

## Groundwater anomalies and active structures related to the Mid Niigata prefecture Earthquake in 2004

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In this paper, we examine considerable changes in temperature, electric conductivity, and hydrochemistry of groundwaters around the epicentral area in one year after the Mid Niigata prefecture Earthquake in 2004, using the snow-melting wells and identifying hydrogeological processes and origin of groundwater.

Considerable increases in temperature and electric conductivity in one year appear along the southern the Yukyu-zan active fault and its inferred southwestern extension and in the eastern part of Mitsuke City area. These areas and zones are located on the hanging wall block of the seismogenic source fault of the Mid Niigata prefecture Earthquake in 2004. Considerable decreases in temperature, electric conductivity, and NaCl contents in one year are recognizable in the Horinouchi area and the western part of the Kawaguchi area and along the inferred northern extension of the Muikamachi active fault (Yamato-Koide-Hirokami-Obiro area). These areas and zones are situated on the footwall of the source fault. The chemical compositions of groundwaters from these anomaly areas and zones on the hanging wall and footwall are characterized by high NaCl contents. The high-salinity and high temperature groundwaters are considered to be mixtures of deep hot fossil seawater and meteoric waters on basis of hydrochemistry. Therefore, the seismic fracturing may have increased permeability and assisted upward flows of deep hot groundwaters immediately after the earthquake. In one year after the earthquake, the permeability in the hanging wall remains enhancing deep circulation of groundwater along the Yukyu-zan active fault. In the footwall, decreases of permeability caused decreases in groundwater temperature, electric conductivity and NaCl contents in one year after the earthquake. The hanging wall and footwall have been under an E-W extensional and compressional conditions, respectively, related to the earthquake. These suggest that hydrogeology and flow system of the groundwaters along active faults in the Chuetsu area are greatly controlled by deformation conditions.