

**REPORT DOCUMENTATION PAGE**

*Form Approved*  
OMB No. 0704-0188

The public reporting burden for this 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 the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 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 any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.  
**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

<b>1. REPORT DATE (DD-MM-YYYY)</b> 31-03-2007		<b>2. REPORT TYPE</b> Final Technical Report		<b>3. DATES COVERED (From - To)</b> 01-APR-02 THROUGH 31-MAR-07	
<b>4. TITLE AND SUBTITLE</b> Nearshore Canyon Experiment				<b>5a. CONTRACT NUMBER</b>	
				<b>5b. GRANT NUMBER</b> N00014-02-1-0415	
				<b>5c. PROGRAM ELEMENT NUMBER</b>	
<b>6. AUTHOR(S)</b> Robert T. Guza				<b>5d. PROJECT NUMBER</b>	
				<b>5e. TASK NUMBER</b>	
				<b>5f. WORK UNIT NUMBER</b>	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Scripps Institution of Oceanography Integrative Oceanography Division 9500 Gilman Drive La Jolla, CA 92093-0209				<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> Office of Naval Research Attn: Dr. Thomas G. Drake, ONR 321 875 N. Randolph Street One Liberty Center Arlington, VA 22203-1995				<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b> ONR	
				<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>	
<b>12. DISTRIBUTION/AVAILABILITY STATEMENT</b> APPROVED FOR PUBLIC RELEASE					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT</b> The objective of the Nearshore Canyon Experiment (NCEX) was to understand the effect of complex continental-shelf bathymetry on surface gravity waves and on the breaking-wave-driven circulation onshore of the irregular bathymetry.  The NCEX observations were the first extensive quantitative field measurements of the effect of severe alongshore bathymetric inhomogeneities (here a submarine canyon) on incident waves, and on the surfzone circulation.					
<b>15. SUBJECT TERMS</b> Waves, surfzone, circulation.					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b> None	<b>18. NUMBER OF PAGES</b> 4	<b>19a. NAME OF RESPONSIBLE PERSON</b> Robert T. Guza
<b>a. REPORT</b> Unrestricted	<b>b. ABSTRACT</b> Unrestricted	<b>c. THIS PAGE</b> Unrestricted			<b>19b. TELEPHONE NUMBER (Include area code)</b> (858) 534-0585

**Nearshore Canyon Experiment**  
**ONR Grant No. N00014-02-1-0415**  
**April 1, 2002 through March 31, 2007**  
**Robert T. Guza, PI**

Over 100 sensors were deployed offshore, near, and onshore of two submarine canyons. In addition, bathymetric surveys extending from above the shoreline to about 8-m water depth were conducted almost weekly along several km of the coast.

A wide range of wave conditions was observed, including 2-m high offshore waves, and cross- and alongshore surfzone mean currents exceeding 40 and 75 cm/s, respectively. In addition, bathymetric surveys extending from above the shoreline to about 8-m water depth were conducted almost weekly along several km of the coast.

During the last year, a data set of quality controlled surfzone observations was made available to the public on the WWW (<http://science.whoi.edu/users/elgar/NCEX>). The data base includes time series of pressures and velocity, as well as data products such as wave heights, wave directions, wave-orbital velocities, and mean currents. NCEX observations are being used in collaboration with modeling studies and as ground truth for remote sensing of nearshore waves and currents. More than 20 researchers (from US universities, Navy laboratories, and American engineering companies, as well as from European institutions) have downloaded data from the NCEX data distribution site in 2006.

NCEX included observations of waves and currents between the shoreline and about 30 m depth. Analysis of NCEX observations seaward of the surf zone, led by Drs Herbers and O'Reilly, has resulted in several journal articles comparing observed and modeled waves.

The surfzone observations, collected with co-PIs Elgar and Raubenheimer, are being used in our studies of surfzone processes. These studies include analysis of previously collected observations.

Infragravity energy levels observed in bottom-pressure records and seismic sensors deployed on the continental shelf are strongly modulated at tidal periods. Recently graduated MIT-WHOI Joint Program student Dr. Jim Thomson used observations from NCEX to demonstrate that the observed tidal modulations of infragravity energy are caused by differences in nonlinear interactions between these low frequency long waves and higher frequency swell in the surfzone as the beach slope changes with the rising and falling tide. In particular, on many beaches the low tide beach profile is convex, and the high tide profile is concave, and thus waves are in shallow water over a longer distance at low tide than at high tide (Thomson et al. 2006). Nonlinear interactions that transfer energy from long waves to swell are stronger in shallow water, and thus more energy is transferred at low than at high tide. The energy transfer results in an apparent dissipation of the low frequency long waves. The tidal difference in energy transfer causes there to

be less energy available to reflect from the shoreline at low tide, and thus offshore energy levels change with the tide. The discovery that the observed energy loss is the result of nonlinear interactions, rather than owing to dissipative processes, such as turbulence generation, is a new finding (Thomson et al., 2006, Henderson et al. 2006).

Including the effect of bottom stress leads to improved skill in models that predict wave-induced setup, especially near the shoreline. The effects of rollers on setup were shown to be small (Apotsos et al., in press).

Ongoing analysis of surfzone circulation, with postdoctoral investigator Steve Henderson, is based on the vertically integrated, wave averaged, nonlinear shallow water equations.

Publications acknowledging ONR support with Guza as co-author.

Herbers, T.H.C., M. Orzech, Steve Elgar, and R. T. Guza,  
Shoaling Transformation of Wave Frequency-Directional Spectra,  
J. Geophys. Res., 108, doi:10.1029/2001JC001304, 2003.

Feddersen, F., E. Gallagher, R.T. Guza, and S. Elgar,  
The drag coefficient, bottom roughness, and wave-breaking in the  
nearshore, Coastal Eng., 48, 189-195, 2003

Lentz, S., S. Elgar, and R. T. Guza,  
Observations of the flow field near the nose of a buoyant coastal current,  
J. Phys. Oceanog., 33, 933-943, 2003.

Noyes, T.J., R.T. Guza, Steve Elgar, and T.H.C. Herbers,  
Field observations of Shear Waves in the Surf Zone,  
J. Geophys. Res., 109, doi:10.1029/2002JC001761, 2004.

Raubenheimer, B., Steve Elgar and R.T. Guza,  
Observations of swashzone velocities : a note on friction coefficients,  
J. Geophys. Res., 109, C1027, doi:10.1029/2003JC001877, 2004.

Feddersen, F., R.T. Guza, and S. Elgar,  
Inverse modeling of one-dimensional setup and alongshore current in the  
nearshore, J. Phys. Oceanog., 34, (4), 920-933, 2004

Sheremet, A., R.T. Guza, and T.H.C. Herbers,  
A new estimator for directional properties of nearshore waves,  
J. Geophys. Res., 110, C01001, doi:10.1029/2003JC002236, 2005.

Gallagher E, Steve Elgar, R.T. Guza, and E. Thornton,  
Estimating nearshore seafloor roughness with altimeters,  
Marine Geology, 216, 51-57, 2005.

Hsu, T.J., Steve Elgar, and R.T. Guza,  
A wave resolving approach to modeling onshore sandbar migration,  
Coastal Engineering, 53,817-824, 2006

Schmidt, W. E., R.T. Guza, and D.L. Slinn,  
Surfzone currents over irregular bathymetry : drifter observations  
and numerical simulations,  
J. Geophys. Res., 110, C12015, doi:10.1029/2004JC002421, 2005.

Noyes, T.J., R.T. Guza, F. Feddersen, Steve Elgar, and T.H.C. Herbers,  
Model-data comparisons of shear waves in the nearshore,  
J. Geophys. Res., 110, C05019, doi: 10.1029/2004JC002541, 2005

Henderson, S.M., R.T. Guza, S. Elgar, and T.H.C. Herbers,  
Refraction of surface gravity waves by shear waves,  
J. Phys. Oc., 36, 629-635, 2006.

Elgar, Steve, B. Raubenheimer, and R.T. Guza,  
Quality Control of acoustic Doppler velocimeter data  
in the surfzone, Measurement Science and Technology, 16}, 1889-1893  
(featured on Cover), 2005

Thomson, J, S. Elgar, B. Raubenheimer, T.H.C. Herbers, and R.T. Guza,  
Tidal modulation of Infragravity Waves via Nonlinear Energy Losses in the  
Surfzone, Geophys. Res. Lett., 33, L05601, doi:10.1029/2005GL025514, 2006.

Apotsos, A., B. Raubenheimer, S. Elgar, R.T. Guza, and J. A. Smith,  
The effect of Wave Rollers and Bottom Stress on Wave Setup,  
J. Geophys. Res., in press.

Henderson, S. M., R. T. Guza, S. Elgar, T. H. C. Herbers, and A. J. Bowen, Nonlinear  
generation and loss of infragravity wave energy,  
J. Geophys. Res.}, 111, C12007, doi:10.1029/2006JC003539, 2006