Title of Proposed Action Group:

PermHg: A global database of mercury concentrations in permafrost and active layer soils

Action Group Contact:

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Objectives and Scope of the Action Group:

Mercury, an environmental toxin of global concern, has accumulated in northern permafrost region soils and at an accelerated rate in active layer soils since the Industrial Revolution (Fitzgerald et al., 2005). Intensifying permafrost thaw can mobilize globally significant amounts of terrestrial mercury into terrestrial, freshwater, and marine ecosystems (Schuster et al., 2011; Zolkos et al., 2022; Schaefer et al., 2020). Very few studies focus on mercury storage and dynamics in permafrost soils (Lim et al., 2020; Olson et al., 2018; Schuster et al., 2018). Available data is sparse and dispersed, severely hindering understanding of the magnitude and timing of mercury release associated with permafrost thaw. We need more data to predict future ecological impacts, effects on food sources, and the added burden to the global mercury budget (Schaefer et al., 2020, Olson et al., 2018).

We propose a two-year Action Group to synthesize available mercury data in permafrost regions. We propose to compile and synthesize published and unpublished mercury measurements in soil, water, and plants in permafrost regions. The synthesis will include metadata such as date, location, measurement team, references and contact information. We will contact authors to obtain the original data, download data from public repositories, or digitize it from the original manuscripts. We will perform a geospatial analysis to identify data gaps in geographic regions poorly represented by Hg measurements. We will publish the results in an open-access, peer-reviewed journal article such as *Earth Systems Science Data*. We will integrate the synthesized measurements into the Northern Circumpolar Soil Carbon Database. To help in this synthesis and increase awareness of permafrost mercury in the permafrost research community, we wish to re-form an early-career researcher focus group of the Permafrost Carbon Network.

We propose to use these funds to pay for travel costs to the American Geophysical Union or similar meeting, publication costs, and geospatial software.

Timeline:

April 2024: Action Group started.

May 2024: Zoom meeting to discuss data collection methods and desired format.

August 2024: Follow-up meeting to discuss progress and remaining tasks.

October 2024: Final editing of PermHg data for upload.

December 2024: Publish PermHg database online.

December 2025: Publish PermHg database in an open-access, peer-reviewed journal article such as *Earth Systems Science Data.*

Deliverables:

1. A publicly available dataset with the most up-to-date and complete synthesis yet of mercury concentrations in permafrost regions from around the globe.
2. An auxiliary dataset combined with the Hg concentration data to provide additional details on important ecosystem characteristics.
3. The database will be advertised during international conferences attended by the Action Group such as AGU, EGU, and ICOP.
4. Submission of PermHg database in an open-access, peer-reviewed journal articles such as Earth Systems Science Data.

Action Group Members:

International Early-Career Researcher Leadership team

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International Dimension:

Our Action Group will include researchers from the USA, Sweden, and Canada. Collectively, this group has been engaged for years in the study of carbon, nutrient, and contaminant cycling across cryosphere landscapes. This Action Group will also leverage previous efforts of an early-career researcher group of the Permafrost Carbon Network focused on mercury in permafrost. We will work closely together to synthesize mercury observations from previous work and communicate our findings about permafrost mercury to the public and broader research community.

Revised Budget (March 25th, 2024): We are requesting 6000 € to fund the travel of one Action Group member to the American Geophysical Union in 2024 and one Action Group member to the European Geophysical Union in 2025. Remaining travel costs will be covered by other grants. A portion of the funding will also be used to cover article processing charges for open-access publication and geospatial software.

Project Cost Estimations

- 2024 Geospatial Software: 500 €
- 2024 AGU Conference Travel Expenses: 2500 €
- 2025 EGU Conference Travel Expenses: 1500 €
- 2025 Open-access Article Processing Fee: 1500 €

Secretarial Support:

We do not request secretarial support beyond the standard information included by IPA working groups on the IPA website.

References

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