



Determination of environmental change point in time-series data: implication of CO₂ leakage monitoring in groundwater

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Measurement, monitoring and verification scheme including leakage warning system is vital to secure safety and public acceptance during carbon capture and storage project. During the last few decades, many artificial CO₂ leakage experiments have been carried out to understand the mechanisms of CO₂ leaks, but there is not much consensus on how to recognize and define the leaks. The main goal of this study is to suggest proper determination process to identify environmental change caused by CO₂ leakage using real-time monitoring data.

Artificial CO₂ leakage experiments in shallow aquifer with controlled flow system were performed for total 4 months (27 days of injection) by K-COSEM research group. During the experiments, pH, EC, and pCO₂ of groundwater were continuously measured.

With 2 days analyzing window, three simple statistical methods (3 sigma rule, interquartile range rule, Q1-Q3 method) were applied to determine environmental change point (tc). In results, overall, Q1-Q3 method showed the fastest tc, and 3 sigma rule showed the slowest tc which means that Q1-Q3 method can be used for identification in early stage, and 3 sigma rule can be confirmed the tc of Q1-Q3 method. From these results, a flowchart for determination of environmental change was suggested.

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