



## **CO<sub>2</sub> leakage monitoring and analysis to understand the variation of CO<sub>2</sub> concentration in vadose zone by natural effects**

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Controlled ex-situ experiments and continuous CO<sub>2</sub> monitoring in the field are significant implications for detecting and monitoring potential leakage from CO<sub>2</sub> sequestration reservoir. However, it is difficult to understand the observed parameters because the natural disturbance will fluctuate the signal of detections in given local system.

To identify the original source leaking from sequestration reservoir and to distinguish the camouflaged signal of CO<sub>2</sub> concentration, the artificial leakage test was conducted in shallow groundwater environment and long-term monitoring have been performed.

The monitoring system included several parameters such as pH, temperature, groundwater level, CO<sub>2</sub> gas concentration, wind speed and direction, atmospheric pressure, borehole pressure, and rainfall event etc. Especially in this study, focused on understanding a relationship among the CO<sub>2</sub> concentration, wind speed, rainfall and pressure difference. The results represent that changes of CO<sub>2</sub> concentration in vadose zone could be influenced by physical parameters and this reason is helpful in identifying the camouflaged signal of CO<sub>2</sub> concentrations.

The 1-D column laboratory experiment also was conducted to understand the sparking-peak as shown in observed data plot. The results showed a similar peak plot and could consider two assumptions why the sparking-peak was shown. First, the trapped CO<sub>2</sub> gas was escaped when the water table was changed. Second, the pressure equivalence between CO<sub>2</sub> gas and water was broken when the water table was changed.

These field data analysis and laboratory experiment need to advance due to comprehensively quantify local long-term dynamics of the artificial CO<sub>2</sub> leaking aquifer.

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