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TITLE: Intercomparison of Terrestrial Laser Scanning Instruments for Assessing Forested Ecosystems: A Brisbane Field Experiment

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ABSTRACT BODY: During 28th July – 3rd August, 2013, an international group of researchers brought five terrestrial laser scanners (TLS) to long-term monitoring plots in three eucalyptus-dominated woodland sites near Brisbane, Queensland, Australia, to acquire scans at common locations for calibration and intercomparison.They included:
DWEL – a dual-wavelength full-waveform laser scanner (Boston U., U. Massachusetts Lowell, U. Massachusetts Boston, USA)
SALCA – a dual-wavelength full-waveform laser scanner (U. Salford, UK)
CBL – a canopy biomass lidar, a small ultraportable low-cost multiple discrete return scanner (U. Massachusetts Boston, USA)
Riegl VZ400 – a survey-grade commercial waveform scanner (Queensland Government and TERN, U. Queensland, Australia)
FARO Focus 3D – a lightweight commercial phase-shift ranging laser scanner (U. Southern Queensland)
Two plots were scanned at Karawatha Forest Park, a Terrestrial Ecosystem Research Network (TERN) Supersite, and one plot at D'Aguilar National Park. At each 50 x 100 m plot, a center scan point was surrounded by four scan points located 25 m away in a cross pattern allowing for 3-D reconstructions of scan sites in the form of point clouds. At several center points, multiple instrument configurations (i.e. different beam divergence, angular resolution, pulse rate) were acquired to test the impact of instrument specifications on separation of woody and non-woody materials and estimation of vegetation structure parameters. Three-dimensional Photopoint photographic panoramas were also acquired, providing reconstructions of stems in the form of point clouds using photogrammetric correlation methods. Calibrated reflectance targets were also scanned to compare instrument

geometric and radiometric performance. Ancillary data included hemispherical photos, TRAC LAI/clumping measurements, spectra of leaves, bark, litter, and other target components. Wet and dry leaf weights determined water content. Planned intercomparison topics and themes include retrieval of leaf area index and related parameters; retrieval of tree diameters, above-ground biomass, and height; approaches to calibration; waveform vs. discrete return data; value of dual wavelength data; ray tracing simulations driven by scanning; and others.
This effort was initiated as an activity of the Terrestrial Laser Scanning International Interest Group. The primary objective of this international collaboration is to advance the understanding and application of TLS to forest management and inventory, rapid and automated measurement of vegetation structure parameters, monitoring vegetation dynamics, calibration and validation of large area above-ground biomass mapping, and the development of new low-cost portable scanners to enable wider application of these technologies.
Immediate application of the data sets and techniques developed will be through national collaborative research programs, such as NEON and TERN, which enable the techniques and infrastructure developed to be applied consistently. These collaborations and the data and techniques developed and shared openly are essential to enable consistent production of forest structural property maps in science and management applications.
http://tlsiig.bu.edu

KEYWORDS: 0480 BIOGEOSCIENCES Remote sensing, 0452 BIOGEOSCIENCES Instruments and techniques, 0428 BIOGEOSCIENCES Carbon cycling.

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Additional Details

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