METHANE EMISSIONS AT WATER-SATURATED AND DRAINED SOILS OF THE POLYGONAL TUNDRA OF SAMOYLOV ISLAND, NORTHEASTERN SIBERIA

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RESUMO

The increase in permafrost temperatures promotes thawing and release of frozen organic carbon. This leads to additional emissions of CO_2 and CH_4. It is vital to assess the amount of C that is mineralized as CH_4 due to its higher global warming potential (GWP) compared to CO_2. The most important environmental source of CH_4 is soil organic matter decomposition in anoxic conditions. Recent publications acknowledge the open debate over the strength of the permafrost carbon-climate feedback of water-saturated and drained soils. Vegetation is also an important control for CH_4 emissions due to its influence in CH_4 oxidation. Our objective was to assess CH_4 emissions in the Siberian tundra during the growing season. We performed *in situ* chamber measurements in a polygon containing two sites with distinct hydrological features in Samoylov Island in the Lena River Delta, Northeastern Siberia. The polygon center presented water-saturated conditions, while the polygon rim was well-drained. A trenching experiment allowed the quantification of the plant-mediated CH_4 transport, through the comparison of plots that had the vegetation removed and intact plots. The median CH_4 flux at the polygon center was of 26 $mg.m^{-2}.d^{-1}$, and at the polygon rim was of 1.8 $mg.m^{-2}.d^{-1}$. The CH_4 fluxes from the center varied greatly throughout the measurement period, presenting evident seasonality. The opposite was found for the rim fluxes. The polygon center median CH_4 flux decreased by 80% when the vegetation was removed, showing the importance of plant-mediated CH_4 transport in this environment. At the polygon rim there was virtually no difference between clipped and vegetated plots. The CH_4 emissions measured in this study are lower than previous studies in the same island and other permafrost-affected environments. It should be noticed that the measurements occurred only during the growing season. The off-season and winter CH_4 emissions might be significant, as has already been showed in year-around measurement studies. Our results emphasize the great pedon-scale variability of CH_4 emissions in the Siberian tundra, specially associated with hydrology, topography, and vegetation.

PALAVRAS-CHAVE: CH4, arctic, oxic, anoxic, clipping, greenhouse gases, carbon

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