



Action Group:

The Yedoma Region: A Synthesis of Circum-Arctic Distribution and Thickness

Date:

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Action Group Contact:

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Objectives and scope of the Action Group:

Background:

Vast portions of Arctic Siberia, Alaska and the Yukon Territory are covered by ice-rich silts that are penetrated by large ice wedges, resulting from syngenetic sedimentation and freezing. Accompanied by wedge-ice growth, the sedimentation process was driven by cold continental climatic and environmental conditions in unglaciated regions during the late Pleistocene (Schirmer et al. 2013) inducing the accumulation of the unique Yedoma deposits up to 50 m thick. Because of fast incorporation of organic material into permafrost during sedimentation, Yedoma deposits include low-degraded organic matter. Moreover, ice-rich permafrost deposits like Yedoma are especially prone to degradation triggered by climate changes or human activity. When Yedoma deposits degrade, large amounts of sequestered carbon as well as other nutrients are released to the geosystem, which is of global significance for the climate system.

Objectives:

The proposed Action Group is a continuation of the successful session “Yedoma origin, records and future projections in a changing Arctic”, which took place at the 4th European Conference on Permafrost. Following the IPA constitution, we encourage early career

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researchers to join the group. Moreover, according to the IPA objectives, we aim (1) to foster the dissemination of permafrost knowledge, and (2) to develop scientific products which are useful for scientific application and for educational outreach. To reach these goals, this proposed Action Group aims to synthesize and generate data on the circum-arctic distribution and thickness of Yedoma permafrost. The quantification of the Yedoma coverage will be conducted by the digitalization of surface geological and Quaternary geological maps according to Grosse et al. (2013) and by the analysis of remote sensing data (Kanevskiy et al. 2011, Ulrich et al. 2014, Veremeeva and Gubin 2009). This will be connected with data on Yedoma thickness revealed from drilling sites and outcrop measurements as reported in the scientific literature.

Statement of significance:

Yedoma deposits, due to their ice-rich nature, are especially prone to degradation under current climate scenarios in Siberia, Alaska and Yukon. Increased permafrost thaw could cause a feedback loop of global significance. Therefore, a detailed assessment of the Yedoma deposit volume (coverage and thickness) is of importance to estimate its potential future climate response. Our results will be connected to the database-product of the Action Group “New Assessment of the deep Permafrost organic carbon pool using the Northern Circumpolar Soil Carbon Database”, lead by Gustav Hugelius. Moreover, as a step beyond the objectives of this Action group, our proposed product is needed to refine Yedoma inventory data as published e.g. by Strauss et al. (2013), Hugelius et al. (2014) and Walter Anthony et al. (2014).

Steps to meet the objectives:

The proposed Action Group will be chaired by Jens Strauss and coordinated by a core group of scientists from Canada, Germany, Russia, and United States. GIS support will be provided by the “Arctic Permafrost Geospatial Centre”, coordinated by the ERC PETA-CARB project (PI Dr. Guido Grosse). Dr. Daniel Fortier, Dr. Duane Froese, and Dr. Mikhail Kanevskiy will coordinate the data synthesis concerning Yedoma of eastern Beringia. The synthesis of Yedoma data from western Beringian regions will be coordinated by Jens Strauss, Dr. Guido Grosse, Dr. Lutz Schirrmeister, Dr. Viktor Kunitsky, Aleksandra Veremeeva and Denis Shmelev.

The first activity of the Working Group will be to gather published data on Yedoma coverage, thickness, ice content and other properties in the Russian and English literature. Besides, geological maps will be acquired in addition to the area already analysed by Grosse et al. (2013).

As a next step, there will be a side meeting of the proposed Action Group during the annual coordination meeting of the Permafrost Carbon Network Coordination Meeting in spring 2015. Follow-up events for Action Group coordination and result discussions are planned as side meetings of international conferences like AGU Fall Meeting 2015, and EGU General Assembly 2017. A full-day workshop will be organized before the ICOP 2016 in Potsdam. Until the ICOP 2016, a first draft of a synthesis publication will be prepared. This article is planned to be submitted in autumn 2016. Finally, the compilation of a comprehensive map for educational outreach and publication in the free encyclopaedia Wikipedia is planned for

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January 2017.

Communication of the results:

Research results will be presented regularly at international conferences to draw attention on our initiatives. The outcome of the proposed Action Group includes GIS-based datasets and maps of Yedoma distribution, coverage and thickness and a comprehensive map which will be incorporated in the free encyclopaedia Wikipedia in English, French, German, Swedish and Russian languages. Moreover, we will involve the Association of Polar Early Career Scientists (APECS) and Permafrost Young Researchers Network (PYRN) to compile material for education and outreach (e.g. development of an interactive map about Yedoma permafrost).

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Timeline:

Milestone 1: (by spring 2015)

- Kick-off meeting as a side meeting of the “Working Group Lead/Co-Lead Meeting” of the Permafrost Carbon Network

Milestone 2: (December 2015)

- Presentation of first results at the AGU Fall Meeting 2015
- Action Group side meeting at the AGU Fall meeting 2015

Milestone 3: (by May 2016)

- First draft of a synthesis manuscript concerning Yedoma deposit coverage and thickness

Milestone 4: (by June 2016)

- Session on Yedoma region at the 11th International Conference on Permafrost (ICOP 2016) in Potsdam
- Action Group workshop in connection with ICOP 2016; Workshop topics: (1) GIS-based quantification and change detection of the Yedoma region, (2) Yedoma inventory data, and (3) communication, and preparation/writing of deliverables (maps, synthesis paper).

Milestone 5: (September 2016)

- Submission of the synthesis publication on Yedoma coverage and thickness

Milestone 6: (by spring 2017)

- Publication of a comprehensive Yedoma map for educational use and integrating the results in Wikipedia
- Final meeting of the proposed Action Group as a side meeting of the EGU General Assembly 2017

Deliverables:

- Digital circum-arctic **map of Yedoma deposits** (distribution and thickness)
- Publication of a **comprehensive map** and discussion in the free encyclopaedia **Wikipedia** in English, German, Russian, Swedish and French languages.
- **Synthesis paper** on circum-arctic distribution and thickness of Yedoma deposits.

Support of Interest groups:

Association of Early Career Scientists (APECS) - Gerlis Fugmann

Permafrost Carbon Network - Edward A.G. Schuur

Permafrost Young Researchers Network (PYRN) - George Tanski

Project CarboPerm - Hans-Wolfgang Hubberten

Project Changing Permafrost in the Arctic and its Global Effects in the 21st Century

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(PAGE21) - Leena - Kaisa Viitanen

Project Rapid Permafrost Thaw in a Warming Arctic and Impacts on the Soil Organic Carbon Pool (PETA-CARB) - Guido Grosse

Other Action Group Members:

The proposed Action Group involves scientists from 5 IPA-member countries; 3 from Canada, 4 from Germany, 5 from Russia, 1 from Sweden, and 3 from USA. Out of this group, 1/3 of the members are early career researchers including PYRN and APECS members.

Core group members:

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International dimension:

The Action Group includes scientists from 3 continents and thus integrates scientist working in the circum-arctic area. The letter of support by the international projects and scientific networks shows the integration of the Action Group aims within international Arctic research. The findings of the proposed Action Group will contribute to international assessments of the vulnerability of permafrost to climate change and the role of permafrost carbon pools to climate change. The international young researcher networks APECS and PYRN support the proposal because of involving early career scientists from the very beginning.

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