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Molecular-level composition and sources of airborne organic matter deposited into the Yellow Sea

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Using Fourier-transform ion cyclotron resonance mass spectrometry (FT-ICR MS), we analyzed the molecular composition of airborne organic matter (airborne OM) deposited to the inshore and offshore regions of the Yellow Sea. The airborne OM deposited to offshore had the largest proportion of recalcitrant lignin-tannin compounds derived from Asian dust, riverine runoff, and biomass burning. The second largest proportion of airborne OM was labile protein-carbohydrate-like compounds produced by marine phytoplankton via sea spray aerosols during air-sea transport. However, in the inshore site, recalcitrant and labile OMs made up airborne OMs in similar proportion, respectively. The remaining airborne OM at both regions was composed of condensed aromatic/unsaturated hydrocarbon-like OM derived from anthropogenic sources. These results implied that airborne OM deposited inshore may be less degraded and more likely to remain in water column, whereas airborne OMs deposited offshore is more readily available to microbes and primary producers. Thus, this study demonstrated the complex composition of airborne OM from a mixture of terrestrial and marine sources at the molecular level, and showed that differences in airborne OM between regions can influence the oceanic C cycle and long-term C dynamics in marginal seas.