900502 An Autonomous Bottom-Transecting Instrument Platform

Understanding how a pelagically-derived food supply of organic matter is used by the sediment community is critical to an understanding of biogeochemical cycling in the ocean. To address such critical questions, we began development of a new autonomous bottom-transecting instrument, ROVER II, to make long time-series estimates of fresh phytodetritus arriving on the sea floor. Under NSF funding, we have been designing ROVER II to concurrently monitor the structural features of the sediment that influence spatial and temporal heterogeneity in sediment community activity, which ultimately affects the signal to noise ratio and resolution of measurements on biogeochemical processes in the sediments. ROVER II will be capable of conducting non-invasive time-series measurements of phytopigment fluorescence as an indicator of fresh phytodetritus on the sediment surface, while imaging the same sediments acoustically to provide 3-dimensional profiles of structural features (e.g. burrows and animals). Metabolism measurements in the sedimentary community (e.g. oxygen consumption) coupled with 2-dimensional oxygen imaging studies, will be conducted along benthic transects.

Critical questions which must be addressed to ultimately resolve pelagic-benthic coupling in the context of biogeochemical cycling are: 1) what is the quality and quantity of phytodetritus reaching the sea floor, 2) how important is irrigation (non-diffusive transport) in measuring mineralization in sediments and 3) what responses are elicited in the sediment community by the arrival of fresh detritus on the sea floor? ROVER II is designed to address the coupling between pelagic and benthic systems by monitoring the arrival and residence of organic matter on the sea floor using instrumentation capable of making measurements with appropriate spatial and temporal resolution. Measuring structural heterogeneity such as burrows in the surface sediments is needed so that spatial and temporal variability of fluxes across the sediment-water interface can be interpreted.

Development of ROVER II at SIO has been stalled due to unforeseen personnel problems that make it unlikely that this project can be completed at SIO. During 2005, further development on this project will transition to MBARI, using equipment funds and what remains of technician salaries from the NSF grant. As a first step, ROVER II will be designed to operate through the MARS observatory infrastructure, thus simplifying greatly the power system requirements and on-board computer processing and decision-making for ROVER II. Use of the MBARI ROV to facilitate release and recovery of the instrument platform will eliminate the failure mechanism that led to the loss of ROVER I. The ultimate goal will be to get enough experience with this instrument system at MARS such that more autonomous versions can be constructed in the future for deployment in more remote locations.