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Description of Research:

Characterization of Sulfate-Reducing Bacteria using Sediment Sulfate Reduction Rates and *in-situ* Community Analysis on the Texas Coast

My research broadly focuses on the mechanisms that control hypoxia in the Gulf of Mexico as well as the Nueces Bay Estuary on the Texas coast. The expanding water column hypoxic zone in the Texas estuaries directly impacts coastal ecosystems and economies, influencing environmental management strategies throughout the Texas coast. The fisheries that have sustained this region are falling victim to the increases in areas of low oxygen. Numerous factors have been implicated in the formation of the hypoxia (defined as less than 2 mg L^{-1} O_2) including massive inputs of nutrient rich freshwater, weak convective mixing, water column stratification, and high water temperatures. Hypoxic conditions associated with rapid microbial degradation of anthropogenically-derived phytoplankton blooms have been attributed to the deposition of carbon and nutrients to the sediment surface. Therefore, understanding mechanisms that control hypoxia, including microbial carbon and nutrient cycling within the Texas shelf sediments, was declared a major objective of the EPA Science Advisory Board's Hypoxia Advisory Panel (2007).

The **overall objective** of the proposed project is to characterize the metabolically active benthic microbial populations associated with geochemically-determined relevant functional groups within Nueces Bay Estuary hypoxic zone sediments. The **overall hypothesis** is that an RNA-based biomolecular rate measurement analysis of prokaryotic population function will provide a more accurate representation of in situ metabolic processes than standard geochemical analysis alone. Additionally, fluctuations in sediment porosity and porewater chemistry will result in vertical and horizontal variations in metabolic activity of the resident prokaryotic communities. To accomplish this goal and test the hypotheses, culture-independent microbiological techniques will be combined with geochemical and geophysical analysis.

The results of this data can be incorporated into future models of benthic respiration processes and its impact on hypoxia. This work will provide initial characterization of the geochemical and microbiological environment within the shallow sediments of Nueces Bay Estuary and the northern Gulf of Mexico. In particular, this study will describe key carbon and nutrient cycling processes of sulfur and iron. Simultaneous geochemical and microbiological analyses will provide a detailed characterization of sediment biogeochemical processes. This study will therefore allow conclusions to be made regarding the potential impact of

the benthic boundary layer to the overlying water column. Additionally, this study will provide unique comparisons of microbial transcript abundance to reduction rate estimates. An experimental approach of this nature may be utilized in environments where geochemical analyses are inconclusive or rate measurements not feasible.

Academic Qualifications:
Graduate GPR:
GRE Scores:
TAMU Courses : Sedimentary Biogeochemistry, Estuarine Biogeochemistry, Marine Chemistry, Biological Oceanography, Geological Oceanography, Chemical Oceanography, Physical Oceanography, Microbial Ecology, Scientific Diving

Proposed use of funds :
I am applying for a scholarship to aid in 2010-2011 academic year tuition and fees. Any additional funding provided through a TWRI Mills scholarship will aid in travel to meetings to present my research, network possible post-doctoral and foster collaborative relationships. I believe that the research I focus on is interdisciplinary and based on collaborations therefore any opportunity to present my work to a national audience is invaluable. Funding from this scholarship will be greatly appreciated and will allow me to explore opportunities in my research.