Lithospheric Deformation in the Central Indian Ocean – A Possible Response to the Uplift of the Tibetan Plateau

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The oceanic lithosphere within the Equatorial "Indo-Australian" plate is seismically very active and this seismicity reflects the presence of three composite plates: Indian, Australian and Capricorn, within a diffuse plate boundary. Seismic reflection data from the central Indian Ocean reveal that the lithosphere deforms on two major spatial scales: long-wavelength (100-300 km) folding of the oceanic lithosphere and overlying sediments, and reverse faulting of 5–20 km wide blocks. Stratigraphic analysis of the Bengal Fan sediments and its correlation to ODP Leg 116 sites shows that the folding of the oceanic lithosphere was in multi-phase with major events occurring at Miocene (7.5-8.0 Ma), Pliocene (4.0-5.0 Ma) and Pleistocene (0.8 Ma). Numerous reverse faults are also noticed distributing most part of the deformation zone and generally modified the long-wavelength folding of the lithosphere. The spatial extent of the folding events have migrated since the onset of flexural deformation and the younger Pleistocene folding region coincides with the area of most active faulting.

Measurement of vertical throws across the fault planes at three major folding surfaces and at prominent reflectors below have revealed that about 12% of the total reverse fault population had initiated the compressional activity at 15.4 to 13.9 Ma and continued to 8.0 – 7.5 Ma. Since then occurrence of long-wavelength folding and reverse faulting has contributed to a sharp increase in the deformation rate in the central Indian Ocean. Structural pattern and their timings suggest a small component of brittle deformation was accommodated by activity on single isolated fault blocks between the ages 15.4 and 7.5 Ma; this initial deformation had lowered the strength of the lithosphere and led to formation of long-wavelength foldings and widespread reverse faulting at different periods (7.5-8.0, 4.0-5.0 and 0.8 Ma).

It is generally believed that the uplift of the Tibetan Plateau had a profound impact on dynamics of the central Indian Ocean lithosphere and early strengthening of the Asian monsoon. The relevance of the timing of central Indian Ocean deformation will be discussed with respect to the development of Tibetan Plateau uplift.