Eco-hydrological land data assimilation to monitor terrestrial water, ecosystem, and hydrological disasters

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Many of global reanalysis datasets include land surface water, temperature, and fluxes. To generate the land reanalysis, a land surface model (LSM) is driven offline using bias-corrected atmospheric forcing based on atmospheric reanalysis. The land reanalysis datasets have greatly contributed to the studies on water resources, natural disasters, and land-atmosphere interactions. However, there are two limitations in the existing global land reanalyses. First, their LSMs cannot explicitly simulate vegetation growth. Although the terrestrial ecosystem has an important role in the global cycle of water, energy, and carbon, the inter-annual variability of vegetation states is not simulated in the existing global land reanalyses. Second, few observations are currently assimilated and the existing global land reanalyses are often regarded as free runs of LSMs. A large amount of satellite land surface observations has yet to be used for the land reanalysis. To address these issues, we developed a new eco-hydrological land data assimilation system, the Coupled Land and Vegetation Data Assimilation System (CLVDAS). The LSM of the CLVDAS can simultaneously simulate terrestrial water and vegetation dynamics. The CLVDAS can assimilate satellite-observed passive microwave brightness temperatures, which are sensitive to both surface soil moisture and vegetation water content, into the LSM. Using the CLVDAS, we generate a new semi-global land reanalysis dataset. In this presentation, we will reveal that this land reanalysis is useful to monitor terrestrial water, ecosystem, and severe droughts.

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