Hydrological Changes in the Four Largest Siberian Arctic River Basins

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The Arctic freshwater budget affects global climate and is critical for understanding the climate in polar regions. However, the hydrology of the largest Eurasian Arctic rivers is still not understood well. In this paper, we analyze spatiotemporal variations in hydro-climatological factors related to four of the largest Siberian Arctic river basins (Ob, Yenisey, Lena, and Kolyma). To examine recent hydro-climatological changes in these river basins, we utilize monthly observation-based gridded meteorological and evapotranspiration data, Moderate Resolution Imaging Spectroradiometer (MODIS)-based products such as the snow area fraction (SAF) and normalized vegetation index (NDVI), global land data assimilation system products, and Gravity Recovery and Climate Experiment (GRACE) data from 2000 to 2016. Combining these with river runoff data, we identify how river runoff shifted from June to May during the study period. River runoff in May significantly increased although there was no clear trend in annual discharge. In addition, SAF decreased drastically in April and this is evidence that spring snow coverage in Siberian basins is shrinking and snowmelt is shifting toward earlier. On the other hand, we found the positive trend in summer NDVI. Focusing on permafrost distribution, this paper will discuss the correlation in the temporal lag between the water cycle and vegetation activity.

Keywords: Snow, Vegetation, Premafrost

