



The sequestration sink of soot black carbon in the Northern European Shelf sediments

L. Sánchez-García (1,2), I. Cato (3,4), and Ö. Gustafsson (1)

(1) Department of Applied Environmental Science and the Bert Bolin Climate Research Centre, Stockholm University, Sweden, (2) Presently at the Catalan Institute of Climate Sciences (IC3), Barcelona, Spain (lsanchez@ic3.cat), (3) Geological Survey of Sweden, Uppsala, Sweden, (4) Department of Earth Sciences, Göteborg University, Göteborg, Sweden

The present study contributes to assess the role of marine sediments in removing soot black carbon (soot-BC) from the atmosphere and large-scale biogeospheric cycling, by constraining the inventory and sediment flux of soot-BC for both the Swedish Continental Shelf (SCS) and the entire Northern European Shelf (NES).

An extensive survey was conducted along the ~2,000 km stretch of the SCS, where the soot-BC content in 120 spatially-distributed sediments showed a median value of 0.18 %dw (interquartile range of 0.13-0.26 %dw). The soot-BC concentrations corresponding to ~5% of total organic carbon (TOC) (interquartile range of 3-6 %TOC) were toward the high end of reports for other shelf surface sediments and attests to the substantial soot-BC influx from the highly industrialized and densely populated regions upwind of NES.

Using side-scan sonar constraints to estimate the areal fraction of postglacial clay sediments that are accumulation bottoms (15% of SCS), the soot-BC inventory in the SCS mixed surface sediment was estimated at ~4,000 Gg. Combining this with radiochronological constraints on sediment mass accumulation fluxes, the soot-BC sink on the SCS was ~300 Gg/yr, which yielded an area-extrapolated estimate for the NES of ~1,100 Gg/yr. This sediment soot-BC sink is ~50 times larger than the river discharge fluxes of soot-BC to these coastal waters, however, of similar magnitude as estimates of atmospheric soot-BC emission from the upwind European continent.

While large uncertainties remain regarding the large-scale to global BC cycle, this study combines with two previous investigations ([1, 2]) to suggest that continental shelf sediments are a major final repository of atmospheric soot-BC.

References

- [1] Gustafsson, Ö., and P.M. Gschwend (1998), The flux of black carbon to surface sediments on the New England continental shelf, *Geochim. Cosmochim. Acta*, 62, 465–472.
- [2] Lohmann, R., K. Bollinger, M. Cantwell, J. Feichter, I. Fischer-Bruns, and M. Zabel, (2009), Fluxes of soot black carbon to South Atlantic sediments, *Global Biogeochem. Cycles* 23, GB1015, doi:10.1029/2008GB003253.