

Study on changes in groundwater quality due to 2016 Kumamoto earthquake and their causes using multivariate analysis

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Kumamoto City and 10 surrounding municipalities in Kumamoto Prefecture, located in Kyushu, southwest of Japan, are called the Kumamoto area, where all of the drinking water for almost 1 million people is supplied by groundwater. The area was hit by the 2016 Kumamoto earthquakes which exceeded magnitude 6.5. We have been conducting monthly groundwater quality investigation at 14 locations in this area since 2014, before the earthquake. In this study, we considered the changes in water quality before and after the earthquake and their causes based on these data. We first confirmed the water-quality change using Stiff diagrams and found slight changes in groundwater samples from four locations. In addition, we evaluated the differences in water quality before and after the earthquake using the K-medoids clustering analysis, and found significant changes for groundwater at a total of 11 locations. Furthermore, we verified the differences in water quality before and after the earthquake using statistical methods for individual water-quality indicators. From these results, we concluded that the main cause of water-quality change was a change in the groundwater balance in the aquifer due to the change in the so-called "water path" caused by the earthquake.