



Dissolved organic matter and bacterial production and respiration in the sea-surface microlayer of the open Atlantic and the western Mediterranean Sea

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ABSTRACT: The sea-surface microlayer (SML) is the boundary layer between the ocean and the atmosphere. We measured bacterial production and respiration along with dissolved organic carbon (DOC), nitrogen (DON), and phosphorus, inorganic nutrients, and dissolved amino acids in the SML and the underlying water (ULW) of the subtropical Atlantic gyre (SATL) and the western Mediterranean Sea (WMED). Dissolved amino acid concentrations in the SML were one order of magnitude higher than in the ULW. DON, ammonium, and nitrate were also significantly enriched in the SML as compared with the ULW. Bacterial leucine incorporation ranged between 3 and 50 pmol L⁻¹ h⁻¹ in the SATL and 5 and 488 pmol L⁻¹ h⁻¹ in the WMED and was generally not significantly different between the SML and the ULW. In contrast, bacterial respiration was significantly higher in the SML than in the ULW, varying between 3.6 and 9.5 μmol L⁻¹ d⁻¹ O₂ at both sites. The resulting bacterial growth efficiencies ranged between 0.1% and 14% using different leucine incorporation to carbon conversion factors. Given the high dissolved free amino acid (DFAA) yield of DOC (~12%) and of DON (~30%) in the SML, bacterial growth efficiencies in the SML were low. This indicates that the DFAA in the SML are not readily available for bacteria. The underlying mechanisms of this immobilization of DFAA in the SML and their production remain enigmatic.

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