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Visco-Elastic Post-Seismic Relaxation Model for 2004 Sumatra Earthquake

C. D. REDDY[1], SANJAY K. PRAJAPATI[1], TERUYUKI KATO[2]

[1] *Indian Institute of Geomagnetism, New Bombay, India*

[2] *Earthquake Research Institute, The University of Tokyo, Japan*

Relaxation of the perturbed stresses following a large earthquake causes post-seismic crustal deformation. Continuous monitoring of post-seismic deformation facilitates understanding physics of the relaxation. We investigate post-seismic deformation due to Sumatra 2004 (Mw 9.1) earthquake using continuous GPS measurements at four sites in Andaman and Nicobar region during 2005-2006. From the time series of the co-ordinates, it is very clear that the post-seismic deformation follow logarithmic decay with a characteristic decay time of few months. The deformation persisted at Port Blair, Rangat and Diglipur with reduced rate while it has ceased at Campbell Bay which is southern most site in the study region. We use visco-elastic model to calculate and compare permanent post-seismic displacement due to visco-elastic mechanism. Visco-elastic relaxation in the lower crust and upper mantle, these phenomena likely involve temporal variations in pore fluid pressure (either as cause, effect or both), reflecting either changes in fluid production or changes in permeability. Variation in pore fluid pressure within or near the plate boundary is particularly relevant to strain accumulation and release normal stress on the fault plane. Our Visco-elastic model promoting a possibility that the post-seismic transient deformation might be dominated by a viscous relaxation with abnormally weak mantle below the strong crust.