.5984	0.0015	0.5951	0.0019	0.6384	0.0029
311_6	0.5459	0.0010	0.5300	0.0008	0.5993	0.0015	0.5961	0.0019	0.6395	0.0029
311_7	0.5460	0.0010	0.5313	0.0009	0.6005	0.0016	0.5975	0.0019	0.6411	0.0030
311_8	0.5461	0.0010	0.5329	0.0009	0.6021	0.0016	0.5993	0.0020	0.6431	0.0030
311_9	0.5461	0.0010	0.5348	0.0010	0.6039	0.0016	0.6013	0.0020	0.6453	0.0030
311_10	0.5462	0.0010	0.5369	0.0010	0.6058	0.0016	0.6036	0.0020	0.6478	0.0031
311_11	0.5463	0.0010	0.5391	0.0010	0.6080	0.0016	0.6061	0.0020	0.6506	0.0030
311_12	0.5464	0.0010	0.5413	0.0010	0.6102	0.0017	0.6085	0.0021	0.6532	0.0031
311_13	0.5466	0.0010	0.5434	0.0010	0.6123	0.0016	0.6110	0.0020	0.6560	0.0029
311_14	0.5470	0.0010	0.5455	0.0009	0.6142	0.0016	0.6131	0.0020	0.6582	0.0031
311_15	0.5474	0.0010	0.5475	0.0010	0.6163	0.0016	0.6155	0.0020	0.6609	0.0029
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.5457	0.0009	0.5267	0.0008	0.5978	0.0015	0.5928	0.0019	0.6351	0.0031
321_2	0.5458	0.0010	0.5285	0.0007	0.5971	0.0015	0.5933	0.0019	0.6357	0.0031
321_3	0.5458	0.0010	0.5285	0.0007	0.5971	0.0015	0.5934	0.0019	0.6358	0.0030
321_4	0.5459	0.0010	0.5287	0.0007	0.5973	0.0015	0.5935	0.0019	0.6359	0.0030
321_5	0.5460	0.0010	0.5292	0.0007	0.5976	0.0015	0.5938	0.0019	0.6362	0.0030

321_6	0.5461	0.0009	0.5300	0.0008	0.5983	0.0015	0.5946	0.0019	0.6370	0.0030
321_7	0.5462	0.0009	0.5312	0.0008	0.5995	0.0015	0.5959	0.0020	0.6385	0.0031
321_8	0.5463	0.0009	0.5328	0.0009	0.6010	0.0016	0.5977	0.0020	0.6404	0.0031
321_9	0.5463	0.0009	0.5347	0.0009	0.6029	0.0016	0.5999	0.0021	0.6429	0.0032
321_10	0.5464	0.0009	0.5369	0.0010	0.6050	0.0016	0.6023	0.0021	0.6456	0.0033
321_11	0.5465	0.0010	0.5390	0.0010	0.6072	0.0016	0.6048	0.0021	0.6484	0.0033
321_12	0.5466	0.0010	0.5412	0.0010	0.6094	0.0017	0.6073	0.0022	0.6513	0.0033
321_13	0.5467	0.0010	0.5433	0.0010	0.6116	0.0017	0.6099	0.0022	0.6541	0.0034
321_14	0.5471	0.0010	0.5454	0.0009	0.6135	0.0016	0.6121	0.0021	0.6564	0.0032
321_15	0.5477	0.0011	0.5476	0.0012	0.6157	0.0017	0.6146	0.0022	0.6591	0.0034
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.5459	0.0009	0.5266	0.0008	0.5972	0.0015	0.5919	0.0018	0.6336	0.0028
331_2	0.5458	0.0009	0.5283	0.0007	0.5963	0.0014	0.5923	0.0018	0.6342	0.0029
331_3	0.5458	0.0009	0.5284	0.0007	0.5964	0.0013	0.5924	0.0017	0.6344	0.0028
331_4	0.5459	0.0009	0.5286	0.0007	0.5967	0.0013	0.5927	0.0017	0.6347	0.0028
331_5	0.5460	0.0009	0.5290	0.0007	0.5971	0.0014	0.5932	0.0018	0.6352	0.0028
331_6	0.5461	0.0009	0.5299	0.0007	0.5979	0.0014	0.5940	0.0018	0.6361	0.0028
331_7	0.5462	0.0009	0.5311	0.0008	0.5990	0.0014	0.5952	0.0018	0.6374	0.0027
331_8	0.5464	0.0009	0.5327	0.0009	0.6005	0.0014	0.5969	0.0018	0.6392	0.0027
331_9	0.5464	0.0009	0.5347	0.0009	0.6023	0.0015	0.5990	0.0019	0.6415	0.0029
331_10	0.5464	0.0009	0.5367	0.0009	0.6043	0.0015	0.6013	0.0019	0.6440	0.0029
331_11	0.5464	0.0009	0.5389	0.0010	0.6065	0.0016	0.6039	0.0020	0.6470	0.0031
331_12	0.5466	0.0010	0.5411	0.0010	0.6087	0.0016	0.6064	0.0020	0.6498	0.0030
331_13	0.5469	0.0009	0.5432	0.0009	0.6109	0.0014	0.6088	0.0018	0.6524	0.0030
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.5464	0.0009	0.5268	0.0008	0.5951	0.0012	0.5885	0.0013	0.6276	0.0020
411_2	0.5465	0.0009	0.5285	0.0007	0.5943	0.0011	0.5889	0.0013	0.6281	0.0020
411_3	0.5465	0.0009	0.5285	0.0007	0.5944	0.0011	0.5890	0.0013	0.6283	0.0020
411_4	0.5465	0.0010	0.5287	0.0007	0.5946	0.0011	0.5893	0.0013	0.6286	0.0020
411_5	0.5467	0.0010	0.5292	0.0008	0.5951	0.0012	0.5899	0.0013	0.6293	0.0020
411_6	0.5467	0.0010	0.5300	0.0008	0.5959	0.0013	0.5908	0.0014	0.6303	0.0020
411_7	0.5468	0.0009	0.5312	0.0008	0.5971	0.0013	0.5922	0.0014	0.6320	0.0020
411_8	0.5469	0.0010	0.5328	0.0009	0.5988	0.0013	0.5942	0.0014	0.6343	0.0020
411_9	0.5470	0.0011	0.5348	0.0010	0.6008	0.0013	0.5964	0.0014	0.6369	0.0019
411_10	0.5470	0.0010	0.5368	0.0010	0.6028	0.0013	0.5988	0.0014	0.6395	0.0019
411_11	0.5471	0.0009	0.5389	0.0009	0.6049	0.0013	0.6013	0.0013	0.6423	0.0018

411_12	0.5472	0.0008	0.5410	0.0008	0.6068	0.0012	0.6033	0.0013	0.6444	0.0018
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.5468	0.0010	0.5271	0.0008	0.5951	0.0013	0.5881	0.0016	0.6267	0.0026
421_2	0.5469	0.0010	0.5288	0.0007	0.5943	0.0012	0.5886	0.0015	0.6272	0.0025
421_3	0.5470	0.0010	0.5288	0.0007	0.5943	0.0012	0.5886	0.0015	0.6273	0.0024
421_4	0.5470	0.0010	0.5290	0.0007	0.5945	0.0012	0.5889	0.0014	0.6276	0.0024
421_5	0.5470	0.0009	0.5294	0.0007	0.5950	0.0012	0.5895	0.0014	0.6284	0.0023
421_6	0.5471	0.0009	0.5302	0.0008	0.5959	0.0012	0.5905	0.0014	0.6296	0.0022
421_7	0.5471	0.0009	0.5314	0.0008	0.5971	0.0012	0.5919	0.0014	0.6312	0.0021
421_8	0.5472	0.0009	0.5330	0.0009	0.5986	0.0012	0.5937	0.0014	0.6333	0.0021
421_9	0.5472	0.0009	0.5349	0.0009	0.6004	0.0013	0.5958	0.0014	0.6356	0.0021
421_10	0.5473	0.0009	0.5369	0.0009	0.6024	0.0013	0.5980	0.0015	0.6381	0.0022
421_11	0.5473	0.0009	0.5390	0.0010	0.6045	0.0013	0.6005	0.0015	0.6409	0.0022
421_12	0.5474	0.0009	0.5410	0.0009	0.6065	0.0013	0.6028	0.0015	0.6434	0.0022
421_13	0.5476	0.0010	0.5431	0.0010	0.6085	0.0014	0.6050	0.0015	0.6457	0.0022
421_14	0.5481	0.0010	0.5453	0.0010	0.6106	0.0014	0.6073	0.0016	0.6483	0.0022
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.5473	0.0010	0.5272	0.0007	0.5943	0.0011	0.5868	0.0012	0.6243	0.0020
431_2	0.5474	0.0010	0.5289	0.0007	0.5936	0.0011	0.5873	0.0012	0.6249	0.0020
431_3	0.5474	0.0010	0.5290	0.0007	0.5937	0.0011	0.5875	0.0012	0.6250	0.0020
431_4	0.5474	0.0010	0.5292	0.0007	0.5939	0.0011	0.5878	0.0013	0.6255	0.0021
431_5	0.5474	0.0009	0.5296	0.0007	0.5944	0.0011	0.5884	0.0013	0.6263	0.0021
431_6	0.5475	0.0009	0.5304	0.0008	0.5953	0.0011	0.5894	0.0013	0.6276	0.0022
431_7	0.5475	0.0009	0.5315	0.0008	0.5965	0.0012	0.5909	0.0014	0.6294	0.0022
431_8	0.5475	0.0009	0.5331	0.0009	0.5981	0.0012	0.5928	0.0014	0.6315	0.0022
431_9	0.5475	0.0009	0.5350	0.0009	0.5999	0.0012	0.5949	0.0014	0.6340	0.0022
431_10	0.5476	0.0009	0.5370	0.0009	0.6019	0.0012	0.5972	0.0014	0.6366	0.0022
431_11	0.5476	0.0009	0.5391	0.0009	0.6040	0.0013	0.5997	0.0015	0.6393	0.0023
431_12	0.5477	0.0010	0.5412	0.0010	0.6061	0.0013	0.6021	0.0015	0.6420	0.0024
431_13	0.5480	0.0010	0.5434	0.0010	0.6083	0.0014	0.6045	0.0016	0.6446	0.0026
431_14	0.5484	0.0009	0.5456	0.0009	0.6106	0.0014	0.6070	0.0017	0.6474	0.0026
431_15	0.5491	0.0009	0.5478	0.0009	0.6125	0.0014	0.6091	0.0017	0.6493	0.0027
431_16	0.5506	0.0009	0.5501	0.0009	0.6146	0.0013	0.6111	0.0016	0.6510	0.0026
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.5478	0.0009	0.5293	0.0007	0.5931	0.0009	0.5861	0.0008	0.6223	0.0011

521_3	0.5479	0.0008	0.5294	0.0006	0.5932	0.0009	0.5863	0.0008	0.6223	0.0010
521_4	0.5480	0.0008	0.5296	0.0006	0.5934	0.0009	0.5865	0.0008	0.6226	0.0009
521_5	0.5481	0.0009	0.5301	0.0007	0.5938	0.0010	0.5869	0.0009	0.6231	0.0011
521_6	0.5481	0.0008	0.5308	0.0007	0.5945	0.0009	0.5878	0.0009	0.6240	0.0011
521_7	0.5480	0.0009	0.5319	0.0007	0.5954	0.0009	0.5889	0.0010	0.6251	0.0013
531_1	0.5478	0.0009	0.5275	0.0007	0.5937	0.0010	0.5856	0.0009	0.6218	0.0009
531_2	0.5480	0.0009	0.5294	0.0006	0.5931	0.0009	0.5862	0.0008	0.6224	0.0008
531_3	0.5480	0.0009	0.5294	0.0006	0.5931	0.0009	0.5862	0.0008	0.6224	0.0009
531_4	0.5481	0.0008	0.5295	0.0007	0.5933	0.0009	0.5864	0.0008	0.6226	0.0009
531_5	0.5482	0.0008	0.5300	0.0007	0.5937	0.0009	0.5869	0.0008	0.6232	0.0009
531_6	0.5482	0.0008	0.5307	0.0007	0.5944	0.0009	0.5877	0.0009	0.6241	0.0009
531_7	0.5483	0.0008	0.5319	0.0008	0.5956	0.0010	0.5891	0.0009	0.6257	0.0010
531_8	0.5484	0.0007	0.5335	0.0008	0.5971	0.0010	0.5908	0.0010	0.6276	0.0011
531_9	0.5484	0.0007	0.5354	0.0009	0.5990	0.0010	0.5929	0.0010	0.6299	0.0011
531_10	0.5483	0.0007	0.5374	0.0008	0.6008	0.0010	0.5951	0.0010	0.6323	0.0011
531_11	0.5485	0.0007	0.5396	0.0009	0.6030	0.0011	0.5975	0.0010	0.6351	0.0011

APPENDIX F: CFRSL H POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.2368	0.0007	0.2655	0.0015	0.2618	0.0032	0.2917	0.0043	0.3317	0.0062
111_2	0.2396	0.0009	0.2702	0.0018	0.2681	0.0038	0.2984	0.0050	0.3394	0.0070
111_3	0.2412	0.0009	0.2727	0.0020	0.2717	0.0041	0.3023	0.0054	0.3441	0.0076
111_4	0.2428	0.0010	0.2753	0.0021	0.2754	0.0043	0.3062	0.0057	0.3487	0.0081
111_5	0.2443	0.0010	0.2781	0.0022	0.2791	0.0045	0.3100	0.0060	0.3531	0.0084
111_6	0.2460	0.0010	0.2812	0.0023	0.2833	0.0047	0.3144	0.0062	0.3581	0.0086
111_7	0.2478	0.0011	0.2843	0.0024	0.2875	0.0048	0.3186	0.0063	0.3630	0.0087
111_8	0.2499	0.0011	0.2876	0.0024	0.2919	0.0048	0.3230	0.0063	0.3679	0.0088
111_9	0.2525	0.0012	0.2912	0.0025	0.2966	0.0049	0.3277	0.0063	0.3732	0.0088
111_10	0.2555	0.0013	0.2950	0.0025	0.3016	0.0049	0.3328	0.0063	0.3787	0.0088
111_11	0.2590	0.0014	0.2992	0.0026	0.3070	0.0050	0.3382	0.0065	0.3849	0.0089
111_12	0.2628	0.0015	0.3036	0.0027	0.3128	0.0051	0.3441	0.0065	0.3913	0.0090
111_13	0.2669	0.0016	0.3084	0.0028	0.3189	0.0051	0.3503	0.0066	0.3983	0.0090
111_14	0.2712	0.0016	0.3133	0.0028	0.3252	0.0051	0.3567	0.0065	0.4053	0.0089
111_15	0.2756	0.0016	0.3186	0.0029	0.3318	0.0052	0.3633	0.0066	0.4125	0.0090
111_16	0.2800	0.0016	0.3240	0.0029	0.3385	0.0052	0.3701	0.0066	0.4198	0.0090
111_17	0.2844	0.0017	0.3298	0.0030	0.3456	0.0053	0.3772	0.0066	0.4275	0.0090
111_18	0.2888	0.0017	0.3356	0.0030	0.3523	0.0053	0.3839	0.0066	0.4345	0.0089
111_19	0.2934	0.0017	0.3416	0.0029	0.3595	0.0052	0.3911	0.0065	0.4421	0.0088
111_20	0.2983	0.0018	0.3477	0.0030	0.3666	0.0052	0.3982	0.0065	0.4493	0.0088
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.2365	0.0005	0.2647	0.0010	0.2602	0.0022	0.2895	0.0030	0.3286	0.0044
121_2	0.2392	0.0007	0.2691	0.0012	0.2660	0.0025	0.2956	0.0033	0.3355	0.0048
121_3	0.2408	0.0007	0.2713	0.0013	0.2688	0.0026	0.2984	0.0035	0.3386	0.0049
121_4	0.2423	0.0007	0.2737	0.0012	0.2719	0.0024	0.3015	0.0032	0.3420	0.0045
121_5	0.2439	0.0008	0.2764	0.0014	0.2756	0.0027	0.3052	0.0036	0.3464	0.0051
121_6	0.2455	0.0008	0.2794	0.0016	0.2796	0.0030	0.3093	0.0040	0.3510	0.0056
121_7	0.2473	0.0009	0.2824	0.0016	0.2835	0.0030	0.3132	0.0039	0.3554	0.0055
121_8	0.2495	0.0009	0.2857	0.0017	0.2879	0.0031	0.3176	0.0041	0.3602	0.0057
121_9	0.2520	0.0011	0.2893	0.0019	0.2925	0.0036	0.3223	0.0045	0.3655	0.0063
121_10	0.2550	0.0012	0.2930	0.0019	0.2974	0.0035	0.3272	0.0044	0.3709	0.0061
121_11	0.2584	0.0013	0.2971	0.0019	0.3025	0.0034	0.3323	0.0043	0.3765	0.0059
121_12	0.2621	0.0014	0.3012	0.0019	0.3078	0.0033	0.3375	0.0042	0.3822	0.0057
121_13	0.2663	0.0015	0.3062	0.0022	0.3143	0.0038	0.3442	0.0048	0.3898	0.0065
121_14	0.2705	0.0015	0.3109	0.0022	0.3202	0.0039	0.3501	0.0048	0.3960	0.0066

121_15	0.2744	0.0015	0.3156	0.0021	0.3257	0.0036	0.3554	0.0045	0.4016	0.0061
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.2367	0.0006	0.2623	0.0008	0.2525	0.0023	0.2784	0.0034	0.3112	0.0055
211_2	0.2393	0.0008	0.2666	0.0010	0.2580	0.0025	0.2841	0.0036	0.3178	0.0057
211_3	0.2409	0.0008	0.2687	0.0010	0.2609	0.0026	0.2869	0.0037	0.3209	0.0058
211_4	0.2424	0.0008	0.2711	0.0011	0.2640	0.0027	0.2901	0.0038	0.3245	0.0059
211_5	0.2438	0.0008	0.2736	0.0011	0.2672	0.0027	0.2933	0.0038	0.3281	0.0060
211_6	0.2454	0.0008	0.2764	0.0012	0.2711	0.0028	0.2972	0.0039	0.3326	0.0061
211_7	0.2471	0.0009	0.2794	0.0013	0.2750	0.0029	0.3012	0.0040	0.3371	0.0062
211_8	0.2492	0.0009	0.2826	0.0013	0.2794	0.0030	0.3057	0.0041	0.3422	0.0064
211_9	0.2517	0.0010	0.2861	0.0014	0.2840	0.0031	0.3104	0.0042	0.3476	0.0065
211_10	0.2546	0.0011	0.2899	0.0015	0.2891	0.0032	0.3157	0.0043	0.3536	0.0066
211_11	0.2579	0.0012	0.2940	0.0016	0.2945	0.0032	0.3212	0.0043	0.3598	0.0065
211_12	0.2616	0.0013	0.2983	0.0017	0.3002	0.0033	0.3270	0.0044	0.3664	0.0065
211_13	0.2655	0.0013	0.3028	0.0017	0.3061	0.0033	0.3330	0.0044	0.3731	0.0065
211_14	0.2696	0.0013	0.3076	0.0018	0.3122	0.0033	0.3392	0.0043	0.3800	0.0063
211_15	0.2738	0.0014	0.3126	0.0018	0.3183	0.0034	0.3452	0.0044	0.3865	0.0064
211_16	0.2780	0.0014	0.3179	0.0019	0.3247	0.0034	0.3516	0.0043	0.3933	0.0063
211_17	0.2823	0.0014	0.3234	0.0019	0.3316	0.0034	0.3586	0.0043	0.4008	0.0062
211_18	0.2866	0.0014	0.3291	0.0020	0.3383	0.0035	0.3651	0.0044	0.4076	0.0063
211_19	0.2909	0.0015	0.3349	0.0019	0.3448	0.0034	0.3716	0.0043	0.4142	0.0063
211_20	0.2956	0.0016	0.3408	0.0021	0.3517	0.0036	0.3784	0.0045	0.4212	0.0064
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.2369	0.0006	0.2624	0.0008	0.2525	0.0024	0.2783	0.0036	0.3111	0.0059
221_2	0.2395	0.0008	0.2665	0.0010	0.2576	0.0025	0.2834	0.0036	0.3166	0.0057
221_3	0.2410	0.0008	0.2686	0.0010	0.2602	0.0025	0.2859	0.0035	0.3193	0.0056
221_4	0.2425	0.0008	0.2710	0.0010	0.2633	0.0025	0.2889	0.0035	0.3226	0.0055
221_5	0.2440	0.0008	0.2734	0.0011	0.2665	0.0025	0.2921	0.0035	0.3261	0.0055
221_6	0.2456	0.0008	0.2762	0.0011	0.2701	0.0026	0.2958	0.0035	0.3302	0.0055
221_7	0.2472	0.0008	0.2791	0.0012	0.2740	0.0027	0.2997	0.0036	0.3347	0.0056
221_8	0.2493	0.0009	0.2823	0.0013	0.2783	0.0028	0.3041	0.0037	0.3397	0.0058
221_9	0.2517	0.0010	0.2858	0.0014	0.2829	0.0029	0.3087	0.0039	0.3449	0.0059
221_10	0.2546	0.0011	0.2895	0.0015	0.2879	0.0030	0.3138	0.0040	0.3506	0.0061
221_11	0.2579	0.0012	0.2936	0.0015	0.2932	0.0031	0.3193	0.0042	0.3568	0.0063
221_12	0.2616	0.0013	0.2978	0.0016	0.2988	0.0033	0.3249	0.0043	0.3631	0.0065
221_13	0.2655	0.0014	0.3023	0.0017	0.3045	0.0033	0.3307	0.0044	0.3697	0.0065

221_14	0.2695	0.0013	0.3071	0.0018	0.3106	0.0034	0.3369	0.0045	0.3764	0.0066
221_15	0.2737	0.0013	0.3121	0.0017	0.3169	0.0032	0.3432	0.0043	0.3833	0.0064
221_16	0.2779	0.0013	0.3172	0.0018	0.3228	0.0032	0.3489	0.0042	0.3891	0.0062
221_17	0.2822	0.0014	0.3226	0.0019	0.3292	0.0035	0.3552	0.0045	0.3955	0.0066
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.2412	0.0007	0.2688	0.0010	0.2605	0.0025	0.2861	0.0037	0.3195	0.0058
231_4	0.2427	0.0007	0.2711	0.0010	0.2636	0.0027	0.2892	0.0038	0.3230	0.0060
231_5	0.2441	0.0008	0.2734	0.0010	0.2664	0.0024	0.2919	0.0033	0.3257	0.0053
231_6	0.2456	0.0007	0.2760	0.0010	0.2697	0.0024	0.2952	0.0034	0.3293	0.0054
231_7	0.2473	0.0008	0.2789	0.0011	0.2734	0.0024	0.2989	0.0032	0.3334	0.0050
231_8	0.2494	0.0009	0.2822	0.0012	0.2777	0.0026	0.3032	0.0035	0.3382	0.0053
231_9	0.2519	0.0009	0.2855	0.0012	0.2821	0.0025	0.3075	0.0034	0.3428	0.0052
231_10	0.2545	0.0010	0.2890	0.0013	0.2865	0.0025	0.3119	0.0033	0.3477	0.0049
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.2376	0.0007	0.2619	0.0006	0.2488	0.0009	0.2722	0.0012	0.3006	0.0021
311_2	0.2401	0.0008	0.2659	0.0008	0.2539	0.0012	0.2776	0.0014	0.3067	0.0021
311_3	0.2416	0.0008	0.2681	0.0009	0.2568	0.0012	0.2804	0.0015	0.3099	0.0022
311_4	0.2431	0.0008	0.2704	0.0009	0.2598	0.0013	0.2835	0.0015	0.3132	0.0023
311_5	0.2445	0.0008	0.2728	0.0009	0.2630	0.0013	0.2866	0.0016	0.3168	0.0023
311_6	0.2460	0.0008	0.2755	0.0010	0.2666	0.0014	0.2903	0.0016	0.3209	0.0024
311_7	0.2477	0.0009	0.2784	0.0010	0.2703	0.0015	0.2940	0.0017	0.3251	0.0024
311_8	0.2497	0.0009	0.2815	0.0011	0.2744	0.0015	0.2981	0.0017	0.3297	0.0025
311_9	0.2522	0.0010	0.2849	0.0011	0.2788	0.0016	0.3025	0.0018	0.3345	0.0026
311_10	0.2550	0.0011	0.2885	0.0012	0.2834	0.0017	0.3072	0.0019	0.3397	0.0027
311_11	0.2581	0.0012	0.2923	0.0013	0.2884	0.0018	0.3122	0.0020	0.3453	0.0027
311_12	0.2617	0.0012	0.2964	0.0013	0.2937	0.0018	0.3175	0.0020	0.3511	0.0028
311_13	0.2654	0.0013	0.3007	0.0014	0.2992	0.0020	0.3231	0.0021	0.3574	0.0029
311_14	0.2695	0.0013	0.3054	0.0014	0.3052	0.0020	0.3290	0.0022	0.3638	0.0029
311_15	0.2736	0.0013	0.3104	0.0015	0.3114	0.0020	0.3353	0.0022	0.3707	0.0028
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.2377	0.0006	0.2619	0.0005	0.2484	0.0009	0.2717	0.0012	0.2996	0.0020
321_2	0.2403	0.0008	0.2660	0.0008	0.2537	0.0011	0.2770	0.0014	0.3056	0.0022
321_3	0.2418	0.0008	0.2681	0.0008	0.2565	0.0012	0.2798	0.0015	0.3088	0.0022
321_4	0.2432	0.0008	0.2704	0.0009	0.2594	0.0013	0.2828	0.0015	0.3120	0.0023
321_5	0.2447	0.0008	0.2728	0.0009	0.2626	0.0013	0.2859	0.0016	0.3154	0.0023

321_6	0.2462	0.0008	0.2756	0.0009	0.2661	0.0014	0.2894	0.0016	0.3193	0.0024
321_7	0.2479	0.0008	0.2784	0.0010	0.2698	0.0014	0.2931	0.0017	0.3234	0.0025
321_8	0.2499	0.0009	0.2815	0.0010	0.2738	0.0015	0.2971	0.0018	0.3278	0.0025
321_9	0.2523	0.0010	0.2848	0.0011	0.2781	0.0016	0.3015	0.0019	0.3327	0.0026
321_10	0.2550	0.0011	0.2884	0.0012	0.2828	0.0017	0.3062	0.0020	0.3381	0.0028
321_11	0.2583	0.0012	0.2922	0.0013	0.2879	0.0018	0.3113	0.0021	0.3438	0.0029
321_12	0.2617	0.0012	0.2962	0.0013	0.2931	0.0019	0.3166	0.0022	0.3496	0.0030
321_13	0.2655	0.0013	0.3007	0.0014	0.2988	0.0020	0.3224	0.0022	0.3561	0.0030
321_14	0.2695	0.0013	0.3053	0.0015	0.3046	0.0020	0.3282	0.0023	0.3625	0.0030
321_15	0.2737	0.0014	0.3103	0.0016	0.3110	0.0022	0.3346	0.0025	0.3694	0.0033
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.2378	0.0007	0.2619	0.0006	0.2481	0.0008	0.2711	0.0010	0.2987	0.0019
331_2	0.2406	0.0007	0.2661	0.0007	0.2535	0.0011	0.2767	0.0013	0.3049	0.0021
331_3	0.2420	0.0007	0.2682	0.0008	0.2563	0.0012	0.2795	0.0014	0.3080	0.0022
331_4	0.2434	0.0008	0.2705	0.0008	0.2592	0.0012	0.2824	0.0014	0.3113	0.0022
331_5	0.2448	0.0008	0.2729	0.0009	0.2624	0.0013	0.2856	0.0015	0.3149	0.0022
331_6	0.2463	0.0008	0.2755	0.0009	0.2658	0.0013	0.2890	0.0016	0.3187	0.0023
331_7	0.2480	0.0008	0.2783	0.0010	0.2695	0.0014	0.2927	0.0016	0.3226	0.0023
331_8	0.2500	0.0009	0.2814	0.0010	0.2734	0.0015	0.2966	0.0017	0.3270	0.0023
331_9	0.2524	0.0010	0.2848	0.0011	0.2779	0.0016	0.3010	0.0018	0.3319	0.0024
331_10	0.2552	0.0011	0.2884	0.0012	0.2826	0.0017	0.3058	0.0019	0.3371	0.0026
331_11	0.2585	0.0012	0.2923	0.0013	0.2877	0.0018	0.3110	0.0020	0.3431	0.0028
331_12	0.2621	0.0012	0.2964	0.0013	0.2931	0.0018	0.3164	0.0020	0.3490	0.0028
331_13	0.2656	0.0012	0.3006	0.0013	0.2983	0.0018	0.3216	0.0020	0.3548	0.0027
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.2385	0.0006	0.2623	0.0005	0.2473	0.0007	0.2694	0.0008	0.2950	0.0013
411_2	0.2410	0.0007	0.2663	0.0008	0.2524	0.0010	0.2746	0.0011	0.3008	0.0017
411_3	0.2426	0.0007	0.2684	0.0008	0.2552	0.0010	0.2775	0.0012	0.3041	0.0017
411_4	0.2440	0.0008	0.2707	0.0008	0.2582	0.0011	0.2804	0.0012	0.3074	0.0017
411_5	0.2453	0.0008	0.2729	0.0009	0.2611	0.0012	0.2834	0.0013	0.3107	0.0017
411_6	0.2468	0.0008	0.2756	0.0009	0.2647	0.0013	0.2870	0.0013	0.3148	0.0018
411_7	0.2484	0.0009	0.2784	0.0010	0.2684	0.0013	0.2908	0.0014	0.3190	0.0018
411_8	0.2504	0.0009	0.2815	0.0011	0.2725	0.0014	0.2949	0.0015	0.3237	0.0019
411_9	0.2528	0.0010	0.2849	0.0011	0.2769	0.0015	0.2993	0.0016	0.3287	0.0019
411_10	0.2556	0.0011	0.2885	0.0012	0.2816	0.0016	0.3041	0.0016	0.3340	0.0020
411_11	0.2587	0.0011	0.2921	0.0012	0.2865	0.0015	0.3090	0.0016	0.3395	0.0019

411_12	0.2621	0.0011	0.2961	0.0011	0.2915	0.0015	0.3139	0.0016	0.3449	0.0019
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.2385	0.0006	0.2622	0.0005	0.2469	0.0007	0.2689	0.0010	0.2941	0.0017
421_2	0.2411	0.0008	0.2663	0.0008	0.2521	0.0010	0.2741	0.0012	0.2999	0.0018
421_3	0.2426	0.0008	0.2684	0.0008	0.2548	0.0011	0.2769	0.0012	0.3030	0.0019
421_4	0.2440	0.0008	0.2706	0.0008	0.2578	0.0012	0.2799	0.0013	0.3064	0.0019
421_5	0.2453	0.0008	0.2730	0.0009	0.2610	0.0012	0.2831	0.0014	0.3100	0.0019
421_6	0.2468	0.0008	0.2757	0.0009	0.2645	0.0013	0.2867	0.0014	0.3141	0.0019
421_7	0.2485	0.0008	0.2785	0.0010	0.2682	0.0013	0.2904	0.0015	0.3183	0.0020
421_8	0.2504	0.0009	0.2815	0.0010	0.2722	0.0014	0.2944	0.0015	0.3228	0.0020
421_9	0.2528	0.0010	0.2848	0.0011	0.2765	0.0015	0.2987	0.0016	0.3276	0.0021
421_10	0.2555	0.0011	0.2883	0.0012	0.2811	0.0015	0.3033	0.0016	0.3328	0.0021
421_11	0.2587	0.0011	0.2920	0.0012	0.2860	0.0016	0.3083	0.0017	0.3383	0.0022
421_12	0.2621	0.0012	0.2960	0.0013	0.2912	0.0017	0.3135	0.0018	0.3441	0.0022
421_13	0.2659	0.0012	0.3004	0.0013	0.2967	0.0018	0.3190	0.0018	0.3501	0.0023
421_14	0.2696	0.0013	0.3047	0.0014	0.3021	0.0018	0.3244	0.0018	0.3561	0.0023
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.2388	0.0006	0.2624	0.0005	0.2466	0.0007	0.2681	0.0009	0.2925	0.0014
431_2	0.2413	0.0007	0.2664	0.0007	0.2517	0.0010	0.2734	0.0011	0.2984	0.0017
431_3	0.2428	0.0008	0.2685	0.0008	0.2544	0.0011	0.2761	0.0012	0.3015	0.0017
431_4	0.2442	0.0008	0.2707	0.0008	0.2574	0.0011	0.2791	0.0013	0.3049	0.0018
431_5	0.2456	0.0008	0.2731	0.0009	0.2606	0.0012	0.2824	0.0013	0.3086	0.0019
431_6	0.2470	0.0008	0.2757	0.0009	0.2641	0.0013	0.2860	0.0014	0.3127	0.0020
431_7	0.2486	0.0008	0.2785	0.0010	0.2678	0.0013	0.2897	0.0015	0.3170	0.0020
431_8	0.2506	0.0009	0.2815	0.0010	0.2718	0.0014	0.2938	0.0015	0.3216	0.0021
431_9	0.2529	0.0010	0.2848	0.0011	0.2762	0.0015	0.2981	0.0016	0.3265	0.0021
431_10	0.2557	0.0011	0.2883	0.0012	0.2808	0.0016	0.3028	0.0017	0.3317	0.0022
431_11	0.2588	0.0011	0.2921	0.0012	0.2857	0.0016	0.3078	0.0018	0.3373	0.0023
431_12	0.2623	0.0012	0.2961	0.0013	0.2909	0.0017	0.3130	0.0018	0.3431	0.0024
431_13	0.2661	0.0012	0.3005	0.0014	0.2965	0.0018	0.3186	0.0020	0.3492	0.0025
431_14	0.2700	0.0012	0.3052	0.0014	0.3025	0.0018	0.3246	0.0020	0.3559	0.0026
431_15	0.2739	0.0012	0.3099	0.0014	0.3083	0.0018	0.3303	0.0019	0.3619	0.0025
431_16	0.2779	0.0012	0.3150	0.0015	0.3142	0.0018	0.3363	0.0020	0.3680	0.0025
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.2416	0.0007	0.2667	0.0007	0.2514	0.0010	0.2726	0.0009	0.2966	0.0011

521_3	0.2430	0.0007	0.2687	0.0007	0.2540	0.0010	0.2752	0.0010	0.2995	0.0011
521_4	0.2444	0.0007	0.2707	0.0008	0.2568	0.0010	0.2780	0.0010	0.3027	0.0012
521_5	0.2457	0.0007	0.2731	0.0009	0.2598	0.0011	0.2810	0.0011	0.3059	0.0013
521_6	0.2473	0.0007	0.2760	0.0009	0.2635	0.0012	0.2848	0.0012	0.3102	0.0013
521_7	0.2491	0.0008	0.2788	0.0010	0.2672	0.0013	0.2885	0.0013	0.3142	0.0015
531_1	0.2391	0.0005	0.2626	0.0005	0.2462	0.0006	0.2674	0.0006	0.2908	0.0006
531_2	0.2416	0.0007	0.2666	0.0007	0.2513	0.0009	0.2725	0.0009	0.2965	0.0010
531_3	0.2430	0.0007	0.2686	0.0008	0.2539	0.0010	0.2751	0.0010	0.2995	0.0011
531_4	0.2444	0.0007	0.2708	0.0008	0.2568	0.0010	0.2780	0.0010	0.3027	0.0012
531_5	0.2458	0.0007	0.2731	0.0009	0.2599	0.0011	0.2811	0.0011	0.3062	0.0013
531_6	0.2473	0.0007	0.2758	0.0009	0.2634	0.0012	0.2846	0.0012	0.3101	0.0013
531_7	0.2489	0.0008	0.2785	0.0010	0.2670	0.0012	0.2883	0.0012	0.3142	0.0014
531_8	0.2509	0.0008	0.2816	0.0010	0.2710	0.0013	0.2923	0.0013	0.3187	0.0014
531_9	0.2534	0.0009	0.2850	0.0011	0.2754	0.0014	0.2968	0.0014	0.3236	0.0016
531_10	0.2563	0.0010	0.2887	0.0011	0.2803	0.0015	0.3016	0.0014	0.3290	0.0016
531_11	0.2592	0.0011	0.2922	0.0012	0.2848	0.0016	0.3062	0.0015	0.3340	0.0017

APPENDIX G: WINDSAT V POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.5369	0.0027	0.5311	0.0031	0.6236	0.0061	0.6261	0.0095	0.6888	0.0130
111_2	0.5366	0.0026	0.5313	0.0033	0.6243	0.0067	0.6275	0.0097	0.6895	0.0129
111_3	0.5363	0.0024	0.5316	0.0034	0.6247	0.0071	0.6284	0.0102	0.6902	0.0132
111_4	0.5362	0.0023	0.5319	0.0035	0.6250	0.0075	0.6290	0.0108	0.6907	0.0137
111_5	0.5361	0.0022	0.5322	0.0036	0.6251	0.0078	0.6293	0.0111	0.6908	0.0140
111_6	0.5362	0.0022	0.5327	0.0037	0.6252	0.0079	0.6299	0.0113	0.6904	0.0140
111_7	0.5369	0.0023	0.5338	0.0039	0.6259	0.0081	0.6310	0.0118	0.6907	0.0142
111_8	0.5379	0.0025	0.5352	0.0041	0.6265	0.0082	0.6317	0.0122	0.6907	0.0143
111_9	0.5392	0.0027	0.5370	0.0044	0.6277	0.0084	0.6332	0.0126	0.6914	0.0147
111_10	0.5407	0.0029	0.5389	0.0046	0.6290	0.0086	0.6344	0.0129	0.6920	0.0149
111_11	0.5425	0.0032	0.5412	0.0051	0.6307	0.0091	0.6364	0.0135	0.6935	0.0156
111_12	0.5441	0.0034	0.5434	0.0053	0.6323	0.0092	0.6380	0.0136	0.6944	0.0155
111_13	0.5463	0.0037	0.5462	0.0057	0.6347	0.0096	0.6408	0.0141	0.6967	0.0162
111_14	0.5485	0.0039	0.5491	0.0059	0.6369	0.0098	0.6431	0.0143	0.6983	0.0164
111_15	0.5512	0.0042	0.5527	0.0063	0.6401	0.0103	0.6466	0.0147	0.7012	0.0174
111_16	0.5538	0.0044	0.5559	0.0065	0.6426	0.0104	0.6493	0.0147	0.7030	0.0172
111_17	0.5567	0.0047	0.5596	0.0070	0.6464	0.0111	0.6536	0.0155	0.7070	0.0185
111_18	0.5597	0.0049	0.5634	0.0072	0.6494	0.0114	0.6569	0.0160	0.7093	0.0193
111_19	0.5626	0.0052	0.5669	0.0075	0.6528	0.0115	0.6606	0.0161	0.7129	0.0198
111_20	0.5635	0.0059	0.5680	0.0081	0.6533	0.0115	0.6614	0.0157	0.7127	0.0187
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.5382	0.0032	0.5314	0.0027	0.6225	0.0057	0.6247	0.0122	0.6863	0.0099
121_2	0.5377	0.0028	0.5312	0.0028	0.6214	0.0060	0.6219	0.0121	0.6859	0.0112
121_3	0.5371	0.0027	0.5310	0.0027	0.6210	0.0062	0.6223	0.0129	0.6858	0.0121
121_4	0.5366	0.0023	0.5306	0.0024	0.6198	0.0061	0.6206	0.0131	0.6841	0.0115
121_5	0.5363	0.0023	0.5308	0.0026	0.6196	0.0064	0.6204	0.0137	0.6844	0.0122
121_6	0.5363	0.0022	0.5311	0.0027	0.6195	0.0067	0.6206	0.0140	0.6836	0.0125
121_7	0.5365	0.0023	0.5316	0.0029	0.6193	0.0072	0.6207	0.0152	0.6825	0.0129
121_8	0.5370	0.0022	0.5325	0.0030	0.6197	0.0070	0.6209	0.0145	0.6821	0.0128
121_9	0.5383	0.0025	0.5343	0.0034	0.6212	0.0082	0.6226	0.0168	0.6839	0.0145
121_10	0.5393	0.0026	0.5354	0.0036	0.6215	0.0082	0.6226	0.0169	0.6831	0.0145
121_11	0.5408	0.0030	0.5373	0.0040	0.6228	0.0087	0.6244	0.0178	0.6847	0.0156
121_12	0.5417	0.0031	0.5384	0.0041	0.6225	0.0092	0.6233	0.0193	0.6836	0.0158
121_13	0.5435	0.0038	0.5411	0.0052	0.6249	0.0105	0.6262	0.0207	0.6871	0.0189
121_14	0.5448	0.0040	0.5428	0.0053	0.6250	0.0115	0.6248	0.0228	0.6873	0.0202

121_15	0.5471	0.0044	0.5453	0.0058	0.6259	0.0106	0.6274	0.0201	0.6854	0.0182
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.5363	0.0022	0.5260	0.0020	0.6101	0.0046	0.6111	0.0087	0.6614	0.0089
211_2	0.5361	0.0022	0.5259	0.0020	0.6098	0.0046	0.6110	0.0086	0.6612	0.0092
211_3	0.5359	0.0020	0.5259	0.0020	0.6091	0.0047	0.6105	0.0088	0.6606	0.0096
211_4	0.5357	0.0020	0.5259	0.0020	0.6085	0.0048	0.6099	0.0089	0.6599	0.0097
211_5	0.5357	0.0019	0.5261	0.0020	0.6081	0.0049	0.6097	0.0092	0.6595	0.0099
211_6	0.5358	0.0020	0.5266	0.0021	0.6080	0.0050	0.6096	0.0093	0.6592	0.0099
211_7	0.5365	0.0022	0.5277	0.0024	0.6085	0.0052	0.6102	0.0099	0.6594	0.0104
211_8	0.5375	0.0024	0.5291	0.0027	0.6092	0.0054	0.6109	0.0102	0.6596	0.0105
211_9	0.5388	0.0026	0.5309	0.0031	0.6104	0.0058	0.6123	0.0108	0.6605	0.0110
211_10	0.5400	0.0028	0.5326	0.0033	0.6115	0.0061	0.6132	0.0113	0.6612	0.0111
211_11	0.5416	0.0030	0.5346	0.0037	0.6130	0.0065	0.6148	0.0118	0.6625	0.0116
211_12	0.5430	0.0033	0.5366	0.0040	0.6144	0.0067	0.6164	0.0122	0.6637	0.0118
211_13	0.5450	0.0036	0.5391	0.0045	0.6161	0.0072	0.6181	0.0129	0.6651	0.0122
211_14	0.5469	0.0038	0.5417	0.0048	0.6179	0.0073	0.6197	0.0131	0.6667	0.0120
211_15	0.5494	0.0044	0.5446	0.0055	0.6199	0.0079	0.6212	0.0134	0.6682	0.0129
211_16	0.5518	0.0044	0.5477	0.0055	0.6223	0.0079	0.6239	0.0136	0.6706	0.0131
211_17	0.5545	0.0048	0.5513	0.0063	0.6256	0.0087	0.6273	0.0138	0.6740	0.0147
211_18	0.5573	0.0052	0.5547	0.0066	0.6286	0.0089	0.6302	0.0143	0.6769	0.0151
211_19	0.5585	0.0054	0.5564	0.0070	0.6298	0.0100	0.6313	0.0157	0.6785	0.0171
211_20	0.5605	0.0054	0.5582	0.0072	0.6314	0.0090	0.6332	0.0148	0.6797	0.0154
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.5373	0.0024	0.5269	0.0022	0.6099	0.0051	0.6095	0.0108	0.6619	0.0119
221_2	0.5372	0.0025	0.5268	0.0022	0.6092	0.0054	0.6089	0.0114	0.6604	0.0116
221_3	0.5368	0.0023	0.5265	0.0022	0.6083	0.0053	0.6080	0.0114	0.6590	0.0117
221_4	0.5366	0.0022	0.5264	0.0021	0.6073	0.0053	0.6067	0.0115	0.6577	0.0114
221_5	0.5364	0.0021	0.5264	0.0021	0.6067	0.0054	0.6060	0.0121	0.6573	0.0117
221_6	0.5364	0.0021	0.5267	0.0022	0.6063	0.0056	0.6057	0.0126	0.6563	0.0117
221_7	0.5369	0.0022	0.5275	0.0024	0.6066	0.0059	0.6059	0.0133	0.6561	0.0120
221_8	0.5378	0.0024	0.5288	0.0027	0.6071	0.0062	0.6060	0.0139	0.6563	0.0123
221_9	0.5389	0.0026	0.5304	0.0031	0.6079	0.0068	0.6066	0.0151	0.6565	0.0130
221_10	0.5400	0.0028	0.5318	0.0034	0.6086	0.0073	0.6073	0.0159	0.6565	0.0133
221_11	0.5411	0.0032	0.5335	0.0039	0.6097	0.0080	0.6087	0.0171	0.6575	0.0144
221_12	0.5423	0.0034	0.5351	0.0042	0.6102	0.0083	0.6088	0.0176	0.6572	0.0149
221_13	0.5436	0.0038	0.5368	0.0047	0.6110	0.0087	0.6095	0.0188	0.6576	0.0153

221_14	0.5451	0.0041	0.5388	0.0051	0.6116	0.0094	0.6091	0.0198	0.6575	0.0161
221_15	0.5471	0.0048	0.5413	0.0057	0.6124	0.0099	0.6079	0.0214	0.6582	0.0167
221_16	0.5495	0.0056	0.5439	0.0072	0.6136	0.0109	0.6095	0.0217	0.6577	0.0180
221_17	0.5501	0.0066	0.5445	0.0082	0.6133	0.0126	0.6066	0.0268	0.6575	0.0212
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.5380	0.0036	0.5279	0.0027	0.6091	0.0067	0.6119	0.0148	0.6599	0.0145
231_4	0.5378	0.0030	0.5277	0.0024	0.6086	0.0066	0.6111	0.0147	0.6591	0.0129
231_5	0.5374	0.0029	0.5275	0.0025	0.6069	0.0064	0.6076	0.0151	0.6570	0.0124
231_6	0.5374	0.0027	0.5277	0.0025	0.6069	0.0066	0.6075	0.0147	0.6564	0.0131
231_7	0.5374	0.0027	0.5279	0.0027	0.6063	0.0066	0.6064	0.0159	0.6546	0.0134
231_8	0.5380	0.0024	0.5287	0.0027	0.6057	0.0066	0.6045	0.0166	0.6536	0.0120
231_9	0.5389	0.0029	0.5300	0.0034	0.6066	0.0085	0.6062	0.0211	0.6547	0.0144
231_10	0.5392	0.0031	0.5305	0.0036	0.6056	0.0081	0.6034	0.0198	0.6519	0.0136
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.5370	0.0019	0.5248	0.0016	0.6041	0.0036	0.6043	0.0078	0.6460	0.0055
311_2	0.5368	0.0019	0.5248	0.0017	0.6037	0.0036	0.6042	0.0078	0.6459	0.0054
311_3	0.5367	0.0018	0.5247	0.0018	0.6031	0.0037	0.6037	0.0079	0.6452	0.0056
311_4	0.5365	0.0018	0.5247	0.0017	0.6022	0.0036	0.6027	0.0079	0.6443	0.0056
311_5	0.5365	0.0017	0.5250	0.0017	0.6019	0.0035	0.6024	0.0079	0.6438	0.0057
311_6	0.5368	0.0018	0.5256	0.0019	0.6017	0.0036	0.6022	0.0079	0.6435	0.0060
311_7	0.5377	0.0019	0.5268	0.0021	0.6020	0.0037	0.6022	0.0081	0.6434	0.0063
311_8	0.5388	0.0020	0.5282	0.0023	0.6026	0.0039	0.6024	0.0083	0.6433	0.0065
311_9	0.5401	0.0022	0.5300	0.0026	0.6034	0.0043	0.6032	0.0088	0.6435	0.0070
311_10	0.5414	0.0023	0.5316	0.0027	0.6042	0.0045	0.6040	0.0091	0.6435	0.0069
311_11	0.5430	0.0026	0.5337	0.0031	0.6055	0.0050	0.6052	0.0101	0.6443	0.0077
311_12	0.5448	0.0029	0.5359	0.0034	0.6065	0.0053	0.6055	0.0102	0.6450	0.0082
311_13	0.5472	0.0032	0.5389	0.0040	0.6086	0.0060	0.6074	0.0116	0.6472	0.0088
311_14	0.5492	0.0034	0.5414	0.0042	0.6108	0.0057	0.6103	0.0109	0.6489	0.0086
311_15	0.5513	0.0040	0.5440	0.0049	0.6125	0.0069	0.6113	0.0129	0.6511	0.0096
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.5383	0.0022	0.5258	0.0020	0.6046	0.0043	0.6047	0.0097	0.6444	0.0057
321_2	0.5380	0.0022	0.5257	0.0020	0.6041	0.0044	0.6043	0.0101	0.6441	0.0060
321_3	0.5376	0.0019	0.5255	0.0018	0.6031	0.0043	0.6031	0.0099	0.6432	0.0062
321_4	0.5374	0.0018	0.5253	0.0017	0.6022	0.0042	0.6020	0.0101	0.6422	0.0063
321_5	0.5372	0.0016	0.5254	0.0016	0.6014	0.0041	0.6013	0.0099	0.6413	0.0065

321_6	0.5374	0.0016	0.5258	0.0017	0.6010	0.0041	0.6006	0.0100	0.6404	0.0067
321_7	0.5381	0.0018	0.5268	0.0019	0.6010	0.0043	0.6002	0.0103	0.6402	0.0072
321_8	0.5391	0.0019	0.5281	0.0021	0.6012	0.0045	0.5997	0.0105	0.6398	0.0075
321_9	0.5402	0.0021	0.5296	0.0024	0.6017	0.0049	0.5998	0.0114	0.6394	0.0079
321_10	0.5413	0.0022	0.5310	0.0025	0.6022	0.0052	0.5999	0.0119	0.6393	0.0082
321_11	0.5426	0.0025	0.5327	0.0030	0.6030	0.0058	0.6004	0.0134	0.6394	0.0092
321_12	0.5439	0.0026	0.5345	0.0032	0.6036	0.0062	0.6004	0.0141	0.6398	0.0097
321_13	0.5456	0.0032	0.5368	0.0040	0.6053	0.0077	0.6021	0.0172	0.6414	0.0117
321_14	0.5473	0.0034	0.5390	0.0043	0.6067	0.0080	0.6036	0.0181	0.6425	0.0121
321_15	0.5485	0.0052	0.5403	0.0069	0.6066	0.0093	0.6009	0.0204	0.6420	0.0133
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.5397	0.0029	0.5269	0.0026	0.6041	0.0052	0.6050	0.0121	0.6408	0.0085
331_2	0.5391	0.0027	0.5265	0.0025	0.6035	0.0053	0.6047	0.0119	0.6410	0.0085
331_3	0.5387	0.0026	0.5262	0.0025	0.6028	0.0055	0.6038	0.0122	0.6403	0.0098
331_4	0.5383	0.0022	0.5260	0.0022	0.6019	0.0052	0.6025	0.0119	0.6397	0.0095
331_5	0.5380	0.0021	0.5260	0.0021	0.6013	0.0052	0.6017	0.0118	0.6393	0.0096
331_6	0.5381	0.0020	0.5264	0.0021	0.6007	0.0051	0.6007	0.0120	0.6383	0.0094
331_7	0.5386	0.0020	0.5271	0.0022	0.6004	0.0052	0.5999	0.0120	0.6370	0.0093
331_8	0.5392	0.0021	0.5280	0.0024	0.6004	0.0055	0.5997	0.0131	0.6362	0.0092
331_9	0.5402	0.0023	0.5294	0.0029	0.6008	0.0064	0.5999	0.0149	0.6359	0.0103
331_10	0.5411	0.0025	0.5306	0.0031	0.6008	0.0068	0.5989	0.0154	0.6350	0.0110
331_11	0.5423	0.0029	0.5324	0.0039	0.6014	0.0075	0.5985	0.0171	0.6351	0.0115
331_12	0.5435	0.0031	0.5338	0.0039	0.6018	0.0075	0.5983	0.0178	0.6348	0.0116
331_13	0.5455	0.0041	0.5364	0.0050	0.6037	0.0092	0.6008	0.0191	0.6376	0.0133
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.5383	0.0020	0.5249	0.0017	0.6019	0.0037	0.6002	0.0091	0.6368	0.0042
411_2	0.5383	0.0019	0.5248	0.0016	0.6011	0.0037	0.5994	0.0087	0.6360	0.0041
411_3	0.5377	0.0018	0.5246	0.0015	0.6002	0.0037	0.5986	0.0087	0.6351	0.0044
411_4	0.5373	0.0016	0.5245	0.0014	0.5995	0.0036	0.5986	0.0086	0.6345	0.0042
411_5	0.5374	0.0017	0.5249	0.0016	0.5992	0.0036	0.5987	0.0089	0.6340	0.0043
411_6	0.5377	0.0018	0.5255	0.0018	0.5989	0.0037	0.5986	0.0088	0.6337	0.0044
411_7	0.5384	0.0020	0.5265	0.0020	0.5993	0.0039	0.5995	0.0089	0.6338	0.0050
411_8	0.5395	0.0022	0.5281	0.0023	0.6001	0.0041	0.6003	0.0094	0.6344	0.0051
411_9	0.5408	0.0023	0.5298	0.0026	0.6008	0.0043	0.6008	0.0097	0.6348	0.0060
411_10	0.5424	0.0024	0.5318	0.0029	0.6018	0.0050	0.6009	0.0109	0.6358	0.0067
411_11	0.5438	0.0025	0.5338	0.0030	0.6028	0.0046	0.6019	0.0100	0.6365	0.0063

411_12	0.5451	0.0030	0.5353	0.0036	0.6038	0.0047	0.6030	0.0094	0.6369	0.0069
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.5392	0.0022	0.5259	0.0019	0.6021	0.0050	0.6015	0.0119	0.6359	0.0060
421_2	0.5389	0.0019	0.5257	0.0017	0.6015	0.0048	0.6006	0.0113	0.6351	0.0059
421_3	0.5386	0.0018	0.5254	0.0016	0.6003	0.0046	0.5991	0.0110	0.6339	0.0057
421_4	0.5382	0.0016	0.5253	0.0014	0.5993	0.0044	0.5981	0.0108	0.6330	0.0057
421_5	0.5381	0.0014	0.5254	0.0014	0.5987	0.0043	0.5975	0.0106	0.6325	0.0056
421_6	0.5382	0.0015	0.5258	0.0014	0.5983	0.0042	0.5970	0.0104	0.6320	0.0056
421_7	0.5389	0.0015	0.5268	0.0016	0.5984	0.0043	0.5971	0.0104	0.6318	0.0057
421_8	0.5399	0.0016	0.5281	0.0017	0.5988	0.0044	0.5973	0.0106	0.6317	0.0059
421_9	0.5411	0.0017	0.5296	0.0019	0.5994	0.0047	0.5974	0.0112	0.6318	0.0064
421_10	0.5422	0.0018	0.5311	0.0020	0.5999	0.0050	0.5971	0.0119	0.6317	0.0070
421_11	0.5435	0.0020	0.5328	0.0023	0.6006	0.0054	0.5975	0.0127	0.6321	0.0076
421_12	0.5448	0.0021	0.5345	0.0025	0.6012	0.0056	0.5975	0.0133	0.6323	0.0081
421_13	0.5461	0.0025	0.5362	0.0031	0.6021	0.0063	0.5985	0.0144	0.6324	0.0092
421_14	0.5475	0.0034	0.5380	0.0041	0.6032	0.0070	0.5995	0.0155	0.6334	0.0105
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.5399	0.0020	0.5262	0.0019	0.6007	0.0049	0.6019	0.0111	0.6305	0.0069
431_2	0.5396	0.0019	0.5260	0.0018	0.6003	0.0049	0.6017	0.0114	0.6302	0.0070
431_3	0.5393	0.0018	0.5258	0.0016	0.5994	0.0050	0.6003	0.0116	0.6292	0.0071
431_4	0.5390	0.0017	0.5257	0.0015	0.5985	0.0049	0.5990	0.0117	0.6286	0.0071
431_5	0.5386	0.0015	0.5256	0.0015	0.5978	0.0048	0.5980	0.0114	0.6281	0.0070
431_6	0.5386	0.0015	0.5259	0.0015	0.5973	0.0048	0.5970	0.0114	0.6276	0.0071
431_7	0.5391	0.0016	0.5267	0.0017	0.5974	0.0049	0.5968	0.0118	0.6277	0.0074
431_8	0.5399	0.0017	0.5278	0.0018	0.5976	0.0051	0.5963	0.0122	0.6275	0.0077
431_9	0.5410	0.0018	0.5293	0.0021	0.5981	0.0055	0.5964	0.0131	0.6277	0.0084
431_10	0.5420	0.0019	0.5306	0.0023	0.5984	0.0057	0.5962	0.0135	0.6276	0.0088
431_11	0.5431	0.0023	0.5321	0.0030	0.5989	0.0063	0.5963	0.0147	0.6276	0.0097
431_12	0.5443	0.0028	0.5337	0.0038	0.5993	0.0068	0.5964	0.0156	0.6276	0.0106
431_13	0.5454	0.0039	0.5352	0.0052	0.5992	0.0073	0.5953	0.0160	0.6275	0.0110
431_14	0.5468	0.0049	0.5371	0.0066	0.6001	0.0077	0.5961	0.0162	0.6286	0.0111
431_15	0.5472	0.0057	0.5373	0.0076	0.6000	0.0081	0.5959	0.0173	0.6277	0.0117
431_16	0.5469	0.0070	0.5368	0.0091	0.6014	0.0092	0.5993	0.0195	0.6293	0.0126
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.5399	0.0017	0.5259	0.0015	0.5977	0.0051	0.5935	0.0130	0.6272	0.0060

521_3	0.5397	0.0020	0.5259	0.0016	0.5969	0.0050	0.5933	0.0124	0.6266	0.0059
521_4	0.5394	0.0017	0.5257	0.0013	0.5960	0.0048	0.5925	0.0118	0.6259	0.0061
521_5	0.5394	0.0017	0.5258	0.0016	0.5950	0.0047	0.5900	0.0123	0.6241	0.0058
521_6	0.5393	0.0023	0.5261	0.0019	0.5945	0.0056	0.5891	0.0136	0.6230	0.0065
521_7	0.5401	0.0024	0.5271	0.0021	0.5952	0.0055	0.5905	0.0143	0.6230	0.0070
531_1	0.5398	0.0017	0.5258	0.0015	0.5985	0.0045	0.5998	0.0107	0.6264	0.0060
531_2	0.5397	0.0016	0.5257	0.0015	0.5980	0.0046	0.5989	0.0111	0.6258	0.0063
531_3	0.5396	0.0016	0.5257	0.0015	0.5975	0.0048	0.5985	0.0114	0.6253	0.0066
531_4	0.5393	0.0015	0.5255	0.0014	0.5965	0.0049	0.5970	0.0116	0.6240	0.0068
531_5	0.5390	0.0014	0.5255	0.0014	0.5957	0.0052	0.5956	0.0125	0.6231	0.0072
531_6	0.5389	0.0014	0.5257	0.0015	0.5947	0.0052	0.5937	0.0127	0.6216	0.0073
531_7	0.5394	0.0017	0.5265	0.0019	0.5945	0.0056	0.5930	0.0138	0.6207	0.0081
531_8	0.5401	0.0017	0.5275	0.0020	0.5946	0.0056	0.5929	0.0133	0.6203	0.0081
531_9	0.5414	0.0025	0.5290	0.0031	0.5945	0.0063	0.5909	0.0155	0.6193	0.0093
531_10	0.5415	0.0026	0.5297	0.0035	0.5940	0.0066	0.5908	0.0158	0.6184	0.0098
531_11	0.5432	0.0035	0.5321	0.0048	0.5961	0.0079	0.5931	0.0178	0.6208	0.0113

APPENDIX H: WINDSAT H POL EMISSIVITY BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
111_1	0.2408	0.0027	0.2712	0.0034	0.2782	0.0086	0.3046	0.0160	0.3594	0.0225
111_2	0.2418	0.0027	0.2723	0.0035	0.2802	0.0088	0.3075	0.0154	0.3610	0.0216
111_3	0.2435	0.0027	0.2741	0.0036	0.2834	0.0091	0.3115	0.0156	0.3649	0.0218
111_4	0.2451	0.0025	0.2758	0.0036	0.2864	0.0092	0.3148	0.0159	0.3688	0.0222
111_5	0.2468	0.0025	0.2777	0.0036	0.2895	0.0093	0.3185	0.0159	0.3727	0.0226
111_6	0.2486	0.0024	0.2797	0.0037	0.2925	0.0094	0.3222	0.0163	0.3754	0.0222
111_7	0.2507	0.0026	0.2823	0.0040	0.2965	0.0099	0.3269	0.0173	0.3804	0.0230
111_8	0.2529	0.0027	0.2851	0.0042	0.3004	0.0103	0.3312	0.0179	0.3853	0.0232
111_9	0.2554	0.0030	0.2883	0.0047	0.3049	0.0109	0.3365	0.0188	0.3911	0.0241
111_10	0.2579	0.0031	0.2915	0.0049	0.3091	0.0112	0.3408	0.0192	0.3963	0.0243
111_11	0.2607	0.0035	0.2952	0.0054	0.3141	0.0120	0.3464	0.0203	0.4028	0.0257
111_12	0.2637	0.0037	0.2989	0.0057	0.3187	0.0121	0.3512	0.0204	0.4078	0.0256
111_13	0.2673	0.0040	0.3035	0.0060	0.3248	0.0128	0.3580	0.0211	0.4152	0.0270
111_14	0.2710	0.0042	0.3081	0.0062	0.3303	0.0128	0.3635	0.0210	0.4207	0.0270
111_15	0.2753	0.0046	0.3134	0.0066	0.3371	0.0138	0.3708	0.0219	0.4284	0.0292
111_16	0.2792	0.0047	0.3182	0.0067	0.3427	0.0136	0.3764	0.0214	0.4336	0.0286
111_17	0.2832	0.0050	0.3233	0.0073	0.3497	0.0149	0.3841	0.0227	0.4422	0.0314
111_18	0.2869	0.0051	0.3278	0.0074	0.3548	0.0154	0.3893	0.0233	0.4469	0.0327
111_19	0.2912	0.0052	0.3331	0.0076	0.3618	0.0164	0.3966	0.0243	0.4553	0.0352
111_20	0.2937	0.0059	0.3360	0.0083	0.3655	0.0160	0.4008	0.0231	0.4580	0.0327
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
121_1	0.2391	0.0027	0.2693	0.0027	0.2754	0.0091	0.2999	0.0218	0.3530	0.0194
121_2	0.2406	0.0029	0.2706	0.0032	0.2767	0.0098	0.2988	0.0217	0.3562	0.0216
121_3	0.2430	0.0028	0.2730	0.0034	0.2820	0.0103	0.3066	0.0230	0.3632	0.0229
121_4	0.2448	0.0025	0.2748	0.0031	0.2848	0.0105	0.3092	0.0237	0.3658	0.0222
121_5	0.2467	0.0023	0.2768	0.0031	0.2885	0.0107	0.3133	0.0245	0.3712	0.0230
121_6	0.2485	0.0022	0.2788	0.0031	0.2920	0.0110	0.3179	0.0247	0.3746	0.0234
121_7	0.2504	0.0023	0.2810	0.0033	0.2956	0.0117	0.3222	0.0267	0.3780	0.0237
121_8	0.2523	0.0024	0.2834	0.0035	0.2992	0.0115	0.3262	0.0254	0.3824	0.0237
121_9	0.2548	0.0028	0.2866	0.0042	0.3043	0.0139	0.3319	0.0299	0.3907	0.0270
121_10	0.2570	0.0030	0.2894	0.0044	0.3076	0.0136	0.3350	0.0297	0.3942	0.0265
121_11	0.2600	0.0035	0.2931	0.0050	0.3129	0.0147	0.3411	0.0311	0.4022	0.0285
121_12	0.2625	0.0037	0.2962	0.0054	0.3157	0.0159	0.3429	0.0343	0.4051	0.0294
121_13	0.2661	0.0043	0.3008	0.0065	0.3222	0.0178	0.3501	0.0359	0.4150	0.0343
121_14	0.2696	0.0044	0.3049	0.0067	0.3267	0.0195	0.3524	0.0397	0.4213	0.0367

121_15	0.2723	0.0047	0.3080	0.0069	0.3300	0.0173	0.3581	0.0344	0.4207	0.0327
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
211_1	0.2395	0.0026	0.2670	0.0026	0.2692	0.0067	0.2970	0.0148	0.3348	0.0133
211_2	0.2409	0.0027	0.2683	0.0027	0.2715	0.0068	0.2996	0.0146	0.3377	0.0136
211_3	0.2430	0.0027	0.2702	0.0029	0.2748	0.0071	0.3034	0.0149	0.3418	0.0151
211_4	0.2451	0.0025	0.2722	0.0028	0.2781	0.0070	0.3069	0.0148	0.3460	0.0150
211_5	0.2470	0.0023	0.2742	0.0028	0.2813	0.0071	0.3106	0.0151	0.3502	0.0156
211_6	0.2488	0.0022	0.2762	0.0028	0.2842	0.0073	0.3137	0.0155	0.3538	0.0156
211_7	0.2508	0.0024	0.2786	0.0031	0.2878	0.0077	0.3178	0.0163	0.3587	0.0164
211_8	0.2528	0.0025	0.2812	0.0033	0.2913	0.0080	0.3215	0.0167	0.3632	0.0164
211_9	0.2552	0.0028	0.2842	0.0037	0.2955	0.0085	0.3262	0.0178	0.3687	0.0170
211_10	0.2576	0.0030	0.2872	0.0040	0.2991	0.0089	0.3297	0.0184	0.3731	0.0168
211_11	0.2604	0.0034	0.2908	0.0045	0.3036	0.0095	0.3346	0.0192	0.3789	0.0178
211_12	0.2634	0.0036	0.2944	0.0048	0.3082	0.0098	0.3393	0.0196	0.3839	0.0178
211_13	0.2669	0.0041	0.2988	0.0054	0.3134	0.0104	0.3443	0.0207	0.3897	0.0184
211_14	0.2705	0.0043	0.3031	0.0056	0.3182	0.0107	0.3486	0.0213	0.3949	0.0183
211_15	0.2746	0.0049	0.3080	0.0064	0.3236	0.0114	0.3536	0.0214	0.4007	0.0198
211_16	0.2785	0.0052	0.3128	0.0066	0.3293	0.0116	0.3592	0.0217	0.4068	0.0203
211_17	0.2825	0.0057	0.3177	0.0075	0.3352	0.0128	0.3649	0.0226	0.4137	0.0234
211_18	0.2869	0.0057	0.3229	0.0073	0.3419	0.0124	0.3716	0.0223	0.4212	0.0242
211_19	0.2892	0.0067	0.3263	0.0088	0.3458	0.0156	0.3749	0.0256	0.4266	0.0293
211_20	0.2921	0.0068	0.3291	0.0088	0.3495	0.0143	0.3794	0.0248	0.4298	0.0262
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
221_1	0.2397	0.0027	0.2674	0.0029	0.2693	0.0090	0.2930	0.0204	0.3359	0.0201
221_2	0.2412	0.0029	0.2687	0.0030	0.2716	0.0093	0.2963	0.0207	0.3377	0.0192
221_3	0.2432	0.0028	0.2704	0.0031	0.2749	0.0094	0.3005	0.0206	0.3411	0.0197
221_4	0.2454	0.0026	0.2724	0.0030	0.2782	0.0091	0.3039	0.0205	0.3449	0.0193
221_5	0.2472	0.0023	0.2743	0.0030	0.2816	0.0094	0.3075	0.0215	0.3495	0.0203
221_6	0.2490	0.0022	0.2763	0.0030	0.2848	0.0096	0.3115	0.0222	0.3529	0.0203
221_7	0.2508	0.0024	0.2784	0.0033	0.2881	0.0102	0.3151	0.0234	0.3570	0.0210
221_8	0.2528	0.0025	0.2810	0.0035	0.2915	0.0105	0.3182	0.0241	0.3618	0.0215
221_9	0.2550	0.0029	0.2838	0.0040	0.2952	0.0115	0.3221	0.0260	0.3667	0.0225
221_10	0.2572	0.0031	0.2864	0.0042	0.2984	0.0121	0.3255	0.0273	0.3700	0.0225
221_11	0.2598	0.0035	0.2897	0.0049	0.3028	0.0133	0.3305	0.0293	0.3754	0.0244
221_12	0.2623	0.0038	0.2928	0.0052	0.3060	0.0138	0.3331	0.0302	0.3785	0.0250
221_13	0.2653	0.0043	0.2964	0.0058	0.3103	0.0144	0.3375	0.0319	0.3830	0.0256

221_14	0.2683	0.0048	0.2999	0.0065	0.3135	0.0154	0.3393	0.0333	0.3861	0.0266
221_15	0.2721	0.0050	0.3043	0.0065	0.3172	0.0160	0.3394	0.0360	0.3904	0.0276
221_16	0.2758	0.0066	0.3083	0.0088	0.3210	0.0172	0.3435	0.0360	0.3921	0.0292
221_17	0.2775	0.0090	0.3102	0.0113	0.3227	0.0222	0.3413	0.0465	0.3944	0.0356
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
231_3	0.2443	0.0027	0.2718	0.0033	0.2794	0.0133	0.3067	0.0281	0.3440	0.0257
231_4	0.2464	0.0025	0.2737	0.0030	0.2838	0.0117	0.3122	0.0262	0.3486	0.0219
231_5	0.2479	0.0023	0.2753	0.0029	0.2859	0.0116	0.3122	0.0269	0.3513	0.0222
231_6	0.2495	0.0022	0.2771	0.0030	0.2896	0.0114	0.3168	0.0255	0.3556	0.0232
231_7	0.2511	0.0025	0.2789	0.0033	0.2926	0.0125	0.3200	0.0287	0.3581	0.0241
231_8	0.2530	0.0023	0.2812	0.0033	0.2951	0.0129	0.3211	0.0307	0.3619	0.0225
231_9	0.2551	0.0027	0.2839	0.0040	0.3003	0.0153	0.3287	0.0369	0.3697	0.0252
231_10	0.2564	0.0027	0.2854	0.0039	0.3014	0.0143	0.3274	0.0350	0.3696	0.0249
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
311_1	0.2399	0.0026	0.2663	0.0024	0.2667	0.0068	0.2958	0.0146	0.3235	0.0098
311_2	0.2413	0.0027	0.2676	0.0026	0.2691	0.0065	0.2986	0.0143	0.3266	0.0097
311_3	0.2436	0.0026	0.2696	0.0026	0.2726	0.0065	0.3028	0.0141	0.3307	0.0101
311_4	0.2459	0.0023	0.2717	0.0024	0.2760	0.0065	0.3062	0.0143	0.3350	0.0104
311_5	0.2479	0.0021	0.2738	0.0023	0.2793	0.0064	0.3099	0.0142	0.3392	0.0106
311_6	0.2497	0.0020	0.2758	0.0024	0.2823	0.0065	0.3130	0.0141	0.3432	0.0112
311_7	0.2516	0.0021	0.2783	0.0027	0.2856	0.0067	0.3163	0.0143	0.3480	0.0118
311_8	0.2538	0.0022	0.2810	0.0029	0.2891	0.0069	0.3197	0.0147	0.3527	0.0118
311_9	0.2562	0.0025	0.2840	0.0033	0.2930	0.0073	0.3239	0.0154	0.3577	0.0123
311_10	0.2586	0.0026	0.2869	0.0034	0.2966	0.0076	0.3279	0.0159	0.3617	0.0118
311_11	0.2615	0.0030	0.2904	0.0039	0.3008	0.0082	0.3319	0.0172	0.3665	0.0125
311_12	0.2646	0.0034	0.2941	0.0043	0.3044	0.0086	0.3343	0.0174	0.3708	0.0130
311_13	0.2685	0.0038	0.2988	0.0049	0.3095	0.0093	0.3387	0.0196	0.3769	0.0138
311_14	0.2723	0.0043	0.3033	0.0056	0.3150	0.0093	0.3455	0.0187	0.3819	0.0135
311_15	0.2758	0.0047	0.3076	0.0059	0.3192	0.0101	0.3475	0.0203	0.3872	0.0140
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
321_1	0.2403	0.0026	0.2667	0.0025	0.2676	0.0076	0.2954	0.0177	0.3211	0.0103
321_2	0.2418	0.0027	0.2680	0.0026	0.2700	0.0081	0.2982	0.0185	0.3242	0.0112
321_3	0.2438	0.0025	0.2698	0.0026	0.2732	0.0079	0.3017	0.0179	0.3281	0.0114
321_4	0.2460	0.0022	0.2719	0.0024	0.2768	0.0078	0.3058	0.0182	0.3325	0.0116
321_5	0.2480	0.0019	0.2739	0.0022	0.2802	0.0075	0.3098	0.0177	0.3366	0.0117

321_6	0.2498	0.0019	0.2759	0.0023	0.2832	0.0076	0.3129	0.0179	0.3404	0.0121
321_7	0.2518	0.0020	0.2783	0.0026	0.2866	0.0078	0.3162	0.0183	0.3454	0.0131
321_8	0.2538	0.0021	0.2809	0.0027	0.2897	0.0080	0.3189	0.0186	0.3497	0.0135
321_9	0.2561	0.0024	0.2836	0.0031	0.2930	0.0087	0.3221	0.0200	0.3536	0.0140
321_10	0.2583	0.0026	0.2864	0.0034	0.2962	0.0093	0.3252	0.0210	0.3574	0.0142
321_11	0.2610	0.0031	0.2896	0.0041	0.3001	0.0105	0.3289	0.0235	0.3618	0.0162
321_12	0.2637	0.0034	0.2929	0.0045	0.3035	0.0111	0.3314	0.0247	0.3657	0.0167
321_13	0.2668	0.0041	0.2968	0.0052	0.3084	0.0131	0.3364	0.0292	0.3712	0.0196
321_14	0.2703	0.0046	0.3009	0.0059	0.3133	0.0141	0.3414	0.0314	0.3763	0.0209
321_15	0.2724	0.0067	0.3032	0.0087	0.3130	0.0160	0.3364	0.0347	0.3749	0.0234
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
331_1	0.2409	0.0027	0.2672	0.0027	0.2673	0.0097	0.2927	0.0227	0.3153	0.0170
331_2	0.2427	0.0027	0.2686	0.0029	0.2709	0.0103	0.2978	0.0231	0.3202	0.0172
331_3	0.2445	0.0026	0.2703	0.0030	0.2744	0.0103	0.3022	0.0223	0.3244	0.0189
331_4	0.2465	0.0023	0.2722	0.0027	0.2782	0.0097	0.3063	0.0219	0.3293	0.0181
331_5	0.2482	0.0021	0.2741	0.0026	0.2817	0.0094	0.3105	0.0211	0.3339	0.0179
331_6	0.2498	0.0019	0.2758	0.0026	0.2845	0.0093	0.3131	0.0215	0.3372	0.0176
331_7	0.2516	0.0020	0.2780	0.0027	0.2876	0.0095	0.3163	0.0215	0.3404	0.0174
331_8	0.2534	0.0022	0.2801	0.0030	0.2907	0.0101	0.3200	0.0231	0.3440	0.0171
331_9	0.2556	0.0027	0.2830	0.0036	0.2947	0.0113	0.3244	0.0260	0.3490	0.0187
331_10	0.2578	0.0031	0.2855	0.0041	0.2973	0.0119	0.3262	0.0265	0.3519	0.0194
331_11	0.2606	0.0039	0.2889	0.0052	0.3010	0.0134	0.3288	0.0295	0.3564	0.0205
331_12	0.2630	0.0042	0.2917	0.0052	0.3046	0.0133	0.3319	0.0311	0.3598	0.0197
331_13	0.2664	0.0053	0.2960	0.0066	0.3099	0.0153	0.3379	0.0324	0.3671	0.0231
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
411_1	0.2412	0.0030	0.2666	0.0025	0.2664	0.0074	0.2947	0.0172	0.3169	0.0089
411_2	0.2430	0.0029	0.2681	0.0027	0.2687	0.0072	0.2970	0.0162	0.3195	0.0083
411_3	0.2453	0.0024	0.2702	0.0022	0.2723	0.0068	0.3012	0.0157	0.3236	0.0081
411_4	0.2474	0.0021	0.2723	0.0021	0.2761	0.0067	0.3063	0.0153	0.3282	0.0075
411_5	0.2492	0.0019	0.2742	0.0020	0.2791	0.0066	0.3103	0.0155	0.3320	0.0075
411_6	0.2507	0.0019	0.2761	0.0021	0.2816	0.0067	0.3132	0.0155	0.3355	0.0081
411_7	0.2525	0.0021	0.2784	0.0024	0.2849	0.0069	0.3177	0.0155	0.3405	0.0090
411_8	0.2547	0.0023	0.2811	0.0028	0.2886	0.0074	0.3216	0.0163	0.3459	0.0093
411_9	0.2570	0.0026	0.2841	0.0032	0.2921	0.0077	0.3250	0.0169	0.3508	0.0105
411_10	0.2598	0.0028	0.2874	0.0037	0.2957	0.0087	0.3273	0.0190	0.3557	0.0113
411_11	0.2625	0.0032	0.2909	0.0038	0.3001	0.0086	0.3319	0.0182	0.3610	0.0113

411_12	0.2652	0.0038	0.2941	0.0047	0.3038	0.0083	0.3361	0.0165	0.3648	0.0118
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
421_1	0.2409	0.0026	0.2667	0.0024	0.2667	0.0090	0.2943	0.0215	0.3146	0.0108
421_2	0.2422	0.0026	0.2679	0.0025	0.2686	0.0088	0.2964	0.0205	0.3168	0.0107
421_3	0.2446	0.0024	0.2700	0.0024	0.2722	0.0085	0.3002	0.0198	0.3209	0.0104
421_4	0.2469	0.0020	0.2720	0.0021	0.2759	0.0082	0.3046	0.0193	0.3253	0.0102
421_5	0.2488	0.0017	0.2742	0.0019	0.2797	0.0079	0.3089	0.0189	0.3299	0.0100
421_6	0.2506	0.0016	0.2762	0.0020	0.2829	0.0078	0.3124	0.0185	0.3342	0.0100
421_7	0.2527	0.0017	0.2788	0.0022	0.2866	0.0079	0.3167	0.0185	0.3393	0.0104
421_8	0.2548	0.0018	0.2815	0.0023	0.2903	0.0081	0.3208	0.0188	0.3445	0.0107
421_9	0.2572	0.0021	0.2844	0.0027	0.2940	0.0086	0.3244	0.0197	0.3494	0.0114
421_10	0.2596	0.0023	0.2874	0.0030	0.2973	0.0091	0.3270	0.0208	0.3535	0.0122
421_11	0.2623	0.0027	0.2907	0.0035	0.3010	0.0098	0.3305	0.0222	0.3581	0.0132
421_12	0.2652	0.0031	0.2941	0.0040	0.3045	0.0103	0.3332	0.0232	0.3618	0.0141
421_13	0.2681	0.0038	0.2975	0.0049	0.3084	0.0113	0.3374	0.0248	0.3652	0.0157
421_14	0.2706	0.0053	0.3005	0.0068	0.3116	0.0127	0.3405	0.0263	0.3684	0.0186
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
431_1	0.2407	0.0025	0.2663	0.0024	0.2647	0.0093	0.2910	0.0212	0.3053	0.0135
431_2	0.2421	0.0026	0.2676	0.0025	0.2676	0.0095	0.2951	0.0216	0.3088	0.0135
431_3	0.2444	0.0025	0.2696	0.0026	0.2714	0.0097	0.2995	0.0218	0.3130	0.0138
431_4	0.2465	0.0022	0.2716	0.0023	0.2752	0.0094	0.3039	0.0216	0.3178	0.0135
431_5	0.2485	0.0019	0.2737	0.0021	0.2793	0.0089	0.3086	0.0207	0.3229	0.0130
431_6	0.2503	0.0017	0.2757	0.0021	0.2828	0.0088	0.3120	0.0205	0.3275	0.0131
431_7	0.2523	0.0018	0.2781	0.0024	0.2867	0.0090	0.3162	0.0211	0.3331	0.0136
431_8	0.2544	0.0020	0.2807	0.0026	0.2901	0.0093	0.3195	0.0217	0.3382	0.0141
431_9	0.2568	0.0024	0.2837	0.0031	0.2941	0.0101	0.3236	0.0231	0.3437	0.0152
431_10	0.2591	0.0027	0.2866	0.0036	0.2976	0.0104	0.3269	0.0237	0.3480	0.0158
431_11	0.2615	0.0034	0.2895	0.0045	0.3010	0.0113	0.3300	0.0254	0.3518	0.0171
431_12	0.2640	0.0045	0.2924	0.0057	0.3040	0.0121	0.3326	0.0266	0.3547	0.0185
431_13	0.2664	0.0064	0.2951	0.0079	0.3062	0.0133	0.3328	0.0265	0.3567	0.0200
431_14	0.2690	0.0082	0.2981	0.0102	0.3093	0.0141	0.3356	0.0261	0.3598	0.0206
431_15	0.2697	0.0103	0.2989	0.0127	0.3100	0.0159	0.3362	0.0269	0.3592	0.0230
431_16	0.2680	0.0123	0.2966	0.0150	0.3088	0.0192	0.3372	0.0309	0.3573	0.0255
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**SST AVG**	**SST STD**	**WV AVG**	**WV STD**	**CLW AVG**	**CLW STD**	**WS AVG**	**WS STD**	**SAL AVG**	**SAL STD**
521_2	0.2426	0.0033	0.2674	0.0021	0.2630	0.0091	0.2849	0.0227	0.3066	0.0106

521_3	0.2458	0.0029	0.2703	0.0023	0.2687	0.0092	0.2924	0.0218	0.3135	0.0112
521_4	0.2477	0.0024	0.2721	0.0020	0.2722	0.0091	0.2970	0.0212	0.3177	0.0115
521_5	0.2496	0.0024	0.2740	0.0023	0.2749	0.0091	0.2981	0.0223	0.3201	0.0113
521_6	0.2515	0.0027	0.2761	0.0024	0.2784	0.0098	0.3016	0.0236	0.3238	0.0115
521_7	0.2539	0.0029	0.2787	0.0027	0.2828	0.0104	0.3082	0.0254	0.3292	0.0127
531_1	0.2405	0.0025	0.2659	0.0022	0.2624	0.0091	0.2879	0.0205	0.3008	0.0117
531_2	0.2418	0.0025	0.2671	0.0024	0.2644	0.0093	0.2903	0.0212	0.3031	0.0127
531_3	0.2442	0.0026	0.2691	0.0025	0.2688	0.0095	0.2961	0.0213	0.3081	0.0131
531_4	0.2463	0.0024	0.2710	0.0025	0.2725	0.0096	0.3004	0.0214	0.3119	0.0135
531_5	0.2483	0.0021	0.2730	0.0022	0.2763	0.0097	0.3043	0.0224	0.3162	0.0138
531_6	0.2500	0.0020	0.2749	0.0024	0.2790	0.0094	0.3060	0.0224	0.3189	0.0137
531_7	0.2520	0.0023	0.2772	0.0028	0.2824	0.0103	0.3095	0.0243	0.3229	0.0151
531_8	0.2538	0.0026	0.2794	0.0033	0.2860	0.0102	0.3137	0.0234	0.3272	0.0152
531_9	0.2562	0.0035	0.2820	0.0043	0.2880	0.0114	0.3135	0.0266	0.3299	0.0171
531_10	0.2579	0.0043	0.2846	0.0055	0.2915	0.0124	0.3175	0.0267	0.3340	0.0187
531_11	0.2607	0.0045	0.2880	0.0062	0.2969	0.0125	0.3241	0.0281	0.3412	0.0182

APPENDIX I: WINDSAT – CFRSL EMISSIVITY DELTAS BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
111_1	-0.0047	0.0031	0.0035	0.0091	0.0062	0.0091	0.0070	0.0052	0.0150	0.0106
111_2	-0.0053	0.0013	0.0012	0.0055	0.0063	0.0048	0.0061	0.0014	0.0130	0.0044
111_3	-0.0060	0.0014	0.0008	0.0048	0.0054	0.0044	0.0054	0.0015	0.0116	0.0037
111_4	-0.0063	0.0014	0.0005	0.0039	0.0045	0.0037	0.0046	0.0010	0.0104	0.0029
111_5	-0.0066	0.0015	0.0000	0.0030	0.0035	0.0030	0.0037	0.0008	0.0091	0.0024
111_6	-0.0067	0.0016	-0.0007	0.0019	0.0021	0.0019	0.0025	0.0001	0.0065	0.0002
111_7	-0.0062	0.0020	-0.0011	0.0014	0.0010	0.0017	0.0015	0.0006	0.0045	0.0003
111_8	-0.0054	0.0020	-0.0015	0.0009	-0.0001	0.0013	0.0003	0.0005	0.0023	0.0003
111_9	-0.0041	0.0019	-0.0018	0.0004	-0.0009	0.0011	-0.0006	0.0011	0.0004	0.0008
111_10	-0.0027	0.0014	-0.0022	-0.0002	-0.0019	0.0002	-0.0019	0.0004	-0.0018	0.0005
111_11	-0.0011	0.0008	-0.0023	-0.0006	-0.0025	-0.0001	-0.0026	0.0005	-0.0033	0.0008
111_12	0.0004	-0.0001	-0.0025	-0.0013	-0.0034	-0.0013	-0.0039	-0.0006	-0.0055	-0.0007
111_13	0.0022	-0.0006	-0.0020	-0.0015	-0.0035	-0.0013	-0.0039	0.0000	-0.0064	-0.0002
111_14	0.0039	-0.0011	-0.0016	-0.0019	-0.0038	-0.0022	-0.0044	-0.0008	-0.0079	-0.0017
111_15	0.0059	-0.0012	-0.0004	-0.0018	-0.0031	-0.0019	-0.0036	-0.0001	-0.0077	-0.0012
111_16	0.0074	-0.0017	0.0005	-0.0025	-0.0029	-0.0031	-0.0035	-0.0013	-0.0086	-0.0033
111_17	0.0085	-0.0021	0.0016	-0.0032	-0.0019	-0.0032	-0.0022	-0.0008	-0.0076	-0.0025
111_18	0.0092	-0.0028	0.0028	-0.0043	-0.0012	-0.0048	-0.0013	-0.0023	-0.0075	-0.0048
111_19	0.0095	-0.0031	0.0035	-0.0052	-0.0007	-0.0050	-0.0007	-0.0022	-0.0069	-0.0039
111_20	0.0082	-0.0055	0.0016	-0.0083	-0.0029	-0.0084	-0.0028	-0.0050	-0.0096	-0.0085
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
121_1	-0.0004	0.0010	0.0054	0.0066	0.0075	0.0046	0.0108	0.0032	0.0118	0.0009
121_2	-0.0010	-0.0003	0.0032	0.0034	0.0067	0.0000	0.0069	-0.0039	0.0101	-0.0029
121_3	-0.0017	0.0006	0.0029	0.0037	0.0064	0.0026	0.0074	0.0011	0.0100	0.0010
121_4	-0.0023	0.0009	0.0025	0.0031	0.0050	0.0022	0.0056	0.0006	0.0082	0.0003
121_5	-0.0027	0.0012	0.0020	0.0024	0.0039	0.0023	0.0043	0.0010	0.0072	0.0013
121_6	-0.0028	0.0013	0.0012	0.0013	0.0027	0.0018	0.0033	0.0015	0.0050	0.0001
121_7	-0.0027	0.0015	0.0004	0.0006	0.0013	0.0015	0.0018	0.0019	0.0022	-0.0009
121_8	-0.0022	0.0012	-0.0004	-0.0004	0.0000	0.0007	0.0002	0.0015	-0.0003	-0.0014
121_9	-0.0011	0.0012	-0.0007	-0.0007	-0.0007	0.0011	-0.0006	0.0025	-0.0013	0.0016
121_10	-0.0002	0.0004	-0.0017	-0.0017	-0.0024	-0.0004	-0.0028	0.0008	-0.0045	-0.0003
121_11	0.0012	0.0000	-0.0021	-0.0020	-0.0031	-0.0003	-0.0034	0.0017	-0.0054	0.0021
121_12	0.0020	-0.0011	-0.0031	-0.0031	-0.0053	-0.0028	-0.0065	-0.0017	-0.0086	-0.0007
121_13	0.0035	-0.0018	-0.0031	-0.0035	-0.0058	-0.0028	-0.0070	-0.0012	-0.0091	0.0017

121_14	0.0044	-0.0025	-0.0034	-0.0040	-0.0077	-0.0041	-0.0104	-0.0047	-0.0109	0.0018
121_15	0.0058	-0.0037	-0.0031	-0.0057	-0.0084	-0.0064	-0.0096	-0.0044	-0.0143	-0.0045
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
211_1	-0.0053	0.0012	0.0028	0.0074	0.0066	0.0078	0.0094	0.0065	0.0135	0.0058
211_2	-0.0056	-0.0001	0.0009	0.0044	0.0069	0.0046	0.0084	0.0034	0.0123	0.0021
211_3	-0.0059	0.0005	0.0008	0.0042	0.0062	0.0050	0.0078	0.0043	0.0116	0.0031
211_4	-0.0061	0.0011	0.0006	0.0039	0.0053	0.0052	0.0070	0.0047	0.0106	0.0037
211_5	-0.0062	0.0016	0.0004	0.0034	0.0045	0.0052	0.0062	0.0052	0.0096	0.0043
211_6	-0.0061	0.0017	-0.0001	0.0025	0.0033	0.0042	0.0048	0.0043	0.0077	0.0034
211_7	-0.0055	0.0020	-0.0003	0.0020	0.0024	0.0040	0.0038	0.0044	0.0060	0.0038
211_8	-0.0046	0.0020	-0.0007	0.0013	0.0012	0.0031	0.0023	0.0037	0.0036	0.0032
211_9	-0.0033	0.0019	-0.0009	0.0008	0.0003	0.0025	0.0011	0.0036	0.0015	0.0033
211_10	-0.0021	0.0014	-0.0015	0.0000	-0.0011	0.0010	-0.0008	0.0019	-0.0012	0.0017
211_11	-0.0007	0.0009	-0.0017	-0.0004	-0.0021	0.0002	-0.0022	0.0013	-0.0033	0.0013
211_12	0.0007	0.0001	-0.0021	-0.0011	-0.0032	-0.0009	-0.0035	0.0002	-0.0055	-0.0003
211_13	0.0024	-0.0002	-0.0018	-0.0013	-0.0039	-0.0016	-0.0046	-0.0008	-0.0071	-0.0012
211_14	0.0040	-0.0008	-0.0015	-0.0018	-0.0044	-0.0029	-0.0057	-0.0027	-0.0085	-0.0029
211_15	0.0057	-0.0008	-0.0007	-0.0018	-0.0044	-0.0036	-0.0062	-0.0038	-0.0090	-0.0035
211_16	0.0071	-0.0012	0.0002	-0.0023	-0.0040	-0.0043	-0.0057	-0.0046	-0.0089	-0.0042
211_17	0.0082	-0.0014	0.0013	-0.0030	-0.0033	-0.0053	-0.0053	-0.0058	-0.0085	-0.0049
211_18	0.0087	-0.0014	0.0023	-0.0035	-0.0024	-0.0052	-0.0045	-0.0057	-0.0074	-0.0042
211_19	0.0075	-0.0034	0.0016	-0.0059	-0.0033	-0.0079	-0.0055	-0.0089	-0.0076	-0.0054
211_20	0.0071	-0.0051	0.0003	-0.0090	-0.0048	-0.0111	-0.0068	-0.0112	-0.0093	-0.0092
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
221_1	-0.0023	0.0016	0.0048	0.0078	0.0081	0.0075	0.0116	0.0060	0.0149	0.0079
221_2	-0.0025	0.0004	0.0030	0.0049	0.0086	0.0047	0.0111	0.0042	0.0137	0.0042
221_3	-0.0030	0.0009	0.0027	0.0046	0.0078	0.0054	0.0105	0.0059	0.0127	0.0049
221_4	-0.0034	0.0015	0.0024	0.0042	0.0068	0.0057	0.0092	0.0063	0.0115	0.0054
221_5	-0.0036	0.0019	0.0020	0.0037	0.0058	0.0058	0.0080	0.0066	0.0106	0.0064
221_6	-0.0037	0.0021	0.0014	0.0028	0.0046	0.0054	0.0068	0.0070	0.0086	0.0057
221_7	-0.0033	0.0023	0.0009	0.0021	0.0034	0.0048	0.0053	0.0066	0.0065	0.0054
221_8	-0.0025	0.0022	0.0005	0.0014	0.0020	0.0039	0.0032	0.0054	0.0041	0.0052
221_9	-0.0015	0.0020	0.0000	0.0008	0.0008	0.0030	0.0015	0.0046	0.0016	0.0049
221_10	-0.0005	0.0013	-0.0008	-0.0003	-0.0008	0.0013	-0.0005	0.0030	-0.0016	0.0024
221_11	0.0007	0.0006	-0.0014	-0.0011	-0.0022	0.0003	-0.0020	0.0025	-0.0040	0.0017
221_12	0.0017	-0.0006	-0.0021	-0.0023	-0.0040	-0.0020	-0.0047	-0.0005	-0.0074	-0.0016

221_13	0.0028	-0.0015	-0.0026	-0.0032	-0.0055	-0.0035	-0.0066	-0.0019	-0.0099	-0.0035
221_14	0.0039	-0.0025	-0.0028	-0.0044	-0.0072	-0.0064	-0.0096	-0.0063	-0.0128	-0.0073
221_15	0.0053	-0.0029	-0.0026	-0.0051	-0.0087	-0.0090	-0.0132	-0.0125	-0.0147	-0.0098
221_16	0.0065	-0.0034	-0.0020	-0.0062	-0.0089	-0.0111	-0.0130	-0.0142	-0.0161	-0.0140
221_17	0.0055	-0.0060	-0.0035	-0.0096	-0.0108	-0.0158	-0.0177	-0.0226	-0.0177	-0.0180
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
231_3	0.0004	-0.0003	0.0024	0.0027	0.0047	0.0004	0.0072	0.0005	0.0066	-0.0004
231_4	0.0001	0.0003	0.0020	0.0023	0.0038	0.0017	0.0061	0.0028	0.0054	0.0007
231_5	-0.0004	0.0005	0.0014	0.0017	0.0022	0.0010	0.0028	0.0001	0.0037	0.0006
231_6	-0.0007	0.0005	0.0007	0.0007	0.0014	0.0014	0.0019	0.0014	0.0026	0.0014
231_7	-0.0007	0.0005	-0.0003	-0.0003	-0.0003	0.0006	-0.0004	0.0010	-0.0006	-0.0002
231_8	-0.0001	0.0002	-0.0011	-0.0013	-0.0025	-0.0011	-0.0041	-0.0022	-0.0036	-0.0012
231_9	0.0006	-0.0002	-0.0018	-0.0019	-0.0032	-0.0003	-0.0044	0.0010	-0.0045	0.0020
231_10	0.0009	-0.0015	-0.0033	-0.0039	-0.0061	-0.0036	-0.0092	-0.0046	-0.0096	-0.0030
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
311_1	-0.0033	-0.0007	0.0023	0.0046	0.0050	0.0043	0.0075	0.0034	0.0096	0.0018
311_2	-0.0036	-0.0018	0.0005	0.0019	0.0052	0.0015	0.0066	0.0009	0.0086	-0.0012
311_3	-0.0038	-0.0010	0.0004	0.0018	0.0045	0.0022	0.0061	0.0022	0.0078	-0.0003
311_4	-0.0040	-0.0002	0.0002	0.0016	0.0036	0.0025	0.0050	0.0026	0.0068	0.0007
311_5	-0.0040	0.0004	0.0001	0.0012	0.0028	0.0026	0.0042	0.0031	0.0058	0.0013
311_6	-0.0038	0.0006	-0.0001	0.0005	0.0018	0.0020	0.0030	0.0026	0.0044	0.0013
311_7	-0.0031	0.0009	-0.0002	0.0001	0.0009	0.0016	0.0017	0.0022	0.0027	0.0018
311_8	-0.0021	0.0010	-0.0004	-0.0003	-0.0001	0.0010	0.0000	0.0014	0.0006	0.0019
311_9	-0.0007	0.0010	-0.0005	-0.0006	-0.0011	0.0005	-0.0012	0.0012	-0.0015	0.0021
311_10	0.0004	0.0006	-0.0010	-0.0013	-0.0023	-0.0005	-0.0027	0.0005	-0.0040	0.0009
311_11	0.0020	0.0003	-0.0011	-0.0016	-0.0032	-0.0013	-0.0040	-0.0004	-0.0059	0.0002
311_12	0.0036	-0.0001	-0.0010	-0.0020	-0.0043	-0.0030	-0.0061	-0.0034	-0.0079	-0.0014
311_13	0.0058	0.0001	-0.0002	-0.0016	-0.0043	-0.0034	-0.0067	-0.0045	-0.0085	-0.0015
311_14	0.0075	-0.0003	0.0003	-0.0018	-0.0041	-0.0039	-0.0059	-0.0037	-0.0090	-0.0030
311_15	0.0091	-0.0008	0.0008	-0.0026	-0.0044	-0.0060	-0.0073	-0.0080	-0.0095	-0.0046
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
321_1	-0.0019	0.0002	0.0039	0.0058	0.0070	0.0053	0.0108	0.0048	0.0115	0.0032
321_2	-0.0022	-0.0009	0.0020	0.0029	0.0073	0.0024	0.0098	0.0023	0.0106	0.0003
321_3	-0.0027	-0.0003	0.0017	0.0026	0.0062	0.0028	0.0086	0.0030	0.0095	0.0010
321_4	-0.0030	0.0004	0.0014	0.0024	0.0051	0.0035	0.0074	0.0041	0.0085	0.0022

321_5	-0.0033	0.0009	0.0010	0.0020	0.0041	0.0038	0.0063	0.0050	0.0073	0.0029
321_6	-0.0032	0.0011	0.0006	0.0012	0.0029	0.0033	0.0048	0.0047	0.0056	0.0028
321_7	-0.0026	0.0015	0.0004	0.0009	0.0018	0.0029	0.0031	0.0042	0.0040	0.0037
321_8	-0.0017	0.0015	0.0000	0.0003	0.0004	0.0020	0.0008	0.0030	0.0016	0.0035
321_9	-0.0006	0.0014	-0.0004	-0.0002	-0.0010	0.0010	-0.0013	0.0017	-0.0012	0.0026
321_10	0.0004	0.0009	-0.0011	-0.0010	-0.0026	-0.0005	-0.0036	0.0001	-0.0042	0.0010
321_11	0.0016	0.0003	-0.0016	-0.0017	-0.0040	-0.0016	-0.0056	-0.0012	-0.0068	-0.0003
321_12	0.0028	-0.0005	-0.0019	-0.0024	-0.0056	-0.0035	-0.0080	-0.0041	-0.0092	-0.0023
321_13	0.0044	-0.0012	-0.0018	-0.0030	-0.0061	-0.0043	-0.0089	-0.0049	-0.0105	-0.0032
321_14	0.0057	-0.0017	-0.0016	-0.0035	-0.0066	-0.0052	-0.0096	-0.0056	-0.0117	-0.0045
321_15	0.0062	-0.0037	-0.0025	-0.0062	-0.0089	-0.0118	-0.0148	-0.0171	-0.0149	-0.0128
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
331_1	-0.0001	0.0004	0.0044	0.0057	0.0061	0.0026	0.0095	0.0001	0.0094	0.0007
331_2	-0.0006	-0.0005	0.0023	0.0030	0.0065	0.0008	0.0089	-0.0003	0.0090	-0.0006
331_3	-0.0011	-0.0002	0.0019	0.0025	0.0056	0.0016	0.0078	0.0013	0.0081	0.0005
331_4	-0.0016	0.0004	0.0016	0.0022	0.0045	0.0024	0.0062	0.0024	0.0072	0.0020
331_5	-0.0020	0.0007	0.0011	0.0016	0.0035	0.0028	0.0050	0.0034	0.0062	0.0031
331_6	-0.0020	0.0008	0.0006	0.0008	0.0021	0.0021	0.0031	0.0026	0.0044	0.0026
331_7	-0.0016	0.0010	0.0001	0.0001	0.0007	0.0016	0.0011	0.0022	0.0018	0.0019
331_8	-0.0011	0.0008	-0.0006	-0.0008	-0.0008	0.0007	-0.0008	0.0019	-0.0008	0.0011
331_9	-0.0002	0.0006	-0.0011	-0.0013	-0.0023	0.0003	-0.0027	0.0020	-0.0034	0.0012
331_10	0.0007	0.0000	-0.0020	-0.0024	-0.0042	-0.0018	-0.0060	-0.0010	-0.0069	-0.0012
331_11	0.0019	-0.0006	-0.0024	-0.0030	-0.0059	-0.0033	-0.0090	-0.0036	-0.0097	-0.0026
331_12	0.0029	-0.0017	-0.0032	-0.0043	-0.0077	-0.0051	-0.0117	-0.0060	-0.0127	-0.0052
331_13	0.0047	-0.0018	-0.0027	-0.0041	-0.0079	-0.0049	-0.0115	-0.0051	-0.0126	-0.0036
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
411_1	-0.0010	-0.0008	0.0025	0.0038	0.0044	0.0030	0.0052	0.0005	0.0075	0.0010
411_2	-0.0012	-0.0016	0.0007	0.0014	0.0044	0.0003	0.0040	-0.0024	0.0062	-0.0023
411_3	-0.0017	-0.0008	0.0005	0.0013	0.0034	0.0009	0.0031	-0.0011	0.0051	-0.0015
411_4	-0.0021	-0.0001	0.0002	0.0012	0.0025	0.0018	0.0028	0.0010	0.0041	-0.0002
411_5	-0.0022	0.0004	0.0001	0.0008	0.0017	0.0019	0.0023	0.0020	0.0030	0.0002
411_6	-0.0020	0.0004	-0.0001	0.0000	0.0006	0.0008	0.0013	0.0013	0.0016	-0.0003
411_7	-0.0014	0.0006	-0.0002	-0.0006	-0.0002	0.0004	0.0008	0.0021	0.0001	0.0005
411_8	-0.0003	0.0007	-0.0003	-0.0009	-0.0011	0.0000	-0.0004	0.0019	-0.0015	0.0012
411_9	0.0008	0.0007	-0.0006	-0.0013	-0.0024	-0.0009	-0.0021	0.0008	-0.0038	0.0011
411_10	0.0024	0.0007	-0.0006	-0.0015	-0.0034	-0.0020	-0.0044	-0.0017	-0.0055	0.0007

411_11	0.0037	0.0002	-0.0008	-0.0017	-0.0045	-0.0025	-0.0058	-0.0019	-0.0075	0.0006
411_12	0.0050	-0.0004	-0.0013	-0.0025	-0.0054	-0.0038	-0.0068	-0.0026	-0.0093	-0.0012
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
421_1	-0.0015	-0.0007	0.0036	0.0045	0.0066	0.0034	0.0101	0.0022	0.0108	0.0016
421_2	-0.0018	-0.0019	0.0017	0.0016	0.0067	0.0002	0.0087	-0.0010	0.0096	-0.0020
421_3	-0.0023	-0.0010	0.0014	0.0016	0.0055	0.0010	0.0072	0.0001	0.0083	-0.0010
421_4	-0.0027	-0.0002	0.0011	0.0014	0.0043	0.0017	0.0059	0.0015	0.0071	0.0000
421_5	-0.0028	0.0005	0.0008	0.0012	0.0032	0.0023	0.0047	0.0026	0.0058	0.0010
421_6	-0.0027	0.0007	0.0004	0.0006	0.0020	0.0020	0.0032	0.0025	0.0041	0.0012
421_7	-0.0021	0.0011	0.0002	0.0003	0.0009	0.0020	0.0018	0.0030	0.0023	0.0021
421_8	-0.0012	0.0013	-0.0001	0.0000	-0.0002	0.0018	0.0002	0.0031	0.0002	0.0028
421_9	0.0000	0.0014	-0.0005	-0.0003	-0.0014	0.0012	-0.0017	0.0024	-0.0021	0.0029
421_10	0.0011	0.0010	-0.0010	-0.0008	-0.0029	-0.0001	-0.0042	0.0004	-0.0047	0.0018
421_11	0.0023	0.0006	-0.0014	-0.0013	-0.0043	-0.0013	-0.0063	-0.0011	-0.0071	0.0009
421_12	0.0036	0.0000	-0.0018	-0.0019	-0.0057	-0.0029	-0.0086	-0.0035	-0.0094	-0.0011
421_13	0.0047	-0.0009	-0.0021	-0.0029	-0.0068	-0.0046	-0.0098	-0.0048	-0.0116	-0.0037
421_14	0.0055	-0.0020	-0.0024	-0.0041	-0.0078	-0.0068	-0.0111	-0.0072	-0.0132	-0.0065
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
431_1	-0.0015	0.0008	0.0050	0.0067	0.0085	0.0045	0.0135	0.0029	0.0128	0.0024
431_2	-0.0018	-0.0003	0.0031	0.0040	0.0088	0.0022	0.0127	0.0017	0.0119	0.0000
431_3	-0.0022	0.0005	0.0028	0.0039	0.0078	0.0032	0.0112	0.0034	0.0107	0.0011
431_4	-0.0025	0.0012	0.0025	0.0036	0.0067	0.0041	0.0096	0.0047	0.0097	0.0024
431_5	-0.0029	0.0019	0.0021	0.0034	0.0055	0.0051	0.0079	0.0061	0.0084	0.0038
431_6	-0.0029	0.0022	0.0015	0.0028	0.0041	0.0050	0.0059	0.0060	0.0066	0.0044
431_7	-0.0025	0.0026	0.0012	0.0024	0.0030	0.0052	0.0042	0.0065	0.0050	0.0057
431_8	-0.0017	0.0027	0.0008	0.0020	0.0016	0.0046	0.0019	0.0057	0.0027	0.0062
431_9	-0.0006	0.0027	0.0003	0.0017	0.0003	0.0042	-0.0002	0.0054	0.0003	0.0068
431_10	0.0004	0.0023	-0.0003	0.0010	-0.0014	0.0031	-0.0027	0.0041	-0.0024	0.0059
431_11	0.0015	0.0016	-0.0010	0.0002	-0.0031	0.0016	-0.0050	0.0022	-0.0052	0.0041
431_12	0.0025	0.0006	-0.0016	-0.0010	-0.0048	-0.0006	-0.0074	-0.0005	-0.0078	0.0011
431_13	0.0034	-0.0008	-0.0022	-0.0026	-0.0070	-0.0040	-0.0108	-0.0058	-0.0105	-0.0029
431_14	0.0044	-0.0021	-0.0026	-0.0044	-0.0084	-0.0069	-0.0126	-0.0091	-0.0121	-0.0065
431_15	0.0040	-0.0053	-0.0045	-0.0083	-0.0105	-0.0120	-0.0148	-0.0142	-0.0150	-0.0132
431_16	0.0023	-0.0110	-0.0073	-0.0156	-0.0111	-0.0192	-0.0135	-0.0191	-0.0151	-0.0212
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**

521_2	0.0005	-0.0024	0.0007	0.0000	0.0026	-0.0029	0.0030	-0.0047	0.0032	-0.0036
521_3	0.0001	-0.0006	0.0006	0.0009	0.0017	0.0002	0.0026	0.0001	0.0026	0.0004
521_4	-0.0002	0.0000	0.0002	0.0006	0.0007	0.0009	0.0016	0.0019	0.0015	0.0014
521_5	-0.0004	0.0006	-0.0001	0.0001	-0.0008	0.0005	-0.0014	0.0001	-0.0007	0.0006
521_6	-0.0004	0.0008	-0.0006	-0.0007	-0.0019	0.0003	-0.0031	-0.0001	-0.0027	-0.0001
521_7	0.0005	0.0015	-0.0007	-0.0009	-0.0022	0.0010	-0.0027	0.0027	-0.0039	0.0013
531_1	0.0000	-0.0005	0.0033	0.0043	0.0050	0.0019	0.0087	0.0005	0.0084	0.0019
531_2	-0.0002	-0.0017	0.0015	0.0016	0.0051	-0.0013	0.0073	-0.0021	0.0072	-0.0015
531_3	-0.0005	-0.0008	0.0013	0.0015	0.0046	0.0005	0.0069	0.0010	0.0067	0.0006
531_4	-0.0008	-0.0001	0.0011	0.0013	0.0034	0.0013	0.0052	0.0024	0.0051	0.0011
531_5	-0.0011	0.0005	0.0006	0.0009	0.0022	0.0021	0.0033	0.0032	0.0036	0.0019
531_6	-0.0012	0.0007	0.0000	0.0001	0.0005	0.0012	0.0005	0.0015	0.0013	0.0007
531_7	-0.0008	0.0011	-0.0004	-0.0003	-0.0009	0.0010	-0.0015	0.0013	-0.0012	0.0007
531_8	-0.0002	0.0009	-0.0010	-0.0012	-0.0023	0.0006	-0.0034	0.0014	-0.0035	0.0004
531_9	0.0010	0.0009	-0.0013	-0.0019	-0.0043	-0.0018	-0.0074	-0.0032	-0.0069	-0.0019
531_10	0.0013	-0.0004	-0.0027	-0.0031	-0.0066	-0.0031	-0.0098	-0.0040	-0.0102	-0.0031
531_11	0.0028	-0.0005	-0.0025	-0.0032	-0.0067	-0.0023	-0.0099	-0.0020	-0.0105	-0.0009

APPENDIX J: WINDSAT – XCAL EMISSIVITY DELTAS BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
111_1	-0.0027	0.0062	-0.0020	0.0062	-0.0033	0.0065	-0.0015	0.0051	0.0057	0.0144
111_2	-0.0033	0.0053	-0.0027	0.0047	-0.0038	0.0044	-0.0020	0.0034	0.0041	0.0102
111_3	-0.0039	0.0048	-0.0034	0.0038	-0.0045	0.0033	-0.0027	0.0025	0.0026	0.0079
111_4	-0.0042	0.0042	-0.0039	0.0027	-0.0050	0.0021	-0.0035	0.0013	0.0015	0.0059
111_5	-0.0046	0.0036	-0.0044	0.0018	-0.0055	0.0012	-0.0041	0.0005	0.0005	0.0043
111_6	-0.0048	0.0029	-0.0047	0.0009	-0.0059	-0.0001	-0.0046	-0.0005	-0.0012	0.0012
111_7	-0.0044	0.0026	-0.0044	0.0006	-0.0057	-0.0002	-0.0044	-0.0002	-0.0019	0.0006
111_8	-0.0038	0.0022	-0.0038	0.0004	-0.0052	-0.0004	-0.0042	-0.0004	-0.0025	0.0001
111_9	-0.0029	0.0017	-0.0029	0.0003	-0.0041	-0.0002	-0.0032	0.0002	-0.0024	0.0003
111_10	-0.0020	0.0012	-0.0020	0.0000	-0.0031	-0.0006	-0.0027	-0.0003	-0.0024	-0.0002
111_11	-0.0009	0.0007	-0.0009	0.0000	-0.0018	-0.0004	-0.0016	0.0002	-0.0019	0.0001
111_12	-0.0001	0.0001	-0.0001	-0.0003	-0.0009	-0.0009	-0.0012	-0.0006	-0.0023	-0.0014
111_13	0.0011	-0.0003	0.0011	-0.0001	0.0007	-0.0003	0.0003	0.0004	-0.0016	-0.0009
111_14	0.0022	-0.0008	0.0021	-0.0003	0.0019	-0.0006	0.0010	-0.0002	-0.0017	-0.0024
111_15	0.0036	-0.0012	0.0037	-0.0001	0.0040	0.0001	0.0028	0.0007	-0.0005	-0.0021
111_16	0.0047	-0.0023	0.0046	-0.0008	0.0053	-0.0007	0.0038	-0.0005	-0.0005	-0.0045
111_17	0.0058	-0.0038	0.0056	-0.0017	0.0075	-0.0006	0.0058	-0.0001	0.0010	-0.0042
111_18	0.0069	-0.0060	0.0066	-0.0034	0.0093	-0.0024	0.0072	-0.0021	0.0015	-0.0075
111_19	0.0075	-0.0082	0.0069	-0.0051	0.0107	-0.0030	0.0083	-0.0027	0.0023	-0.0079
111_20	0.0059	-0.0127	0.0045	-0.0095	0.0095	-0.0073	0.0065	-0.0067	-0.0004	-0.0140
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
121_1	0.0008	0.0030	0.0014	0.0041	0.0018	0.0029	0.0055	0.0034	0.0059	0.0042
121_2	0.0003	0.0025	0.0006	0.0029	0.0003	0.0004	0.0019	-0.0018	0.0044	0.0021
121_3	-0.0005	0.0028	0.0000	0.0029	0.0001	0.0022	0.0022	0.0022	0.0042	0.0043
121_4	-0.0011	0.0025	-0.0007	0.0021	-0.0010	0.0014	0.0004	0.0009	0.0024	0.0022
121_5	-0.0015	0.0020	-0.0012	0.0014	-0.0015	0.0011	-0.0006	0.0007	0.0017	0.0021
121_6	-0.0017	0.0014	-0.0016	0.0005	-0.0018	0.0005	-0.0010	0.0008	0.0002	0.0000
121_7	-0.0018	0.0009	-0.0017	0.0000	-0.0020	0.0002	-0.0014	0.0010	-0.0014	-0.0016
121_8	-0.0015	0.0002	-0.0015	-0.0007	-0.0016	-0.0003	-0.0014	0.0005	-0.0021	-0.0026
121_9	-0.0007	-0.0002	-0.0006	-0.0007	-0.0005	0.0005	-0.0005	0.0016	-0.0012	0.0001
121_10	-0.0003	-0.0010	-0.0004	-0.0013	-0.0002	-0.0006	-0.0009	0.0001	-0.0023	-0.0020
121_11	0.0006	-0.0013	0.0005	-0.0013	0.0010	0.0001	0.0003	0.0013	-0.0012	0.0003
121_12	0.0009	-0.0022	0.0005	-0.0020	0.0005	-0.0018	-0.0012	-0.0018	-0.0027	-0.0025
121_13	0.0017	-0.0027	0.0013	-0.0019	0.0017	-0.0012	-0.0003	-0.0010	-0.0015	-0.0001
121_14	0.0019	-0.0033	0.0015	-0.0022	0.0014	-0.0019	-0.0024	-0.0042	-0.0020	0.0000

121_15	0.0029	-0.0047	0.0022	-0.0037	0.0019	-0.0037	-0.0006	-0.0037	-0.0045	-0.0066
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
211_1	-0.0037	0.0040	-0.0027	0.0045	-0.0024	0.0053	0.0015	0.0066	0.0051	0.0100
211_2	-0.0040	0.0036	-0.0031	0.0036	-0.0028	0.0043	0.0008	0.0055	0.0042	0.0082
211_3	-0.0043	0.0036	-0.0036	0.0030	-0.0033	0.0040	0.0001	0.0054	0.0033	0.0076
211_4	-0.0046	0.0036	-0.0040	0.0026	-0.0039	0.0036	-0.0008	0.0050	0.0023	0.0068
211_5	-0.0047	0.0034	-0.0042	0.0021	-0.0043	0.0033	-0.0013	0.0049	0.0015	0.0063
211_6	-0.0048	0.0028	-0.0044	0.0013	-0.0046	0.0023	-0.0020	0.0037	0.0003	0.0045
211_7	-0.0042	0.0025	-0.0039	0.0010	-0.0042	0.0021	-0.0020	0.0036	-0.0002	0.0042
211_8	-0.0035	0.0020	-0.0033	0.0006	-0.0039	0.0014	-0.0021	0.0028	-0.0010	0.0031
211_9	-0.0026	0.0016	-0.0023	0.0004	-0.0030	0.0012	-0.0016	0.0027	-0.0012	0.0028
211_10	-0.0018	0.0010	-0.0016	0.0000	-0.0025	0.0001	-0.0018	0.0012	-0.0019	0.0011
211_11	-0.0008	0.0007	-0.0007	0.0000	-0.0016	-0.0001	-0.0013	0.0009	-0.0020	0.0005
211_12	0.0001	0.0002	0.0000	-0.0003	-0.0009	-0.0006	-0.0011	0.0001	-0.0025	-0.0010
211_13	0.0012	0.0000	0.0011	-0.0001	0.0000	-0.0008	-0.0007	-0.0006	-0.0026	-0.0020
211_14	0.0023	-0.0005	0.0021	-0.0003	0.0010	-0.0015	-0.0006	-0.0022	-0.0028	-0.0038
211_15	0.0037	-0.0008	0.0033	-0.0001	0.0024	-0.0017	-0.0001	-0.0031	-0.0023	-0.0046
211_16	0.0048	-0.0017	0.0045	-0.0006	0.0041	-0.0020	0.0012	-0.0039	-0.0013	-0.0057
211_17	0.0062	-0.0028	0.0057	-0.0013	0.0059	-0.0028	0.0024	-0.0052	-0.0004	-0.0069
211_18	0.0074	-0.0042	0.0067	-0.0021	0.0080	-0.0028	0.0038	-0.0055	0.0010	-0.0071
211_19	0.0068	-0.0078	0.0059	-0.0051	0.0082	-0.0058	0.0033	-0.0093	0.0010	-0.0094
211_20	0.0066	-0.0113	0.0044	-0.0092	0.0078	-0.0095	0.0025	-0.0126	-0.0005	-0.0147
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
221_1	-0.0009	0.0037	0.0001	0.0050	0.0011	0.0055	0.0053	0.0062	0.0080	0.0115
221_2	-0.0012	0.0033	-0.0003	0.0041	0.0009	0.0048	0.0050	0.0062	0.0071	0.0095
221_3	-0.0017	0.0032	-0.0010	0.0035	0.0003	0.0047	0.0043	0.0069	0.0060	0.0086
221_4	-0.0020	0.0032	-0.0015	0.0030	-0.0004	0.0045	0.0030	0.0065	0.0047	0.0078
221_5	-0.0024	0.0029	-0.0019	0.0025	-0.0009	0.0044	0.0020	0.0063	0.0040	0.0077
221_6	-0.0025	0.0024	-0.0022	0.0017	-0.0013	0.0038	0.0015	0.0062	0.0028	0.0061
221_7	-0.0023	0.0019	-0.0019	0.0012	-0.0012	0.0033	0.0010	0.0057	0.0018	0.0051
221_8	-0.0017	0.0014	-0.0014	0.0008	-0.0010	0.0025	0.0004	0.0043	0.0010	0.0044
221_9	-0.0009	0.0009	-0.0007	0.0005	-0.0005	0.0020	0.0003	0.0036	0.0004	0.0037
221_10	-0.0003	0.0001	-0.0002	-0.0003	-0.0002	0.0007	0.0001	0.0022	-0.0008	0.0010
221_11	0.0004	-0.0004	0.0004	-0.0006	0.0004	0.0003	0.0004	0.0020	-0.0012	0.0002
221_12	0.0009	-0.0013	0.0008	-0.0014	0.0003	-0.0014	-0.0007	-0.0007	-0.0028	-0.0031
221_13	0.0015	-0.0020	0.0012	-0.0019	0.0005	-0.0023	-0.0012	-0.0018	-0.0039	-0.0050

221_14	0.0022	-0.0030	0.0015	-0.0028	0.0002	-0.0046	-0.0030	-0.0059	-0.0055	-0.0089
221_15	0.0031	-0.0036	0.0022	-0.0032	0.0001	-0.0067	-0.0056	-0.0119	-0.0064	-0.0116
221_16	0.0042	-0.0046	0.0031	-0.0042	0.0012	-0.0084	-0.0045	-0.0135	-0.0071	-0.0161
221_17	0.0036	-0.0081	0.0018	-0.0078	0.0004	-0.0130	-0.0084	-0.0221	-0.0082	-0.0208
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
231_3	0.0008	0.0018	0.0012	0.0024	0.0017	0.0009	0.0050	0.0019	0.0042	0.0028
231_4	0.0004	0.0017	0.0006	0.0018	0.0011	0.0017	0.0038	0.0034	0.0029	0.0025
231_5	-0.0002	0.0013	0.0000	0.0013	-0.0001	0.0007	0.0007	0.0003	0.0014	0.0014
231_6	-0.0005	0.0005	-0.0004	0.0004	0.0000	0.0009	0.0005	0.0011	0.0010	0.0013
231_7	-0.0007	-0.0001	-0.0007	-0.0004	-0.0004	0.0003	-0.0008	0.0005	-0.0010	-0.0009
231_8	-0.0003	-0.0009	-0.0005	-0.0011	-0.0010	-0.0013	-0.0030	-0.0028	-0.0025	-0.0025
231_9	0.0002	-0.0015	0.0000	-0.0015	0.0000	-0.0002	-0.0016	0.0005	-0.0014	0.0004
231_10	0.0002	-0.0029	-0.0003	-0.0029	-0.0011	-0.0030	-0.0047	-0.0049	-0.0046	-0.0048
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
311_1	-0.0024	0.0011	-0.0018	0.0021	-0.0005	0.0025	0.0024	0.0034	0.0042	0.0049
311_2	-0.0027	0.0008	-0.0022	0.0013	-0.0009	0.0019	0.0019	0.0030	0.0035	0.0038
311_3	-0.0029	0.0010	-0.0026	0.0009	-0.0015	0.0019	0.0012	0.0032	0.0025	0.0031
311_4	-0.0031	0.0012	-0.0030	0.0006	-0.0021	0.0017	0.0001	0.0029	0.0015	0.0028
311_5	-0.0032	0.0011	-0.0031	0.0002	-0.0024	0.0015	-0.0005	0.0029	0.0006	0.0023
311_6	-0.0030	0.0006	-0.0030	-0.0003	-0.0025	0.0008	-0.0011	0.0019	-0.0001	0.0014
311_7	-0.0024	0.0003	-0.0024	-0.0005	-0.0023	0.0004	-0.0014	0.0013	-0.0006	0.0012
311_8	-0.0016	0.0000	-0.0016	-0.0007	-0.0018	0.0000	-0.0016	0.0005	-0.0012	0.0008
311_9	-0.0005	-0.0003	-0.0006	-0.0007	-0.0010	-0.0002	-0.0012	0.0003	-0.0014	0.0006
311_10	0.0003	-0.0007	0.0002	-0.0010	-0.0003	-0.0007	-0.0010	-0.0002	-0.0020	-0.0008
311_11	0.0015	-0.0009	0.0014	-0.0009	0.0007	-0.0010	-0.0006	-0.0009	-0.0021	-0.0016
311_12	0.0027	-0.0010	0.0025	-0.0008	0.0013	-0.0021	-0.0011	-0.0035	-0.0024	-0.0033
311_13	0.0044	-0.0006	0.0042	0.0000	0.0029	-0.0019	-0.0003	-0.0043	-0.0015	-0.0034
311_14	0.0058	-0.0009	0.0054	0.0001	0.0047	-0.0017	0.0017	-0.0032	-0.0008	-0.0049
311_15	0.0070	-0.0016	0.0064	-0.0003	0.0058	-0.0032	0.0014	-0.0073	-0.0002	-0.0067
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
321_1	-0.0010	0.0020	-0.0002	0.0032	0.0015	0.0036	0.0058	0.0049	0.0061	0.0064
321_2	-0.0013	0.0016	-0.0007	0.0023	0.0011	0.0029	0.0051	0.0044	0.0055	0.0052
321_3	-0.0018	0.0017	-0.0013	0.0017	0.0002	0.0025	0.0037	0.0040	0.0042	0.0044
321_4	-0.0021	0.0018	-0.0018	0.0014	-0.0006	0.0026	0.0025	0.0044	0.0032	0.0042
321_5	-0.0024	0.0016	-0.0022	0.0010	-0.0012	0.0027	0.0016	0.0048	0.0022	0.0038

321_6	-0.0024	0.0012	-0.0023	0.0004	-0.0015	0.0021	0.0007	0.0040	0.0012	0.0029
321_7	-0.0019	0.0009	-0.0018	0.0002	-0.0014	0.0017	0.0000	0.0034	0.0006	0.0031
321_8	-0.0013	0.0005	-0.0012	-0.0001	-0.0013	0.0010	-0.0008	0.0020	-0.0002	0.0024
321_9	-0.0004	0.0001	-0.0004	-0.0003	-0.0009	0.0003	-0.0013	0.0008	-0.0012	0.0011
321_10	0.0003	-0.0004	0.0001	-0.0007	-0.0007	-0.0007	-0.0019	-0.0007	-0.0022	-0.0007
321_11	0.0011	-0.0009	0.0009	-0.0009	-0.0002	-0.0013	-0.0022	-0.0017	-0.0030	-0.0021
321_12	0.0019	-0.0014	0.0016	-0.0012	0.0000	-0.0026	-0.0030	-0.0042	-0.0037	-0.0041
321_13	0.0030	-0.0018	0.0027	-0.0014	0.0012	-0.0027	-0.0024	-0.0047	-0.0035	-0.0051
321_14	0.0040	-0.0022	0.0036	-0.0015	0.0022	-0.0031	-0.0019	-0.0051	-0.0034	-0.0065
321_15	0.0043	-0.0045	0.0032	-0.0040	0.0014	-0.0091	-0.0060	-0.0164	-0.0057	-0.0149
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
331_1	0.0005	0.0021	0.0010	0.0035	0.0021	0.0014	0.0057	0.0003	0.0053	0.0036
331_2	0.0000	0.0018	0.0004	0.0027	0.0018	0.0015	0.0054	0.0018	0.0052	0.0039
331_3	-0.0005	0.0017	-0.0002	0.0020	0.0011	0.0017	0.0042	0.0024	0.0041	0.0035
331_4	-0.0010	0.0016	-0.0009	0.0015	0.0002	0.0019	0.0026	0.0028	0.0032	0.0037
331_5	-0.0014	0.0013	-0.0013	0.0009	-0.0003	0.0020	0.0016	0.0033	0.0025	0.0037
331_6	-0.0016	0.0007	-0.0015	0.0002	-0.0009	0.0013	0.0003	0.0021	0.0013	0.0024
331_7	-0.0013	0.0003	-0.0012	-0.0003	-0.0011	0.0008	-0.0007	0.0015	-0.0002	0.0010
331_8	-0.0009	-0.0004	-0.0010	-0.0009	-0.0010	0.0001	-0.0012	0.0011	-0.0013	-0.0003
331_9	-0.0002	-0.0008	-0.0003	-0.0011	-0.0007	0.0000	-0.0015	0.0012	-0.0020	-0.0006
331_10	0.0004	-0.0014	0.0001	-0.0018	-0.0008	-0.0016	-0.0030	-0.0016	-0.0036	-0.0032
331_11	0.0012	-0.0018	0.0009	-0.0019	-0.0006	-0.0026	-0.0042	-0.0039	-0.0045	-0.0047
331_12	0.0017	-0.0027	0.0012	-0.0027	-0.0006	-0.0037	-0.0053	-0.0060	-0.0058	-0.0073
331_13	0.0031	-0.0025	0.0026	-0.0022	0.0009	-0.0030	-0.0038	-0.0049	-0.0042	-0.0058
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
411_1	-0.0005	0.0007	-0.0003	0.0017	0.0011	0.0018	0.0022	0.0007	0.0042	0.0035
411_2	-0.0007	0.0007	-0.0007	0.0012	0.0005	0.0012	0.0011	-0.0002	0.0031	0.0021
411_3	-0.0012	0.0010	-0.0013	0.0009	-0.0004	0.0012	0.0001	0.0000	0.0018	0.0013
411_4	-0.0017	0.0011	-0.0017	0.0007	-0.0009	0.0015	-0.0002	0.0014	0.0009	0.0014
411_5	-0.0018	0.0009	-0.0018	0.0003	-0.0014	0.0013	-0.0004	0.0019	0.0000	0.0007
411_6	-0.0017	0.0003	-0.0017	-0.0004	-0.0015	0.0001	-0.0008	0.0008	-0.0008	-0.0007
411_7	-0.0012	-0.0002	-0.0012	-0.0007	-0.0012	-0.0002	-0.0004	0.0014	-0.0012	-0.0006
411_8	-0.0003	-0.0005	-0.0003	-0.0008	-0.0006	-0.0004	-0.0002	0.0011	-0.0013	-0.0004
411_9	0.0006	-0.0008	0.0007	-0.0009	-0.0001	-0.0010	-0.0003	0.0000	-0.0017	-0.0008
411_10	0.0019	-0.0008	0.0019	-0.0007	0.0007	-0.0017	-0.0008	-0.0022	-0.0015	-0.0015
411_11	0.0029	-0.0011	0.0029	-0.0005	0.0015	-0.0016	-0.0005	-0.0022	-0.0017	-0.0017

411_12	0.0037	-0.0014	0.0035	-0.0008	0.0023	-0.0023	0.0001	-0.0027	-0.0019	-0.0034
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
421_1	-0.0008	0.0010	0.0000	0.0022	0.0019	0.0020	0.0057	0.0024	0.0062	0.0047
421_2	-0.0011	0.0005	-0.0006	0.0012	0.0014	0.0008	0.0046	0.0010	0.0052	0.0027
421_3	-0.0016	0.0009	-0.0012	0.0009	0.0003	0.0009	0.0029	0.0011	0.0037	0.0021
421_4	-0.0020	0.0011	-0.0017	0.0006	-0.0006	0.0011	0.0017	0.0018	0.0024	0.0018
421_5	-0.0022	0.0011	-0.0020	0.0003	-0.0012	0.0014	0.0007	0.0024	0.0014	0.0018
421_6	-0.0021	0.0007	-0.0021	-0.0001	-0.0016	0.0010	-0.0002	0.0019	0.0004	0.0011
421_7	-0.0016	0.0005	-0.0016	-0.0002	-0.0015	0.0011	-0.0006	0.0022	-0.0003	0.0014
421_8	-0.0009	0.0002	-0.0009	-0.0003	-0.0011	0.0010	-0.0008	0.0022	-0.0009	0.0015
421_9	0.0000	0.0000	-0.0001	-0.0002	-0.0006	0.0007	-0.0011	0.0015	-0.0014	0.0013
421_10	0.0008	-0.0003	0.0006	-0.0004	-0.0003	-0.0002	-0.0019	-0.0003	-0.0022	0.0000
421_11	0.0017	-0.0006	0.0015	-0.0004	0.0002	-0.0008	-0.0023	-0.0015	-0.0027	-0.0010
421_12	0.0026	-0.0009	0.0022	-0.0005	0.0005	-0.0018	-0.0030	-0.0036	-0.0034	-0.0031
421_13	0.0033	-0.0016	0.0028	-0.0011	0.0011	-0.0028	-0.0028	-0.0046	-0.0041	-0.0057
421_14	0.0039	-0.0025	0.0032	-0.0019	0.0016	-0.0044	-0.0029	-0.0066	-0.0043	-0.0085
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
431_1	-0.0007	0.0026	0.0004	0.0041	0.0022	0.0026	0.0078	0.0029	0.0067	0.0058
431_2	-0.0009	0.0022	-0.0001	0.0032	0.0019	0.0023	0.0073	0.0036	0.0062	0.0049
431_3	-0.0013	0.0025	-0.0006	0.0028	0.0010	0.0026	0.0057	0.0043	0.0048	0.0044
431_4	-0.0017	0.0026	-0.0012	0.0024	0.0002	0.0030	0.0040	0.0049	0.0037	0.0045
431_5	-0.0021	0.0026	-0.0016	0.0021	-0.0005	0.0037	0.0026	0.0058	0.0027	0.0049
431_6	-0.0022	0.0023	-0.0018	0.0017	-0.0011	0.0035	0.0012	0.0052	0.0016	0.0045
431_7	-0.0018	0.0020	-0.0015	0.0015	-0.0010	0.0038	0.0005	0.0055	0.0010	0.0052
431_8	-0.0012	0.0017	-0.0009	0.0013	-0.0009	0.0034	-0.0004	0.0047	0.0002	0.0052
431_9	-0.0003	0.0015	-0.0002	0.0014	-0.0004	0.0033	-0.0008	0.0045	-0.0003	0.0054
431_10	0.0004	0.0011	0.0004	0.0012	-0.0003	0.0027	-0.0016	0.0033	-0.0011	0.0044
431_11	0.0011	0.0006	0.0010	0.0008	0.0000	0.0017	-0.0022	0.0017	-0.0020	0.0024
431_12	0.0018	-0.0002	0.0016	0.0001	0.0000	0.0001	-0.0030	-0.0007	-0.0029	-0.0005
431_13	0.0023	-0.0013	0.0019	-0.0011	-0.0004	-0.0026	-0.0050	-0.0057	-0.0041	-0.0046
431_14	0.0030	-0.0025	0.0024	-0.0024	-0.0002	-0.0048	-0.0054	-0.0085	-0.0044	-0.0082
431_15	0.0025	-0.0058	0.0011	-0.0059	-0.0008	-0.0093	-0.0065	-0.0134	-0.0063	-0.0151
431_16	0.0012	-0.0119	-0.0010	-0.0130	0.0001	-0.0160	-0.0042	-0.0181	-0.0056	-0.0233
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
521_2	0.0005	-0.0008	0.0008	0.0002	0.0016	-0.0018	0.0027	-0.0030	0.0030	-0.0006

521_3	0.0002	0.0003	0.0004	0.0008	0.0009	0.0006	0.0022	0.0009	0.0020	0.0018
521_4	-0.0002	0.0004	0.0000	0.0004	0.0000	0.0008	0.0009	0.0020	0.0009	0.0017
521_5	-0.0004	0.0004	-0.0005	0.0000	-0.0010	0.0002	-0.0017	-0.0004	-0.0010	-0.0002
521_6	-0.0005	-0.0002	-0.0006	-0.0007	-0.0012	-0.0003	-0.0027	-0.0011	-0.0024	-0.0018
521_7	0.0004	0.0000	0.0000	-0.0007	-0.0003	0.0006	-0.0014	0.0016	-0.0025	-0.0009
531_1	0.0002	0.0009	0.0009	0.0025	0.0024	0.0008	0.0063	0.0008	0.0058	0.0043
531_2	0.0000	0.0005	0.0005	0.0016	0.0019	-0.0002	0.0052	0.0000	0.0049	0.0026
531_3	-0.0002	0.0008	0.0001	0.0013	0.0016	0.0009	0.0045	0.0022	0.0042	0.0032
531_4	-0.0005	0.0010	-0.0005	0.0009	0.0007	0.0012	0.0028	0.0028	0.0026	0.0024
531_5	-0.0009	0.0009	-0.0009	0.0005	-0.0001	0.0016	0.0012	0.0031	0.0013	0.0021
531_6	-0.0011	0.0005	-0.0012	-0.0001	-0.0010	0.0007	-0.0010	0.0009	-0.0004	0.0001
531_7	-0.0007	0.0002	-0.0009	-0.0004	-0.0013	0.0005	-0.0020	0.0005	-0.0018	-0.0006
531_8	-0.0003	-0.0004	-0.0005	-0.0010	-0.0012	0.0003	-0.0025	0.0006	-0.0027	-0.0014
531_9	0.0007	-0.0006	0.0004	-0.0014	-0.0013	-0.0018	-0.0050	-0.0040	-0.0042	-0.0040
531_10	0.0008	-0.0019	0.0004	-0.0021	-0.0017	-0.0026	-0.0055	-0.0046	-0.0056	-0.0054
531_11	0.0020	-0.0018	0.0018	-0.0017	0.0000	-0.0013	-0.0040	-0.0023	-0.0040	-0.0034

APPENDIX K: XCAL – CFRSL EMISSIVITY DELTAS BY BIN

0 < SST ≤ 10, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
111_1	-0.0020	-0.0031	0.0055	0.0029	0.0095	0.0027	0.0085	0.0001	0.0094	-0.0038
111_2	-0.0021	-0.0040	0.0039	0.0008	0.0101	0.0004	0.0081	-0.0020	0.0089	-0.0058
111_3	-0.0021	-0.0034	0.0042	0.0010	0.0099	0.0011	0.0082	-0.0010	0.0090	-0.0042
111_4	-0.0021	-0.0028	0.0044	0.0011	0.0095	0.0016	0.0081	-0.0003	0.0089	-0.0029
111_5	-0.0021	-0.0021	0.0044	0.0011	0.0090	0.0019	0.0078	0.0003	0.0085	-0.0019
111_6	-0.0020	-0.0013	0.0040	0.0010	0.0080	0.0019	0.0071	0.0007	0.0077	-0.0010
111_7	-0.0018	-0.0006	0.0033	0.0008	0.0067	0.0019	0.0059	0.0008	0.0064	-0.0003
111_8	-0.0016	-0.0001	0.0023	0.0005	0.0051	0.0017	0.0044	0.0009	0.0047	0.0002
111_9	-0.0012	0.0002	0.0011	0.0002	0.0032	0.0013	0.0027	0.0008	0.0027	0.0005
111_10	-0.0007	0.0002	-0.0002	-0.0002	0.0012	0.0008	0.0008	0.0006	0.0007	0.0007
111_11	-0.0002	0.0001	-0.0014	-0.0006	-0.0007	0.0002	-0.0010	0.0003	-0.0014	0.0007
111_12	0.0005	-0.0001	-0.0024	-0.0010	-0.0025	-0.0004	-0.0027	0.0000	-0.0032	0.0007
111_13	0.0011	-0.0003	-0.0032	-0.0013	-0.0042	-0.0010	-0.0041	-0.0004	-0.0049	0.0006
111_14	0.0018	-0.0003	-0.0037	-0.0016	-0.0057	-0.0016	-0.0054	-0.0006	-0.0062	0.0007
111_15	0.0023	0.0000	-0.0040	-0.0017	-0.0070	-0.0021	-0.0064	-0.0008	-0.0072	0.0008
111_16	0.0027	0.0006	-0.0041	-0.0017	-0.0083	-0.0024	-0.0073	-0.0009	-0.0080	0.0012
111_17	0.0027	0.0017	-0.0041	-0.0014	-0.0094	-0.0025	-0.0080	-0.0007	-0.0086	0.0018
111_18	0.0023	0.0033	-0.0038	-0.0009	-0.0105	-0.0023	-0.0085	-0.0002	-0.0090	0.0027
111_19	0.0020	0.0051	-0.0034	-0.0001	-0.0115	-0.0019	-0.0089	0.0005	-0.0092	0.0039
111_20	0.0023	0.0071	-0.0028	0.0011	-0.0124	-0.0011	-0.0092	0.0017	-0.0092	0.0055
0 < SST ≤ 10, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
121_1	-0.0012	-0.0020	0.0040	0.0025	0.0058	0.0017	0.0054	-0.0002	0.0060	-0.0033
121_2	-0.0013	-0.0028	0.0026	0.0005	0.0064	-0.0004	0.0051	-0.0021	0.0056	-0.0050
121_3	-0.0012	-0.0022	0.0030	0.0008	0.0063	0.0003	0.0052	-0.0011	0.0058	-0.0033
121_4	-0.0012	-0.0015	0.0032	0.0010	0.0060	0.0009	0.0052	-0.0002	0.0058	-0.0019
121_5	-0.0012	-0.0008	0.0032	0.0010	0.0054	0.0012	0.0049	0.0003	0.0055	-0.0008
121_6	-0.0011	-0.0001	0.0028	0.0008	0.0045	0.0012	0.0043	0.0007	0.0047	0.0001
121_7	-0.0009	0.0006	0.0021	0.0006	0.0033	0.0012	0.0031	0.0009	0.0035	0.0007
121_8	-0.0007	0.0011	0.0011	0.0004	0.0016	0.0010	0.0016	0.0010	0.0018	0.0012
121_9	-0.0004	0.0014	-0.0001	0.0000	-0.0002	0.0007	-0.0001	0.0009	-0.0002	0.0015
121_10	0.0001	0.0014	-0.0014	-0.0004	-0.0022	0.0001	-0.0019	0.0007	-0.0022	0.0017
121_11	0.0006	0.0013	-0.0026	-0.0008	-0.0041	-0.0004	-0.0037	0.0004	-0.0042	0.0018
121_12	0.0012	0.0011	-0.0035	-0.0011	-0.0058	-0.0010	-0.0053	0.0001	-0.0059	0.0018
121_13	0.0018	0.0008	-0.0044	-0.0015	-0.0076	-0.0016	-0.0068	-0.0003	-0.0076	0.0018
121_14	0.0025	0.0008	-0.0049	-0.0018	-0.0091	-0.0022	-0.0080	-0.0006	-0.0089	0.0018

121_15	0.0029	0.0011	-0.0052	-0.0020	-0.0103	-0.0027	-0.0090	-0.0007	-0.0098	0.0021
10 < SST ≤ 20, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
211_1	-0.0016	-0.0029	0.0055	0.0029	0.0090	0.0025	0.0079	-0.0001	0.0084	-0.0042
211_2	-0.0016	-0.0037	0.0040	0.0009	0.0097	0.0003	0.0076	-0.0021	0.0081	-0.0061
211_3	-0.0016	-0.0031	0.0044	0.0012	0.0096	0.0010	0.0077	-0.0011	0.0083	-0.0045
211_4	-0.0015	-0.0025	0.0046	0.0013	0.0093	0.0015	0.0078	-0.0003	0.0083	-0.0031
211_5	-0.0015	-0.0018	0.0046	0.0013	0.0088	0.0018	0.0075	0.0002	0.0081	-0.0020
211_6	-0.0014	-0.0011	0.0043	0.0012	0.0079	0.0020	0.0069	0.0006	0.0074	-0.0011
211_7	-0.0012	-0.0004	0.0036	0.0010	0.0067	0.0019	0.0058	0.0008	0.0062	-0.0004
211_8	-0.0010	0.0000	0.0026	0.0007	0.0051	0.0017	0.0044	0.0009	0.0046	0.0001
211_9	-0.0007	0.0003	0.0014	0.0004	0.0033	0.0014	0.0027	0.0009	0.0027	0.0005
211_10	-0.0004	0.0003	0.0001	0.0000	0.0014	0.0009	0.0009	0.0007	0.0007	0.0007
211_11	0.0001	0.0002	-0.0011	-0.0004	-0.0005	0.0004	-0.0009	0.0004	-0.0013	0.0007
211_12	0.0007	0.0000	-0.0021	-0.0008	-0.0023	-0.0003	-0.0025	0.0001	-0.0030	0.0008
211_13	0.0012	-0.0002	-0.0030	-0.0012	-0.0039	-0.0009	-0.0039	-0.0002	-0.0045	0.0008
211_14	0.0017	-0.0003	-0.0036	-0.0015	-0.0054	-0.0014	-0.0051	-0.0005	-0.0058	0.0009
211_15	0.0021	-0.0001	-0.0040	-0.0017	-0.0068	-0.0019	-0.0061	-0.0007	-0.0067	0.0011
211_16	0.0022	0.0005	-0.0043	-0.0018	-0.0081	-0.0023	-0.0069	-0.0007	-0.0075	0.0014
211_17	0.0021	0.0014	-0.0044	-0.0017	-0.0092	-0.0025	-0.0076	-0.0006	-0.0081	0.0021
211_18	0.0013	0.0028	-0.0044	-0.0013	-0.0104	-0.0024	-0.0083	-0.0002	-0.0085	0.0029
211_19	0.0007	0.0044	-0.0043	-0.0008	-0.0115	-0.0021	-0.0088	0.0005	-0.0087	0.0040
211_20	0.0005	0.0062	-0.0041	0.0002	-0.0126	-0.0015	-0.0093	0.0014	-0.0088	0.0055
10 < SST ≤ 20, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
221_1	-0.0014	-0.0022	0.0048	0.0027	0.0070	0.0020	0.0063	-0.0001	0.0069	-0.0036
221_2	-0.0014	-0.0029	0.0033	0.0008	0.0077	0.0000	0.0061	-0.0020	0.0066	-0.0053
221_3	-0.0013	-0.0023	0.0037	0.0011	0.0075	0.0007	0.0062	-0.0010	0.0067	-0.0037
221_4	-0.0013	-0.0017	0.0039	0.0012	0.0072	0.0012	0.0062	-0.0002	0.0068	-0.0023
221_5	-0.0013	-0.0010	0.0039	0.0012	0.0067	0.0015	0.0060	0.0003	0.0065	-0.0013
221_6	-0.0012	-0.0003	0.0036	0.0011	0.0059	0.0016	0.0053	0.0007	0.0058	-0.0003
221_7	-0.0010	0.0004	0.0029	0.0009	0.0047	0.0016	0.0043	0.0010	0.0047	0.0003
221_8	-0.0008	0.0008	0.0019	0.0006	0.0031	0.0014	0.0028	0.0010	0.0031	0.0008
221_9	-0.0006	0.0011	0.0007	0.0003	0.0013	0.0010	0.0012	0.0010	0.0012	0.0012
221_10	-0.0002	0.0011	-0.0006	-0.0001	-0.0007	0.0006	-0.0006	0.0008	-0.0008	0.0014
221_11	0.0003	0.0010	-0.0018	-0.0005	-0.0025	0.0000	-0.0024	0.0005	-0.0028	0.0015
221_12	0.0008	0.0007	-0.0029	-0.0009	-0.0043	-0.0006	-0.0040	0.0002	-0.0045	0.0015
221_13	0.0013	0.0005	-0.0037	-0.0013	-0.0060	-0.0012	-0.0054	-0.0001	-0.0060	0.0015

221_14	0.0018	0.0005	-0.0043	-0.0016	-0.0075	-0.0018	-0.0066	-0.0004	-0.0073	0.0016
221_15	0.0022	0.0007	-0.0048	-0.0019	-0.0088	-0.0023	-0.0076	-0.0006	-0.0083	0.0018
221_16	0.0022	0.0013	-0.0051	-0.0020	-0.0101	-0.0027	-0.0085	-0.0006	-0.0091	0.0021
221_17	0.0019	0.0021	-0.0053	-0.0019	-0.0112	-0.0028	-0.0092	-0.0005	-0.0095	0.0028
10 < SST ≤ 20, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
231_3	-0.0004	-0.0021	0.0012	0.0003	0.0030	-0.0005	0.0023	-0.0014	0.0025	-0.0032
231_4	-0.0003	-0.0014	0.0014	0.0005	0.0028	0.0000	0.0023	-0.0006	0.0025	-0.0018
231_5	-0.0003	-0.0008	0.0014	0.0004	0.0023	0.0003	0.0021	-0.0001	0.0023	-0.0008
231_6	-0.0002	0.0000	0.0011	0.0003	0.0014	0.0004	0.0014	0.0003	0.0016	0.0001
231_7	0.0000	0.0006	0.0004	0.0001	0.0002	0.0004	0.0003	0.0004	0.0004	0.0008
231_8	0.0001	0.0011	-0.0006	-0.0002	-0.0014	0.0001	-0.0011	0.0006	-0.0012	0.0013
231_9	0.0004	0.0013	-0.0018	-0.0005	-0.0032	-0.0001	-0.0028	0.0005	-0.0031	0.0017
231_10	0.0007	0.0014	-0.0030	-0.0009	-0.0050	-0.0006	-0.0045	0.0003	-0.0049	0.0018
20 < SST ≤ 25, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
311_1	-0.0010	-0.0018	0.0040	0.0026	0.0055	0.0018	0.0050	0.0000	0.0054	-0.0031
311_2	-0.0010	-0.0026	0.0026	0.0006	0.0061	-0.0004	0.0047	-0.0021	0.0051	-0.0050
311_3	-0.0009	-0.0020	0.0030	0.0009	0.0060	0.0003	0.0049	-0.0011	0.0053	-0.0034
311_4	-0.0009	-0.0014	0.0032	0.0010	0.0057	0.0008	0.0049	-0.0003	0.0053	-0.0020
311_5	-0.0009	-0.0007	0.0032	0.0010	0.0052	0.0011	0.0047	0.0002	0.0051	-0.0010
311_6	-0.0008	0.0000	0.0029	0.0009	0.0044	0.0012	0.0041	0.0006	0.0045	-0.0001
311_7	-0.0006	0.0006	0.0022	0.0007	0.0032	0.0012	0.0031	0.0009	0.0033	0.0006
311_8	-0.0005	0.0011	0.0012	0.0004	0.0016	0.0010	0.0016	0.0009	0.0018	0.0011
311_9	-0.0002	0.0013	0.0000	0.0001	-0.0001	0.0007	0.0000	0.0009	0.0000	0.0015
311_10	0.0001	0.0013	-0.0012	-0.0003	-0.0020	0.0002	-0.0017	0.0007	-0.0020	0.0017
311_11	0.0005	0.0012	-0.0024	-0.0007	-0.0038	-0.0003	-0.0035	0.0005	-0.0038	0.0018
311_12	0.0010	0.0009	-0.0035	-0.0012	-0.0056	-0.0009	-0.0050	0.0001	-0.0055	0.0019
311_13	0.0014	0.0007	-0.0044	-0.0016	-0.0072	-0.0016	-0.0064	-0.0002	-0.0070	0.0019
311_14	0.0017	0.0006	-0.0051	-0.0020	-0.0088	-0.0022	-0.0077	-0.0005	-0.0082	0.0020
311_15	0.0020	0.0008	-0.0056	-0.0023	-0.0102	-0.0027	-0.0087	-0.0007	-0.0093	0.0022
20 < SST ≤ 25, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
321_1	-0.0009	-0.0017	0.0041	0.0026	0.0055	0.0017	0.0050	-0.0001	0.0054	-0.0032
321_2	-0.0009	-0.0025	0.0027	0.0006	0.0062	-0.0004	0.0048	-0.0020	0.0051	-0.0050
321_3	-0.0009	-0.0020	0.0030	0.0008	0.0060	0.0003	0.0049	-0.0011	0.0053	-0.0034
321_4	-0.0009	-0.0014	0.0032	0.0010	0.0057	0.0008	0.0049	-0.0003	0.0053	-0.0020
321_5	-0.0008	-0.0007	0.0032	0.0010	0.0052	0.0011	0.0047	0.0003	0.0051	-0.0010

321_6	-0.0008	0.0000	0.0029	0.0009	0.0044	0.0012	0.0041	0.0006	0.0044	-0.0001
321_7	-0.0006	0.0006	0.0022	0.0007	0.0032	0.0012	0.0031	0.0009	0.0033	0.0006
321_8	-0.0005	0.0011	0.0012	0.0004	0.0017	0.0010	0.0017	0.0009	0.0018	0.0011
321_9	-0.0002	0.0013	0.0000	0.0001	-0.0001	0.0007	0.0000	0.0009	0.0000	0.0015
321_10	0.0001	0.0013	-0.0012	-0.0003	-0.0020	0.0002	-0.0017	0.0007	-0.0019	0.0017
321_11	0.0005	0.0012	-0.0025	-0.0007	-0.0038	-0.0003	-0.0034	0.0005	-0.0038	0.0018
321_12	0.0009	0.0009	-0.0035	-0.0012	-0.0056	-0.0009	-0.0050	0.0001	-0.0055	0.0019
321_13	0.0014	0.0007	-0.0045	-0.0016	-0.0073	-0.0016	-0.0064	-0.0002	-0.0070	0.0019
321_14	0.0017	0.0006	-0.0052	-0.0020	-0.0088	-0.0022	-0.0077	-0.0005	-0.0083	0.0019
321_15	0.0020	0.0007	-0.0057	-0.0023	-0.0103	-0.0027	-0.0088	-0.0007	-0.0093	0.0021
20 < SST ≤ 25, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
331_1	-0.0006	-0.0017	0.0034	0.0022	0.0040	0.0013	0.0038	-0.0002	0.0041	-0.0029
331_2	-0.0006	-0.0024	0.0019	0.0003	0.0047	-0.0007	0.0035	-0.0021	0.0038	-0.0045
331_3	-0.0006	-0.0019	0.0022	0.0005	0.0045	-0.0001	0.0036	-0.0011	0.0040	-0.0030
331_4	-0.0006	-0.0012	0.0024	0.0007	0.0043	0.0005	0.0037	-0.0004	0.0040	-0.0017
331_5	-0.0005	-0.0006	0.0024	0.0007	0.0038	0.0007	0.0034	0.0002	0.0038	-0.0006
331_6	-0.0005	0.0001	0.0021	0.0006	0.0029	0.0008	0.0028	0.0005	0.0031	0.0002
331_7	-0.0003	0.0007	0.0014	0.0004	0.0017	0.0008	0.0018	0.0008	0.0020	0.0009
331_8	-0.0002	0.0012	0.0004	0.0001	0.0002	0.0006	0.0004	0.0008	0.0005	0.0014
331_9	0.0000	0.0014	-0.0008	-0.0002	-0.0016	0.0003	-0.0012	0.0008	-0.0014	0.0018
331_10	0.0004	0.0014	-0.0021	-0.0007	-0.0034	-0.0002	-0.0030	0.0006	-0.0033	0.0020
331_11	0.0007	0.0013	-0.0034	-0.0011	-0.0053	-0.0007	-0.0047	0.0004	-0.0052	0.0021
331_12	0.0012	0.0010	-0.0044	-0.0015	-0.0071	-0.0014	-0.0064	0.0000	-0.0069	0.0021
331_13	0.0016	0.0008	-0.0053	-0.0020	-0.0088	-0.0020	-0.0077	-0.0003	-0.0084	0.0022
25 < SST ≤ 30, 0 < WV ≤ 20, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
411_1	-0.0005	-0.0015	0.0028	0.0021	0.0033	0.0012	0.0031	-0.0002	0.0033	-0.0026
411_2	-0.0005	-0.0023	0.0014	0.0001	0.0040	-0.0009	0.0028	-0.0022	0.0031	-0.0044
411_3	-0.0004	-0.0018	0.0017	0.0004	0.0038	-0.0002	0.0030	-0.0012	0.0032	-0.0028
411_4	-0.0004	-0.0012	0.0019	0.0005	0.0035	0.0003	0.0030	-0.0004	0.0032	-0.0015
411_5	-0.0004	-0.0006	0.0019	0.0005	0.0030	0.0006	0.0028	0.0001	0.0030	-0.0005
411_6	-0.0003	0.0001	0.0016	0.0004	0.0022	0.0007	0.0021	0.0005	0.0024	0.0004
411_7	-0.0002	0.0008	0.0009	0.0002	0.0010	0.0006	0.0012	0.0007	0.0013	0.0011
411_8	0.0000	0.0012	0.0000	-0.0001	-0.0005	0.0004	-0.0002	0.0008	-0.0002	0.0016
411_9	0.0002	0.0015	-0.0013	-0.0004	-0.0023	0.0001	-0.0019	0.0008	-0.0021	0.0020
411_10	0.0005	0.0015	-0.0025	-0.0008	-0.0042	-0.0003	-0.0037	0.0006	-0.0040	0.0022
411_11	0.0008	0.0013	-0.0037	-0.0012	-0.0060	-0.0009	-0.0053	0.0003	-0.0058	0.0023

411_12	0.0013	0.0010	-0.0048	-0.0016	-0.0077	-0.0015	-0.0068	0.0001	-0.0074	0.0023
25 < SST ≤ 30, 20 < WV ≤ 40, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
421_1	-0.0007	-0.0017	0.0037	0.0023	0.0047	0.0014	0.0044	-0.0002	0.0047	-0.0031
421_2	-0.0007	-0.0024	0.0023	0.0004	0.0054	-0.0006	0.0041	-0.0021	0.0044	-0.0047
421_3	-0.0007	-0.0019	0.0026	0.0007	0.0052	0.0001	0.0042	-0.0011	0.0046	-0.0031
421_4	-0.0007	-0.0013	0.0028	0.0009	0.0049	0.0006	0.0042	-0.0003	0.0046	-0.0018
421_5	-0.0006	-0.0006	0.0028	0.0009	0.0044	0.0009	0.0040	0.0002	0.0044	-0.0008
421_6	-0.0006	0.0001	0.0025	0.0007	0.0036	0.0010	0.0034	0.0006	0.0037	0.0001
421_7	-0.0004	0.0007	0.0018	0.0005	0.0024	0.0010	0.0024	0.0008	0.0026	0.0007
421_8	-0.0003	0.0011	0.0008	0.0003	0.0009	0.0008	0.0010	0.0009	0.0011	0.0013
421_9	-0.0001	0.0014	-0.0004	-0.0001	-0.0008	0.0005	-0.0006	0.0008	-0.0007	0.0016
421_10	0.0002	0.0014	-0.0016	-0.0005	-0.0027	0.0000	-0.0023	0.0007	-0.0026	0.0018
421_11	0.0006	0.0012	-0.0028	-0.0009	-0.0045	-0.0005	-0.0040	0.0004	-0.0044	0.0019
421_12	0.0010	0.0009	-0.0039	-0.0013	-0.0062	-0.0011	-0.0056	0.0001	-0.0061	0.0020
421_13	0.0014	0.0007	-0.0049	-0.0018	-0.0079	-0.0018	-0.0070	-0.0003	-0.0075	0.0020
421_14	0.0016	0.0005	-0.0057	-0.0022	-0.0094	-0.0024	-0.0083	-0.0005	-0.0088	0.0021
25 < SST ≤ 30, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
431_1	-0.0008	-0.0017	0.0046	0.0027	0.0063	0.0019	0.0057	-0.0001	0.0061	-0.0034
431_2	-0.0008	-0.0025	0.0032	0.0008	0.0069	-0.0001	0.0054	-0.0019	0.0058	-0.0049
431_3	-0.0008	-0.0020	0.0035	0.0011	0.0068	0.0006	0.0056	-0.0009	0.0059	-0.0034
431_4	-0.0008	-0.0013	0.0037	0.0012	0.0065	0.0011	0.0056	-0.0002	0.0060	-0.0021
431_5	-0.0008	-0.0007	0.0037	0.0012	0.0060	0.0014	0.0053	0.0004	0.0057	-0.0010
431_6	-0.0007	0.0000	0.0034	0.0011	0.0051	0.0015	0.0047	0.0007	0.0050	-0.0002
431_7	-0.0006	0.0006	0.0027	0.0009	0.0040	0.0014	0.0037	0.0009	0.0039	0.0005
431_8	-0.0005	0.0010	0.0017	0.0006	0.0024	0.0012	0.0023	0.0010	0.0024	0.0010
431_9	-0.0002	0.0012	0.0005	0.0003	0.0007	0.0009	0.0007	0.0010	0.0006	0.0013
431_10	0.0000	0.0013	-0.0008	-0.0001	-0.0012	0.0004	-0.0010	0.0008	-0.0013	0.0015
431_11	0.0004	0.0011	-0.0020	-0.0006	-0.0030	-0.0001	-0.0028	0.0005	-0.0031	0.0016
431_12	0.0007	0.0008	-0.0031	-0.0010	-0.0048	-0.0007	-0.0044	0.0002	-0.0048	0.0017
431_13	0.0011	0.0005	-0.0041	-0.0015	-0.0066	-0.0014	-0.0059	-0.0002	-0.0064	0.0017
431_14	0.0014	0.0004	-0.0050	-0.0020	-0.0082	-0.0021	-0.0072	-0.0005	-0.0077	0.0017
431_15	0.0014	0.0005	-0.0056	-0.0023	-0.0097	-0.0027	-0.0083	-0.0008	-0.0087	0.0019
431_16	0.0011	0.0009	-0.0063	-0.0026	-0.0112	-0.0032	-0.0093	-0.0010	-0.0095	0.0021
30 < SST ≤ 35, 40 < WV ≤ 70, 0 < CLW ≤ 0.1										
Bin ID	**6.8 V**	**6.8 H**	**10.7 V**	**10.7 H**	**18.7 V**	**18.7 H**	**23.8 V**	**23.8 H**	**37.0 V**	**37.0 H**
521_2	-0.0001	-0.0015	-0.0001	-0.0002	0.0009	-0.0011	0.0003	-0.0017	0.0002	-0.0030

521_3	-0.0001	-0.0009	0.0001	0.0001	0.0009	-0.0004	0.0005	-0.0008	0.0005	-0.0015
521_4	0.0000	-0.0004	0.0002	0.0002	0.0007	0.0001	0.0006	0.0000	0.0006	-0.0003
521_5	0.0000	0.0002	0.0004	0.0002	0.0001	0.0004	0.0003	0.0005	0.0003	0.0008
521_6	0.0000	0.0010	0.0000	0.0000	-0.0007	0.0005	-0.0003	0.0009	-0.0003	0.0017
521_7	0.0001	0.0015	-0.0006	-0.0002	-0.0019	0.0004	-0.0014	0.0011	-0.0014	0.0023
531_1	-0.0002	-0.0014	0.0024	0.0018	0.0025	0.0010	0.0025	-0.0003	0.0026	-0.0024
531_2	-0.0003	-0.0022	0.0010	0.0000	0.0032	-0.0011	0.0021	-0.0021	0.0023	-0.0041
531_3	-0.0003	-0.0017	0.0013	0.0003	0.0030	-0.0003	0.0023	-0.0011	0.0025	-0.0026
531_4	-0.0003	-0.0011	0.0016	0.0004	0.0028	0.0001	0.0024	-0.0004	0.0026	-0.0013
531_5	-0.0003	-0.0004	0.0015	0.0004	0.0023	0.0004	0.0021	0.0002	0.0023	-0.0002
531_6	-0.0002	0.0003	0.0012	0.0003	0.0015	0.0006	0.0015	0.0005	0.0017	0.0006
531_7	-0.0001	0.0008	0.0005	0.0001	0.0003	0.0005	0.0006	0.0008	0.0006	0.0013
531_8	0.0001	0.0013	-0.0004	-0.0002	-0.0012	0.0003	-0.0008	0.0008	-0.0009	0.0018
531_9	0.0003	0.0015	-0.0017	-0.0006	-0.0030	0.0000	-0.0025	0.0008	-0.0027	0.0022
531_10	0.0005	0.0015	-0.0030	-0.0010	-0.0048	-0.0005	-0.0043	0.0006	-0.0046	0.0024
531_11	0.0008	0.0013	-0.0043	-0.0014	-0.0067	-0.0010	-0.0059	0.0002	-0.0065	0.0025

APPENDIX L: MATLAB CODE

formatData.m

```
function = formatData(filename1,filename2)
% INPUT FILE FORMAT (*.dat files)
% Include full path and extension for filename and enclose in ''
%
% INPUT README
% col 001         WS asc/desc flag (asc-0,dsc-1)
% col 002         lat
% col 003         lon
% col 004         WS GMT in min
%
% col 005-014     WS Tb mean (10 channels)
% col 015-024     WS Tb std dev (10 channels)
% col 025-029     WS inc angles for 5 frequencies
% col 030         WS counts
%
% col 031-35      Tup
% col 036-40      Tdown
% col 041-45      tau
% col 046-50      ev_xcal
% col 051-55      eh_xcal
% col 055-60      ev_salem
% col 061-65      eh_salem
% col 066         GDAS u-wind
% col 067         GDAS v-wind
%
% col 068         GDAS Cloud Liq Water
%
% col 069         EDR wind speed
% col 070         water vapor
% col 071         sea surface temperature
% col 072         salinity
% col 073         day
% col 074         month

% Combines and saves the WindSat data portion of two larger data files.
% Output format is the following:

% Tb Mean Observations:
% 6.8V 6.8H 10.7V 10.7H 18.7V 18.7H 23.8V 23.8H 37.0V 37.0H

% Simulated Tb using Salem's model and XCAL model have same format:
% 6.8V 6.8H 10.7V 10.7H 18.7V 18.7H 23.8V 23.8H 37.0V 37.0H

% Also saves environmental parameters of interest.

wsMeasTb = []; Tup = []; Tdown = []; tau = []; xcalEmis = []; salemEmis = [];
WSpd = []; WV = []; SST = []; CLW = []; WSpd_gdas = []; lat = []; lon = [];
salinity = [];
```

```
for i = 1:2
    if i == 1
        input = load(filename1);
    elseif i == 2
        input = load(filename2);
    else
    end

    wsMeasTb = [wsMeasTb; input(:,5:14)];
    xcalEmis = [xcalEmis; input(:,46),input(:,51),input(:,47),...
        input(:,52),input(:,48),input(:,53),input(:,49),input(:,54),...
        input(:,50),input(:,55)];
    salemEmis = [salemEmis; input(:,56),input(:,61),input(:,57),...
        input(:,62),input(:,58),input(:,63),input(:,59),input(:,64),...
        input(:,60),input(:,65)];

    Tup = [Tup; input(:,31:35)];          % Upwelling Tb
    Tdown = [Tdown; input(:,36:40)];      % Downwelling Tb, including cosmic
    tau = [tau; input(:,41:45)];          % Atmospheric power transmissivity

    WSpd = [WSpd; input(:,69)];           % EDR Wind Speed
    WV = [WV; input(:,70)];               % GDAS Water Vapor
    SST = [SST; input(:,71)];             % GDAS Sea Surface Temperature
    CLW = [CLW; input(:,68)];             % GDAS Cloud Liquid Water
    WSpd_gdas_sum = sqrt(input(:,66).^2+input(:,67).^2);
    WSpd_gdas = [WSpd_gdas; WSpd_gdas_sum];

    lat = [lat; input(:,2)];              % Latitude
    lon = [lon; input(:,3)];              % Longitude

    salinity = [salinity; input(:,72)]; % Salinity

    clear input
end

save wsMeasTb wsMeasTb
save xcalEmis xcalEmis
save salemEmis salemEmis

save tempData Tup Tdown tau
save edrData WSpd WV SST CLW
save WSpd_gdas WSpd_gdas
save location lat lon
save salinity salinity
clear all
```

filter1.m

```
function [] = filter1(partNum)
% Filter Data according to the thresholds in PART I and apply to remaining
% data with PART II - VII, uses WindSat collocations with EDR and GDAS
% PART I:   wsMeasTb......... Measured WindSat TOA Tb (L1C product)
% PART II:  windSatEmis ..... Calculated WindSat ocean surface emissivity
%           xcalEmis......... XCAL simulated ocean surface emissivity
%           salemEmis........ CFRSL simulated ocean surface emissivity
% PART III: Tup.............. Upwelling Tb
%           Tdown............ Downwelling Tb, including cosmic (2.7K*e-?)
%           tau.............. Atmospheric power transmissivity
% PART IV:  WSpd............. EDR Wind Speed, m/s
%           WV............... GDAS Water Vapor, mm
%           SST.............. GDAS Sea Surface Temperature, K
%           CLW.............. Cloud Liquid Water, mm
% PART V:   lat.............. Latitude of 1 degree box for collocations
%           lon.............. Longitude of 1 degree box for collocations
% PART VI:  WSpd_gdas........ GDAS Wind Speed, m/s
% PART VII: salinity......... salinity in ppt

% ------------------------------ PART I ---------------------------------
if partNum == 1

    upBound = 285;
    loBound = 75;

    load wsMeasTb

    for j = 1:10 % number of channels
        rows(:,j) = (wsMeasTb(:,j)<upBound & wsMeasTb(:,j)>loBound);
    end

    rows_ok =
(rows(:,1)&rows(:,2)&rows(:,3)&rows(:,4)&rows(:,5)&rows(:,6)&...
        rows(:,7)&rows(:,8)&rows(:,9)&rows(:,10));
    wsMeasTb = wsMeasTb(rows_ok,:);

    save rowsOK_filter1 rows_ok
    save wsMeasTb_f1 wsMeasTb
    clear all

% ------------------------------ PART II ---------------------------------
elseif partNum == 2

    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load windSatEmis        % contains windSatEmis
    load xcalEmis           % contains xcalEmis
    load salemEmis          % contains salemEmis
```

```
    windSatEmis = windSatEmis(rows_ok,:);
    xcalEmis = xcalEmis(rows_ok,:);
    salemEmis = salemEmis(rows_ok,:);

    save windSatEmis_f1 windSatEmis
    save xcalEmis_f1 xcalEmis
    save salemEmis_f1 salemEmis
    clear all


% ------------------------------ PART III --------------------------------
elseif partNum == 3

    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load tempdata           % contains Tup, Tdown, tau

    Tup = Tup(rows_ok,:);
    Tdown = Tdown(rows_ok,:);
    tau = tau(rows_ok,:);

    save tempData_f1 Tup Tdown tau
    clear all

% ------------------------------ PART IV --------------------------------
elseif partNum == 4

    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load edrData            % contains WSpd, WV, SST, CLW

    WSpd = WSpd(rows_ok,:);
    WV = WV(rows_ok,:);
    SST = SST(rows_ok,:);
    CLW = CLW(rows_ok,:);

    save edrData_f1 WSpd WV SST CLW
    clear all

% ------------------------------ PART V --------------------------------
elseif partNum == 5

    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load location           % contains lat, lon

    lat = lat(rows_ok,:);
    lon = lon(rows_ok,:);

    save location_f1 lat lon
    clear all
```

```
% ------------------------------ PART VI --------------------------------
elseif partNum == 6


    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load WSpd_gdas          % contains WSpd_gdas

    WSpd_gdas = WSpd_gdas(rows_ok,:);

    save WSpd_gdas_f1 WSpd_gdas
    clear all

% ------------------------------ PART VII --------------------------------
elseif partNum == 7

    load rowsOK_filter1     % contains rows_ok w/ filter 1
    load salinity           % contains salinity

    salinity = salinity(rows_ok,:);

    save salinity_f1 salinity
    clear all

else
end
```

filter2.m

```
function [] = filter2(partNum)
% Filter Data according to the thresholds in PART I and apply to remaining
% data with PART II - VII
% PART I:   wsMeasTb......... Measured WindSat TOA Tb (L1C product)
% PART II:  windSatEmis ..... Calculated WindSat ocean surface emissivity
%           xcalEmis......... XCAL simulated ocean surface emissivity
%           salemEmis........ CFRSL simulated ocean surface emissivity
% PART III: Tup.............. Upwelling Tb
%           Tdown............ Downwelling Tb, including cosmic (2.7K*e-?)
%           tau.............. Atmospheric power transmissivity
% PART IV:  WSpd............. EDR Wind Speed, m/s
%           WV............... GDAS Water Vapor, mm
%           SST.............. GDAS Sea Surface Temperature, K
%           CLW.............. Cloud Liquid Water, mm
% PART V:   lat.............. Latitude of 1 degree box for collocations
%           lon.............. Longitude of 1 degree box for collocations
% PART VI:  WSpd_gdas........ GDAS Wind Speed, m/s
% PART VII: salinity......... salinity in ppt

% ------------------------------ PART I ---------------------------------
if partNum == 1

    load edrData_f1;        % contains WSpd, WV, SST, CLW w/ filter 1
    load wsMeasTb_f1;       % contains wsMeasTb w/ filter 1

    % Sea Surface Temperature (Celsius) Thresholds
    sstMin = 253.15;
    sstMax = 308.15;
    % Water Vapor (mm) Thresholds
    wvMin = 0;
    wvMax = 70;
    % Cloud Liquid Water (mm) Thresholds
    clwMin = 0-eps; %min(CLW);
    clwMax = 0.4;
    % Wind Speed (m/s) Thresholds
    wsMin = 0;
    wsMax = 30;
% Note: eps returns the distance from 1.0 to the next largest
% double-precision number, that is eps = 2^(-52)

    rows_ok = (SST<=sstMax & SST>sstMin & WV<=wvMax & WV>wvMin & ...
        CLW<=clwMax & CLW>clwMin & WSpd<=wsMax & WSpd>wsMin);
    wsMeasTb = wsMeasTb(rows_ok,:);

    save rowsOK_filter2 rows_ok
    save wsMeasTb_f2 wsMeasTb
    clear all

% ------------------------------ PART II ---------------------------------
```

```
elseif partNum == 2

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load windSatEmis_f1     % contains windSatEmis w/ filter 1
    load xcalEmis_f1        % contains xcalEmis w/ filter 1
    load salemEmis_f1       % contains salemEmis w/ filter 1

    windSatEmis = windSatEmis(rows_ok,:);
    xcalEmis = xcalEmis(rows_ok,:);
    salemEmis = salemEmis(rows_ok,:);

    save windSatEmis_f2 windSatEmis
    save xcalEmis_f2 xcalEmis
    save salemEmis_f2 salemEmis
    clear all

% ------------------------------ PART III --------------------------------
elseif partNum == 3

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load tempData_f1        % contains Tup, Tdown, tau w/ filter 1

    Tup = Tup(rows_ok,:);
    Tdown = Tdown(rows_ok,:);
    tau = tau(rows_ok,:);

    save tempData_f2 Tup Tdown tau
    clear all

% ------------------------------ PART IV --------------------------------
elseif partNum == 4

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load edrData_f1         % WSpd, WV, SST, CLW w/ filter 1

    WSpd = WSpd(rows_ok,:);
    WV = WV(rows_ok,:);
    SST = SST(rows_ok,:);
    CLW = CLW(rows_ok,:);

    save edrData_f2 WSpd WV SST CLW
    clear all

% ------------------------------ PART V --------------------------------
elseif partNum == 5

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load location_f1        % contains lat, lon w/ filter 1
```

```
    lat = lat(rows_ok,:);
    lon = lon(rows_ok,:);

    save location_f2 lat lon
    clear all

% ------------------------------ PART VI --------------------------------
elseif partNum == 6

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load WSpd_gdas_f1       % contains WSpd_gdas w/ filter 1

    WSpd_gdas = WSpd_gdas(rows_ok,:);

    save WSpd_gdas_f2 WSpd_gdas
    clear all

% ------------------------------ PART VII --------------------------------
elseif partNum == 7

    load rowsOK_filter2     % contains rows_ok w/ filter 2
    load salinity_f1        % cntains salinity w/ filter 1

    salinity = salinity(rows_ok,:);

    save salinity_f2 salinity
    clear all

else
end
```

filter3.m

```
function [] = filter3
% Filter Data to remove 1 degree box that contains calculated WindSat
% emissivity beyond 3 sigma in any channel or has a negative emissivity in
% any channel. Applies filter to remaining data with PART II - VII
% PART I:   wsMeasTb......... Measured WindSat TOA Tb (L1C product)
% PART II:  windSatEmis ..... Calculated WindSat ocean surface emissivity
%           xcalEmis......... XCAL simulated ocean surface emissivity
%           salemEmis........ CFRSL simulated ocean surface emissivity
% PART III: Tup.............. Upwelling Tb
%           Tdown............ Downwelling Tb, including cosmic (2.7K*e-?)
%           tau.............. Atmospheric power transmissivity
% PART IV:  WSpd............. EDR Wind Speed, m/s
%           WV............... GDAS Water Vapor, mm
%           SST.............. GDAS Sea Surface Temperature, K
%           CLW.............. Cloud Liquid Water, mm
% PART V:   lat.............. Latitude of 1 degree box for collocations
%           lon.............. Longitude of 1 degree box for collocations
% PART VI:  WSpd_gdas........ GDAS Wind Speed, m/s
% PART VII: salinity......... salinity in ppt

% ------------------------------ PART I ---------------------------------
load wsMeasTb_f2 %wsMeasTb
totalRows = length(wsMeasTb(:,1));
rows_ok = zeros(totalRows,1);

for i=1:5
    for j=1:3
        tic;
        for k=1:1
            for y = 1:10
                rowsToAdd = getFilter3rows(i,j,k,y);
                rows_ok = rows_ok | rowsToAdd;
            end
        end
    end
end

wsMeasTb = wsMeasTb(rows_ok,:);
save wsMeasTb_f3 wsMeasTb
save rowsOK_filter3 rows_ok
clear wsMeasTb

% ------------------------------ PART II ---------------------------------
load xcalEmis_f2
load salemEmis_f2
load windSatEmis_f2

xcalEmis = xcalEmis(rows_ok,:);
salemEmis = salemEmis(rows_ok,:);
```

```
windSatEmis = windSatEmis(rows_ok,:);

save xcalEmis_f3 xcalEmis
save salemEmis_f3 salemEmis
save windSatEmis_f3 windSatEmis
clear xcalEmis  salemEmis windSatEmis

% ------------------------------ PART III --------------------------------
load tempData_f2   % Tup Tdown tau

Tup = Tup(rows_ok,:);
Tdown = Tdown(rows_ok,:);
tau = tau(rows_ok,:);

save tempData_f3 Tup Tdown tau
clear Tup Tdown tau

% ------------------------------ PART IV --------------------------------
load edrData_f2 %WSpd WV SST CLW

WSpd = WSpd(rows_ok,:);
WV = WV(rows_ok,:);
SST = SST(rows_ok,:);
CLW = CLW(rows_ok,:);

save edrData_f3 WSpd WV SST CLW
clear WSpd WV SST CLW

% ------------------------------ PART V --------------------------------
load location_f2   % lat lon

lat = lat(rows_ok,:);
lon = lon(rows_ok,:);

save location_f3 lat lon
clear lat lon

% ------------------------------ PART VI --------------------------------
load WSpd_gdas_f2

WSpd_gdas = WSpd_gdas(rows_ok,:);

save WSpd_gdas

% ------------------------------ PART VII --------------------------------
load salinity_f2

salinity = salinity(rows_ok,:);
```

```
save salinity
```

getFilter3Rows

```
function rows_ok = getFilter3rows(sstBin, wvBin, clwBin, wsBin)
% Finds rows within specified bin that where 1 degree box contains
% calculated WindSat emissivity beyond 3 sigma in any channel or has a
% negative emissivity in any channel (freq/pol).

load windSatEmis_f2
load edrData_f2          % contains WSpd WV SST CLW

% Sea Surface Temperature (Celsius) Thresholds
if sstBin == 1
    sstMin = 253.15; % 2^(-52) deg C
    sstMax = 283.15; % 10 deg C
elseif sstBin == 2
    sstMin = 283.15; % 10 deg C
    sstMax = 293.15; % 20 deg C
elseif sstBin == 3
    sstMin = 293.15; % 20 deg C
    sstMax = 298.15; % 25 deg C
elseif sstBin == 4
    sstMin = 298.15; % 25 deg C
    sstMax = 303.15; % 30 deg C
else
    sstMin = 303.15; % 30 deg C
    sstMax = 308.15; % 35 deg C
end

% Water Vapor (mm) Thresholds for the bin
if wvBin == 1
    wvMin = 0;
    wvMax = 20;
elseif wvBin == 2
    wvMin = 20;
    wvMax = 40;
elseif wvBin == 3
    wvMin = 40;
    wvMax = 70;
end

% Cloud Liquid Water (mm) Thresholds
if clwBin == 1
    clwMin = 0-eps;
    clwMax = 0.1;
elseif clwBin == 2
    clwMin = 0.1;
    clwMax = 0.2;
elseif clwBin == 3
    clwMin = 0.2;
    clwMax = 0.4;
end
```

```
% Wind Speed (m/s) Thresholds (2 m/s bins)
if wsBin == 1
    wsMin = 0;
    wsMax = 2;
else
    wsMin = 2*(wsBin-1);
    wsMax = 2*wsBin;
end

rows1 = (SST<=sstMax & SST>sstMin & WV<=wvMax & WV>wvMin & ...
    CLW<=clwMax & CLW>clwMin & WSpd<=wsMax & WSpd>wsMin);
clear SST WV CLW WSpd

for j = 1:10 % number of channels
    binMean = nanmean(windSatEmis(rows1,j));
    binStdDev = nanstd(windSatEmis(rows1,j));
    rows2(:,j) = windSatEmis(:,j)<(binMean + 3*binStdDev) & ...
        windSatEmis(:,j)>(binMean - 3*binStdDev) & windSatEmis(:,j)>0;
end
rows_ok = rows1 & rows2(:,1) & rows2(:,2) & rows2(:,3) & rows2(:,4) ...
    & rows2(:,5) & rows2(:,6) & rows2(:,7) & rows2(:,8) & rows2(:,9) ...
    & rows2(:,10);
end
```

APPENDIX M : MATLAB FILE DESCRIPTONS

MATLAB Files (*.mat)

Name	**Description**	**Variable Name(s)**
envData_f3_gdas	Contains four(4) envir. variables from GDAS dataset	CLW, SST, WSPd, WV
envData_f3_edr	Contains four (4) envir. variables from EDR dataset	CLW, SST, WSPd, WV
salemEmis_f3_gdas	Contains one(1) variable created from GDAS dataset	salemEmis
salemEmis_f3_edr	Contains one (1) variable created from EDR dataset	salemEmis
xcalEmis_f3_gdas	Contains one (1) variable created from GDAS dataset	xcalEmis
xcalEmis_f3_edr	Contains one (1) variable created from EDR dataset	xcalEmis
windSatEmis_f3_gdas	Contains one (1) variable created from GDAS dataset	windSatEmis
windSatEmis_f3_edr	Contains one (1) variable created from EDR dataset	windSatEmis
location_f3_gdas	Contains two (2) variables from GDAS dataset	lat, lon
tempData_f3_gdas	Contains three (3) variables found from GDAS dataset	Tdown, Tup, tau
tempData_f3_edr	Contains three (3) variables found from EDR dataset	Tdown, Tup, tau
wsMeasTb_f3_gdas	Contains three (1) variable from GDAS dataset	wsMeasTb
wsMeasTb_f3_edr	Contains three (1) variable from EDR dataset	wsMeasTb

Variables (within MATLAB Files)

Name	**Description**	**Units**	**# Columns**
CLW	Cloud Liquid Water	mm	1
SST	Sea Surface Temperature	K	1
WSpd	Wind Speed	m/s	1

WV	Water Vapor	mm	1
salemEmis	Emissivity using CFRSL RTM	N/A	10 - See Freq/Pol Order below
xcalEmis	Emissivity using XCAL RTM	N/A	10 - See Freq/Pol Order below
windSatEmis	Emissivity from WindSat	N/A	10 - See Freq/Pol Order below
lat	Latitude coordinate for data point	Degrees	1
lon	Longitude coordinate for data point	Degrees	1
Tdown	Downwelling Brightness Temperature	K	1
Tup	Upwelling Brightness Temperature	K	1
tau	Atmospheric tranmissivity	N/A	1
wsMeasTb	WindSat measured Brightness Temp	K	10 - See Freq/Pol Order below

Frequency (GHz) and Polarization Order for all variables									
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10
6.8 V	6.8 H	10.7 V	10.7 H	18.7 V	18.7 H	23.8 V	23.8 H	37.0 V	37.0 H

Notes:

All MATLAB files with ending “f3_gdas”will have the same number of rows (1855976) so that any data point in a given row of one variable is the collocated data point of another variable in the same row. Similarly, all data with ending “f3_edr” will have the same number of rows (1558771) and collocation pattern.

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