

seamounts, a simplified modelling method was used for the paleomagnetic analysis of the results of geomagnetic measurements (Belyaev et al. 1987b). In this method, the seamount is modelled to a first approximation by a single magnetic dipole placed at its centre of gravity. Theoretical values of the dipole magnetic field have been computed for different values of the declination and inclination at intervals of 15° . The present day inclination within the area is -20° , as read from the magnetic maps. An analysis of the results has shown that characteristic features of the theoretical isodynamic lines (the number of extremes, their location, and the relations between the intensities) allow one to choose the parameters of the ancient field corresponding to the optimal coincidence with observed data. The relevant paleo-inclination is -50° and the declination difference is 45° . So, the paleo-latitude of the seamount could be about 31° S during its formation and the volcano might have moved by about 30° , i.e. about 3,300 km since its formation. Assuming the age of formation of the volcano to be late Cretaceous - early Paleocene, a mean rate of 4.4 cm/yr of drift for the Indo-Australian Plate in the north-south direction during Cenozoic time is estimated. The results of dredged samples from the seamount provide evidence of the subaerial character of the volcanic eruption. The present day depth of the seamount summit (about 3,200 m) enables evaluation of the time required for its subsidence together with the supporting lithosphere following Sorokhtin (1974). An age $t = 81$ Ma can be estimated using the formula $h=0.35\sqrt{t}$, where $h=3200$ m. Thus, both the paleomagnetic analysis and theoretical calculations indicate that the seamount under study is an ancient paleo-volcano of late Cretaceous or early Paleocene age. As the alkali composition of the volcanic rocks and the height of the volcano indicate a younger age of the volcanic structure (less than 70 Ma), it is most likely that the volcano and possibly the entire volcanic chain started subsiding somewhat faster than the supporting lithosphere. This may probably be related to the high present day tectonic activity in this region of the Central Indian Basin leading to increased seismicity, abnormally high heat flow values, and dislocations of the sedimentary cover. The paleomagnetic analysis using the magnetic dipole theory revealed that, the difference between the present day and ancient magnetic declination for the volcano is 45° . This makes it possible to estimate the drift of the Indo-Australian Plate during the Cenozoic time in a northeastern direction which was accompanied by a clockwise rotation of the plate by about 45° .

MAGNETIC INVESTIGATIONS IN THE S22 CRUISE

Magnetic gradiometer (differential proton precession magnetometer, version II, Fig. 4.5 DPM 2) data of about 3400 line km along 11 profiles (3 NE-SW, 4 E-W and 4 NW-SE) were collected in the polygon S22-II ($81^\circ 30'E$ to $84^\circ E$ and $1^\circ 00'S$ to $1^\circ 30' N$) during 22nd cruise of the R/V

Prof. Shtokman. The study area is located at about 80 km NE of ODP leg 116 drilling sites. Continuous seismic profiling with 0.31 air gun, gravity, bathymetry and heat flow data were also collected. The DPM-2 consists of two sensors filled with octane fluid separated by a horizontal distance of 100 m, towed 350 m astern of the ship. The data is recorded at 20 s sampling interval. The gradiometer data has been interpolated, filtered and integrated to get the total field anomaly. All the data are confined to limited area coverage with random profile orientation and thus are insufficient for better understanding of the basement structure in relation to the crustal deformation zone. Bathymetry map of the study area (Fig. 2.4) shows topographic rise south of the equator with relief of about 0.6 km, and north of the equator the seabed depth ranges from 4.0 to 4.2 km. Magnetic anomaly map of the study area prepared at 10 nT contour interval is characterised by complex anomaly pattern which can be distinguished into 4 zones (Fig 4.5). 1) A high gradient intense negative anomaly region of 70 km width and 325 nT amplitude trending NE-SW (A in Fig 4.5) occurs at 1°N and 83° E, east of Indira Fracture Zone. 2) A NW-SE trending positive anomaly is about 100 nT at 0°30'N and 83°45'E (B in Fig. 4.5). 3) A negative anomaly of about 300 nT trending NE-SW observed south of equator at 0°30'S and 82°30'E (C in Fig. 4.5) and 4) a N-S positive anomaly zone of about 140 nT is recorded between 0° to 1° S. Linear anomaly 34 (84 Ma) is identified north of equator in the study area along profiles AB and CD (Fig 4.6a and b).

CONCLUSIONS

The following conclusions are drawn from the analysis of magnetic data: 1) Offset in the linear anomaly 32B and morphology and anomalous magnetic field suggest one more fracture zone between Indira and Indrani fracture zones that cross the Central Indian Basin along 80° 30'E. 2) Anomalies in the region are associated with structural inhomogeneity of magnetic layers. 3) Magnetic data has revealed seafloor spreading anomalies 32, 32B and 34 in the study area. 4) The estimated 4.4 cm/yr rate of seafloor spreading during early Cenozoic may be considered for the average northward drift of Indo-Australian plate. 5) Magnetic data in combination with geothermic investigations point to the development of intense overthrust locations in the intraplate region that cause thickening of the magnetic layer and dissipative heating.