InterRidge Cruise Travel Bursary for an equatorial Atlantic cruise

An InterRidge cruise travel bursary is available for an early-career scientist, to allow participation on a cruise to deploy 3 hydrophones in the equatorial Atlantic. The chief scientist is Deborah Smith (WHOI). The cruise departs from and returns to Bridgetown, Barbados. The dates of the cruise are June 22 – July 9, 2012. Details of the bursary and an application form can be found at: http://www.interridge.org/cruisebursary.

Cruise objectives

This cruise will deploy 3 hydrophones in the equatorial Atlantic to complete an array of 8 hydrophones. Five hydrophones have already been deployed during NOAA servicing cruises of the PIRATA buoys. The array will be in place for approximately 2 years monitoring the seismicity of this tectonically interesting region. During the cruise, we will also collect multibeam bathymetry data along the Mid-Atlantic Ridge in regions that currently are not mapped.

Applicant details

The successful applicant will gain experience at sea, and in mapping the seafloor in regions where there are no previous multibeam bathymetry data. The successful applicant will also participate in the deployment of the hydrophones, and will learn how the moorings and hydrophones are designed and how the instruments work.

Background

The goal of the experiment is to increase our understanding of the slow spreading, equatorial Mid-Atlantic Ridge (MAR). This region is especially interesting because of its tectonic history associated with the opening of the Atlantic Ocean. A strongly segmented MAR is offset on some of the longest fracture zones in the oceans. The North America-South America-Africa (NA-SA-AF) triple junction is thought to be between 10°N and 20°N at the MAR, but its exact location is not known. Moreover, the boundary between the NA-SA plates is not clearly delineated by teleseismicity or prominent seafloor features even though there is still relative motion between the plates. The hydrophone array will obtain a two-year, continuous record of seismicity, and will provide an unparalleled view of the spatial and temporal patterns of seismicity near the spreading ridge and its transforms. Using the data collected in 2014, we will address the following hypotheses on modes of spreading, short-term earthquake predictability, and triple junction dynamics at slow-spreading ridges: 1) *Detachment faults and the formation of core complexes play a central role in accretion at slow-spreading ridges (Escartin et al., 2008)*. Determining whether detachment faulting is common along the equatorial MAR will provide insights into the ridge-axis thermal structure, the magmatic system, and hydrothermal circulation and associated ecosystems. 2) *Foreshock sequences can be used to predict (retrospectively) earthquakes of magnitude 5.4 or greater on Atlantic transform faults (McGuire et al., 2005)*.

Demonstrating that Atlantic and Pacific transforms show similar high ratios of foreshocks to aftershocks associated with > 5.4 m_b mainshocks will help in understanding earthquake nucleation processes in ocean lithosphere. 3) *Deformation associated with NA-SA plate motion does not occur on a discrete boundary but is diffuse (Roest and Collette, 1986)*. Constraining the geometry and pattern of stresses induced by the NA-SA-AF triple junction will provide improved understanding of triple junction dynamics and overall lithospheric strength. A secondary benefit of this project will be a seismic record of the entire South Atlantic (at reduced location accuracy).