1. INTRODUCTION
Remote sensing of vegetation requires modelling to retrieve parameters (pigments, water content etc.) from a recorded spectrum. A well-predicting model does not necessarily cover all aspects of reality (figure 1).

As you see, the model does not correctly represent leaf anatomy for an accidental leaf.

2. QUESTIONS
1. Is there a significant difference in optical properties of two leaf sides?
2. Can we attribute the difference (if any) to physiological traits?
3. Can we make the Fluspect model more accurate by incorporating leaf heterogeneity?

4. RESULTS
The results showed that there was 5-10% difference in reflectance between two leaf sides (from the abaxial reflectance was higher) for dicots and no substantial difference for monocots (figure 2). No substantial difference in transmittance was recorded (figure 2).

The quality of chlorophylls and carotenoids concentration retrieval with the Fluspect model is presented in the Table 1.

Table 1. Root Mean Square Error (RMSE in µg cm\(^{-2}\)) of Fluspect retrieval of chlorophylls and carotenoids concentrations from reflectance (R), transmittance (T) or both (R+T) spectral data of adaxial and abaxial leaf sides.

<table>
<thead>
<tr>
<th>Side</th>
<th>Chlorophylls (Cab)</th>
<th>Carotenoids (Cca)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>adaxial</td>
<td>abaxial</td>
</tr>
<tr>
<td>R</td>
<td>22 (0.20)</td>
<td>52 (0.46)</td>
</tr>
<tr>
<td>T</td>
<td>34 (0.30)</td>
<td>33 (0.29)</td>
</tr>
<tr>
<td>R + T</td>
<td>34 (0.30)</td>
<td>55 (0.49)</td>
</tr>
</tbody>
</table>

Note: Chlorophylls were, as expected, retrieved with higher accuracy from adaxial reflectance, however, Carotenoids, surprisingly, - from abaxial reflectance.

5. CONCLUSION
1. For leaves of dicots broadband reflectance from the adaxial side was lower than from the abaxial.
2. Leaf roughness or chlorophyll packaging are plant traits that may cause it.
3. The Fluspect, probably, will not be more accurate, but we can retrieve more traits without losing the current accuracy.

3. MATERIALS AND METHODS
Reflectance and transmittance from both sides of leaves were measured with FieldSpec 4 Wide-Res Spectroradiometer (ASD Inc.) under solar illumination.

Leaves were fixed in a FluWat (Alonso et al., 2007) leaf clip (figure 3).

The curves were fitted in the Fluspect model.

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