In the coastal east-central Florida (ECF) region, the low-lying coastal alluvial plains and barrier islands have a high risk of being inundated by seawater due to climate change such as sea-level rise and intensified storm surge from hurricanes, and saltwater intrusion into the coastal aquifer is inevitable from infiltration of overtopping saltwater. In the inland ECF region, sinkhole occurrence has been recognized as the primary geologic hazard causing massive financial losses to society since the past several decades. Therefore, the objectives of this dissertation are to: (1) evaluate the impacts of sea-level rise and intensified storm surge on the extent of saltwater intrusion into the coastal ECF region; (2) assess the risk level of sinkhole occurrence in the inland ECF region. In this dissertation, numerical modeling method is used to achieve these objectives. Several three-dimensional groundwater flow and salinity transport models focused on the coastal ECF region are developed and calibrated to simulate the impacts of sea-level rise and storm surge based on various sea-level rise scenarios and a developed storm surge model for quantifying the future extent of saltwater intrusion, and several three-dimensional groundwater flow models focused on the inland ECF region are developed and calibrated to simulate the spatial variation of groundwater recharge rate for analyzing the risk level of sinkhole occurrence in the geotypical central Florida karst terrains. Results indicate that sea-level rise and storm surge play a dominant role in causing saltwater intrusion, and the risk of sinkhole occurrence increases linearly with an increase in recharge rate while the timing of sinkhole occurrence is highly related to the temporal variation of the difference of groundwater level between confined and unconfined aquifers. The outcome will contribute to ongoing research focused on forecasting the impacts of climate change on the risk level of natural hazards in ECF region.