

Observations on stable water isotopes in permafrost and surface water in taiga-tundra boundary ecosystem of northeastern

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Eastern Siberia is covered by permafrost which is the largest and the deepest in the world, and permafrost plays an important role for hydrologic cycles in the area. Degradation of permafrost system, therefore, may have a great impact on the hydrologic regime, consequently, on the material cycling including greenhouse gas emission, through vegetation changes. Isotopic composition of water is powerful tool for investigation of hydrological processes.

Observations on the water isotope ratios of soil moisture and permafrost ice were conducted near Chokurdakh, Russia. Indigirka river water and precipitation were also sampled, in order to know the hydrological processes in the area.

Landscape of the Observational site consists of various types of wetlands (wet area) and hummocks which includes micro ridge growing larches (tree mound). At an intensive observation site (site K), 15m or 30m transect including different vegetation types were set and obtained permafrost cores down to 1m.

The isotope ratios of Indigirka river water showed the clear seasonal variation; decrease was found in spring with a runoff of snow melt water. The isotope ratios of Indigirka tributary showed year to year variation. In 2010 and 2012, it was higher than that of mainstream, while it showed the same values as that of mainstream in 2011, when the river water level was unusually high. This result shows water from mainstream flowed into the tributary.

The water contents of permafrost soil depended on the surface vegetation. Ice rich layers were found below the tree mounds. The ice rich soil layer showed higher delta value than the layers above and below. This may be caused by an isotopic fractionation during freezing. Ice rich or pure ice layers at the top of the permafrost or the bottom of active layer showed low delta values, suggesting snow melt water infiltration and freeze on the top of permafrost layer.

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