Coseismic groundwater quality change after the Kumamoto earthquake using long-term public observation data

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A severe earthquake occurred in Kumamoto district, Japan in April, 2016. Many investigators have been reported coseismic groundwater quality change over the world; however, most of these studies were focused only on point monitoring sites and water quality change in the context of regional groundwater flow dynamics has not been understood well due to the lack of numbers of monitoring wells and monitoring record to compare before and after the quake. However, in Kumamoto area, where hydrogeological conditions are well studied with plenty number of monitoring wells, there are long-term public observation data which provide us an excellent opportunity to investigate coseismic hydrochemical changes in detailed scale.
I analyzed change of groundwater hydrochemistry before and after the Kumamoto earthquake using above mentioned monitoring data for the past 10 years at 135 wells. Results show that hydrochemistry changes were confirmed in 34 items among 96 examined chemistry, including the increase of soluble silicon and decrease of evaporation residue and chlorine after the earthquake. Changing manner differs depending on each water quality item and areas. It is suggested that the most soluble silicon contained in the crust was increasingly dissolved in water due to rock deformation in the time of seismic fracture formation. The decrease of evaporation residue was remarkable near the Suizenji fault where the water level declined was confirmed recently. It is suggested that water of low concentration has flowed along this fracture systems and dilute deep groundwater. In coastal areas, chlorine concentrations were drastically reduced due to vertical water mixing effect driven by theliquefaction.
This study is important from the view point of groundwater conservation.

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