Supplement of Vertical partitioning of CO₂ production in a Dystric Cambisol

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Compensation algorithm of dependence of pressure and temperature for GMP221:

\[
c_{\text{i+1}} = c_i - k_{p1}[c_i] \times \left( \frac{p-1013}{1013} \right)^2 - k_{p2}[c_i] \times \left( \frac{p-1013}{1013} \right) \times p
- k_{t1}[c_i] \times \left( \frac{T-25}{25} \right)^3 - k_{t2}[c_i] \times \left( \frac{T-25}{25} \right)^2 - 16320 \times \left( - (k_{t3}[c_i]^2 + k_{t4}[c_i]) \times \frac{T-25}{25} \right)
\]

S1

where \( i \in \{1,2,3,4\} \), \( c_{\text{i+1}} \) [ppm] is the compensated CO₂ reading in the iteration process, \( c_i \) 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 CO₂ concentration in [%] and \( A, B, C, D \) are empirical derived constants (Table S1).

Table S1: Empirical derived constants for temperature and pressure compensation

<table>
<thead>
<tr>
<th>( A_{p1} )</th>
<th>( A_{p2} )</th>
<th>( A_{p3} )</th>
<th>( A_{p4} )</th>
<th>( A_{t1} )</th>
<th>( A_{t2} )</th>
<th>( A_{t3} )</th>
<th>( A_{t4} )</th>
<th>( A_{t5} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.97501</td>
<td>-9.3269E-3</td>
<td>0.046481</td>
<td>-3.0166</td>
<td>8.3600E-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-54.1519</td>
<td>0.14345</td>
<td>-1.02280</td>
<td>-8.8421</td>
<td>-2.4199E-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>479.778</td>
<td>15.7164</td>
<td>-37.4433</td>
<td>0.066814</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>-11362.8</td>
<td>-49.000</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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.