DEGRADATION OF TERRIGENOUS ORGANIC CARBON DURING CROSS-SHELF TRANSPORT IN EAST SIBERIA AS INDICATED BY LIGNIN OXIDATION PRODUCTS

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Introduction

Ongoing global warming is expected to increase the remobilization and transport of terrigenous organic matter to the East Siberian Arctic Shelf (ESAS), mainly due to thawing and associated enhanced coastal erosion and river discharge (Vonk et al., 2013; Vonk and Gustafsson, 2013). While an increasing number of studies has focused on sources, transport and degradation of organic matter that has been released by permafrost thawing (e.g., Andersson and Meyers, 2012; Bröder et al., 2016; Goñi et al., 2013; Karlsson et al., 2016; Salvadó et al., 2016; Semiletov et al., 2011; Tesi et al., 2014), there is still only little known about translocated degradation. To contribute to fill this knowledge gap, the objective of the current pilot study is to explore a large data set on δ\textsuperscript{13}C as well as lignin- and cutin-derived signals to investigate sources and distribution of terrigenous organic carbon (terrOC) in ESAS sediments, and assess the pattern of their degradation states across the ESAS.

Results

Lignin- and cutin-derived products showed a decreasing trend in concentration, normalized to specific surface area, and a moderately decreasing lignin/cutin ratio from the coastal areas to the outer shelf. These results imply that lignin might be less recalcitrant than cutin under the environmental conditions of the ESAS (Bröder et al., 2016) or that sediment sorting across the shelf exerts first order control on the redistribution of terrOC, since cutin and lignin were associated to different sediment density and size fractions (Tesi et al., 2016). The ratios of 3,5-dihydroxybenzoic acid to vanillyl phenols (3,5-Bd/V), and of acids to aldehydes of vanillyl and syringyl lignin phenols (Vd/Vl and Sd/Sl) increased away from the coast, likely reflecting ongoing degradation of this part of terrOC across the ESAS. While Sd/Sl ratios showed higher values in the west, possibly due to the input of material from the Lena River (Semiletov et al., 2005), 3,5-Bd/V ratios exhibited higher values in the east, which may reflect the different terrOC pools along the ESAS (Tesi et al., 2014).

Outlook

Overall, the degradation proxies suggest an increasing decomposition of terrestrial material from the coast to the ocean and a decreasing trend of lignin/cutin ratios. These results will be further compared to other biomarkers to better understand how terrOC behaves during cross-shelf transport. One hypothesis is that the distribution of these proxies reflects differences in the degradation state of different fractions of organic matter, delivered by coastal erosion and river discharges over the ESAS.
References


