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Soil controls on land-atmosphere methane fluxes from an arctic floodplain of the Lena River Delta, Siberia

Benjamin Runkle (1), Alexander Sabrekov (2), Mikail Glagolev (2), and Lars Kutzbach (1)

(1) Institute of Soil Science, KlimaCampus, University of Hamburg, Germany (benjamin.runkle@zmaw.de), (2) Faculty of Soil Science, Moscow State University, Moscow, Russia

Accurately quantifying methane emissions from permafrost tundra landscapes into the atmosphere is a major concern of the global climate modeling community. A better, data-driven understanding of the drivers of soil-atmosphere CH4 fluxes could help constrain the global methane balance, offer predictions in response to global climate change, and advance understanding of these regions' soil biogeochemistry and landscape ecology. Previous research at our Lena River Delta research site (72° N, 126° E) has found relatively low methane emissions (∼18-30 mg m^2 d^1) in the polygonal tundra of the delta's Holocene river terrace (Sachs et al., 2008; Wille et al., 2008). In fall 2013 we compare methane emissions from this landscape type to the adjacent active river floodplain, a sandy, *Equisetum – Salix –Alopecurus alpinus* community ecosystem. This landscape has backswamp regions with higher organic matter accumulation though is generally dominated by soils with high sand contents, low organic matter content, and lower water tables than the Holocene terrace (Boike et al., 2013). The wet parts of a similar landscape unit in the Indigirka lowlands (71° N, 147° E) have been demonstrated to have greater methane emissions which were in part attributed to the annual deposition of nutrients via flooding, increased primary productivity and associated root exudates, and higher soil temperatures.

The results presented in this study compare methane fluxes derived from the closed chamber technique from the two landscape units. In addition to descriptions of the inundation height and vegetation cover, we examine soil chemical and physical characteristics to test how these factors help control CH4 fluxes. We find, for example, relatively high concentrations of dissolved organic carbon at sites with relatively high CH4 production.

As the modern floodplain landscape type covers 40% of the soil-covered area of the Lena River Delta and is analogous to similar regions across the Arctic, increased mechanistic understanding of its methane fluxes will provide valuable insights into the functioning of the terrestrial-fluvial interface. Similarly, the Holocene river terrace is representative of 22% of the Lena River Delta, and as the subject of a longer-term measurement campaign offers the opportunity to contextualize this year's findings within a spectrum of multi-annual climate conditions. The work presented here anticipates upcoming campaigns where the eddy covariance method will be used to measure near continuous flux estimates from these landscapes in order to significantly constrain methane flux estimates from lowland portions of the terrestrial Arctic.

Works Cited

Boike, J., et al. (2003) Baseline characteristics of climate, permafrost and land cover from a new permafrost observatory in the Lena River Delta, Siberia (1998–2011), Biogeosciences, 10(3), 2105–2128.

Sachs, T., et al (2008) Environmental controls on ecosystem-scale CH4 emission from polygonal tundra in the Lena River Delta, Siberia, J Geophys Res, 113, G00A03.

Wille, C., et al. (2008) Methane emission from Siberian arctic polygonal tundra: eddy covariance measurements and modeling, Glob. Change Biol., 14(6), 1395–1408.