Vertical Self-Potential (SP) monitoring in Tomakomai CCS demonstration site, Hokkaido

*Takuya Horikawa¹, Tsuneo Ishido¹, Yuji Nishi¹

1. CO2 Geological Storage Research Group, GREEN, GSJ, AIST

In the geological CO₂ storage and geothermal exploration, it is important to monitor the changes of subsurface fluid for a long time. We have developed passive monitoring system combining gravity method, self-potential (SP) method and elevation change, and this system was applied practically on several CCS and geothermal fields. These passive exploration methods have the advantages of cost and operation compared to the active methods (e.g., seismic reflection method), but the passive methods are required to detect the tiny signal induced by the reservoir condition changes (Alnes *et al.* 2011, Nishi & Ishido 2012). Especially, the change of soil moisture and water table level due to rainfall disturbs gravity and SP measurements, and the signal of perturbation is known to be as much as the one of the reservoir changes (Kazama & Okubo 2009, Matsushima *et al.* 2017). For high-precision gravity and SP monitoring, evaluating the influences of rainfall infiltration is indispensable.

We have measured continuously gravity, vertical-SP, elevation changes (GNSS), precipitation and water table level in Tomakomai CCS demonstration site, Hokkaido. The vertical-SP monitoring was to measure electric potential difference between two electrodes, one of them was settled on the bottom of the observation well (5 m or 10 m under the ground level) and the other was settled on the vicinity of the ground level. Rainwater infiltration generates streaming potential between top and bottom of the water flow, and vertical-SP can be changed according to the percolation process. For example, heavy rain of almost 100 mm in total was observed between 14 Aug. and 17 Aug. in 2018, and we observed SP changes of 10 mV coincide with the rainfall. We tried to interpret the observation results by history-matching method using 2-D flow simulation and geophysical postprocessor (Pritchett 1995). In our presentation, we will report the continuous monitoring results and evaluate the disturbance of SP and gravity due to rainfall.

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