

APPLICATION FOR CONSENT TO CONDUCT MARINE SCIENTIFIC RESEARCH

1. General Information

1.1 Cruise name and/or number:	Exploration of Montserrat and Dominica (NA033) - F2013-050
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1.2 Sponsoring institution(s):		
Name	Address	Name of Director
Ocean Exploration Trust	Dr. Katherine Croff Bell University of Rhode Island South Ferry Rd Narragansett, Rhode Island 02882	Dr. Robert Ballard

1.3 Scientist in charge of the project:	
Name:	Steven Carey
Country:	US
Affiliation:	University of Rhode Island/GSO
Address:	, Rhode Island US
Telephone:	401-874-6209
Email:	scarey@gso.uri.edu

1.4 Entity(ies) /Participant(s) from coastal State involved in the planning of the project:	
Name:	See Section 6.2.
Country:	
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	

2. Description of Project

2.1 Nature and objectives of the project:
<p>Volcanic activity in the Lesser Antilles island arc produces large quantities of fragmental material that is being delivered to the shallow and deep marine environments. In particular, the islands of Montserrat and Dominica have been the source of massive discharges of volcanic material into the sea. Relatively little is known about the direct impacts of this process on the marine biological communities and the formation of submarine geological deposits. On Montserrat the Soufriere Hills volcano has been erupting since 1995 leading to evacuation of most of the southern part of the island. About 1 km³ of andesite magma has been erupted and much of this material has ended up in the ocean in the form of volcanic ash and debris, mostly through the mechanism of large collapses of the lava dome often accompanied by explosions. The volcanic events also included a devastating volcanic blast on 26th December 1997 that affected the west flanks of the volcano and razed two villages to the ground, sweeping the houses, their contents, and other objects such as trucks and tractors, into the sea. These events provide a remarkable opportunity for the application of state-of-the-art ocean exploration techniques to understand the dynamics of pyroclastic flows that are discharged into the ocean and their effects on the marine environment. The E/V Nautilus will use side-scan sonar surveys and remotely operated vehicles (ROVs) to investigate the area to southwest, south and east of Montserrat where volcanic material has entered the sea. In addition, the nature of several unexplored submarine volcanoes southeast and southwest of the Montserrat will be investigated by ROV exploration. In the area of Dominica, previous work has identified the occurrence of at least three debris avalanche deposits in the Grenada Basin that have formed by large-scale collapse of the island flanks. These collapse have led to the creation of a highly irregular seafloor dominated by megablocks up to several hundred meters in diameter. The E/V Nautilus will explore and sample the blocks using ROVs in order to obtain information about the timing of the collapse events and their specific source areas on Dominica. In addition, ROV exploration will focus on the shallow offshore area of southern Dominica where submarine hydrothermal degassing has been observed and is part of a highly active seismic zone that may represent an area of future volcanic activity.</p>

2.2 Relevant previous or future research projects:
<p>Mapping and CHIRP sonar work has previously been conducted off the west coast of Montserrat to define the entrance of pyroclastic flows into the sea from the Soufriere Hills volcano (Hart et al., 2004) and the evolution of the submarine geomorphology (LeFriant et al., 2004). These data sets were compared with pre-eruption bathymetric data in order to identify areas of recent deposition and erosion. Deposition off the Tar and White River valleys was thickest nearest the coastline and deltas, and extended into deeper water up to 5 km from shore. The total volume of submarine pyroclastic deposits as of July 1998 was 73 x 10⁶ m³ DRE. Submarine pyroclastic deposits off the Tar River valley made up more than two thirds of the total volume (55 x 10⁶ m³ DRE) and covered an area of approximately 5.0 km², which included the delta. The volume of submarine pyroclastic deposits in the White River area (18 x 10⁶ m³ DRE) is probably underestimated due to the lack of precise pre-eruption bathymetric data in areas greater than 2 km from shore. In addition, Trofimovs et al. (2006) collected core samples of the submarine pyroclastic flow deposits and determined that fine grained material from the flows transformed into turbidity currents that traveled over 30 kms from the east coast of Montserrat. Offshore of Dominica, multibeam mapping and seismic profiling identified multiple debris avalanches resulting from collapse of the islands western flanks (DePlus et al., 2001). The debris avalanches were recognized based on their distinctive hummocky topography and hyperbolic reflections from 3.5 kHz echosounder data. In the Grenada basin the extent of deposits associated with collapses from Dominica is estimated at 3500 km². No ROV explorations of this area has been previously undertaken.</p>

2.3 Previous publications relating to the project:

1. Hart, K., Carey, S., Sigurdsson, H., Sparks, R.S.J., and Robertson, R. (2004) Discharge of pyroclastic flows into the sea during the 1996-1998 eruptions of the Soufriere Hills volcano, Montserrat. Bulletin of Volcanology v. 66, 599-614. 2. Trofimovs, J. et al., 2006. Submarine pyroclastic deposits formed at the Soufriere Hills volcano, Montserrat (1995-2003): What happens when pyroclastic flows enter the ocean? Geology, v 34 (7), p. 549-552. 3. Deplus, C., LeFriant, A., Boudon, G., Komorowski, J.C., Villemant, B., Harford, C., Segoufin, J. and J.L. Cheminee, (2001). Submarine evidence for large-scale debris avalanches in the Lesser Antilles arc. Earth Planet. Sci. Lett., vol., 192, 145-157. 4. Le Friant, A., Harford, C.L., Deplus, C., Boudon, G., Sparks, R.S.J., Herd, R.A., and Komorowski, J.C., (2004) Geomorphological evolution of Montserrat (West Indies): Importance of flank collapse and erosional processes: Geological Society [London] Journal, v. 161, p. 147-160.

3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude, including coordinates of cruise track/ way points):

Montserrat/Antigua Operational Area 1: polygon defined by Lat/Long coordinates 1. 16.968690 -62.121459 2. 16.684827 -61.854429 3. 16.012146 -62.595069 4. 16.815659 -62.604461 5. 16.962626 -62.253223 Dominica Operational Area 2: polygon defined by Lat/Long coordinates 1. 15.728982 -61.498320 2. 15.438909 -61.471524 3. 15.233153 -61.395962 4. 15.069214 -61.227256 5. 14.7000 -62.322272 6. 15.218782 -62.469016

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical areas of the intended work and, as far as practicable, the location and depth of sampling stations, the tracks of survey lines, and the locations of installations and equipment.

Chart provided - see Section 10.1.

4. Methods and Means to be Used

4.1 Particulars of vessel:

Name:	NAUTILUS
Type/Class:	Ship
Nationality (Flag state):	Saint Vincent and the Grenadines
Identification Number (IMO/Lloyds No.):	6711883
Owner:	Humboldt Shipping
Operator:	Ocean Exploration Trust
Overall length (meters):	64.23
Maximum draught (meters):	4.90
Displacement/Gross tonnage:	1249.00
Propulsion:	single 1286 controllable pitch
Cruising:	10.00
Maximum speed:	12.00
Call sign:	J8B3605
INMARSAT number and method and capability of communication (including emergency frequencies):	Inmarsat 437700078@inmc.eik.com
Name of master:	Pavel Chubar
Number of crew:	17
Number of scientists on board:	31

4.2 Other craft in the project, including its use:

None

4.3 Particulars of methods and scientific instruments:

Types of samples and measurements	Methods to be used	Instruments to be used
Acoustic seafloor, subseafloor, and water column mapping High-definition video footage; CTD; Dissolved oxygen; eH probe; Geological samples (cores and grab samples); Biological samples; Water samples; Gas samples; High-resolution microbathymetry; Stereo imaging; Structured light mapping; sidescan sonar	Multibeam sonar and sub-bottom profiler Underwater electronic still cameras; Underwater video cameras; CTD; eH probe; dissolved oxygen sensor; ROV-deployed sediment coring; suction sampler; Other ROV-based sampling tools (in development); High-frequency multibeam sonar; Mass spectrometry; Sidescan sonar	Kongsberg EM302 and Knudsen 15 kHz SBP Remotely Operated Vehicle Hercules; Remotely Operated Vehicle Argus

4.4 Indicate nature and quantity of substances to be released into the marine environment:

No

4.5 Indicate whether drilling will be carried out. If yes, please specify:

No

4.6 Indicate whether explosives will be used. If yes, please specify type and trade name, chemical content, depth of trade class and

stowage, size, depth of detonation, frequency of detonation, and position in latitude and longitude:
No

4.7 Indicate whether protected species be studied. If yes, please specify:
No

5. Installations and Equipment

Details of installations and equipment (including dates of laying, servicing, method and anticipated timeframe for recovery, locations and depth, and measurements):
No

6. Dates

6.1 Expected dates of first entry into and final departure from the research area by the research vessel and/or other platforms:
Project Start Date: Oct 15, 2013
Project End Date: Nov 05, 2015

6.2 Coastal State-specific details:		
Coastal Area	Estimated Entry Date	Estimated Departure Date
Antigua and Barbuda	Oct 20, 2013	Oct 21, 2013
Explanation of multiple entries: N/A		
Research will be performed: within 12 nm		
Extent to which Antigua and Barbuda will be enabled to participate or to be represented in the research project: Coordination is being established with the Montserrat Volcano Observatory and the Seismic Research Center of the University of West Indies (see supporting letter from Dr. Joan Latchman, Director of SRC)		
Name, affiliation and contact information for all participants from coastal state Antigua and Barbuda: Prof. R.S.J. Sparks, School of Earth Science, University of Bristol, UK (steve.sparks@bristol.ac.uk) Potential participants from the Seismic Research Centre, University of the West Indies (Trinidad and Tobago) include: 1. Dr. Adam Sinton (adam@mvo.ms) 2. Dr. Federic Dondin (fredericdondin@gmail.com) 3. Dr. Richard Robertson (richie_robertson -at- uwiseismic.com)		
Coastal Area	Estimated Entry Date	Estimated Departure Date
Montserrat	Oct 21, 2013	Oct 25, 2013
Explanation of multiple entries: Port call for personel transfer 24, 25 OCT		
Research will be performed: within 12 nm		
Extent to which Montserrat will be enabled to participate or to be represented in the research project: Coordination is being established with the Montserrat Volcano Observatory and the Seismic Research Center of the University of West Indies (see supporting letter from Dr. Joan Latchman, Director of SRC)		
Name, affiliation and contact information for all participants from coastal state Montserrat: Prof. R.S.J. Sparks, School of Earth Science, University of Bristol, UK (steve.sparks@bristol.ac.uk) Potential participants from the Seismic Research Centre, University of the West Indies (Trinidad and Tobago) include: 4. Dr. Adam Sinton (adam@mvo.ms) 5. Dr. Federic Dondin (fredericdondin@gmail.com) 6. Dr. Richard Robertson (richie_robertson -at- uwiseismic.com)		
Coastal Area	Estimated Entry Date	Estimated Departure Date
Dominica	Oct 25, 2013	Oct 29, 2013
Explanation of multiple entries: N/A		
Research will be performed: within 12 nm		
Extent to which Dominica will be enabled to participate or to be represented in the research project: Scientific collaboration has been established with the Seismic Research Center of the University of West Indies (see supporting letter from Dr. Joan Latchman, Director of SRC).		
Name, affiliation and contact information for all participants from coastal state Dominica: Potential participants from the Seismic Research Centre, University of the West Indies (Trinidad and Tobago) include: 1. Dr. Adam Sinton (adam@mvo.ms) 2. Dr. Federic Dondin (fredericdondin@gmail.com) 3. Dr. Richard Robertson (richie_robertson -at- uwiseismic.com)		
Coastal State		
Martinique		
Port Call Only		

7. Port Calls

Port	Arrival Date	End Date	Special Logistical Requirements	Shipping Agent
Fort de France	10/29/2013	10/30/2013	None	TBD
Plymouth	10/21/2013	10/22/2013	None	TBD

8. Participation of the representative of the coastal State

8.1 Modalities of the participation of the representative of the coastal State in the research project:

See Section 6.2.

8.2 Proposed dates and ports for embarkation/disembarkation:

See Section 6.2.

9. Access to Data, Samples and Research Results

9.1 Expected dates of submission to coastal State of preliminary report, which should include the expected dates of submission of the data and research results:

No more than 60 days from the end date of the research as provided in Section 6.1.

9.2 Anticipated dates of submission to the coastal State of the final report:

No more than 2 years from the end date of the research as provided in Section 6.1.

9.3 Proposed means for access by coastal State to data (including format) and samples:

Data will be provided through official channels at no cost to the coastal State(s). Samples will be provided upon request.

9.4 Proposed means to provide coastal State with assessment of data, samples and research results:

Assessment of data, samples and research results will be provided at no cost to the coastal State(s).

9.5 Proposed means to provide assistance in assessment or interpretation of data, samples and research results:

Assistance in further assessment or interpretation will be provided upon request.

9.6 Proposed means of making results internationally available:

All digital data will be given to the coastal state representative on external hard drives at the conclusion of the cruise. It may take up to 1 month to provide video data because files are very large (1 TB/day video collected) and it takes a significant amount of time to copy. Some data will also be available in real-time on a web-based portal, and will be archived at the University of Rhode Island Inner Space Center for access after the cruise. Rocks and Sediment: Marine Geological Sample Lab (Graduate School of Oceanography, University of Rhode Island) Biological Specimens: Harvard Museum of Comparative Zoology Genetic Subsamples: Ocean Genome Legacy

10. List of Supporting Documentation

10.1 List of attachments, such as additional forms required by the coastal State, etc.:

Attachment Type	Description	Attachment	Submission Date
Proposed Cruise Track	Proposed cruise working areas	2898281250_NA033Map.pdf	Apr 01, 2013
Supplemental Material	Support Letter for proposed research	3312031250_NA033 and NA034 SRCsupportLetter.pdf	Apr 01, 2013