

3.066 Organic matter in marine aerosol particles: chemical characterization, transfer and sources.

Early Career Scientist

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Abstract:

The oceans are an important source for marine aerosol particles and the chemical composition of the particles determines their microphysical properties. However, there are few available field data of the composition of organic matter (OM) in the marine environment, especially on a molecular level.

This study presents measurements of organic compounds (free/combined amino acids (FAA/CAA) and proteins) in marine field samples as important subgroups of marine OM. Concerted measurements- the simultaneous sampling of bulk water (ULW), sea-surface-microlayer (SML) as well as marine aerosol particles (PM₁)- were performed at a remote atmospheric station in the tropical Atlantic Ocean, the Cape Verde Atmospheric Observatory (CVAO).

Analytical measurements of FAA and CAA (after hydrolysis) were based on derivatization with 6-Aminochinoly-N-hydroxy-succinimidyl-carbamate(AQC)-reagent and LC-MS analysis. Proteins were quantified as Coomassie stainable particles.

The results of the concerted measurements show that the analytes are present in all three measured marine compartments. Phenylalanine was quantified in SML samples with an enrichment factor (EF) up to 15 compared to ULW and an EF of Phenylalanine in the corresponding aerosol particles up to 944. These results are in the same order of magnitude compared to other field studies: The EF of FAA in SML of the western Mediterranean Sea is up to 26 (Rheinthaler et al. 2008) and the EF of total organic carbon in aerosol samples of the Atlantic ocean is up to 10⁴/10⁵ -depending on chlorophyll-a-concentration (van Pinxteren et al. 2017).

However, most studies focus on only one marine compartment: either aerosol particles or seawater investigations. The simultaneous determination of the analytes in aerosol particles and in SML/ULW presented here will allow a more comprehensive analysis of OM on molecular level in the marine environment including its sources in the oceans, enrichment in SML, transfer across the air-sea-interface and the chemical composition of marine aerosol particles.