[JJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-HW Hydrology & Water Environment

[A-HW24]Hydrological change after the 2016 Kumamoto earthquake

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More than two years have been passed after the occurrence of 2016 Kumamoto earthquake. Many investigators have been investigated the cause of observed coseismic hydrological changes such as spring lake dry up, groundwater level drop and rise. We also found groundwater quality changes before and after the quake and this information has been becoming accumulated. In fact, highly densed groundwater monitoring network installed in Kumamoto enables us to grasp comprehensive view of coseismic hydrological responses in very high resolution, so that, the results of these studies have high potential impact to this academic area globally. In this sense, we are welcome for all topics regarding coseismic hydrological changes after or even before the 2016 Kumamoto earthquake from broad point of view including hydrological cycle, deep water and hydrothermal water contribution, subsurface temperature, water quality, isotopes and microbiology. Topics of earthquake prediction and crustal defamation mechanism, surface morphological change in relation to hydrological changes are also welcomed.

[AHW24-P04]Change in flow dynamics of springs after Kumamoto earthquake based on groundwater residence time tracer.

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The Kumamoto earthquake sequence, which occured on 14th and 16th April 2016, resulted in visible hydrological events (e.g. increase in flow rate of some springs and complete stopping of others). These events implied a possible change in the groundwater flow dynamics. This change in flow dynamics might have occurred over a wide area. However, since groundwater flow changes may or may not be accompanied by visible hydrological events, it was necessary to compare hydrological information before the earthquake with that after to identify specifically the areas where groundwater flow changes have occured.

Kumamoto region groundwater flows from the east (west mount foot of Aso and middle of the shira river area) to the west (Kumamoto plain). Kumamoto region has the applicable hydrological information on the main aquifers to understand changes in the groundwater flow process since groundwater monitoring has been implemented for over a decade by the government office. However, there is no monitoring program for spring water. Spring water information (distribution and discharge) are only reported in past studies.

Residence time data of both groundwater and springs is one of the most important hydrological

information used in groundwater studies. In recent times, chemical tracers (CFCs and SF_6) have been used to estimate groundwater residence time at Kumamoto region. The application of CFCs and SF_6 in estimating groundwater residence time is easier and have higher time resolution than other methods (^3H). Hence, CFCs and SF_6 are the best methods for estimating spring water residence time, which is particularly affected by shallow groundwater with short residence time.

The objective of this research was to examine and understand the changes in the spring water discharge mechanism before and after the Kumamoto earthquake. In order to accomplish this, spring water residence time estimation was carried out using CFCs. The obtained residence time results were compared with residence times estimated in 2010, before the earthquake.

In the Kumamoto plain area, a lot of springs have very high CFC-12 concentration, which is not good for residence time estimation. Comparing both 2010 and 2017 data showed that 2017 data was far higher. Based on the extensive use of CFCs (as refrigerant in electrical products), it is asserted that shallow groundwater might have been contaminated with high CFC-12 concentration of anthropogenic origin. There is higher contribution of CFC-12 water from urban areas to spring water at the Kumamoto plain in 2017.

Other spring water with CFC-12 that could be analyzed for residence time estimation also showed the characteristic higher 2017 CFC-12 concentration than that of 2010. Comparison of the estimated residence times and flow changes of these springs for both 2010 and 2017 will be reported in this presentation.