

# Uncertainty propagation with RTM: Exercise 1

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# 1. Exercise 1. PROSPECT

## ■ Aim:

1. Simulate the measurement / estimation of different parameters of the model PROSPECT
2. Reproduce distributions according to uncertainties
3. Estimate the uncertainty of the transmittance and reflectance factors predicted by PROSPECT

# 1. Exercise 1. PROSPECT

- Pigments:

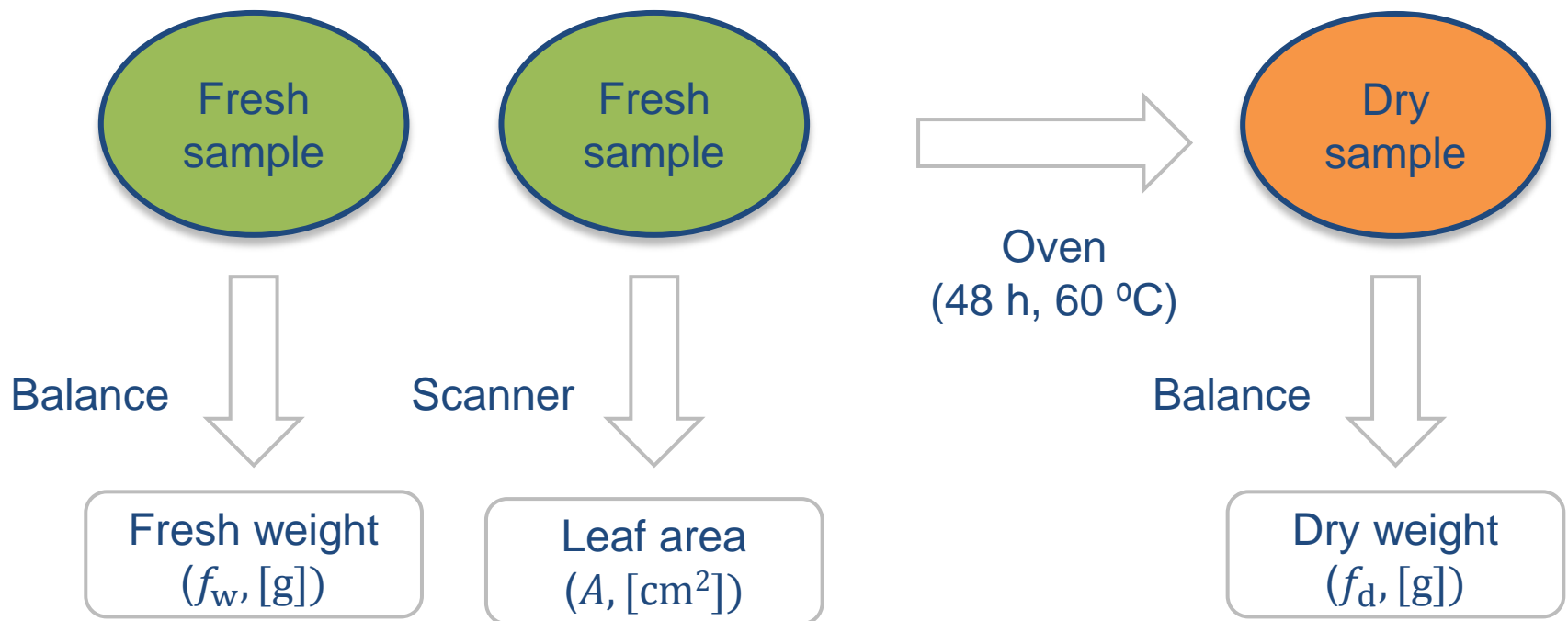
- We assume that  $C_{ab}$  and  $C_{ar}$  are estimated using leaf clip type SPAD-502
- Laboratory curves give the following prediction standard uncertainties:
  - $u_{C_{ab}} = 3 \mu\text{g}/\text{cm}^2$
  - $u_{C_{ar}} = 1.5 \mu\text{g}/\text{cm}^2$



<https://www.enviromonitors.co.uk>

# 1. Exercise 1. PROSPECT

- Water and dry matter content
  - Gravimetric method



# 1. Exercise 1. PROSPECT

- Water and dry matter content

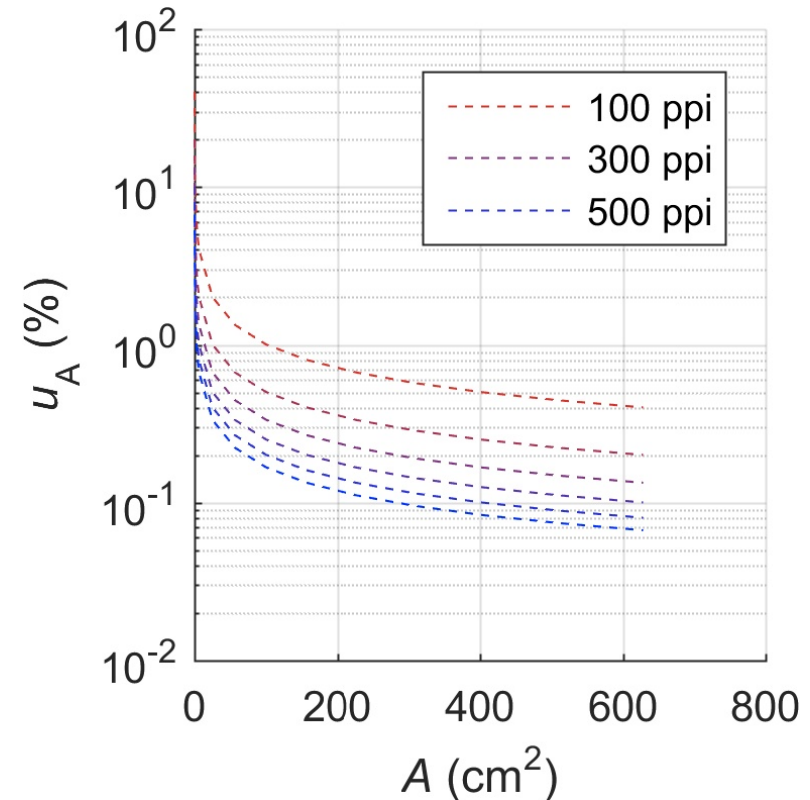
- $C_w = \frac{m_w - m_d}{A}$ , [g cm<sup>-2</sup>]

- $C_m = \frac{m_d}{A}$ , [g cm<sup>-2</sup>]

- Uncertainties

- $u_{\text{Balance}} = 0.02$ , [g]

- $u_{\text{Area}} = \frac{n_{\text{pix,perimeter}}}{n_{\text{pix,area}}}$ , [-]



# 1. Exercise 1. PROSPECT

- Assume ellipsoidal leaves

- $R_1 = 2R_2$

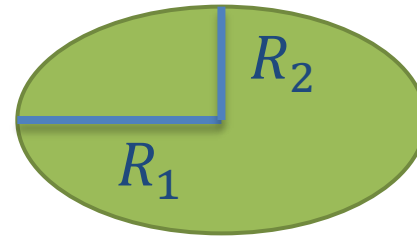
- $A_{\text{ellipse}} = \pi R_1 R_2$

- $P_{\text{ellipse}} = 2\pi \sqrt{\frac{R_1^2 + R_2^2}{2}}$

- $n_{\text{pixels}} = \frac{l \cdot r}{2.54}$

- $r$  is scanner resolution (300 dpi)

- $l$  is length (cm)



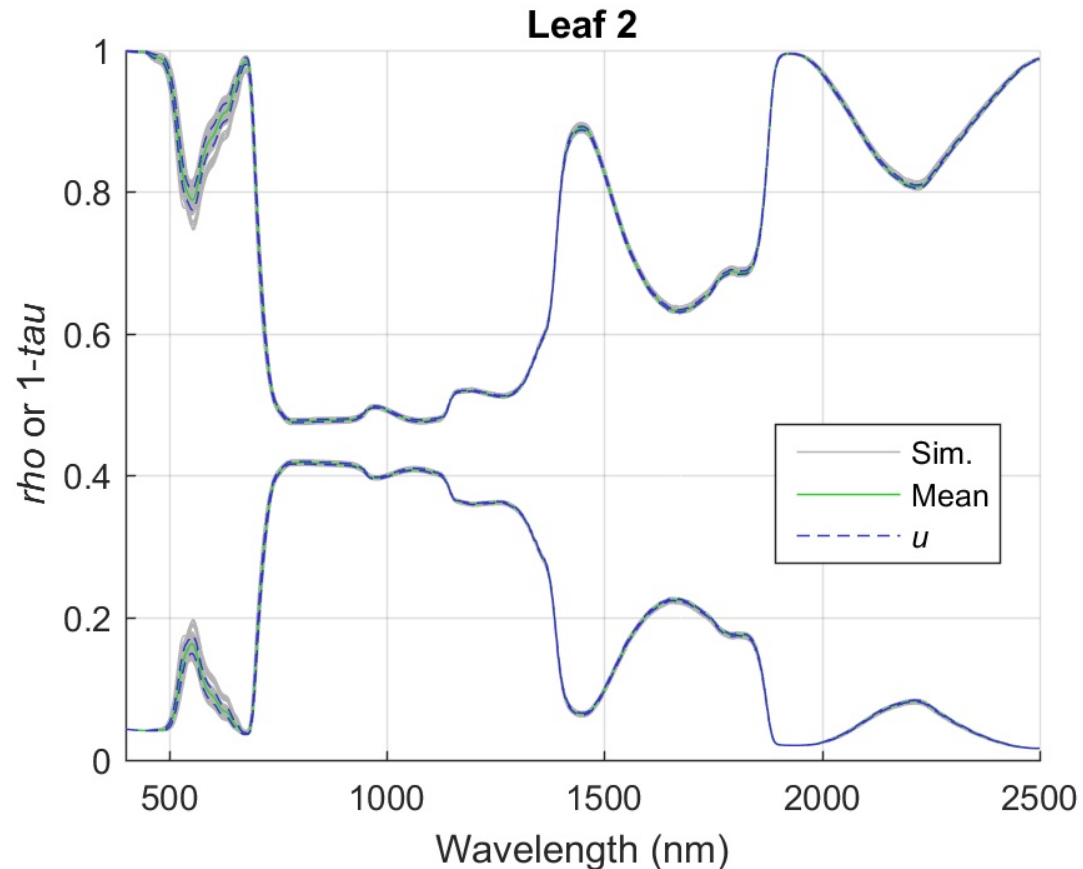
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- Data available
  - /Session2/Ex1\_TableLeafParam.csv

	$C_{ab}$	$C_{ar}$	$m_f$	$m_d$	$A$	$N$
Leaf 1	10	3	1.02	0.62	39.26991	1.8
Leaf 2	30	9	1.75	0.34	56.54867	1.3
Leaf 3	50	15	2.93	0.62	76.96902	1.4

# 1. Exercise 1. PROSPECT

## ■ Target:







# THANKS!