Evaluation of groundwater flow change by repeated measurements of subsurface temperature in the Kumamoto area: a comparison of subsurface temperature data from 2017 to 2018 and previous data

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Repeated measurements of subsurface temperature have been conducted from 2017 to 2018 to make an examination of groundwater flow changes in the Kumamoto area, Japan. We have also made a comparison of subsurface temperature data from 2017 to 2018 and previous data to evaluate not only effects of urbanization such as groundwater development, but the 2016 Kumamoto earthquakes to groundwater environment in this area. Dry up of natural springs and changes of groundwater level were observed aftermath the 2016 Kumamoto earthquakes, and it was expected that the earthquakes was affecting groundwater environment in this area.
Regional tendency was observed in the distribution of high and low temperatures. Low temperature area is located the upland which is the eastern part of this area. Relative High temperature area are found around the lowland which is the western part of this area. Similar tendency is recognized in the distribution of previous data, however there is a difference between high and low temperatures. Moreover, subsurface warming is widely recognized at the shallow part. The temperature increase is greater as close to surface, and it is considered to be affected by urbanization. On the other hand, a few points which shows temporary temperature changes were observed on the upland in January 2017. These unique points were not recognized in the winter of 2018, and the temporary temperature changes is considered to suggest the effects of groundwater flow changes due to the 2016 Kumamoto earthquake. We are expecting to be able to evaluate groundwater flow change by comparing our subsurface temperature data and other various groundwater data which are accumulated in the Kumamoto area.

Keywords: Subsurface temperature, repeated measurements of subsurface temperature, groundwater flow, urbanization, groundwater development, 2016 Kumamoto earthquake

