Morphology of the Equatorial Mid-Atlantic Ridge and its Large Offset Transforms

R/V Atlantis AT21-03 cruise, Equatorial Atlantic, 21st June - 9th July 2012

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The main aim of the Cruise AT21-03 was to deploy three hydrophones in the equatorial Atlantic, in order to complete an array of eight instruments (Fig. 1). Five hydrophones have already been deployed during previous cruises. The goal of the experiment is to increase our understanding of the slow spreading, equatorial Mid-Atlantic Ridge (MAR).During the 18 day cruise, over 110,000 km2 of multibeam bathymetry and associated acoustic backscatter data were acquired using a Kongsberg EM122 echosounder, operating at 12 kHz. In the following sections we describe some of the observations made from our newly collected bathymetry. Range of features documented for the first time: off-axis ocanic core complexes (OCCs), observed on east and west flanks of MAR, submarine channels carved into Amazon cone, etc.

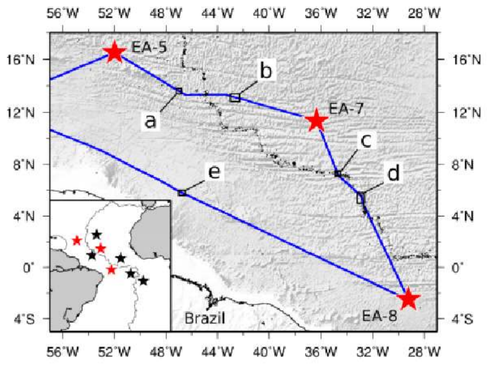

Figure 1. Map showing route of Cruise AT21-03.
Blue line = multibeam bathymetry data;
stars = hydrophone deployment locations; black dots = teleseismic earthquakes; black boxes = location of maps in Figure 2 (boxes labeled a and b), Figure 3 (box c), Figure 4 (box d) and Figure 5 (box e).

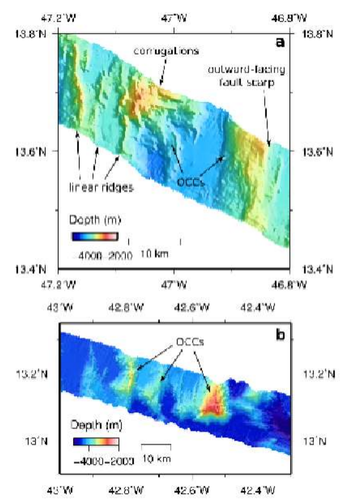

Figure 2. Examples of extinct oceanic core complexes (OCCs) located more than 200 km off-axis.

(a) OCCs on the western flank of the MAR. Note the corrugations (labeled) on the western core complex. Linear ridges marking the tops of rotated faults are also labeled.

(b) Three extinct OCCs located on the eastern flank of MAR. These core complexes were active at the 13°N segment and indicate that detachment faulting has been common on both sides of the MAR in this region.

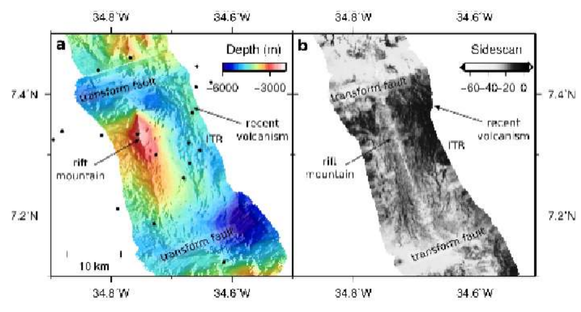

Figure 3. Intra-transform ridge located at 7°N.
(a) Multibeam bathymetry data. Black circles = telesismic earthquakes; ITR = intra-transform ridge. An axial volcanic ridge is observed on the eastern edge of the data.
(b) Sidescan backscatter image derived from the multibeam data. The high backscatter of the axial volcanic ridge indicates that the ITR is magmatically active.

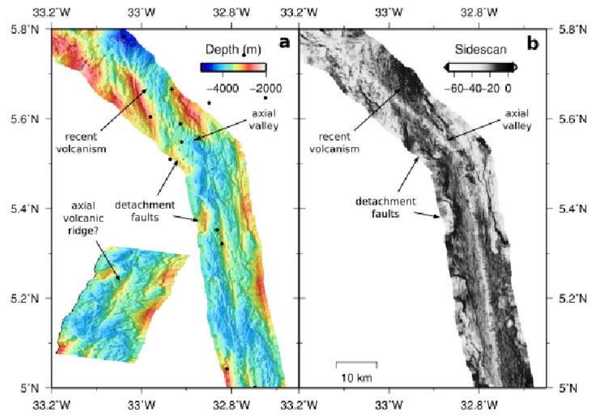

Figure 4. Single ship track along the MAR near 5°N.
(a) Multibeam bathymetry data. Black circles = telesismic earthquakes. An area of high backscatter indicating recent volcanism is marked. An axial volcanic ridge is observed between 5.1 and 5.4°N. Two features that we interpret as detachment faults are labeled on the western flank of the axis.
(b) Sidescan backscatter image derived from the multibeam data.

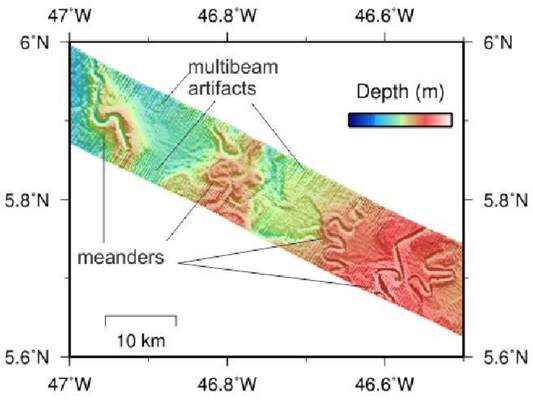

Figure 5. Submarine channels carved into Amazon cone.
The channels range in depth from about 5-10 m up to 50 m. The channel, which is second to the end in the south is the deepest at 50 m.

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