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Residence time of permafrost groundwater at Yakutsk region, Eastern Siberia

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Water environments and hydrologic changes in permafrost regions are very crucial issues in current climate change. Better understanding of groundwater dynamics in permafrost regions is necessary for vulnerability assessment to the changing climate. Recent researches focusing on Eurasian Arctic Rivers reported that discharge from those rivers should 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 those age or residence time are not much known. In this research, in order to determine residence time of permafrost groundwater, hydrologic tracers such as 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 5 to 50 years old after the recharge. It is necessary to separate the groundwater age estimation between supra-permafrost and intra-permafrost groundwater.

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