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Creep on the Philippine fault in northern Leyte Island

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The Philippine fault is a major strike-slip fault that traverse 1250 km along the Philippine Islands. It is a left-lateral fault and the slip velocity inferred from GPS surveys exceed 20 mm/year. In Masbate and Leyte Islands, located in central Philippines, no earthquakes of M7 or larger are not known for the last 400 years, and fault creeps have been found in a part of Leyte (Tsutsumi and Perez, 2011). In this presentation, we report our results showing evidence of fault creeps along the Philippine fault in Leyte Island and discuss the creep rate.

In our InSAR analysis, we used 20 images acquired from west between February 2007 and January 2011. We used 39 pairs of images having small baselines to form interferograms. We modeled the long-wavelength noise due to inaccurate orbit data and ionospheric disturbances as a bi-linear trend and removed it in such a way that the fluctuations in the displacement time-series are minimized. Namely, the noise components and displacement time-series were obtained simultaneously using least square's method. Finally, we obtained the mean displacement rate from the displacement time-series.

The result of the InSAR analysis shows, in central to northern Leyte, spatial discontinuities in the displacement rate coincident with the traces of the Philippine fault, indicating that the fault is creeping in this part of the Philippine fault. The creep rate is up to 2.5 mm/year in the line-of-sight direction of the satellite, corresponding to 11mm/year in the direction of the fault motion. On the other hand, we had an estimation of 12-26 mm/year from field surveys. The values obtained from InSAR are generally smaller, but the InSAR rates were obtained as mean values within small areas, and this apparent difference does not necessarily contradict with each other. In addition, it may be possible that the difference is simply due to the difference in the analysis periods, and further investigation is needed. In the southern part of Leyte, we have not find so far any evidence of creeps from InSAR or field surveys.

Keywords: Philippine fault, Leyte Island, fault creep, InSAR