SENSECO WG1
SIFCOMX

FLIGHT
a 3D MCRT model

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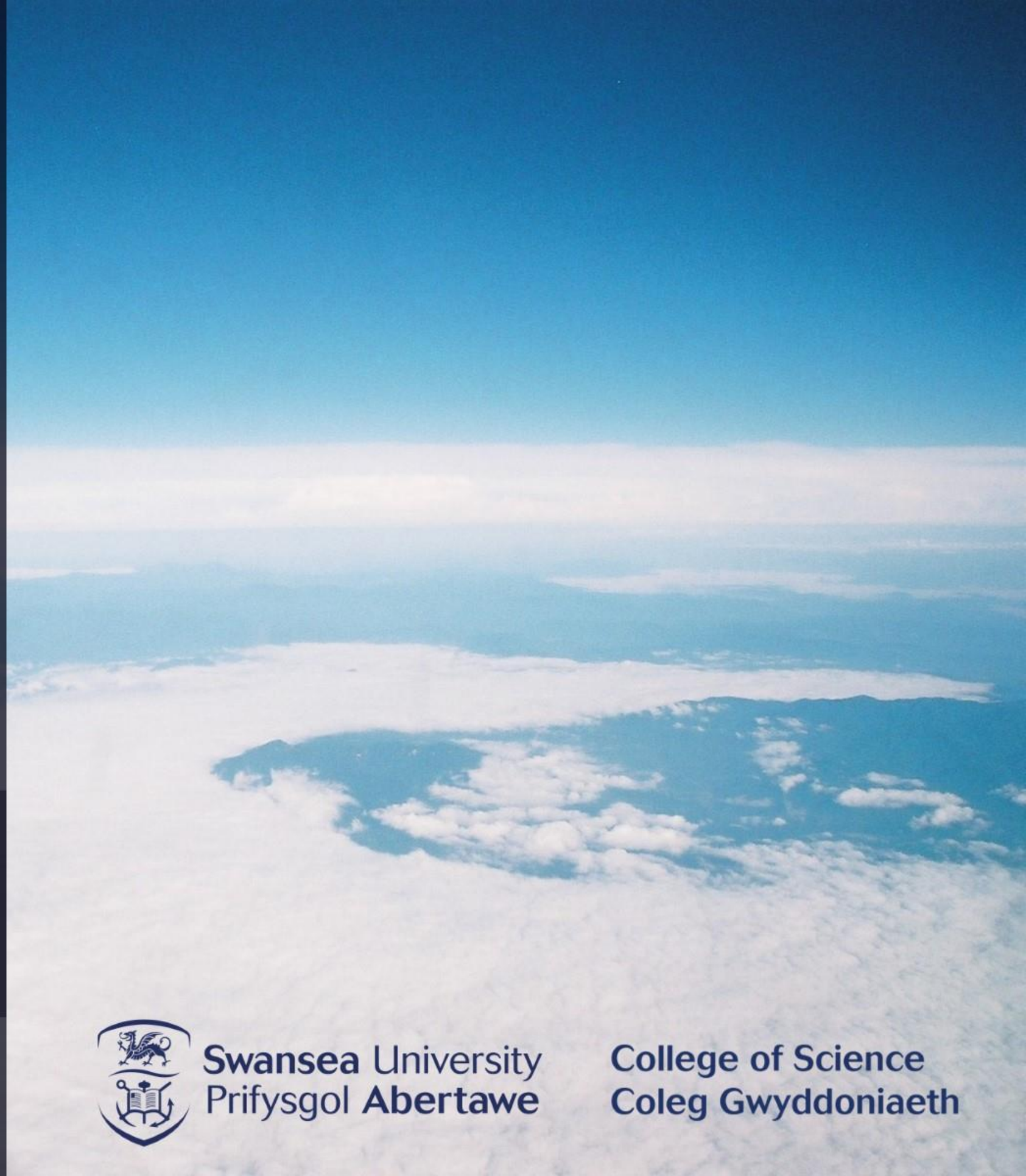

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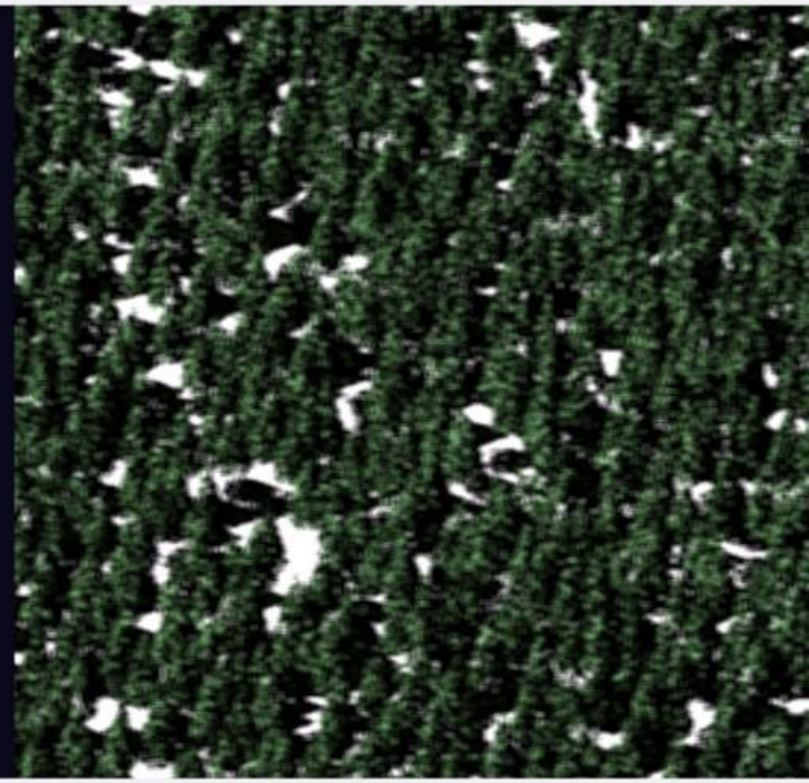
FLIGHT
North 1996, North et al., 2010, Hernandez-Clemente et al 2017

FLIGHT 3D MCRT Model

- Standalone application
  - in_flight.data, reverse.data
  - crowns.data || forest_gen()
  - SPEC, LIDAR, FLUOR

- Reflectance response of 3D veg. canopies
- Photosynthesis model (LUE)
- LiDAR Waveform, photon count
- **Fluorescence (SIF)**

- Inverse modelling for atmospheric and **biophysical parameters** retrieval



FLIGHT BRF Comparisons

- RAMI1-3 Intercomparisons
  Widlowski et al., JGR (2007)
  Widlowski et al., RSE (2008)

- Comparison with ASAS Data
  North, IEEE TGARS (1996)

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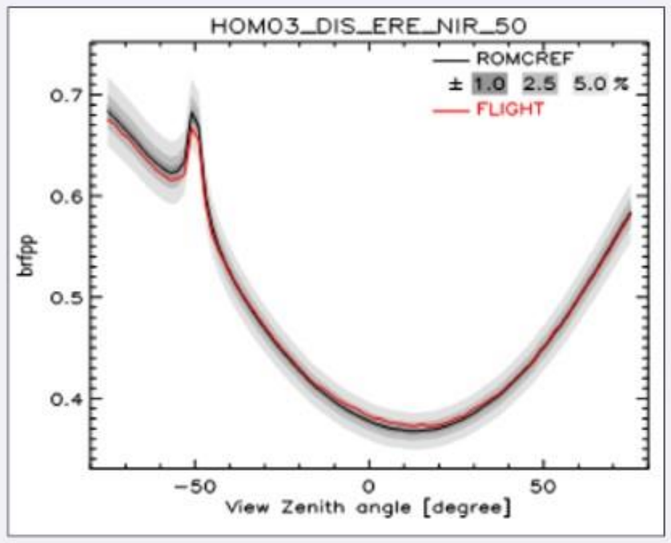
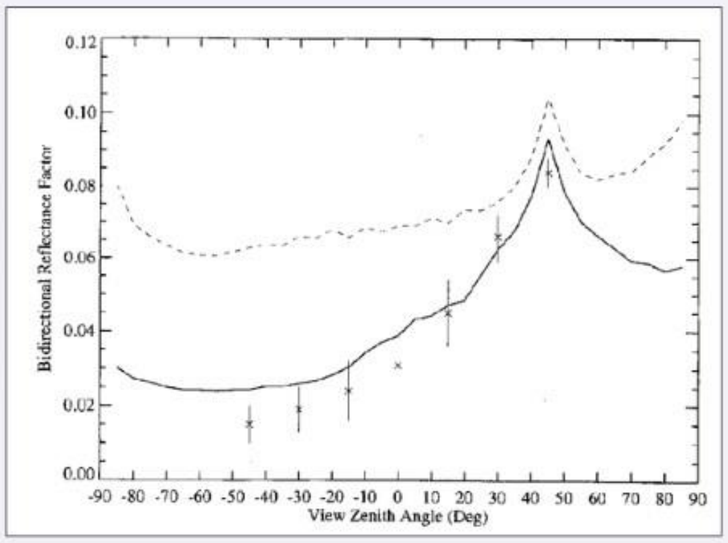
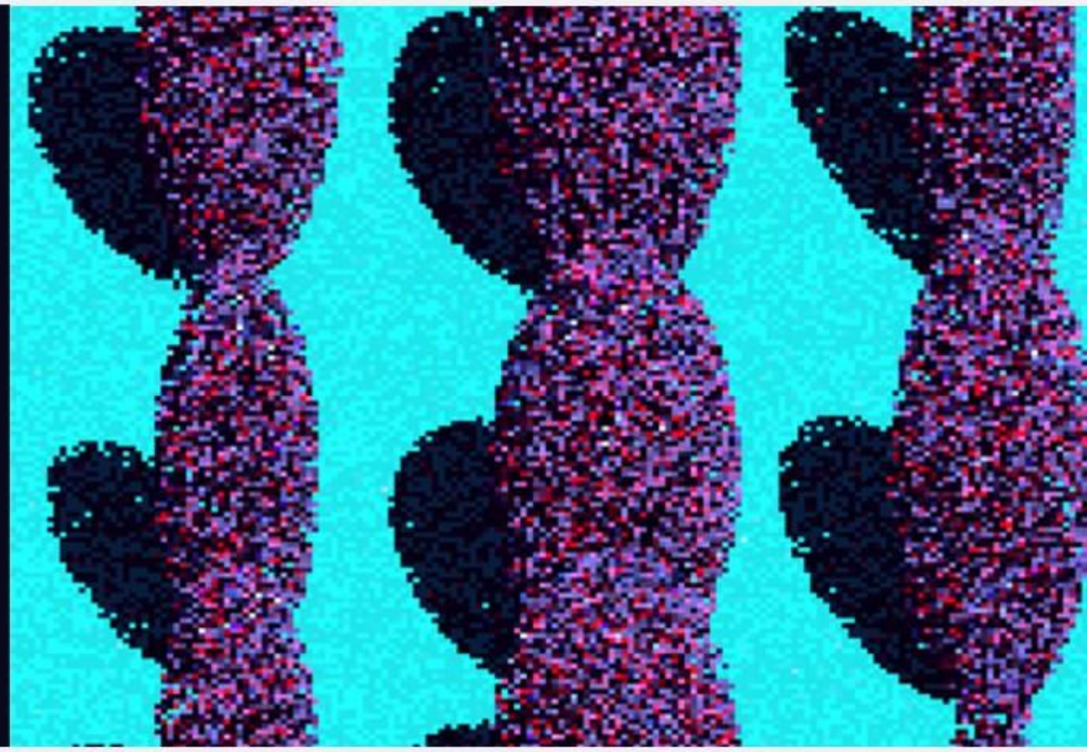


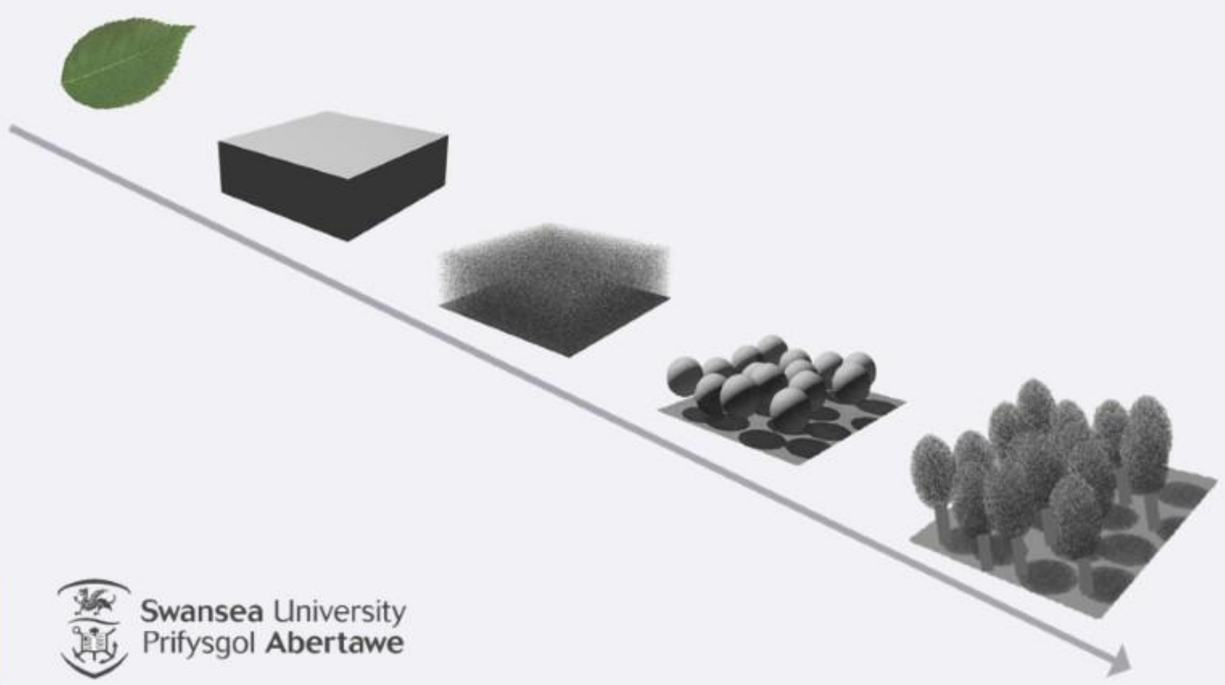


FluorFLIGHT
fluspect + FLIGHT*

- Coupled with FLUSPECT
  + Fluorescence quantum efficiency (Fi)

Canopy model plus:
- EEFM contribution to radiance
  Down/upwards fluorescence matrices (PSI & PSII)
- Leaf reflectance/transmittance without fluorescence
- Solar Irradiance





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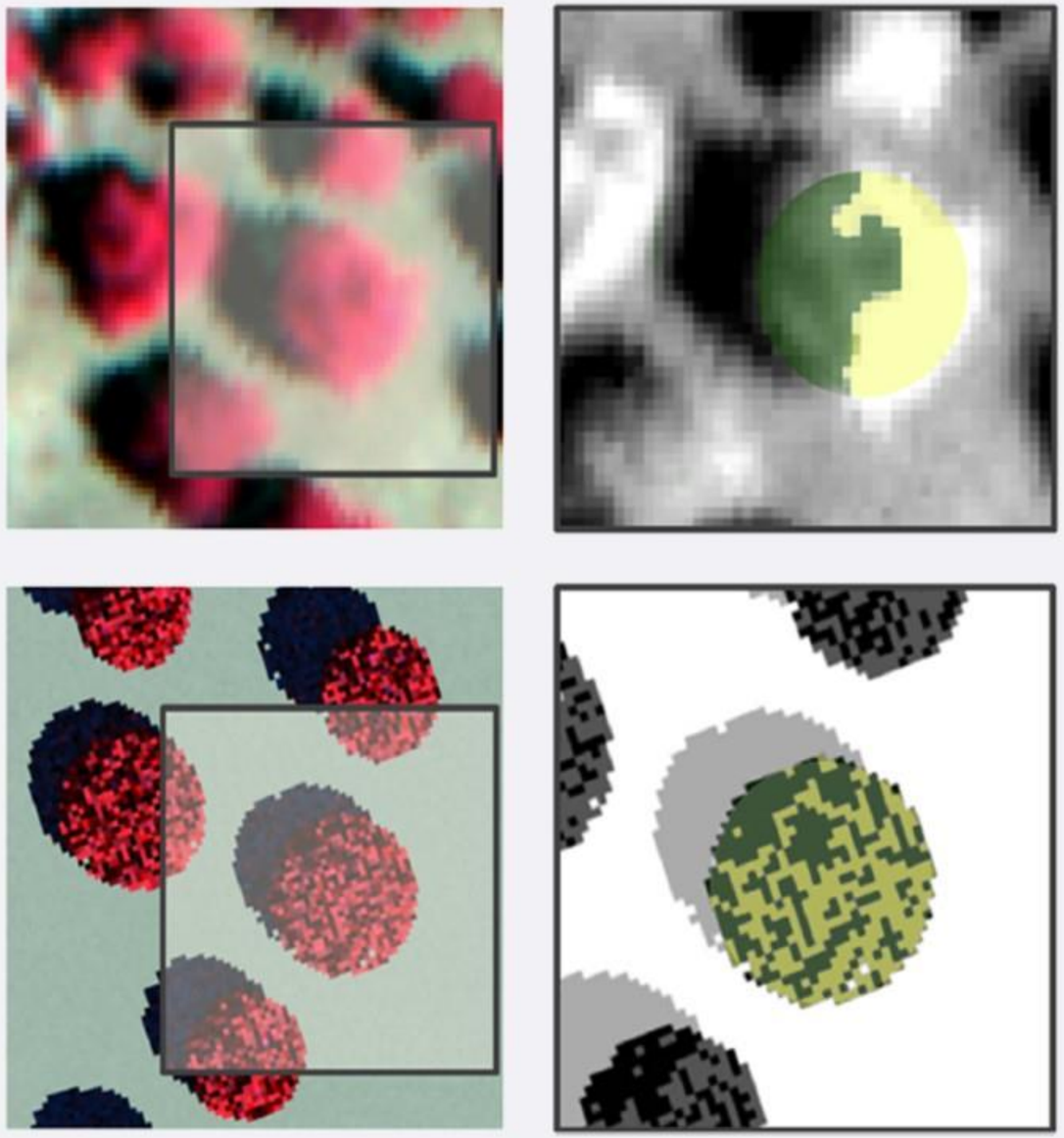
Hernández-Clemente et al., RSE (2017)

FluorFLIGHT
Early detection of *Phytophthora* infections in oaks



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Model simulation approach

i) Modelling forest canopy structural effects on fluorescence signal.

ii) Fluorescence retrieval with FluorFLIGHT and hyperspectral data for detecting forest stress

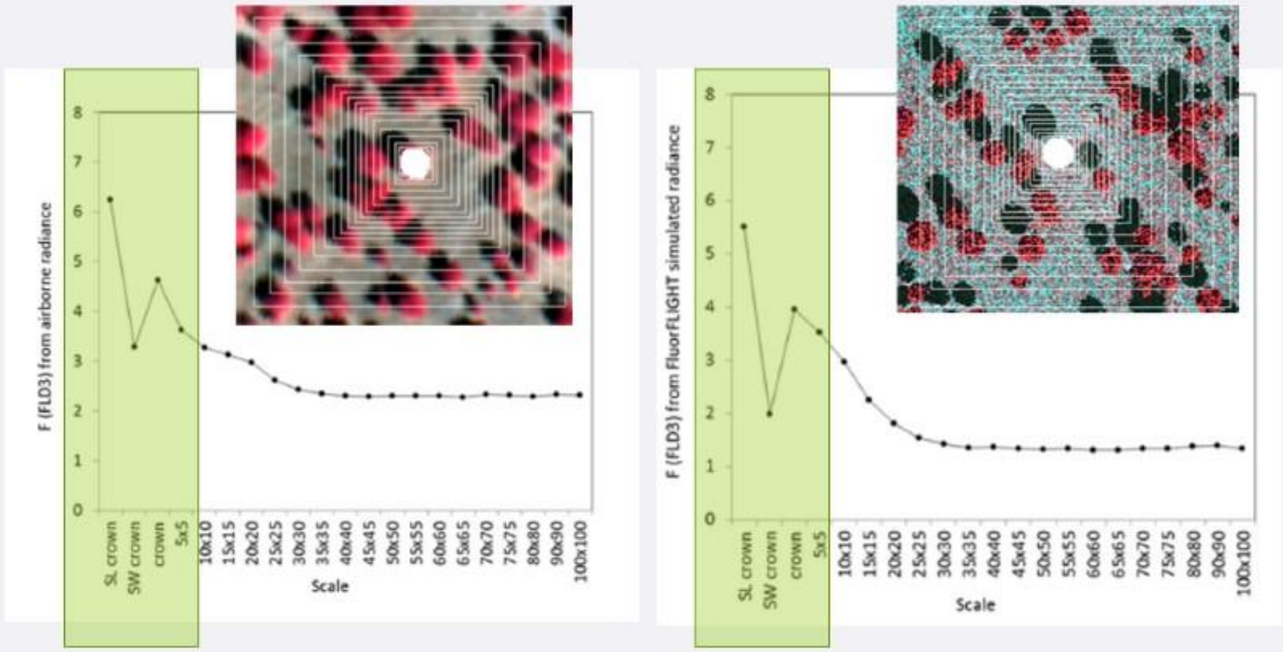
↖ Micro-hyperspectral imagery acquired at 40 cm

↙ Scene simulated with FluorFLIGHT

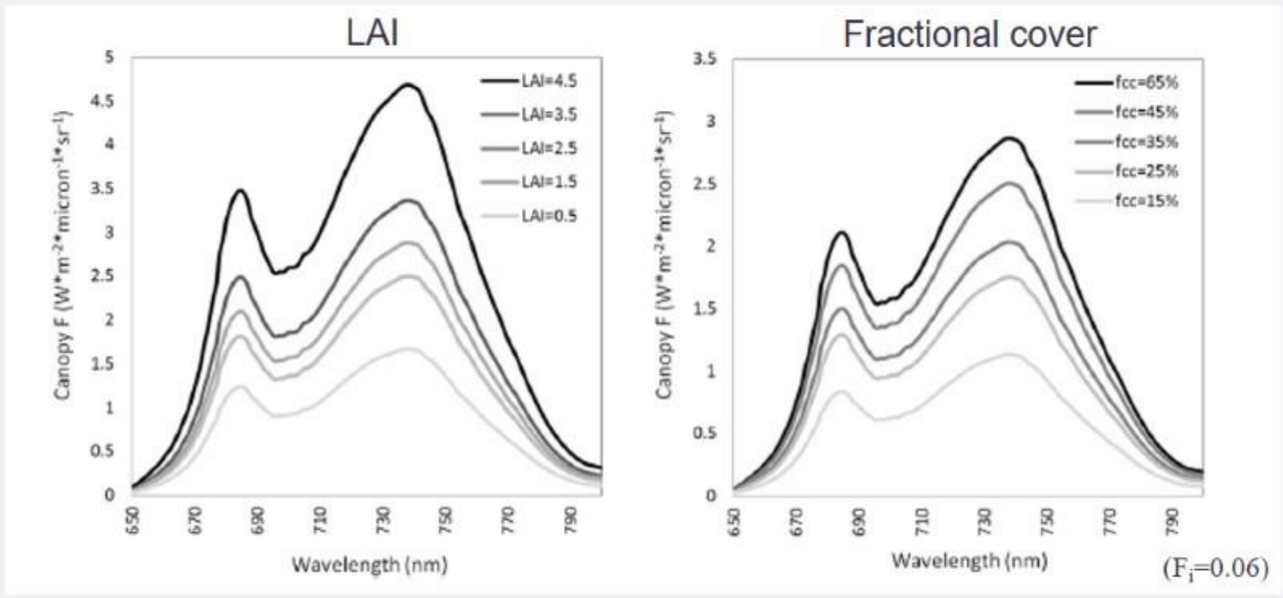
Hernández-Clemente et al. RSE (2017)

FluorFLIGHT
Early detection of *Phytophthora* infections in oaks

F (FLD3) from micro-hyperspectral imagery / FluorFLIGHT simulated scene with aggregated pixels



Simulated canopy radiance including the effects of fluorescence using the FluorFLIGHT model for a varied range of Leaf Area Index (LAI)



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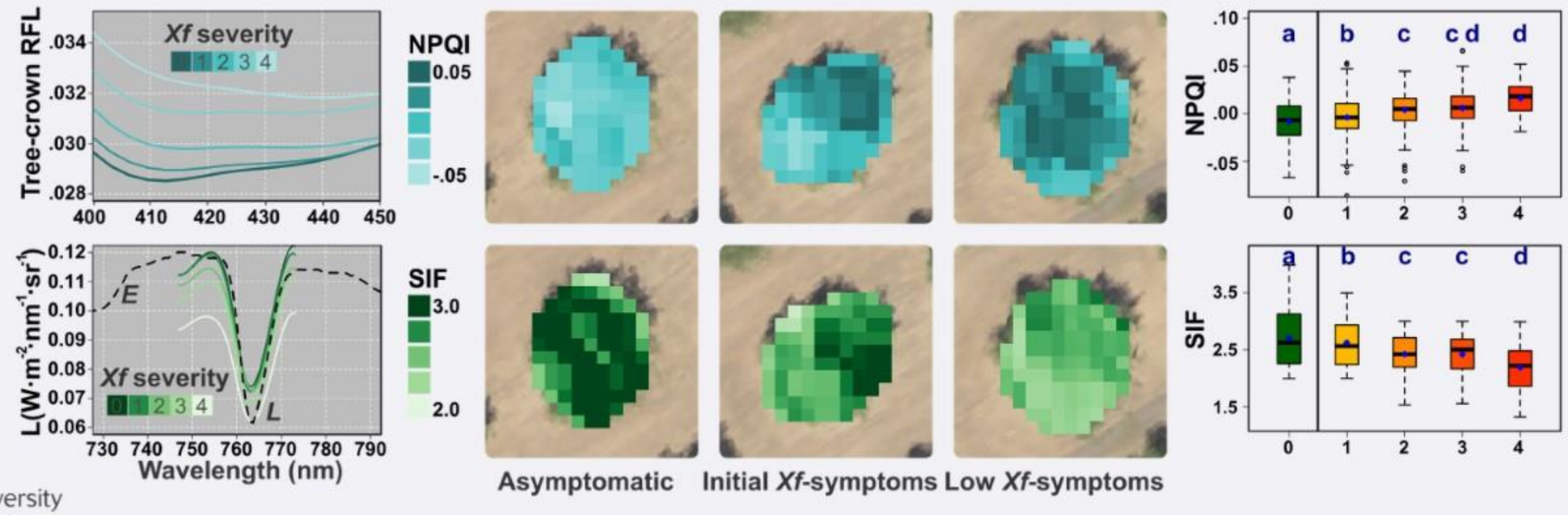
FluorFLIGHT
Xylleya fastidiosa infections in olives

SIF and vegetation stress detection

- Fluorescence quantum efficiency (Fi) calculated with FluorFLIGHT inversion

- In combination with other indices (principally NPQI) and thermal anomaly, shows early detection of *Xf* infection, before field recognition

Zarco-Tejada et al., Nature Plants (2018)



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Thank you