

Estimation of gas flow through Taiwan Chelungpu fault during Fluid Injection Test

Masaki Murakami[1]; Hidemi Tanaka[2]

[1] Earth Planetary Sci., Univ. Tokyo; [2] Dept. of Earth and Planet Sci., Univ. Tokyo

Fluid Injection Test (FIT) was performed on from November 2006 to March 2007 to estimate permeability and to understand hydrological and chemical properties between two boreholes penetrated through Chelungpu fault in Taiwan. Murakami et al. (AGU, 2007) reported results of water quality, flow rate, gas and water pressure monitoring at the observation hole during the FIT. As a result, they found the two different signals suggesting arrivals of the injected water. The values of Oxidation Reduction Potential (ORP) and Dissolved Oxygen (DO) as well as the gas pressure of oxygen, nitrogen and argon suddenly increased 3 days after the start of the FIT. This suggested that the injected water, which well mixed with the air, arrived at the observation hole 39 m distant from the injection hole. Then, the flow rate at the observation hole suddenly increased 10 days after the start of the FIT. In this study, we estimated the water and gas flows through the permeable zone during the FIT in order to estimate the permeability from the both data suggesting water arrivals. Used model was based on the 2D water diffusion model and the 2D gas diffusion model in the water, and we applied them to estimations of gas flow in an unsteady water flow during FIT. Here we used gas diffusivity in water of $2 \times 10^{-9} \text{ m}^2/\text{s}$, and permeable zone of 1 m for the estimations. As a result, the permeability of $1 \times 10^{-16} \text{ m}^2$ explained the increase of water flow rate 10 days after the start of the FIT. In contrast, the estimated DO was fitted with that in the experience when the permeability was $1 \times 10^{-15} \text{ m}^2$. These lines suggest that the permeability between two boreholes through Chelungpu fault was between $1 \times 10^{-16} \text{ m}^2$ and 10^{-15} m^2 .