



Advantages of using satellite soil moisture estimates over precipitation products to assess regional vegetation water availability and activity

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To improve the understanding of water–vegetation relationships, direct comparative studies assessing the utility of satellite remotely sensed soil moisture, gridded precipitation products, and land surface model output are needed. A case study was investigated for a water-limited, lateral inflow receiving area in northeastern Australia during December 2008 to May 2009. In January 2009, monthly precipitation showed strong positive anomalies, which led to strong positive soil moisture anomalies. The precipitation anomalies disappeared within a month. In contrast, the soil moisture anomalies persisted for months. Positive anomalies of Normalized Difference Vegetation Index (NDVI) appeared in February, in response to water supply, and then persisted for several months. In addition to these temporal characteristics, the spatial patterns of NDVI anomalies were more similar to soil moisture patterns than to those of precipitation and land surface model output. The long memory of soil moisture mainly relates to the presence of clay-rich soils. Modeled soil moisture from four of five global land surface models failed to capture the memory length of soil moisture and all five models failed to present the influence of lateral inflow. This case study indicates that satellite-based soil moisture is a better predictor of vegetation water availability than precipitation in environments having a memory of several months and thus is able to persistently affect vegetation dynamics. These results illustrate the usefulness of satellite remotely sensed soil moisture in ecohydrology studies. This case study has the potential to be used as a benchmark for global land surface model evaluations. The advantages of using satellite remotely sensed soil moisture over gridded precipitation products are mainly expected in lateral-inflow and/or clay-rich regions worldwide.