

Quantifying mercury (Hg) release from coastal erosion along the Yukon Coast, Canada

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Hg

Eroding cliff coast at the Yukon Coastal Plain. Photo by Katharina Jaspers.

WHY?

Permafrost in the Northern Hemisphere stores 1656 ± 962 Gg of mercury (Hg) (Schuster et al., 2018). Due to high rates of coastal erosion in permafrost regions (Irrgang et al., 2018), Hg is being mobilized and released into the Arctic Ocean. This process impacts local ecosystems and has broader implications, as Hg might be transported over long distances (Dastoor et al., 2022). To better understand such risks, the amount of Hg that is released by coastal erosion needs to be quantified.

Yukon Coast

PRELIMINARY RESULTS



The image shows Slump D, a retrogressive thaw slump on Herschel Island-Qikiqtaruk. Photo by Dr. Anna Irrgang. Mean Hg concentrations ± standard deviation for the respective landscape features are given in orange.

WHERE?

Herschel Island-Qikiqtaruk in northwestern Canada at the Yukon Coast. Here, we focus on a retrogressive thaw slump (Slump D) at the southwestern coast of the island (see orange star in figures below and image in the middle).



HOW?

Samples were

- taken in July 2024 from different landscape features in a retrogressive thaw slump (active layer, permafrost, mudpools, stabilized zone, thaw streams) and from marine sediments along an offshore transect in front of the slump
- analyzed for TOC, TN, Hg, MeHg, and grain size distribution in the labs at AWI Potsdam and University of Stockholm

Mercury flux estimation

- mean Hg concentrations for different landscape features
- total amount of Hg released from the thaw slump

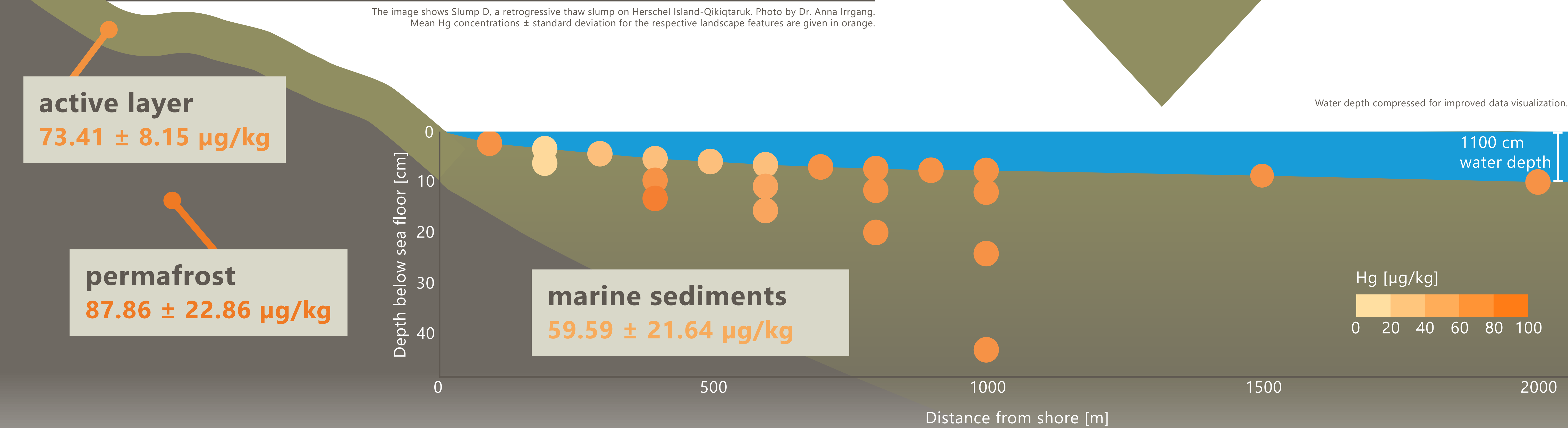
ASSUMPTIONS

- 8796 t of sediment are released from the Slump in July and August (Weege, 2016)
- using the mean Hg concentration for the released sediment from mudpools, thawstreams, active layer, and permafrost = 77.68 ± 21.12 µg Hg/kg dry sediment



Taking samples from a stabilized zone in Slump D. Photo by Alfred Wegener Institute/Esther Horvath.

683.3 ± 185.7 g Hg
are transported from the slump into the ocean in July and August



Water depth compressed for improved data visualization.

CONCLUSION

- sediment Hg concentrations are in the expected order of magnitude
- mercury distribution in marine sediments suggests that some Hg is not directly deposited, but either transported further offshore, transformed into other mercury species or taken up by ecosystems

NEXT STEPS

- including more samples along the Yukon Coast
- considering sample characteristics such as organic carbon content and grain size distribution
- combining Hg concentrations with release from coastal erosion along the Yukon Coast

More than 0.8% of the Hg released from coastal erosion on Herschel Island-Qikiqtaruk originate from Slump D

(Assuming a total Hg release from coastal erosion of up to 85 kg/year for Herschel Island-Qikiqtaruk (Leitch, 2006))

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