Carbon isotopic characterization of organic aerosols in tropical marine atmosphere at the Maïdo high-altitude observatory, Reunion Island

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Ocean-derived atmospheric aerosols can affect radiative forcing via formation of cloud droplets and ice nuclei as well as biogeochemical cycle of bioelements. Moreover, oxygenated volatile organic compounds (OVOCs) give significant impact on the atmospheric oxidative capacity and climate, which serve as key precursors of climatically active secondary organic aerosol (SOA) in the marine boundary layer. Atmospheric reactions of OVOCs and aerosols are closely linked to those of halogens, emissions of which are significant in the tropical oceans. However, current atmospheric models significantly underestimate the budget of OVOCs as well as SOA especially over tropical oceans, primarily due to poor knowledge of sources and paucity of observations of these parameters in tropical remote regions.
To improve our knowledge on the role of tropical oceans in the formation of atmospheric organic aerosols, size-segregated aerosol sampling was conducted for the first time at the Maïdo observatory (2,200m a.s.l) in Reunion Island in the Indian Ocean. The aerosol measurements were made during the Oxygenated Compounds in the Tropical Atmosphere–Variability and Exchanges (OCTAVE) project in March-June 2018, with integrated approach combining in situ/off-line measurements, satellite retrievals, and modelling. Stable carbon isotopic compositions together with molecular characterization of organic aerosols showed clear seasonal changes with significant contribution of marine sources to the observed aerosols in March when the microbial activity in sea surface was most active in that oceanic region. The effect of the changes in conditions of marine boundary layer and free troposphere on the observed organic aerosols are also discussed.

Keywords: Marine atmospheric organic aerosol, OVOCs, Tropical marine atmosphere, Halogen chemistry

