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The impact of permafrost thaw and climatic fluctuations on the geochemistry of thermokarst lakes of Yamal peninsula

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Climate warming in the Arctic might lead to increase of organic matter inflow to lakes by accelerating permafrost thaw and vegetation dynamics. Colored fraction of dissolved organic matter (CDOM) is a significant component of the aquatic ecosystems including thermokarst lakes in the high Arctic. The work presents results of study of CDOM in thermokarst lakes of Yamal peninsula (Western Siberia, Russia). CDOM absorption and spectral slope (S) values, suspended matter concentrations (SPM) in several thermokarst lakes were obtained during 2011 – 2015 field campaigns. Lake characteristics were compared with different catchment properties (cryogenic processes, geomorphology, productivity of vegetation, snow accumulation), hydrology (drainage regimes, seasonal water level changes, volume of lake water) as well as with climatic controls (air temperature, atmospheric precipitation). The climatic fluctuations and thermal denudation in the shore line seem to be responsible for the additional portion of terrestrial organic input into the thermokarst lakes. Measured CDOM concentration is at least twice higher in lakes affected by thermal denudation (and accompanied by declined S values) than in not affected lakes. The increase of CDOM concentration in 2012 compared to that in 2011 is probably due to higher summer air temperature and higher amount of atmospheric precipitation. Decrease of S values explains the increase of mobilized organic matter recently stored in permafrost in past years. Generally, variation of CDOM in studied lakes is very high due to different conditions in which the lakes are located. The catchment properties (especially vegetation) may explain the differences in CDOM concentrations between Yamal lakes. The presence of high productive shrubs and sedges in this particular area makes the CDOM concentration parameter comparable with more southern regions like taiga within the tree line.