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The feedback between GRACE observed terrestrial water storage and vegetation changes

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Water availability conditions strongly affect vegetation growth. Meanwhile, vegetation changes will also affect land water conditions by changing the surface energy-water balance. Here, interactions between land water variation and vegetation growth has been investigated at both global and 405 major basin scales based on terrestrial water storage (TWS) from the Gravity Recovery and Climate Experiment (GRACE) and normalized difference vegetation index (NDVI) during the period of Jan. 2003 to Dec. 2015. Strong impacts of TWS on NDVI were identified over 61% of global vegetated areas which was higher than previous reported using the discrete wavelet transform analysis, and a common 1- to 3-month lagged response of NDVI to TWS were observed. Interactions between TWS and NDVI were detected relying on the Granger-causality technique. At basin scales, TWS–NDVI feedbacks were found in 56 basins, such as Yangtze River, Danube, Murray, and Limpopo.