Source and transport of particulate organic matter in the western Sea of Okhotsk

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The Sea of Okhotsk is well known as a source region of the North Pacific Intermediate Water. The intermediate water formed on the northwestern continental shelf is thought to play an important role in biogeochemical cycles in the sea in terms of transport of suspended particles. In this study, we analyed total organic carbon (TOC), long-chain n-alkanes and their stable carbon isotope ratio in settling particles and surface sediments collected from the western region of the Sea of Okhotsk to investigate sources and transport of total and terrestrial organic matter in the western region of the sea. The stable carbon isotope measurements of TOC in time-series sediment traps indicate lateral transport of resuspended organic matter from the northwestern continental shelf to the area off Sakhalin via the dense shelf water (DSW) flow at intermediate depth. The n-alkanes in the surface sediments showed strong odd carbon number predominance with relatively lighter stable carbon isotope values (from -33 to -30 per mil). They fall within the typical values of C3-angiosperms, which is the main vegetation in east Russia, including the Amur River basin. On the other hand, the molecular distributions and stable carbon isotope values of n-alkanes in the settling particles clearly showed two different sources: terrestrial plant and petroleum in the Sea of Okhotsk. We reconstructed seasonal change in the fluxes of terrestrial n-alkanes in settling particles using the mixing model proposed by Lichtfouse and Eglinton (1995). Results of the terrestrial n-alkane fluxes indicate that there are two transport pathways of terrestrial plant n-alkanes to sediments off Sakhalin, the Sea of Okhotsk. One is lateral transport of resuspended particles with lithogenic material from the northwestern continental shelf by the DSW flow. Another is the vertical transport of terrestrial plant n-alkanes, which is independent of transport of lithogenic material. The latter may include dry/wet deposition of aerosol particles derived from terrestrial higher plants possibly associated with forest fires in Siberia.