

北東シベリア・インディギルカ低地における湿潤化がCH₄フラックスに及ぼす持続的影響
Multi-year response of CH₄ efflux to wetting at Indigirka Lowland in Northeastern Siberia

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Under the amplified Arctic warming climatic response of CH₄ emission from the wetlands needs to be understood and predicted because of possible influence to the global climate. Indigirka Lowland in Northeastern Siberia has wetlands in a taiga-tundra boundary on permafrost, whose ecosystem are possibly sensitive to the climate change. Though environmental controls on CH₄ efflux have been found such as water level (soil moisture), soil temperature and vegetation, the quantitative relationship between the controls and CH₄ efflux are still unclear, which depends on region and timescale (Olefeldt et al., 2013, Global Change Biol.; Treat et al., 2007, JGR). One difficulty is that CH₄ emission is composed of 3 processes, i.e. CH₄ production, oxidation and transport; they can respond to environmental controls and affect CH₄ efflux in different ways. These processes are reflected by stable isotope ratios of CH₄ (delta-¹³C-CH₄, delta-D-CH₄), which can associate field observation and knowledge from laboratory incubation experiments on CH₄ production and on oxidation.

In this study we assessed interannual variation in chamber CH₄ efflux and in delta-¹³C-, delta-D-CH₄ near Chokurdakh (70.62 N, 147.90 E) over summers of 2009-2013 to understand relationship between CH₄ efflux and environmental factors based on the 3 processes of CH₄.

CH₄ efflux was around the detection limit at dry tree mounds through the observation period, while large interannual variation was observed at wet areas of sphagnum moss and sedges. Wet event concurrent with the highest precipitation occurred in 2011 and CH₄ efflux increased at wet areas in the same year. Although water level decreased from 2011 to 2013, large CH₄ emission continued. Moreover, dissolved CH₄ concentration in soil pore water (at 10-15 cm depth) increased by 1 order of magnitude from 2011 to 2012 and kept high till 2013. CH₄ isotopes implies that CH₄ oxidation was depressed in 2012 after the wetting in 2011, suggesting soil reduction induced by the wetting proceeded over multiple years, which may have affected dissolved CH₄ concentration and CH₄ efflux. Such variation in CH₄ efflux and in dissolved CH₄ concentration will be discussed in relation to the 3 processes in this presentation.

キーワード：メタンフラックス、年々変動、同位体比、タイガ - ツンドラ境界

Keywords: methane flux, interannual variation, isotope ratio, taiga-tundra boundary