Long-term level and temperature changes in groundwater at the frontier land zone for impending great earthquakes at the Nankai trough, southwest Japan
- Recent anomalous changes, possible great earthquake precursors -

*Tameshige Tsukuda[1]

1. none

For the purpose of monitoring the preparing process of the impending Nankai and Tonankai earthquakes, groundwater measurements are being conducted in the Nanki region,Wakayama Prefecture, southwest Japan. Semiconductor pressure sensors for water level and platinum resistance thermometers for water temperature are exploited.
We have 16 groundwater observation stations for temperature, and 3 stations for water level in the Tokai and Nanki regions, central and southwest Japan, respectively, where are close to the source regions of the great Nakai-trough earthquakes. This paper reports the seismological meaning of the data from Nanki region.
At stations HA and WA in Shionomisaki, Nanki region, Wakayama Prefecture, the long-term trend of the water level is rising with a rate of about 70mm/year, corresponding to the ground subsidence found by levelling and GNSS data (Kobayashi, 2013) till around 2015. The recent water level changes are nearly constant in time. Here, we deal with one-year moving average of levelling data. At the two stations, the trend of temperature is similarly rising with a rate of about 50 m degree/year, suggesting contraction of the rock medium under Shionomisaki, the southernmost end of Honshu.
At KZ(Kozagawa)about 15km northeast of HA or WA in the Nanki region, the temperature is monotonously falling since the observation started in 2002 with some precursory change for the 2004 Kii-Hanto-Oki earthquake(M7.4). However, the decreasing temperature changed to severely increase in the middle of 2015, and changed to decrease again in 2017.
The groundwater temperature changes are related to preparatory earthquake generations. In the preparing process of a large earthquake, the medium would be deformed generating regions of contraction and dilatation around the nucleus of the shearing stresses. According to a hydraulic model, pore fluid flow is driven upward to the ground surface through crack systems serving as flowing pipes by high pressure pumps at a deep spot. The change in the quantity of the upwelling hot water from deep underground causes a change of groundwater temperature(Tsukuda et al., 2005).
As mentioned above, the deformations of the rock medium are accelerated under the regions close to the source regions of the great erthquakes at the Nankai trough. For prediction studies for the impending great erthquakes, we should start to conduct detailed and multidisciplinary observations.
The observations are supported by the NPO, CADASU(Collaborators Association for Detecting Anomalous Signs from Underground).

Keywords: dilatation , contraction, water level, groundwater temperature, precursor

©2020. Japan Geoscience Union. All Right Reserved.