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# NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

## THESIS

### COASTAL BATHYMETRY USING 8-COLOR MULTISPECTRAL SATELLITE OBSERVATION OF WAVE MOTION

by  
Bradley L. McCarthy  
September 2010 Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion

Thesis Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion  
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#### REPORT DOCUMENTATION PAGE Form Approved OMB No. 0704-0188

Public reporting burden Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, 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, Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

#### **1. AGENCY USE ONLY (Leave blank) 2. REPORT DATE 3. REPORT TYPE AND DATES COVERED**

September 2010 **4. TITLE AND SUBTITLE** Coastal Bathymetry Using Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion 8-Color Multispectral Satellite Observation of Wave Motion

**6. AUTHOR(S)** Bradley L. McCarthy

#### **7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

Naval Postgraduate School  
Monterey, CA 93943-5000

#### **9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A**

Master's Thesis **5. FUNDING NUMBERS**

#### **8. PERFORMING ORGANIZATION REPORT NUMBER**

#### **10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

**11. SUPPLEMENTARY NOTES** The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number \_\_\_\_\_.

**12a. DISTRIBUTION / AVAILABILITY STATEMENT 12b. DISTRIBUTION CODE** Approved for

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**13. ABSTRACT (maximum 200 Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion words)**

Coastal bathymetry was measured using wave motion as observed by a commercial satellite imaging system. The linear finite depth dispersion relation for surface gravity waves was used to determine nearshore ocean depth from successive images acquired by the WorldView-2 satellite of the coastal area near Camp Pendleton, California.

Principal component transforms were performed on co-registered images and Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion principal component four was found to very effectively highlight wave crests in the surf zone. Change detection images, which included principal component four Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion from successive images, contained both spatial and temporal information. From these change detection images, wave celerity could be determined and depth inversion could be performed.

For waves farther from shore, principal component four no longer highlighted wave crests. Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion Waves could be resolved within a single RGB composite image with equalization enhancement. The wavelength of a wave above a known depth was measured and the wave period method was used to determine depth for other waves in the propagation direction of this wave. Our depth calculations compared favorably to our reference bathymetry. The spatial resolution for this method of determining depth is higher and perhaps more accurate than our reference bathymetry, particularly in the surf zone.

**14. SUBJECT** Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion **TERMS** Remote Sensing, Multispectral, 8-Color, Bathymetry, WorldView-2, Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion ENVI, Principal Component Transform, Depth Inversion, Wave Methods, Dispersion Relation.

**17. SECURITY**

**CLASSIFICATION OF REPORT**

**18. SECURITY**

**CLASSIFICATION OF THIS PAGE**

Unclassified NSN 7540-01-280-5500 Unclassified

**19. SECURITY**

**CLASSIFICATION OF ABSTRACT**

Unclassified

**15. NUMBER OF PAGES**

71

**16. PRICE CODE**

**20. LIMITATION OF ABSTRACT**

UU

Standard Form 298 Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion (Rev. 2-89) Prescribed by ANSI Std. 239-18

i ii

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# **COASTAL BATHYMETRY USING 8-COLOR MULTISPECTRAL SATELLITE OBSERVATION OF WAVE MOTION**

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## **MASTER OF SCIENCE IN REMOTE SENSING INTELLIGENCE**

from the

**NAVAL POSTGRADUATE SCHOOL September 2010**

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## **ABSTRACT**

Coastal bathymetry was measured using wave motion as observed Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion by a commercial satellite imaging system. The linear finite depth dispersion relation for surface gravity waves was used to determine nearshore ocean depth from successive images acquired by the WorldView-2 satellite of the coastal area near Camp Pendleton, California.

Principal component transforms were performed on co-registered images and principal component four was found to very effectively highlight wave crests in the surf zone. Change detection images, which included principal component four from successive images, contained both spatial and temporal information. From these change detection images, wave celerity Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion could be determined and depth inversion could be performed.

For waves farther from shore, principal component four no longer highlighted wave crests. Waves could be resolved within Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion a single RGB composite image with equalization enhancement. The wavelength of a Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion wave above a known depth was measured and the wave period method was used to determine depth for other waves in Coastal Bathymetry Using 8-Color Multispectral Satellite Observation of Wave Motion the propagation direction of this wave. Our depth calculations compared favorably to our reference bathymetry. The spatial resolution for this method of determining depth is higher and perhaps more accurate than our reference bathymetry, particularly in the surf zone.

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## Coastal Bathymetry Using 8 Color Multispectral Satellite Observation Of Wave Motion

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