Natural wetlands, as the largest source of atmospheric CH$_4$, are considered to be the main driver of the interannual variation in global CH$_4$ emission [Cias et al., 2013, IPCC AR5]. Under the amplified warming Arctic wetlands might change in the CH$_4$ emission. Controls on the CH$_4$ efflux, such as water level, soil temperature and vegetation have been found [Olefeldt et al., 2013], while the quantitative relationship between the environmental factors and CH$_4$ efflux can vary from region to region [Turetsky et al., 2014]. Indigirka Lowland in the Northeastern Siberia has wetlands in a taiga-tundra boundary on permafrost, possibly sensitive to the climate change. There we assessed year-to-year variation of chamber CH$_4$ efflux from 2009 to 2013 near Chokurdakh (70.62 N, 147.90 E), aiming to understand the variation based on processes.

Active CH$_4$ emission was observed at wet areas of Sphagnum moss or sedge, while not at dry tree mounds. Wet event occurred in 2011 with the highest precipitation [Jones & Harris, 2013, CRU TS3.21] and CH$_4$ efflux at wet areas increased from 2009 and 2010 to 2011. After 2011 till 2013 water level at wet areas decreased, while high CH$_4$ emission continued. In addition, CH$_4$ efflux in 2012 and 2013 were higher than in 2011 at the same soil temperature. Dissolved CH$_4$ concentration in soil pore water was also higher in 2012 and 2013. This increase of CH$_4$ efflux may be explained by depressed CH$_4$ oxidation and/or increased CH$_4$ production. Low delta-D values of the dissolved CH$_4$ observed in 2012 also supported the low CH$_4$ oxidation. These results imply slow process of soil reduction and that high water level in 2011 caused increase in CH$_4$ efflux over years in 2012 and 2013.