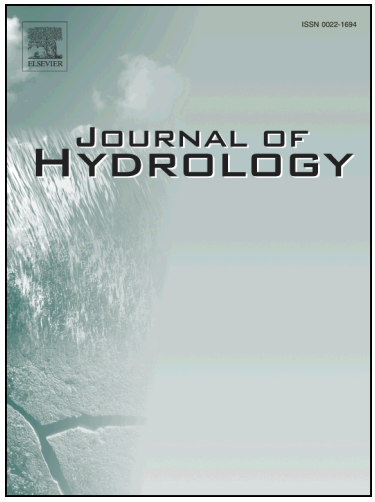

Research papers

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Simultaneous state-parameter estimation supports the evaluation of data assimilation performance and measurement design for soil-water-atmosphere-plant system

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Abstract

Improvements to agricultural water and crop managements require detailed information on crop and soil states, and their evolution. Data assimilation provides an attractive way of obtaining these information by integrating measurements with model in a sequential manner. However, data assimilation for soil-water-atmosphere-plant (SWAP) system is still lack of comprehensive exploration due to a large number of variables and parameters in the system. In this study, simultaneous state-parameter estimation using ensemble Kalman filter (EnKF) was employed to evaluate the data assimilation performance and provide advice on measurement design for SWAP system. The results demonstrated that a proper selection of state vector is critical to effective data assimilation. Especially, updating the development stage was able to avoid the negative effect of "phenological shift", which was caused by the contrasted phenological stage in different ensemble members. Simultaneous state-parameter estimation (SSPE) assimilation strategy outperformed updating-state-only (USO) assimilation strategy because of its ability to alleviate the inconsistency between model variables and parameters. However, the performance of SSPE assimilation strategy