GC34A-08 Permafrost and Hydrology in the High Latitudes of Eurasia

Back to: Session: Environmental, Socioeconomic, …

Wednesday, December 17, 2014 05:45 PM - 06:00 PM
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Eurasia contributes three quarters of all terrestrial runoff to the Arctic Ocean and contains three out of four major Arctic rivers. River flow is an integrated characteristic reflecting numerous environmental characteristics and processes aggregated over large spatial domains. A significant increase in discharge during low-flow has been observed everywhere in the Eurasian pan-Arctic, while precipitation decreased over the same period. This increase was accompanied by a significant increase in air temperature. Over the permafrost regions climatic warming results in higher ground temperature, a deeper annual thaw propagation, degradation of the ice rich upper permafrost layers, and a longer thaw season. The thicker active layer has more ground water storage and regulating capacity for increased contribution to runoff during low flow periods. Melt water of the excess ground-ice near the permafrost surface also contribute to the increase in river runoff. The deeper active layer delays its freeze-up date in winter and this late active layer freeze-up and increased ground water storage result in greater contribution of subsurface water to the river system, especially in the winter season. Extensive fieldwork and analytical procedures were implemented to quantify the contribution of permafrost to river flow in small rivers of Siberia and to understand its relation to air temperature. The paper focuses on variability of various water inputs to a hydrological system across multiple scales in a series of watersheds located in the transition of tundra to forest landscapes in the Arctic. Stable isotopes of $\delta^{18}O$ and D were used used to trace the inputs of various sources (ground ice, snow, precipitation, ground water) in a river flow. Mixing of these sources results in isotopic composition that varies throughout the year. Heavy content of $\delta^{18}O$ and D was found during winter season and is attributed to ground water from permafrost taliks. Lighter values in spring are attributed to snow melt. Heavy isotope content during the summer is attributed to evaporation of already heavy summer precipitation.

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