Characterising Vegetation Structural Differences Across Australian Ecosystems From a Network of Terrestrial Laser Scanning Survey Sites & Airborne & Satellite Image Archives

Aims and Objectives

Vegetation structural information is critical for environmental monitoring, modelling, management and compliance assessment, from continental to global scales. We refer to vegetation structural properties as their vertical, horizontal and volumetric dimensions, including: canopy height; amount and distribution of vegetation by height.

Our aim was to determine if there were significant differences between select vegetation structural properties across 11 ecosystems in Australia as measured by Auscover’s terrestrial laser scanner (TLS) structure meter.

Vegetation Structure Over Australia

Vegetation structure in Australia (Fig 2) is the basis for our national vegetation community map. National vegetation information systems NVIS (Fig 3a) and is a regularly monitored parameter for local, regional, state and national purposes.

It is challenging to repeat the NVIS processes, and the monitoring and measurement of structural changes requires more accurate and efficient mapping processes. Field based terrestrial laser scanning surveys across our vegetation communities can be used to drive new approaches to satellite mapping of vegetation – this paper reviews some of our practices.

Measurement and mapping of vegetation structural properties for forest, rangeland, savannah, grassland and savannah woodland forests, plant based ecological studies and aerial photograph interpretation. We can now measure vegetation height and other properties at a site scale (m), in a form that can be directly linked to airborne and satellite data to calibrate and validate models. Airborne lidar is an operational method, with data available over Australia for a range of purposes (Fig 5).

We have now systematically collected a range of ecosystems with detailed monitoring programs that are part of the TERN Auscover network (Figs 4 and 5). The TERN Superpixels focus ecological and biophysical data collection at a 5km area, storey and structural properties from airborne laser scanning.

Vegetation Structure Differences

The field measurement process at each Auscover site was part of a systematic and extensive ground and airborne image acquisition campaign across Australia. We built the field sampling protocols developed through the Queensland Government Remote Sensing Centre and data processing systems (Bunting et al., 2015). The field sampling protocols are explained in Armston et al. (2009), Held et al. (2015) and et al. (2015).

Fig 6 shows the layout used across multiple ecosystems for measuring foliage projective cover. TLS, hyperspectral photography and LiDAR. The sites sampled covered the range of structural variation in Australian vegetation communities (Fig 3 and 8). Conform to field data collection - airborne hyperspectral (SPECIM Hawk-E) airborne LiDAR and wavefront lidar (Rieg-VZ500) were collected. All data have been processed. QA/QC’d and are available at: www.auscover.org.au/data/product

The main structural differences in terms of canopy height, vegetation substrata, leaf canopy morphology and ground cover are evident in the photoshops for each site (Fig 8). Phenological differences also occur between vegetation communities at each site, affecting the amount of canopy, mid-storey and ground biomass at different times of year.

Access These Data and Use Them !

All data presented are part of our national ecosystem research infrastructure and are open for use. Our results shown the power to a simple ecological division and comparison across ecosystems. The vegetation structure data shown in this poster are suited to calibration and validation of local to national (Fig 9) and global scale, airborne and satellite data. We have also developed a range of ecosystem models. (Please use the data to provide feedback and add your own data.)

References:

