Intra-seasonal variations in CH_4 emissions observed by automatic and manual chambers, and in dissolved CH_4 concentration at taiga-tundra boundary in northeastern Siberia

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Methane emission from northern wetlands contributes significantly to the global CH_4 emission, and may be affected by changes in Arctic climate and ecosystems. Controls on CH_4 emission such as soil temperature, thaw depth, plant productivity and water level have been reported for northern wetlands (*Nakano et al., 2000, Atmos. Environ.; Parmentier et al., 2011, J. Geophys. Res. Biogeosci.; Ström et al., 2015, Biogeochem.*). Water level is important partly because water saturation in soil layer makes reductive conditions, which is essential for the CH_4 production by methanogenic archaea. However, formation of soil reductive conditions can lag water level rise as reported in subtropical pasture (*Chamberlain et al., 2016, J. Geophys. Res. Biogeosci.*), which complicates relationship between water level and CH_4 flux. Our previous study (*Shingubara et al., 2016, JpGU meeting*) reported that a wet event concurrent with heavy precipitation increased CH_4 flux for three years despite of decreasing water level at taiga-tundra boundary in northeastern Siberia, likely through soil reduction over multiple years.

To investigate intra-seasonal variation in CH_4 emission in detail, we observed CH_4 flux by automatic chambers at taiga-tundra boundary in the vicinity of Chokurdakh (70° 37′ N, 147° 55′ E) on the lowland of the Indigirka River in summers from 2013 to 2016. A transect was set across a sedge wet area, a sphagnum wet area and a shrub mound, and automatic chambers were installed at these areas. These chambers were connected to a photoacoustic field gas monitor (INNOVA 1412, LumaSense Technologies) to monitor CH_4 flux. To assess variations in CH_4 production, oxidation and transport processes, dissolved CH_4 concentration, $\delta^{13}C$ and δD were observed at observation points of manual chambers in 2011, 2012, 2013 and 2016, and at observation points of both manual and automatic chambers in 2016. Relationship of summer-season variations in CH_4 flux against water level changes (precipitation events and drainage) and thawing process of active layer will be discussed in this presentation.

Keywords: methane flux, automatic chambers, dissolved methane, water level, stable isotope ratios, Russian Arctic

