Estimation of Leaf Area Index from Hyperspectral Thermal Data

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Elnaz Neinavaz

Roshanak Darvishzadeh
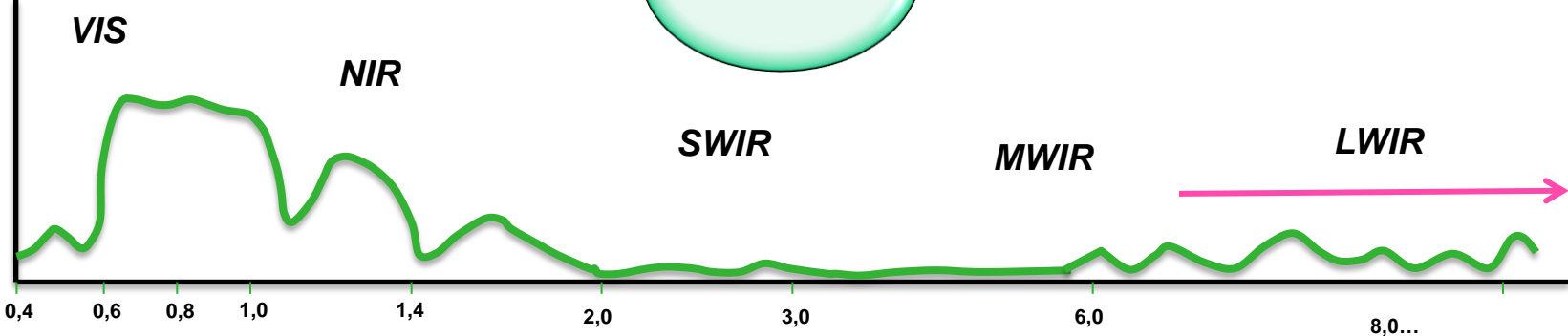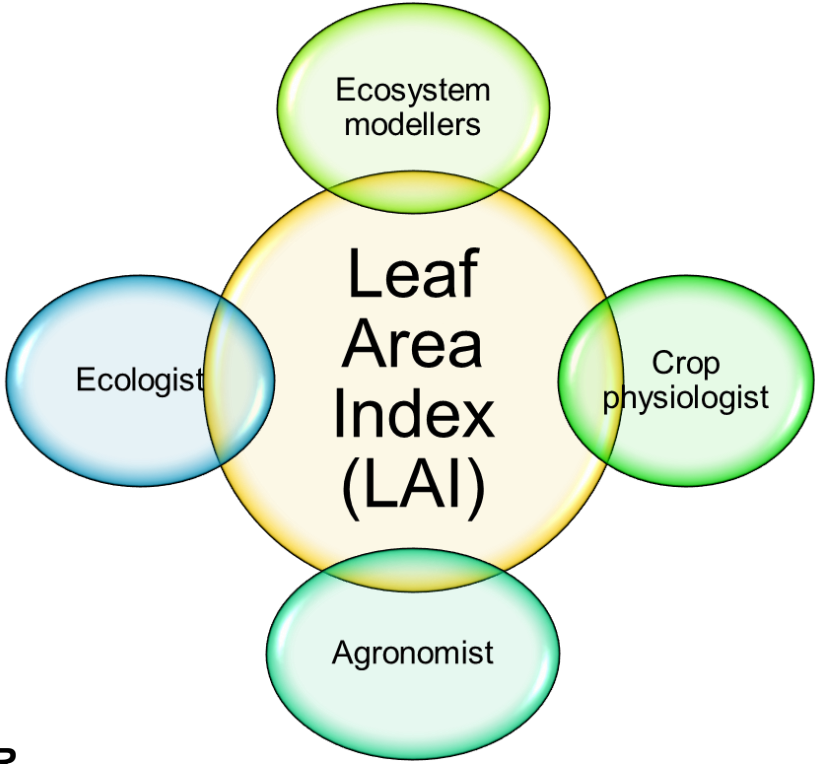
Andrew Skidmore

Thomas Groen

Christoph Hecker

Department of Natural Resources

UNIVERSITY OF TWENTE.

Context of this research:

VIS

NIR

SWIR

MWIR

LWIR

0,4   0,6   0,8   1,0   1,4   2,0   3,0   6,0   8,0...

Objective:

❑To evaluate the

effects of variation of

LAI on emissivity of

plants.

Experiment:

Euonymus japonicus

Azalea japonica

Ficus benjamina

Buxus sempervirens

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Variation in leaf area index:

Species name	Mean LAI (m²m⁻²)	Std. Err of Mean	Std. Deviation	LAI sample size	Emissivity spectra sample size
Azalea japonica	1.5733	0.09930	0.54390	30	120
Buxus sempervirens	4.5484	0.34414	2.14913	40	160
Euonymus japonicas	3.2813	0.19960	1.32401	44	176
Ficus benjamina	3.6018	0.32960	1.80528	30	120
Total	-	-	-	**144**	**576**

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FTIR Spectrometer:

❖ MIDAC (M4401-F)

- Wavelength from 2.5 to 20 (μm)

- Spectral resolution of 32 to 0.5 (cm^{-1}).

Methodology:

Radiance spectra of hot and cold blackbodies

Radiance spectra of the sample surface

Radiance spectra of the gold diffuse plate
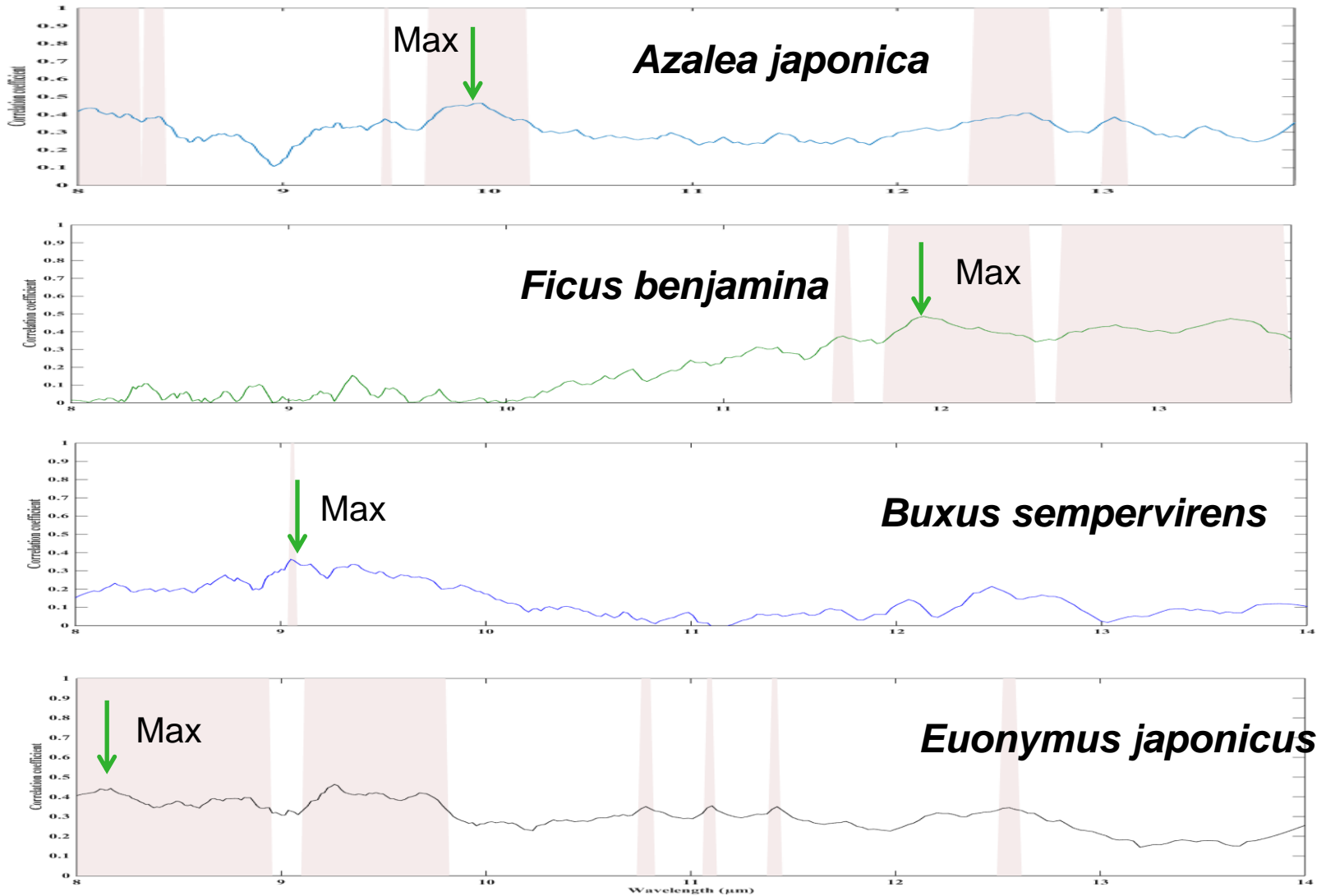
Data processing

Radiometric calibration

Emissivity derivation

Emissivity spectra
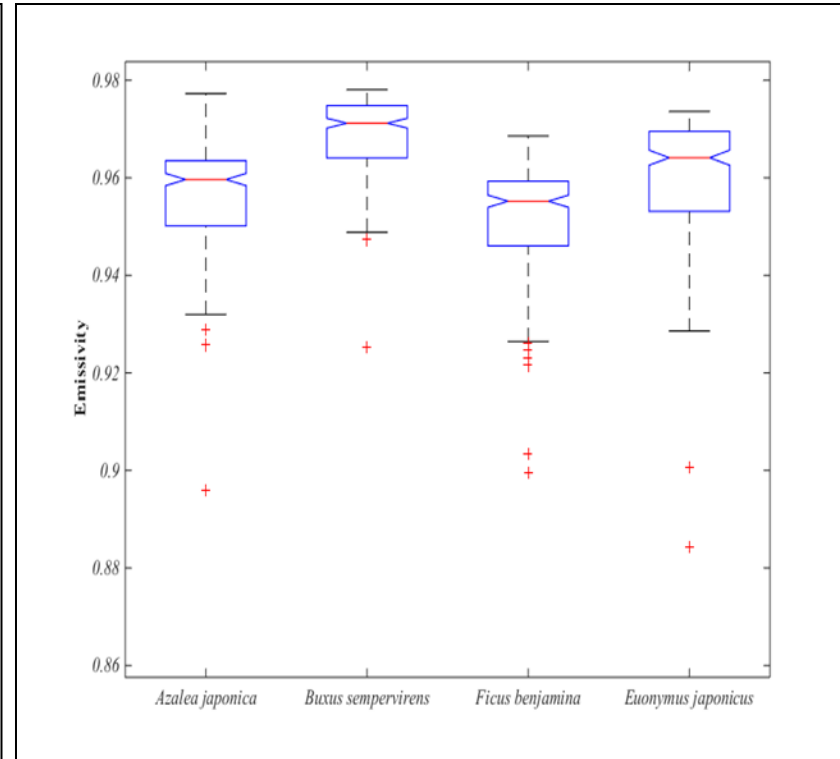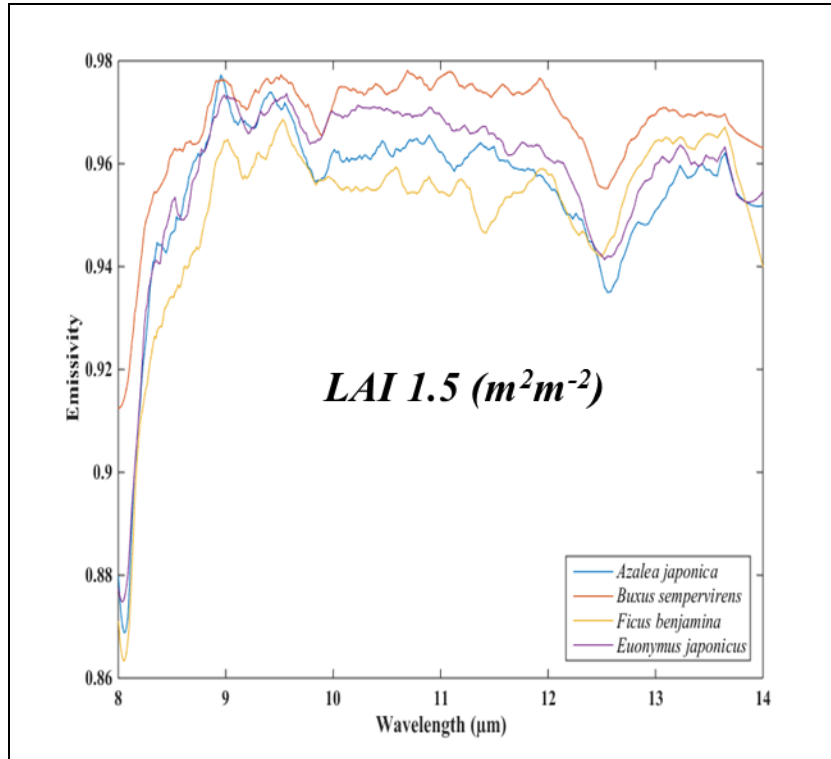
Pre-preprocessing of spectra

Primary results:
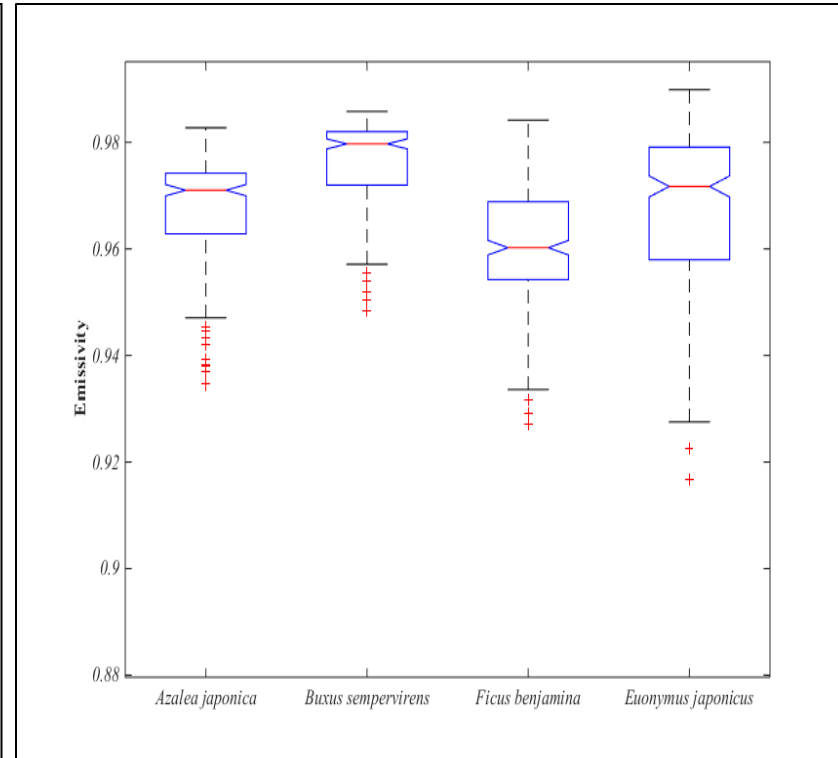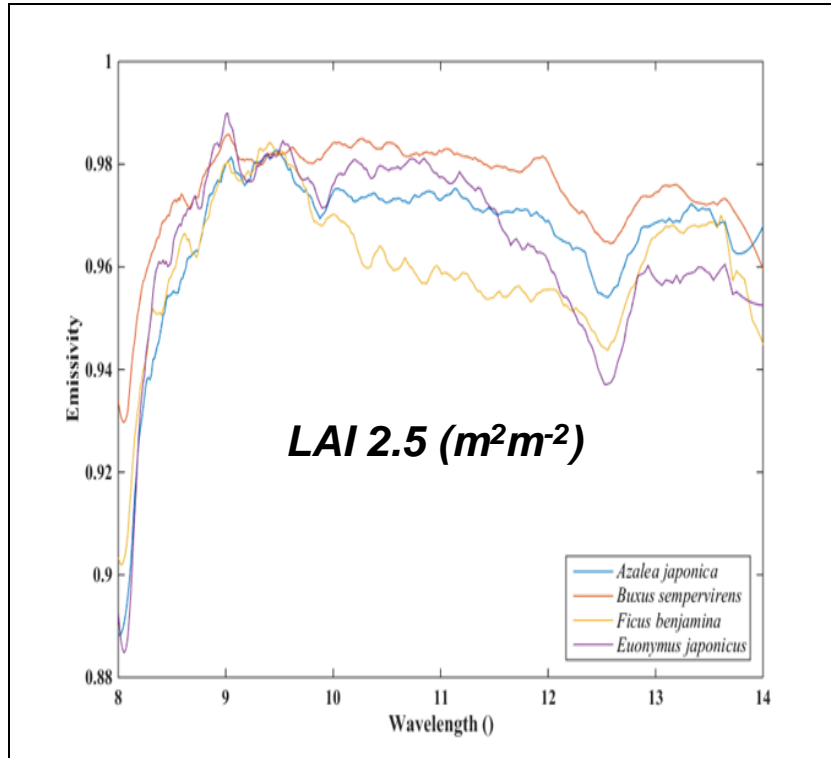
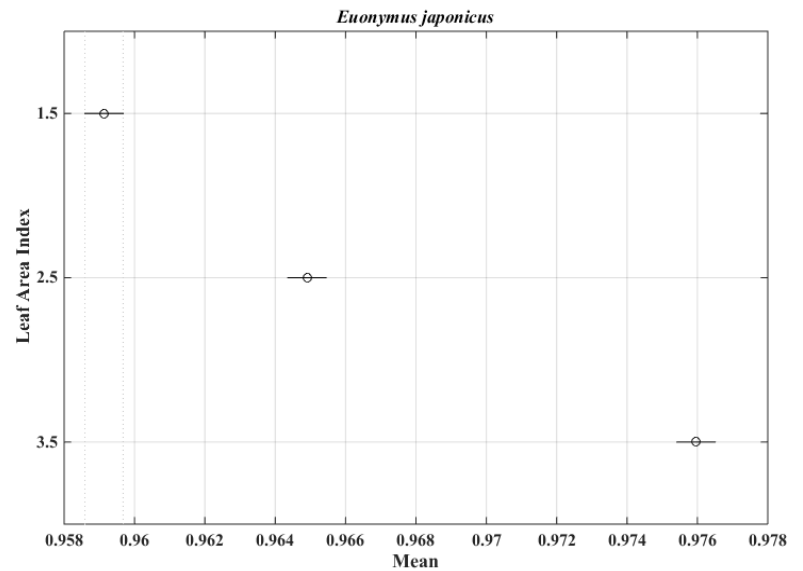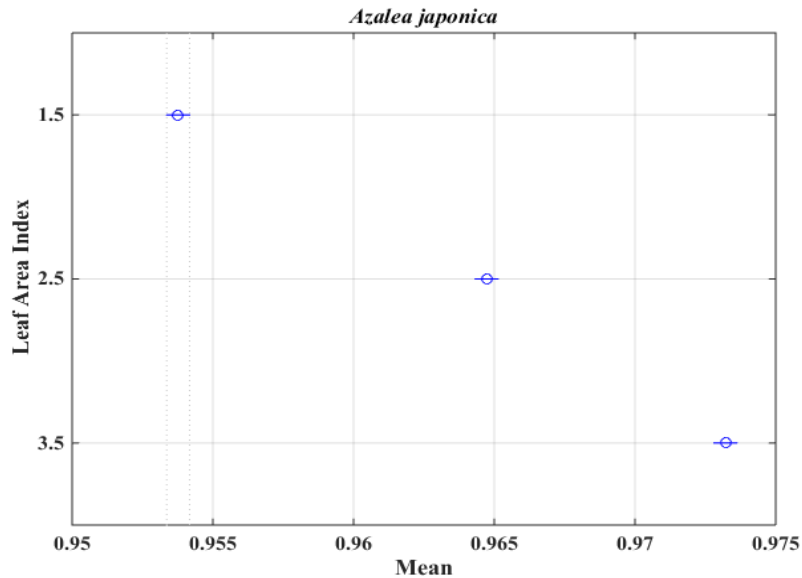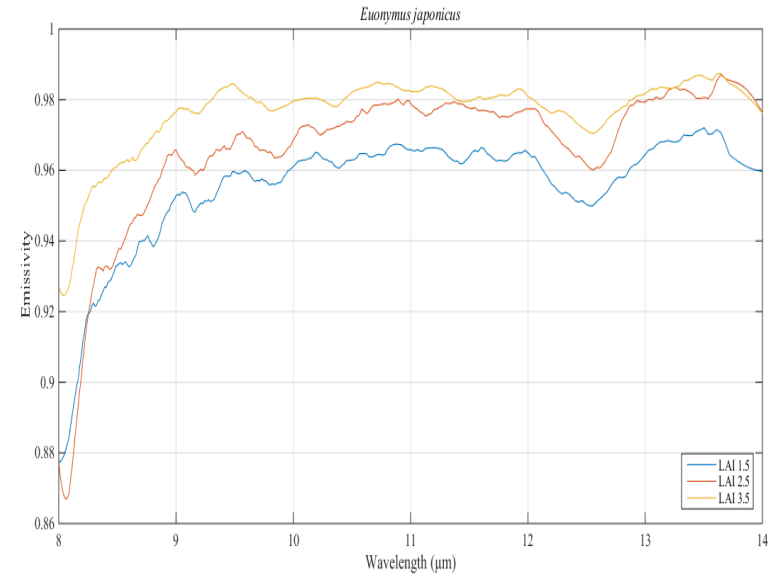❖ **Correlation between emissivity and leaf area index**
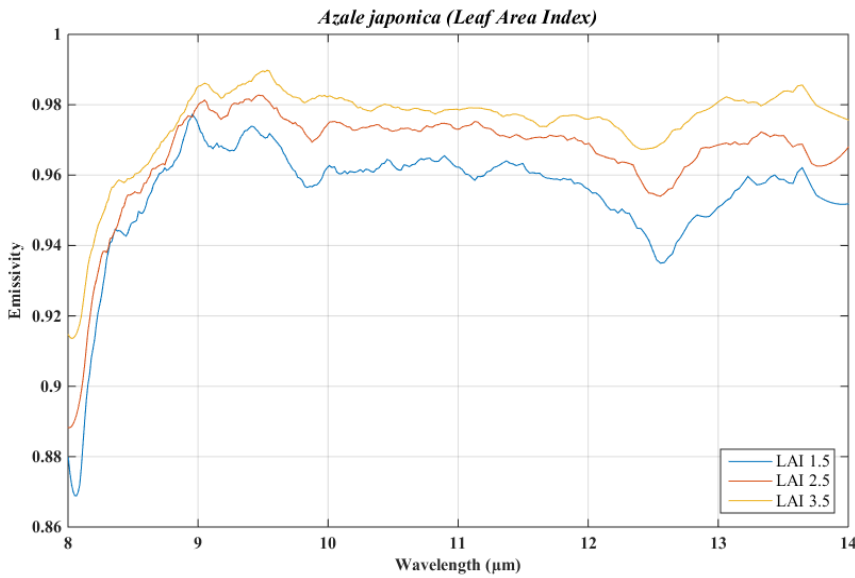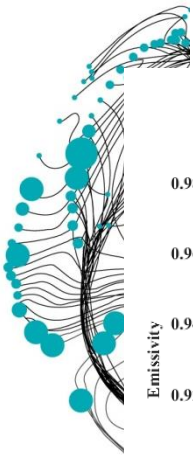
Results:

Influence of same amount of LAI on emissivity in different species

LAI 2.5 (m²m⁻²)

LAI 2.5 (m²m⁻²)

Effects of variation of LAI on emissivity spectra

Conclusions:

❖ The emissivity spectra changes with LAI variation;

❖ Emissivity spectra demonstrates differences between species with similar LAI from 8-14 µm of the spectrum;

❖ Hyperspectral data at the TIR region has the potential for retrieval of vegetation biophysical variables.

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Thank you for your attention!

E., Neinavaz, R., Darvishzadeh, A.K., Skidmore, T., Groen and C., Hecker.