Geochemical characteristics of new spring water occurred after the Kumamoto earthquake

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Often the generation of new springs is associated with large earthquakes, of which some are temporary, while others may be persistent. Later ones may contribute to the geochemical imprint of regional runoff, suggesting a potential relevance of the process of Earthquakes triggering new springs. However, the nature of the formation mechanisms of new springs, and their influence on the local water geochemical budgets is often unknown due to the lack of comprehensive studies. After the 2016 Kumamoto earthquake (Mw = 7.0) with postseismic activity moving through the Aso Caldera new springs were observed in the Kumamoto Plain area (three new springs) and the Aso Caldera (six new springs). The flow rate was monitored every months for one year to characterize the discharge manner. To identify possible water sources, samples for the determination of major ions, trace elements, and H, Li, B, C, N, O, S, Si and Sr isotope ratios were taken.

All springs at both sites are located along active fault systems. The discharge rates for all springs were relatively constant and did not show a clear seasonal change, suggesting that these new springs passed along structural breaks forming new water pathways and discharged due to pressure release from confined aquifers. Moreover, geochemical comparison between the new springs and possible endmembers suggest that new spring water in the Kumamoto Plain origins from 100 to 200 meter deep, unconfined aquifers. Water of new springs in the Aso Caldera, however, origins from deep reservoirs similar to local hot spring sources in the Aso caldera, which leave an imprint in the runoff from the volcanic system.