Precise geomagnetic structure of Atlantis Bank, Southwest Indian Ridge

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Atlantis Bank in Southwest Indian Ridge was surveyed in 1998 (MODE'98 Leg4), 2000 (MODE2000) and 2002 (ABCDE) by use of JAMSTEC fleets in order to test the ophiolite model and to observe the in situ crust-mantle boundary, exposure of mantle peridotite, plutonic rocks and sheeted dikes. In addition to the total 23 dives, geophysical survey was carried out at night and on the submersible/ROV maintenance days. Precise magnetization structure was also studied by dense survey lines above Atlantis Bank by use of proton precession magnetometer and STCM 3-D magnetometer on board. The northern part of the bank is characterised by the positive/negative geomagnetic anomaly patterns with the intensity of +-500nT whereas the southern part of the bank by +-200nT anomaly. Both show normal magnetisation. The northern part of the bank (north of 32 45'S) is more magnetised by extensive magmatic activity than the southern part. Precise topography shows that many small ridges parallel to the spreading axis on the eastern side of the bank north of 32 45'S, whereas such ridges are not located south of 32 45'S. The E-W width of the bank is about 15km in the northern part and 10km in the southern part. On the eastern escarpment of Atlantis Bank, cataclasites were collected by Dive #653 (32 49'S) and mylonites were collected by Dives #644 (32 44'S) and #648 (32 41'S). The magnetic anomaly pattern and collected rock samples suggest a sudden change of magmatic activity at 12 Ma.: from amagmatic tectonic extension stage into magmatic stage. During ABCDE cruise, magnetic survey by DSTCM 3-D magnetometer of ORI University of Tokyo equipped on the submersible was carried out in all 13 dives to investigate precise seafloor magnetisation structure. Magnetic Z-component anomaly pattern in #644 and #648 shows relatively about 3000 nT, which might be corresponding to the dike intrusion into the gabbroic layers. Dive #650 (near 32 37'S, 57 13'E) showed relatively negative anomalies of about 5000 nT on the slope of Atlantis Bank corresponding to the magnetization of the northern part of the bank.