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Pathways and rates of carbon mineralization on the Eastern Siberian shelf and slope

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In recent years the Eastern Siberian Sea shelf and slope have received considerable attention because the area connects some of the largest landward organic carbon reservoirs on Earth – Arctic soil and permafrost carbon - with the ocean. Understanding mobilization and transport of organic carbon along the land-sea continuum and quantifying the burial efficiency of carbon in the seafloor are critical for quantifying the inventory of marine dissolved inorganic carbon and the exchange of CO_2 with the atmosphere. We report on biomarker composition, oxygen uptake rates, sulfate reduction rates as well as porewater chemistry from 18 stations from the Laptev Sea to the Eastern Siberian Sea ranging from 40 to 3000 m water depth. Our data indicate overall low rates of aerobic and anaerobic carbon mineralization compared to other shelf and slope marine environments indicating that the deposited organic material is of overall low reactivity. Carbon mineralization rates increase eastward towards the Eastern Siberian and Chukchi Sea, in accordance with an increase in the proportion of marine-derived organic matter due to Pacific influence towards the East. From 40 to 3000 m water depth range, carbon mineralization rates decrease only by about a factor 20 from the shelf to the slope, which is significantly less than the 100- to 1000-fold decrease observed in other shelf-slope environments. These findings indicate that organic matter on the Siberian shelf and slope is already significantly degraded and efficiently buried once it is deposited after land-sea transport in the shelf and slope sediments.