



## Organic Compounds in the Tropical Oligotrophic Atlantic Ocean: Insights into Sea-to-Air Transfer and Atmospheric Transformations

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Carbohydrates, amino acids, and lipids are significant contributors to organic carbon in the marine environment, playing key roles in ocean-atmosphere interactions. To investigate their sea-to-air transfer, enrichment in the sea surface microlayer (SML), and potential transformations during atmospheric transport, we conducted field studies in the tropical Atlantic Ocean at the Cape Verde Atmospheric Observatory. This study links measurements of these compounds in surface seawater, including the SML, with their presence and composition in submicron aerosol particles.

The study found moderate enrichment of lipids and carbohydrates in the SML, while amino acids exhibited higher enrichment, despite their relatively lower surface activity. In aerosol particles, lipids were markedly more enriched compared to amino acids and carbohydrates, likely due to their surface-active and lipophilic nature.

Detailed molecular analyses revealed shifts in the relative abundance of organic compounds during atmospheric transport, particularly for amino acids, suggesting in situ atmospheric transformations via biotic or abiotic processes. On average, 49% of aerosol OC was attributable to specific compound groups, with lipids accounting for the largest fraction. Amines, oxalic acid, and carbonyls contributed around 6%, while carbohydrates and amino acids each represented less than 1% of the total aerosol OC. Notably, carbohydrate-like compounds likely reside in glycolipids within the lipid fraction, underscoring the complexity of organic matter in marine aerosols.

These findings advance our understanding of the processes governing organic carbon transfer from the ocean to the atmosphere, including the roles of the SML and atmospheric processing. This knowledge is crucial for refining models of marine aerosols and their impact on atmospheric chemistry and climate.

The study contributes to the international SOLAS program.

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