

炭素・水素安定同位体比から見たインディギルカ川下流タイガ - ツンドラ境界域におけるメタン放出過程

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Process of Methane Emission from Taiga-Tundra Ecotone in the Lowland of Indigirka River (Northeastern Siberia) with Carbon and Hydrogen Isotope Ratios

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Wetland in the Arctic is one of the significant sources of atmospheric methane. Arctic warming may change environmental parameters such as soil temperature, water table, thaw depth, or vegetation and lead to a change in the amount of methane emission, which affects the climate through its strong green house effect. To clarify the controls and the process of methane emission, methane efflux based on chamber method and $\delta^{13}\text{C}$ -, $\delta\text{D}-\text{CH}_4$ were observed near Chokurdakh village (70.62N, 147.90E) in the lowland of Indigirka River in northeastern Siberia. The period of observation was summer of 2009-2013. Mean air temperature in July at Chokurdakh is 10.3 °C (1979-2008, calculated from Yabuki *et al.*, 2011). Chokurdakh is underlain by the largest continuous permafrost of eastern Siberia, and the thaw depth on the observation days was as small as 10-60 cm. There spreads the ecotone of taiga and tundra, where 3 observation sites with different tree density were selected. Mounds and depressions, whose heights of the grounds differed by several tens of centimeters, were distributed in a patchy way. Depressions were covered with tussocks of sedges and *Sphagnum spp.*. On the other hand, mounds with the other kinds of moss and larch trees.

Isotopic compositions of methane reflect its production, oxidation and transport processes. $\delta^{13}\text{C}$ -, $\delta\text{D}-\text{CH}_4$ of the methane produced underground are changed both by oxidation and by diffusion before reaching the atmosphere. Fractionation factor of hydrogen (α_{D}) is larger than that of carbon ($\alpha_{13\text{C}}$) through oxidation, while diffusion has the same fractionation factor for both of the elements (Chanton, 2005). Organic layers of sphagnum-covered wet area and sedge-covered wet area in Kodak site (70.564N, 148.267E) were incubated under oxidative conditions. As a result, the fractionation factors of oxidation were found to be ($\alpha_{13\text{C}}$, α_{D}) = (1.015, 1.16) for the sedge wet area and ($\alpha_{13\text{C}}$, α_{D}) = (1.021, 1.25) for the sphagnum wet area (8 °C). By using both of $\delta^{13}\text{C}$ and δD , it might be possible to clarify the complex process of methane emission better. Methane flux data of each site and the process of methane emission will be discussed in the presentation.

References

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