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Temperature response of methane oxidation and production potentials in peatland ecosystems across Finland

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It has been suggested that the ecosystems located in the high latitudes are especially sensitive to warming. Therefore, we compared 14 peatland systems throughout Finland along a latitudinal gradient from 69°N to 61°N to examine the response of methane production and methane oxidation with warming climate. Peat samples were taken at the height of the growing season in 2015 from 0 – 10cm below the water table depth. The plant communities in sampling locations were described by estimating cover of each plant species and pH of water was measured. Upon return to the lab, we made two parallel treatments, under anoxic and oxic conditions in order to calculate the CH4 production and consumption potentials of the peat and used three temperatures, 4°C, 17.5°C, and 30°C to examine the temperature effect on the potentials. We hypothesized that there will be an observable response curve in CH4 production and oxidation relative to temperature with a greater response with increasing latitude. In general, increasing temperature increased the potential for CH4 production and oxidation, at some sites, the potential was highest at 17.5°C, indicating that there is an optimum temperature threshold for the in situ methane producing and oxidizing microbial communities. Above this threshold, the peat microbial communities are not able to cope with increasing temperature. This is especially noticeable for methane oxidation at sites above 62°N. As countries are being expected to adequately account for their greenhouse gas budgets with increasing temperature models, knowing where the temperature threshold exists is of critical importance.