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- AusCover -

A Facility for Producing Consistent Remotely Sensed Biophysical Data Products of Australia

June, 2011

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An Australian Government Initiative
National Collaborative Research
Infrastructure Strategy

Outline of Presentation

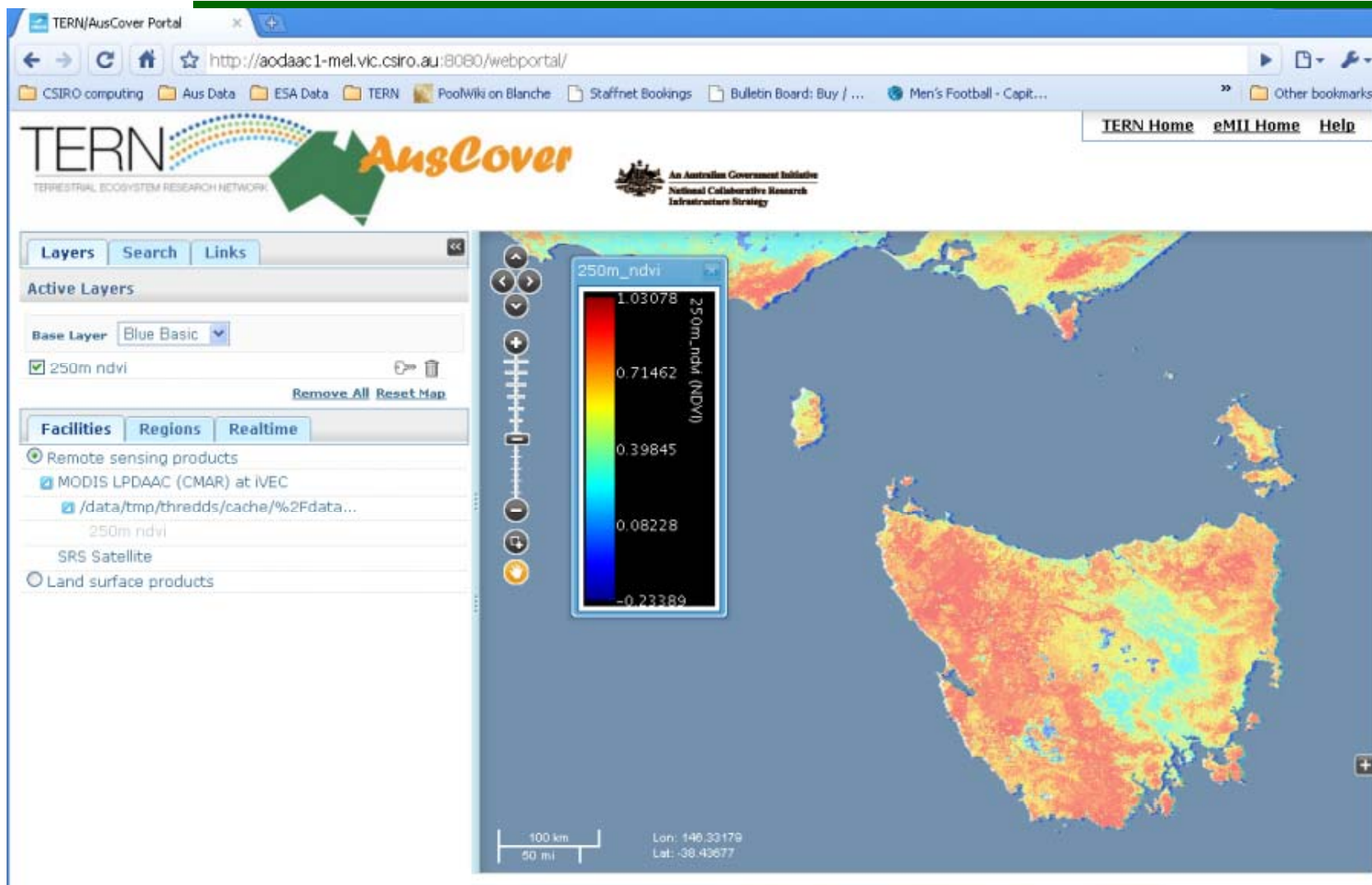
- The Scope of AusCover
- Moderate to Low Resolution Remote Sensing Data Sets Delivered via Portal
- Field Data Collection Program – NIST referenced optical calibration lab at Curtin
- Validation of Products /attach uncertainty
- High Spatial Resolution Remote Sensing Products via the Portal

AusCover – Scope

- AusCover remote sensing data archive and access capability (DAAC) launched in the first half of 2010
- One of several TERN facilities
- Current funding till mid-2014 [incl EIF funding]
- Delivery of consistent national time-series of remotely sensed biophysical parameters
- To support ecosystem research and natural resource management communities in Australia
- LANDSAT, MODIS, AVHRR among others
- Consistently formatted and detailed metadata
- Publically accessible and retrievable through the online AusCover data portal

AusCover Portal

eg for NDVI



Moderate-Low Resolution Data Sets Delivered by AusCover

Products – Ecosystem dynamics

- Land Cover
- Green Land Cover
- Leaf Area Index
- FPAR
- Foliage Projected Cover
- Ground cover fraction
- Forest cover
- National ecosystems map
- Water bodies
- Vegetation height
- Land cover moisture
- Above ground Vegetation Biomass

Additional Products

- Fire
- National MODIS mosaics
- Atmospheric products
- Climatologic products
- Site focussed

Metadata

- Considered equally important to image data

AVHRR NDVI

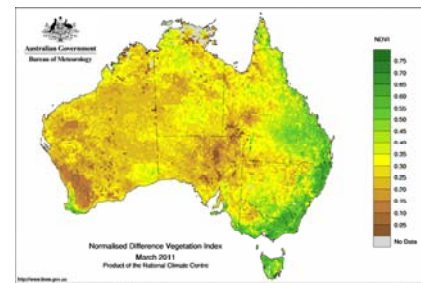
Normalised Difference Vegetation Index (NDVI) derived from AVHRR
Vegetation greenness time series

Synopsis

NDVI is an index of the amount and greenness of live green vegetation.

AVHRR NDVI gives a long time series overview of the dynamics of vegetation.

Spatial resolution:	0.01°, 0.05°
Spatial coverage:	Australia, land only
Temporal resolution:	3 per month, monthly
Temporal coverage:	April 1992 – present
Custodian:	Bureau of Meteorology
Sensor & platform:	AVHRR on NOAA-11 to -18
Algorithm date:	2008
Production date:	2008, then near real time
Use limitation:	Some licence description



Algorithm: Data up to June 2008 is stitched passes from CSIRO. Subsequent data is unstitched near real time passes from Bureau of Meteorology. CAPS navigation, cloud masking, regridding. Calibration drift detrended and locked to NOAA-14 by invariant semi-arid IBRA regions. No atmospheric or angular corrections. Compositing by maximum value NDVI.

Datasets

AVHRR NDVI, 0.01°, 3 per Month:	Available September 2011
AVHRR NDVI, 0.05°, 3 per Month:	Available September 2011
AVHRR NDVI, 0.01°, Monthly:	http://www6.bom.gov.au:8080/thredds/catalog/avhrr_ndvi_1km_monthly/catalog.html
AVHRR NDVI, 0.05° Monthly:	http://www6.bom.gov.au:8080/thredds/catalog/avhrr_ndvi_5km_monthly/catalog.html

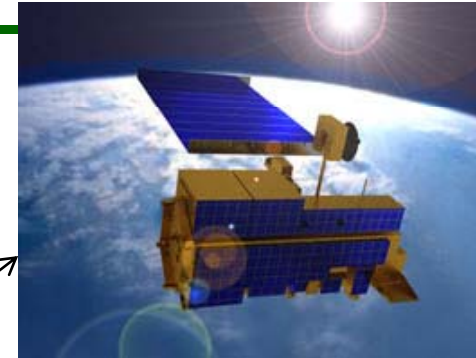
Overview

The Normalised Difference Vegetation Index (NDVI) grids and maps are derived from satellite data. The data provides an overview of the status and dynamics of vegetation across Australia, providing a measure the amount of live green vegetation. The satellite data comes from the Advanced Very High Resolution Radiometer (AVHRR) instruments on board the National

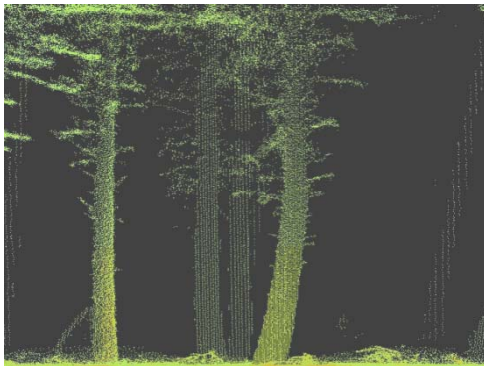
Linking Data Sets – Scaling Up



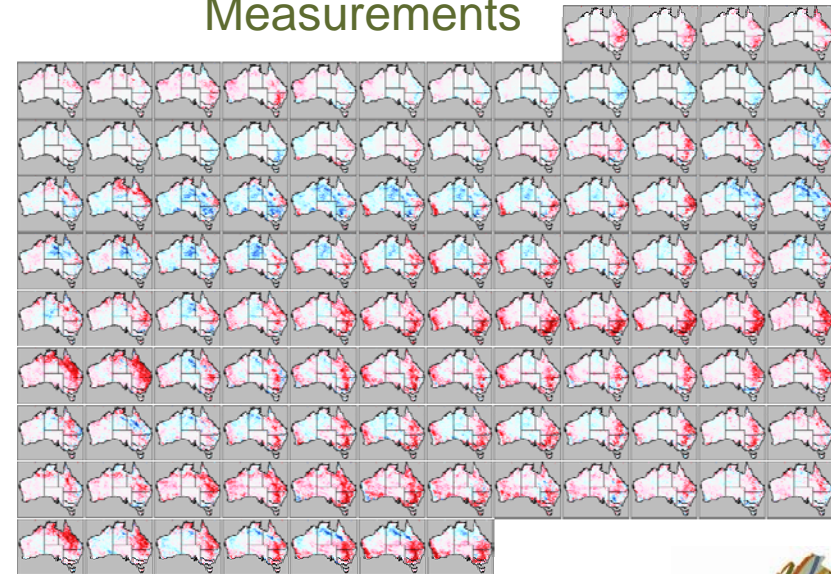
High-Resolution, Field-based Measurements



Medium/Low-Resolution, Space-based Measurements



Canopy Lidar Point-Clouds



Continental Dynamics in Green Cover



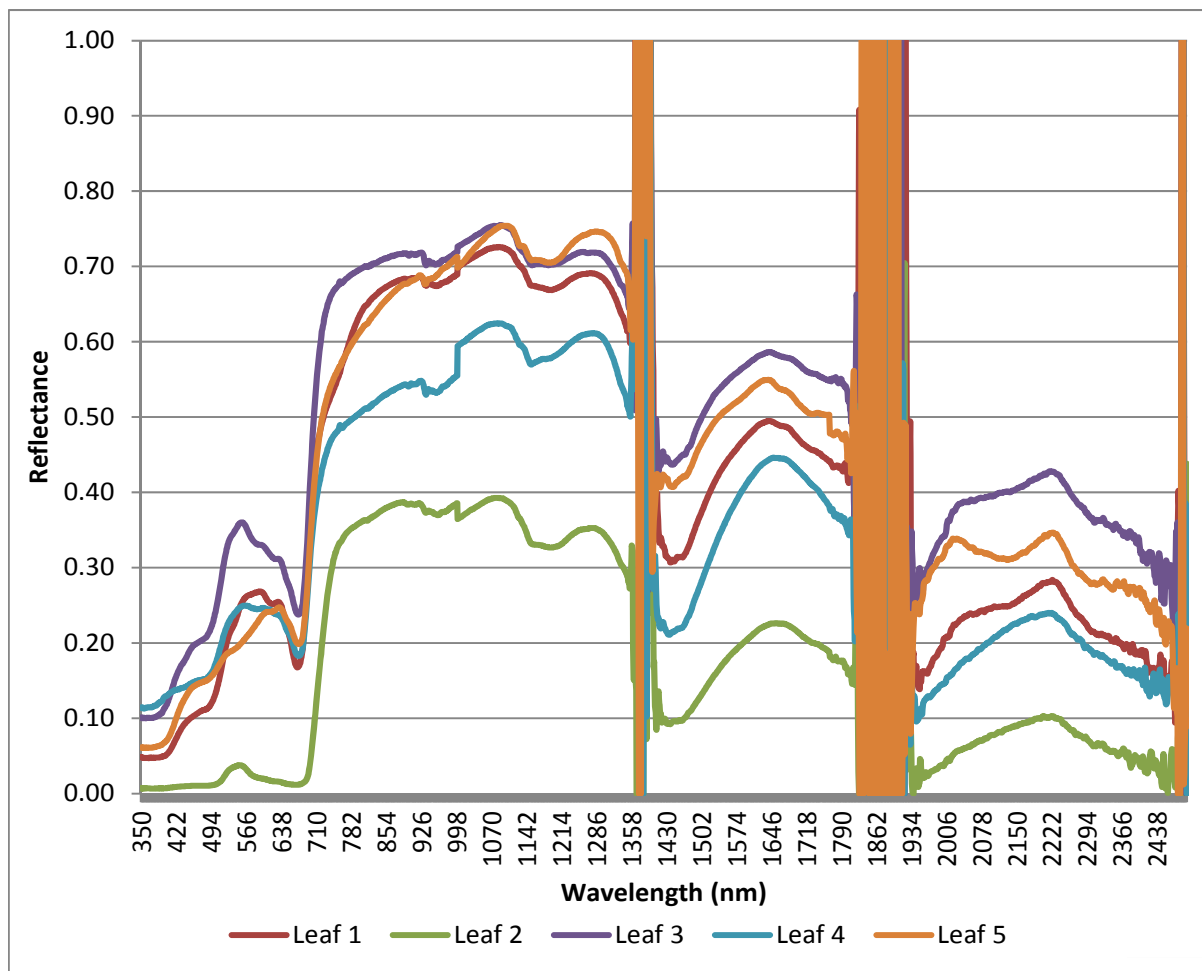
Field Photos - Tumberumba



Hemispherical Photography



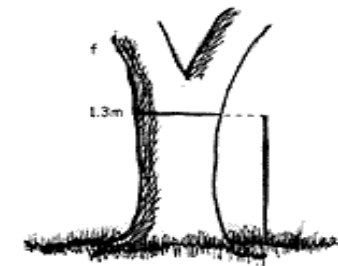
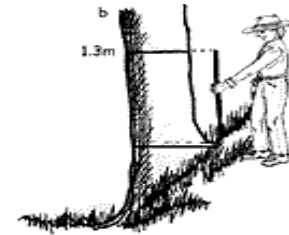
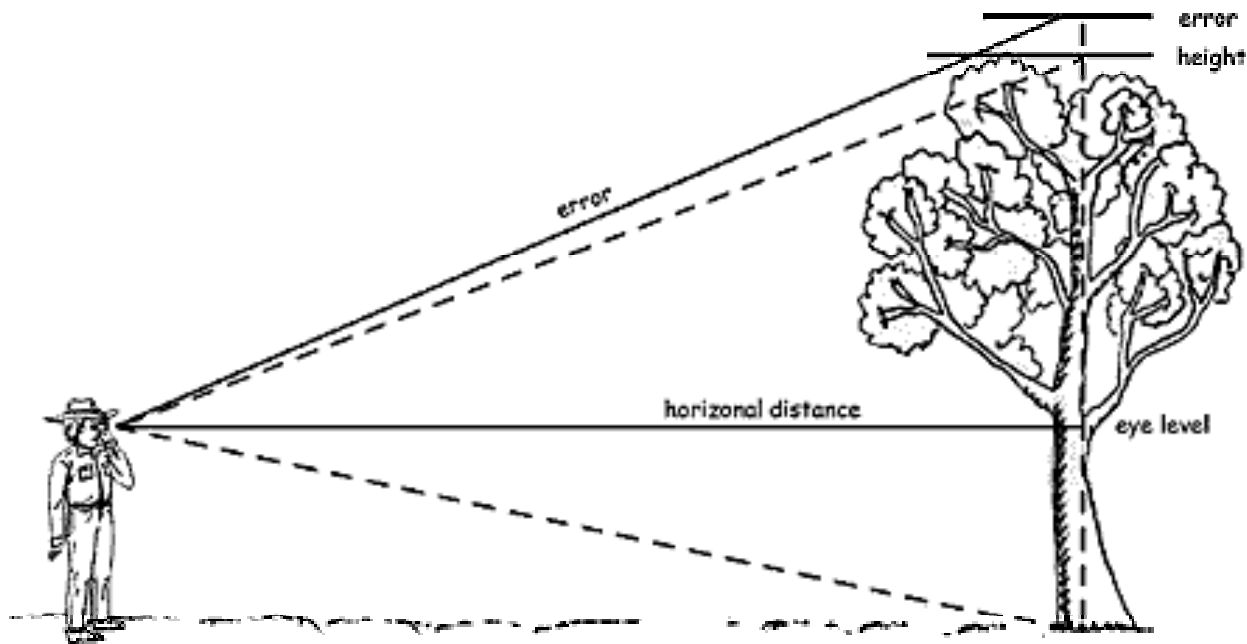
Spectroradiometric Measurements



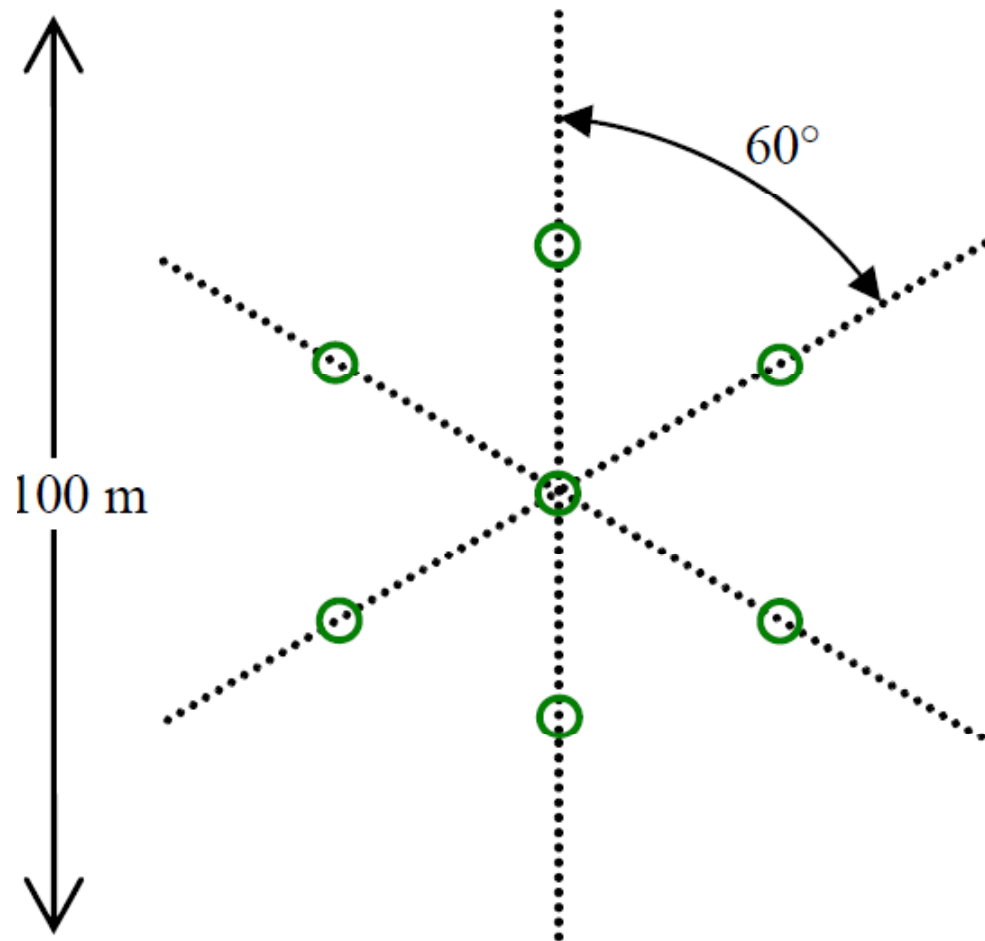
Leaf Samples and Their Properties



Basic Structural Measurements

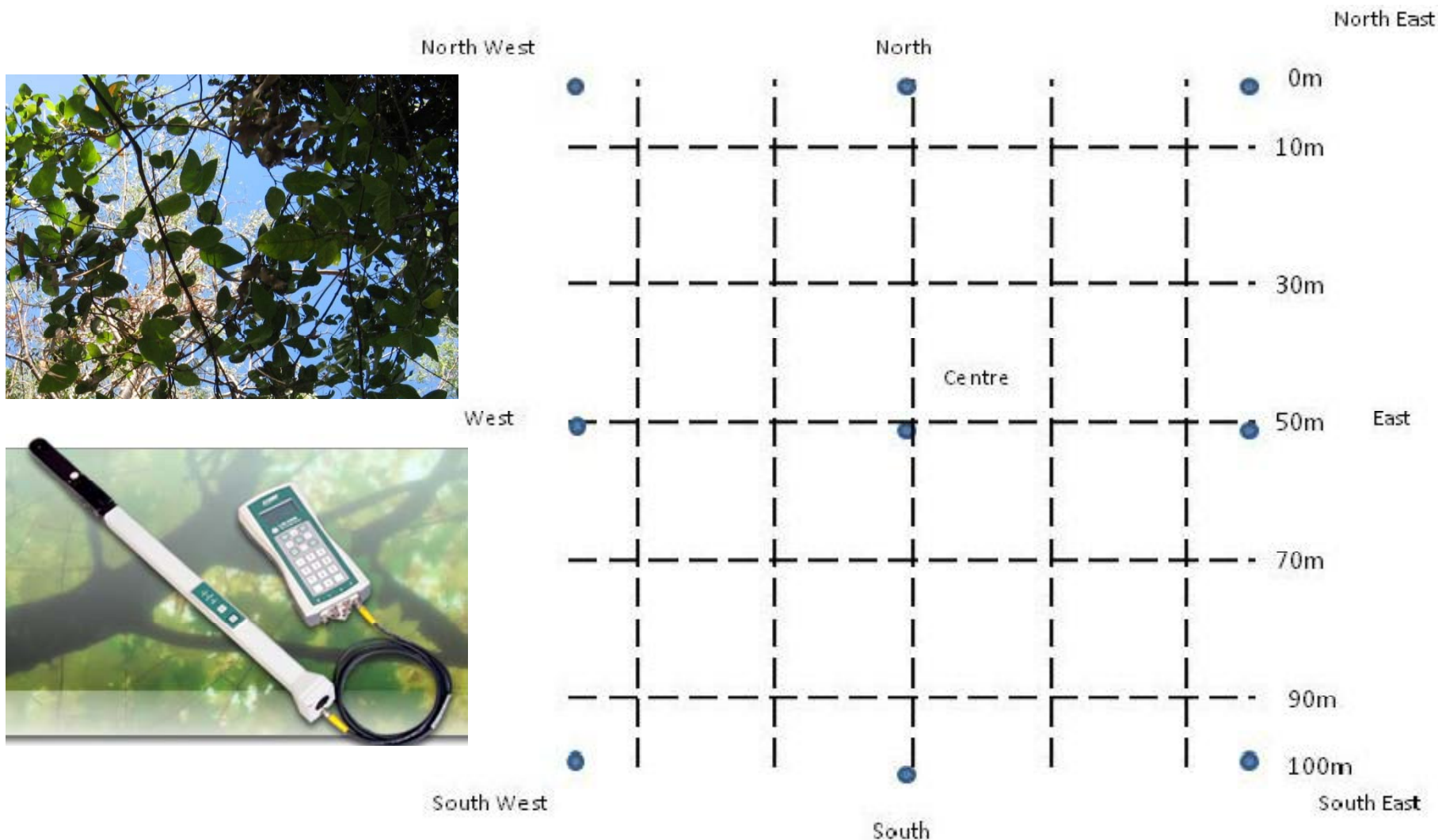


Foliage Projective Cover & Fractional Ground Cover



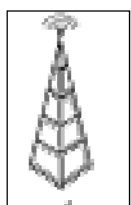
AusPlots – LAI

Eg LAI2200 instrument



Validation

- Dominant biomes
- Homogenous 5 x 5 km sites (CEOS Bigfoot)



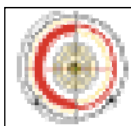
Flux tower



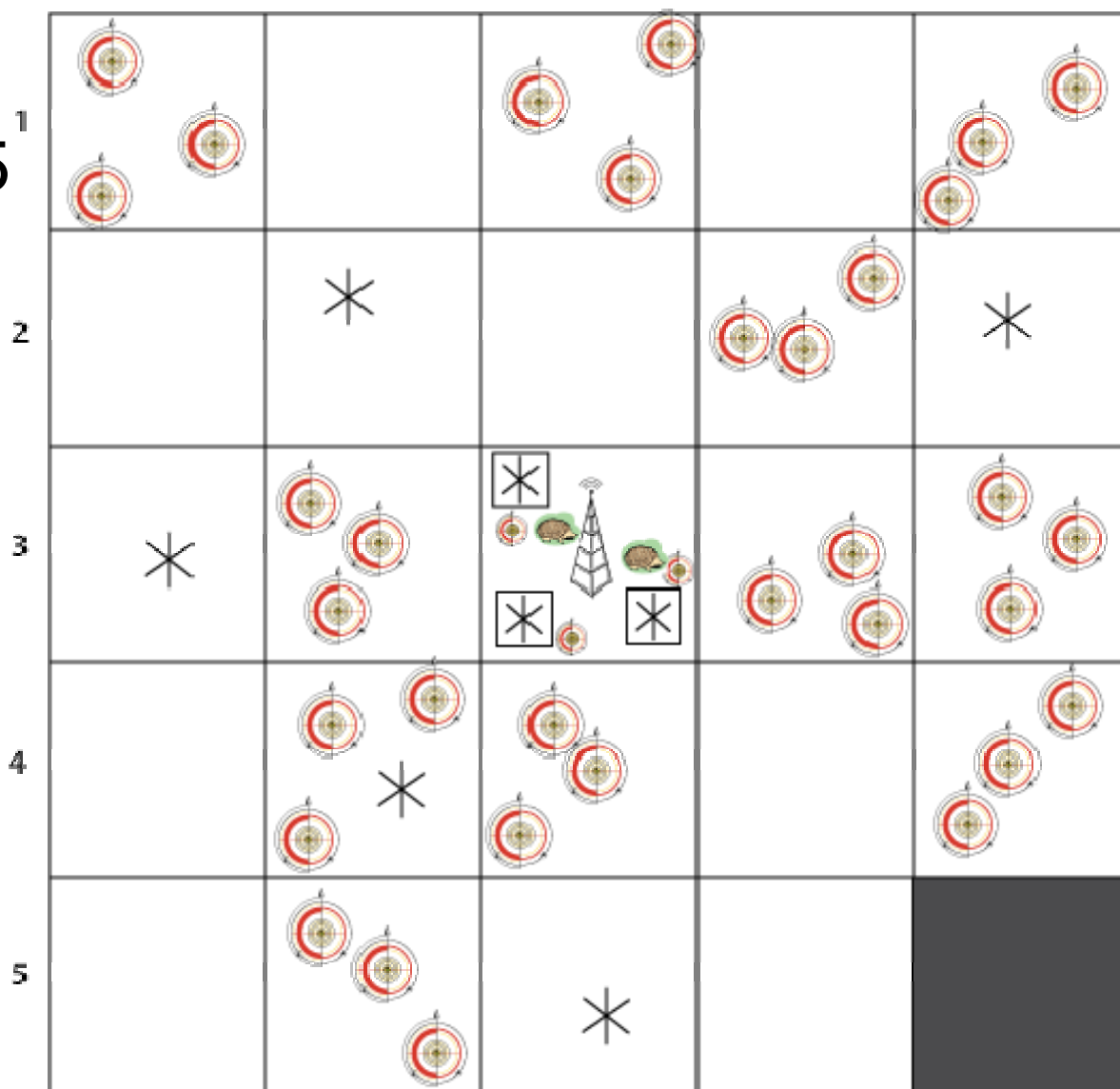
TLS



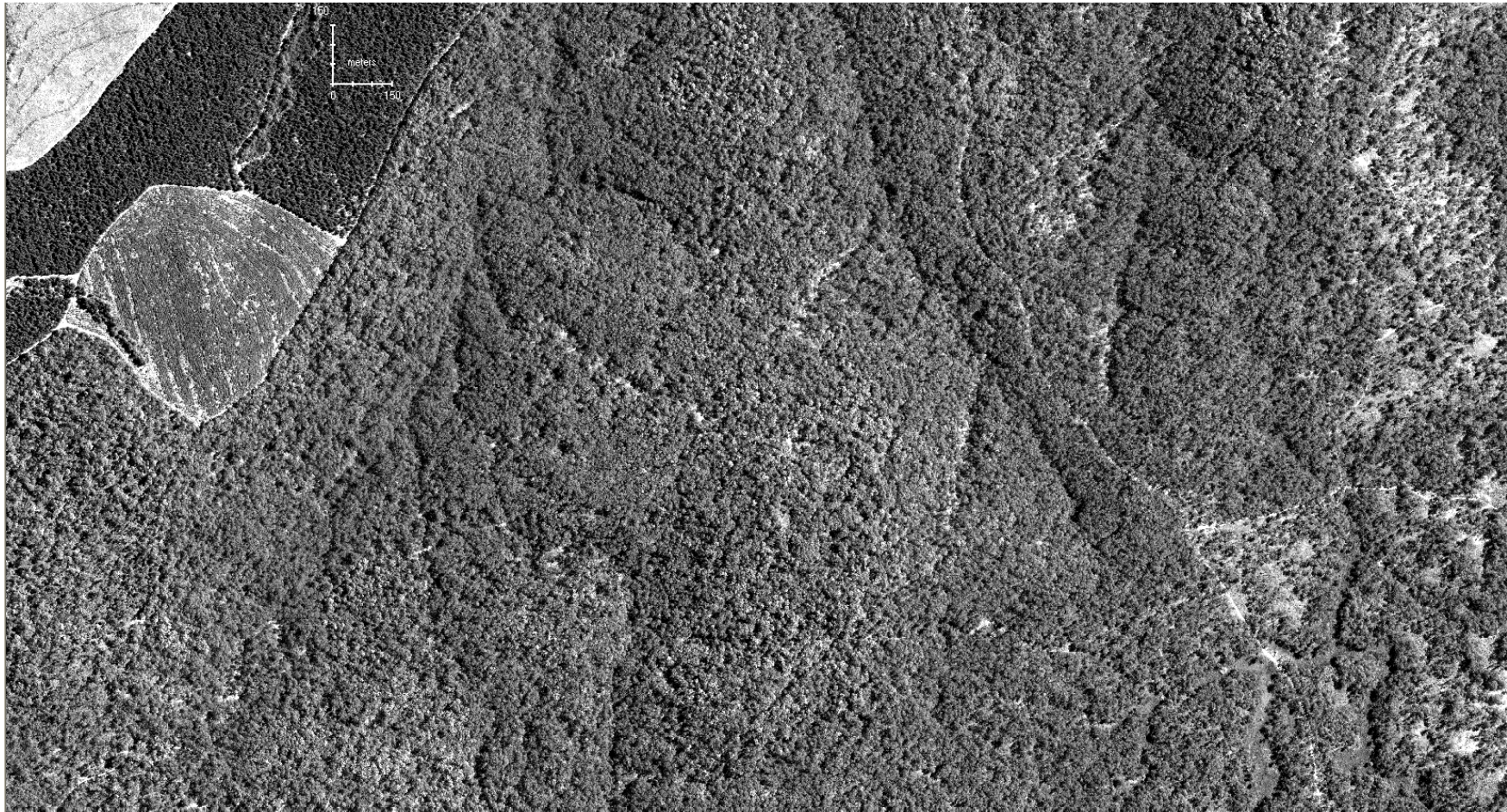
FPC / Structure



Hemi / LAI-2200



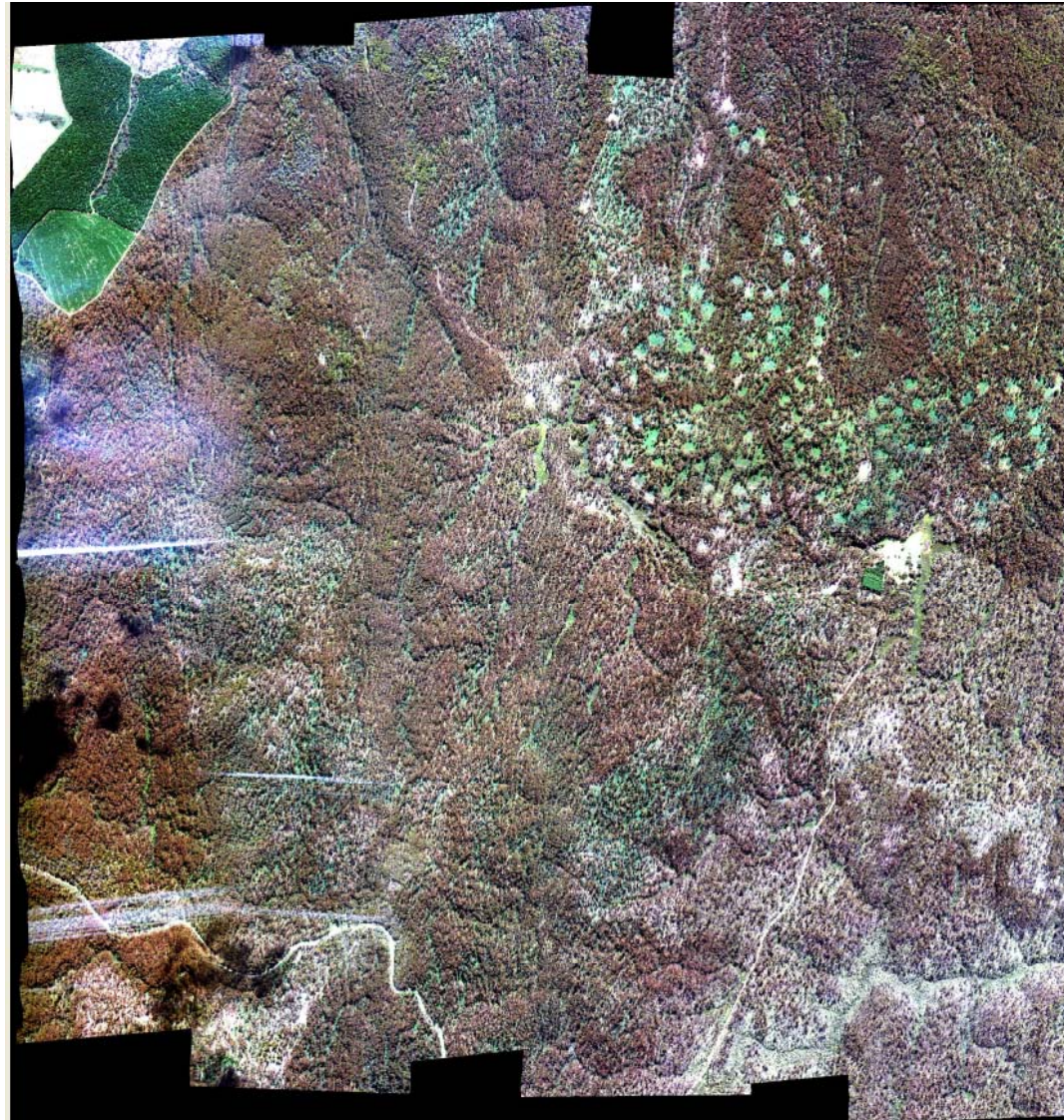
WorldView-2 - Tumberumba



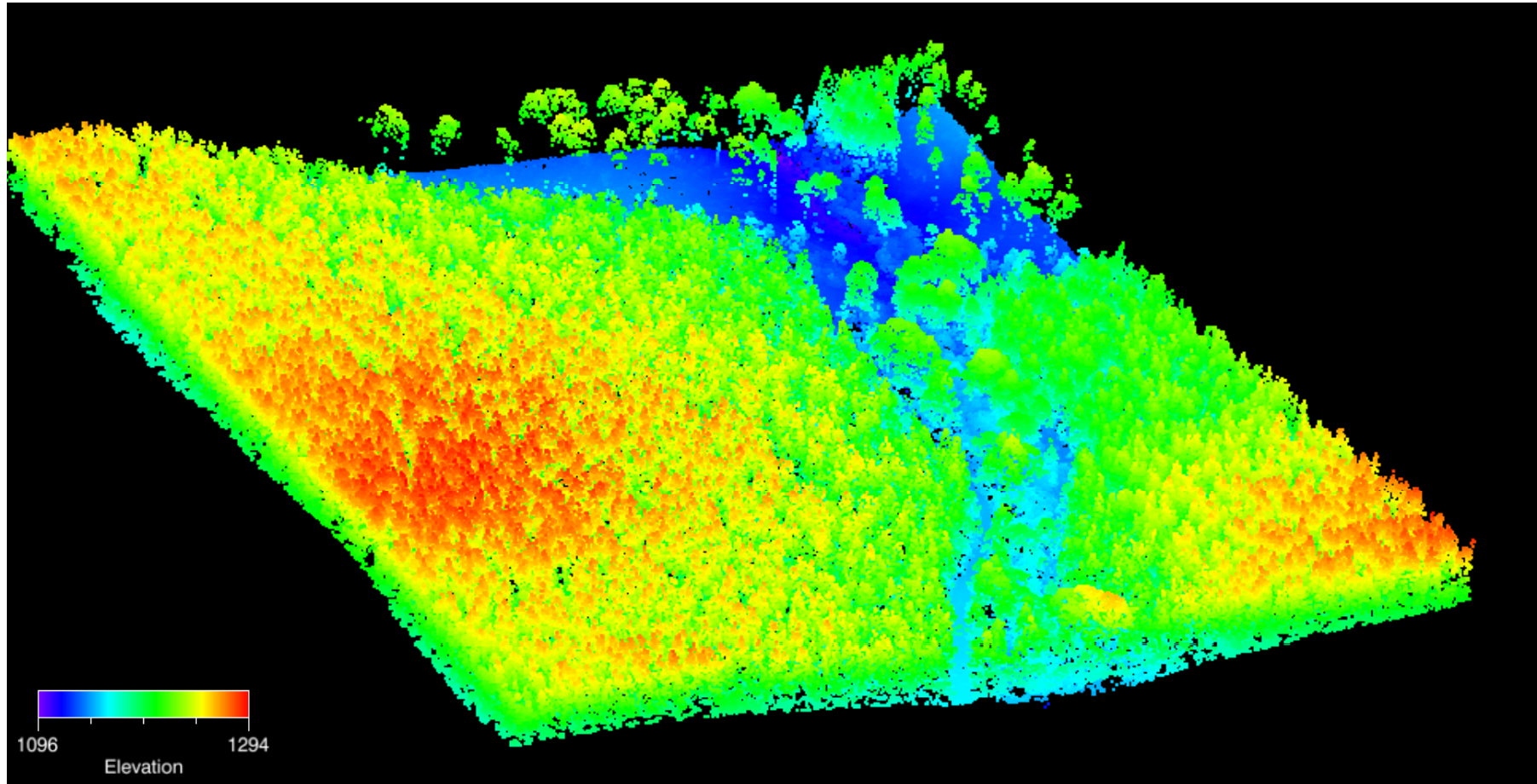
WorldView-2 - Tumberumba



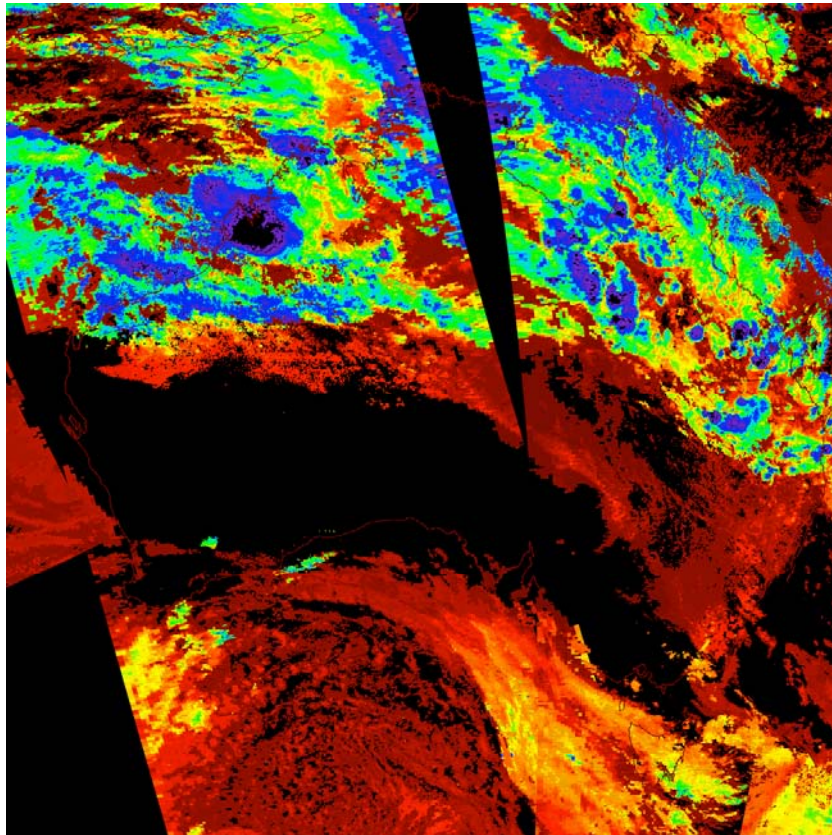
Hymap - Tumberumba



CW LIDAR - Tumberumba



AusCover MODIS Cloud Products



1000 100 mb

MODIS Cloud Mask
- Cloud Detection

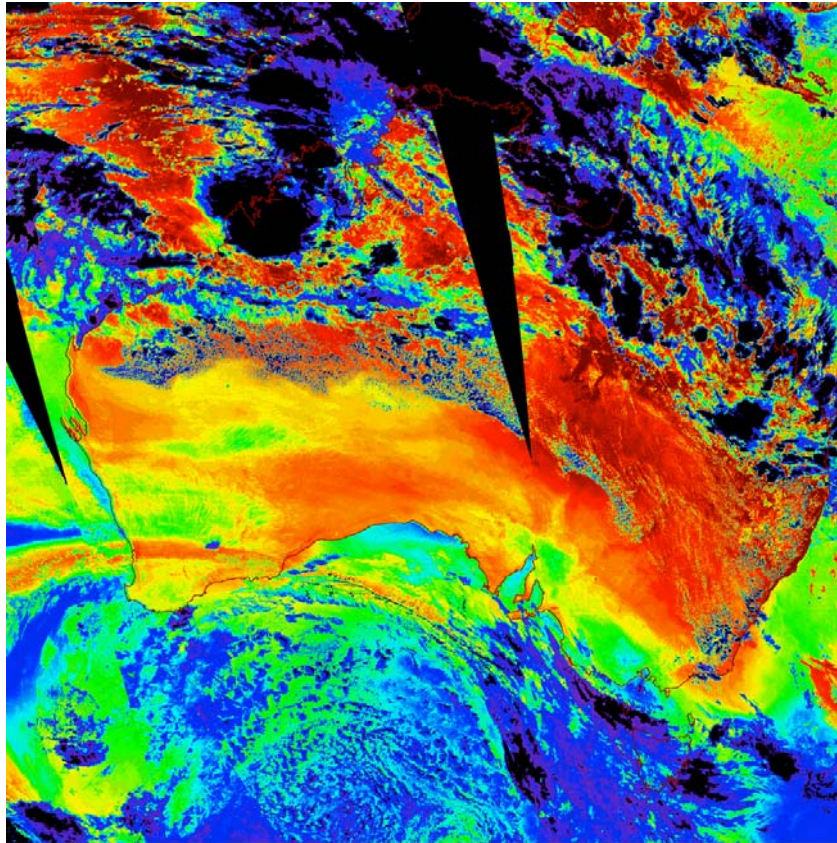
MODIS Cloud Top Properties
- Bulk Cloud Properties

MODIS Cloud Optical Properties
- Cloud Microphysics

Applications:

- Hydrodynamic cycle
- thin cloud detection and screening

AusCover MODIS Atmosphere Products



0 10 20 30 40 50 kg/m²

MODIS Atmospheric Profiles

- Vertical Temperature
- Vertical Water Vapor

MODIS Water Vapor

- Precipitable Water Vapor

Applications:

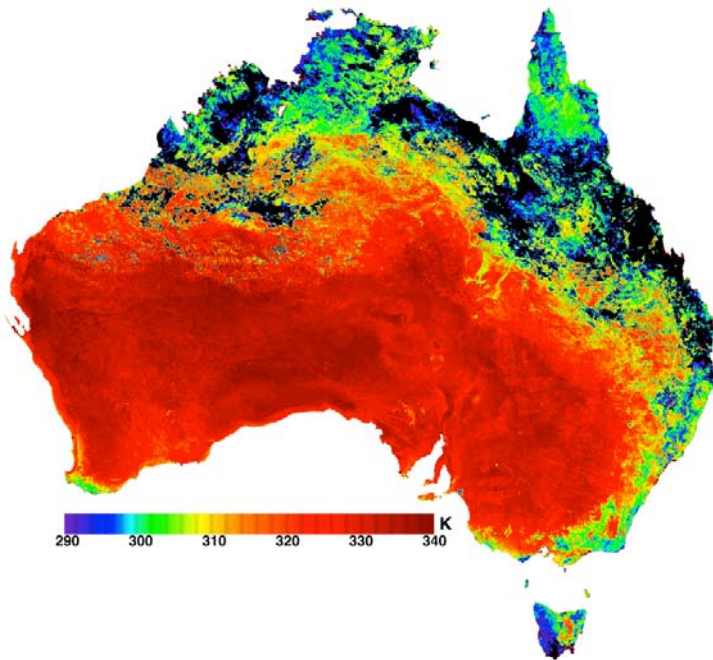
- Hydrodynamic cycle
- Model assimilation
- Atmospheric Dynamics

AusCover MODIS Surface Products

MODIS Daily Land Surface
Temperature

MODIS Atmospheric and BRDF
Corrected Reflectance

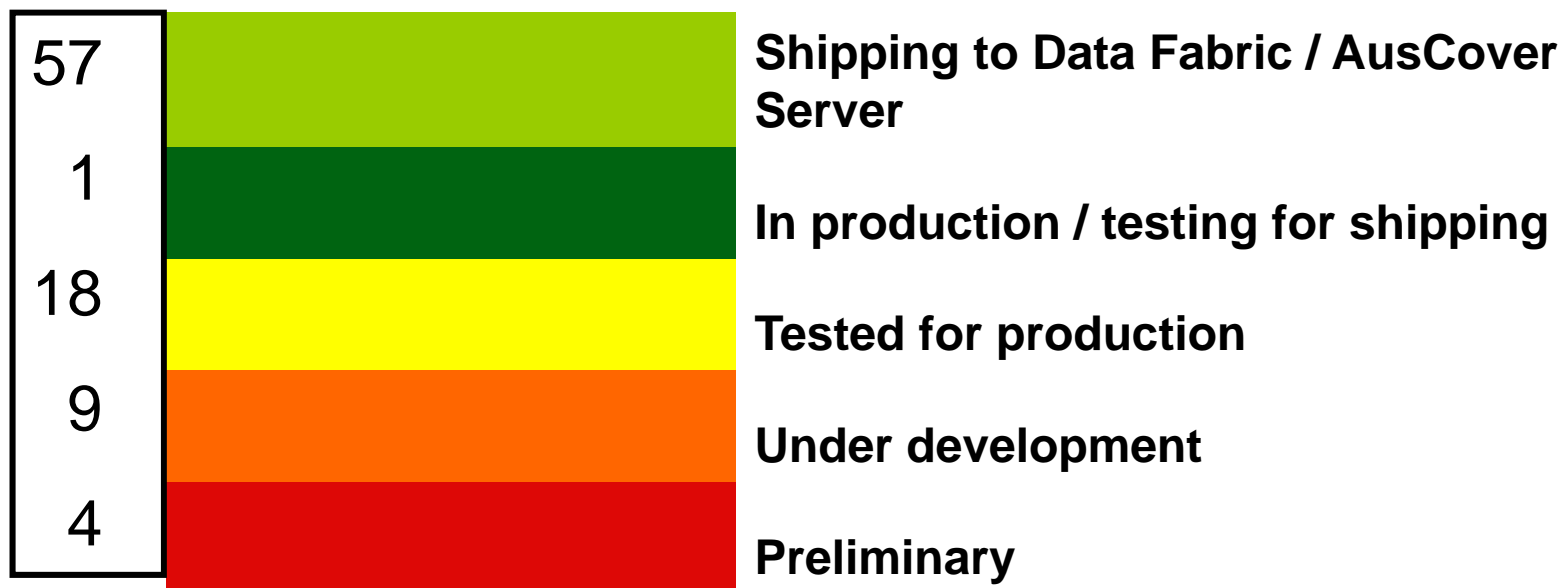
- Optimized for Australian land surface conditions
- Numerous applications
- VIIRS extension



Status of RS Data Delivery by Perth AusCover Node

of Products

Coding of Status of Products



Total = 89 products of which 57 [64%] currently are being delivered and another 19 products [21%] close to delivery which will bring the tally to 85%.

Proposed High Resolution Data Products

- **LIDAR**
 - DEM, DTM
 - Canopy height
 - Foliage Projective Cover
 - Vertical Profiles
 - Tree density
 - LAI
- **Hyper-Spectral data**
 - At-Surface Reflectance
 - Leaf / Canopy properties: N, H₂O, chlorophyll content
 - Unmixing: Photosynthetic vegetation NV, NPV and bare ground
- **WorldView-2 Imagery**
 - Land cover / Structural category classification
 - Visual image interpretation for cal/val airborne data products

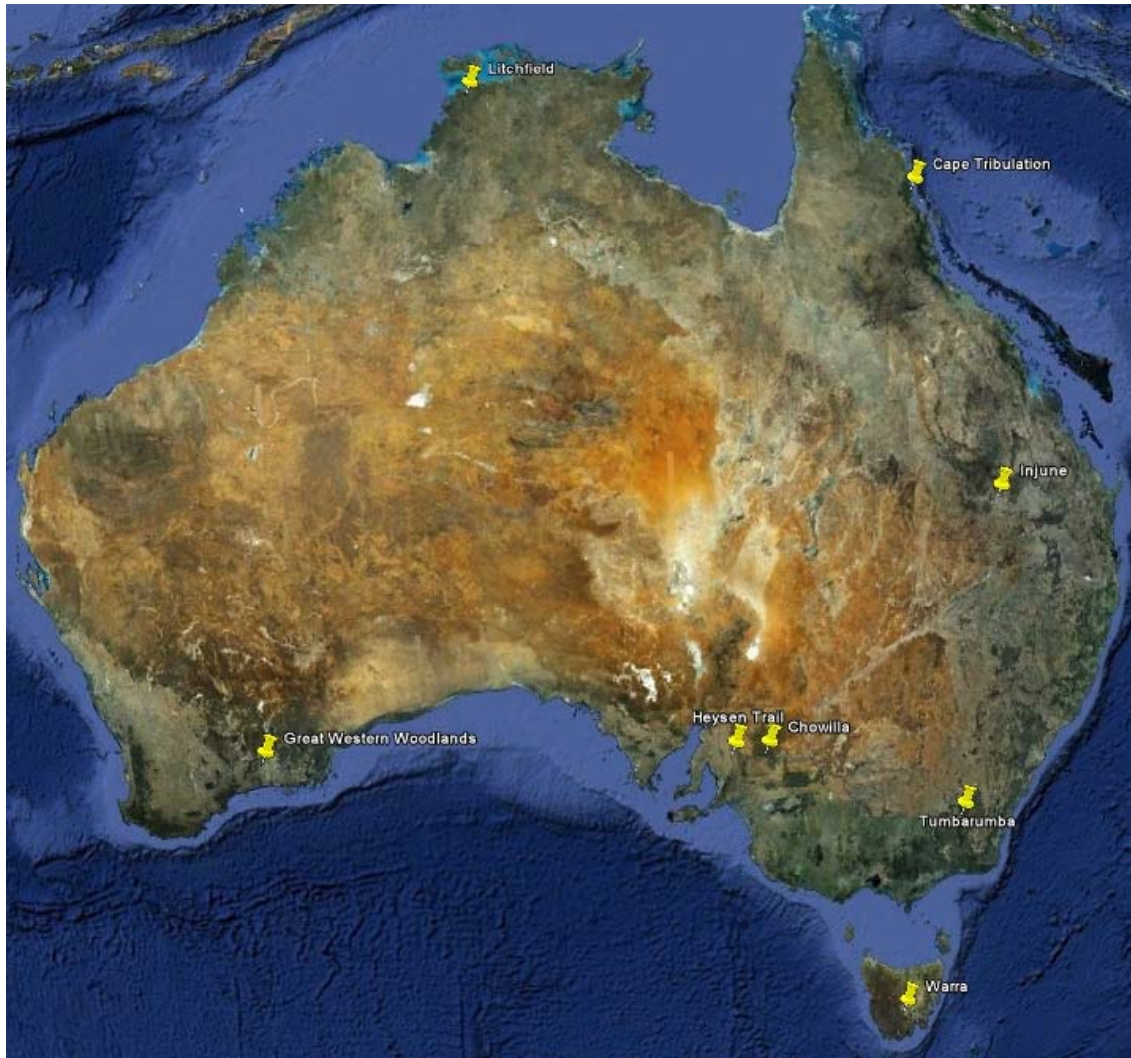
Product Deliveries via Portal

- **LIDAR data:**
 - Las format, ascii
 - All derived products
 - Metadata, including processing steps and validation results
- **Hyperspectral data:**
 - Reflectance
 - All derived products
 - Metadata, including processing steps and validation results
- **WorldView-2 data:**
 - All derived products
 - Metadata, including processing steps and validation results

Engaging with End Users

- **AusCover User Reference Group**
 - Ensuring use of final products
 - Ensuring suitable data formats
 - Ensuring suitable accuracies are achieved
- **Involving state and federal government agencies and NGO's**
 - Building on existing approaches
 - Integrating existing field and image data
- **International remote sensing community**

Future Outlooks



- Focus areas suitable for long-term ecosystem monitoring
- Consistent data sets
- Consistent processing
- Consistent validation
- Consistent products and metadata
- All data available via online portal

Products – Ecosystem dynamics

- Land Cover (DLCM)
- Time series Green Land Cover
- Leaf Area Index
- Time series FPAR
- Foliage Projected Cover (FPC, Landsat)
- Ground cover fraction

- Forest cover (>20%)
- Sparse forest cover (<20%)
- National ecosystems map
- Water bodies
- Vegetation height
- Land cover moisture
- Aboveground Vegetation Biomass Cover Dynamics

Fire, LST

- Burnt area
- Fire frequency
- Fire radiative energy
- Grassland curing
- LST

National MODIS mosaics

- MOD09 Surface Reflectance
- M* D11 LST and emissivity
- MCD12 Land cover type & dynamics
- MOD13 Vegetation Indices (NDVI, EVI)
- MOD14 Thermal anomalies / Fire
- MOD15 LAI and fPAR
- MOD17 Gross Primary Productivity
- MCD43 BRDF and Albedo (NBAR)
- MOD44 Vegetation Continuous Fields
- MCD45 Burned area

Inputs to satellite processing

- Mean sea level pressure (NWP)
- Total column water vapour (NWP)
- Total column ozone
- Aerosol optical depth

Ancillary

- Solar radiation/PAR
- Rainfall
- Air temperature
- Humidity
- Wind run
- NWP wind
- Albedo
- Soil moisture (Satellite?, Modelled)
- Continental shape files

AWAP outputs

- Soil Moisture (Upper, Lower)
- Total Evaporation
- Transpiration
- Soil Evaporation
- Potential Evaporation
- Local Discharge
- Surface Runoff
- Deep Drainage
- Sensible Heat
- Latent Heat

Base satellite

- Land surface reflectance (Landsat, MODIS, AVHRR)
- Brightness temperatures (AVHRR, GEO)
- AVHRR (stitched passes, composites, PAL)
- ATSR1,2/AATSR/MERIS
- Hyperion

Site focused

- Land surface reflectance (100+ bands, air/in-situ)
- Lidar (air, ground)

MODIS atmosphere

- Cloud top properties
- Cloud optical properties
- Aerosol, smoke, dust
- Atmospheric profiles
- Column water vapour