Linkages between atmospheric organic aerosols and surface seawater during phytoplankton blooms in spring

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Ocean-derived atmospheric aerosols can affect radiative forcing via formation of cloud droplets as well as biogeochemical cycle of bioelements. Marine atmospheric aerosols are known to largely consist of organics associated with phytoplankton and dissolved organic matter in seawater. The current climate models parameterize marine emissions of organic aerosol based on surface chlorophyll *a* concentrations and wind speeds. However, recent field studies have suggested that other chemical/physical/biological processes affecting marine aerosol production may also be missing in current emission parameterizations, such as chemical/biochemical forms of organics associated with microbial activity in surface seawater. Studies are very limited with respect to direct linkage between biochemical characteristics of organics in seawater and ambient atmospheric organic aerosols.
Observational study during the R/V *Hakuho-maru* cruise from March 6 to 26, 2015, investigated the contribution of microbial activity in surface seawater to the formation of atmospheric organic aerosols by direct comparison of chemical/biogeochemical characteristics of organics aerosol with those of particulate/dissolved organics in surface seawater. On average, organics accounted for the majority (~40%) of the submicron particle mass, which was attributable to dissolved organic carbon (DOC) and particulate organic carbon (POC) in the sea surface based on the measurement of stable carbon isotopic ratios of water-soluble organic carbon (WSOC) aerosols ($\delta^{13}C_{WSOC}$). We present a general overview of atmospheric observations during the cruise and discuss (1) chemical characterization of ocean-derived submicron WSOC compared with biogeochemical characterization of DOC measured by excitation emission matrix (EEM) fluorescence, and (2) comparison between organic aerosol mass and the fraction of POC linked to the development/aging of diatom bloom.

Keywords: Atmospheric organic aerosols, Phytoplankton bloom, Biogeochemical linkage between atmosphere and ocean

