AGU FALL MEETING
San Francisco | 12–16 December 2016

GC31H-1197: The Nitrogen Inventory of the Yedoma Permafrost Domain

Wednesday, 14 December 2016
08:00 - 12:20
Moscone South - Poster Hall

Fossil organic matter (OM) stored in permafrost is an important subject in climate research. Such OM represents a huge reservoir of carbon (C). Multiple studies suggest its source potential for C release into the active C cycle through permafrost thaw and subsequent microbial turnover in a warming Arctic. However, net ecosystem OM balance in the permafrost region depends on more than just carbon. The abundance and availability of nitrogen (N) following permafrost thaw will influence plant growth, nutrient delivery to aquatic and estuarine ecosystems, and N oxide (N_2O) emissions. Despite its central importance to predicting permafrost impacts and feedbacks to climate change, relatively little is known about permafrost N stocks and composition. In this study, we present the most extensive dataset to date of permafrost N in the Siberian and Alaskan Yedoma domain. The Yedoma domain comprises decameter thick ice-rich silts intersected by syngenetic ice wedges, which formed in late Pleistocene tundra-steppe environments, as well as other deposits resulting from permafrost degradation during the Holocene. Together, the deposits in this region constitute a large C inventory storing several hundred Gt C, but are also known to be nutrient-rich due to rapid burial and freezing of plant remains. Hitherto, the total organic C pool of the Yedoma region was quantified, while the total N inventory is lacking so far. Based on the most comprehensive data set of N content in permafrost to date, our study aims to estimate the present pool of N stored in the different stratigraphic units of the Yedoma domain: 1) late Pleistocene Yedoma deposits, 2) in-situ thawed and diagenetically altered Yedoma deposits (taberite), 3) Holocene thermokarst deposits, 4) Holocene cover deposits on top of Yedoma, and 5) the modern active layer of soils. To quantify measurement uncertainty, we estimated nitrogen stocks with bootstrapping techniques.

We show that the deposits of the Yedoma region store a substantial pool of N that is expected to get mobilized after thaw and, at least partially, affecting biogeochemical budgets of thawing warming permafrost ecosystems.

Authors

Jens Strauss *
Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Potsdam

Benjamin W Abbott
Université de Rennes 1

Christina Biasi
University of Eastern Finland

Guido Grosse
University of Potsdam

Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Potsdam

Marcus A. Horn
Gottfried Wilhelm Leibniz Universität Hannover

Susanne Liebner
Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences

Tina Sanders
Helmholtz Centre Geesthacht, Centre for Materials and Coastal Research

Lutz Schirrmeister
Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Potsdam

Thomas Schneider von Deimling
Max Planck Institute for Meteorology

Matthias Winkel
Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences

Sebastian Wetterich
Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Potsdam

Sebastian Zubrzycki
Universität Hamburg

Find Similar

View Related Events

Day: Wednesday, 14 December 2016