Sources and age of terrigenous organic matter exported from the Lena River watershed, NE Siberia

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The Lena River in central Siberia represents one of the major pathways for relocating pre-aged terrestrial organic matter (OM_{terr}) stored in permafrost soils from its catchment to the coastal zone of the Laptev Sea. Future Arctic warming and permafrost thawing will likely enhance the re-mobilization and export of this pre-aged OM_{terr}. Despite our improving knowledge about the fate of OM_{terr} released from permafrost, the quality and age of particulate OM_{terr} as well as the sources within the large watershed contributing to the exported OM_{terr} are still not completely understood.

To characterize the composition and sources of OM_{terr} discharged by the Lena River, we analyzed the lignin phenol and carbon isotopic composition ($\delta^{13}C$ and $\Delta^{14}C$) in Lena Delta soils, total suspended matter (TSM) from surface waters along with surface sediments offshore the delta. A simple linear mixing model based on the bulk lignin phenol distributions indicates that OM_{terr} in TSM samples and coastal surface sediments contains comparable contributions from gymnosperms originating from the taiga forests south of the delta and angiosperms typical for tundra vegetation. Further, we present results of the lignin phenol compositions and inferred sources of OM_{terr} transported with specific grain-size classes (>2mm, 63μm – 2mm, <63μm) of soil and sediment samples associated with different hydrological conditions (spring flood vs. summer low flow).

Overall stronger diagenetic alteration in TSM and coastal sediments relative to soils appears to reflect degradation of more labile components during permafrost thawing and transport. Moreover, Lignin phenols and $\Delta^{14}C$ of surface sediments suggest that OM_{TERR} deposited offshore is more degraded and older than materials present in river suspended particles and catchment soils.