Applicability of the multi-channel surface-soil CO$_2$-concentration monitoring (SCM) system as a soil CO$_2$ monitoring tool

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Monitoring of CO$_2$ release through the ground surface is essential to verify the safety of carbon capture and storage. We conducted a small injection field test using the multi-channel surface soil CO$_2$ monitoring (SCM) system as a soil CO$_2$ monitoring method. In the system, NDIR sensors measure CO$_2$ concentration 10 cm above the ground surface and acrylic chambers covered the NDIR sensors to protect the sensors. Before injection, the background CO$_2$ concentrations were monitored. They showed the distinct diurnal variation, and were positively related with relative humidity of the air, but negatively with air temperature. The daily variation of CO$_2$ concentrations was damped with precipitation. 4.2 kg of CO$_2$ was injected 1 m below the ground for 29 minutes. CO$_2$ concentrations increased in the all five chambers, which were located less than 2.8 m of distance from each other. The Chamber 1, which is closest to the injection point, showed the largest increase of CO$_2$ concentrations, while Chamber 2, 3, 4 showed the peak which is 2 times higher than the average of background CO$_2$. The CO$_2$ concentrations decreased from the peak around 4 hours after the injection ended in Chamber 2, 4, and 5. The CO$_2$ concentrations seem to be recovered to the background around 4 hours after the injection ended. The result of statistical analysis for determining the leakage shows that the coefficient of variation of CO$_2$ for 30 minutes (CV$_{30min}$) is efficient to determine the leakage signal, with reflecting the fast change in CO$_2$ concentrations.

Biography
Jeong-Chan Kim has completed his PhD from Seoul National University. He is the director of Deep Geoenvironment Research Center, KIGAM (Korea Institute of Geoscience and Mineral Resources). He has published more than 20 papers in reputed journals and has been serving as a member of Geological Society of Korea.

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