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COMPOSITION, TEXTURE AND DIAGENESIS OF CARBONATE SEDIMENTS: EFFECTS ON BENTHIC OPTICAL PROPERTIES

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LONG-TERM GOAL

Our long term goal is to understand how physical and chemical characteristics of bottom sediment affect the optical properties of the shallow sea floor. Of particular interest is sorting out how inorganic and organic parameters of the sediment interrelate to determine benthic light fields.

SCIENTIFIC OBJECTIVES

Our research focuses on sedimentologic characteristics of carbonate grains. Specific objectives are 1) to determine feedback mechanisms between mineralogical and textural (e.g. size, shape, surface roughness, density, and packing) sediment parameters, light fields within the sediment, and benthic biological community structure and organic production, and 2) to use these relationships to model spectral reflectance and its contribution to the upwelling component of scalar irradiance.

APPROACH

Analyses of composition, texture and diagenesis of shallow-water carbonate sediments will be integrated with biologic and optical measurements made by collaborating investigators in the CoBOP Program. Sedimentological analyses will include determination of grain size and shape, index properties (water content, porosity, bulk density, and grain density), total carbonate content, and mineralogy. In addition, thin sections and scanning electron microscopy (SEM) will be used to examine grain composition, microfabric, surface texture, diagenetic alteration of grains and interactions between organic and inorganic sedimentary components.

WORK COMPLETED

The first year of my participation in the CoBOP project was concerned mainly with logistical issues-- getting equipped for the field and laboratory analyses of Year 2 and beyond. An important task was to purchase and set up an image analysis system for quantification of textural parameters. Time was also spent setting up newly acquired laboratory space, which will be needed for my CoBOP research. In addition, I was the PI of a successful proposal to NSF to obtain funding for an environmental field emission scanning electron microscope (FEG-ESEM), which will be in place at the University of Miami in spring 1998, in time for the first CoBOP field

session. This sophisticated and technologically innovative microscope will be a major research tool for my work in CoBOP. In the past year, I also attended the CoBOP planning workshop held in Tucson, Arizona, in Nov. 1996, and conducted preliminary collaborative work on the effects of exopolymer sediment coatings on in-sediment light fields with Dr. Alan Decho and Dr. Brad Bebout.

RESULTS

Preliminary studies with Drs. Decho and Bebout suggest that light scattering properties of sediment are enhanced by adhesion of exopolymers to the grains; these results will be used to design experimental field studies for 1998. As Year 1 focused mainly on equipment-related issues, we have no other data to report.

IMPACT/APPLICATION

As few data were generated in Year 1, discussing the impact of results is not relevant.

TRANSITIONS

As above.

RELATED PROJECTS

1. My successful efforts to obtain funding from the Major Research Instrumentation Program at NSF for purchase of a field emission environmental scanning electron microscope, as mentioned above, is important for CoBOP. This microscope, which will allow high resolution imaging of hydrated samples, will be a critical tool for examining organic-inorganic associations within the sediment.

2. Alan Decho, Brad Bebout and I are investigating biofilms, in sediment light fields, and sediment parameters in modern stromatolites in the Bahamas in an NSF funded study.

REFERENCES

None