Precursory crustal deformation before short-term slow slip event in January 2006, recorded at Shingu borehole station in Wakayama

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Associated with the subduction of the Philippine Sea plate beneath southwest Japan, there occur various geophysical phenomena such as megathrust earthquakes, slow slip events (SSEs), and deep low frequency tremors (LFTs). Especially, in Bungo channel and the Tokai region, short- term SSEs and LFTs occur at the same time. (e.g. Hirose and Obara, 2006). In January 2006, migration of LFT and short term SSE activity from the middle of the Kii peninsula to the eastern Aichi Prefecture was detected. The migration velocity was about 10 km/day (National Research Institute for Earth Science and Disaster Prevention, 2006). In this study, we investigate crustal deformation data recorded at a deep borehole at Shingu, Wakayama Prefecture, to detect changes associated with this migration event.

The Shingu station is located on a hinge-line where stress changes related to interplate coupling are large (Ikeda et al, 2001). We analyzed strain (3 components) as well as tilt (2 components) changed recorded with an integrated borehole instrument. We applied BAYTAP-G (Tamura et al., 1991) to correct for tidal as well as barometric responses in the original records. We made use of hourly atmospheric pressure data provided by the Japan Meteorological Agency. As a result of analysis we found stepwise strain changes (-0.02 - 0.05 ppm) and tilt changes (0.8 microrad, NE down) from 29 December 2005 to 2 January 2006. These changes can be interpreted as an effect of a reverse fault slip on the plate boundary at 34.1N and 136.1E. The estimated fault is equivalent to a Mw 6.0 event. The location is about 50 km southwest from the start point of the migration event in January 2006, and is concordant with a backward extrapolation of the migration for 5 days at the rate of 10km/day.

The result suggests the possibility that the event in January 2006 starts -silently- from the southwest of the starting point estimated from LFT activity. It might have important implications for physical mechanism of LFTs and SSEs.