

Groundwater level changes during the 2018 Hokkaido Eastern Iburi earthquake

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Groundwater table level in wells can fluctuate under stress provoked by earthquakes located even thousands of kilometers away. The mechanisms of changes in groundwater level can be explained by hydrological changes such as pore-pressure response to coseismic static elastic strain, permeability changes caused by seismic waves and fluid migration along seismogenic dilatant cracks or crustal ruptures. The Geological Survey of Hokkaido, Hokkaido Research Organization (HRO), has been monitoring groundwater tables in several wells after the 2018 Hokkaido Eastern Iburi earthquake. The wells were drilled for exploiting hot spring water but have not been used in the last 20 years. The groundwater level was measured by pressure gauges with resolution about 5-10 mm in 10-minute intervals in each monitored well. After the Hokkaido Eastern Iburi earthquake, we were able to find a step-like decrease in groundwater levels in three wells. These wells are located within the region where tensile changes of the quake-induced volumetric strain can be calculated by using the fault model, suggesting that the changes in groundwater levels are qualitatively consistent with those in volumetric strain. The observed groundwater level changes are also affected by tidal and barometric effects, and we can estimate the response of groundwater level for tidal components. The tidal responses in all the wells have not changed before and after the earthquake.

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