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CONTROL ID: 1196987

TITLE: Increase in groundwater storage in discontinuous permafrost areas in Eurasia and impact on vegetation productivity

PRESENTATION TYPE: Poster Requested

CURRENT SECTION/FOCUS GROUP: Global Environmental Change (GC)

CURRENT SESSION: GC16. Regional Climate Impacts 7. Environmental, Socio-economic and Climatic Changes in Northern Eurasia and their Feedbacks to the Global Earth System: The Role of Remote Sensing and Integrative Studies

AUTHORS (FIRST NAME, LAST NAME): Jinjun Tong[1], Isabella Velicogna[1, 2], Tingjun Zhang[3, 4], John S Kimball[5]

INSTITUTIONS (ALL): 1. Univ. of California, Irvine, Irvine, CA, United States.
2. Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, United States.
3. NSIDC, CIRES, University of Colorado, Boulder, Boulder, CO, United States.
4. MOE Key Lab. of West China's Environ. System, Lanzhou University, Lanzhou, China.
5. Flathead Lake Biological Station, University of Montana, Polson, MT, United States.

SPONSOR NAME: Jinjun Tong

ABSTRACT BODY: We use monthly measurements of time-variable gravity from the GRACE (Gravity Recovery and Climate Experiment) satellite mission to determine the increase in terrestrial water storage (TWS) in Eurasia, during the period 2002-2011.
We compare monthly TWS from GRACE with TWS from time series of precipitation (P) minus evapo-transpiration (ET) from ERA-Interim re-analysis and observational river discharge (R) in the Lena, Yenisei and Ob river basins. We find an excellent agreement between the two time series of TWS. If we account for a negative bias in the average annual precipitation during the analyzed period, we effectively close the terrestrial water budget. From this comparison, we attribute both the increase in R and in TWS to an increase in P. In the Lena river basin the TWS increase is dominated by a large signal in an area of discontinuous permafrost. We attribute the observed signal to an increase in groundwater storage of 68+/-19 cubic km or to surface water recharging the ground water through areas not underlain by permafrost, while changes in active layer thickness have likely less impact. These TWS changes will have a significant impact on the terrestrial hydrology of the region, including increased baseflow and alteration of seasonal runoff. We also analyze the temporal and spatial correlation between TWS and Normalized Difference Vegetation Index (NDVI) and Net Primary Production (NPP) from MODIS. We show how the correlation changes within water rich and water limited areas as well as in function of different land cover types. We find that vegetation productivity in the Lena river basin is mainly controlled by temperature constraints rather than moisture availability, while in the Ob river basin it is mainly controlled by water limitation.

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INDEX TERMS: [1640] GLOBAL CHANGE / Remote sensing, [1813] HYDROLOGY / Eco-hydrology.