Product Delivery Report for K&C Phase 3

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Science Team meeting #21 – Phase 3 Result Presentations
Kyoto Research Park, Kyoto, Japan, December 3-4, 2014

K&C Phase 3 Project Objectives

Objective: To provide R&D support to the generation of JAXA's global forest/non-forest and above ground biomass maps

- Advance development and validation of algorithms for Australian conditions
- Support quantification of forest/non-forest extent and change, biomass (carbon), biomass change and associated carbon losses and gains

Supports *K&C thematic drivers*

- **C**arbon cycle science – products are to be input to carbon data assimilation schemes (CSIRO) and carbon offsets research
- Environmental **C**onservation – regional mapping at a scale relevant to land management and State Government vegetation management policy

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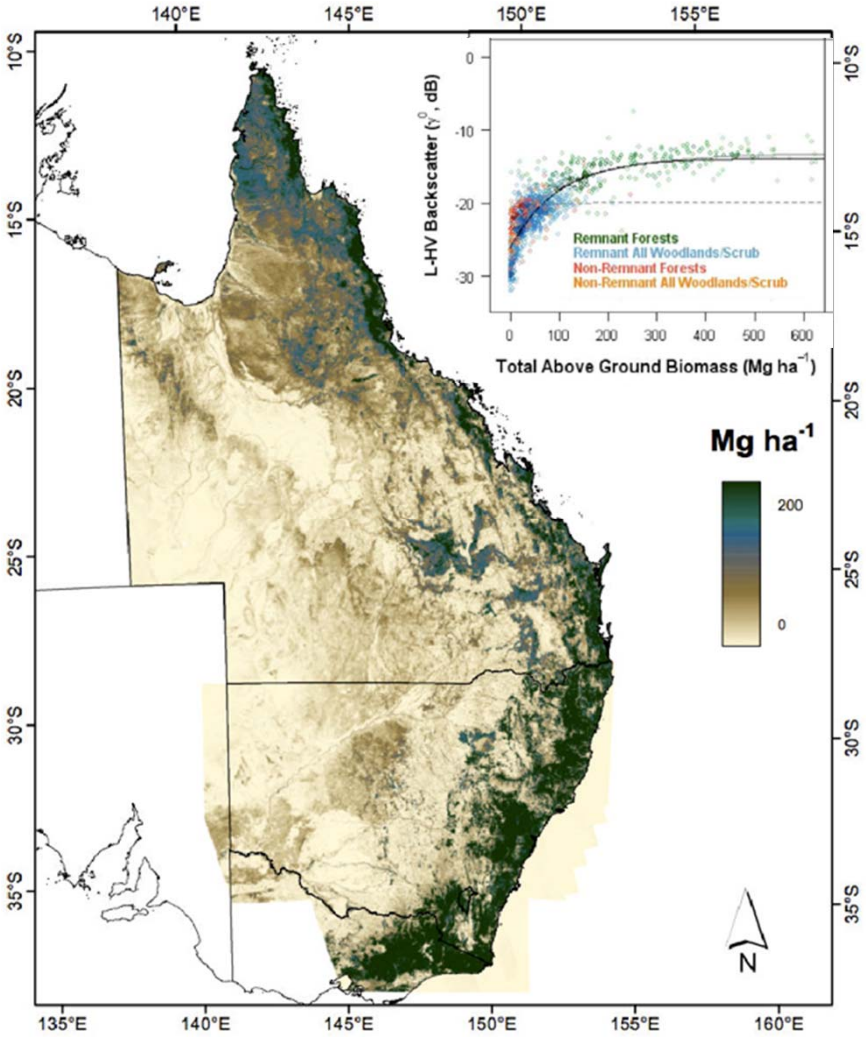
Results and Significant Findings

K&C Phases 2/3 – ALOS PALSAR only AGB map

Brigalow Forest

Open Callitris Forest

Low Acacia Woodland



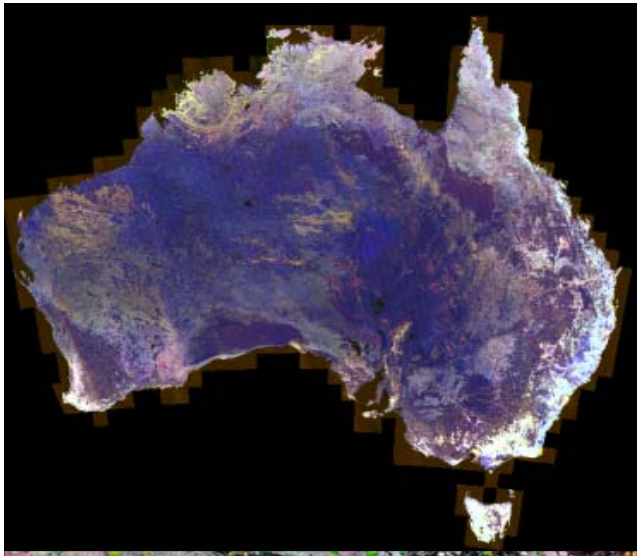
Tall Closed Rainforest

Eucalypt Woodland

Low Banksia woodland

Results and Significant Findings

K&C Phase 3 – Use backscatter, cover and height information



- Segmentation based on Landsat persistent green vegetation and ALOS PALSAR L-band HH/HV
- Brigalow Belt Bioregion forest regrowth extent and growth stage mapping (complete)
- National wooded extent and vertical plant profile mapping (complete)
  - Validation of wooded extent, segmentation and clustering for canopy height mapping using airborne lidar
- Extension of biomass library across Australia to build national allometrics database (Dec 2014)
- Baseline 2009 national above-ground biomass maps in progress (Feb 2015)

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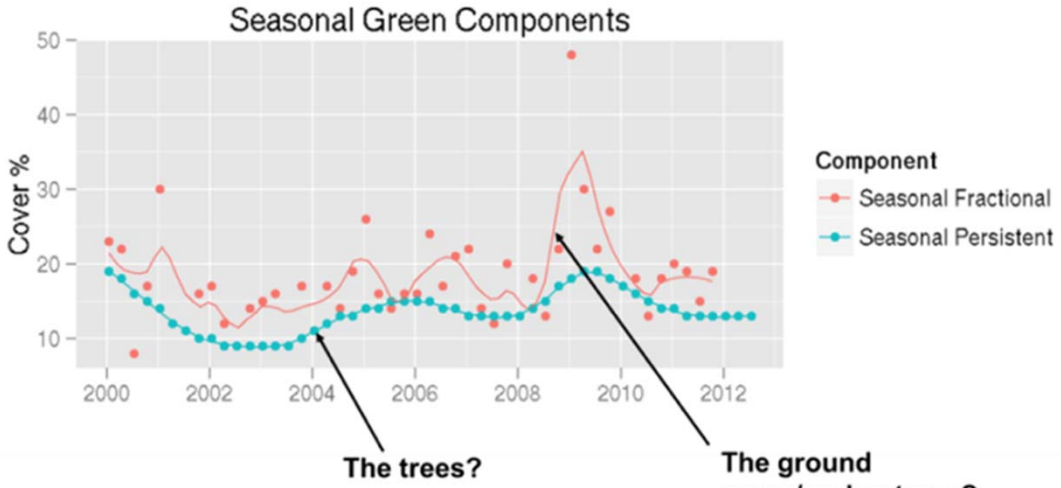
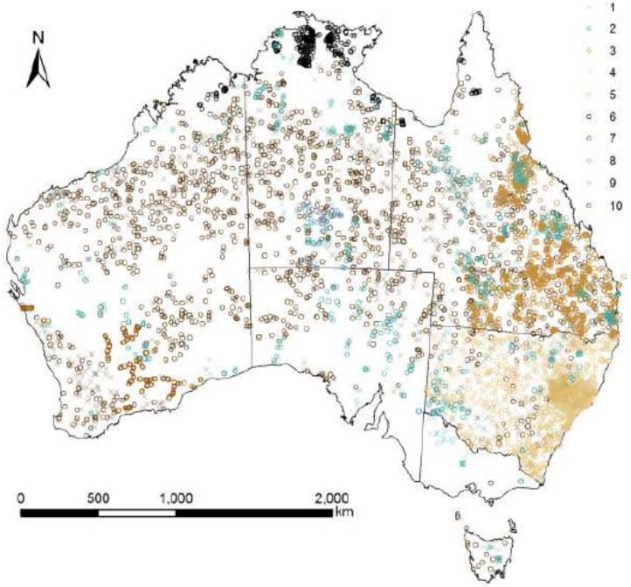
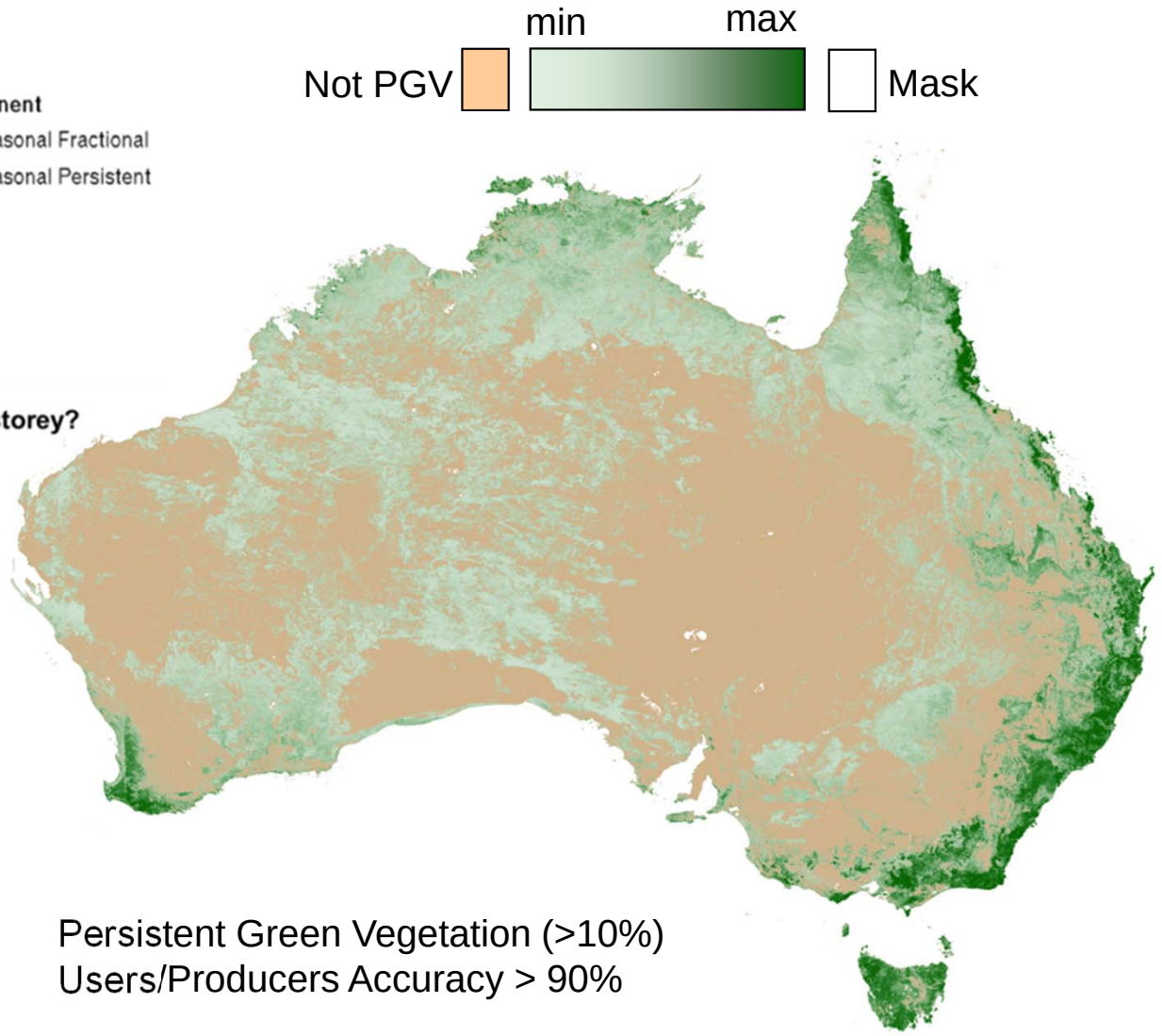
Persistent Green Vegetation Product (Version 2)

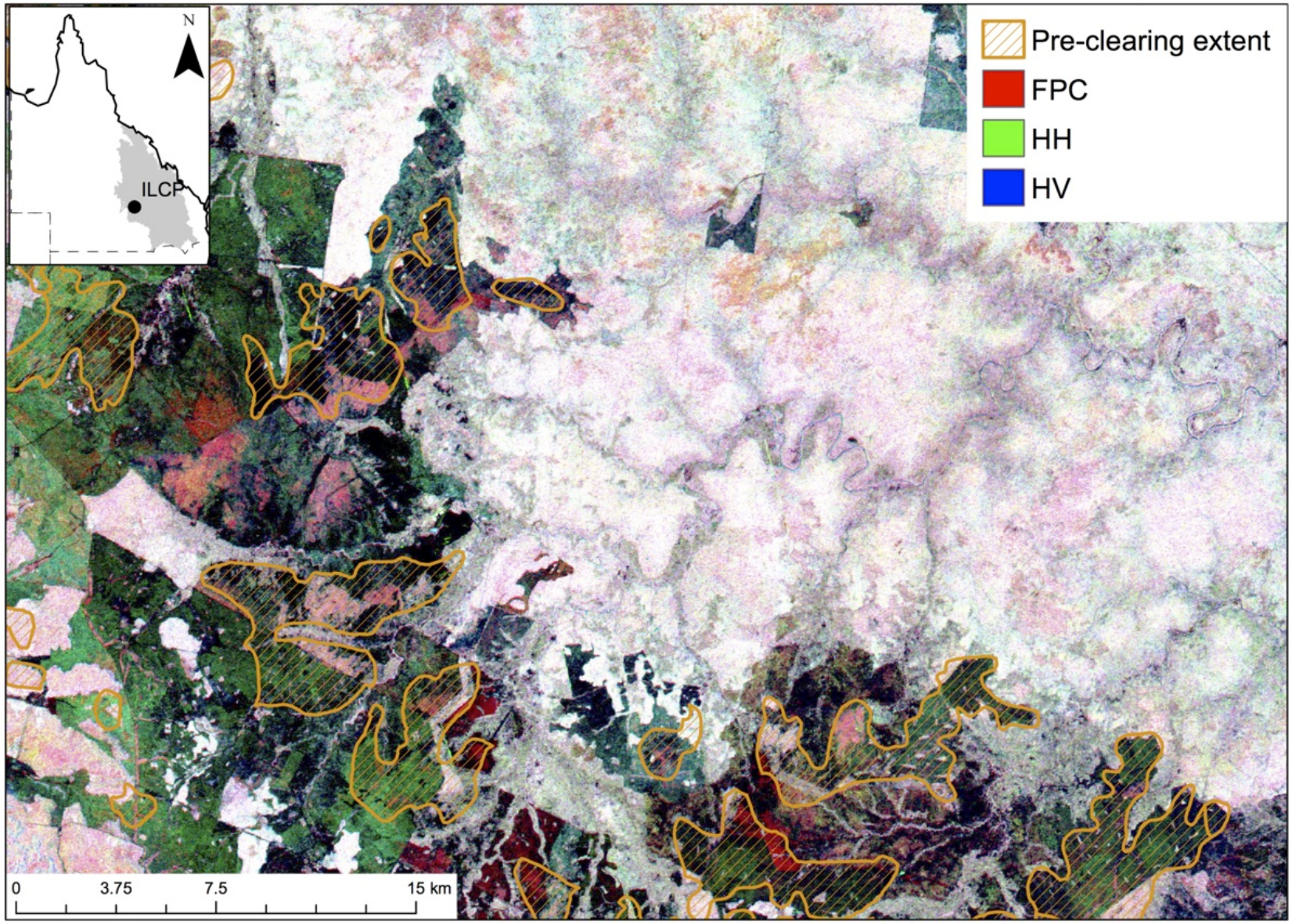






Persistent Green Vegetation (>10%)
Users/Producers Accuracy > 90%

Brigalow forest regrowth extent and growth stage product



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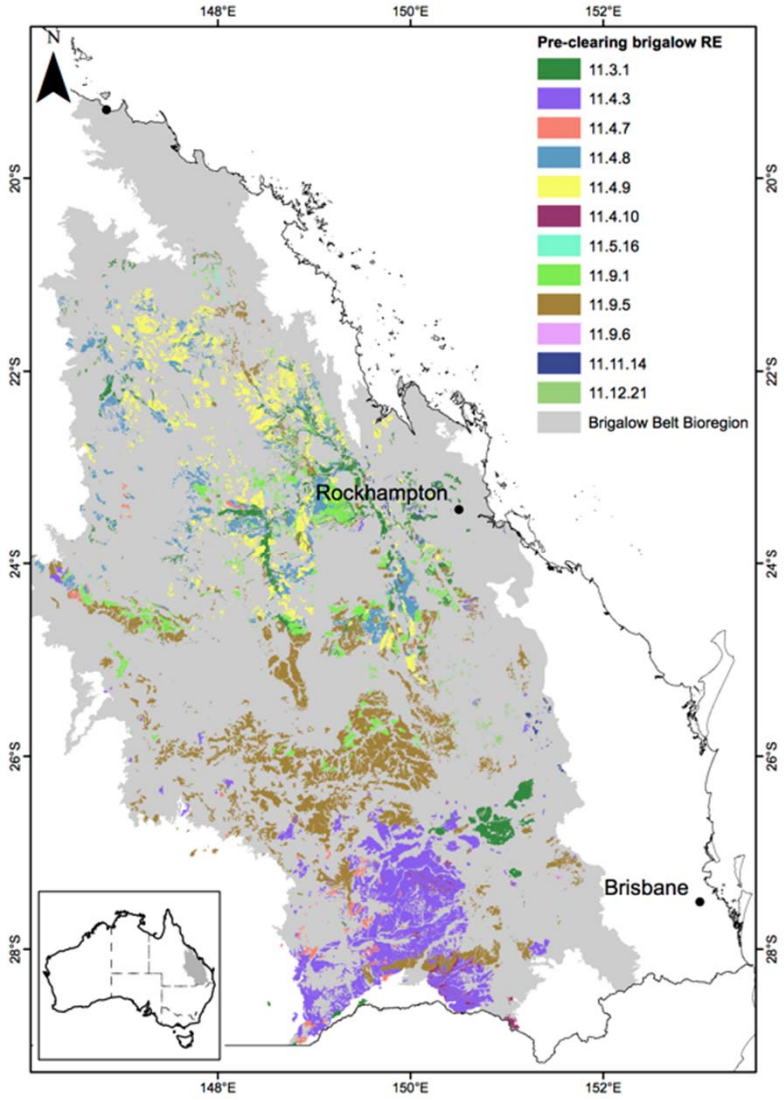
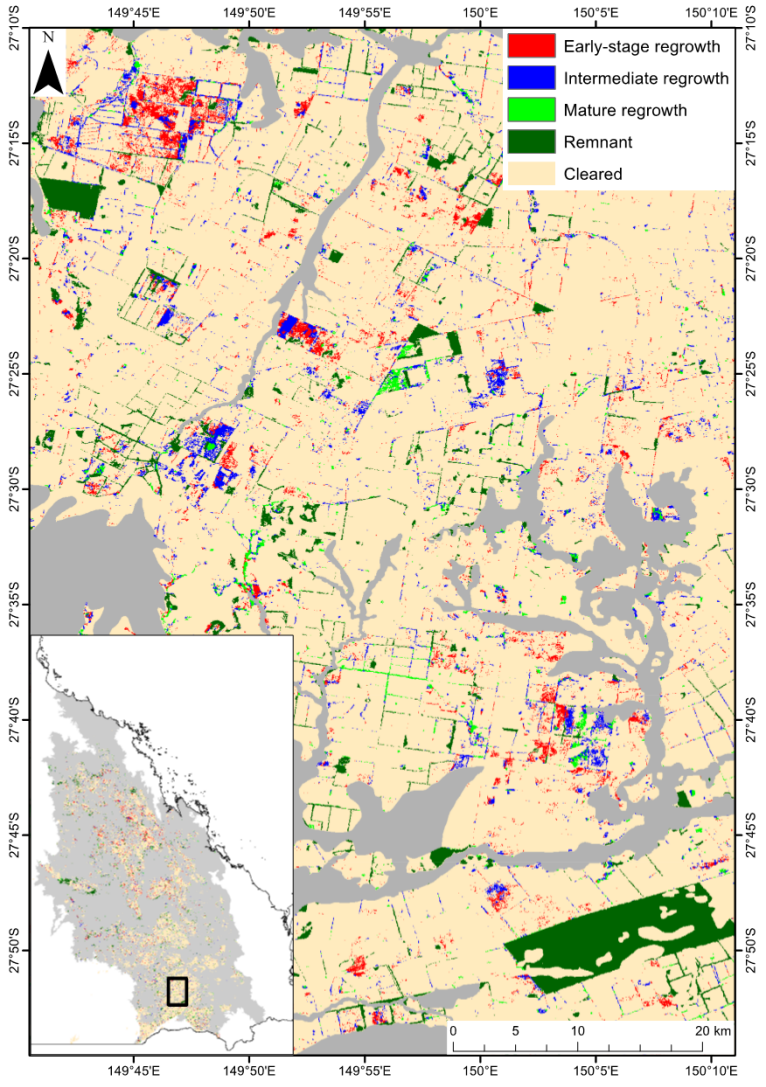
Brigalow forest regrowth extent and growth stage product



12 Brigalow Regional Ecosystems



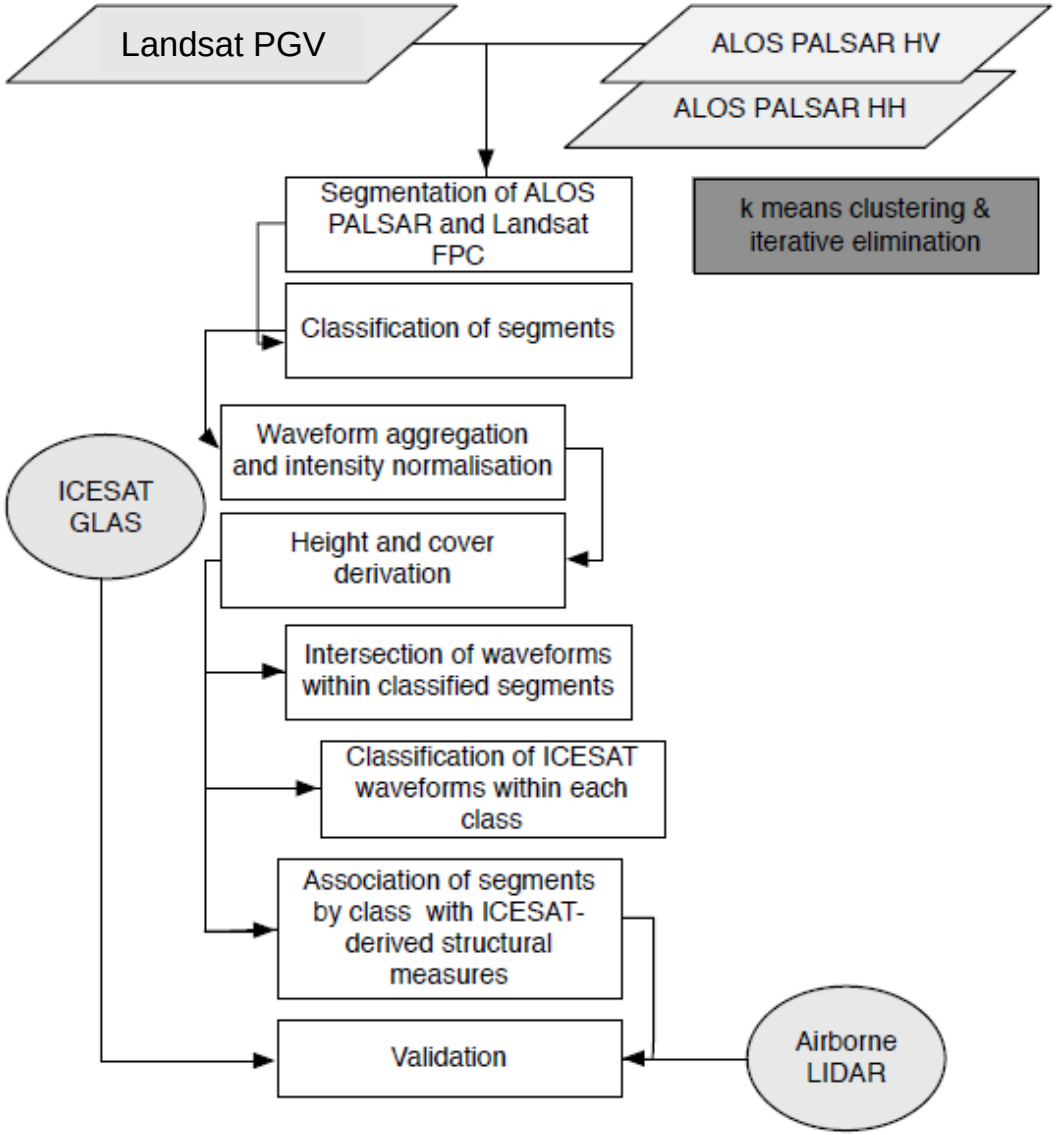
Extent & growth stage classification

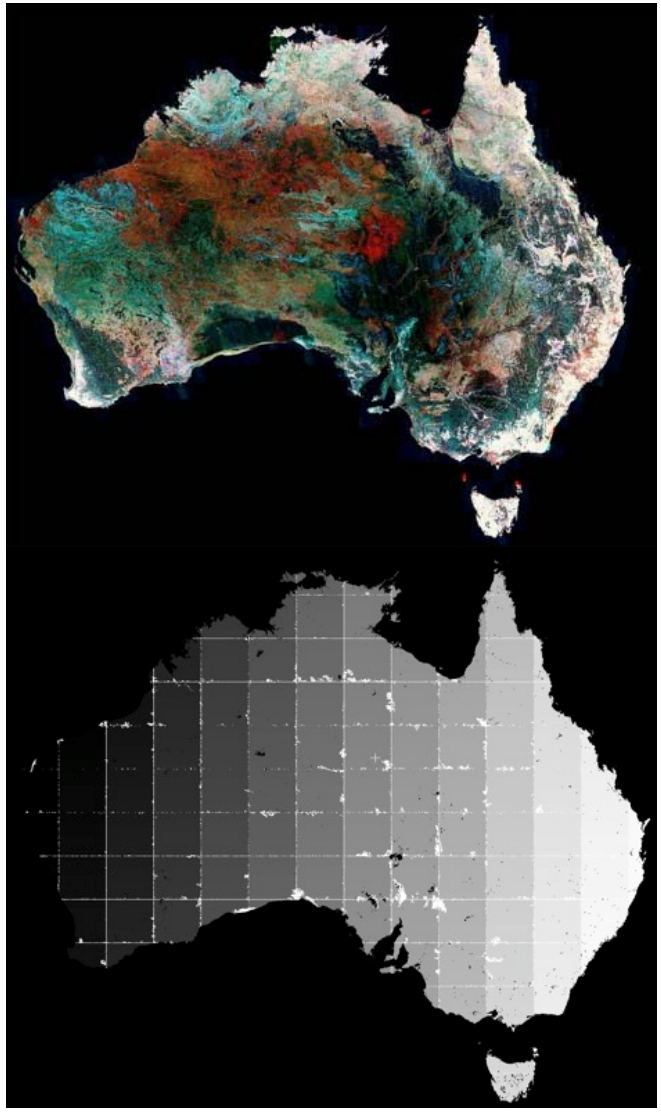
Regrowth Extent (Brigalow Belt Bioregion)

RE	Pre-clearing	Area; ha (% of pre-clearing extent)				Total (all stages)
		Early-stage	Intermediate	Mature	Remnant	
11.3.1	668,770	36,938 (5.5)	34,198 (5.1)	10,944 (1.6)	41,763 (6.2)	123,842 (10.5)
11.4.3	1,542,078	39,052 (2.5)	44,354 (2.9)	20,123 (1.3)	69,336 (4.5)	172,865 (14.6)
11.4.7	191,102	9,165 (4.8)	6,752 (3.5)	5,932 (3.1)	15,758 (8.2)	37,607 (3.2)
11.4.8	646,596	60,739 (9.4)	12,593 (1.9)	16,854 (2.6)	56,324 (8.7)	146,510 (12.4)
11.4.9	932,691	82,860 (8.9)	37,991 (4.1)	4,904 (0.5)	70,873 (7.6)	196,629 (16.6)
11.4.10	57,582	1,780 (3.1)	2,644 (4.6)	2,135 (3.7)	5,596 (9.7)	12,154 (1.0)
11.5.16	12,797	903 (7.1)	584 (4.6)	572 (4.5)	2,832 (22.1)	4,892 (0.4)
11.9.1	524,056	37,465 (7.1)	23,631 (4.5)	9,469 (1.8)	40,418 (7.7)	110,982 (9.4)
11.9.5	2,176,007	95,148 (4.4)	64,016 (2.9)	47,761 (2.2)	147,539 (6.8)	354,464 (30.0)
11.9.6	15,317	113 (0.7)	84 (0.6)	157 (1)	204 (1.3)	558 (<0.1)
11.11.14	34,609	1,142 (3.3)	1,927 (5.6)	1,502 (4.3)	3,794 (11)	8,364 (0.7)
11.12.21	71,350	3,169 (4.4)	1,777 (2.5)	3,310 (4.6)	6,063 (8.5)	14,318 (1.2)
Total (all REs)	6,872,955	368,473	230,551 (3.4)	123,662 (1.8)	460,499 (6.7)	1,183,185
Percentage ([1],[2])		5.4 31.1	3.4 19.5	1.8 10.5	6.7 38.9	

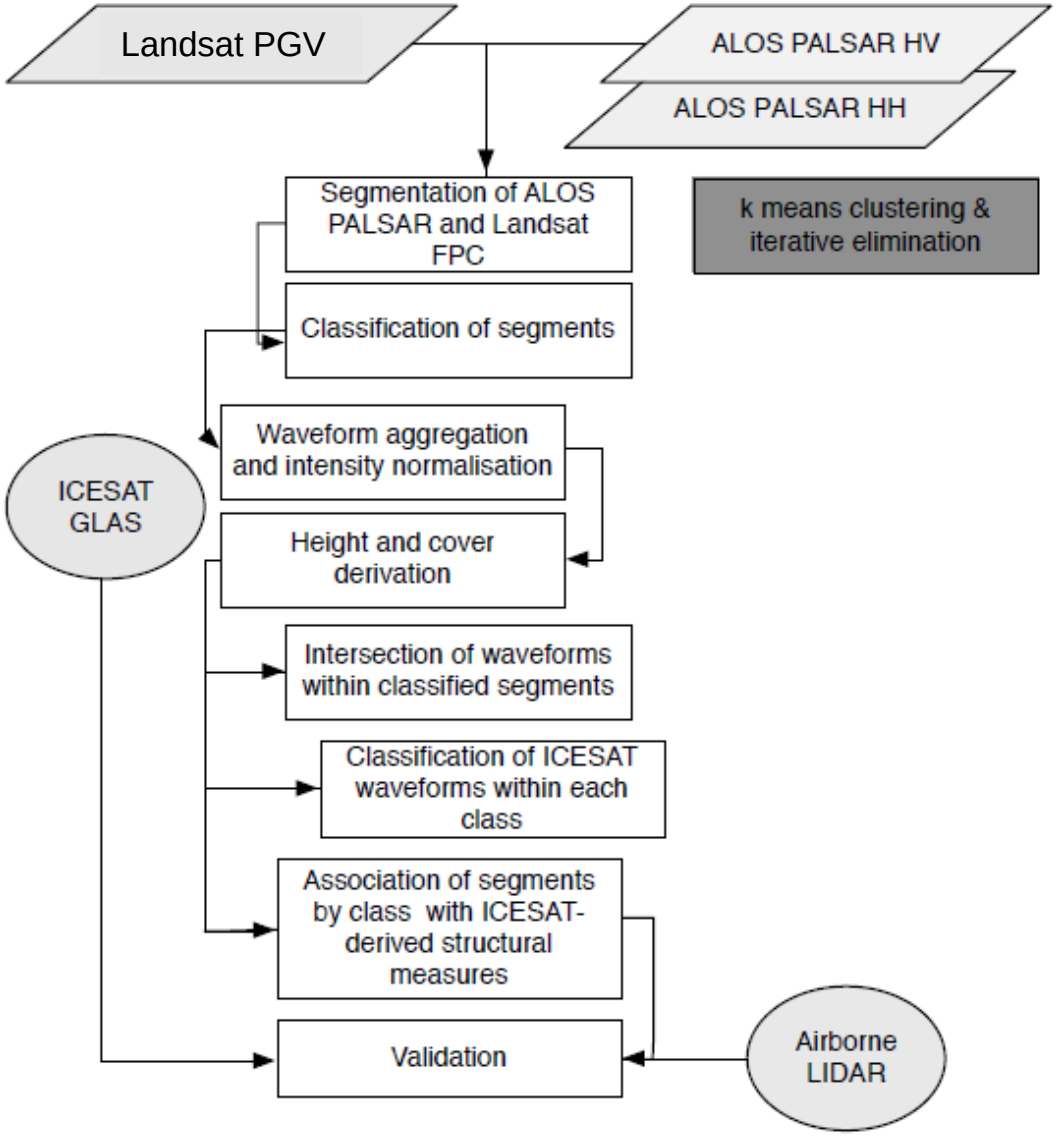
[1]Of total area of the 12 REs; [2]Of area of forest within the 12 REs

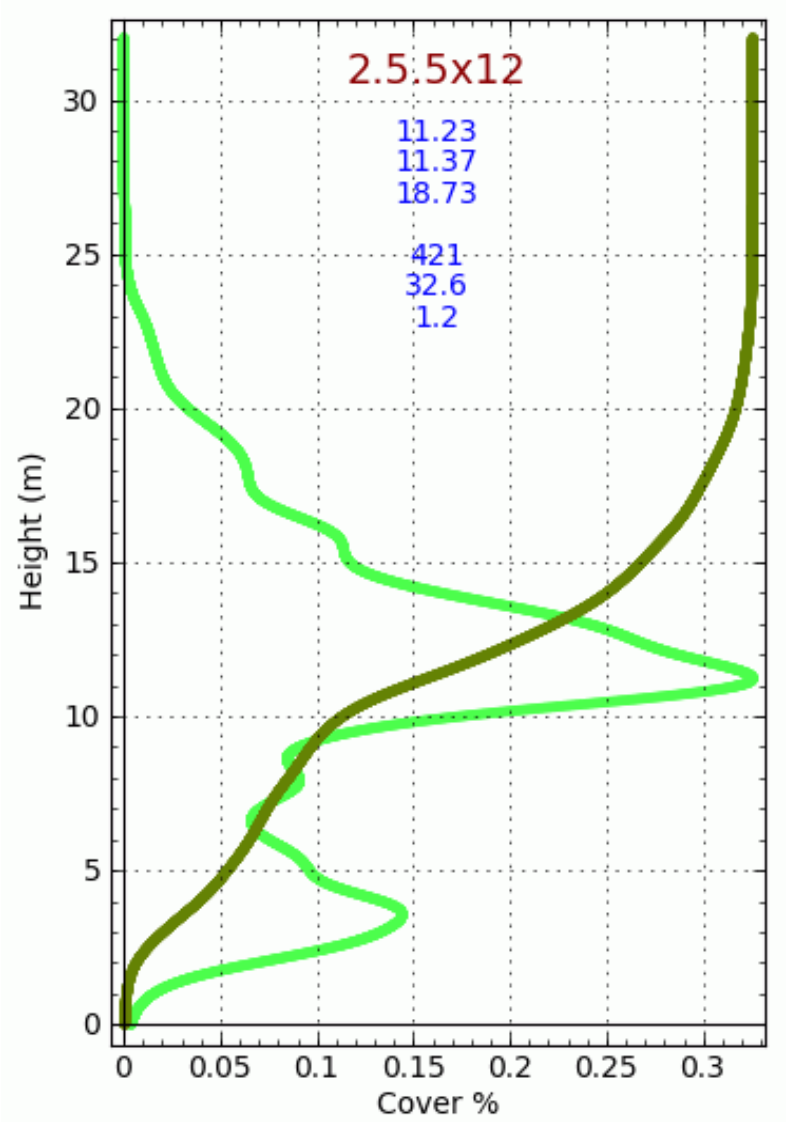
National Vertical Foliage Profile Product



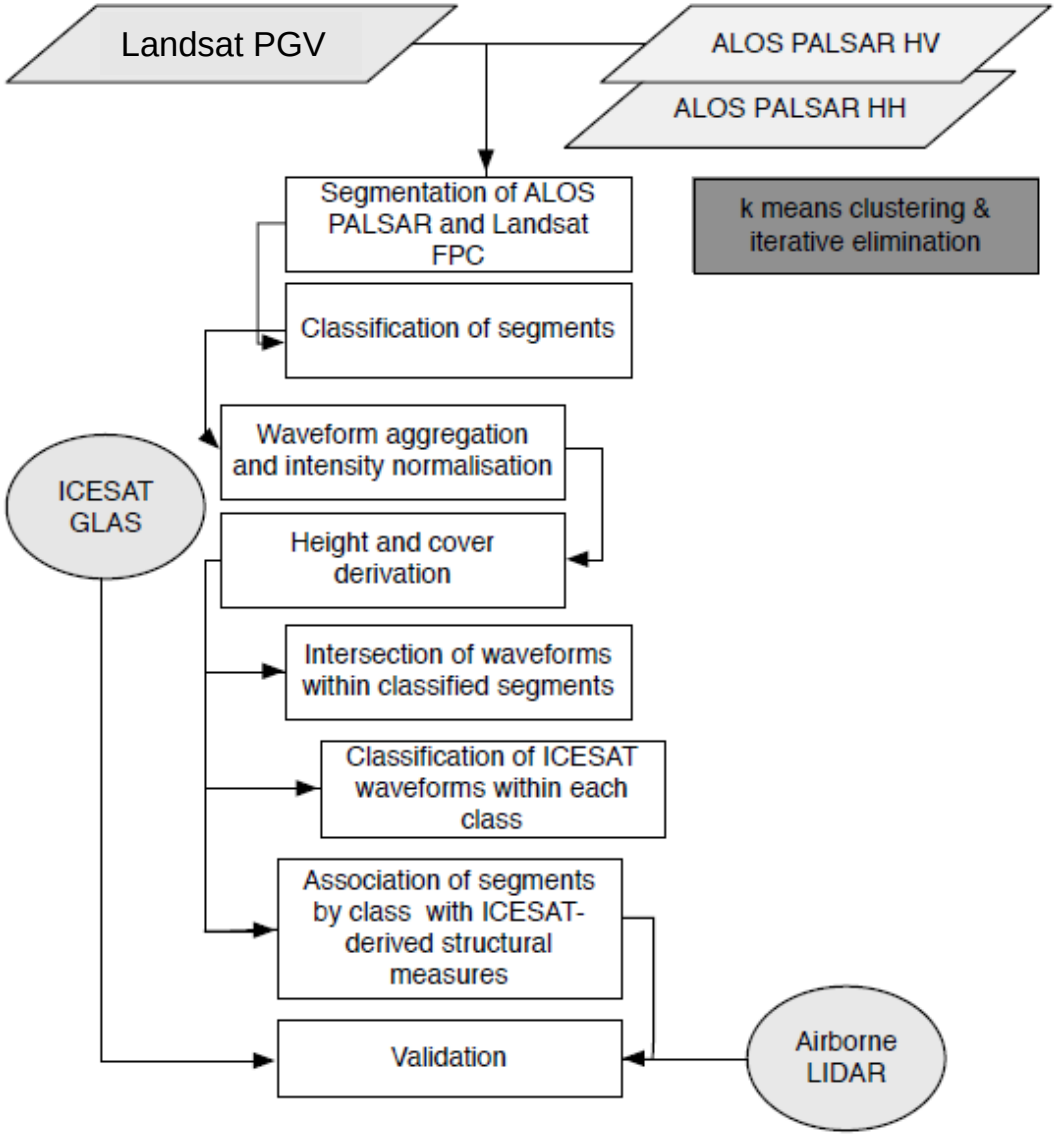


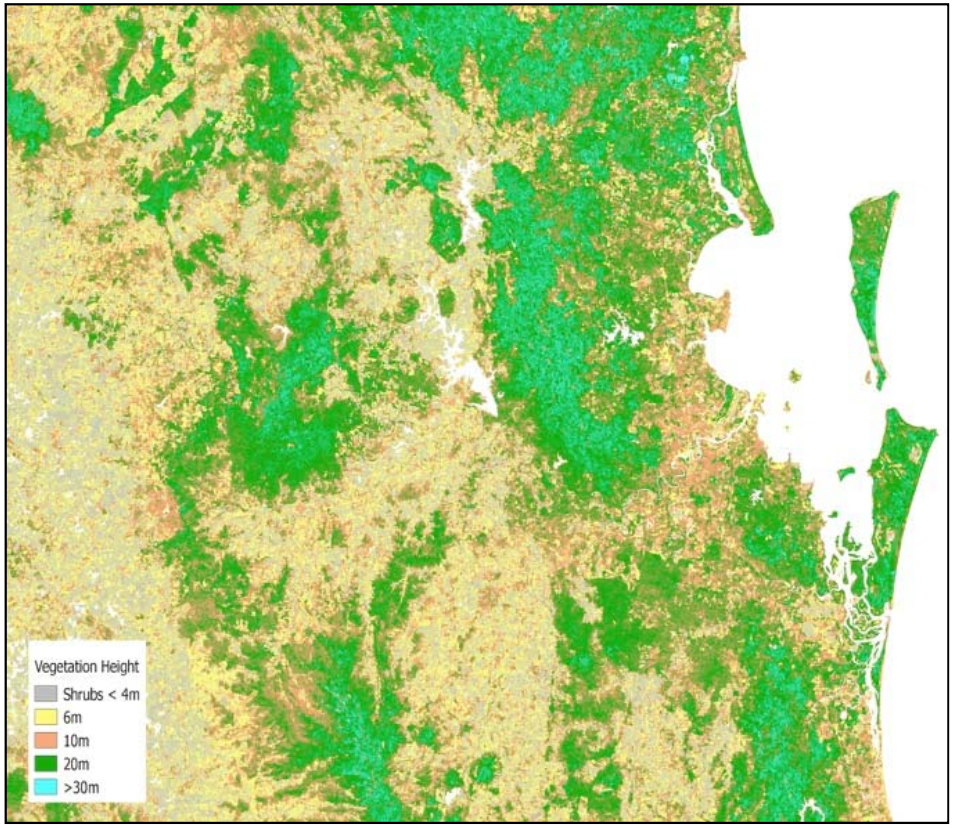
National Vertical Foliage Profile Product





National Vertical Foliage Profile Product





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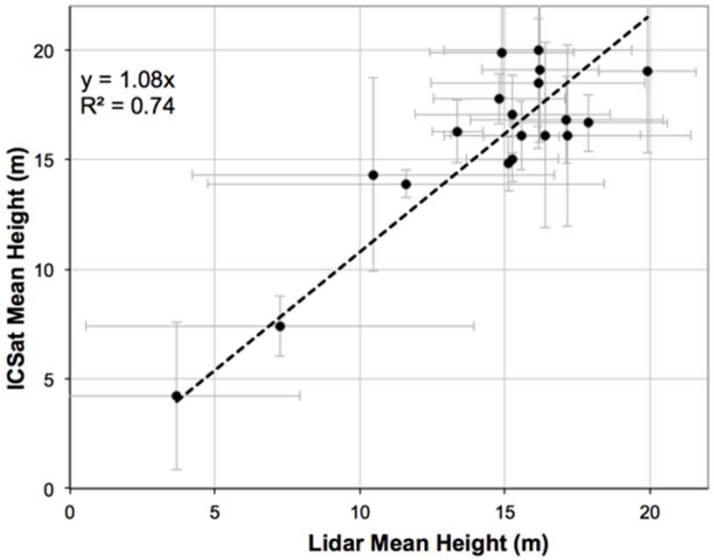
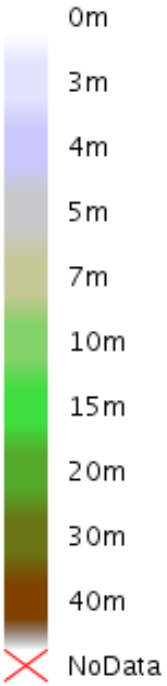
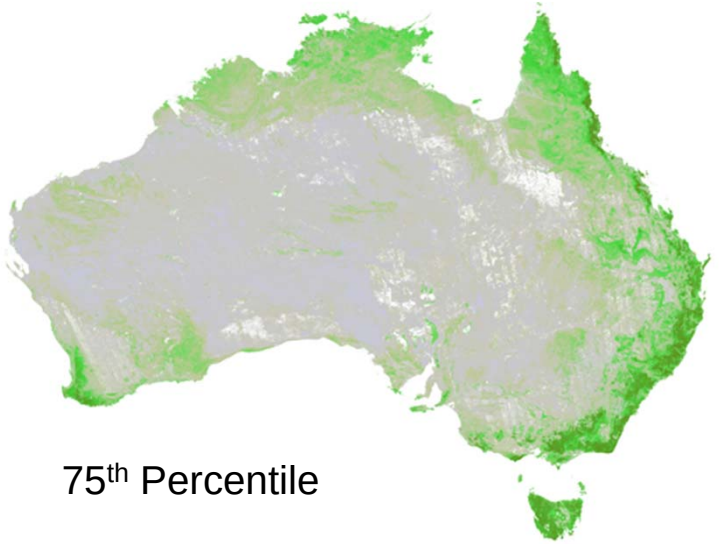
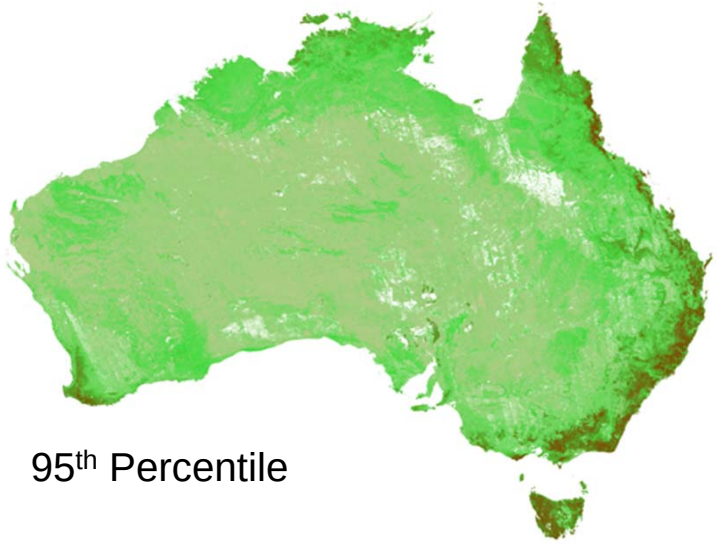
National Vertical Foliage Profile Product



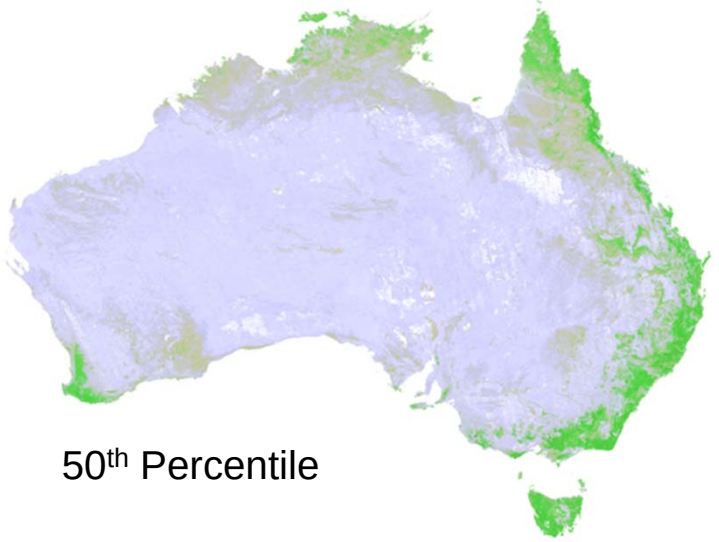




75th Percentile



95th Percentile



50th Percentile

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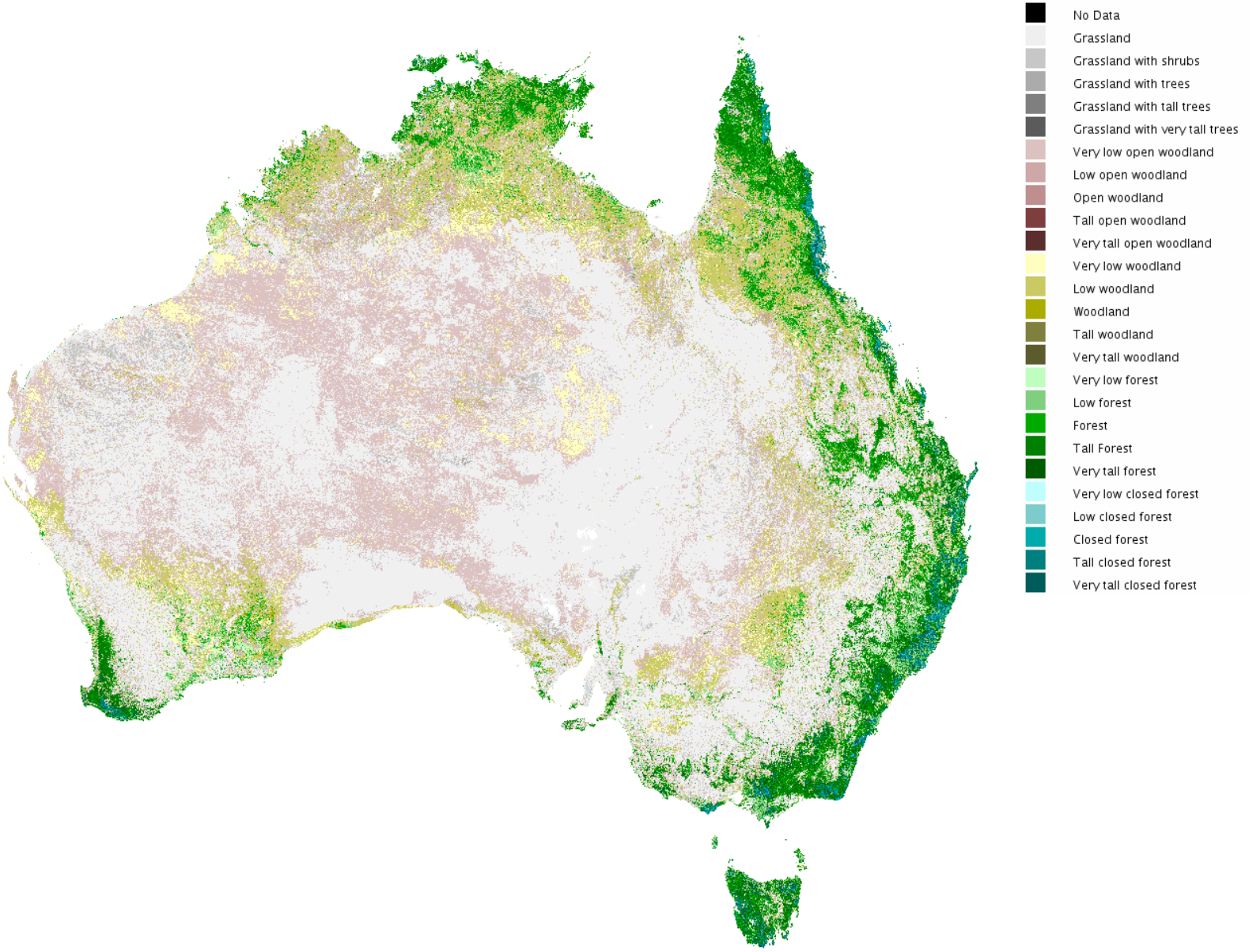
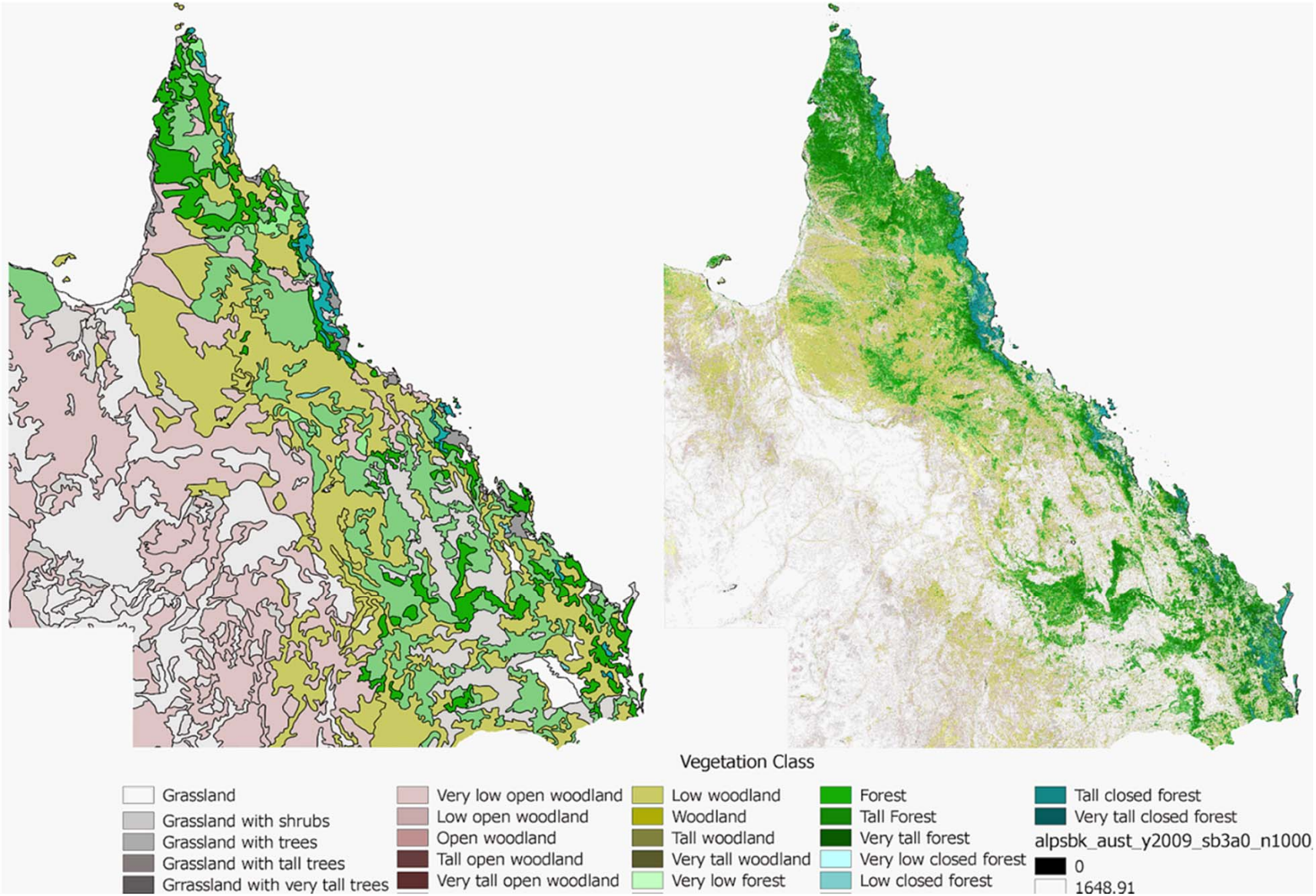
Vegetation Structural Formation Map



Comparison with existing national mapping



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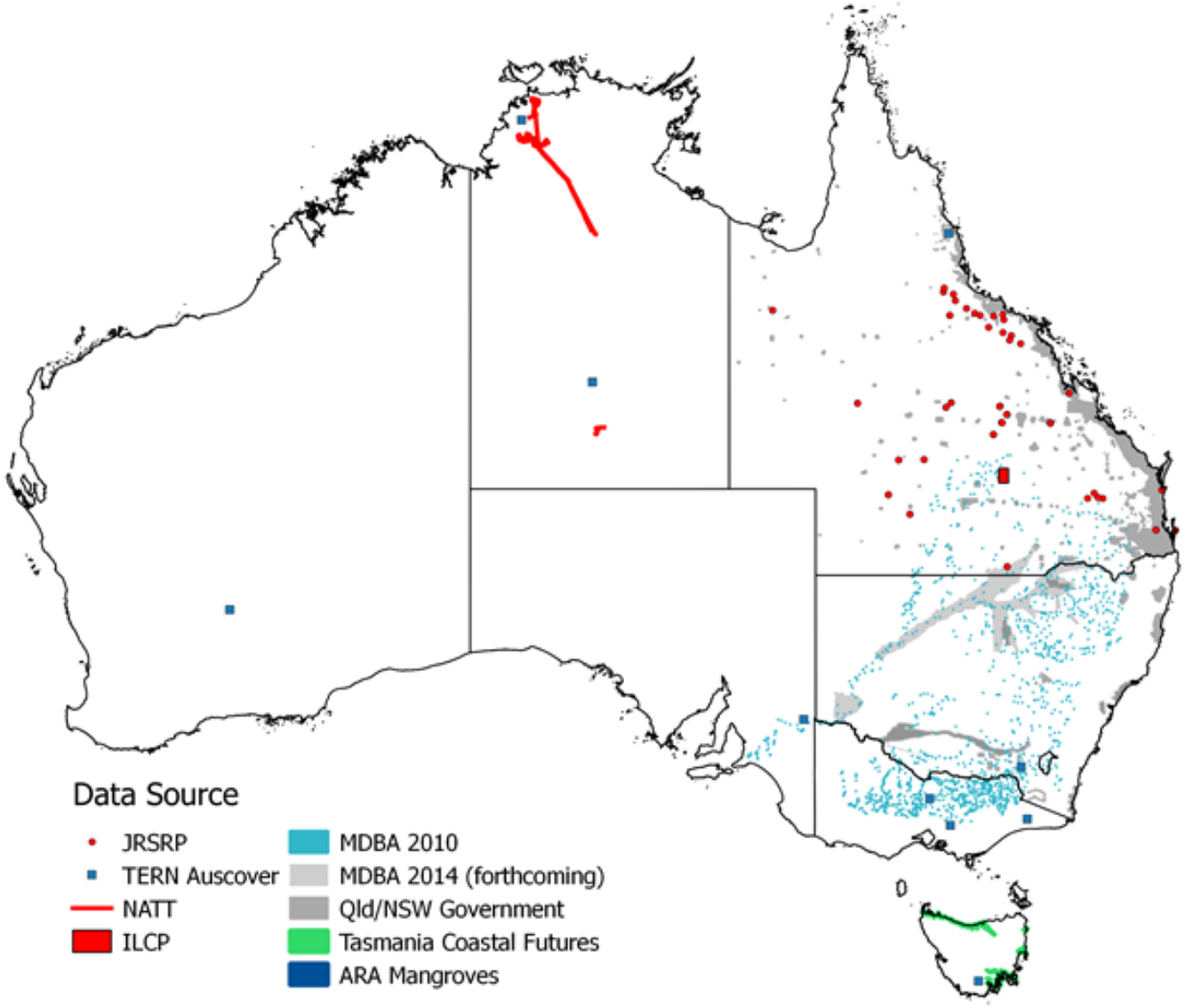
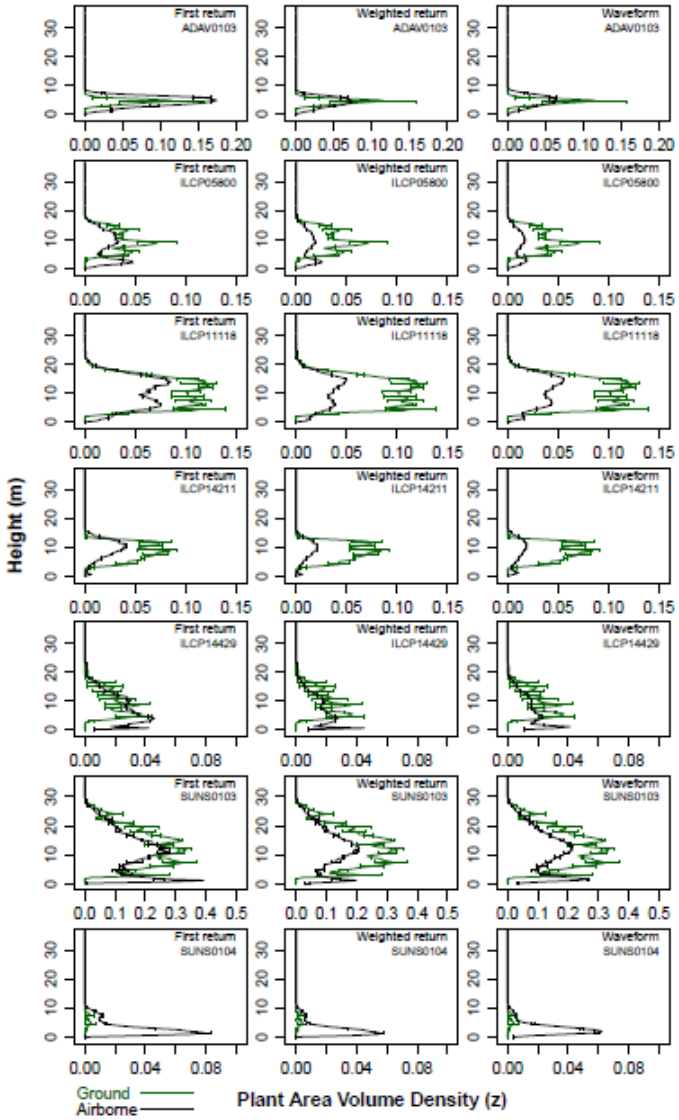
National Airborne Lidar Validation Database





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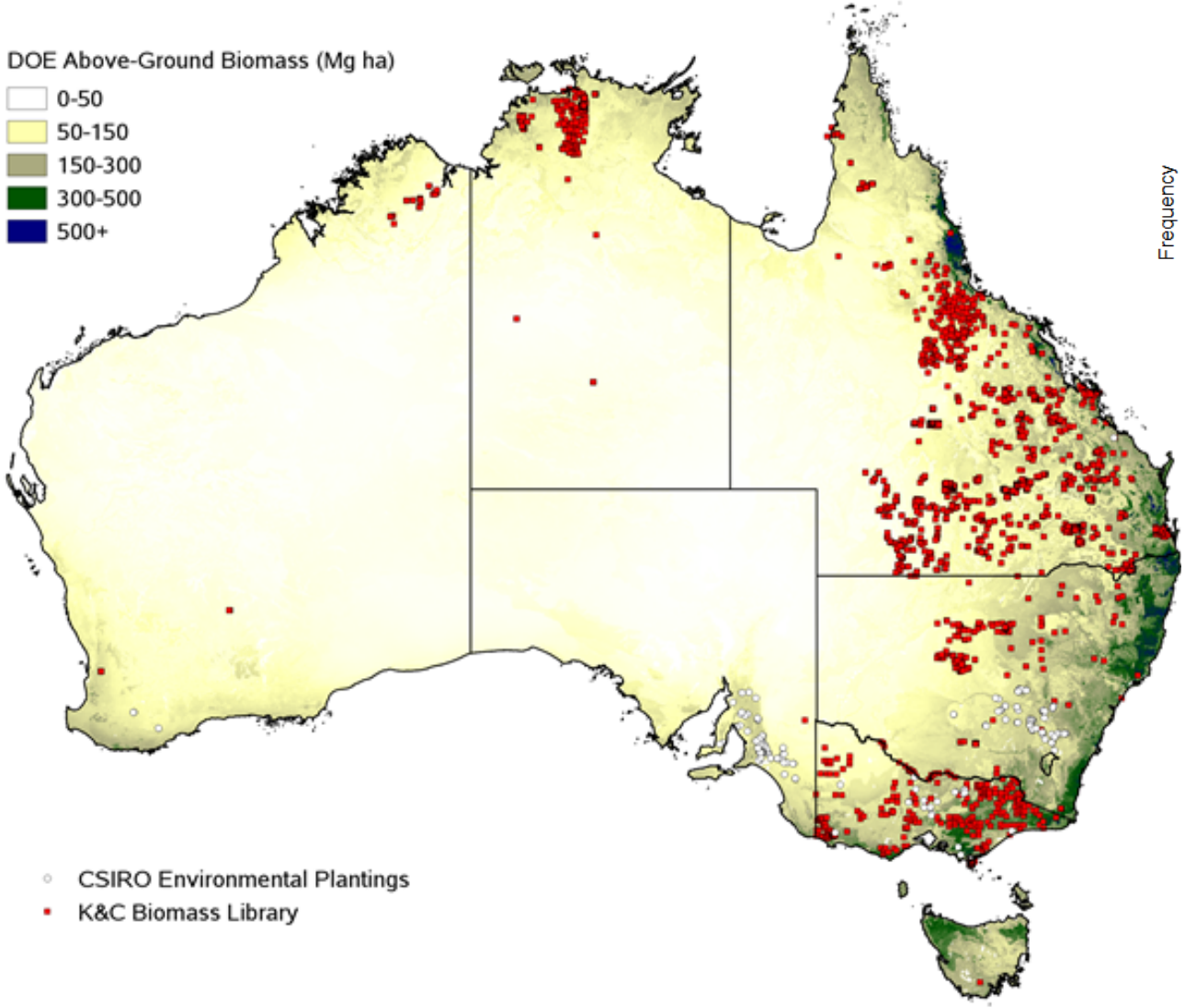
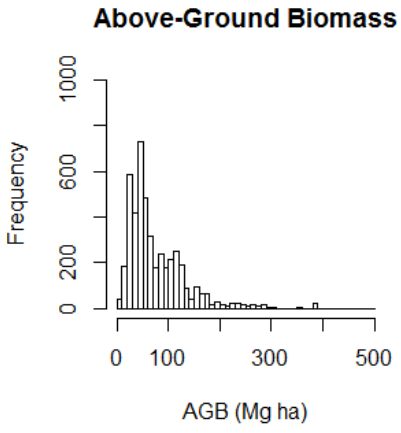
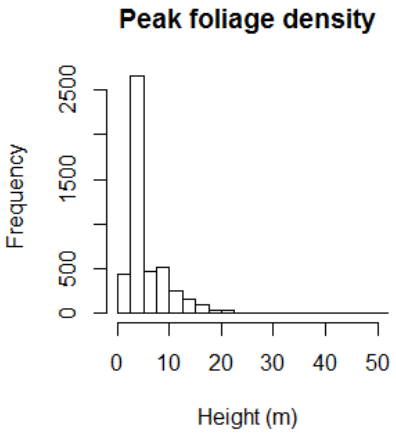
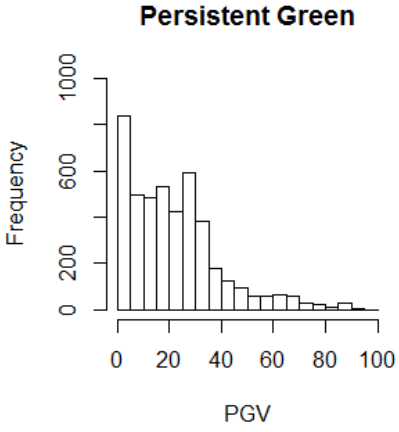
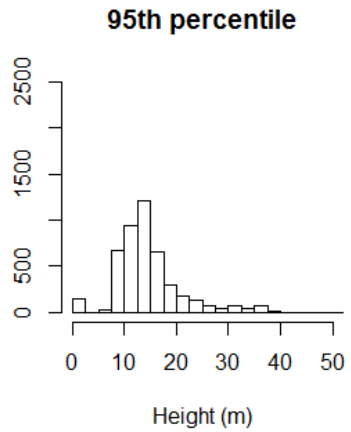
National Above-Ground Biomass Library











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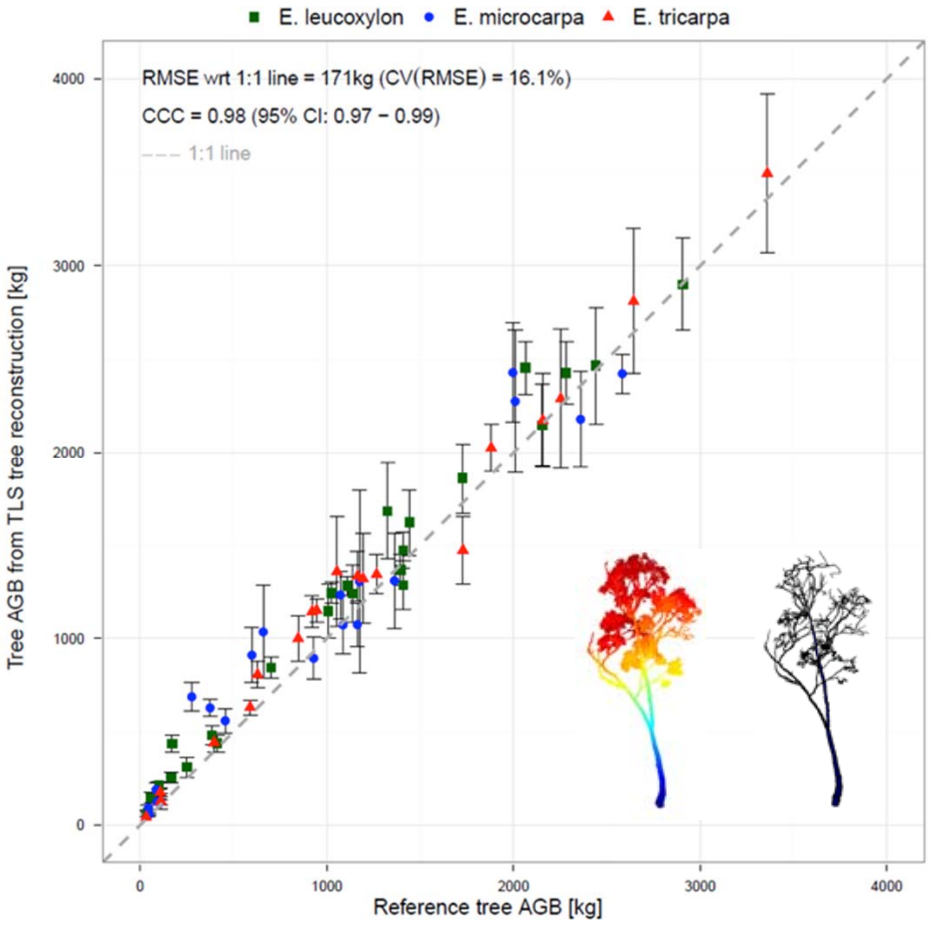
Terrestrial Laser Scanning (TLS) for validation of AGB products

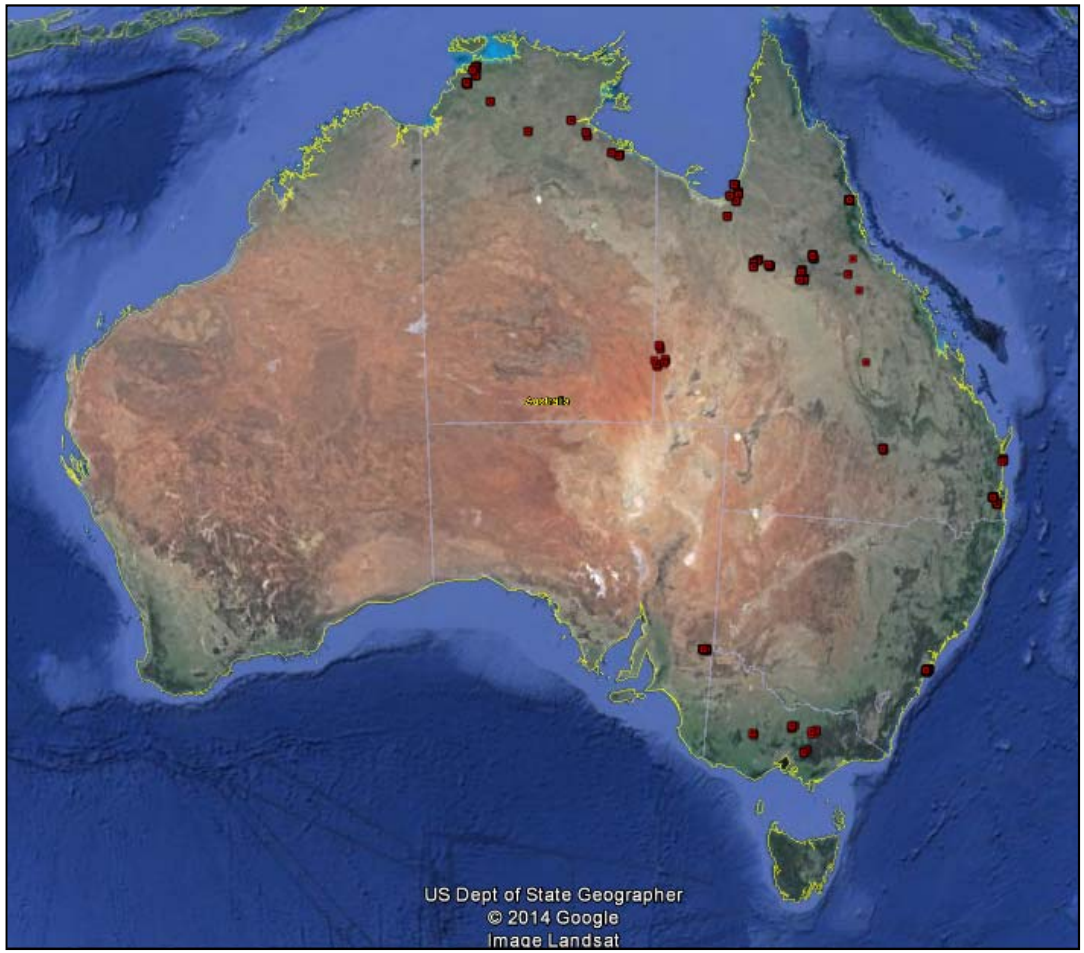
Calders *et al*. (2014) MEE

http://dx.doi.org/10.4227/05/542B766D5D00D



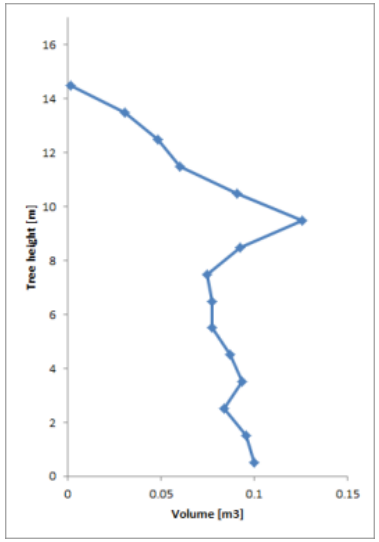
TLS Acquisitions

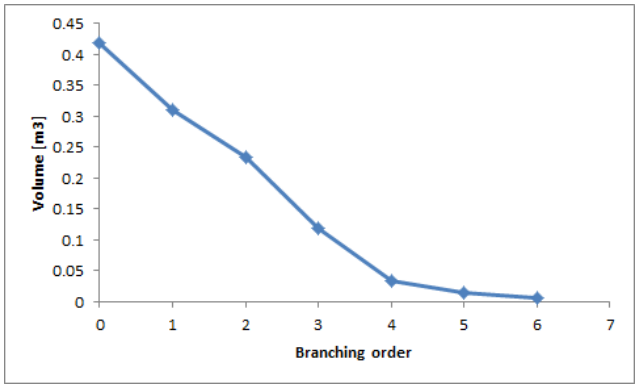
JRSRP and TERN Auscover Brisbane Node



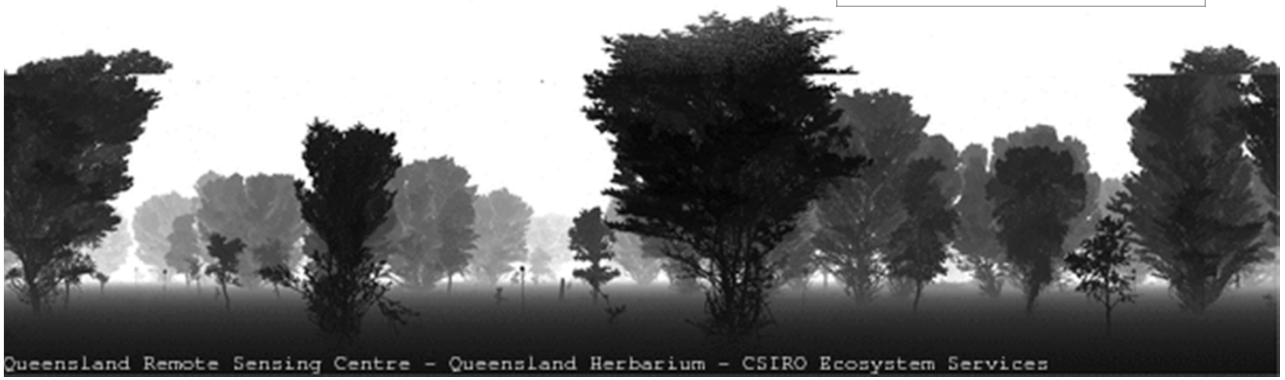
Terrestrial Laser Scanning (TLS) for validation of AGB products

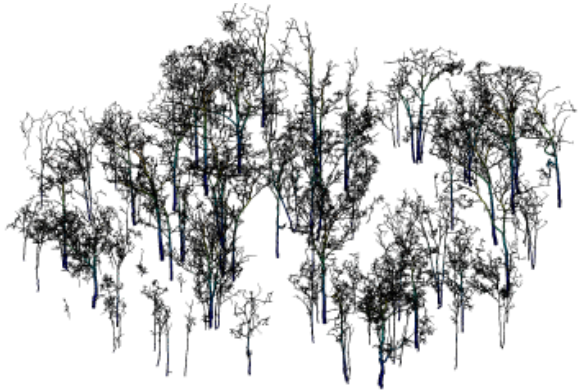
- Harvesting in Queensland regrowth communities underway
- Plot level estimation and change
- TLSIIG comparison of different instruments (http://tlsiig.bu.edu)





2014-07-20





Credit: P. Raumonen / K. Calders

K&C Phase 3 deliverables – Papers and reports

1. Published

- Clewley D., Lucas R., Accad A., Armston J., Bowen M., Dwyer J., Pollock S., Bunting P., McAlpine C., Eyre T., Kelly A., Carreiras J., Moghaddam M. 2012. An Approach to Mapping Forest Growth Stages in Queensland, Australia through Integration of ALOS PALSAR and Landsat Sensor Data. *Remote Sensing*. 2012; 4(8): 2236-2255. **http://dx.doi.org/10.3390/rs4082236**
- Lucas R.M., Clewley D., Accad A., Butler D., Armston J., Bowen M., Bunting, P. et al. 2014. Mapping forest growth and degradation stage in the Brigalow Belt Bioregion of Australia through integration of ALOS PALSAR and Landsat-derived foliage projective cover data. *Remote Sensing of Environment*, 155: 42-57. **doi:10.1016/j.rse.2013.11.025**

2. Submitted/in preparation

- Gill T., Scarth P. Johansen K., Armston, J., Flood N., Trevithick R., Phinn, S. 2015. Linking continental-scale field and long-term satellite image archives – An approach to mapping persistent-green vegetation in Australia. *Photogrammetric Engineering & Remote Sensing*, in preparation.
- Scarth P., Lucas R., Armston J. 2015. An Evaluation of ICESat, ALOS PALSAR and Landsat sensor data for Retrieving the Structure of Woodlands, Queensland, Australia. *Remote Sensing*, in preparation.
- Armston J., Lucas R., Butler, D., Fensham, R., Scarth, P., Phinn, S. 2015. A biomass library for Australia. *Nature Scientific Data*, in preparation.

K&C Phase 3 Deliverables – Datasets and thematic products

1. Completed and delivered to JAXA

- Forest and woodland presence/absence observations for Australia
  ⇒ *Updated dataset available*
- Eastern Australia ALOS PALSAR above-ground biomass map
- Brigalow Belt Bioregion forest extent and growth stage map

2. Completed, but not yet delivered

- Australian vertical plant profile product
- Above-ground biomass library for Australia
- National products will be released via TERN Auscover
  http://www.auscover.org.au/data/product-list

Acknowledgements

- JAXA & NASA IceSAT/GLAS Data team
- Queensland DSITIA RSC and Herbarium
- University of Queensland (JRSRP)
- University of New South Wales
- All the field data providers (lots!)
- Airborne Research Australia
- TERN
- NSW OEH
- CSIRO Land & Water
- TLSIIG (UCL/WUR/BU)