Postseismic deformations following the 2004 Sumatra-Andaman earthquake detected by continuous GPS observations in SE Asia

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We analyzed continuous GPS data from 14 sites in Thailand, Sumatra and Myanmar with IGS sites in surrounding regions during the period from December 5, 2004 to October 12, 2005, in order to detect crustal deformations associated with the Sumatra-Andaman earthquake of December 26, 2004 and the Nias earthquake of March 28, 2005.

Large postseismic displacements that are oriented in WSW directions, similar to those of coseismic displacements are observed at Phuket and Sampari before the Nias earthquake. The former is three times larger than the latter, while this ratio for coseismic displacement is about two. This suggests that the spatial distribution of afterslip is different from the coseismic slip distribution. Wider fault plane than 200km is preferable to explain the postseismic displacements, which activation of afterslip in the deep extension of the plate interface. Slip was dominant on the segment beneath the Nicobar Islands and southern Andaman Islands during this period, which suggests afterslip propagated toward north. These displacements suggest about 1.7~2.7m slip on a shallow dipping thrust fault. However northernmost segment beneath the Great Andaman Island has no significant afterslip. Equivalent moment release is estimated to be 2.11x10^22Nm (Mw=8.82). Postseismic displacement toward SW is dominant at Sampari after the Nias earthquake, while those from the Sumatra-Andaman earthquake are prevailing in Thailand. It is worth noting that no remarkable postseismic displacement is found in Yangon, Myanmar. Equivalent moment release is estimated to be 4.23x10^22Nm (Mw=9.02) including afterslip following the Nias earthquake during the period from December 27, 2004, and the end of September 2005.

We fit a curve based on ductile creep rheology by Motesi (2004) to time series of postseismic displacements. The results imply short time constants and negative exponents which imply significant reloading effects.

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