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Methane oxidation under ice-cover conditions in Siberian lakes, rivers, and coastal waters

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Permafrost thaw affects global climate, the land surface and coastal structures. Under subaquatic conditions, permafrost thaw is often more rapid than on land. The thaw depth below water bodies (taliks) and changes in biogeochemical gradients are difficult to predict. The influence of taliks and biogeochemical gradients on the production and release of the greenhouse gases methane and carbon dioxide is not clear yet.
Although our research in this region has produced multi-decadal data sets, most of our knowledge on the methane cycle pertains only to the summer. We focus on water bodies in the Lena Delta region, including thermokarst ponds, lakes, lagoons and the marine shoreface. For most of the year, however, ice covers these water bodies, creating a barrier between the water column and the atmosphere, and changing benthic conditions. It is therefore important to assess methane-related processes during the ice-covered season.
In spring 2017 we investigated the Lena Delta and Tiksi Bay at the end of winter, while still ice-covered. Thirty ice cores of different water bodies were obtained by Kovacs ice corer. The in situ temperature of the ice cores was measured immediately afterwards. Methane oxidation rates were determined with radio tracer method in melted ice core samples. Analyses of methane concentration and further hydrochemical analyses are on their way. Initial results indicate rather low activities of methane oxidation in the ice cores, but active biological processes in the water below.