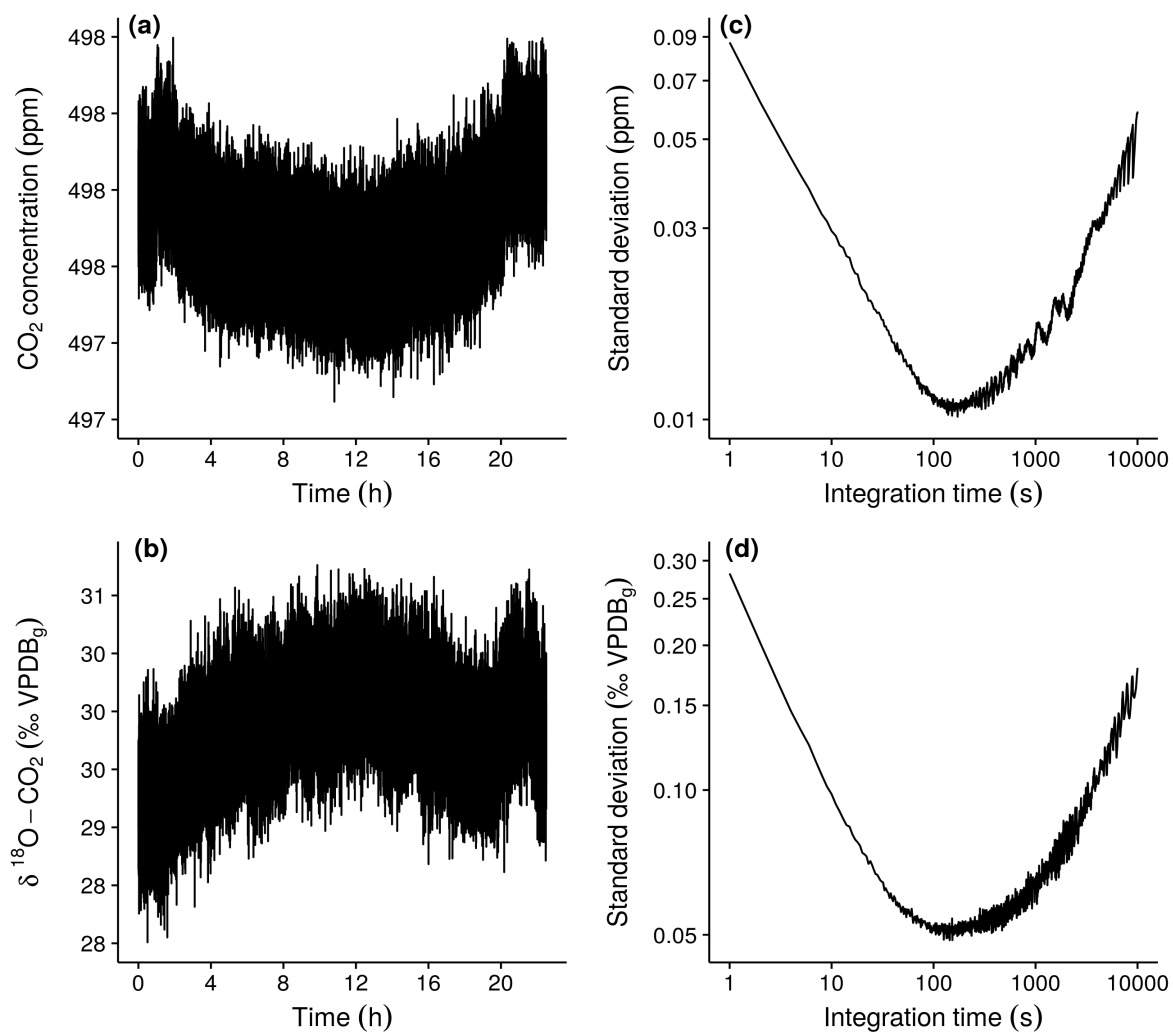**Supplementary material**

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.
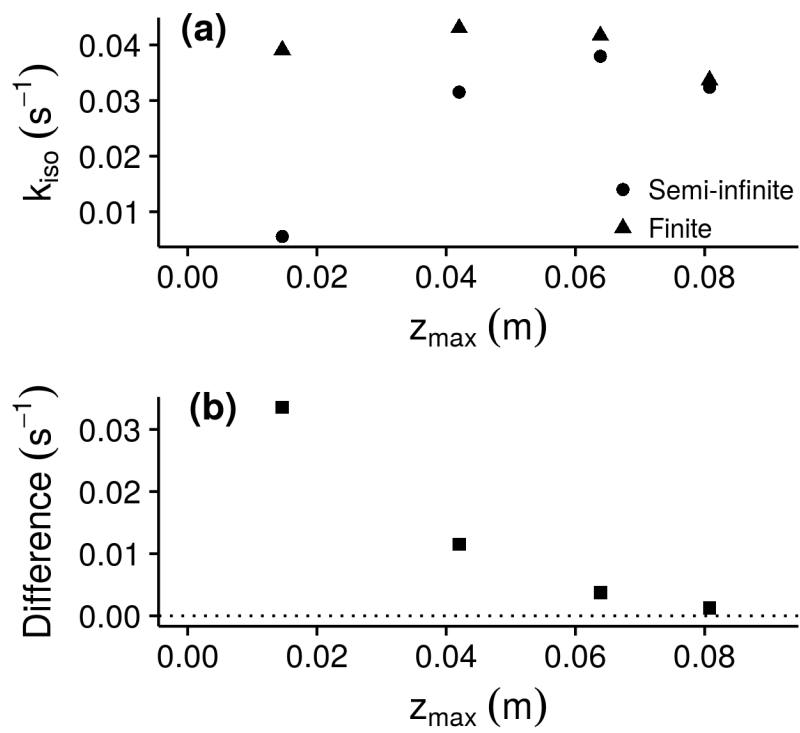
Figure S2: The influence of extending Eq. 1 to account for boundary conditions found at the bottom of incubation vessels (Eq. 7) was tested in four incubations containing 70, 100, 300 and 400 g of soil (θ_w = 0.11 to 0.12). Solutions for v_{inv} and $\tilde{v}_{inv}$ and the corresponding semi-infinite 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.