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Long-term increasing and decreasing changes with short-term rises in groundwater temperature in the Tokai region

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Stress concentration due to deformation of the crust may generate highly compressed fluids within cracks in the rocks. Those fluids tend to migrate upwards through crack system in the crust. The intrusion of water with high temperature into a shallow water layer results in an increase in the temperature of the shallow water. An increasing trend in water temperature is found since the beginning of the observation in December, 2003 at a depth of 30m in an observation well, in Yaizu City. The increasing rate is 23m degree/year. At an artesian well in Shizuoka, where we set thermometers at depths of 5 m and 30m, we found an increasing rate of 34m degree/year since March 29, 2006. However, the rate changed up to 67m degree/year around February in 2007 and turned to decrease down to 14m degree/year in September. After September, 2008, the temperature is decreasing with a rate of -40 m degree/year. This change of long-term trend is a possible precursor for the Aug. 11, 2009 Suruga Bay earthquake of M6.5. The recent increasing and decreasing trends with impulsive events in groundwater temperature in the Tokai region is possibly due to increasing and decreasing compressional stresses deep underground, indicating a sign of the preparation process of the impending Tokai or Tonankai earthquake. A co-seismic increasing pulse change of the 2009 Suruga Bay earthquake at Shizuoka observation station and some short-term changes at Yaizu were found, together with long-term changes.

Keywords: crustal movement, earthquake prediction, groundwater, groundwater temperature