Data assimilation of soil moisture and snow water equivalent into hydrologic model of an urban basin.

Introduction

Both Soil Moisture (SM) and snow have major roles in the water cycle. Data assimilation (DA) can be used to integrate data into hydrologic models while accounting for their uncertainties [1].

Using the Ensemble Kalman Filter (EnKF), SM and Snow Water Equivalent (SWE) data will be integrated into the Sacramento Soil Moisture Accounting (SAC-SMA) Model. These analyses will examine the impact that different assimilation schemes have on hydrologic modeling and forecasting in an urban basin.

Study Area and Data

Don River watershed covers municipalities of Toronto, York, Markham, Richmond Hill, and Vaughan. The area of the watershed is 358 km². Length of major tributaries range from 9–43 km and they have an average monthly range from 9–43 km and they have an average monthly.

Results

Summary and Future Work

The analyses found the Q-SMSEW and Q-SWE schemes have the better performances for both simulation and forecasts. Indicating that after some pre-processing the SMOS L2 SM and SNODAS SWE data products can be used for assimilated and provide improved performances. To determine how robust these results are, future work will include:

• Using different hydrologic models
• Transitioning into distributed models of basin
• Using hourly time scale
• Using forecast data sets instead of ‘perfect’ forecast
• Examining different DA methods

Discussion

In general, the state and parameter updating DA schemes had better performance for both simulation and forecasts. Under state updating, a large difference is seen in the performance when using ECCC over SNODAS SWE data, however, when updating parameters and states this difference was negligible.

Despite the improvements gained from DA, the peak flows were not always correctly represented by the ensemble mean. However, they were still captured by the ensemble (Figure 3).

The forecast performances for each assimilation scheme, except the Q-Q scheme, were fairly similar to the open loop, with the Q-SWE and Q-SMSEW schemes performing marginally better. One explanation of this is due to the forcing data used as it was just the historical values and not an actual forecast product.

References