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Vertical partitioning of CO_2 production in a forest soil

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Compensation algorithm of dependence of pressure and temperature for GMP221:

$$c_{[i+1]} = c_1 - k_{p1}[c_i] \times \left(\frac{p-1013}{1013}\right)^2 - k_{p2}[c_i] \times \left(\frac{p-1013}{1013}\right) \times p$$
$$- k_{t1}[c_i] \times \left(\frac{T-25}{25}\right)^3 - k_{t2}[c_i] \times \left(\frac{T-25}{25}\right)^2 - 16320 \times (-(k_{t3}[c_i])^2 + k_{t3}[c_i]) \times \left(\frac{T-25}{25}\right)$$

S1

where $i \in \{1,2,3,4\}$, $c_{(i+1)}$ [ppm] is the compensated CO_2 reading in the iteration process, c_1 is the uncompensated reading in [ppm], p is the pressure in [hPa], T is the temperature in [°], and k_{p1}, k_{p2}, k_{t1}, k_{t2} and k_{t3} are empirical derived functions.

$$k_{p1}[c_i] = A_{p1} \times c_i^4 + B_{p1} \times c_i^3 + C_{p1} \times c_i^2 + D_{p1} \times c_i$$

S2

$$k_{p2}[c_i] = A_{p2} \times c_i^3 + B_{p2} \times c_i^2 + C_{p2} \times c_i$$

S3

$$k_{t1}[c_i] = A_{t1} \times c_i^3 + B_{t1} \times c_i^2 + C_{t1} \times c_i + D_{t1}$$

S4

$$k_{t2}[c_i] = A_{t2} \times c_i^2 + B_{t2} \times c_i$$

S5

$$k_{t3}[c_i] = A_{t3} \times c_i^3 + B_{t3} \times c_i^2 + C_{t3} \times c_i$$

S6

where c_i is the CO_2 concentration in [%] and A, B, C, D *are* empirical derived constants (Table S1).

Table S1: Empirical derived constants for temperature and pressure compensation

A_{p1} =	0.97501	A_{p2} =	-9.3269E-3	A_{t1} =	0.046481	A_{t2} =	-3.0166	A_{t3} =	8.3600E-5
B_{p1} =	-54.1519	B_{p2} =	0.14345	B_{t1} =	-1.02280	B_{t2} =	-8.8421	B_{t3} =	-2.4199E-3
C_{p1} =	479.778	C_{p2} =	15.7164	C_{t1} =	-37.4433			C_{t3} =	0.066814
D_{p1} =	-11362.8			D_{t1} =	-49.000				

The compensated reading was calculated in an iterative process. In the first iteration loop (i=1), c_2 was calculated from equation (1) by using c_1 for S2-S5. The obtained c_2 was then used in the following loop and so on. The iteration stops at the last c_5, which was the temperature and pressure corrected reading.

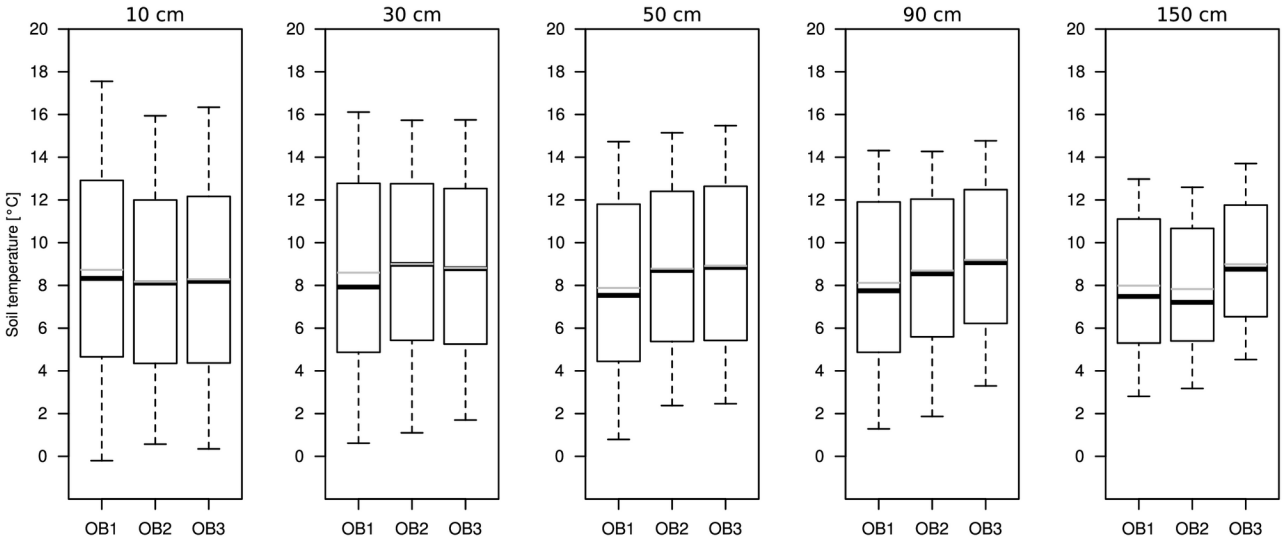

Figure S1. Box-whisker-plot of soil temperature for each soil depth and observatory (OB). Medians and means are shown as black and grey lines respectively.

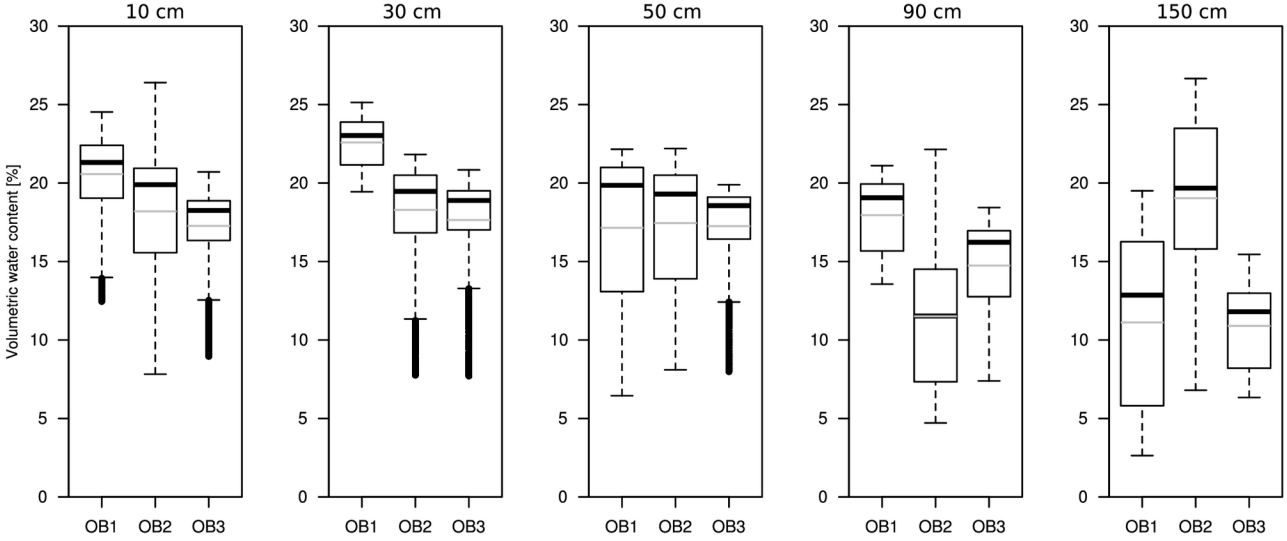

Figure S2. Box-whisker-plot of volumetric water content for each soil depth and observatory (OB). Medians and means are shown as black and grey lines respectively.