2.096 New understanding on sources and impacts of marine VOCs from the Oceanic Reactive Carbon: chemistry-climate impacts (ORC3) project.

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Abstract:

Oceanic emissions of reactive organic carbon alter marine background chemistry and have the potential to contribute to marine aerosol distributions, with implications for climate. Highly reactive compounds such as isoprene, monoterpenes and glyoxal have been observed in the marine atmosphere, yet their atmospheric impact is extremely uncertain. The Oceanic Reactive Carbon: chemistry-climate impacts (ORC3) project aims to improve our knowledge of the sources and impacts of these reactive species in the remote marine atmosphere. The project included two 1-month field campaigns at the Cape Verde observatory in the tropical Atlantic Ocean. New datasets on the abundances of speciated monoterpenes, isoprene and glyoxal were obtained, spanning several weeks. Glyoxal was measured using a sensitive laser-induced phosphorescence (LIP) in-situ

technique. Cruise observations of isoprene and monoterpenes have also been made in air and seawater during cruises traversing the north and south Atlantic, and in the Arctic Ocean. Both box modelling and global modelling studies exploiting these new datasets have been used to investigate sources, processing and impacts of these reactive organic compounds.

Maximum glyoxal mixing ratios of ~15 pptv were observed during ORC3, with typical daytime maxima of ~ 5-6 pptv during June and ~ 6-8 pptv during August-September. Using Master Chemical Mechanism (MCM) box model simulations constrained to observations of glyoxal precursors, we investigate the sources and sinks of glyoxal in the tropical marine boundary layer. Total monoterpene observed at Cape Verde and during the cruises was present in very small concentrations (1-4 pptv), however several different terpenes were observed. Using a global model, we have constrained a biologically-driven source term for monoterepenes to these observed atmospheric concentrations, and derive a source of ~5-10 Tg/yr from the global oceans. Using a global aerosol-chemistry model, we investigate the implications of this terpene source for remote marine aerosol and cloud condensation nuclei abundances.