

**Application for Consent to Conduct Marine Scientific Research
in Areas Under National Jurisdiction of**

República de Chile

State Department file # 2009-084.

Date: revised 10/5/2009

1. General Information

1.1 Cruise name and/or #:	Chilean Margin
---------------------------	----------------

1.2 Sponsoring institution:	University of California, San Diego Scripps Institution of Oceanography University of California, San Diego La Jolla, California 92093-0210
Name:	Dr. Bruce Appelgate- Director of Ship Operations
Address:	
Name of Director:	Dr. Tony Haymet- SIO

1.3 Scientist in charge of the project (include CV and passport photo):	
Name:	Andrew Thurber
Address:	University of California, San Diego Scripps Institution of Oceanography 9500 Gilman Drive, Mail Code 0208 La Jolla, California 92093 – 0208, USA
Telephone:	858-534-3579
Fax:	831-822-0562
Email:	athurber@ucsd.edu

1.4 Scientist(s) from coastal state involved in the planning of the project:	
Name(s):	Dr. Javier Sellanes López
Address:	Universidad Católica del Norte. Facultad de Ciencias del Mar Larrondo 1281. Coquimbo, Chile Tel: +56 51 205974 Fax: +56 51 209812

1.5 Submitting officer:	
Name and address:	Rose M. Dufour/ Elizabeth Brenner/ Ship Schedulers/Foreign Clearances Scripps Institution of Oceanography University of California, San Diego La Jolla, California 92093-0210
Nationality:	USA
Telephone:	(858) 534-2841
Fax:	(858) 822-5811
Email:	shipsked@ucsd.edu

2. Description of Project (Attach additional pages as necessary)

2.1 Nature and objectives of the project:

The purpose of this project is to collect biologic, geologic, and chemical data on the Chilean cold seeps, El Quisco and the Concepcion Methane Seep Area (CMSA), and explore the Chilean Triple Junction region for potential hydrothermal vents and cold seeps. Description of faunae and geochemistry at those locations will be done in collaboration between Chilean, US and UK scientists. High resolution bathymetric maps and photomosaics will be performed with the Autonomous Underwater Vehicle SENTRY to guide sampling and provide the first in situ photographs of Chilean cold seeps. An at-sea course on the geology and biology of seep and vent habitats aimed at US and Chilean graduate students will be taught by international experts and lead by Dr. Lisa Levin, Scripps Institution of Oceanography. Specimens will be preserved for both molecular and morphological identification and description to address biodiversity, connectedness among seep and vent habitats, dispersal modes of deep-sea organisms, and the impact of vent and seep fluids on the micro- and macrobiology of the seafloor and overlying water column. Free vehicles will be used to collect samples from the southern most extent of the Peru-Chile trench to compare the Chilean hadal (trench) microbial fauna to those of other global hadal habitats. This cruise is funded to support student research at the University of California (both San Diego and Santa Barbara campuses) and as such the Chief Scientist is a late stage Ph.D. student, Andrew Thurber, under the guidance of Professor Lisa Levin. Seven additional students from these two universities will participate in leading roles.

2.2 Relevant previous or future research cruises:

VG-07 – RV “*Vidal Gormáz*”- September 2007
SeepOx Cruise – RV “*Vidal Gormáz*”- October 2006
VG-04 – RV “*Vidal Gormáz*”- October 2004
Ocean Drilling Program Leg 141 – ODP “JOIDES Resolution” – November 1991- January 1992

2.3 Previously published research data relating to the project:

Bourgois, J., Guivel, C., Lagabroelle, Y., Calmus, T., Boulegue, J. and V. Daux – 2000. Glacial-interglacial trench supply variation, spreading-ridge subduction and feedback controls on the Andean margin development at the Chile triple junction area (45-48°S). *J. Geophys. Res.*, 105: 8355-8386.

Coffin, R., J. Gardner, J. Diaz and J. Sellanes. – 2006. Gas Hydrate Exploration, Mid Chilean Coast; Geochemical-Geophysical Survey. NRL/MR/6110-06-9006. Tech. Rep., 1-61.

Froussen, K. and J. Sellanes – 2008. Three new buccinid species (Gastropoda: Neogastropoda) from Chilean deep-water, including one from a methane seep. *Veliger*, 5: 97-106.

González, R.R., Quiñones, R.A. Quiroga, E. and Sellanes, J. -2008. Aerobic and anaerobic enzymatic activities of *Calyptogena gallardoi* (vesicomidae): a clam associated with methane cold seeps off Chile. *Journal of the Marine Biological Association of the United Kingdom*, 88: 983-986.

Holmes, A.M., P.G. Oliver and J. Sellanes. – 2005. A new species of *Lucinoma* (Bivalvia: Lucinoidea) from a methane gas seep off the south west coast of Chile. *J. Conch.*, 36(6): 673-681.

Quiroga, E and J. Sellanes. – 2009. Two new polychaete species living in the mantle cavity of *Calyptogena gallardoi* (Bivalvia: Vesicomidae) at the methane seep site off central Chile (~36°S). *Scientia Marina*, 73(2): 399-407.

Lewis, S.D., Behrmann, J.H., Musgrave, R.J., and Cande, S.C. (Eds.), *Proc. ODP, Sci. Results*, 141: College Station, TX (Ocean Drilling Program). pp 1-320.

Morales, E. – 2003. Methane hydrates in the Chilean continental margin. *Biotechnology Issues for Developing Countries*, 6: 80-84.

Oliver, P.G. and J. Sellanes. – 2005. New species of Thyasiridae from a methane seepage area off Concepción, Chile. *Zootaxa*, 1092: 1-20.

Reyes, P.R. – 2007. Abyssal fishes of “Triple union”, join point of Antarctic, South America and Nazca plates (northwestern Patagonic archipelago). *Rivista de Biologia Marina y*

Oceanografia. 41:37-47.

Sellanes, J. and E. Krylova. – 2005. A new species of *Calypptogena* (Bivalvia, Vesicomidae) from a recently discovered methane seepage area off Concepción Bay, Chile (~36°S). *J. Mar. Biol. Ass. U.K.*, 85: 969-976.

Sellanes, J., E. Quiroga and V.A. Gallardo. – 2004. First direct evidences of methane seepage and associated chemosynthetic communities in the bathyal zone off Chile. *J. Mar. Biol. Ass. U.K.*, 84: 1065-1066.

Sellanes, J., E. Quiroga and C. Neira. – 2008. Megafaunal community structure and trophic relationships of the recently discovered Concepción Methane Seep Area (Chile, ~36°S). *ICES J. Mar. Sci.*, 65: 1102-1111.

Thurber, A.R., Kroger, K., Neira, C., Wiklund, H. and L.A. Levin - In Press. Stable isotope signatures and methane use by New Zealand cold seep benthos. *Marine Geology*.

Treude, T., Niggemann, J., Kallmeyer, J., Wintersteller, P., Schubert, C.J., Boetius, A., B.B. Jørgensen– 2005. Anaerobic oxidation of methane in the sulfate-methane transition along the Chilean continental margin. *Geochim. Cosmochim. Acta.*, 69, 2767-2779.

Vilvens, C. and J. Sellanes– 2006. Description of *Otukaia crustulum* new species (Gastropoda: Calliostomatidae) and *Margarites huloti* new species (Gastropoda: Trochidae: Margaritinae) from a methane seep area off Chile. *Nautilus*, 120: 15–20.

3. Methods and Means to be Used

3.1 Particulars of vessel:	
Name:	R/V <i>Melville</i>
Nationality (Flag state):	USA
Owner:	Office of Naval Research
Operator:	Scripps Institution of Oceanography
Overall length (meters):	85 m
Maximum draught (meters):	5 m
Displacement/Gross tonnage:	2,516
Propulsion:	Two 1385 hp Z-Drive
Cruising & Maximum speed:	11.7 knots, 14 knots
Call sign:	WECB
Method and capability of communication (including emergency frequencies):	<p>Email master@rv-melville@ucsd.edu</p> <p>F77 Voice Telephone Pacific 011-872-763452498</p> <p>F-77 FAX Pacific 011-872-81600255637 Telex 81600255637 (AnsBk=WECB)</p> <p>Vessels guard standard GMDSS frequencies for calling, distress and dissemination of marine safety information.</p> <p>MMSI # 366784000 SELCAL # 11024</p>
Name of master:	Capt. Christopher Curl
Number of crew:	23
Number of scientists on board:	38

3.2 Aircraft or other craft to be used in the project:
None

3.3 Particulars of methods and scientific instruments		
Types of samples and data	Methods to be used	Instruments to be used
Multibeam	Autonomous Underwater Vehicle (AUV) SENTRY	200kHz multibeam 675 kHz scanning sonar
Bathymetry and Sidescan	Swath mapping with multibeam system.	EM122 12 kHz 150 deg swath
Water Column Biological Sampling	Microbiological sample collection	Free Vehicle and CTD rosette, shipboard and laboratory processing of samples
Seafloor Photography	Autonomous Underwater Vehicle (AUV)	AUV SENTRY 1024 x 1024 12-bit digital still camera
Microbiota and Macrobiota (marine invertebrate)	Small Trawl, Sediment collection, and Plankton tows	Beam and Otter Trawl, Multiple-Corer, and Plankton Nets
Sediment Chemistry	Porewater extraction and micro-profiling	Shipboard laboratory processing on multiple-corer collected samples

3.4 Indicate whether harmful substances will be used: None

3.5 Indicate whether drilling will be carried out: None

3.6 Indicate whether explosives will be used:
None

4. Installations and Equipment

Details of installations and equipment (dates of laying, servicing, recovery; exact locations and depth):
None

5. Geographical Areas

5.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude):
South Peru-Chile Trench – 32°00'S 72°42'W El Quisco Seep Site – 33°23'S 71°52'W Concepción Methane Seep Area – 36°22'S 73°43'W Chilean Triple Junction – 46°16'S 75°58'W

5.2 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 positions of intended stations, the tracks of survey lines, and the locations of installations and equipment.

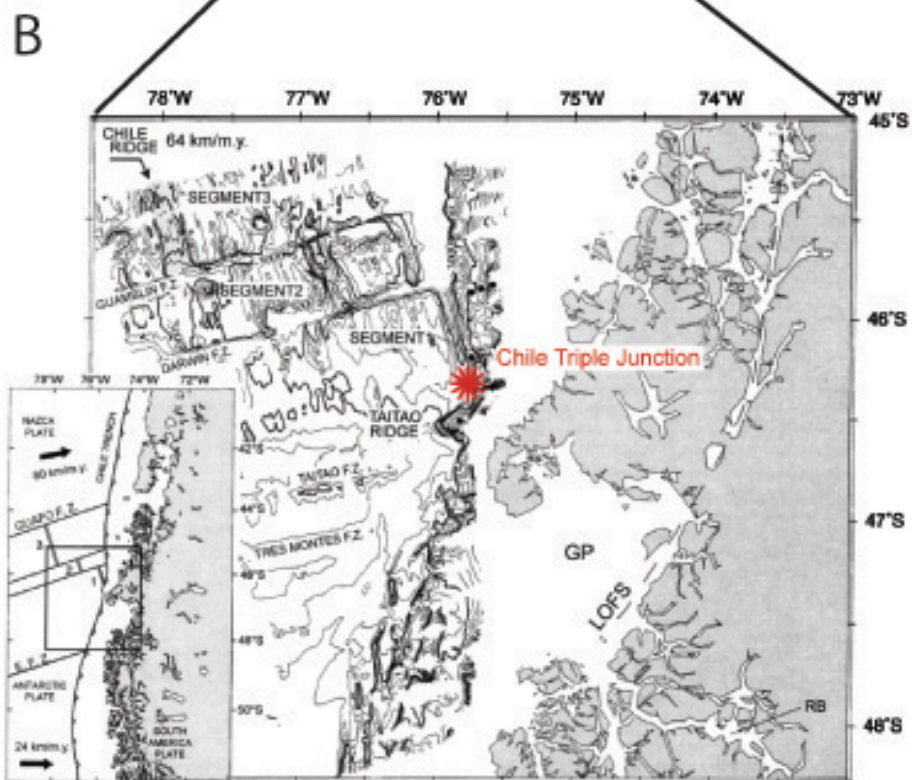
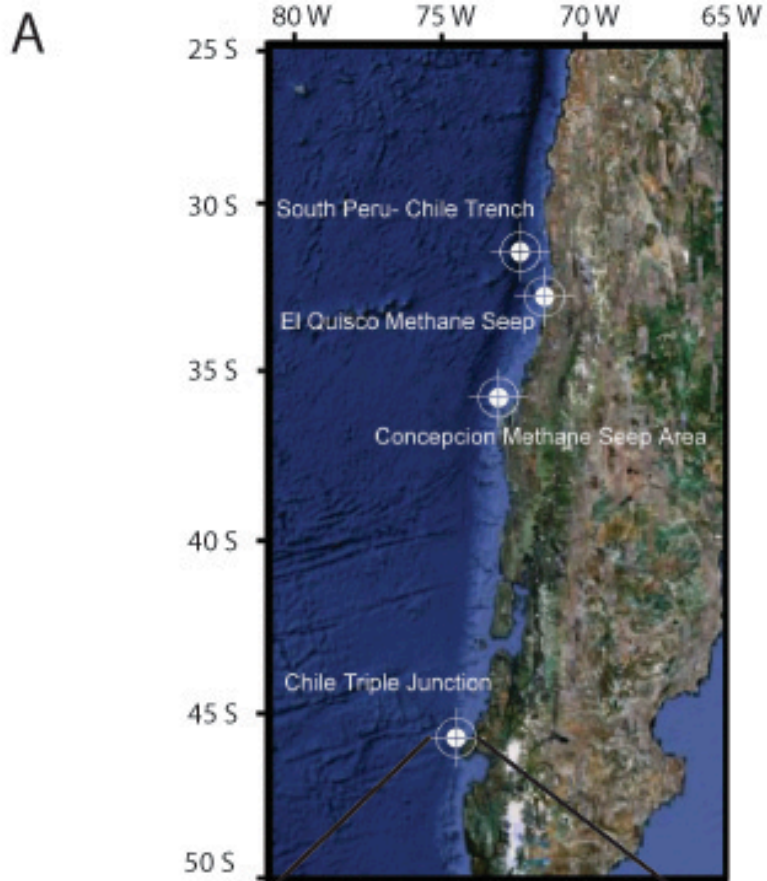


Figure: Locations of proposed sampling. A: Broader context and B: Close up of the Chilean Triple Junction region modified from Bourgois et al. 2000.

6. Dates

6.1 Expected dates of first entry into and final departure from the research area of the research <i>[requested clearance dates, Feb. 18- March 17, 2010]. This will enable the cruise to modify within this period of time in case of delays or shifts within this work area.</i>
South Peru-Chile Trench – ~March 14-17, 2010 El Quisco Seep Site – ~March 10-13, 2010 Concepción Methane Seep Area- ~ March 6- March 09, 2010 Chilean Triple Junction – ~ Feb 24- March 05, 2010

6.2 Indicated if multiple entry is expected:
Not expected but possible.

7. Port Calls

7.1 Dates and names of intended ports of call:
Bahia de Valparaiso, Chile Feb. 14-17, 2010, Puerto Montt Feb. 23-24, 2010; Bahia de Valparaiso, Chile March 17-19, 2010

7.2 Any special logistical requirements at ports of call:
Normal, including fuel and provisions.

7.3 Name/Address/Telephone of shipping agent (if available):
Agent, Main Office in Valparaiso: A.J. Broom y Cia S.A.C. Errazuriz 629 3er. Piso, Valparaiso Chile Tel: 56 - 32 2268200 Fax: 56 - 32 2213308 POC : Mario Montero / Operations Manager Broom Group Tel: 56 – 32 - 2268209 Mobile: 56 9 92190462 Fax: 56 – 32 - 2213308 E-mail: mmontero@ajbroom.cl operations@ajbroom.cl

8. Participation:

8.1 Extent to which coastal state will be enabled to participate or to be represented in the research project:

Invitations have been extended to Dr. Victor Gallardo, University of Concepcion; Dr. Eduardo Quiroga, Centro de Investigación en Ecosistemas de la Patagonia; Dr. Jorge Muñoz, Sernageomin; Dr. Juan Díaz, Pontificia Universidad Católica de Valparaiso; a minimum of two graduate students from Chile in addition to the aforementioned Dr. Javier Sellanes López from Universidad Católica del Norte.

8.2 Proposed dates and ports for embarkation/disembarkation:

Embarkation on 24 Feb. in Puerto Montt, Chile

Disembarkation on 17 March, Bahia de Valparaiso, Chile

Access to data, samples and research results

9.1 Expected dates of submission to coastal state of preliminary reports, which should include the expected dates of submission of the final results:

A preliminary report of the cruise and cruise data will be provided by April 17 2010, ~ 30 days after the end of the cruise.

9.2 Proposed means for access by coastal state to data and samples:

Data from the cruise will be provided to Chile on DVDs and also will be accessible by FTP from servers in the United States.

9.3 Proposed means to provide coastal state with assessment of data, samples and research results or provide assistance in their assessment or interpretation:

A full cruise report, including explanation and guides to all data sets will be provided to Chile, in final form by 01 April 2011, one year after the completion of the cruise.

9.4 Proposed means of making results internationally available:

Results of research will be published in peer reviewed scientific journals. General information on findings will be made public via web access in both Spanish and English. Course materials will be made available in such format to allow integration into graduate level courses and web-pages. Species data will be integrated into the Obis and ChEssBase databases, a part of the Census of marine life, of global deep-water and reducing ecosystems which is available to international access to findings and allow global synthesis.

Andrew R. Thurber
Curriculum Vitae

Graduate Student
Scripps Institution of Oceanography
9500 Gilman Drive, 0208
La Jolla, CA 92093 USA
Phone: (831) 402-7043
Fax: (831) 822-0562
email: athurber@ucsd.edu



INTERESTS

Benthic ecology. Invertebrate taxonomy. Biogeography. Microbial metabolic pathways. Benthic-pelagic coupling. Food web biomarkers and dynamics. Biochemical tracers. Trawl impacts on benthic communities. Cold-seep, Hydrothermal, Polar, and Deep-sea ecosystems.

EDUCATION

- 2005-Current Ph.D. Student – Scripps Institution of Oceanography, UC San Diego
- Advisor – Dr. Lisa Levin
- 2001-2005 M.S. in Marine Science - Moss Landing Marine Labs, CSU- Stanislaus
- Co-Advisors: Drs. Stacy Kim and Nicholas Welschmeyer
 - Graduated with Distinction
- 1997-2001 B.S. in Marine Biology– Hawaii Pacific University
- Minor in Mathematics
 - Graduated Magna Cum Laude

RELATED CRUISE EXPERIENCE

2000-2009 Over 208 Days At Sea on 11 Oceanographic Research Cruises

FELLOWSHIPS AND AWARDS

- 2008 ChEss Training Awards for New Investigators - TAWNI
- 2008-2009 UC Marine Council – Coastal Environmental Quality Initiative Fellowship
- 2006 Michael M. Mullin Fellowship
- 2005-2006 Regents Fellowship
- 2005 Marine Science Student of the Year- CSU Stanislaus
- 2004 John H. Martin Memorial Fellowship
- 2004 PADI Foundation Grant
- 2004 Dr. Earl H. Meyers and Ethyl M. Myers Oceanographic & Marine Biology

Trust
2004 Best Student Poster- Monterey Bay National Marine Sanctuary Symposium

UNIVERSITY SERVICE

2007-2008 Chair, Students at SIO
2005-Current Webmaster for siostudents.ucsd.edu
2002 President, Student Body of Moss Landing Marine Laboratories

PUBLICATIONS

"Peer reviewed literature"

- Levin L.A., G. Mendoza, J. Gonzalez, P. McMillan, A. Thurber, Submitted. Diversity of bathyal macrobenthos on the northeastern Pacific margin: the influence of methane seeps and oxygen minimum zones. *Marine Ecology*.
- Thurber, A.R.**, K. Kroger, C. Neira, H. Wiklund, L.A. Levin, In Press. Stable isotope signatures and methane use by New Zealand cold seep benthos. *Marine Geology*.
- Glover A.G., C.R. Smith, S.L. Minks, P.Y. Sumida, and **A. Thurber**, 2008. Temporal and spatial variability in macrofaunal abundance and community structure on the West Antarctic Peninsula continental shelf. *Deep-Sea Research II* 55:2491-2501.
- Thurber A.R.**, 2007. Diets of Antarctic sponges: links between the pelagic microbial loop and benthic metazoan food web. *Marine Ecology Progress Series* 351:77-89.
- Kim S.L., **A. Thurber**, K. Hammerstrom and K. Conlan, 2007. Seastar response to organic enrichment in an oligotrophic polar habitat. *Journal of Experimental Marine Biology and Ecology* 346:66-75.
- Kim S.L. and **A. Thurber**, 2007, Comparison of seastar (Asteroidea) fauna across island groups of the Scotia Arc. *Polar Biology* 30:415-425.
- Detrich H.W., C.D. Jones, S. Kim, A.W. North, **A. Thurber**, and M. Vacchi, 2005. Nesting behavior of the icefish *Chaenocephalus aceratus* at Bouvetoya Island, Southern Ocean. *Polar Biology* 28:828-832.

"Gray literature" and Technical reports

- Thurber A.**, K. Kroger, R. Martin, L. Zemke-White, and S. Boyd, 2007. Foraminiferal and Metazoan Biology. In: Bialas J., J. Greinert, P. Linke, O. Pfannkucke (eds.) FS Sonne Cruise Report SO 191 New Vents. Leibniz-Institute of Marine Sciences, IFM-GEOMAR, Kiel, Germany. Pp120-122.
- Kim S., **A. Thurber**, R. Mooi, S. Lockhart, and R. Rowley, 2003. Benthic Invertebrate Bycatch. In: Lipsky, J.D. (ed.) AMLR 2002/2003 Field Season Report. Objectives, Accomplishments and Tentative Conclusions. Southwest Fisheries Science Center. La Jolla, CA. pp.144-157.
- Welschmeyer N.A., L. Younan, **A. Thurber**, and G. Wagner, 2003. Phytoplankton, biodiversity, and invasive species in Elkhorn Slough. In: Carless, J. Ecosystem Observations for the Monterey bay National Marine Sanctuary 2003. Monterey National Marine Sanctuary, CA. pp. 13-14.

PUBLIC OUTREACH

2008	Seminar	Rancho Santa Fe 7 th and 8 th grade classes (~80 students)
2008	Seminar	Loma Linda Academy (High School) Earth Science Class
2008	Tour of SIO	High Tech High Elementary School Class
2007	Job Fair	Job fair at National City Middle School
2004	Website	ASPIRE 2004 –Daily updates for elementary school readers
2004	Seminar	Crary Science Lecture, McMurdo Station Antarctica
2004	Seminar	Spring Hill elementary and Seaside High school
2003	Seminar	Friends of Moss Landing Marine Labs (co-presented with S. Kim, D. Malone, A. Carlisle, J. Oliver)
2002	Seminar	Monterey Bay Aquarium Student Oceanography Club
2002	Website	ASPIRE 2002, Webmaster and Daily Updates (1 of 6 contributors)

AD HOC REVIEWER

Deep-Sea Research, Marine Ecology, Marine Ecology Progress Series, The