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Modelling key water storages and fluxes in the Arctic drainage basin to explain observed trends in river flow

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The pace of change in the arctic system during recent decades has captured the world's attention. Observations and model simulations both indicate that the arctic experiences an amplified response to climate forcing relative to that at lower latitudes. At the core of these changes is the arctic hydrologic system, which includes ice, gaseous vapor in the atmosphere, liquid water in soils and fluvial networks on land, and the freshwater content of the ocean. 11% of world's river-runoff flows to the Arctic Ocean and there is evidence of changes in the delicate fresh-water balance. River monitoring show increase in annual discharge from the largest rivers and spring snow-cover is reduced at a higher rate than estimated by climate projections. However, about 30% of the Arctic Ocean drainage basin is still ungauged, and thus, the total influence of interacting processes across the drainage basin still remains unknown.
The Hydrological Predictions for the Environment (HYPE) model was recently set-up for the entire drainage basin of the Arctic Ocean (excluding Greenland), simulating daily discharge rates for the period 1961-2010. The model domain cover 23 million km2 and is divided into 30 700 subbasins in the model set-up. The aim is to increase the understanding of climate impact on fine-scale hydrology in the entire drainage basin, with the aim to improve predictions of river discharge into the ocean in present and future climate. Special attention is given to key processes, which dominate the discharge pattern and/or are sensitive to climate change. Process descriptions and observed trends from several data sources are co-evaluated by using global earth observations and in-situ datasets for the region.
The presentation will show spatial patterns of water load contribution to the sea for various seasons, tends terrestrial water cycle fluxes and storage (especially precipitation, evapotranspiration, snow, ice and lakes). We focus on separating changes in weather and changes in water storages for explaining current trends in river flow.