Geophysical Research Abstracts
Vol. 15, EGU2013-3427, 2013
EGU General Assembly 2013

Moisture budget of Northern Eurasia: uncertainties, changes and implications for hydrology of Siberian rivers

Vladimir Alexeev (1,2), Alexander Shiklomanov (3), Ipshita Majhi (1), and Pasha Groisman (4)

(1) University of Alaska Fairbanks, Fairbanks AK, United States (valexeev@iarc.uaf.edu, +1-907-474-2643), (2) Obukhov Institute for Atmospheric Physics, Moscow, Russia, (3) University of New Hampshire, Durham NH, USA, (4) National Climatic Data Center, Asheville NC, USA

Warming of recent decades coincides with the overall increase in runoff from Siberian rivers to the Arctic Ocean. Significant changes in moisture budgets and contributing components have been observed. Changes in precipitation are usually considered as the primary cause of any alteration to the hydrological regime and this is often the default assumption. During the past decade there were many studies to understand the effects of climate variability on the increasing discharge of large Eurasian rivers and characterizing the freshwater input into the Arctic Ocean. Most of them, however, have found that, increase in the annual river runoff across Siberia was not accompanied by the increase in annual precipitation. Our estimates based on "naturalized discharge records" (with removed local anthropogenic influence like reservoir regulation) showed that changes over the low flow period (fall-winter) account for about 80% of total documented changes in annual discharge to the Arctic Ocean from Eurasia.

Various products are used in order to assess uncertainties and suggest mechanisms of observed changes. Observations of precipitation are infamously difficult to correct, especially in the cold season. Observations of evaporation are extremely sparse and even more difficult to interpret. Reanalysis products offer a variety of options, including model-derived evaporation and precipitation fields obtained as a result of data assimilation and methods based on using the convergence of atmospheric moisture transport. Available direct observations and reanalysis products are compared against each other to see what kind of conclusions can or cannot be made about the mechanisms of observed change. We hypothesize that widely documented significant increase in air temperature across the North Eurasian pan-Arctic has significant impacts upon the hydrological regime and river discharge even without noticeable changes in annual precipitation. Changes in frozen moisture regime, along with deeper active layer, thinner river ice, earlier and faster spring snowmelt associated with regional warming are offered as the most prominent major drivers for the river runoff increase in recent decades.