

Integrated groundwater observation network in and around Shikoku and Kii Peninsula for monitoring the episodic slow slip events

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Geological Survey of Japan, AIST has a network composed of about 40 groundwater observation stations in and around the Tokai and Kinki areas in Japan (Fig.1). This is one of the most well-equipped groundwater observation networks for earthquake prediction research in the world. Based on the pre-slip model of the impending Tokai Earthquake in the Suruga Trough and the assumption that groundwater level changes is proportional to volumetric strain changes, it is found that our network has a capability of detecting pre-seismic groundwater level changes (Matsumoto et al., 2007). This pre-slip is an aseismic slow slip in and around the focal region expected to start a few days before the main shock.

We have been monitoring groundwater in the Tokai area for earthquake prediction since 1970's. However, the possibility of occurrence of the Tonankai and Nankai earthquakes, which have occurred in the Nankai Trough next to the Suruga Trough with an interval of 100-200 years, has also been increasing recently. In addition, hydrological anomalies related to the past Nankai earthquakes were often reported in Shikoku and Kii Peninsula by historical documents. Sato et al.(2005) also pointed out that there might be large drop in the discharge of the Yunomine hot spring just after the 1944 Tonankai Earthquake although the Yunomine hot spring has been known for coseismic and/or postseismic drop in the discharge related to past Nankai earthquakes (Usami, 2003). These results can be explained by volumetric strain changes caused by the fault slips in the plate boundary (Kawabe, 1991; Koizumi et al., 2005; Itaba and Koizumi,2007). In addition, there are the episodic slow slip events accompanied by non-volcanic tremors in the plate boundary under Shikoku and Kii Peninsula (Obara and Hirose,2006). They are considered to have much relation to the Tonankai and Nankai earthquakes. Therefore we have started constructing new observation stations in and around the Shikoku and Kii Peninsula since 2006 for research of groundwater changes and crustal deformation related to the Tonankai and Nankai earthquakes. The 12 stations were already constructed by February 2009 and other 2 stations are under construction (Fig.1). Each station has three wells where groundwater and crustal deformation are observed (Fig.1). This highly precise monitoring system will have much contribution to clarify the mechanism of the slip in the plate boundary and be useful to forecast the Tonankai and Nankai earthquakes in future.

In this presentation, we will introduce our new observation stations and show the outline of preliminary results related to the short-term slow slip events and deep-seated tremors. These groundwater data can be accessed from <http://www.gsj.jp/wellweb/>

References

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Fig.1 Integrated groundwater observation network of Geological Survey of Japan, AIST (left) and schematic figure of the new observation system(right).

