

Water temperature and discharge at Yudani spa(Tottori pref.)

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Continuous observation of underground water temperature and water discharge have been carried out at Yudani hot spring, eastern part of Tottori pref.. Two wells, about 10 meters apart from each other, are located just front of a town house. The observation equipments are settled one of these wells. Groundwater rises through the cracks in Mesozoic granitic rocks. From the vertical profile of water temperature, ground water flows in from three depths, at 18m, 25m and deeper than 25m. In this study, water temperature variations since 1991 and water discharge since 1995 are reported.

After large earthquakes in and around Japan, water temperature at Yudani rises abruptly in all cases. These temperature rises are not depend on the mechanism of earthquakes nor azimuth from them. Temperature variations and a list of corresponding earthquakes are shown in the figure.

Using BAYTAP-G, the tidal components of discharge from each aquifer and also strain sensitivity coefficients of discharge were calculated. By applying these coefficients and water temperature of each aquifer, temperature changes corresponding to strain steps can be calculated. Nevertheless, observed temperature changes are much greater than those expected theoretically. One reason of this phenomena may be that locally accumulated strain is released by an earthquakes and observed temperature change is caused by this local strain release.

The observing well does not stop discharging by a big earthquake, but the other well neighbouring the observing one stops by a big event. At Tottori earthquakes of M7.2 in 1943, water discharge stopped. After one year had passed, water discharge started again naturally. At Hyogoken-nanbu earthquake of M7.3 in 1995 and Tottoriken-seibu earthquake of M7.3 in 2000, this well stopped and started discharging one year later. This means that the underground water behaviors depend on some kinds of local conditions.

