

PROBING THE MOLECULAR BASIS FOR MICROBE-DISSOLVED ORGANIC MATTER INTERACTIONS IN THE MARINE ENVIRONMENT

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Dissolved organic matter (DOM) in marine systems is a large, heterogeneous pool of reduced carbon, whose fate affects all aspects of the global carbon cycle. Molecules within DOM are produced, removed and altered by microbial consortia in all depth regimes of the ocean. These molecular-level processes culminate in the observed fluxes among OM pools in the ocean and of paramount importance in global carbon dynamics. Recent analytical advances allow researchers to probe the composition of DOM and to probe the interactions between DOM and microbes at the molecular level. With these novel tools, we are able to quantify known compounds and discover new markers for biotic processes. My laboratory has focused recent efforts on the examination of DOM in laboratory cultures of representative marine microbes and in field samples from Line P in the eastern Pacific Ocean. We employ three mass spectrometric techniques designed to detect, identify and quantify known and unknown compounds within organic matter mixtures. We explore the sources of DOM with culture-based investigations of metabolites exuded by phytoplankton and heterotrophic bacteria. We further examine the shifts in DOM composition and cellular metabolites from the coast to the open ocean as well as down the depth profile at selected locations. Through the integration of our complementary datasets, we are developing a more comprehensive view of the role microbes may play in DOM composition and modification. These data provide important chemical contexts for an emerging systems-biology view of the ocean.