

Airborne Imaging Spectroscopy Workshop

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BruHyp'05

Water Stress and Fluorescence Detection in Crop Canopies with AHS Thermal Imagery: simulations with FluorMOD

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IAS/CSIC

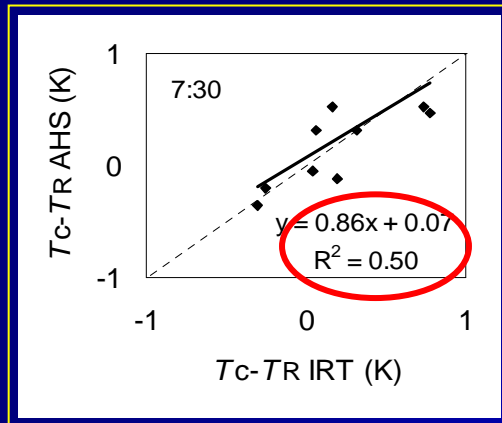


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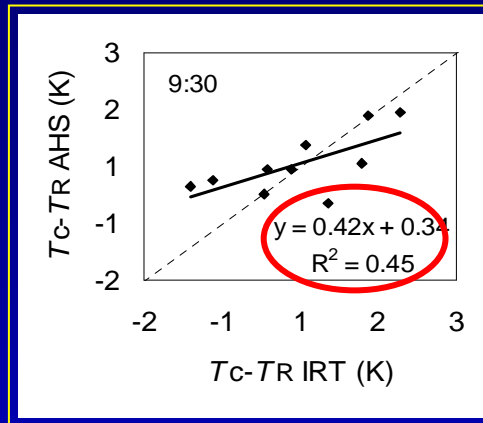


York University

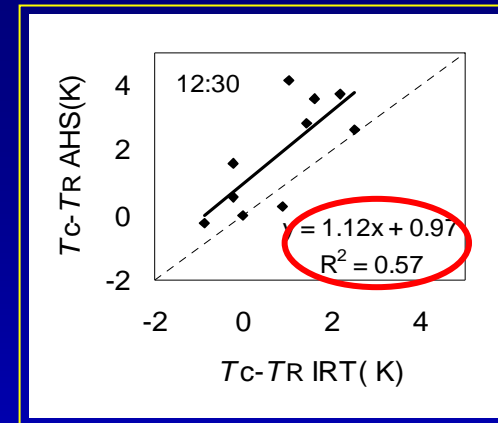
Tree Crown Temperature from 3 Image Acquisitions



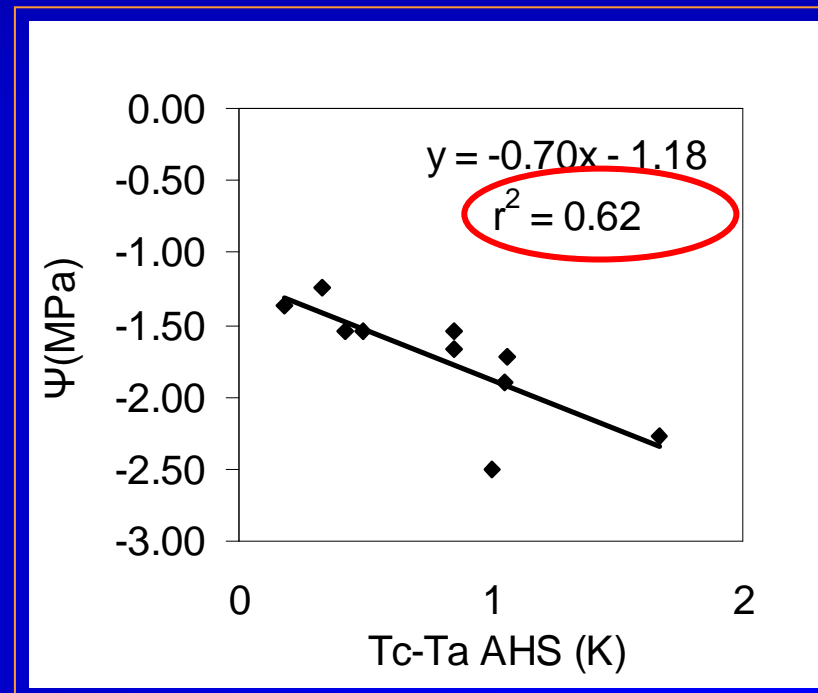
7:30



9:30

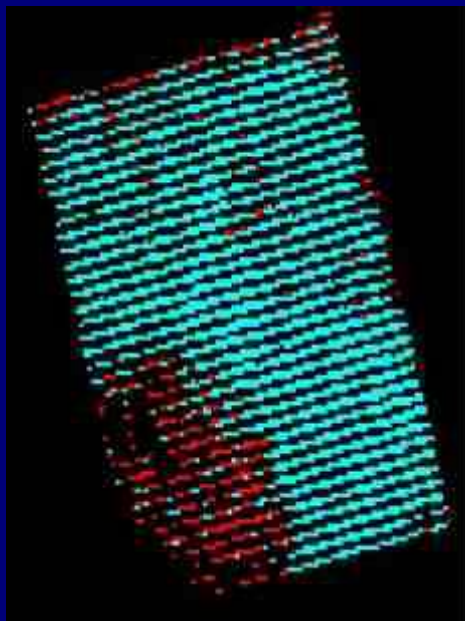


12:30



Water stress detection at the crown level
→ relationship with water potential

7:30



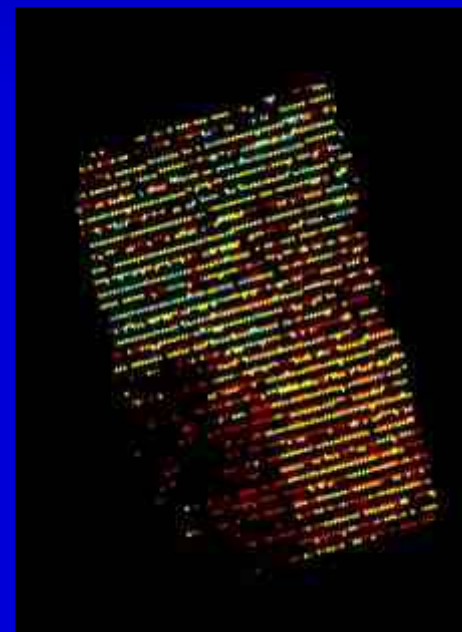
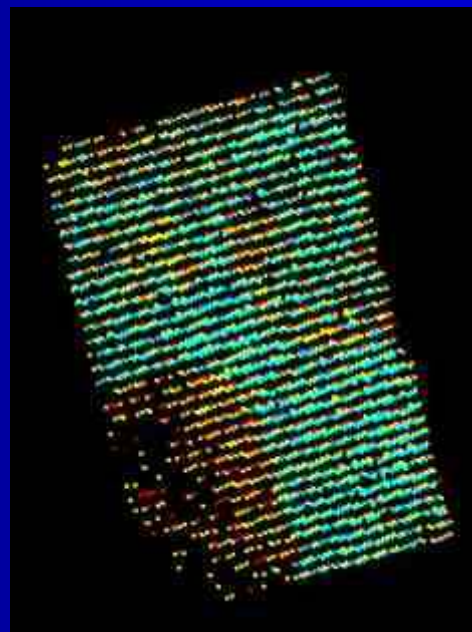
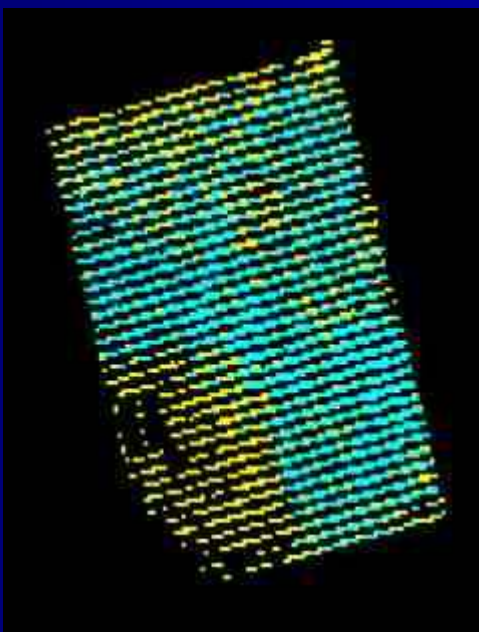
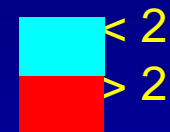
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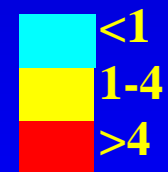
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$T_c - T_R$ (K)

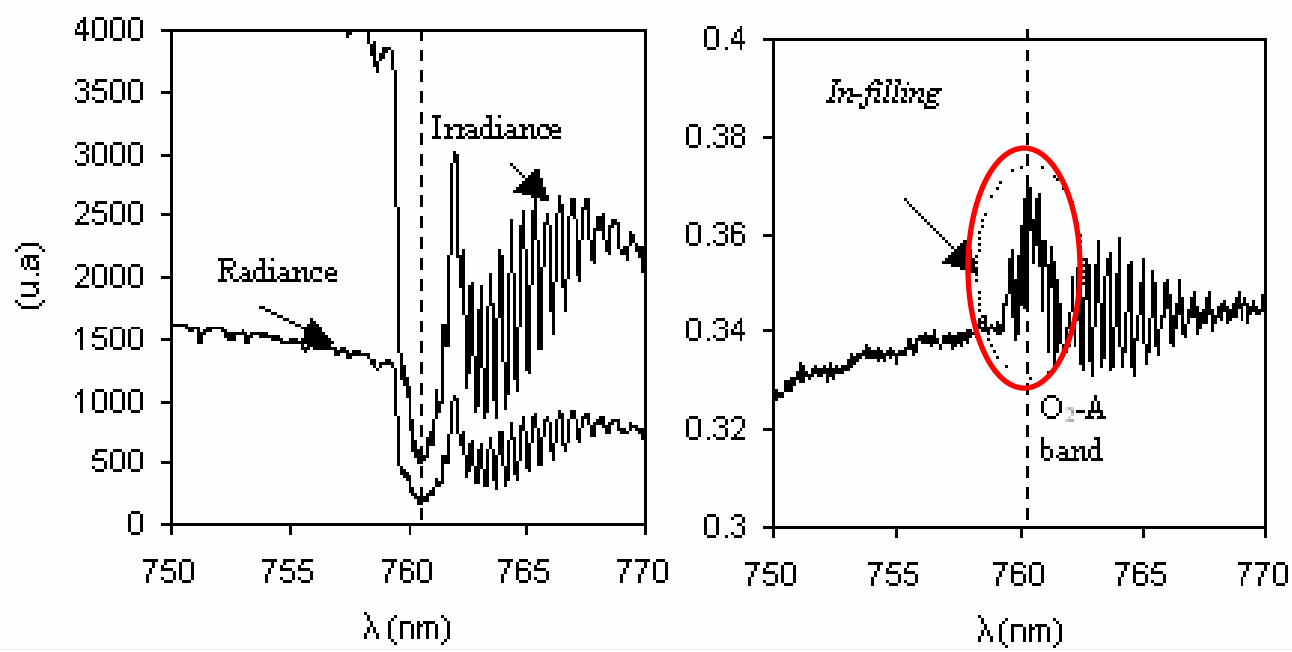
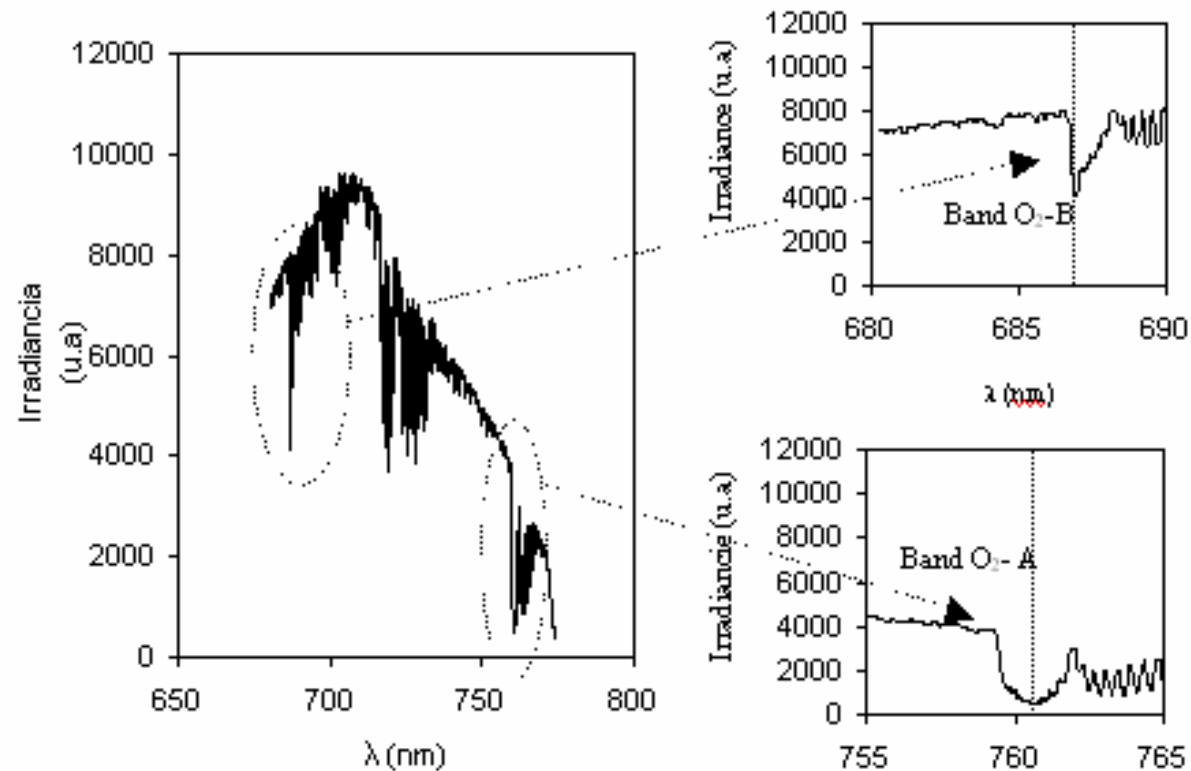


$T_c - T_a$ (K)



Spectral Measurements of Fluor *In-filling*

Irradiance and crown radiance measured with very high spectral detail inside the O₂-A (760.5 nm) and O₂-B (687 nm) bands



Spectral calculation of reflectance from irradiance and vegetation radiance spectra, showing a *peak* or *in-filling* at the oxygen bands

MODTRAN Atmospheric File

Input MEP File:

Value from Atm. File

Visibility:
 View Zenith:
 Rel. Azimuth:
 Solar Zenith:

INLET INL_dn
 INL_up INL_dn
 INL_up_dn
 INL_dn

FluorMod

Graphic User Interface

Waiting

Leaf Input Parameters

n	<input type="text" value="1.5"/>	τ_l	<input type="text" value="0.04"/>
C_{ab}	<input type="text" value="33"/>	T	<input type="text" value="20"/>
C_w	<input type="text" value="0.025"/>	g	<input type="text" value="2"/>
C_s	<input type="text" value="0.7"/>	S_{ts}	<input type="text" value="2.0"/>

F (fluorleaf.txt)

Leaf I (FN, TN)

Output Files

Automatic
 Manual

Canopy Input Parameters

ρ_{so}	<input type="text" value="0.0"/>	v_{zo}	<input type="text" value="0.0"/>
LAI	<input type="text" value="4"/>	h	<input type="text" value="0.1"/>
LIDF _a	<input type="text" value="0.5"/>	PAR _b	<input type="text" value="0.0025"/>
LIDF _b	<input type="text" value="0.5"/>	PAR _{ref}	<input type="text" value="0.0015"/>

Canopy Input / Output Files

Soil Reflectance:
 Leaf Reflectance:
 Leaf Transmittance:
 Upward Fluorescence:
 Downward Fluorescence:

Output File

Automatic Manual

Output Canopy Model

Eson Esky Etop Rshad
 Flrad Tshad Rshel Rshel
 wSAIL wSAIL/wshel
 TOAb TOAlb TOAs TOAts

Output File:

FluorMOD Simulation: Fluorescence Effects on Reflectance

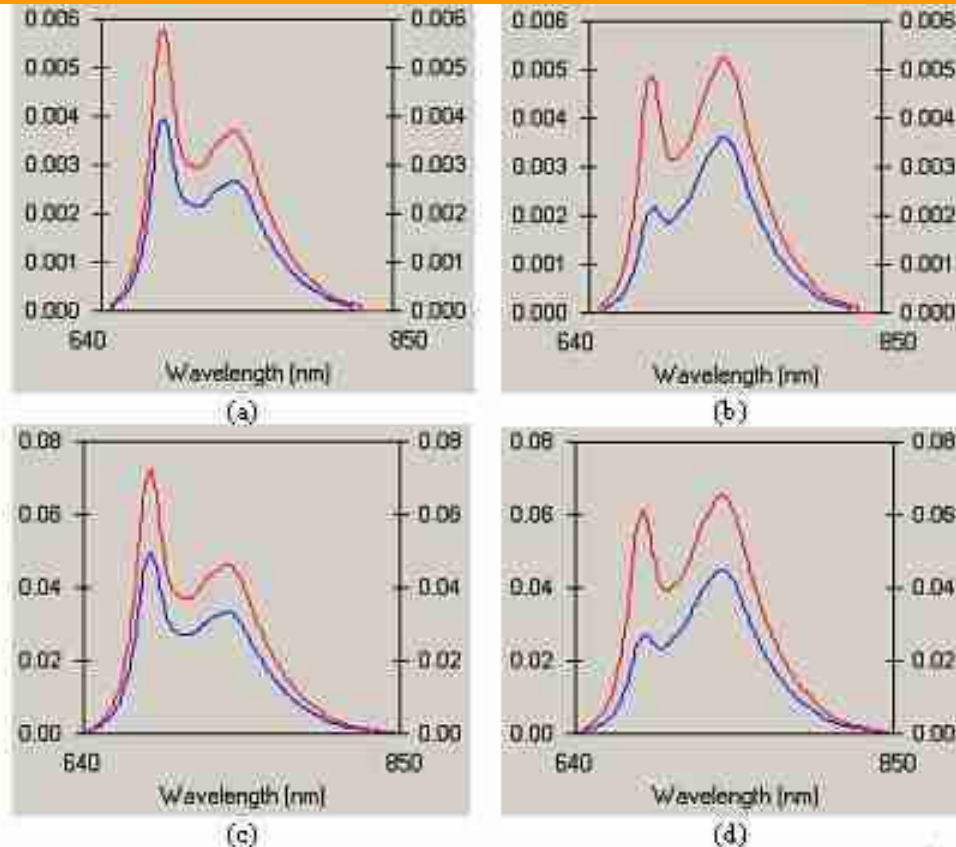
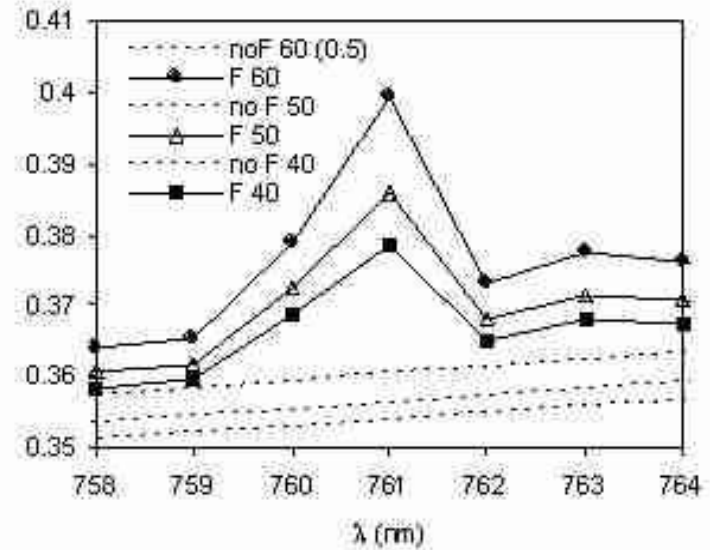


Figure 6. Simulation results for the fluorescence emission spectra for $C = 20 \mu\text{g}/\text{cm}^2$ (a, c) and $C = 60 \mu\text{g}/\text{cm}^2$ (b, d) for $F_i = 0.04$ (a, b) and $F_i = 0.5$ (c, d) using FluorMODgui.



Fluorescence Effects on Leaf Reflectance

Fluorescence Effects on Canopy Reflectance