Geomagnetic Depth Sounding in Andaman Island Region, NE Indian Ocean

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Geomagnetic Deep Sounding (GDS) is an electromagnetic method which is capable of imaging the Earth's interior in terms of electrical conductivity using natural geomagnetic transient variations. This method is widely used in geophysical exploration and particularly suited to map geological structures marked by large lateral conductivity contrasts.

Transient geomagnetic field variations recorded along four different E-W profiles in Andaman Islands are analyzed to infer the electrical conductivity distribution of this complex subduction zone. The vertical field transfer functions which depict the characteristics of electrical conductivity distribution are presented as induction arrows. From the spatial distribution of these arrows, it is inferred that the sediments filling the fore arc basin (Andaman- Nicobar deep) are more conducting than the region of outer non-volcanic island arc. This high conductivity over fore arc region (Andaman-Nicobar deep) can be explained in terms of high conducting sediments and upward migrated fluids which are trapped at mid-crustal depths during the subduction processes.

Z/H pseudo sections along the four different profiles bring out anomalous conductivity anomaly associated with Jarwar thrust (in the central part of the profiles) and contrast between different crustal types. The tectonic formation associated with the anomaly is found to be polarization sensitive but inclined 20^0-40^0 in anticlockwise direction.

2D modeling across these profiles brings out localized character of the conductivity anomaly that is associated with Jarwar shear zone. The possible causes for these anomalies across fault zone could be (a) contact between two different geological units, (b) the formation of a fractured, cataclastic zone along a fault can enhance the percolation of fluids and thereby enhance the conductivity anomaly and (iii) due to the presence of fluids generated by the metamorphosis of the subducting crust and also expelled from the subducting sedimentary rocks at deeper levels. Any combination of the above processes is possible for explaining the high conductivity observed in Andaman Islands.