GC34A-01 Water Control on Vegetation Growth Pattern in Eurasia from GRACE

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High latitude ecosystem productivity is constrained by cold temperature and moisture limitations to plant growth, while these environmental restrictions may be changing with global warming. Satellite data driven assessments indicate that over the past three decades, rapid warming in the northern high latitudes has resulted in earlier and longer potential growing seasons and widespread greening, due to general relaxation of cold temperature constraints to vegetation productivity. However, warming may have also increased water stress limitations to growth. In this study, we use GRACE (Gravity Recovery and Climate Experiment) derived total water storage (TWS), 2-m air temperature (T) from ERA-interim reanalysis, normalized difference vegetation index (NDVI) data from MODIS (Collection 5) and satellite data driven vegetation gross primary productivity (GPP) estimates as surrogates for vegetation growth, for the period August 2002-December 2013 to evaluate terrestrial water supply controls to vegetation growth changes over the three major river basins of northern Eurasia. We find that during the analyzed period, the apparent growth response follows regional vegetation, moisture and temperature gradients and is spatially complex. In the drier southwest characterized by grassland, vegetation growth is mainly controlled by TWS availability. In the central region, dominated by cold temperature and water limited boreal forest, T is the main control on vegetation growth. In the Lena basin, where vegetation includes both boreal forest and water limited grassland, both T and TWS impact vegetation growth. We suggest that GRACE TWS estimates provide reliable observational constraints on water availability to vegetation that supplement sparse soil moisture observations and satellite precipitation estimates with unknown bias.

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