

AHW017-10

Room: Exhibition hall 7 subroom 3

Time: May 26 11:30-11:45

## Estimate of past soil moisture in Eastern Siberian Taiga, using tree ring width and carbon isotope ratio

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Eastern Siberian Taiga forest located on permafrost area can greatly affect the global climate through the energy, water and carbon cycles on the earth because they cover a huge area. The amount of precipitation in this area is characteristically small compared to the other area. In such dry area as Eastern Siberia, understanding of hydrological cycle is very important because carbon cycle is affected by hydrological condition.

We collected larch (*Larix cajanderi*) tree samples in Yakutsk (62 N) located in center part of Eastern Siberian Taiga for tree ring and its isotope analysis. At this site, soil moisture shows large seasonal and interannual variation. Therefore, seasonal variability in soil moisture may cause difference in  $\delta^{13}\text{C}$  between early wood and late wood. From the radial sections, we, thus, carefully subdivided annual tree ring into two parts (early wood and late wood) to analyze  $\delta^{13}\text{C}$  separately. To develop the method for reconstruct past soil moisture conditions,  $\delta^{13}\text{C}$  data were compared with hydrological data set obtained for recent 10 years and past soil moisture conditions was estimated for the period of past 60 years.

We compared relationships between  $\delta^{13}\text{C}$  of whole wood and cellulose for the period 1976-1984 and 1998-2007. The  $\delta^{13}\text{C}$  of whole wood and cellulose were nicely correlated over the two periods. However, we found cellulose  $\delta^{13}\text{C}$  for the period 1976-1984 was 0.5 per mill lower than that for the period 1998-2007. This fact shows lignin contents was different between two periods. Therefore, cellulose extraction is needed for past 60 years analysis.

We found negative correlation between early wood  $\delta^{13}\text{C}$  and soil moisture averaged for the period of late growing season (7/15-9/15) in the previous year. We also found the negative correlation between late wood  $\delta^{13}\text{C}$  and soil moisture averaged for the period of late growing season in the year. Therefore, it is possible to estimate soil moisture in the late growing season from late wood in the year and early wood in the following year. Using above mentioned correlation, estimate equation was obtained and soil moisture condition was calculated from the equation for the period of past 60 years. Compared with amount of precipitation for the period from Jun to August, the variation of reconstructed soil moisture seems to be reasonable.

However, it may be possible that another factors except for soil moisture affect tree ring  $\delta^{13}\text{C}$ . Therefore, in order to more precise estimate of soil moisture, another effect should be understood.

Keywords: Tree ring, Carbon isotope ratio, Eastern Siberian Taiga, Permafrost, Soil moisture