

Observations of Megaripples

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Award Number: N00014-00-10811
<http://science.whoi.edu/users/pvlab/TRURO/index.html>

Thrust category: Mine Burial Prediction (Bedforms)

LONG-TERM GOALS

The long-term objective is to develop models that predict the presence (or absence) and characteristics of seafloor megaripples given geological (sediment characteristics, underlying geological framework) and hydrodynamical (waves, currents) conditions.

OBJECTIVES

Bedforms with amplitudes of O (1 m) and lengths of O (10 m) (megaripples, bumps, and holes) are believed to form and migrate on seafloors with mobile sediment for a range of wave and current conditions. Strong currents that produce sheet flow can destroy bedforms. The specific objectives here are to observe seafloor bedforms, waves, and near-bottom currents to determine

- wave and current conditions that produce megaripple-sized bedforms
- relationships between megaripple size and waves, currents, and bottom stress
- megaripple migration rate as a function of waves, currents, and bottom stress
- conditions that cause megaripple destruction

APPROACH

To obtain field observations of megaripple sizes and migration rates, waves, currents, and near-bottom stress this fall, we will deploy 2 sonar altimeters, 4 current meters, and a pressure gage in a dense array close to a sandy seafloor in about 5-m water depth on the southern California coast (Figure 1). The altimeters will be mounted on a frame that can be rotated, allowing continuous monitoring of megaripple heights and migration rates in either the cross- or the alongshore direction. The altimeter array will be collocated with 4 acoustic Doppler current meters to estimate near-bottom stress. The current meter array also can be rotated from a cross- to an alongshore orientation. By maintaining the instruments from November until late spring (possible at this relatively warm water site), we expect to observe a wide range of bedform heights and migrations, waves, and currents.

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE SEP 2000		2. REPORT TYPE		3. DATES COVERED 00-00-2000 to 00-00-2000	
4. TITLE AND SUBTITLE Observations of Megaripples				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) Woods Hole Oceanographic Institution,,Applied Ocean Physics & Engineering, MS #11,,Woods Hole,,MA,02543				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					
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			

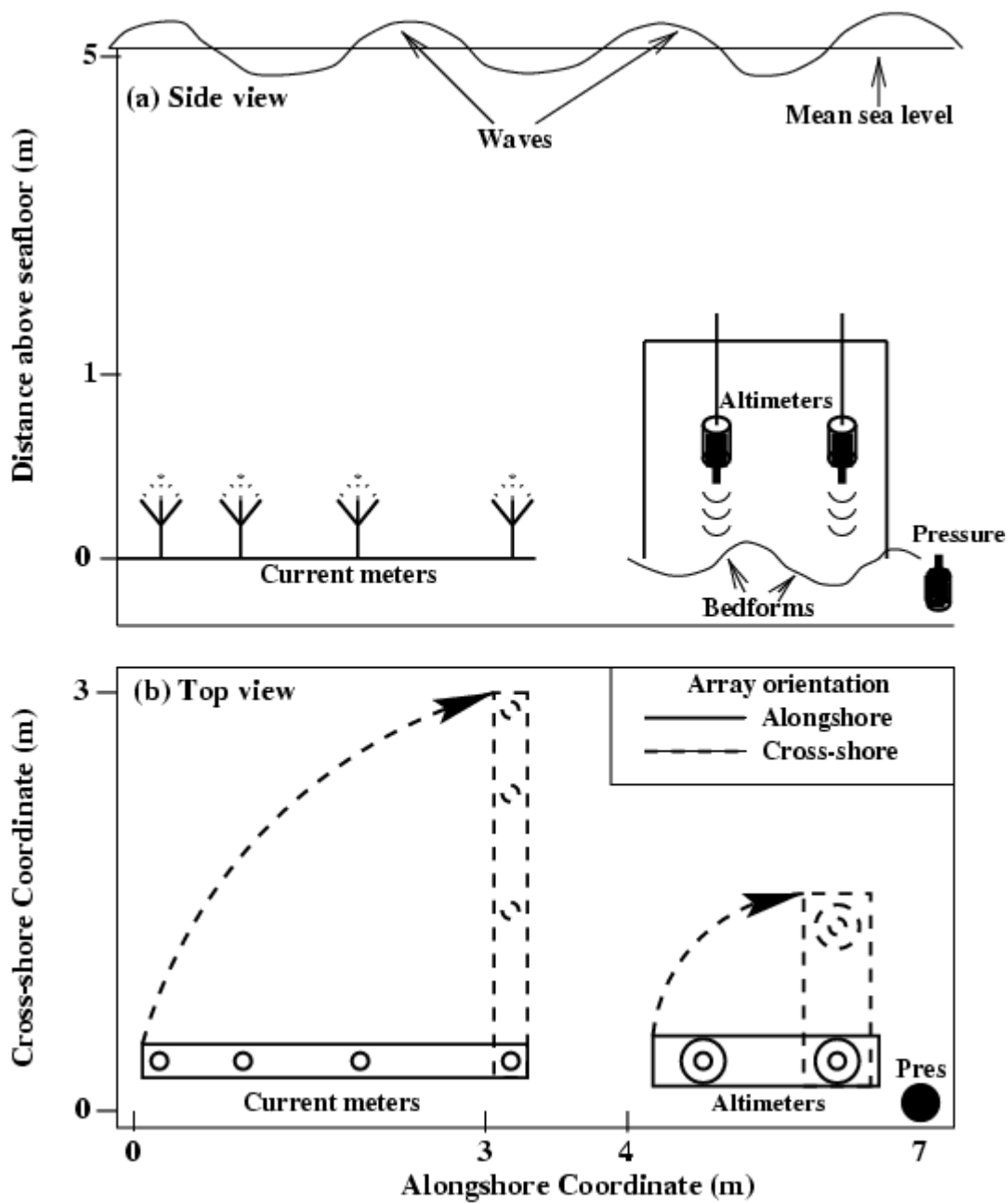


Figure 1. Sketch of megaripple detection instrument array. The side view in the upper panel (a) shows approximate alongshore-oriented deployment locations. The top view in the lower panel (b) shows that both the current meter and altimeter arrays can be rotated 90 degrees, allowing cross- and alongshore alignments.

The altimeters provide time series of seafloor elevation at spatially separated locations, allowing determination of megaripple heights and migration speeds. The pressure gage and the array of current meters provide observations that allow megaripple characteristics to be correlated with waves and near-bottom wave-orbital velocities, mean current, and stress. By rotating the instrument arrays, megaripple migration can be observed in both the cross- (dominated by wave-orbital velocities) and alongshore (dominated by mean currents) directions.

WORK COMPLETED

We have been preparing for the November 2000 deployment. Instrument frames have been designed and are under construction, and the current meters and the pressure gage have been calibrated. Software for real-time data acquisition and display is being written.

RESULTS

None (new start).

IMPACT/APPLICATIONS

One potential impact of this study will be an improvement of Navy operational mine burial prediction models.

TRANSITIONS

None (new start).

RELATED PROJECTS

The near-bottom stress estimates are in collaboration with J. Trowbridge (WHOI). We also are collaborating with P. Traykovski (WHOI) on studies of bedforms in shallow water.