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Marine organic matter in the remote environment of the Cape Verde Islands – An introduction and overview to the MarParCloud campaign

Manuela van Pinxteren¹, Kanneh Wadinga Fomba¹, Nadja Triesch¹, Heike Wex¹, Xianda Gong¹, Jens Vogtländer¹, Stefan Barthel¹, Christian Stolle², Enno Bahlmann³, Tim Rixen³, Detlef Schulz-Bull², Tiera-Brandy Robinson⁴, Oliver Wurl⁴, Frank Stratmann¹, and Hartmut Herrmann¹

¹Leibniz-Institut für Troposphärenforschung - TROPOS, Chemistry, Leipzig, Germany (manuela@tropos.de)

²Leibniz Institute for Baltic Sea Research, Warnemünde, Germany

³Leibniz Centre for Tropical Marine Research, Bremen, Germany

⁴Institute for Chemistry and Biology of the Marine Environment, Carl-von-Ossietzky University Oldenburg, Wilhelmshaven, Germany

The project MarParCloud (marine biological production, organic aerosol particles and marine clouds: a process chain) aims at achieving a better understanding of the biological production of organic matter (OM) in the oceans, its export into marine aerosol particles and finally its ability to act as ice and cloud condensation nuclei (INP and CCN). The core of MarParCloud comprised a field campaign at the Cape Verde Atmosphere Observatory (CVAO) in autumn 2017, where a variety of chemical, physical, biological and meteorological approaches were applied. The investigations included concerted measurements of the bulk water, the Sea Surface Microlayer (SML), ambient aerosol particles on the ground (30 m a.s.l.) and in mountain heights (744 m) as well as cloud water. Important aspects of the ocean atmosphere Interactions focusing on marine OM have been addressed through detailed observation and modeling approaches.

Key variables comprised the chemical characterization of the atmospherically relevant OM components (e.g. lipids, proteins, sugars) in the ocean and the atmosphere as well as measurements of INP and CCN. Moreover, bacterial cell counts, mercury species and trace gases were analysed. To interpret the results, the measurements were accompanied by various auxiliary parameters such as air mass back trajectory analysis, vertical atmospheric profile analysis, cloud observations and pigment measurements in seawater. Additional modelling studies supported the experimental analysis.

Here we show the proof of concept of the connection between organic matter emission from the ocean to the atmosphere and up to the cloud level. A link between the ocean and the atmosphere was clearly observed as (i) the particles measured at the surface are well mixed within the marine boundary layer up to cloud level and (ii) ocean-derived compounds can be found in the aerosol particles at mountain height and in the cloud water. The organic measurements will be implemented in a new source function for the oceanic emission of OM. However, from a

perspective of particle number concentrations, the marine contributions to both CCN and INP are rather limited.

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