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A new assimilation method with physical mechanism to estimate evapotranspiration

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Abstract The accurate estimation of regional evapotranspiration has been a research hotspot in the field of hydrology and water resources both in domestic and abroad. A new assimilation method with physical mechanism was proposed to estimate evapotranspiration, which was easier to apply. Based on the evapotranspiration (ET) calculating method with soil moisture recurrence relations in the Distributed Time Variant Gain Model (DTVGM) and Ensemble Kalman Filter (EnKF), it constructed an assimilation system for recursive calculation of evapotranspiration in combination with "observation value" by the retrieval data of evapotranspiration through the Two-Layer Remote Sensing Model. By updating the filter in the model with assimilated evapotranspiration, synchronization correction to the model estimation was achieved and more accurate time continuous series values of evapotranspiration were obtained. Through the verification of observations in Xiaotangshan Observatory and hydrological stations in the basin, the correlation coefficient of remote sensing inversion evapotranspiration and actual evapotranspiration reaches as high as 0.97, and the NS efficiency coefficient of DTVGM model was 0.80. By using the typical daily evapotranspiration from Remote Sensing and the data from DTVGM Model, we assimilated the hydrological simulation processes with DTVGM Model in Shahe Basin in Beijing to obtain continuous evapotranspiration time series. The results showed that the average relative error between the remote sensing values and DTVGM simulations is about 12.3%, and for the value between remote sensing retrieval data and assimilation values is 4.5%, which proved that the assimilation results of Ensemble Kalman Filter (EnKF) were closer to the "real" data, and was better than the evapotranspiration simulated by DTVGM without any improvement.
Keyword Evapotranspiration assimilation Ensemble Kalman Filter Distributed hydrological model Two-Layer Remote Sensing Model