University of Southampton

Temporal and Spatial Variability Of Spectral Indicators Of CO_2 Fluxes Around a UK Flux Tower (Wytham Woods, Oxfordshire)

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Determination of the sensitivity of a number of vegetation indices (e.g. NDVI, MSAVI, PRI) to uncertainty in definition of a flux footprint.

What causes the footprint to be uncertain (flux footprint variability)?

Which vegetation indices to be accurate indicator of CO_2 flux with respect to spatial and temporal variability of the flux footprint?

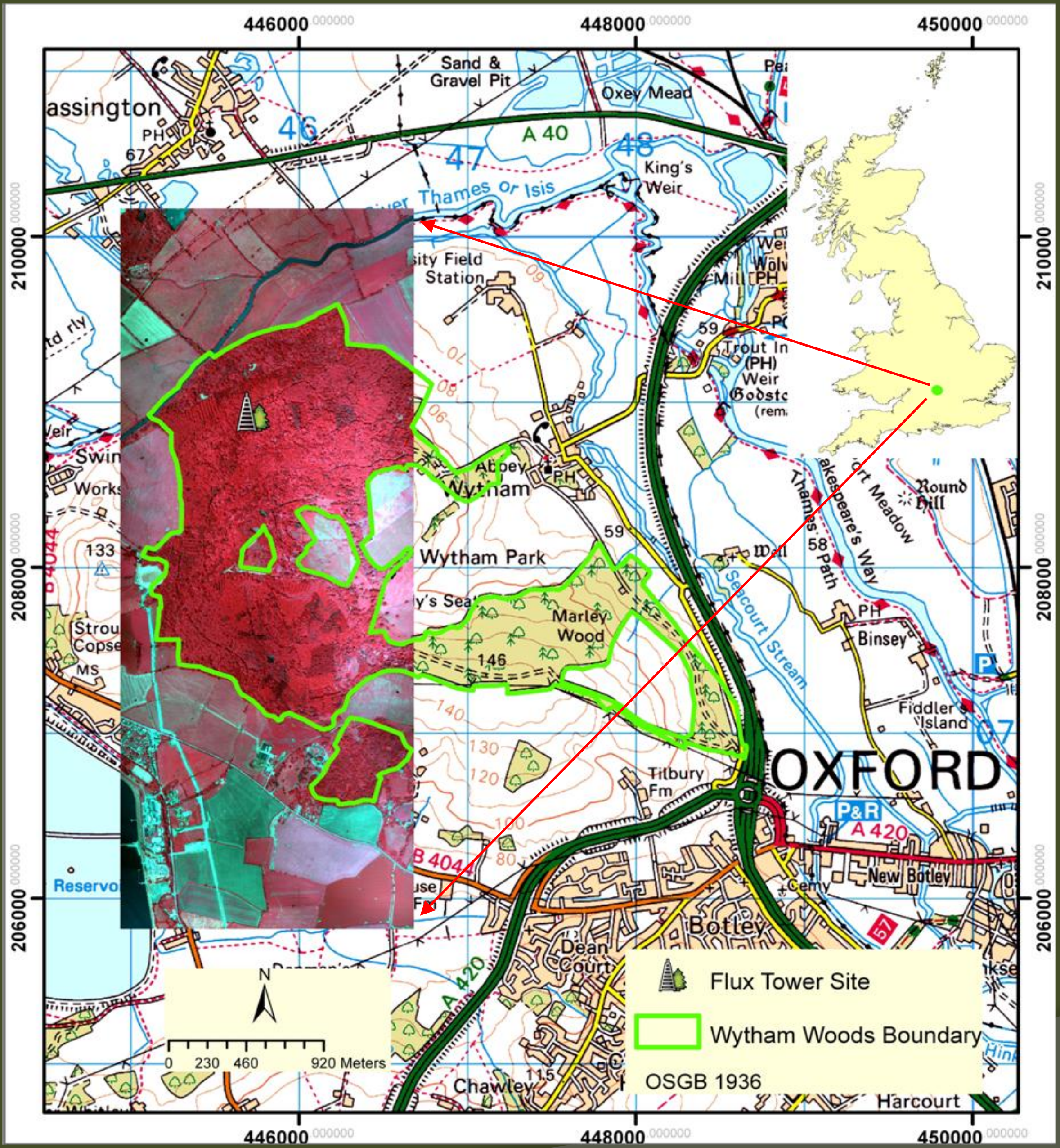
RS data time-series assessment (i.e. temporal variability) of VI over a growing season and comparing them with MOD13 to estimate their error regarding up-scaling

Bridging the EC measurements and satellite indicators of CO_2 flux using airborne LiDAR and hyperspectral data.

Which vegetation indices maximize sensitivity to vegetation biophysical parameters, such as LAI, FAPAR and LUE?

What cause of these indices to be uncertain whit respect to canopy patches and external effects (e.g. atmospheric effects and sun/viewing angles for consistent temporal and spatial comparisons)?

How these spectral indicators to be scaled-up (e.g. validation of MODIS-derived spectral indicators)?


Flux Tower Site
Wytham Woods Boundary
OSGB 1936
0 230 460 920 Meters
N
446000
448000
450000
210000
208000
206000
OXFORD
Wytham
Marley Wood
Botley

Study Site

Remote Sensing

UK DMC Imagery

The UK Disaster Monitoring Constellation (UK-DMC) imagery is high frequency multispectral imaging provides three spectral bands (Green, Red, NIR)

MODIS Products

MODIS vegetation indices, MOD13Q1: NDVI and EVI

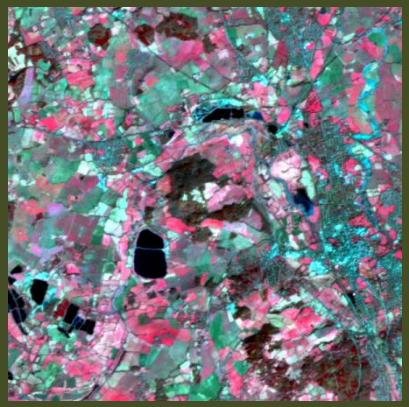
MODIS GPP, MOD17

Airborne Remote sensing

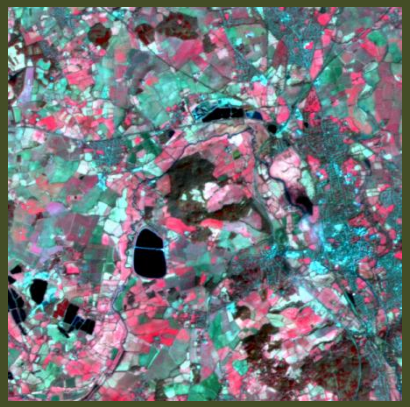
Airborne Imaging Spectrometer for Applications (AISA) Eagle (i.e. in 252 narrow spectral wavebands, ranging from 392nm to 987nm)

Airborne LiDAR data over a growing season

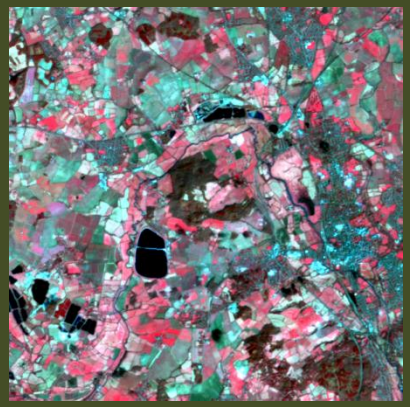
DMC Subsets Centered on Wytham Woods



02 March 2010



05 March 2010



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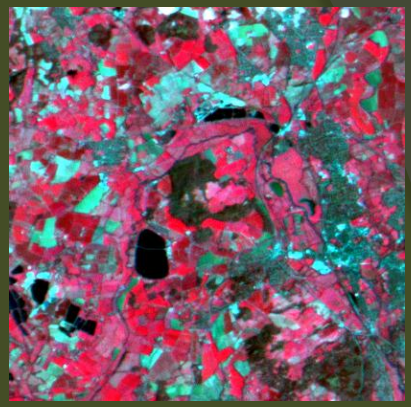
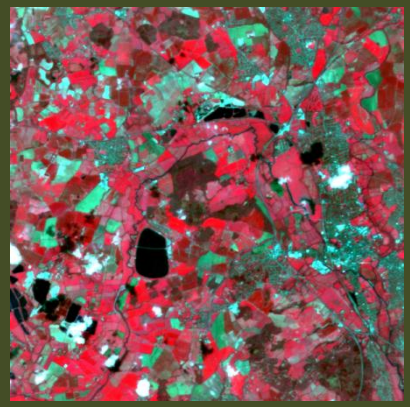


20 April 2010



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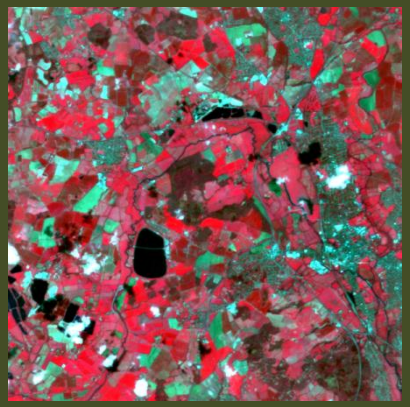

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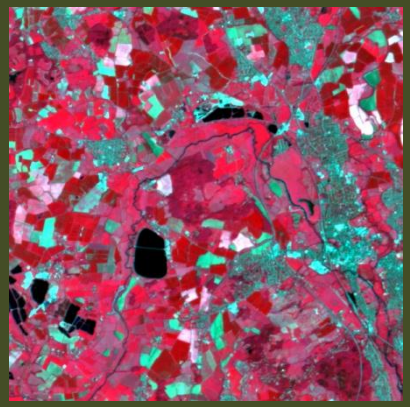

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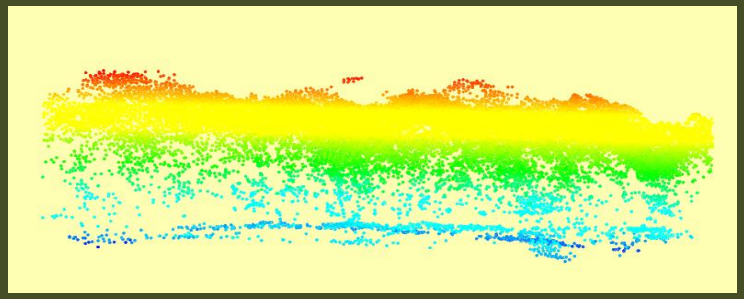
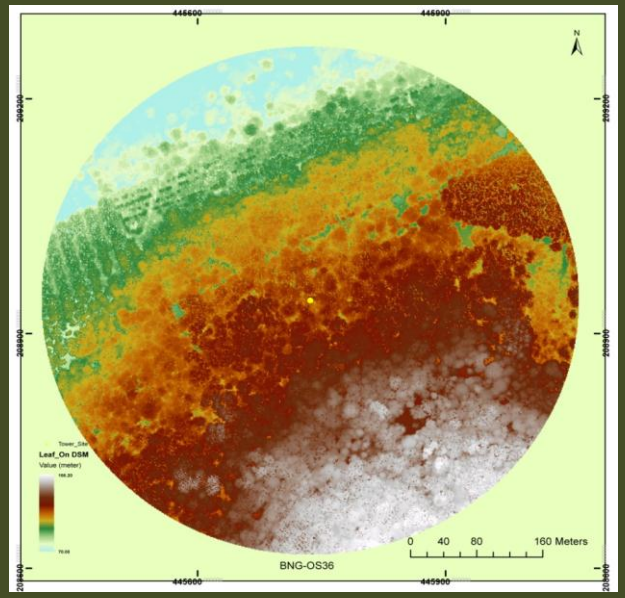
LiDAR derived Canopy Structure

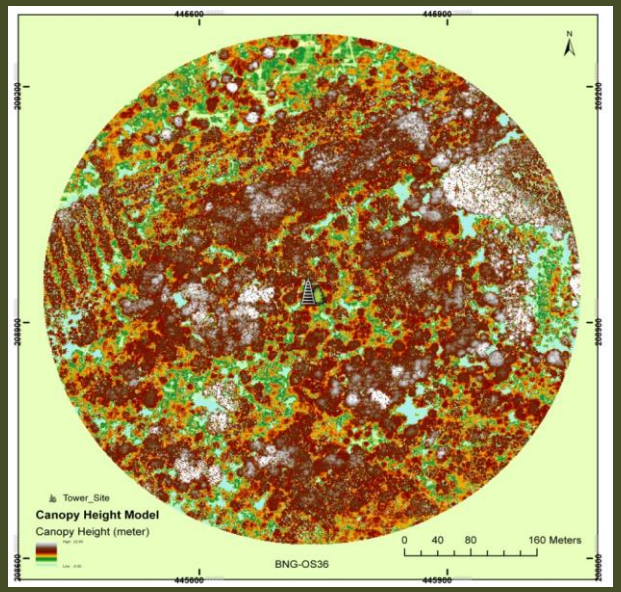


Point cloud LiDAR data coloured in height intervals around Wytham flux tower site

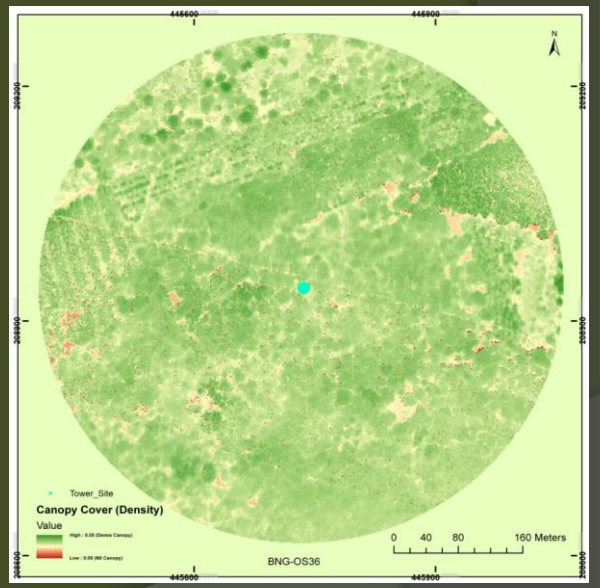
buffered distance of 300 m radius around flux tower site



Leaf-on Digital Surface Model (DSM)



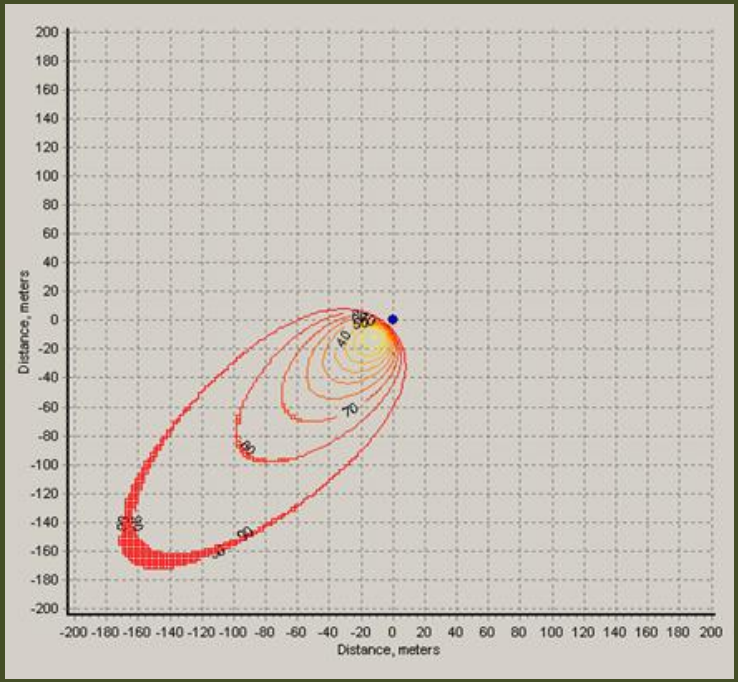
normalized Canopy Height (nCH)



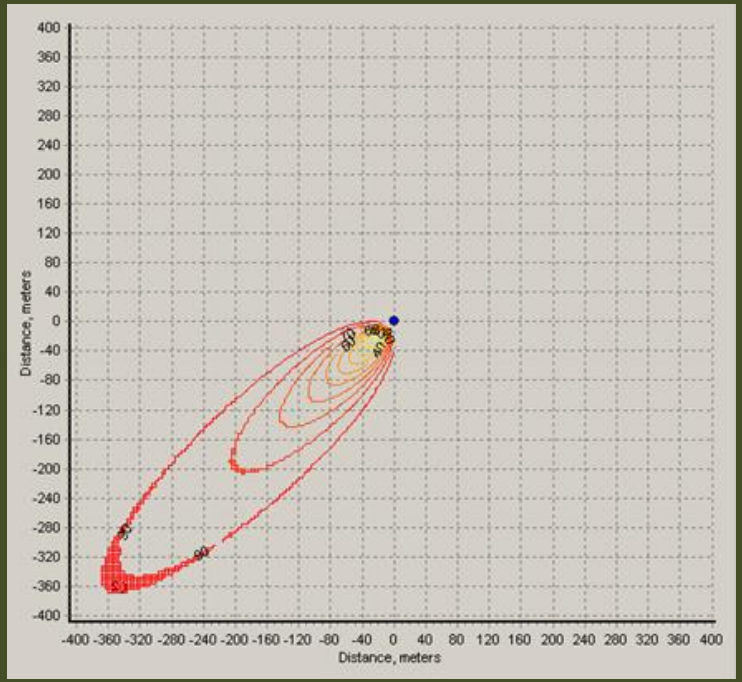
Canopy Cover

Flux Tower Footprint

Using the EdiRe Footprint Tool based on the Korman and Meixner analytical model, flux footprints were estimated for prevailing wind direction of 225° (South-West) and 315° (North-West) from slightly to moderate unstable)



upwind direction 225° under moderate unstable condition



upwind direction 225° under slightly unstable condition

Future Work

Here at the PSU, I wish to investigate:

- What causes the flux footprint to be uncertain (spatial and temporal flux footprint variability)

- Role of landscape-level heterogeneity in terms of canopy patches in influencing CO2 fluxes through growing season

Thank you for your attention