



The distribution of terrestrial biomarkers along an estuarine-basin transect in the northern Bothnian Bay

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Climate warming is expected to be strongest in high latitude areas, which contain relatively large amounts of soil organic matter. Surface sediment in coastal areas provides an integrated signal of land-derived carbon export fluxes. In this study, we present the results from a surface sediment transect through the northern Bothnian Bay, from the Kalix river mouth to the open basin, providing a baseline study on the terrestrial molecular distribution. Furthermore, the propensity of biomarker deposition along the transect is investigated. This information can be used to predict the impact on mineralisation processes in shelf areas. The Kalix river is the largest unregulated river system in northern Europe, draining a sub-Arctic catchment. This easily accessible estuary may be used as a model system for the Great Russian Arctic Rivers. The bulk surface sediments showed values between -27.4 and -24.5 per mille for delta-13C, and between 45.8 and 15.0 mg/g for total organic carbon (TOC) when going from the river mouth to the open basin. In the inner estuary, long-chain (sum C20-C32) n-alkanes, n-alkanoic acids, n-alkanols were present in concentrations of 379, 566 and 550 µg/g TOC respectively. The oc-normalized concentrations of n-alkanes and n-alkanols were higher further out in the estuary and the basin, whereas oc-normalized concentrations of n-alkanoic acids decreased. For the n-alkanes, average chain lengths were around 26 with an odd-over-even predominance illustrated by carbon preference index values between 4.1 and 2.2. Concentrations of the most abundant terrestrially-derived sterols lie between 41 and 270 µg/g TOC at the inner estuary (13 km from the river mouth). At 22 km from the river mouth those concentrations increased with around a factor of 5, similar to a smaller increase in the long chain n-alkanols with a factor of 2. From the analysed terrestrial compounds, long chain n-alkanes and n-alkanols appear to be more amenable to degradation than n-alkanoic acids. There

is a decoupling in spatial distribution of different terrestrial biomarker classes along the transect, suggestive of differential recalcitrancy or transport potential. This study demonstrates that concentrations of terrestrial compounds in the Bothnian Bay are higher than in most other northern latitude coastal areas, making this a useful setting to perform compound-specific radiocarbon studies on terrestrial compounds in the near future. The results of this study will also be compared with surface sediments from the Ob estuary in western Siberia.