Temporal changes of natural leakage of geogenic CO_2 in Daepyeong, South Korea

G. CHAE[1]*, C. Y. KIM[1], S. YU[2], Y. J. SHINN[1]

[1]Korea Institute of Geoscience and Mineral resources, 124 Gwahak-ro, Yuseong-gu, Daejeon 34132, South Korea (*correspondence: gtchae@kigam.re.kr, kcy404@gmail.com, shinn21@kigam.re.kr)

[2]Korea-CO_2 Storage Environmental Management (K-COSEM) Research Center, Korea Univ., 145 Anam-ro, Seongbuk-gu, Seoul 02841, South Korea (s7yu.iamysy@gmail.com)

We monitored geogenic CO_2, which naturally discharges into the air through the soil, to characterize changes in leaks over time. The study area, Daepyeong, South Korea, is the contact zone between Jurassic granite and Precambrian gneiss, and devoid of volcanic activity and large-scale faults. The temporal monitoring was conducted at a point where the CO_2 flux, vadose zone CO_2 concentration and $\delta^{13}C_{CO2}$ were significantly higher than those obseved at the surrounding area[1]. This point is about 2 m away from a carbonated water well, and the soil CO_2 was found to be the result of degassing from the carbonated water[1]. CO_2 flux, vadose zone (60 cm depth) gas composition and carbon-13 isotope were monitored every two hours from November 2 to 5, 2018. As a result, the CO_2 flux showed a diurnal variation, with increasing daytime and decreasing at night. The CO_2 flux was more correlated with atmospheric pressure than with atmospheric temperature or relative humidity. This is probably because the discharge of CO_2 to the surface was affected by barometric pumping. The mean value of CO_2 flux was 564.1 g/m^2/d, and similar to 546.2 g/m^2/d measured in summer in the previous study[1]. This supported that the discharging CO_2 is geogenic rather than biogenic that varies seasonally. The vadose zone CO_2 concentrations, which was sampled 1 m from the CO_2 flux measurement point, varied from 40 to 48%, but a diurnal variation was not evident. The vadose zone CO_2 concentration did not correlate with the CO_2 flux measured on the surface, while it was on the mixing line with the atmosphere in the CO_2-O_2 and CO_2-N_2 relationship. These results suggeted that the change of vadose zone CO_2 was due to the mixing with atmosphere. In addition, the carbon isotope mass balance calculation did not show any influx or mixing of biogenic CO_2. Therefore, it can be concluded that the change of vadose zone CO_2 was due to the change of geogenic CO_2 inflow.

[1] Chae et al. (2018) *EGU2018* **4080**