Impact of assimilating the terrestrial water storage on the water and carbon cycles in CLM5-BGC

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Abstract

Terrestrial water storage (TWS) includes all components of water (e.g., surface water, groundwater, snow and ice) over the land. So accurately predicting and estimating TWS is important in water resource management. Although many land surface models are used to predict the TWS, model output has errors and biases in comparison to the observation data due to the model deficiencies in the model structure, atmospheric forcing datasets, and parameters. In this study, Gravity Recovery And Climate Experiment (GRACE) satelite TWS data is assimilated in the Community Land Model version 5 with a biogeochemistry module (CLM5.0-BGC) over East Asia from 2003 to 2010 by employing the Ensemble Adjustment Kalman Filter (EAKF). Results showed that TWS over East Asia continued to decrease during the study period, and the ability to simulate the surface water storage, which is the component of the CLM derived TWS, was greatly improved. We further investigated the impact of assimilated TWS on the vegetated and carbon related variables, including the leaf area index and primary products of ecosystem. We also evaluated the simulated total ecosystem carbon and calculated its correlation with TWS. This study shows that how the better simulated TWS plays a role in capturing not only water but also carbon fluxes and states.

Keywords : Terrestrial water storage (TWS), CLM, GRACE, Data assimilation

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