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Biogeochemistry of dissolved organic matter in mangrove-fringed coastal environments

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To understand global biogeochemical cycles it is crucial to quantify the sources and dynamics of marine dissolved organic matter (DOM). We investigated the impact of mangroves, the dominant intertidal vegetation of the tropics, on marine DOM inventories. Stable carbon-isotopes showed that mangroves are the main source of terrigenous DOM on the North Brazilian shelf. On a global scale, we estimate that mangroves account for $>$10% of the terrestrially-derived DOM transported to the ocean.

In an attempt to trace molecular modifications of mangrove DOM during transport offshore, a new molecular fingerprinting approach via liquid chromatography / mass spectrometry (LC/MS) was introduced. Significant differences between mangrove and open-ocean DOM successively disappeared in the course of a photodegradation experiment. By irradiating mangrove DOM for 10 days ($\sim$70 kWh/m^2), the molecular patterns of open-ocean DOM were largely reproduced. In addition to LC/MS we used Fourier transform-ion cyclotron resonance mass spectrometry (FT-ICR MS) which is the only technique capable of resolving and identifying individual molecules in complex DOM mixtures. During initial stages of outwelling and in photodegradation experiments, high-molecular weight, aromatic compounds disappeared, and only few new compounds were added to the DOM pool.

The different approaches concordantly show the presence of photodegraded mangrove-derived DOM on the North Brazilian shelf. Photodegradation changed the molecular structure in ways that this DOM would not be detected as terrigenous through conventional remote sensing techniques.