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Short-term slow slip events in the Tokai region and the Kii peninsula detected by a new borehole strainmeter array

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Since 2006, Geological Japan, AIST has constructed fourteen observatories in and around expected focal zones of the Nankai and Tonankai earthquakes to monitor groundwater and borehole strain. The 30, 200 and 600 m-depth wells are constructed in each of the observatories. Groundwater level and groundwater temperature are observed at each well, and the multi-component borehole strainmeter and borehole tiltmeter are installed at the bottom of either the 600 m-depth well or the 200-m depth well. The purposes of this observation array are i) detection of groundwater and/or strain changes associated with the possible preseismic, co- and afterseismic crustal deformation, and ii) precise mapping of Short-term slow slip events (SSEs).

Obara et al.(2004) and Hirose and Obara (2006) already reported that SSEs are recursively observed at an adjacent area of the focal zones of the Nankai, Tonankai and Tokai earthquakes using the Hinet tiltmeter network. Kobayashi et al. (2006) also made a precise location of SSEs in and around a focal zone of the future Tokai earthquake using the borehole strainmeter array of Japan Meteorological Agency (JMA). The new borehole strainmeter array of AIST is expected to improve the mapping accuracy of SSEs in and around focal zones of the Nankai and Tonankai earthquakes

Using the AIST's borehole strainmeter array we could determine locations of SSEs beneath the central Kii peninsula which were relatively difficult to be detected by the Hinet tiltmeter array (Itaba et al., 2010). We detected SSEs in the central Kii peninsula seven times in 2009 and two times in 2010, and the corresponding magnitude and duration of SSEs were about Mw 5.4 – 5.9 and several days, respectively.

We could also determine the SSEs at the Tokai region by using borehole strainmeter data at two strainmeter sites, and the determined location of SSEs are consistent with the SSE locations determined by JMA.

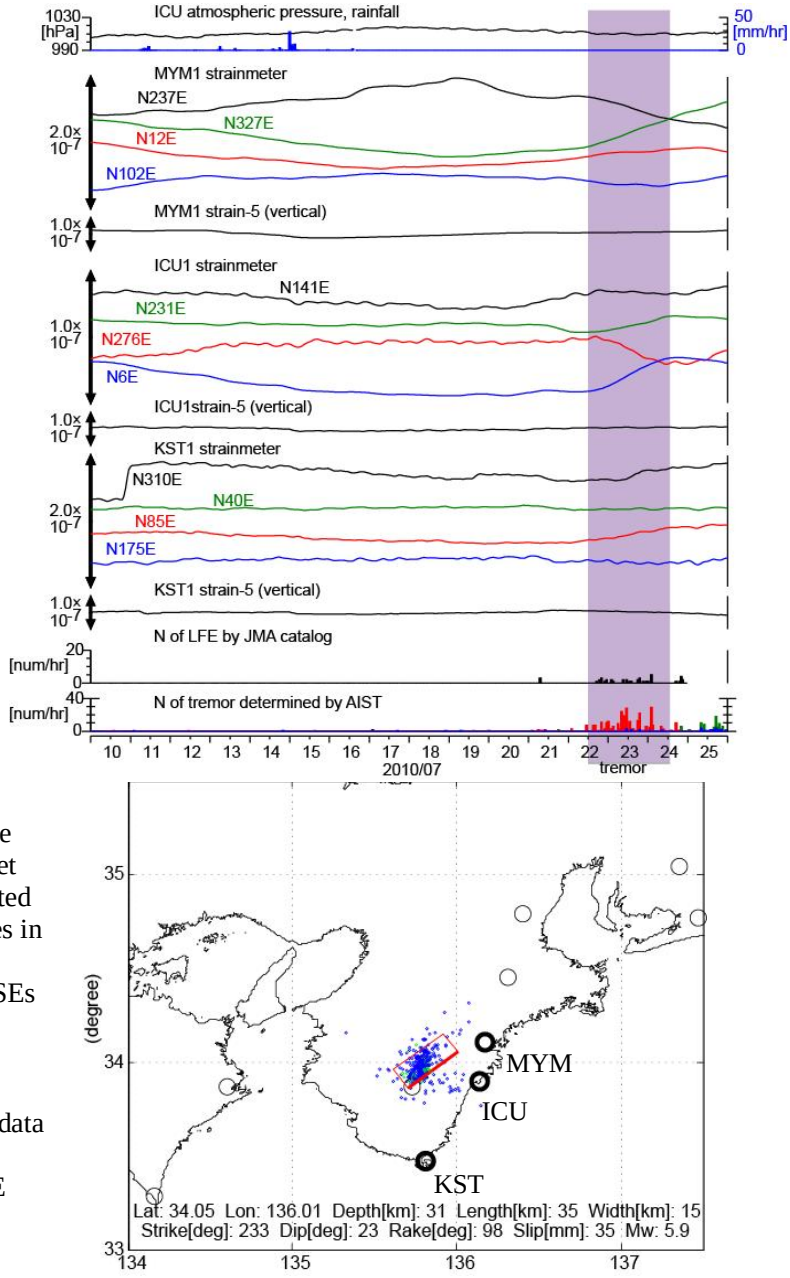

Figure Top: Recent example of borehole strain data at MYM, ICU and KST sites during July 10 – 25, 2010. Numbers of LFEs by JMA and tremors by AIST are also shown. Bottom: Determined location of the SSE by the data at KST, ICU and MYM during the period shown by a purple shade in the top figure.