On the Correlation between Changes in Groundwater Temperature and Stress Changes in the Western Region of Shizuoka Prefecture

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We are observing the groundwater temperature in Kosai Arai (KOA) in Shizuoka prefecture, Nakagori (NG) in Hamamatsu city, Nakaizumi Iwata city (IWN), Tokuizumi (KAT) in Kakegawa city. KOA is located west of the Tenryu River system and west of Lake Hamana, NG is on the west side of the Tenryu River system, IWN is on the east side of the Tenryu River system, on the western side of the Ota River system and KAT on the east side of the Ota River system. KOA is 175m, NG is 150m (133.8 to 145.0), IWN is 150m, and KAT is 120m (65.0 to 87.0). Data are acquired every 10 minutes and average daily values are used. Since the equipment is affected by the temperature, the annual change is corrected.

Four examples show examples where the water temperature of the four locations in the western Shizuoka prefecture showed the same change. In KOA, NG, IWN, KAT, we observed low temperature in water temperature on December 24, 2016, April 10, 2017, October 12 (KAT is October 13), June 9, 2017 We observed high temperature. Four water temperatures had fallen from August 2016 until late December, but everything began to rise from late December 2016. After the common temperature rise peak on June 9, 2017, each showed different changes.NG shows a downward trend since May 2013 when observation began, it turned to rise after recording the lowest temperature on December 28, 2016.We can understand that the same underground stress change occurred in the western part of Shizuoka Prefecture because we changed the water temperature at the same time in the four different regions across different water systems. Harmonize with the deep fluid rise hypothesis (Tsukuda et al., 2005) that a certain amount of interstitial water under pressure according to the stress level tends to enter the crack network and float up to the ground. There is no correlation with rainfall of 50 mm / d or more in Hamamatsu city .In addition, the positions of the four wells cross the Tenryu River system and Ota River water system, but the change in water temperature is the same. The change in water temperature due to the influence of the water system is difficult to think.

Changes in water temperature may have captured the movements of the bedrock in this area. In the 375th Earthquake Disaster Prevention Measures Enhancement Region Decision Meeting (July 24, Heisei 24)"In the recent Tokai region crustal deformation, the momentary increase around Lake Hamana is stagnant after December 2016" (18). As the Philippine Sea plate subducts, the ground in the western Shizuoka prefecture has a compression field in the northeast-southwest direction. If the long-term slow slip is stagnant, it can be understood that the compression of the ground progresses and the hot pore water contained in the ground moves upward, which is a low pressure field, to raise the water temperature. On the other hand, if the long-term slow slip is progressing, it is understood that the compression of the ground is loose, the high-temperature pore water in the ground stagnates or falls, and the water temperature falls.The figure is a stack of NG water temperature change upside down and superimposed on the cumulative graph of the moment around Lake Hamana (produced by the Japan Meteorological Agency) (the 375th Earthquake Disaster Preparedness Measures Enhancement Region Press Conference Report page 71)The water temperature of NG has continued to decline until the end of 2016, then it has started to rise. It may have captured stress change due to slow slip.

References:
Tsukuda,T.,K.Gotoh and O.Sato,Deep groundwater discharge and ground surface phenomena, B.E.R.I., Univ. Tokyo, 80, 105-131, 2005.
Tsukuda,T,deep fluid rise hypothesis and its verification, Earth Monthly, 28, 813-822, 2006.

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