EUG XI
Strasbourg, France
8-12 April, 2001

Journal of Conference Abstracts
Vol. 6(1), 308

Deep-Sea Exploration and Sea-Surface Magnetics on the Central Indian Ridge at 19°S: Initial Results of Cruise Gimnaut

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In May-June 2000, the first dives of deep sea submersible Nautile in the Indian Ocean have been carried out during cruise GIMNAUT of R/V L'Atalante on the Central Indian Ridge (CIR) at 19°S. Cruise GIMNAUT was mainly devoted to the problem of accurate dating methods for recent processes at mid-ocean ridges, with a particular attention to the combined use of existing geochemical absolute dating methods for recent Mid-Ocean Ridge Basalt on one hand, the observation of a dated and continuous sequence of the recent geomagnetic intensity variations on the other hand. The CIR at 19°S, the latitude of the Rodrigues Ridge, is a good target area to address this topic because rock samples are enriched in trace elements required for an optimal quality of the ages. We have realized two transects of the CIR from the axis to the Brunhes- Matuyama magnetic polarity boundaries (~800 ka) on both the African and Indian flanks. These transects intersect the CIR axis at 19°11'S and 19°29'S (9 and 8 dives). Direct visual geological observation and continuous vector magnetic field acquisition has been carried out along each dive. Rock samples have been collected at about 150 sites. Complementary surface geophysical data have been acquired during the nights. Some preliminary conclusions can be derived from the direct observation as follows: a) all observed and sampled rocks are basalts, with a majority of pillow lava and a large number of dykes, in agreement with the presumed hot / magmatic character of the CIR at 19°S; b) the rapid deposition of pelagic sediment shows that active tectonics is focused in the inner valley floor and on the inner walls; similarly, active volcanism mostly occurs inside the inner valley floor: c) despite reported signs of possible hydrothermal plumes in the water column, no active hydrothermal vent has been observed, although evidence of pervasive hydrothermal circulation is widespread. The dense coverage of sea-surface magnetic anomaly data allows the computation of equivalent magnetization on a 1 km-interval grid assuming a 500 m-thick magnetic layer. In addition to anomalies 1, J, 2 and 2A, secondary linear features agree well with previously recognized tiny wiggles of geomagnetic origin (Pouliquen et al., J. Geophys. Res., in press). Within the axial anomaly, at least four of such features flank the Central Anomaly Magnetic High (CAMH) on both sides. Along-axis variations of the equivalent magnetization are associated with the faint, secondorder, segmentation depicted by the bathymetry, with higher equivalent magnetization values at segment ends and lower values at segment centers, as observed on other spreading centers.

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