Morphodynamics and Geology of the Southeastern Virginia Shelf: False Cape Shoals Area (Phase 2)

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Award Number: N00014-00-1-0247

LONG-TERM GOALS

The long-term goal is to investigate the morphodynamics of shore-oblique shoals at False Cape, Virginia from geologic and hydrodynamic perspectives to address sand body genesis, geometry, and evolution. An additional goal of this ROPO is to continue analysis and publication of data taken in Bab el Mandab, the entrance Strait to the Red Sea.

OBJECTIVES

Geologic data (i.e., sediment cores) will be collected to analyze the geologic framework (i.e., sedimentology, stratigraphy) of the shore-oblique shoals at False Cape, Virginia.

APPROACH

Shore-oblique shoals along the southeastern Virginia shelf have proven to be viable sources of sand for beach replenishment. Numerous studies have addressed the distribution and orientation of shore-oblique sand shoals along the U.S. Atlantic shelf (e.g., Duane et al., 1972; Swift et al., 1972; Swift and Field, 1980; Figueiredo et al., 1981; McBride and Moslow, 1991) but more detailed geologic data are needed to characterize the internal stratigraphy and sedimentology (e.g., physical and biological sedimentary structures, grain size analysis, foraminiferal analysis) in order to document shoal genesis, evolution, and migration (see Snedden and Dalrymple, 1999; Snedden et al., 1999; Dyer and Huntley, 1999). Huthnance (1982a, b) has proposed a purely fluid dynamical model to explain the flow field responsible for the morphodynamics of shore-oblique shoals but this model needs further testing using actual field data (geologic and hydrodynamic information). This ROPO project helps to address these issues.

WORK COMPLETED

In June 2001, a total of 20 vibracores (sediment cores) were collected in the False Cape, VA/NC area. Fourteen of the cores were collected from the continental shelf directly on or adjacent to False Cape

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **30 SEP 2001**	2. REPORT TYPE	3. DATES COVERED **00-00-2001 to 00-00-2001**
4. TITLE AND SUBTITLE **Morphodynamics and Geology of the Southeastern Virginia Shelf:False Cape Shoals Area (Phase 2)**		5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)		5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Environmental Science and Policy, MS 5F2,,George Mason University,,Fairfax,,VA, 22030**		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR’S ACRONYM(S) 11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
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15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**4**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

shoal, whereas six cores were drilled on the adjacent barrier island at Old Currituck inlet (i.e., flood-tidal delta). Athena Technologies, Inc. from Columbia, SC was subcontracted to provide coring vessels, equipment, and support.

In the open ocean, the RV *Artemis* was maneuvered to the desired vibracore sample site using a Trimble Ag132 DGPS. Once on station the vibracoring system was prepared for sampling. The sample barrel was lowered to the seafloor by attaching lengths of drill stem until the seafloor was reached. Once the end of the core barrel touched bottom, the vibracore was turned on. When penetration reached refusal, the vibracore was turned off. The sample barrel was then winched to the deck of the RV*Artemi*s, where the vibracores were cut, capped, and measured for recovery. Fourteen vibracores, ranging from 2 to 6 m, were collected from the continental shelf using the RV *Artemis*.

Six vibracore samples were taken in Currituck Sound on an abandoned flood-tidal delta. These cores ranged in length from 2 to 8 m and were taken using Athena's terrestrial sampling gear. This gear included a backpack mounted vibracore system, an aluminum tripod, and a hand winch. This vibracore process used 3-inch diameter aluminum sample barrels instead of the 2 3/8 inch galvanized. Athena used a Jon Boat to carry the equipment to the desired sample locations that were located in the field using a DGPS provided by George Mason University. Once on station the equipment was carried a short distance to the desired site. The vibrator head was attached to the sample barrel and raised to the vertical position. The vibracore machine was then turned on and allowed to vibrate in until refusal. The sample barrel was then capped to provide a seal at the top, the tripod positioned over the sample barrel, and the hand winch was then attached to the tripod. The sample was then winched out of the ground, cut down to the proper size, and capped on both ends. Each vibracore sample was sectioned into one-meter lengths and each was cut open longitudinally. These were then placed into plastic tubing to preserve the sample and transported back to George Mason University for analysis.

Dr. Randy McBride is now processing and describing the sediment cores in the Coastal Geology Laboratory at George Mason University. In addition, a Ph.D. student in Environmental Science and Policy, who is working under the direction of Dr. McBride, is performing a micropaleontological study of the foraminiferal assemblages in the cores for her dissertation topic. Identifying the foraminiferal assemblages will play a major role in understanding the stratigraphy and geologic processes characterizing the shoal sand bodies.

RESULTS

Oceanographic coring must be done in the summer months when sea conditions are optimal for drilling operations. As a result, data collection had to be postponed eight months to June 2001 in order to ensure appropriate sea conditions. As such, data analysis on the sediment cores has only recently begun and no results are available at this time.

RELATED PROJECTS

This ROPO project complements a recently awarded research project to George Mason University (GMU) entitled "Hard Mineral Resources of the Southeastern Virginia Shelf: Preliminary Geologic Investigation of the False Cape Shoals Area" (Principal Investigator: R. A. McBride). This latter GMU project was funded by an ongoing cooperative agreement between the Minerals Management Service (MMS), US Dept. of the Interior and the Virginia Institute of Marine Science (VIMS) of the College of William and Mary. This federal/state cooperative agreement is for the purpose of conducting geological and physical oceanographic studies relating to the identification, characterization, and potential use of offshore sand resources for beach nourishment along coastal Virginia.

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