Coupled dynamics of dimethylsulfoniopropionate and dimethylsulfide cycling and the microbial food web in surface waters of the North Atlantic

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ABSTRACT: Oceanic dimethylsulfide (DMS), the main natural source of sulfur to the global atmosphere, is suggested to play a key role in the interaction between marine biota and climate. Its biochemical precursor is dimethylsulfoniopropionate (DMSP), a globally distributed, intracellular constituent in marine phytoplankton. During a multidisciplinary Lagrangian experiment in the subpolar North Atlantic, we determined the fluxes of DMSP and DMS through phytoplankton, microzooplankton, and bacterioplankton and compared them with concurrent carbon and sulfur fluxes through primary and secondary productions, grazing, and release and use of dissolved organic matter. We found that DMSP and derivatives contributed most (48-100%) of the sulfur fluxes and 5-15% of the carbon fluxes. Our findings highlight DMSP as a prominent player in pelagic biogeochemical pumps, especially as a major carrier in organic sulfur cycling. Also, our results illustrate the key role played by microzooplankton and heterotrophic bacteria (hence the microbial food web) in controlling the amount of phytoplanktonic DMSP that ultimately vents to the atmosphere in the form of DMS.