

## Slow slip events and deep low frequency tremors in the Nankai subduction zone, southwest Japan

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Two of major progresses in seismology in Japan in the past decade are discoveries of around 20 slow slip events of equivalent magnitude from 6 to 7 and deep low frequency tremors (abbreviated as DLT) along the subduction zone of the Philippine Sea plate, southwest Japan. Common features of the slow slip events can be summarized as below (e.g. Kawasaki, 2004),

(1) They occurred along the transition zone between shallower seismogenic and deeper stably sliding zones on the subduction interface,

and are segregated from the major asperities of Mw8 class great earthquakes.

(2) Amounts of overall slip were less than 30 cm, while those of the major asperities were from 1 m to 5 m.

(3) They recurred in the off Boso peninsula, Tokai area and the Bungo Channel between Shikoku and Kyushu Islands, releasing relative plate motion accumulated during the recurrence interval of around 5 years.

(4) No slow slip event occurred within asperities in the seismogenic zone.

(5) Based on preceding numerical simulation studies, slow slip events can be interpreted as buffer at the final stage of stress accumulation of seismic cycle.

DLT occurs around the plate boundary at the deep extension of the seismogenic zone in a narrow belt along the strike of the subducting Philippine Sea plate from southern Nagano to the Bungo Channel (Obara, 2002). Principal feature of waveforms of DLT is that random wave trains of the predominant frequency of 1.5 to 5 Hz last for tens of hours or days and it is difficult to identify P waves and S waves. However, among the wave trains, pulse-like phases predominant in the horizontal component seismograms are included and considered as S phase in the hypocentral determination. Obara, et al. (2004) showed that slow slip events of source duration time of a few days were associated with the swarm of DLT. Recently, Obara, et al.(2005) showed that slow slip events in the Aichi prefecture synchronized with those in Kii peninsula. Obara (2004) suggested that the activity of DLT was sometimes dynamically triggered by long period seismic waves due to Mw8 class great earthquake which occurred far away from Japan. Considering the features of waveforms and the dynamic triggering, mechanism of DLF should be associated with mineral phase transition, explosive intrusions of water, and bubbling of volatile compositions, in addition to stress transfer.

Thus, mid-term targets should be to search for evidence of such non-seismological phenomena ongoing around the subduction interface and to understand the mechanism of the synchronization of the deep low frequency tremors and slow slip events and synchronization between slow slip events at different regions. They would provide us with a good clue to understanding the relationship between the slow slip events and the coming Nankai and Tonankai earthquakes.