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Contributions of organic matter to aerosol number, size and radiative effects over the global ocean

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Atmospheric organic matter (OM) over the oceans arises from a variety of land- and marine-based sources. The relative contributions of these various sources to aerosol number and size in the remote marine atmosphere have not been well-quantified. In this study, we address this knowledge gap by employing the high-performance configuration of the GEOS-Chem model coupled with size-resolved aerosol microphysics. Using this model, we explore the relative contributions of anthropogenic, biogenic, and biomass burning sources in shaping aerosol size distributions in the remote marine atmosphere. We consider the contributions of both primary and secondary organic matter. For this work, we employ several recent developments, including fully 3-dimensional biomass burning emissions, a new particle formation mechanism involving organics, size-dependent accommodation coefficients for OM condensation, and updates to marine emissions affecting OM. Consideration is given to aerosol size distributions in the marine boundary layer, as well as vertical profiles in the free troposphere. The study evaluates model-measurement comparisons over the global ocean using flight track simulations of the NASA ATom campaigns. This work also quantifies the impact of the various OM sources on direct and indirect aerosol radiative effects over the oceans. Our findings highlight the interesting interplay between land- and marine-based sources in shaping aerosol size distributions and their radiative effects over the global ocean.