Testing the potential of a dual-wavelength terrestrial laser scanner for estimating fuel moisture content

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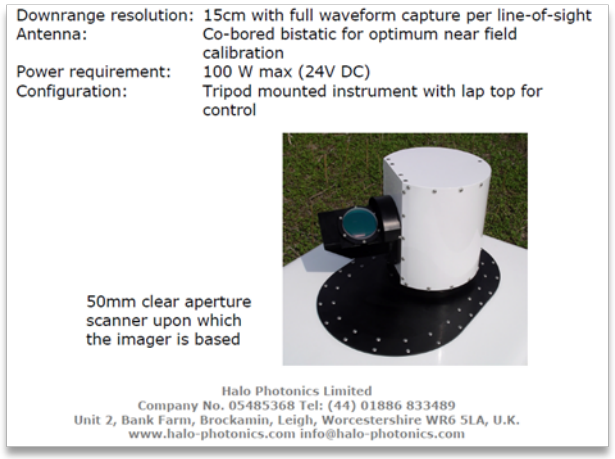
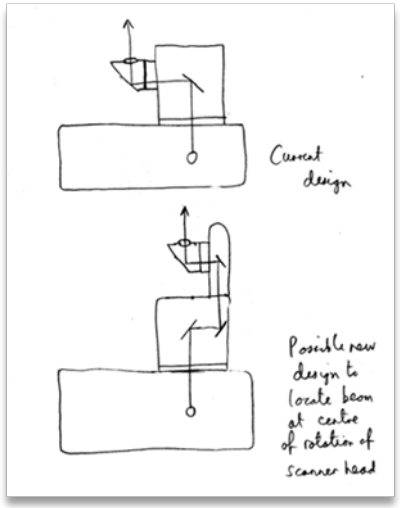
Salford Advanced Laser Canopy Analyser (SALCA)

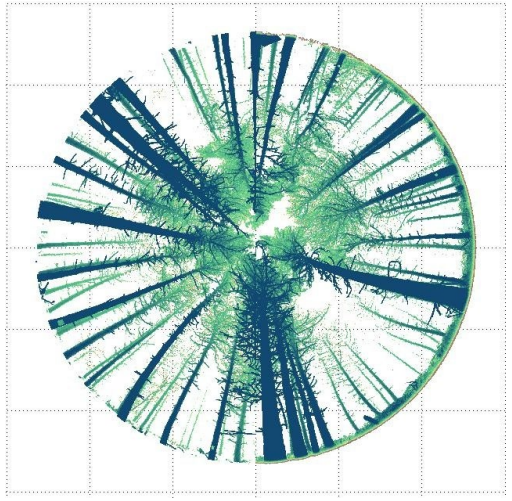


September 2008



February 2009

April 2010



First SALCA scan in a conifer plantation, 19th April 2011

SALCA system specifications:	
Centre wavelengths	1545.4 nm and 1063.4 nm
Pulse length	3 ns (1545 nm) and 1 ns (1063 nm)
Pulse rate	5 kHz
Beam width at sensor	3.6 mm (1545 nm) and 2.4 mm (1063 nm)
Beam divergence	0.56 mrad
Laser output energy	5 µJ (1545 nm) and 0.5 µJ (1063 nm)
Detector field of view	2.67 mrad
Sampling rate	1 GHz
Range resolution	15 cm
Maximum range	105 m
Angular sampling step	1.05 mrad
Angular displacement between wavelengths	6 µrad

SilviLaser 2012, Sept. 16-19 September 2012 –Vancouver, Canada

Field trials of a full-waveform terrestrial laser scanner to measure forest canopy dynamics

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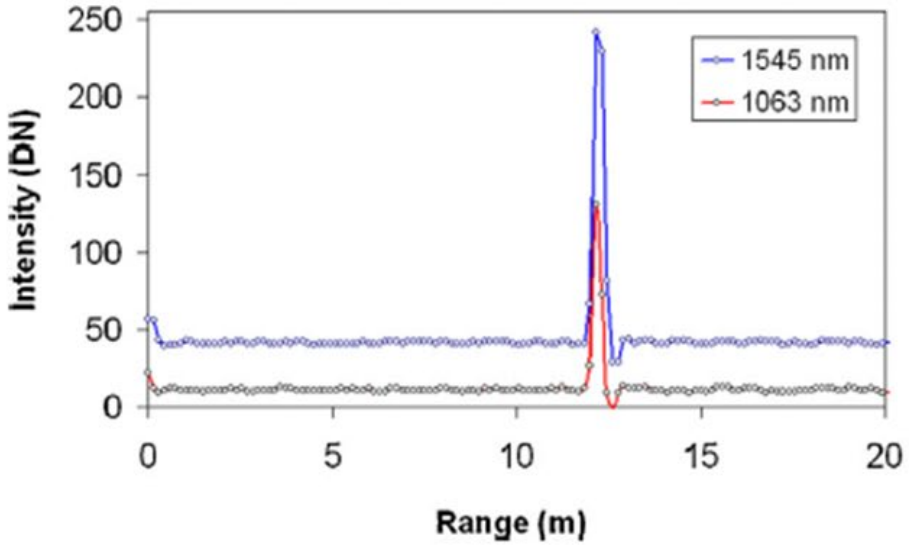
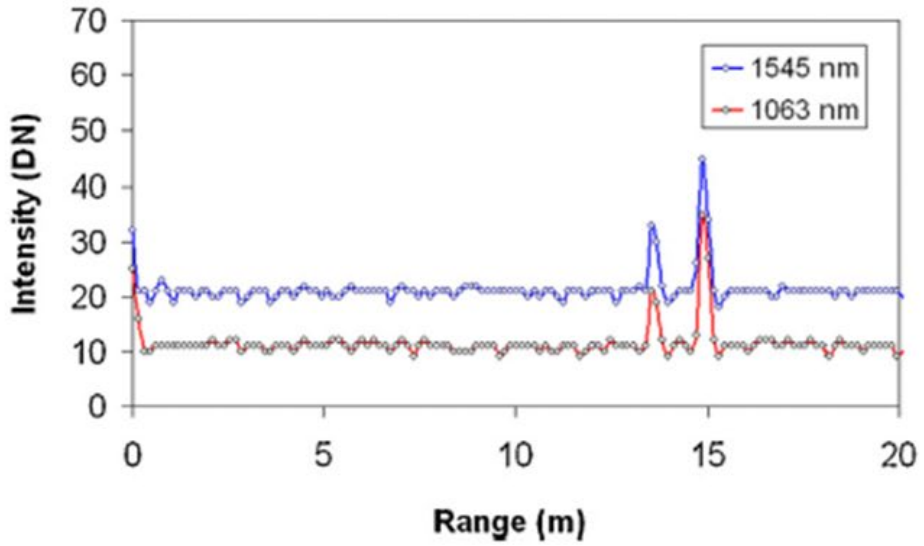
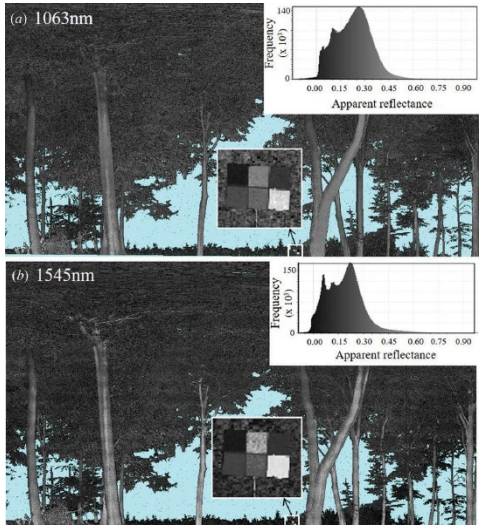
Structure of lidar waveforms

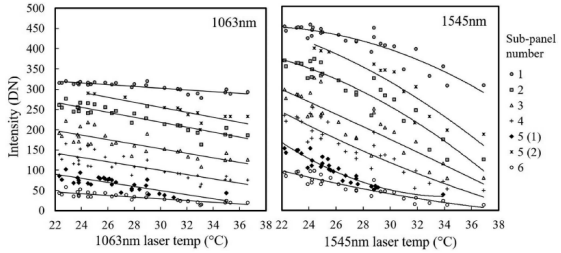


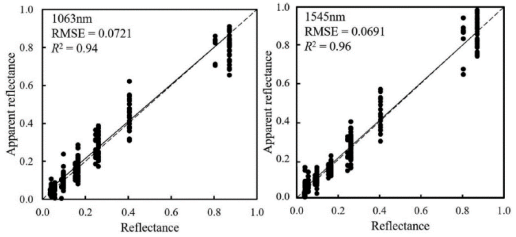


Return pulse shape f outgoing pulse shape, reflectance of object, area of material in beam, angle of incidence

Reflectance calibration

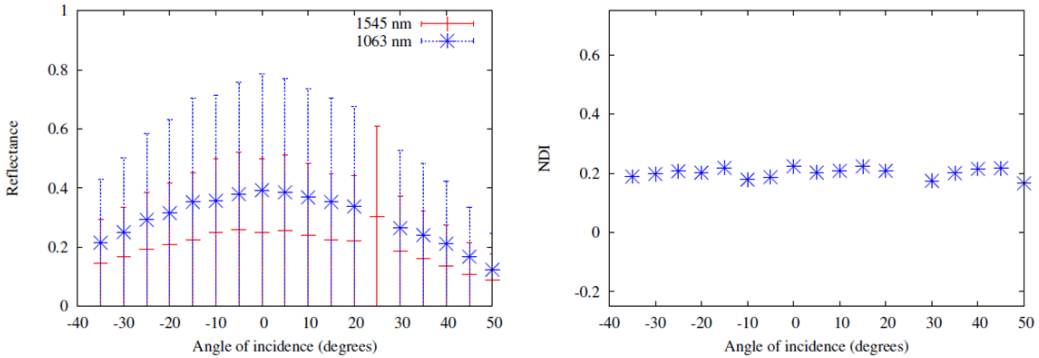






From: Schofield, LA, Danson, FM, Entwistle, NS, Gaulton, R and Hancock, S 2016, *Remote Sensing Letters*, **7** (4) , pp. 299-308.

BRDF effects



From: Hancock, S., Gaulton, R., & Danson, F.M., 2017, IEEE *Transactions Geoscience and Remote Sensing*

Spectral and spatial leaf/wood separation

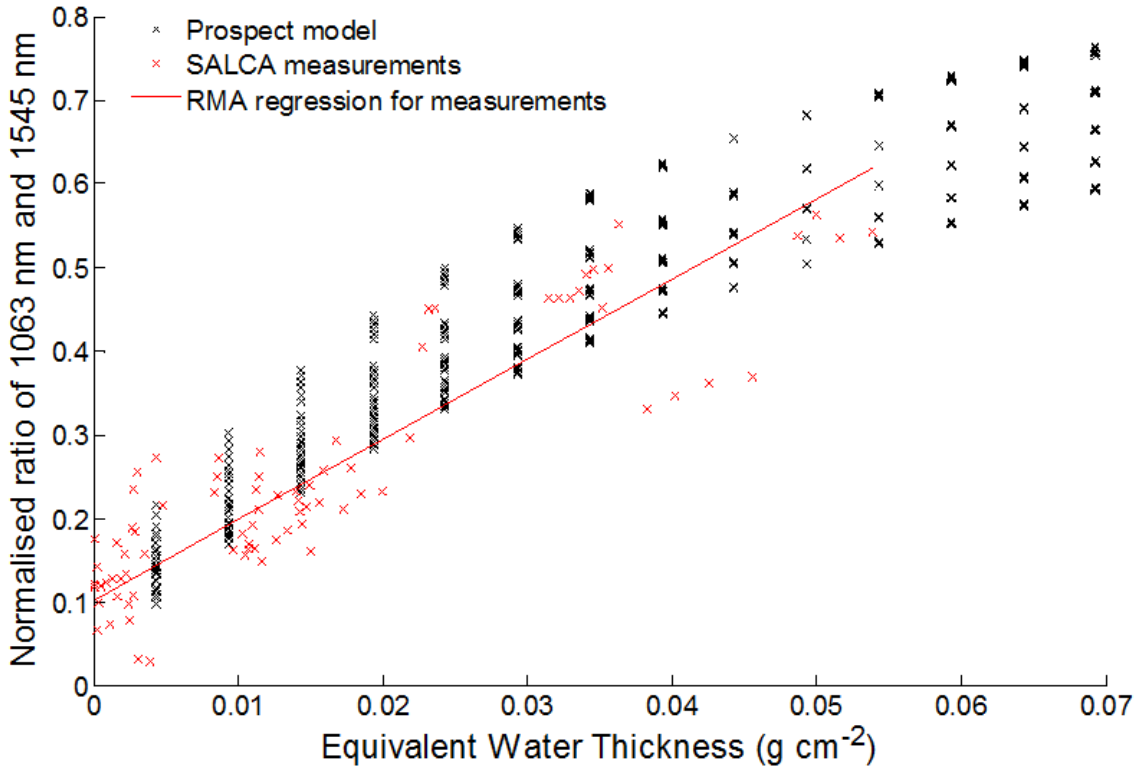
good tree: classification agreement = 62%

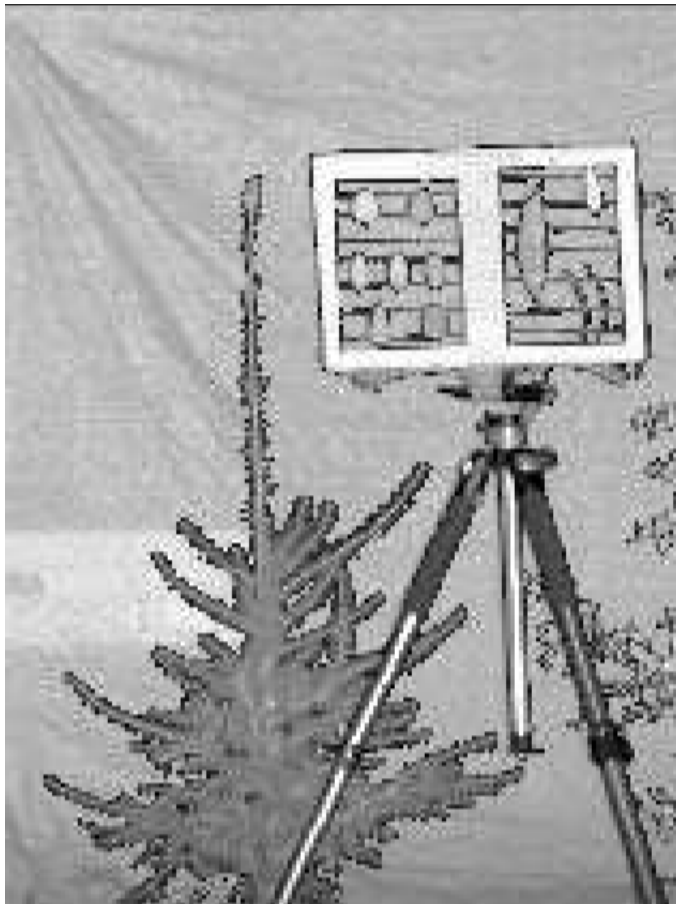
moderate tree: classification agreement = 58%

poor tree: classification agreement = 82%

From: Danson, F.M., Sasse, F., and Schofield, L.A., 2018, *Interface* Focus,

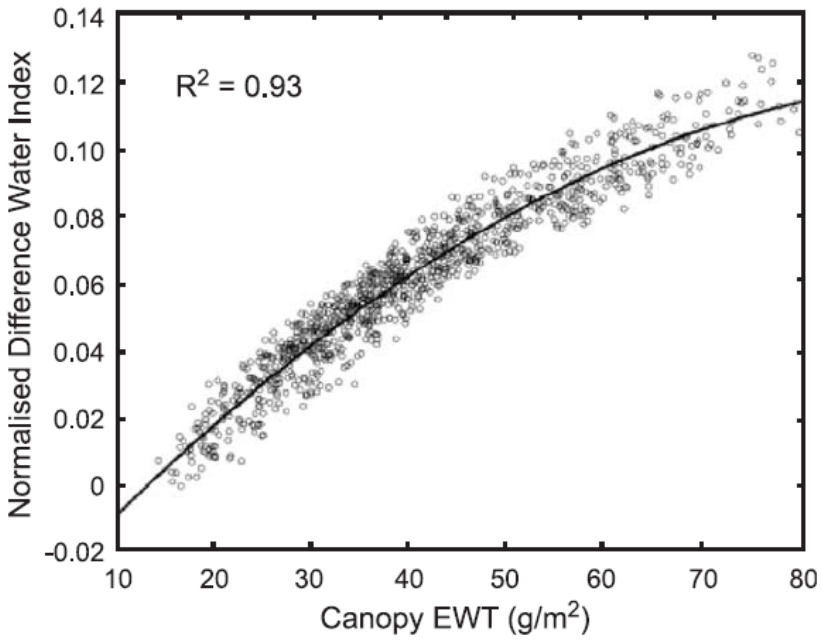
Measuring leaf water content

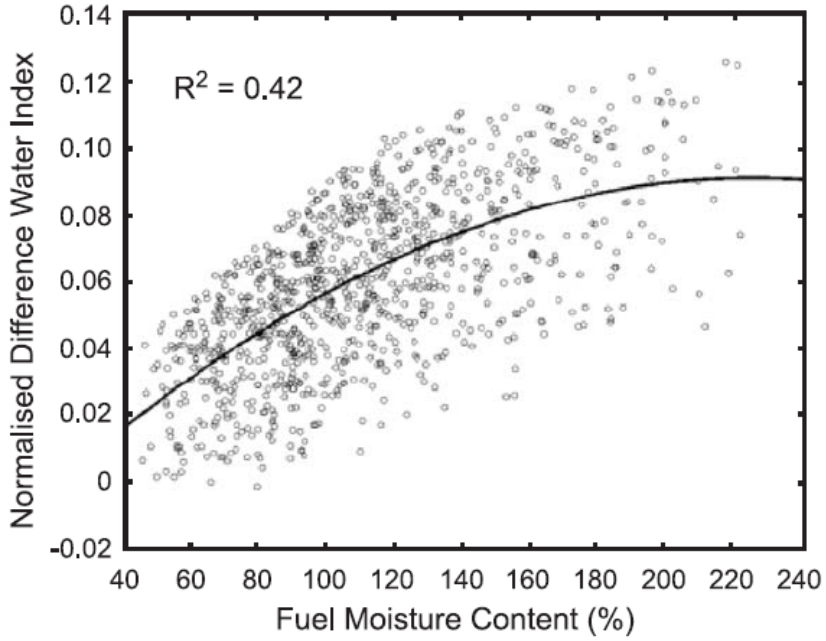




From: Gaulton *et al.* 2013. *Remote Sensing of Environment*, 132, 32-39.

Vegetation canopy reflectance is sensitive to water content (EWT) but less sensitive to FMC

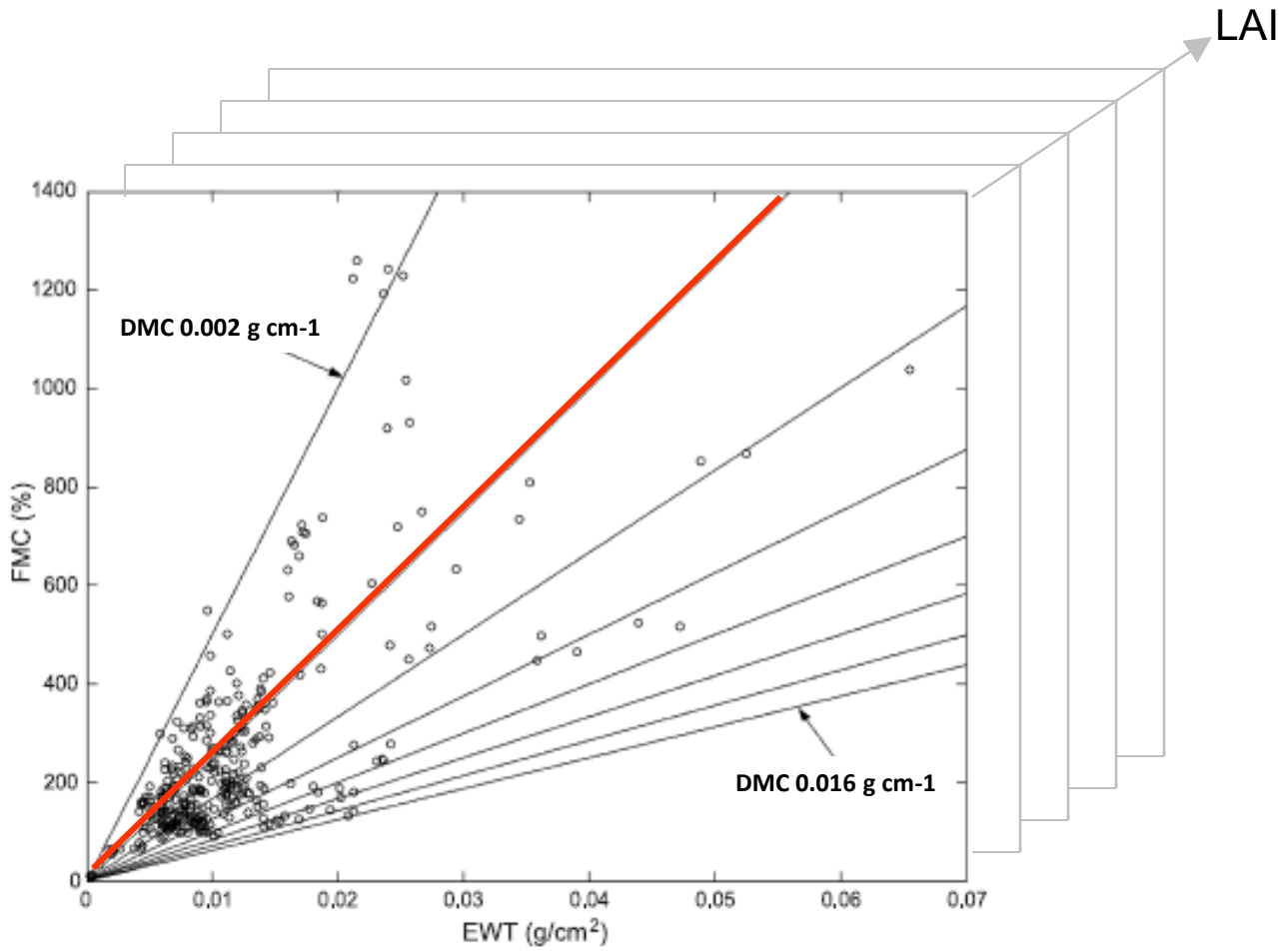




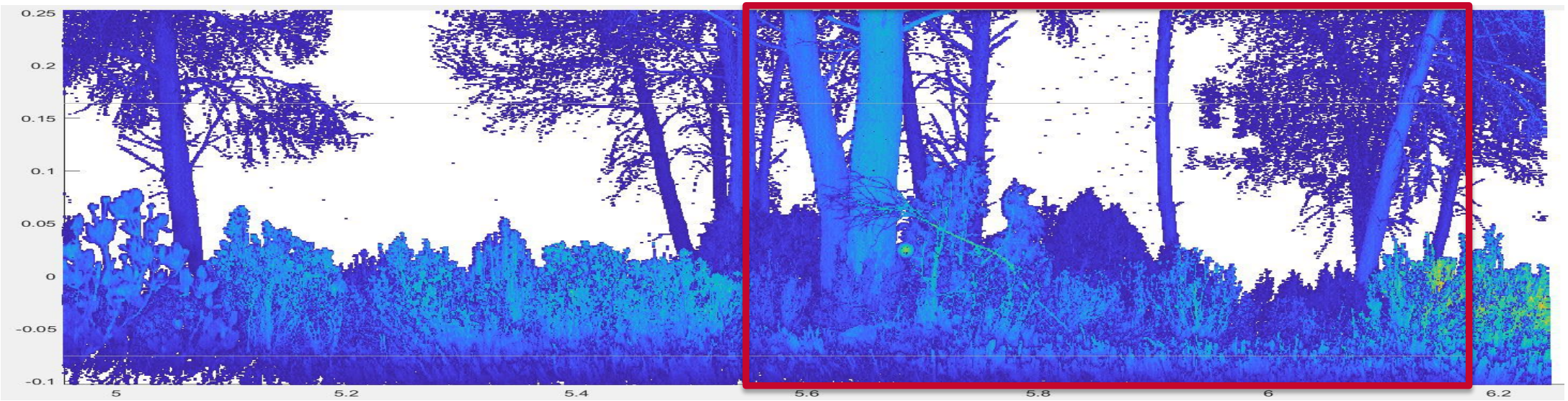
EU SPREAD project 2001:

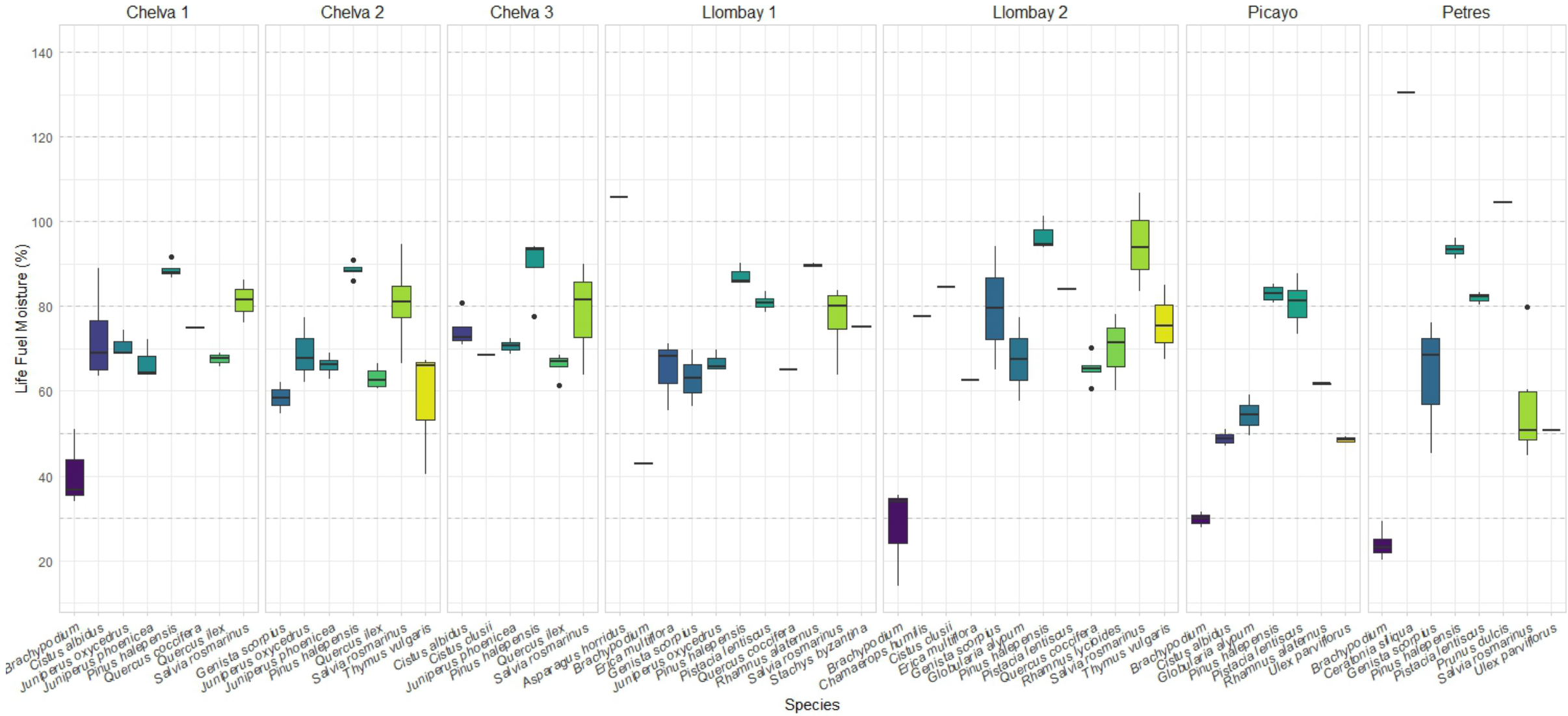
ProSail model simulations with site-specific variable ranges

Vegetation canopy reflectance is most sensitive to FMC when DMC and LAI variations are small

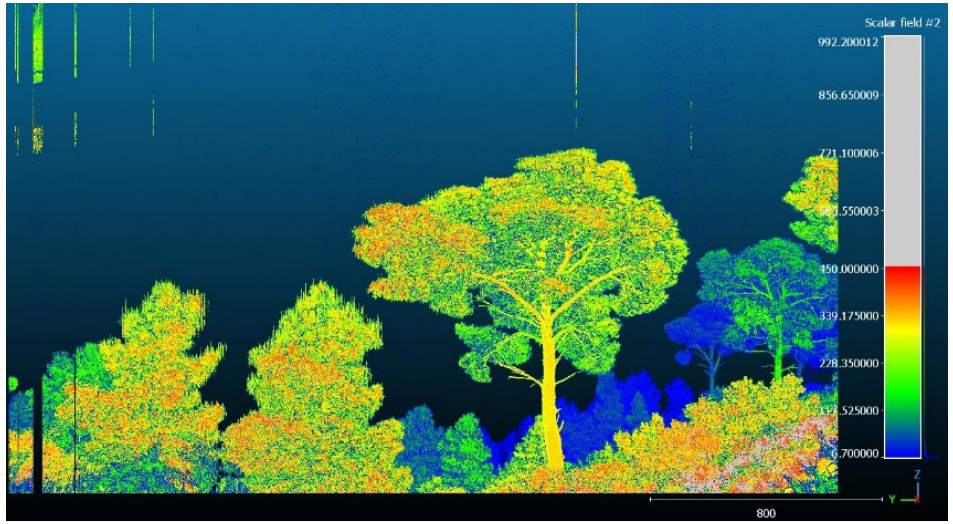


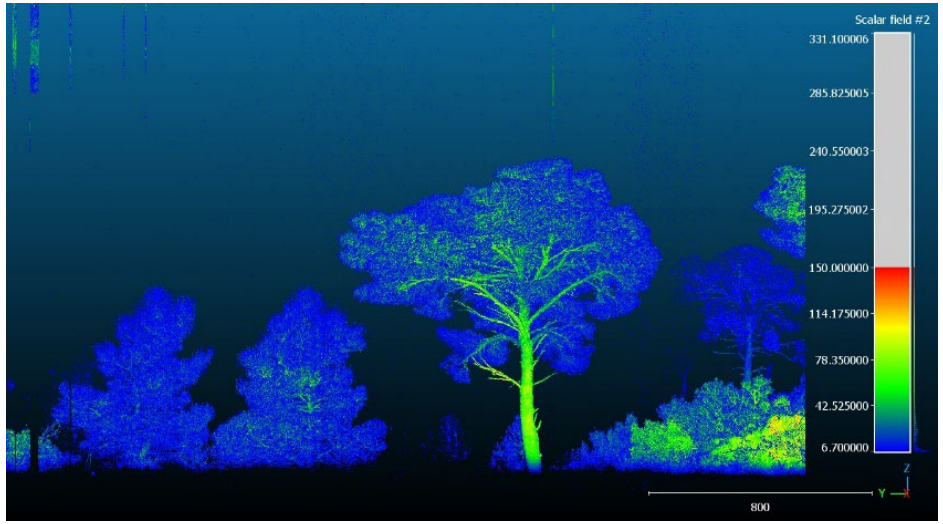
Chelva



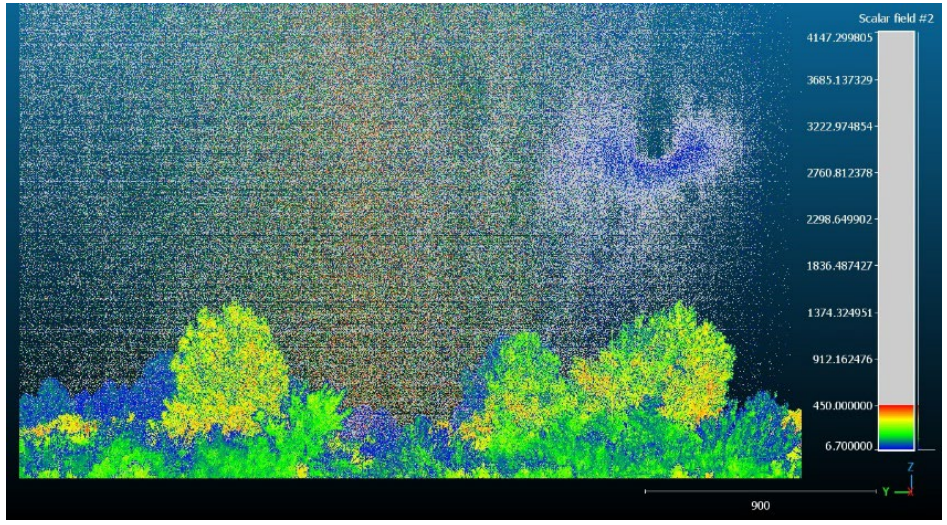

Chelva 1
Chelva 2
Chelva 3
Llombay 1
Llombay 2
Picayo
Petres
Life Fuel Moisture (%)
140
120
100
80
60
40
20
Brachypodium
Cistus albidus
Juniperus oxycedrus
Juniperus phoenicea
Pinus halepensis
Quercus coccifera
Quercus ilex
Salvia rosmarinus
Genista scorpius
Thymus vulgaris
Cistus clusii
Asparagus horridus
Erica multiflora
Pistacia lentiscus
Rhamnus alaternus
Stachys byzantina
Chamaerops humilis
Globularia alypum
Rhamnus lycioides
Ceratonia siliqua
Prunus dulcis
Ulex parviflorus
Species

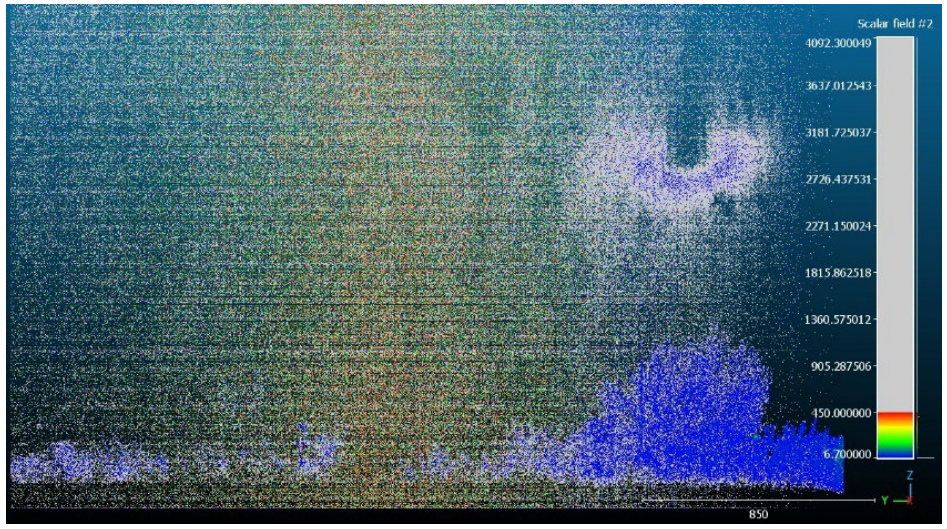
Picayo



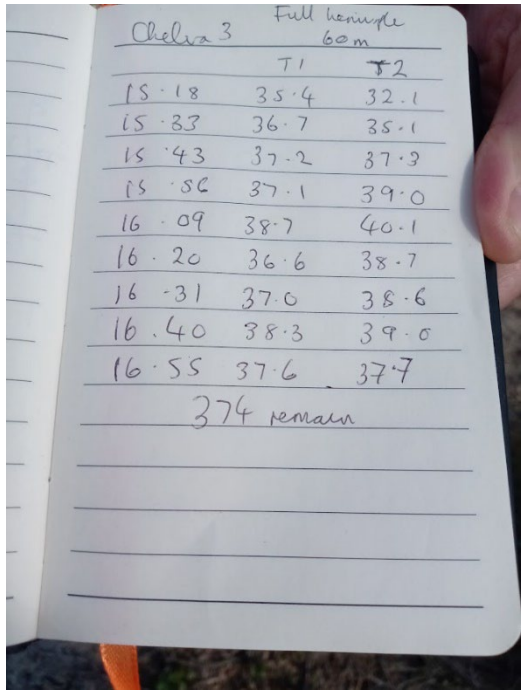


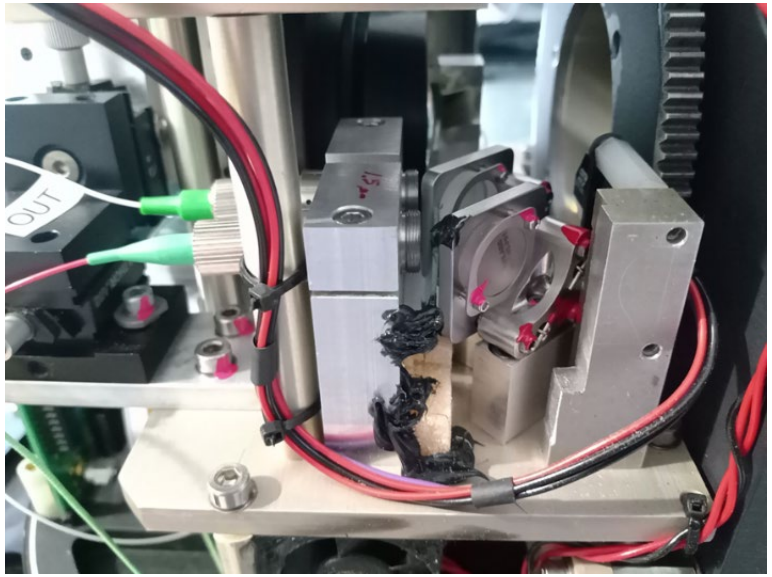
Llombay

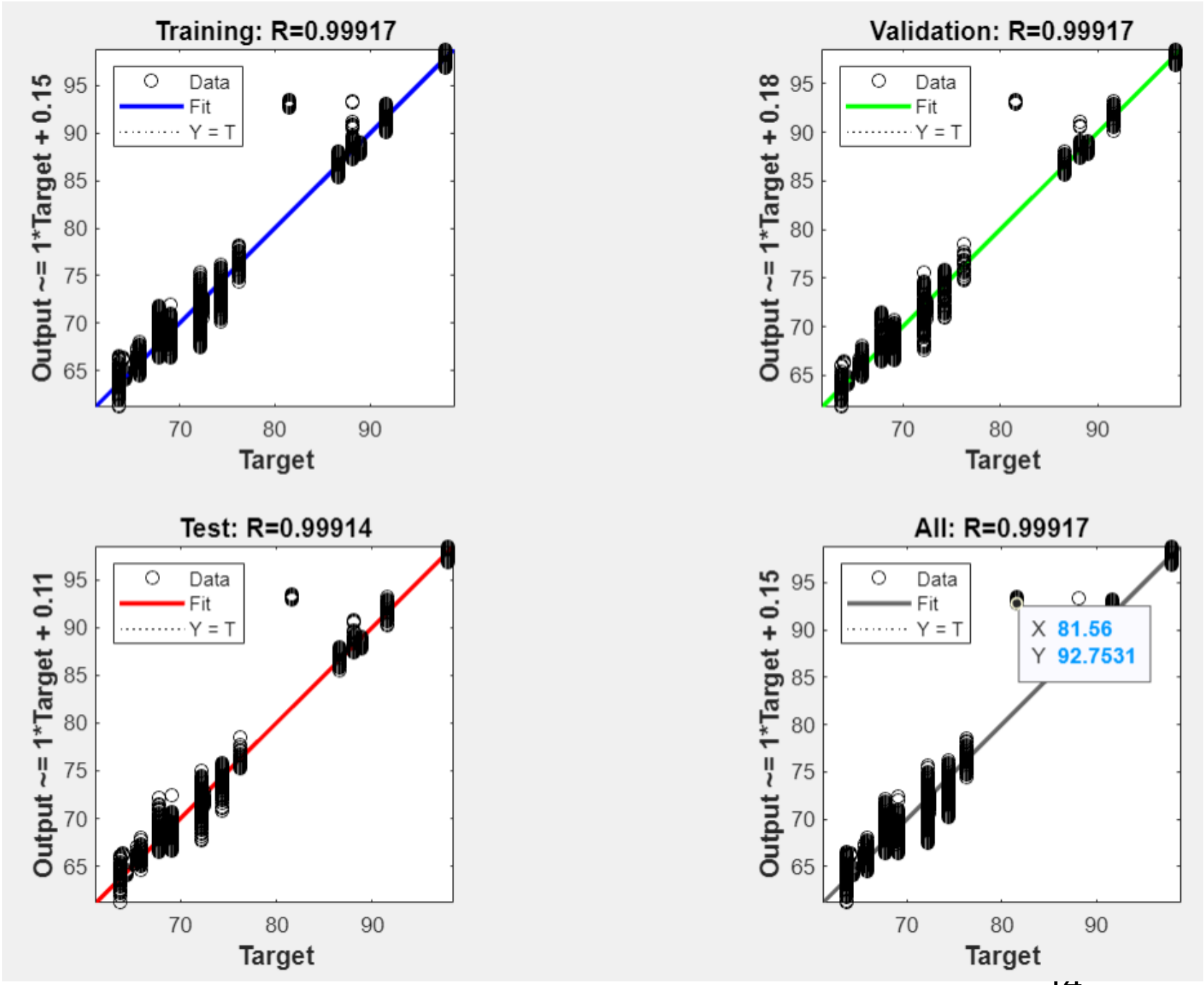




Challenges


Chelsea 3
Full hemiple
60m
T1
T2
15·18 35·4 32.1
15·33 36·7 35·1
15·43 37·2 37·3
15·56 37·1 39·0
16·09 38·7 40·1
16·20 36·6 38·7
16·31 37·0 38·6
16·40 38·3 39·0
16·55 37·6 37·7
374 remain


OUT



Chelva 1
Nº species: 8
Nº samples: 24


NO SER RES
SI NO S'ÉS
POBLE