Supplementary material

Figure S1: IRIS measurement stability for a cylinder of compressed air containing about 500 ppm of CO$_2$. (a) 1 Hz time-series of total CO$_2$ concentration, (b) 1 Hz time-series of $\delta^{18}$O of CO$_2$, (c) Allan plot of total CO$_2$ concentration and (d) Allan plot of $\delta^{18}$O of CO$_2$. 
Figure S2: The influence of extending Eq. 1 to account for boundary conditions found at the bottom of incubation vessels (Eq. 7) was tested in four incubations containing 70, 100, 300 and 400 g of soil ($\theta_w = 0.11$ to 0.12). Solutions for $v_{inv}$ and $\bar{v}_{inv}$ and the corresponding semi-infinite and finite estimates of $k_{iso}$ calculated as described in the manuscript (a) $k_{iso}$ estimates using the semi-infinite and the finite-depth solutions for different soil depths and (b) their difference.