To investigate the transient strain rate of postseismic deformation associated with the highly devastating December 26, 2004 Andaman-Sumatra earthquake (Mw 9.3), a combined analysis has been done using Global Positioning System (GPS) data and Moment Tensor Solutions (MTS) acquired from Andaman-Nicobar-Sumatra regions during 2005 to 2007. For the purpose, we used GPS time series and fault plane solution data during the post seismic periods (2005-2007) and clarified the characteristics of the postseismic transient using some mathematical functions. From the postseismic transients, it is observed that, following the earthquake, during the initial three months post-seismic transients fit better to logarithmic function, suggesting afterslip while the later period tends to follow an exponential function, suggesting viscoelastic relaxation.

The displacements estimated during postseismic periods 2005-2006 and 2006-2007 with respect to International Terrestrial Reference Frame 2005 (ITRF2005) and Indian Reference Frame (IRF), display dominating arc-normal active deformation in the southern part close to epicenter, and arc-parallel deformation towards the northern part of along the Andaman Sumatra Subduction Zone (ASSZ). The principal strain rates during the same different periods also indicate larger strain accumulation during 2005-2006 and decreased rate of strain rate during 2006-2007 with a maximum arc-normal compression on southern part and a changing trend of arc-parallel extension towards the central and northern part along the ASSZ. We also carried out moment tensor stress inversion to produce regional scale models of stress orientations containing the minimum complexity necessary to fit the MTS data with estimated principal strain rate. The state of compressive horizontal stress in the southern part and extensional stress towards the central and northern part of the study area shows a remarkable agreement with GPS derived strain rate pattern.