Crustal deformation in western Shikoku, southwest Japan and its implications to slip distribution along the Median Tectonic Line

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Crustal deformation field in southwest Japan is dominated by oblique subduction of the Philippine Sea plate (PHS). We constructed a new dense GPS campaign network composed of 11 stations in western Shikoku (MTL-West), nearly parallel to and about 120km west of the pre-existing MTL-East network (Tabei et al., 2002). The main purpose of the MTL-East and -West projects is to better understand strain accumulation process in the plate convergence region and its relation to slip distribution along the Median Tectonic Line (MTL). We conducted GPS campaign measurements of about one week on September 2002 and 2003, and calculated station displacements. At the same time we made a campaign analysis of GPS data from adjacent 24 stations of the nationwide continuous GPS array (GEONET) and 4 stations of a small-scale continuous network operated by the Shikoku Research Institute Inc (SRI).

We compare crustal velocities from campaign analysis with the longer-term GEONET velocities that have been derived from continuous data from March 1996 to December 1999. Velocities at new 11 stations and 4 SRI stations are very consistent with the GEONET velocities, showing a crustal shortening due to plate convergence. In contrast, campaign velocities at the GEONET stations are not consistent with those from continuous data. This is because GPS antennas of the GEONET sites has been replaced to a new different type after the 2002 campaign and phase center variation of the antenna may have affected the results. Therefore we don't use campaign velocities at the GEONET stations.

In the analysis of the MTL-East velocity field, the PHS subduction effects can be estimated by a simple model since geometry of the plate boundary is fairly simple and nearly full plate coupling is realized off the eastern Shikoku. In contrast, estimation of the PHS subduction effects is more difficult in the MTL-West velocity field. From off the western Shikoku to the further west, plate boundary changes to a more southward strike and subduction angle becomes much steeper, making a spatial variation of plate coupling. Furthermore, slow slip event has been detected by borehole tiltmeters and GPS in the westernmost Shikoku in summer to autumn 2003. We will combine data from other geophysical observations to estimate strain accumulation due to the plate subduction, transient effects of the slow slip event, and stationary slip distribution along the MTL.