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Eawag Seminar Invitation

Catalysts of the Carbon Cycle: Microbially-driven Carbon Cycling in the Ocean

Speaker **Prof. Carol Arnosti**
University of North Carolina, Chapel Hill, USA

When **May 19, 11.00 – 12.00 a.m.**

Where **Forum Chriesbach C20, Eawag Dübendorf**

Abstract Marine dissolved organic carbon (DOC) is one of the largest actively-cycling carbon reservoirs on earth - comparable in magnitude to atmospheric CO2 - and thus is an essential component of the global carbon cycle. Microbial communities play a key role in driving the carbon cycle, recycling, repackaging, and respiring approximately half of the organic matter produced in the ocean. Much of this organic matter initially is produced as high molecular weight (HMW) substrates. The initial step in degradation of these substrates is extracellular enzymatic hydrolysis, through which substrates are hydrolyzed to sizes sufficiently small to be taken into the cell. The structural selectivity of microbial enzymes, as well as the rates at which they function, are therefore critical parameters determining the depth and location at which organic matter is remineralized and nutrients are regenerated in the ocean, or conversely, the nature and quantity of organic matter that may persist in ocean waters, or in sediments over geologic time periods.

The ability to produce extracellular enzymes varies greatly among microbes: some lack extracellular enzymes, others possess a genetic arsenal capable of hydrolyzing a broad range of substrates. This variation extends to entire microbial communities: our fieldwork in the Atlantic, Pacific, and Arctic Oceans demonstrates that there are large-scale patterns in microbial enzyme activities. The spectrum of enzyme activities (the number of structurally-distinct substrates hydrolyzed in the water column) narrows markedly from temperate to high latitudes, from coastal to offshore waters, and from surface to deep waters. These patterns parallel large-scale differences in microbial community composition (microbial biogeography) that have been reported in recent years. The capabilities, distribution, and temporal dynamics of microbial communities, as well as the structure and form of organic substrates, are therefore key determinants of organic carbon cycling in the ocean.