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An Australian Government Initiative

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PROJECT 2.07 | WOODY VEGETATION LANDSCAPE FEATURE GENERATION

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Project Aim

- To use remote sensing data to derive spatial layers of relevant descriptors of Australian woody vegetation
- To use those descriptor layers to create landscape features characterising large area woody vegetation systems.

Outcomes The project team will deliver a set of tools ready to be applied by Australian state agencies to create landscape features describing woody vegetation. The tools will be developed using open source language and adapted to be applied at a large area scale.

Introduction

Ground-based measurements of Leaf Area Index are a priority for calibration and validation (cal/val) initiatives of remotely sensed LAI products. A crucial consideration when gathering field measurements is determining a suitable instrument. Presently a number of instruments can be used interchangeably, each with a potential for error and bias. A selection of ground-based instruments to derive LAI including low and high resolution digital hemispherical cameras, the LAI-2200 and a Riegl Vz 400 terrestrial laser scanner were selected. These measurements are used to validate the MODIS LAI product in a subset of representative forested environments within Australia.

The benchmark for assessing the comparability of instruments (adapted from a Committee on Earth Observation Satellites (CEOS) recommendation for LAI validation): ±0.5 or maximum 20% (LAI)

What is Leaf Area Index ?

Leaf Area Index (LAI) is a fundamental descriptor of vegetation structure and function. It can be defined as the total one-sided leaf area per unit of ground area. LAI is recognised as an Essential Climate Variable (ECV) which supports research, modelling, analysis, and capacity-building activity requirements of the United Nations Framework Convention on Climate Change (UNFCCC).

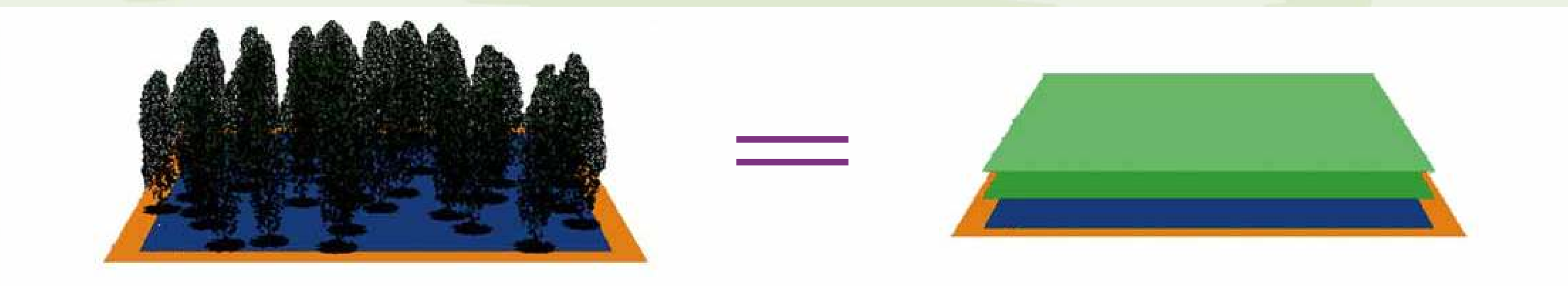


Figure 1: Visualising a forest with LAI equal to 2

Study Sites

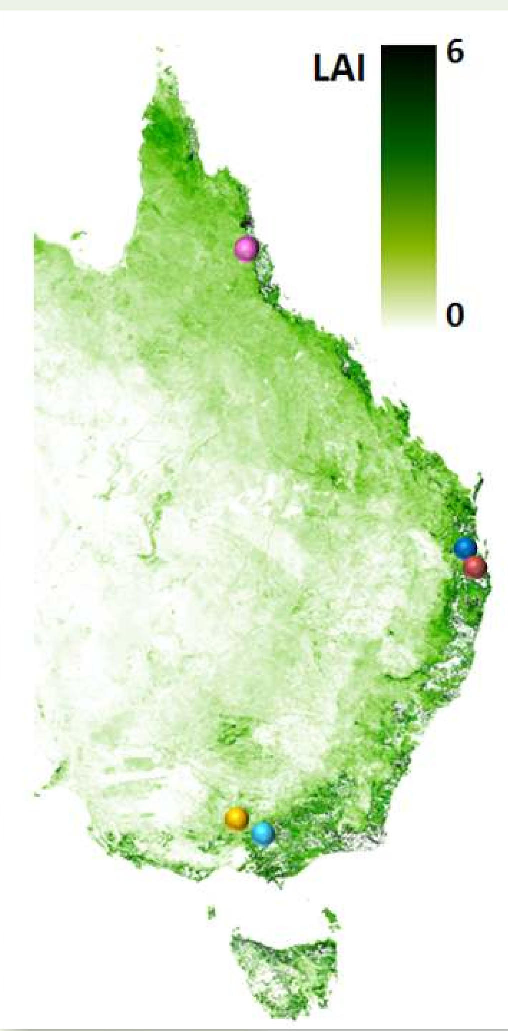
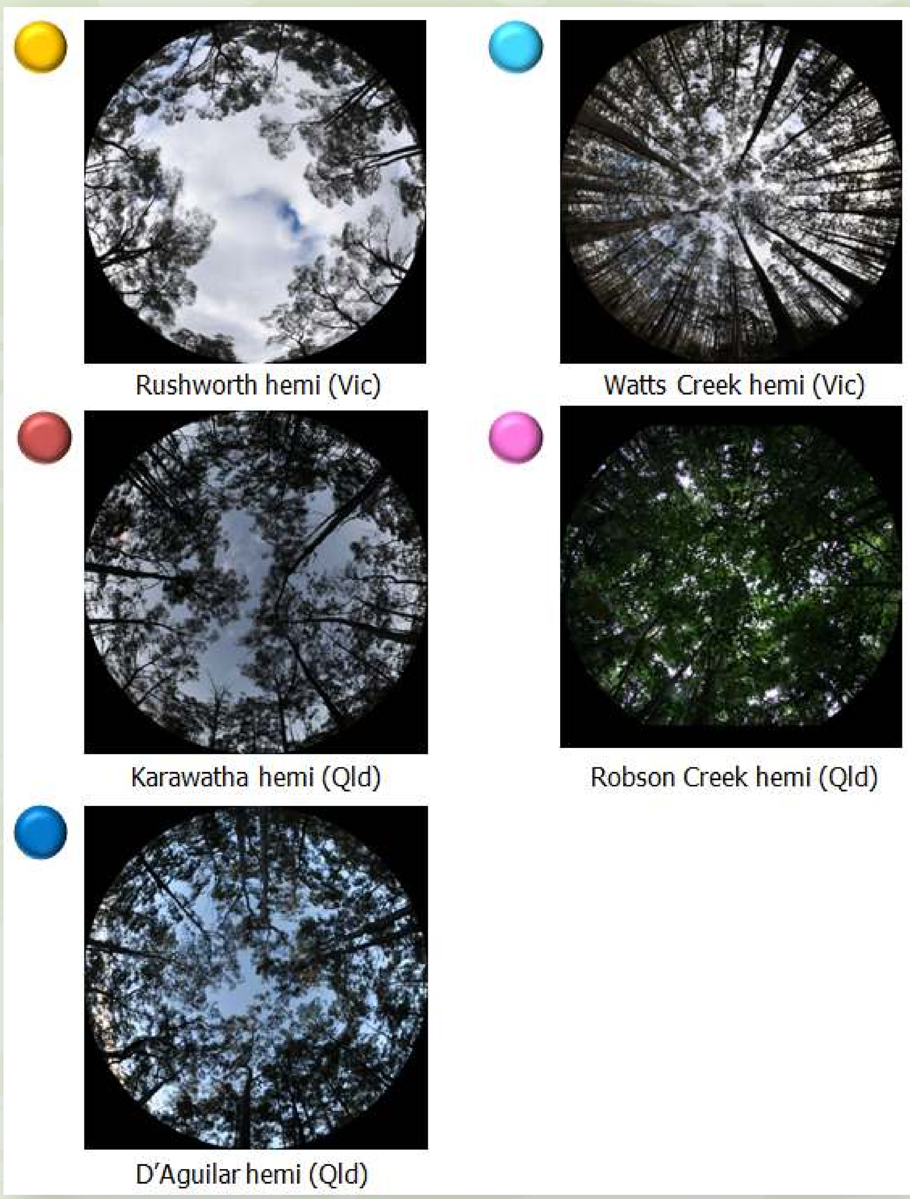


Figure 2: Location of study sites overlaid on MODIS LAI product (2012)



Results

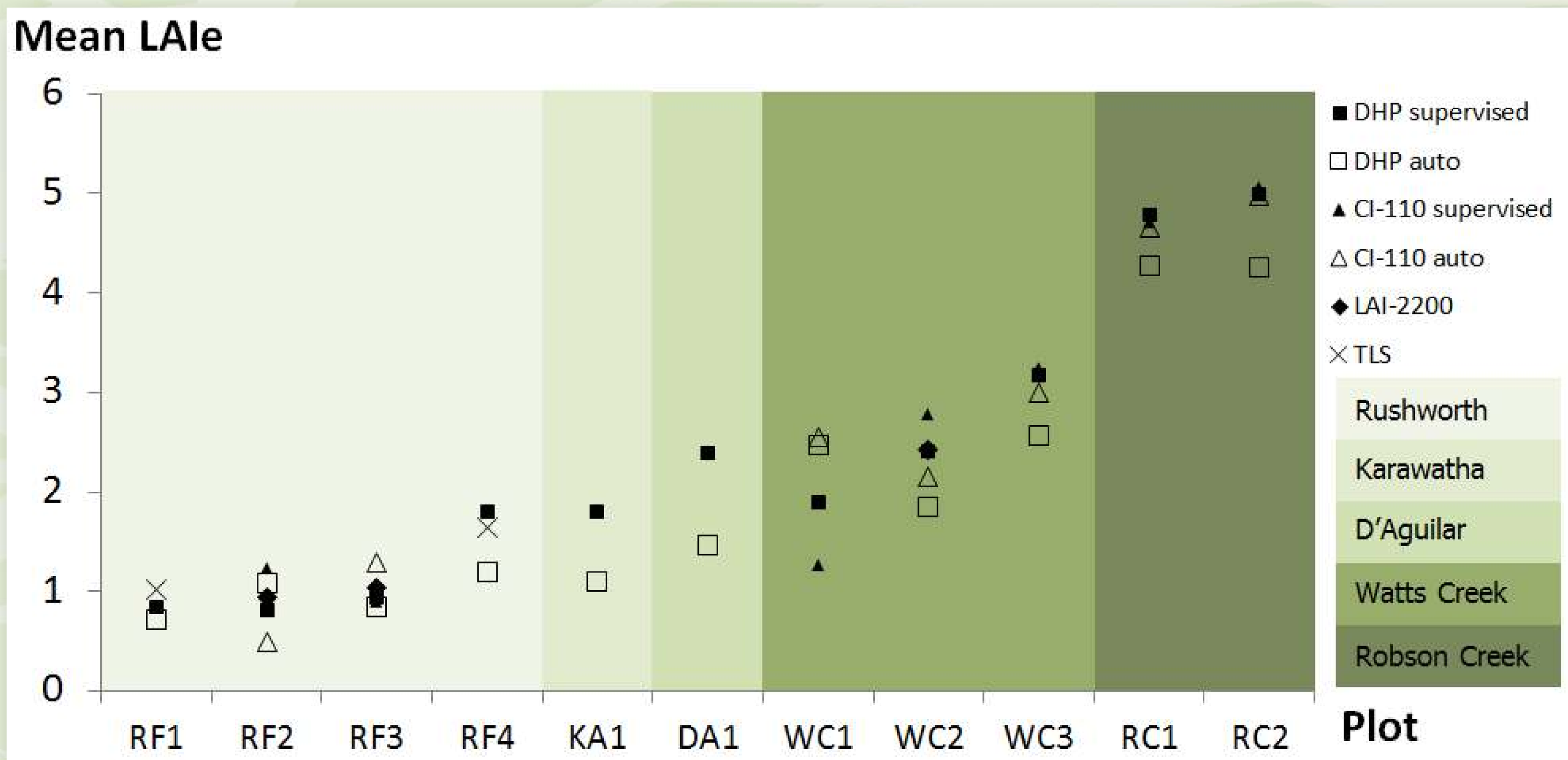


Figure 4: Plot averages for effective LAI for each method and instrument used.
Note the unsupervised classification approach (auto) is from Ridler and Calvard (1978)

Instruments

Figure 3
(a) Digital hemispherical photography
(b) CI-100 (CID Inc)
(c) Terrestrial Laser Scanner (Riegl Vz400)
(d) LAI-2200 (Licor Inc)

Conclusions & Future Work

- Forest type or density did not explain the level of bias between instruments or methods
- The maximum level of bias was high (>0.5 LAI or 20%) at every plot
- TLS matched more closely with supervised classification of DHP than low resolution CI-110
- In most cases the unsupervised classification of images underestimated LAI compared to the supervised classification. This was not linked to LAI levels
- Future work will use 3D modelling to investigate instrument differences separate from confounding sources of error such as lighting conditions
- End users of this research are organisations responsible for collecting ground-based measurements for cal/val and forest inventory

Figure 5: 3D model of a Rushworth forest plot

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RMIT UNIVERSITY
The University of Melbourne
Queensland Government
Australian Government Geoscience Australia
State Government Victoria