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Woods Hole Oceanographic Institution

Biology Department Seminar

Thursday, October 25, 2012

Redfield Auditorium - 12:00 Noon

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Investigating the role of phosphorus availability on Trichodesmium N2 fixation and the factors determining niche differentiation in the Western North Atlantic Ocean

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Populations of the cyanobacterium Trichodesmium play a crucial role in the carbon and nitrogen cycle of the tropical and subtropical oceans. There are many factors that can influence Trichodesmium growth and N2 fixation, including physical parameters like light and mixed layer depth, and geochemical factors such as iron and phosphorus availability. There are 6 defined Trichodesmium species that group into two major clades. In addition, colonies of Trichodesmium present 3 main morphologies. Recent work by Davis and McGillicuddy (2006) demonstrated a broader vertical distribution of Trichodesmium than previously recognized. However, spatial and vertical clade distribution is largely unexplored, and the physiological ecology of surface as compared to the subsurface populations are poorly understood. In order to better understand Trichodesmium ecophysiology in the western North Atlantic, colony distribution, clade distribution, N2 fixation rates and alkaline phosphatase activities (APA), along with various physiochemical parameters were measured along a cruise transect from Woods Hole, MA, USA, to Barbados during the Fall of 2010. APA is typically regulated by phosphorus bioavailability in Trichodesmium and hydrolyzes phosphate from esters in the dissolved organic phosphorus pool. As was observed previously, Trichodesmium was distributed in the subsurface, particularly the puff morphology. Subsurface populations were actively fixing nitrogen in most cases. Methods for the analysis of clade distribution using qPCR are currently being validated in the laboratory for application to these samples. These data will help to define a possible association between colony morphology patterns and species distribution and will provide insight into the factors determining Trichodesmium niche differentiation. In surface populations, N2 fixation rate and phosphate levels were generally inversely related to APA, suggesting that surface phosphorus availability influences N2 fixation in this area. As the full dataset is compiled additional parameters will be compared in the surface and subsurface populations to gain additional insight into the factors determining nich differentiation of Trichodesmium in this system.