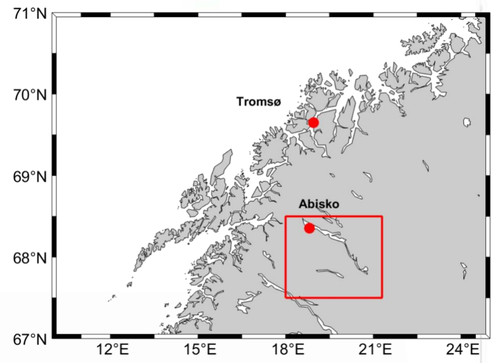
www.gmos-train.eu

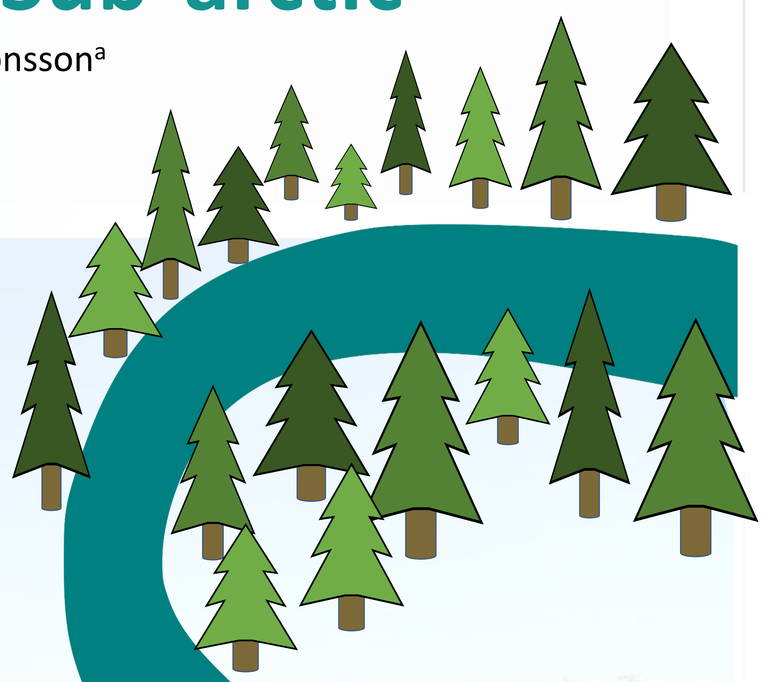
Sonja.Gindorf@aces.su.se

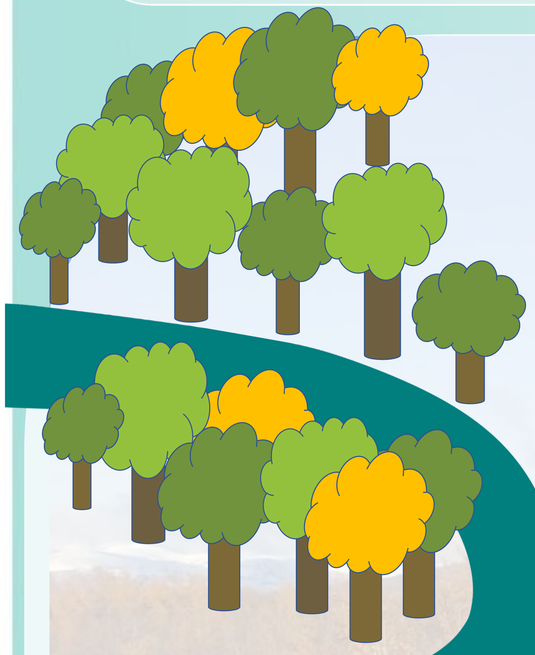


Downstream Mercury Reactivity in Contrasting Catchment Environments in the Swedish Sub-arctic

Sonja Gindorf[a], Carluvy Baptista-Salazar[a], Van Liem-Nguyen[a], Reiner Giesler[b], Carl-Magnus Mörth[c], Sofi Jonsson[a]

[a] Department of Environmental Sciences, Stockholm University, Stockholm, Sweden
[b] Department of Ecology and Environmental Science, Climate Impacts Research Centre, Umeå University, Umeå, Sweden
[c] Department of Geological Sciences, Stockholm University, Stockholm, Sweden





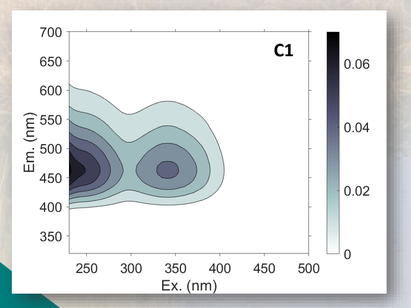
Introduction

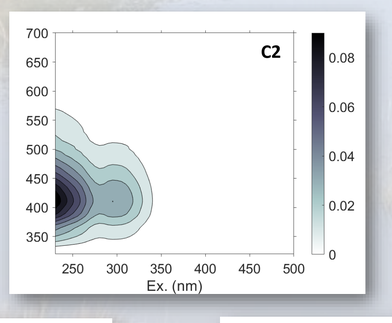
- Dissolved organic matter (DOM) is an important vector for the transport and reactivity of mercury (Hg) in aquatic systems.
- Composition and concentration of DOM have been shown to control Hg bioavailability (Jonsson et al., 2014) and bacterial Hg methylation rates (Jędruch & Bełdowska, 2020)
- We want to study the role catchment properties play for Hg reactivity

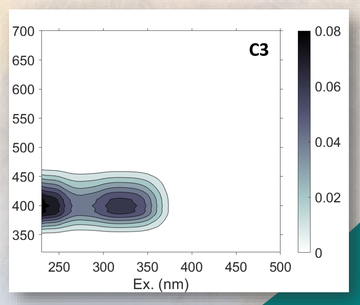
Methods

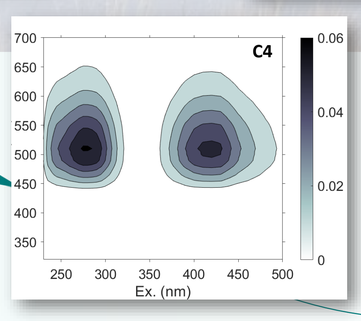
- We sampled 18 Streams & and 8 lakes along a climate and vegetation gradient in the Swedish sub-arctic, encompassing tundra-, birch-, and coniferous catchments
- Water analysis: total Hg (THg), methylated Hg (MeHg) & ancillary parameters
- Fluorescence spectroscopy to characterize the DOM with fluorescence indices and a 5 component parafac model.
- Plankton analysis: THg & MeHg

Preliminary Results









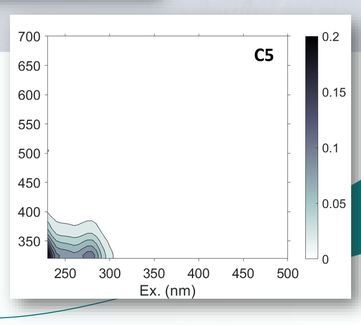
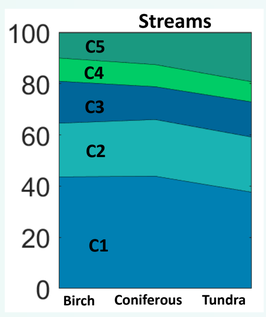
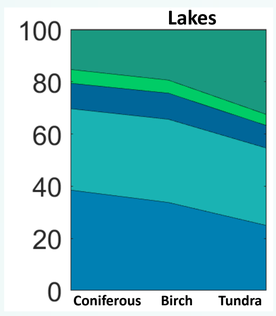
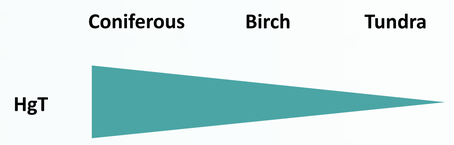
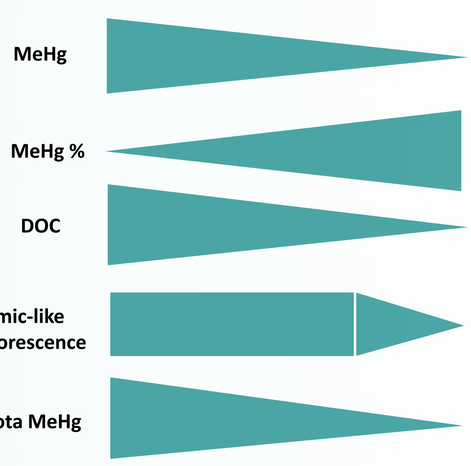


Foto credit: Charlotte Haugk, 2020







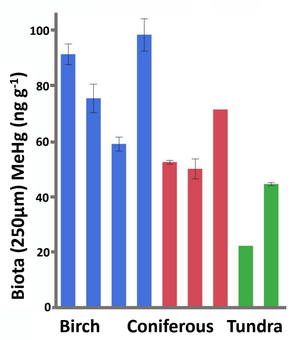


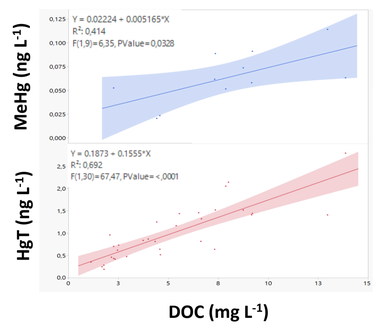
Parafac components; for openfluor matches, excitation & emission minimum similarity score (TCC) were set to 0.97

Component	Type	Openfluor Matches	Reference example
C1	humic-like terrestrial	38	Shutova at al., 2014; Kowalczuk et al., 2009
C2	humic-like; characteristic of soil, sediment, and freshwater environments	31	Romero et al., 2017
C3	humic-like; dissolved organic matter that has been altered by microbial reprocessing	20	Kowalczuk et al., 2009
C4	strong correlation to lignin phenol concentrations	2	Gonçalves-Araujo et al., 2015
C5	linked to aquatic productivity and dissolved amino acids	35	Gonçalves-Araujo et al., 2016

Conclusions

- Lowest HgT & MeHg water concentrations in the Tundra Streams and Lakes but highest MeHg%
- Biota MeHg concentrations increase with increasing amounts of terrestrial DOM
- Catchment properties may be important for environmental fate of Hg





References

Gonçalves-Araujo, R., Granskog, M. A., Bracher, A., Azetsu-Scott, K., Dodd, P. A., & Stedmon, C. A. (2016). Using fluorescent dissolved organic matter to trace and distinguish the origin of Arctic surface waters. Scientific Reports, 6(June), 1–12. https://doi.org/10.1038/srep33978
Gonçalves-Araujo, R., Stedmon, C. A., Heim, B., Dubinenkov, I., Kraberg, A., Moiseev, D., & Bracher, A. (2015). From fresh to marine waters: Characterization and fate of dissolved organic matter in the Lena River Delta Region, Siberia. Frontiers in Marine Science, 2(DEC), 1–13. https://doi.org/10.3389/fmars.2015.00108
Jędruch, A., & Bełdowska, M. (2020). Mercury forms in the benthic food web of a temperate coastal lagoon (southern Baltic Sea). Marine Pollution Bulletin, 153. https://doi.org/10.1016/j.marpolbul.2020.110968
Jonsson, S., Skyllberg, U., Nilsson, M. B., Lundberg, E., Andersson, A., & Björn, E. (2014). Differentiated availability of geochemical mercury pools controls methylmercury levels in estuarine sediment and biota. Nature Communications, 5. https://doi.org/10.1038/ncomms5624
Kowalczuk, P., Durako, M. J., Young, H., Kahn, A. E., Cooper, W. J., & Gonsior, M. (2009). Characterization of dissolved organic matter fluorescence in the South Atlantic Bight with use of PARAFAC model: Interannual variability. Marine Chemistry, 113(3–4), 182–196. https://doi.org/10.1016/j.marchem.2009.01.015
Romero, C. M., Engel, R. E., D'Andrilli, J., Chen, C., Zabinski, C., Miller, P. R., & Wallander, R. (2017). Bulk optical characterization of dissolved organic matter from semiarid wheat-based cropping systems. Geoderma, 306(May), 40–49. https://doi.org/10.1016/j.geoderma.2017.06.029
Shutova, Y., Baker, A., Bridgeman, J., & Henderson, R. K. (2014). Spectroscopic characterisation of dissolved organic matter changes in drinking water treatment: From PARAFAC analysis to online monitoring wavelengths. Water Research, 54, 159–169. https://doi.org/10.1016/j.watres.2014.01.053

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.