Finite vs Instantaneous Deformation of the Indo-Australian Plate.

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The Indian Ocean is well known for its diffuse plate boundary between India and Australia, involving "intraplate" deformation distributed over a broad area. N-S shortening of the oceanic lithosphere reflects an exceptionally high level of stress across the Indo-Australia plate resulting from the Himalayan collision. Bengal sedimentation shows that deformation has occurred during the past 7.5 Myrs. Two wavelengths of deformation are superimposed in the Central Indian Basin: seismic profiles revealed a regular thrust fault spacing of 7 km and long wavelength (200 km) undulations of the basement. We analyze new seismic reflection profiles collected during the Andaman 2000 Cruise near NinetyEast Ridge (3°S, 88°E). This highly deformed region shows many more thrust faults (fault spacing 2 km) and shorter undulation wavelength (100 km), possibly in relation with the proximity of NinetyEast Ridge and/or the presence of a fossile spreading ridge. Reflectors in the sediments may indicate an earlier initiation of deformation, around 12 Ma. We compare the style and amplitude of the observed finite deformation recorded in the seismic profiles to instantaneous deformation obtained by kinematic modeling of India/Australia intraplate motion. Using Haines and Holt method, the horizontal velocity field is obtained from a combination of recent GPS data and the seismic moment release of 128 earthquakes (Mw>5). Our analysis confirms that NinetyEast Ridge is a major rheological discontinuity acting as the true plate boundary between India and Australia.

9340 Indian Ocean
8005 Folds and folding
8010 Fractures and faults
8159 Rheology--crust and lithosphere
3040 Plate tectonics (8150, 8155, 8157, 8158)