MIS03-09   Room:101B   Time:May 25 11:30-11:45

Age estimation of permafrost groundwater in Eastern Siberia

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Changes in water environment and hydrological cycle in permafrost region are very crucial issues in current global warming. Better understanding of groundwater dynamics in permafrost region is necessary for vulnerability assessment to the changing climate. Recent researches focusing on Eurasian Arctic Rivers reported that discharge from those rivers might be sensitive to climate warming primarily as a result of the melting of ground ice, because positive streamflow trends might exceed precipitation trends in magnitude around the Russian Arctic region. It was demonstrated that permafrost most likely plays a key role in long-term streamflow variability. It was also speculated that reduced intensity of seasonal ground freezing, together with precipitation increases, might drive increases in river discharge to the Arctic Ocean. However groundwater ages are not much known yet. In order to determine residence time of permafrost groundwater, hydrologic tracers such as tritium, chlorofluorocarbons (CFCs), and sulfur hexafluoride have been applied to the supra-permafrost and intra-permafrost groundwater in Yakutsk region of Eastern Siberia. The results showed that bulk groundwater age ranged from around 5 to 55 years old after the recharge. Because this bulk age is the mixture of those from supra-permafrost and intra-permafrost groundwater, it is necessary to separate the groundwater age from one to another. In this presentation, results of separated bulk age will be shown.

Keywords: permafrost, thermokarst, supra-permafrost groundwater, intra-permafrost groundwater, lake-talik-groundwater system