

Ecology of willow in the Arctic for reconstruction of river condition of Indigirka and its tributaries

RONG FAN¹, SHINYA TAKANO¹, TOMOKI
MOROZUMI¹, RYO SHINGUBARA¹, SHUNSUKE
TEI¹², TROFIM C. MAXIMOV³⁴ AND ATSUKO
SUGIMOTO¹⁵

¹ Graduate School of Env. Sci., Hokkaido Univ.,
Sapporo, Hokkaido, Japan

² National Institute of Polar Research, Tokyo, Japan

³ Institute for Biological Problem of Cryolithozone,
Yakutsk, Russia

⁴ North-Eastern Federal University, Yakutsk, Russia

⁵ Faculty of Environmental Earth Science, Hokkaido
University, Sapporo, Hokkaido, Japan

(*correspondence: fanrong@ees.hokudai.ac.jp)

In northeast Siberian Arctic, rapid warming have been observed and Yana-Indigirka-Kolyma lowland located there has a large area. River changes is one of key parameters to control material cycling through water level changes. From our former work (Morozumi, in preparation), we found willow growing widely along river, so that willow there can be good records of river condition. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of plants are known as integrated indicators of environment, meanwhile plant $\delta^{18}\text{O}$ is expected to record source water isotope ratio.

This study was conducted in taiga-tundra ecosystem along Indigirka river (70.63°N, 147.91°E). Three sites in total were set up along mainstream and also tributary. In each site, sampling was made at three points along a transect from river to land. Willow current year shoot were collected, other samples including river water, soil water, willow stem were collected every 4 days totally 5 times in summer, 2015.

At water logging points, higher willow foliar $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were found. From $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of willows along transect from river to land, water logging range (water level) can be estimated. In summer of 2015, $\delta^{18}\text{O}$ value of mainstream was different from tributaries, which indicates tributary had different water supplies from mainstream (mainstream water level lower than tributaries). In addition, soil water $\delta^{18}\text{O}$ at nearest location of river was affected by river water. Stem water of willow was confirmed to reflect soil water $\delta^{18}\text{O}$. At the point by the river, $\delta^{18}\text{O}$ of current year shoot along tributary was higher than along mainstream. This means $\delta^{18}\text{O}$ of willow could record $\delta^{18}\text{O}$ of river.