Numerous water balance models at various timescales have been proposed in the literature. However, those models are usually developed for a particular time scale. Particularly, several monthly water balance models including Thornthwaite model and "abcd" model have been developed in the past sixty years.

This thesis proposes a model structure that can be used at multiple time scales because the model is based on the proportionality hypothesis, which is tested from event to annual scales. The primary difference with the proposed model structure in comparison with other water balance models is the application of the proportionality hypothesis to both the partitioning of direct runoff and continuing abstraction and to the partitioning of continuing evapotranspiration and subsurface flow.

The model structure is evaluated at three time scales (daily, monthly and annual) using 72 catchments in the continental United States. A six-parameter variation of this model structure is evaluated against the popular "abcd" monthly water balance model and a Budyko-type model developed for use at multiple time scales. Evaluation of the models shows that the proposed model performs better than the other models at all time scales.

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The public is welcome to attend.