

How do the environmental extremes of Siberian permafrost soils shape the composition of the bacterial soil community?

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Microbial communities in permafrost soils of the Siberian Arctic are exposed to extreme environmental conditions. The soils are frozen throughout the entire year except for the short summer period, when thawing of the uppermost 20 to 50 cm of the permafrost sediment allows for the formation of a so-called active layer. Active layers show steep temperature gradients between 10 to 18 °C near the surface and 0 to 1 °C near the permafrost table. Additionally, seasonal freezing and thawing processes lead to the formation of patterns of low-centered polygons. Low-centered polygons determine a pronounced small-scale heterogeneity with regard to their physical and chemical properties between the elevated polygon rims and the depressed polygon centers.

Within the active layer of a polygon rim, vertical profiles of potential methane oxidation rates in respond to different temperatures indicated a shift in the temperature optimum from 21 °C near the surface to 4 °C near the permafrost table [1]. This temperature shift could not be shown in samples of the polygon center. Based on these results we used 16S rDNA clone libraries as well as *in-situ* cell counting to compare the bacterial, in particular the methane oxidizing, community near the surface and near the permafrost table in samples of the polygon rim. The phylogenetic analyses show that the composition of the bacterial community near the surface is significantly different from the bacterial community near the permafrost table. The results also show that bacterial diversity and abundance in Siberian permafrost soils are comparably high as in temperate terrestrial environments.

- [1] Liebner, S. and Wagner, D. (in press) Abundance, distribution and potential activity of methane oxidizing bacteria in permafrost soils from the Lena Delta, Siberia. *Environmental Microbiology* doi: 10.1111/j.1462-2920.2006.01120.x