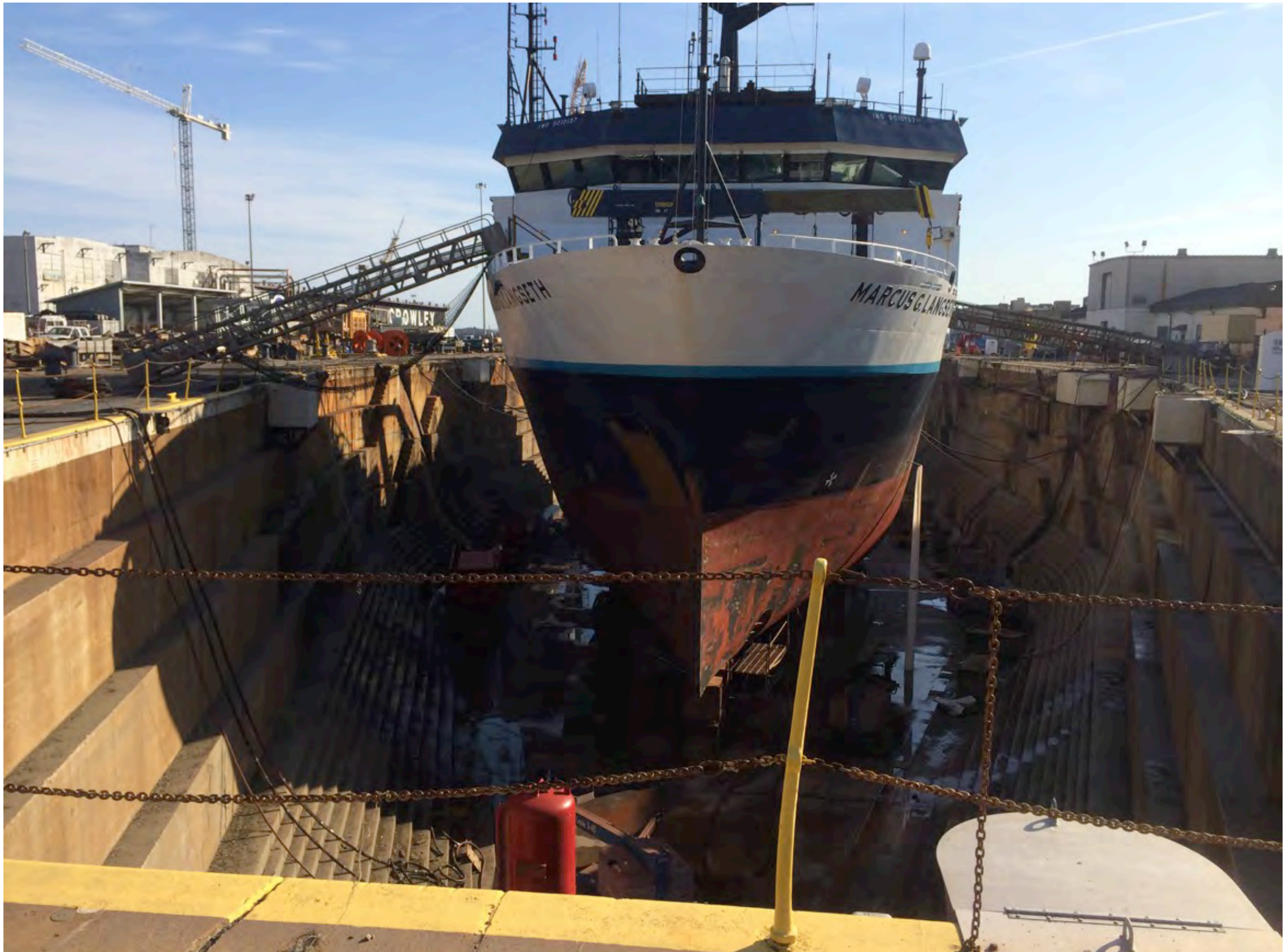
R/V *Marcus Langseth:* First Visit to New York- June 2014

2014 Langseth Shipyard– (Feb -June)
Detyens Shipyard, Charleston, South Carolina



2014 Shipyard/Maintenance Projects

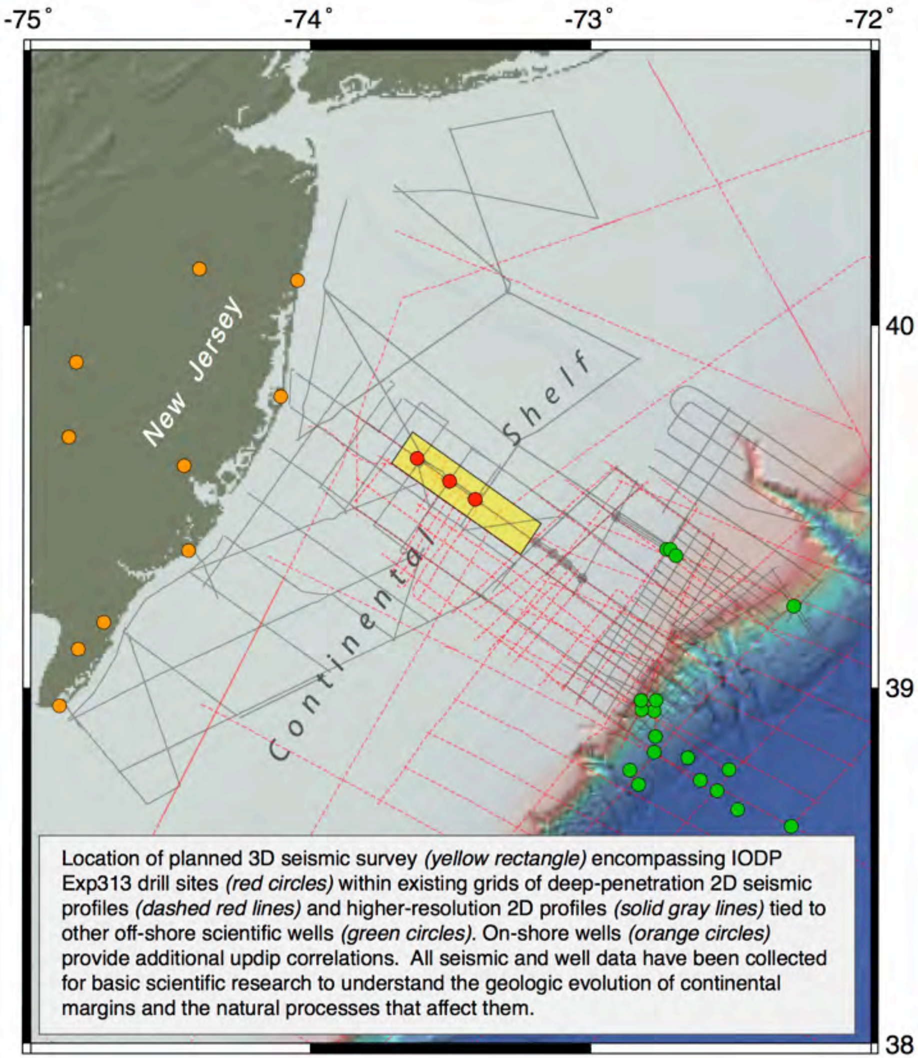
Projects below contains both shipyard and maintenance projects funded by MOSA and SSSE that were addressed in shipyard and dockside in 2014 (February-June). Complete list encompasses about 50 projects with estimated value of ~ $3+M.

PRIORITY PROJECTS:

*Propeller/ Hub Overhaul *Rudders/ Steering Overhaul * Service Science Pod
*20K Hour Engine Overhaul *Anchor windlass Overhaul *Shaft Seals Overhaul
*New Markey Desh 5 Winch installation and structural modifications for new trawl winch install
*Complete Wireless Controls *New Winch Control booth
*Compressor Rm. Bilge preservation *MG sets Overhaul
*Hull and deck paint *Fwd. Ballast tank preservation/rebuild of ballast containment
*Service Source arrays *Shaft Generator Overhaul

*** Denotes Major Projects Completed**

NJ Margin Sea Level 3D Experiment (July 2014)



Location of planned 3D seismic survey *(yellow rectangle)* encompassing IODP Exp313 drill sites *(red circles)* within existing grids of deep-penetration 2D seismic profiles *(dashed red lines)* and higher-resolution 2D profiles *(solid gray lines)* tied to other off-shore scientific wells *(green circles)*. On-shore wells *(orange circles)* provide additional updip correlations. All seismic and well data have been collected for basic scientific research to understand the geologic evolution of continental margins and the natural processes that affect them.

NJ Margin 3D cruise led by Greg Mountain and others was postponed until 2015 after a series of delays due to environmental permitting, a Federal Lawsuit by State of NJ, and finally ship mechanical issues that resulted in not having further time to complete survey in 2014.

While lawsuit was finally dismissed, it highlighted a challenging year for environmental compliance for seismic cruises along east coast of US in 2014.

2014 USGS Atlantic ECS and GeoPrisms ENAM Experiment

From August 21- Sept.13- USGS Atlantic Extended Continental Shelf project completed ~2700 km of 2D seismic survey along US Atlantic Coast

Debbie Hutchinston –Chief Scientist

"The initial 2014 Atlantic ECS Langseth cruise report will give a sense of the breadth and quality of the data and is not exhaustive…… Despite some adversity in the beginning of the cruise, overall it was a complete success, satisfying the primary purposes and ancillary science, as well. ""

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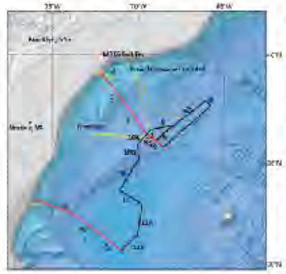
From September 12- October 18- GeoPrisms Eastern North American Margin Seismic Experiment completed ~4800km of 2D Seismic Survey and ~100 active OBS deployments (R/V Endeavor) along with deployment of passive OBS deployments at sea and on land.

Donna Shillington: (Langseth Chief Scientist):

" The R/V Langseth finished the Eastern North American Margin Community Seismic Experiment offshore North Carolina. Onboard analysis of the data has already revealed a number of exciting observations, from anomalously deep Moho reflections beneath the old oceanic crust formed during the early opening of the Atlantic Ocean to intriguing structures associated with relatively recent major submarine landslides. This community experiment brought 9 young scientists and graduate students to sea to collect seismic reflection data for the first time, and resulted in a very dynamic training and research environment on the ship."

MGL1407

USGS 2D Seismic Cruise
August 20 - September 13, 2014



MGL1407 Science party

Figure 1. Map showing MGL1407 cruise tracks. Colors show ECS (black) and hazard (red) multichannel seismic reflection tracks. Yellow tracks indicate where only multibeam echo-sounding and subbottom data were collected.

MGL1407 addresses two scientific objectives for USGS:

(1) to map sediment thickness as part of delineating the extended continental shelf of the United States beyond 200 nm as part of ***Law of the Sea studies***, and

(2) to collect transects of ***submarine landslides*** that will help determine tsunami hazards that might affect the infrastructure and communities of the eastern seaboard.

Law of the Sea Studies

Background: Article 76 of the Convention on the Law of the Sea specifies the criteria under which coastal States (i.e., nations) can delineate the Continental Shelf beyond 200 nm where the State can exert certain sovereign rights, such as management, conservation, or exploitation of natural resources. This region beyond 200 nm is called the Extended Continental Shelf (ECS). One of the two formulas that can be used (Fig 2) is based on sediment thickness. The Atlantic margin is thought to have the second largest ECS of the U.S. and will most likely utilize the sediment thickness formula to delineate its ECS.

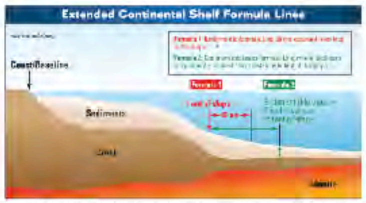


Figure 2. Two formulas for determining the outer limits of the Continental Shelf. For more information about the Extended Continental Shelf Project, go to http://continentalshelf.gov.

MGL1407 is the first of two cruises to help determine sediment thickness in the region beyond 200 nm. In this first cruise (Fig 1), tracks are being run primarily parallel to the margin to gather reconnaissance information, such as whether valleys of thicker sediment exist (for example along fracture zones or near seamounts) and to estimate sediment velocities so that the time measurements determined from the seismic data can be converted to thickness measurements. The second cruise will use data from 2014 to optimize sediment thickness data collection on lines perpendicular to the margin.

Figure 3. Hatteras Outer Ridge and associated contourites. A) Multichannel reflection profile. B) 3D image from multibeam data collected along (A) showing backscatter data (top) and shaded-relief bathymetry (bottom). C) Subbottom profile coincident with (A) showing greater detail in near-seafloor reflections within contourite package.

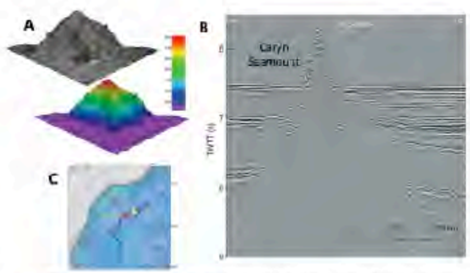


Figure 4. Caryn Seamount. A) 3D visualization from multibeam data, showing backscatter (top) and bathymetry (bottom). B) MCS Line across the edge of Caryn Seamount. C) Map showing location of Caryn Seamount (yellow dot).

Results to date: The seismic data are providing exceptional clarity of not only the seafloor and basement surface, which will be used to determine sediment thickness, but also of the many sedimentary reflecting horizons that tell the story of the evolution of the continental margin (see Figs 3 and 4). While much of the basic geologic history of the Atlantic margin is known from studies dating back to the 1970's and 1980's, the clarity of the newer data are exceptional (Fig 9). The basement has considerable relief and sedimentary packages vary in their extent and thickness, making for variable sediment thicknesses. These measurements are helping to show where tracks need to be located for the second (2015) cruise.

Submarine Landslide Hazards

Background: Since the 2004 Banda Aceh tsunami and the more recent 2010 Tohoku tsunami, the U.S. Nuclear Regulatory Agency has contracted with the USGS to evaluate tsunami hazards along the U.S. margins, because of the potential threat to, for example, nuclear power plants, coastal cities, industrial centers, and port facilities. Tsunamis on passive margins such as the Atlantic pose a challenge to regulators because these events are rare (i.e., low probability) but potentially devastating (i.e., high risk). The Atlantic margin is not immune to the potential tsunamigenic hazards, as demonstrated by (a) the 1929 Grand Banks tsunami, (b) measured and modeled over-pressures on the NJ margin that can cause slope failure, and (c) evidence of enormous submarine landslides along the margin (such as the Cape Fear landslide).

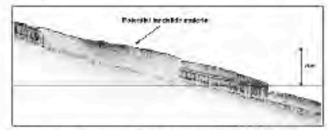


Figure 5. Subbottom profile showing potential landslide material in the near-seafloor reflections. Landslide material is acoustically transparent, compared to layered stratigraphy evident in the adjacent sediments.

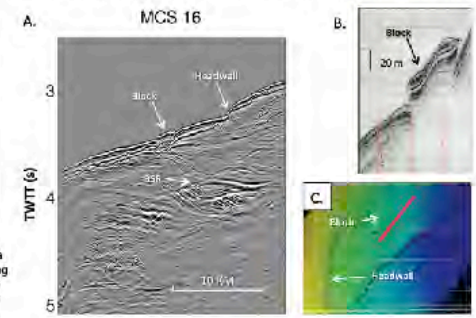


Figure 6. Headwall region of the Cape Fear Slide. A) MCS line showing a failed block and headwall. B) High-resolution subbottom profile showing the same failed block on the seafloor. C) Multibeam image showing the location of the subbottom profile (red) and a second headwall crossing beneath the "H" of "Headwall".

MGL1407: One of the challenges in understanding the hazards posed by submarine landslides is that no single landslide has been mapped from its origin (headwall on the continental slope) to its runout on the lower rise/abyssal plain, with supporting evidence to show the aggradational and structural relationships in the subsurface among the different parts of the composite landslide system. MGL1407 will image two landslide transects: the Hudson composite landslide system and the Cape Fear landslide.

Results to date: The seismic data seaward of New York provide excellent imaging of the upper portions of the Hudson landslide system. The multibeam-only transects collected during the passage of hurricane Cristobal and a medevac provide additional excellent images of the seafloor and subbottom of the Southern New England landslide complex and others on the mid-Atlantic margin (Fig 5). The final line of the cruise imaged the Cape Fear landslide; additional multibeam & subbottom data captured details of multiple headwalls and displaced blocks (Fig 6).

Additional Highlights
include...

Figure 7. Launching sonobuoys to record far offset (up to 25 km) seismic data.

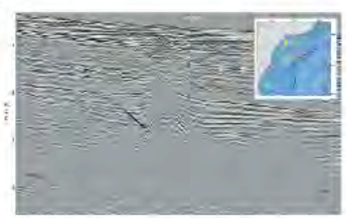


Figure 8. Salt diapir (black arrow) along the northern transect. Yellow dot on inset map shows location.

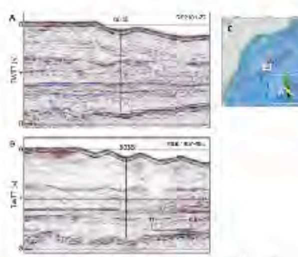


Figure 9. Comparison of legacy and MGL 1407 data across DSDP Hole 603B. A) 1977 data. B) 2014 data from MGL 1407. C) Map showing location of hole and profiles.

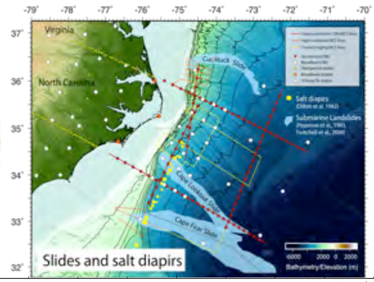
2014 EASTERN NORTH AMERICAN MARGIN (ENAM) SEISMIC EXPERIMENT

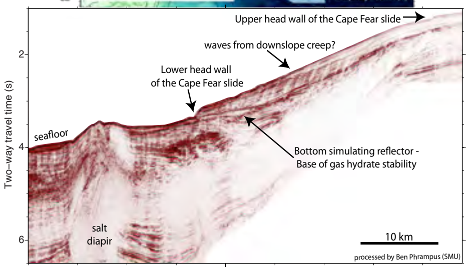
DONNA SHILLINGTON, ANNE BECEL, AND ENAM SCIENCE TEAM

Science Party

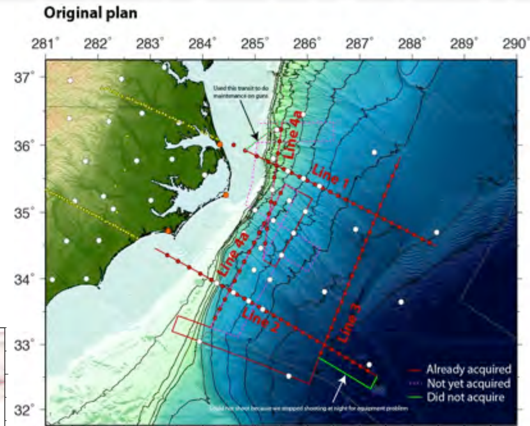
Photo of R/V Marcus Langseth off of North Carolina from R/V Endeavor

NSF





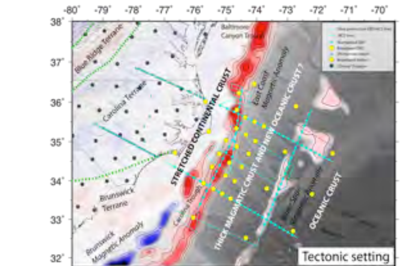
Above: Example of data across the Cape Fear slide that shows the upper and lower headwalls (thought to have formed in two different slide events) and two proposed culprits for slope instability here: a salt diapir and methane hydrates. The evidence for the latter is the Bottom Simulating Reflector (BSR), which is caused by the transition from hydrates above (which are ice containing methane) to free gas in the pores of the sediments below. Hydrates are stable at high pressures and low temperature. Temperature increases with depth in the earth. Once it gets hot enough, hydrates are no longer stable and methane is instead present as free gas.

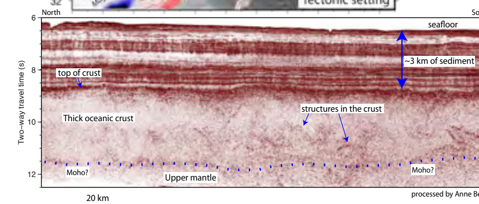


September-October 2014: The ENAM experiment is a major onshore-offshore active-passive seismic investigation to understand the formation and evolution of the Eastern North American Margin. It involves collecting data to image the geology under the seafloor with the R/V Marcus G. Langseth as well as placing seismic stations onshore and on the seafloor to record the Langseth's air gun array and distant and local earthquakes.

GeoPRISMS Geodynamic Processes at Rifting and Subducting Margins

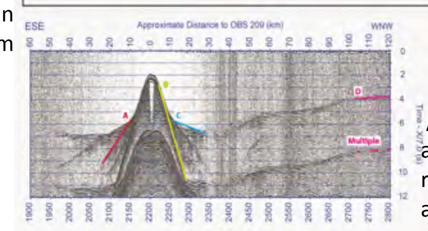
LAMONT-DOHERTY EARTH OBSERVATORY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

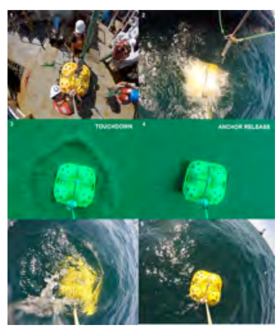




Above: Example of seismic reflection data crossing oceanic crust along the enigmatic Blake Spur Magnetic Anomaly offshore North Carolina, which is thought to mark a transition in the speed and nature of seafloor spreading during the early opening of the Atlantic Ocean. Note the reflections within the crust, which may be faults or shear zones, and the reflections marked as "Moho?" which we tentatively interpret to represent the base of the crust

Below: Traces recorded from OBS 209 (bottom) with various arrivals identified by color. The dashed line shows the multiple of Slope D. Cartoon (top) shows representative raypaths of seismic waves that produced the arrivals indicated in the trace records (Figure Credit: Kate Volk).

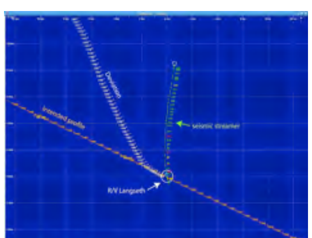


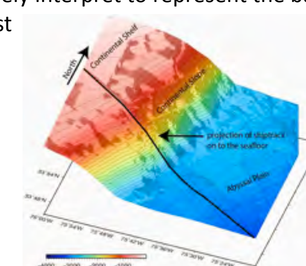


Above: GoPro Camera captures deployment and release of Ocean Bottom Seismometers (OBS) from the seafloor. The ENAM experiment is a major onshore-offshore active-passive OBS project. More than 100 OBS are being deployed.

Above: Data Collection in Langseth Main Lab

Below: Impact of Gulf Stream Current on towed 5-Mile Long Hydrophone Streamer





Above: Perspective view of seafloor depth from MGDS across the continental slope overlain by a higher resolution swath of bathymetric data that we acquired along our transect, which is also shown projected onto the seafloor.