Australian Government
Geoscience Australia

Agency Report: Geoscience Australia

Medhavy Thankappan

Geoscience Australia

- Agency in Federal Government Resources, Energy and Tourism portfolio
- Provides geoscientific information enabling government / community to make informed decisions about:
  - resources
  - environment
  - community safety

National Earth Observation Group

- National remote sensing capability
- Advice on use of EO data in national programs
- Provide data / information on land, oceans and hazards
- Manage EO data from international partners / commercial sources
- Work with stakeholders in the Australian Government

Calibration / Validation Activities

National Field Spectroradiometer Loan Facility

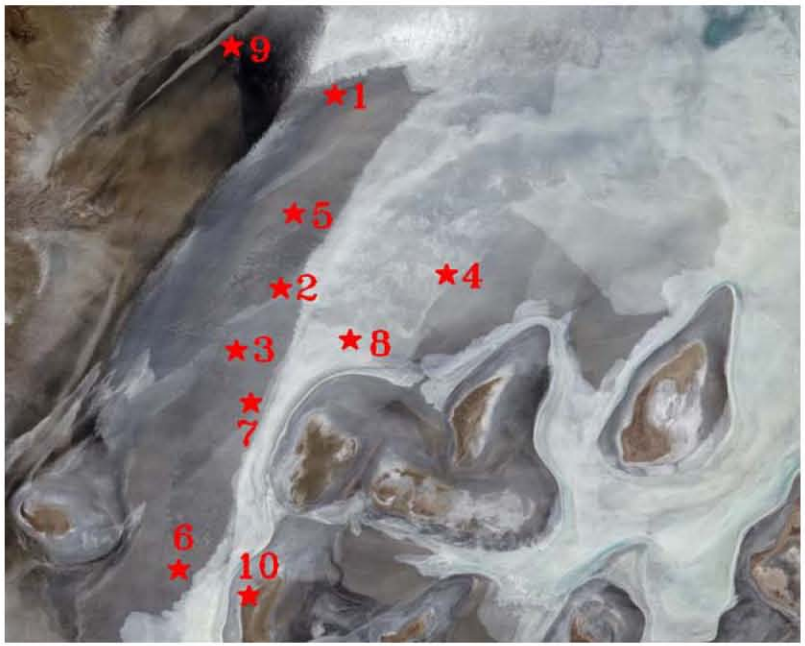
FieldSpec® Handheld Pro (325-1075nm)

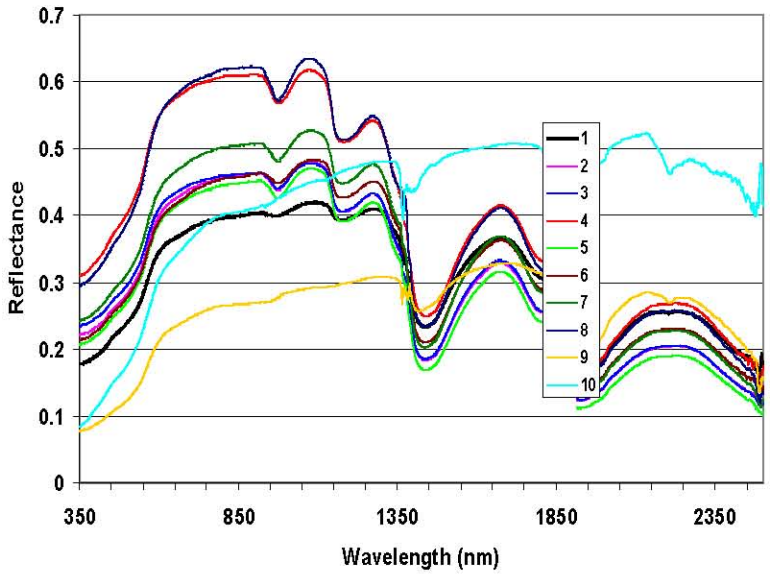
HH Full Sky Irradiance Cosine Receptor

7.5 Deg HH FOV Lens Fore optic

Available to researchers for field data collection; only condition is sharing of the data

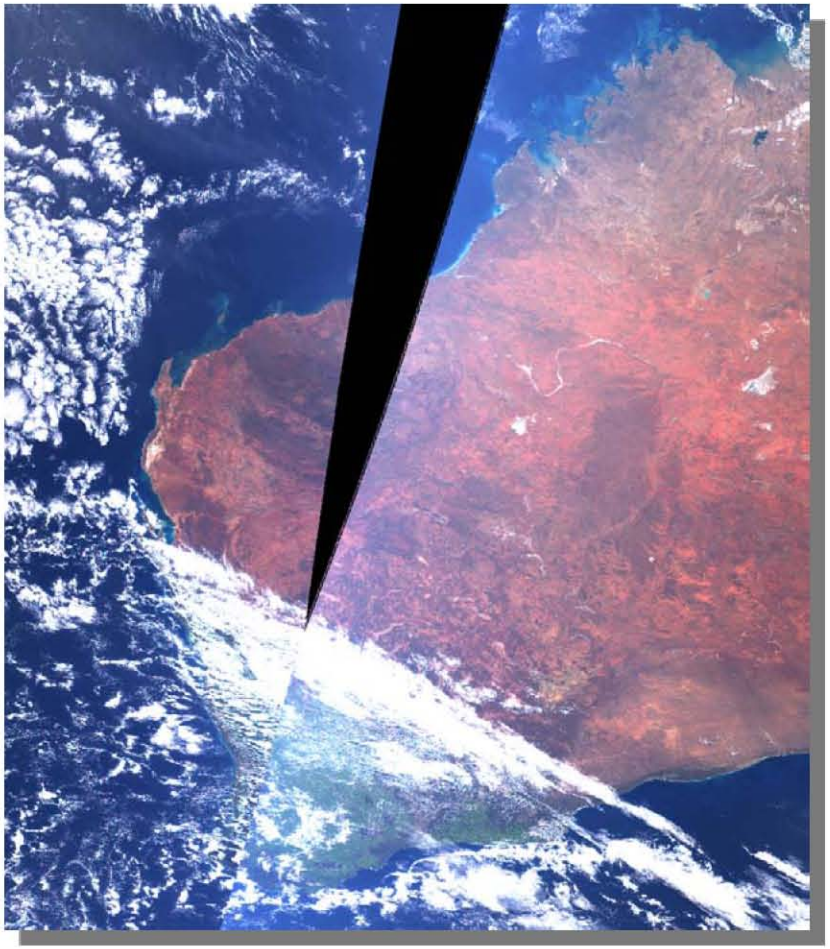
Participation in joint campaigns on vicarious calibration

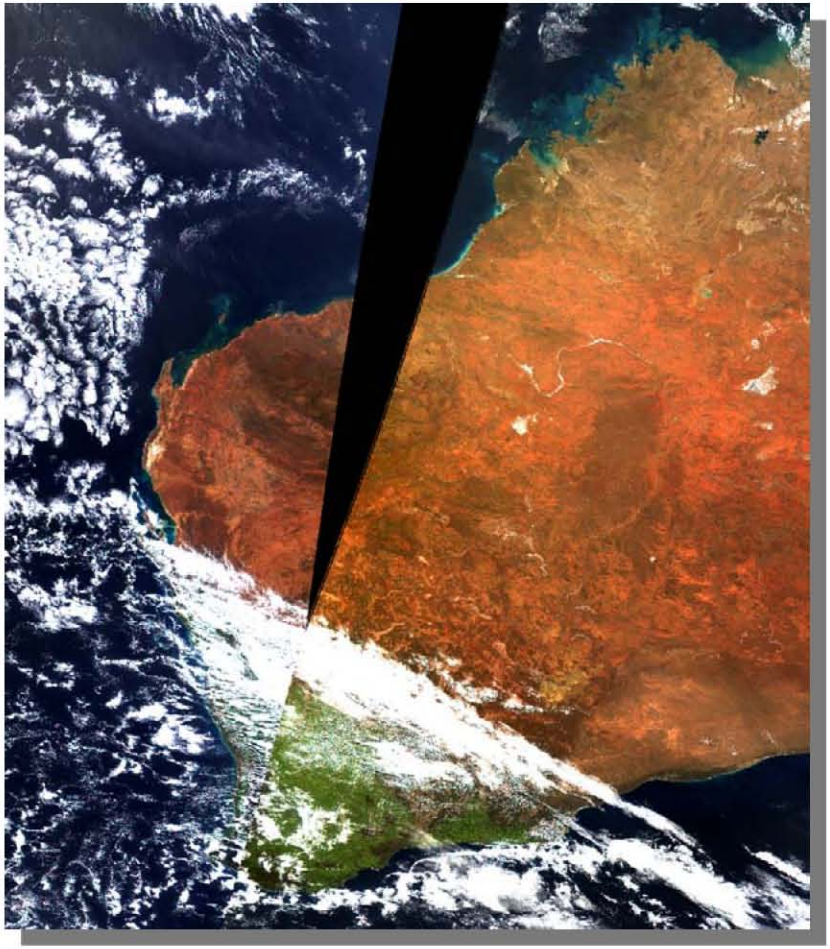




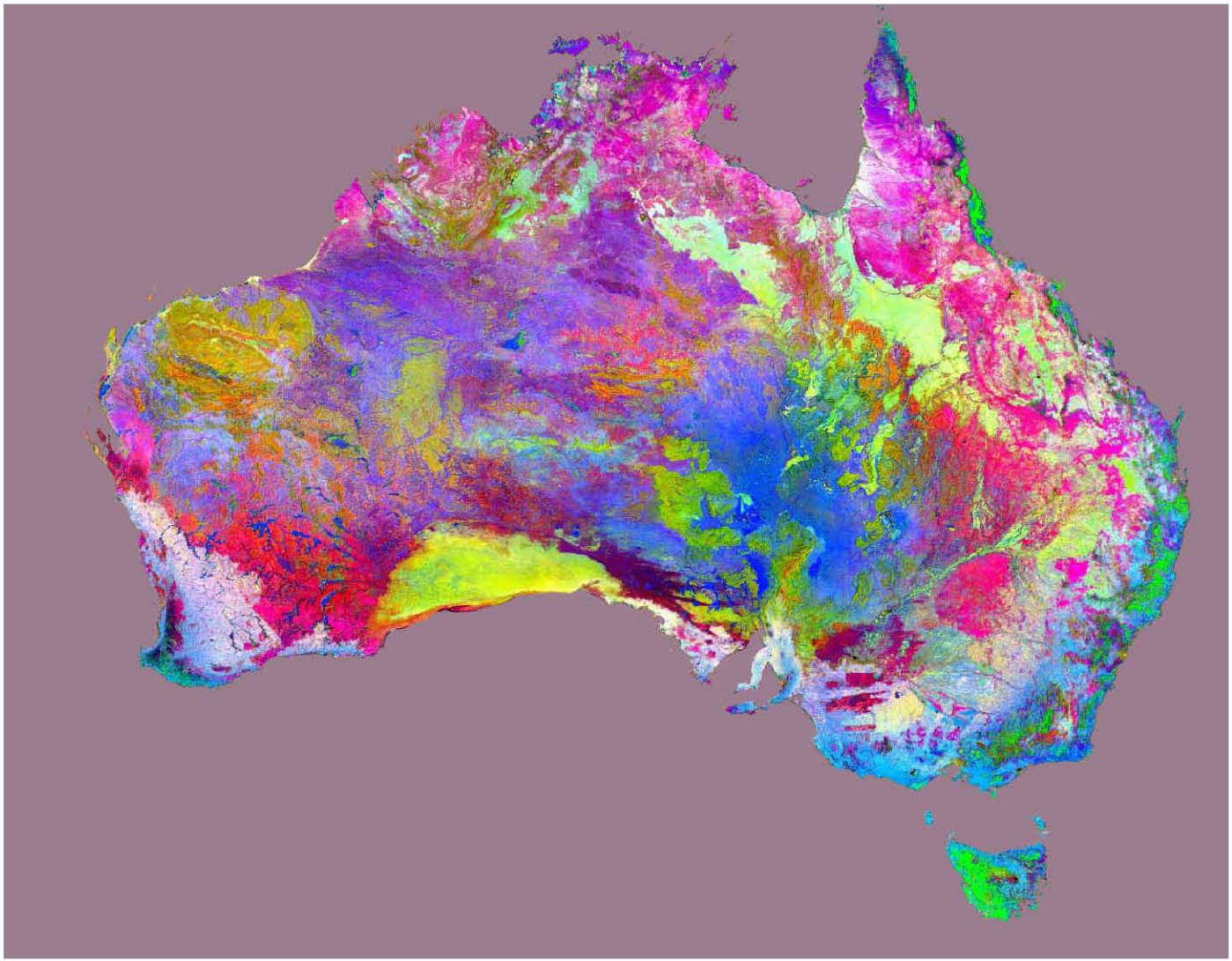
Field experiment 09/02/2009 to 13/02/2009 South Australia, Dry salty lake (Lake Frome)

Correction for Atmosphere and Viewing Geometry





BRDF Shape over Australia

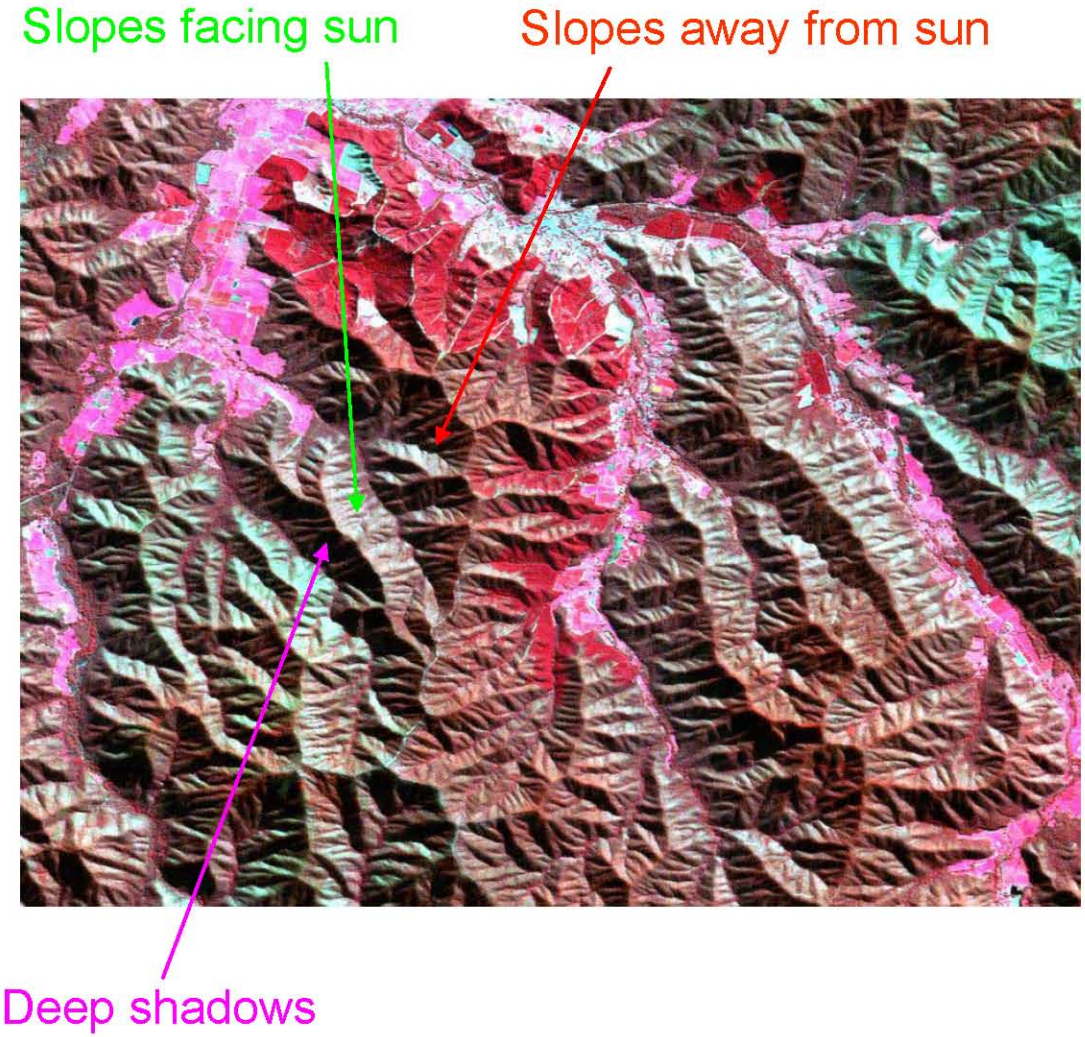


BRDF Patterns over Australia - Li et al 2013

THE VARIABILITY OF SATELLITE DERIVED SURFACE BRDF SHAPE OVER AUSTRALIA FROM 2001 TO 2011

Fuqin Li, David L.B. Jupp, Medhavy Thankappan, Matt Paget, Adam Lewis and Alex Held – submitted to IGARSS 2013

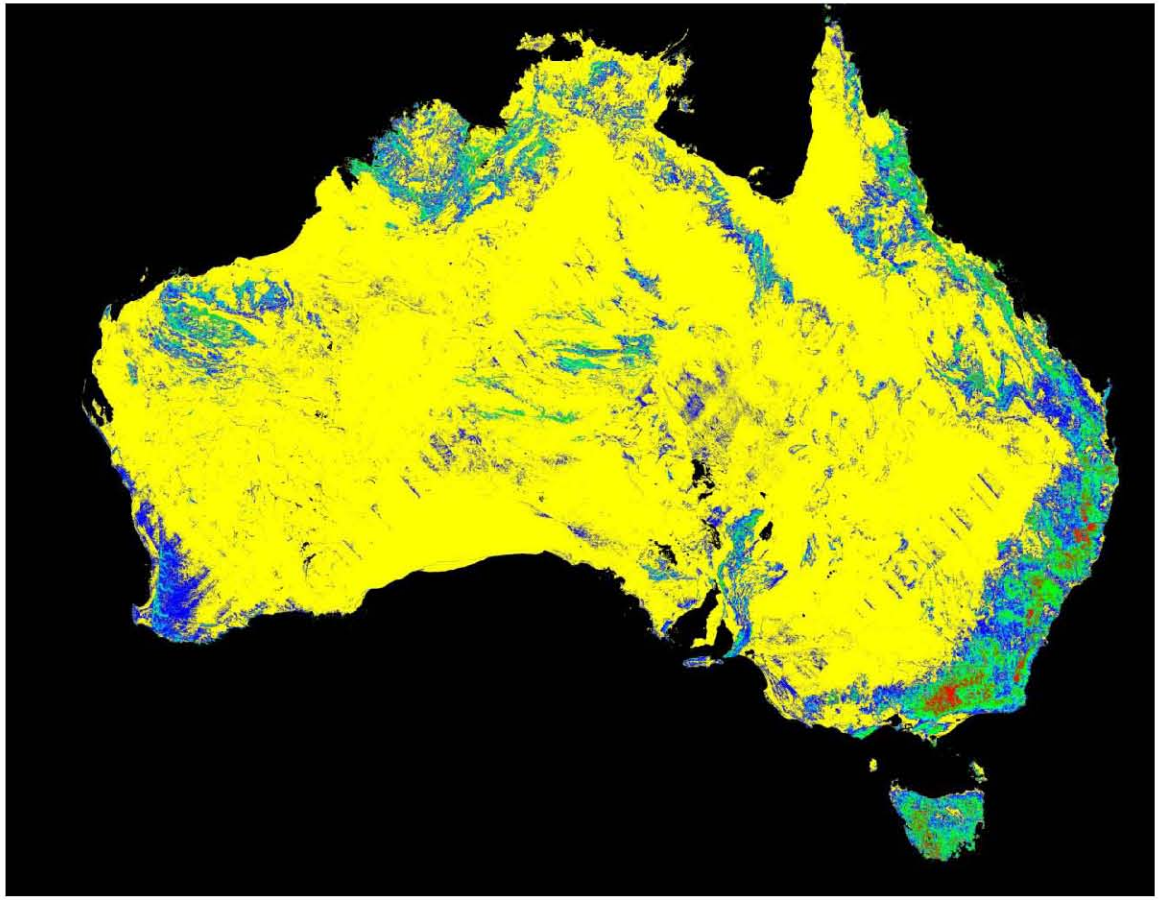
Correction for Terrain Illumination



Landsat 5 image over Victorian Alps (May 11, 2007)

Two corrections needed:
Detect deep shadows (self and cast)
Remove terrain shadows

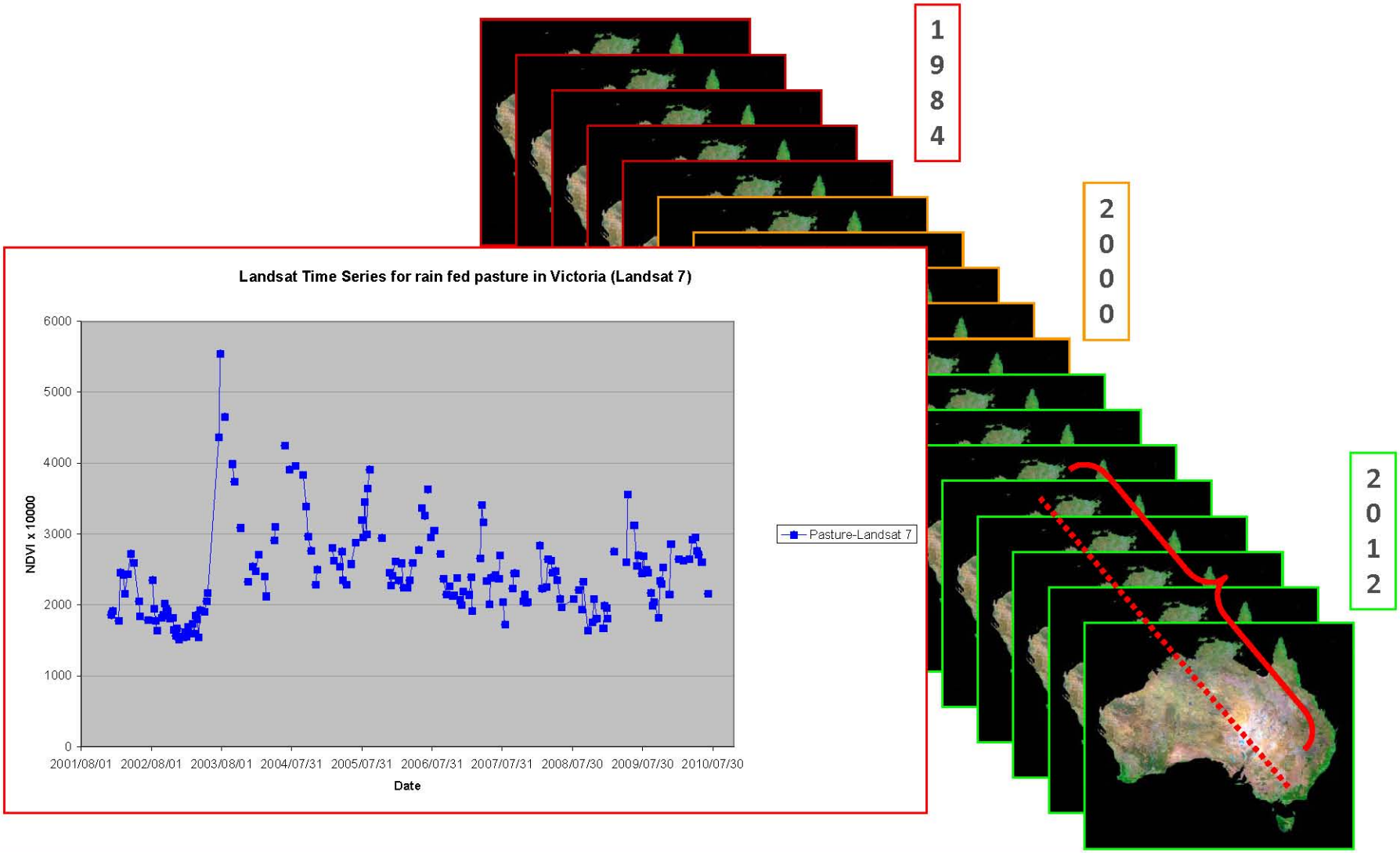
Terrain Roughness Image



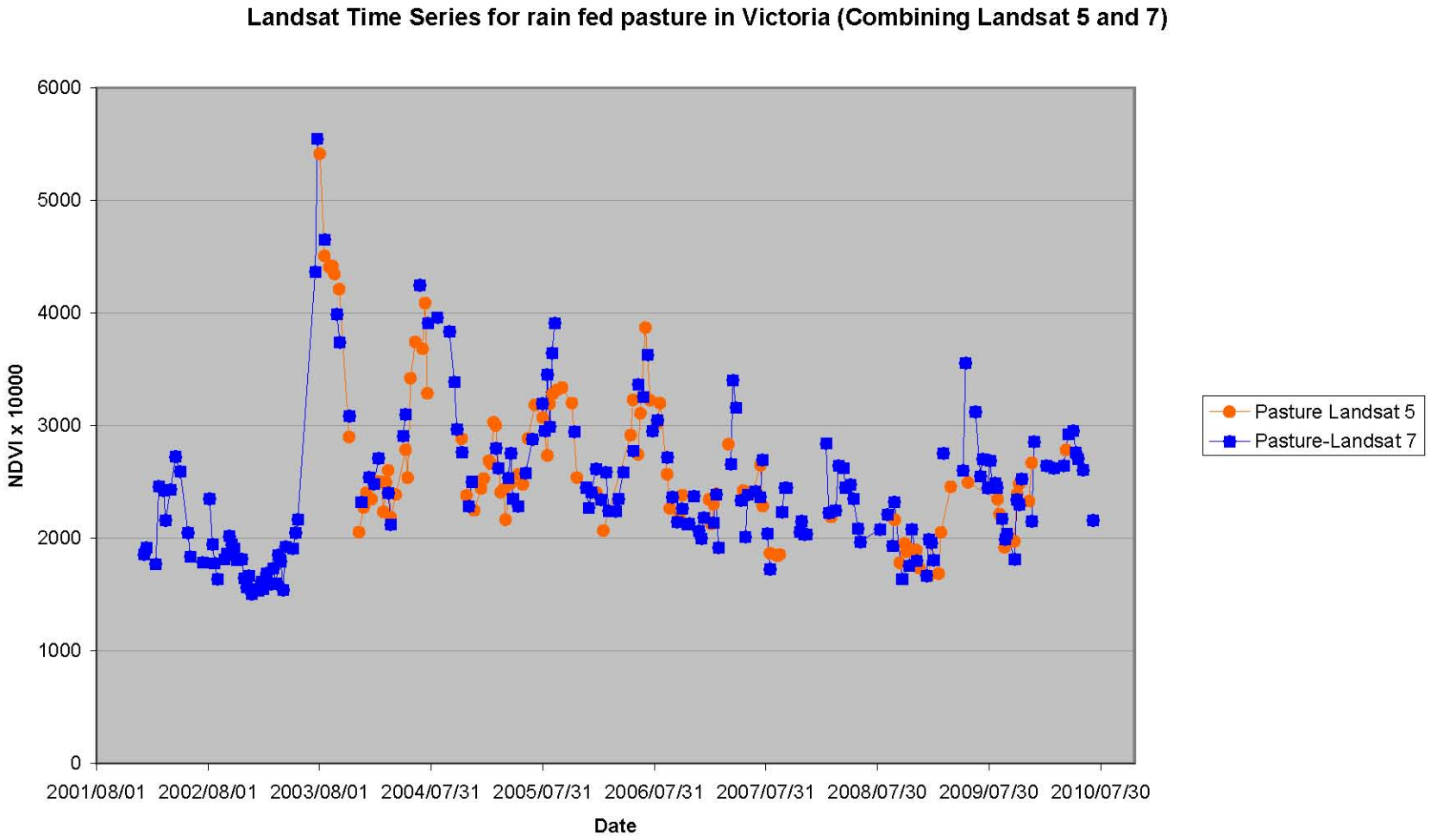
Map of terrain roughness for Australia: yellow is very low relief; green and red - high relief where correction is essential

Li et al 2013 (presented at the 2013 TERN Symposium)

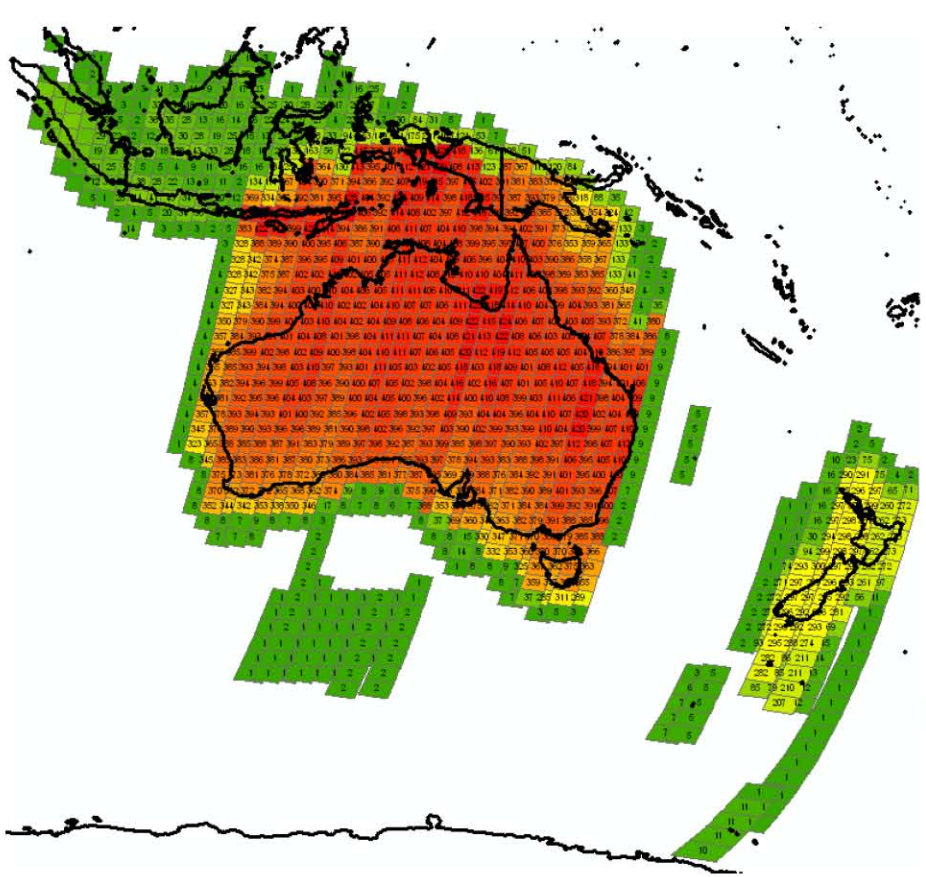
Landsat 7 Time Series

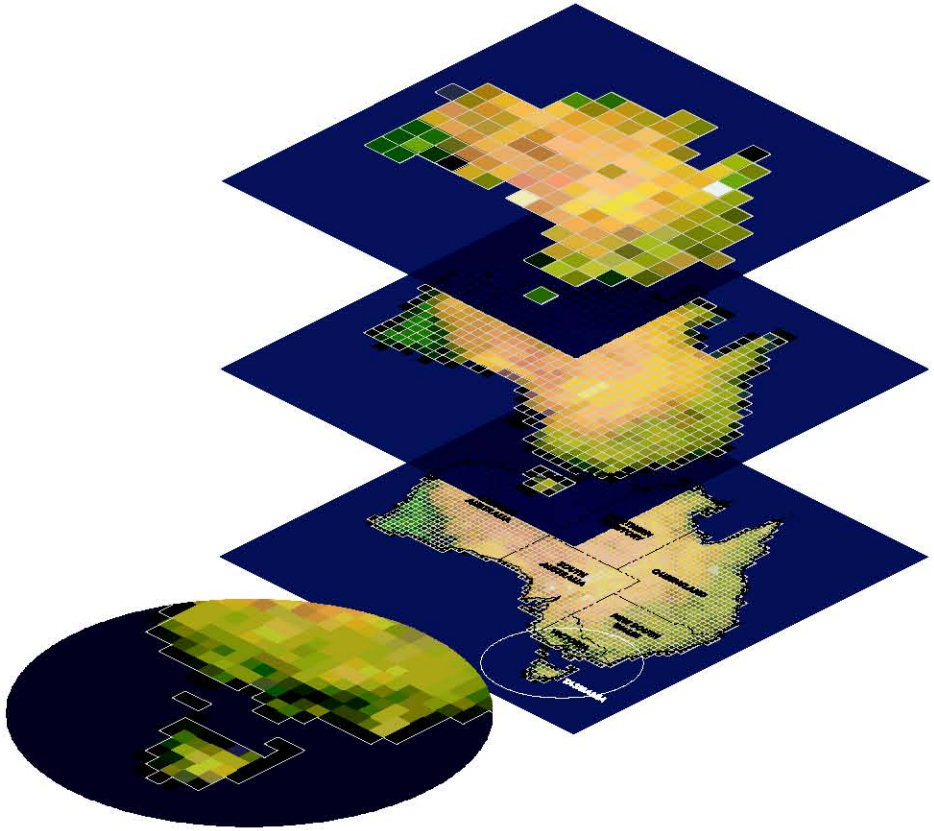


Landsat 5 and 7 Integrated Time Series



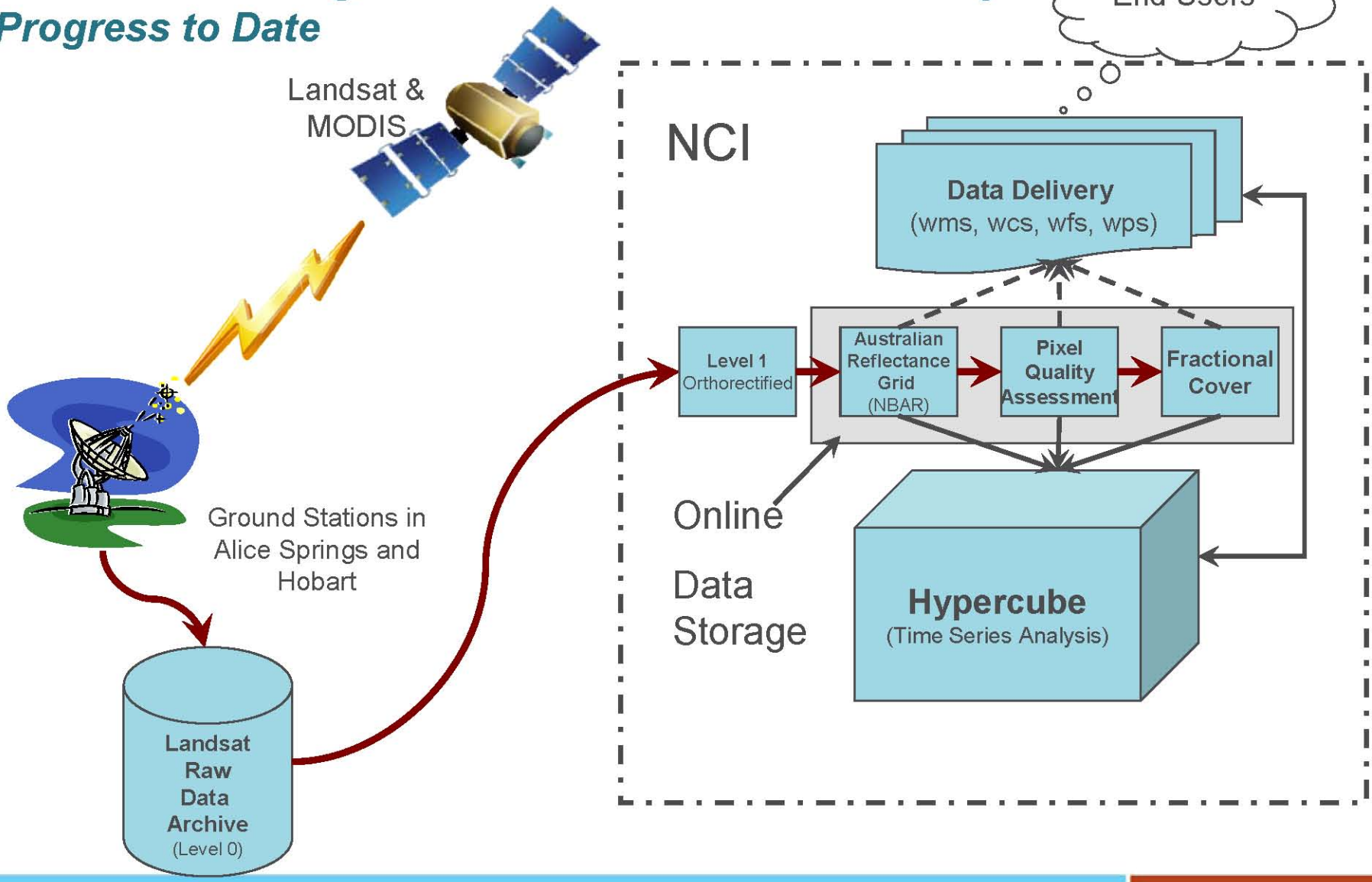
The Unlocking the Landsat Archive Project

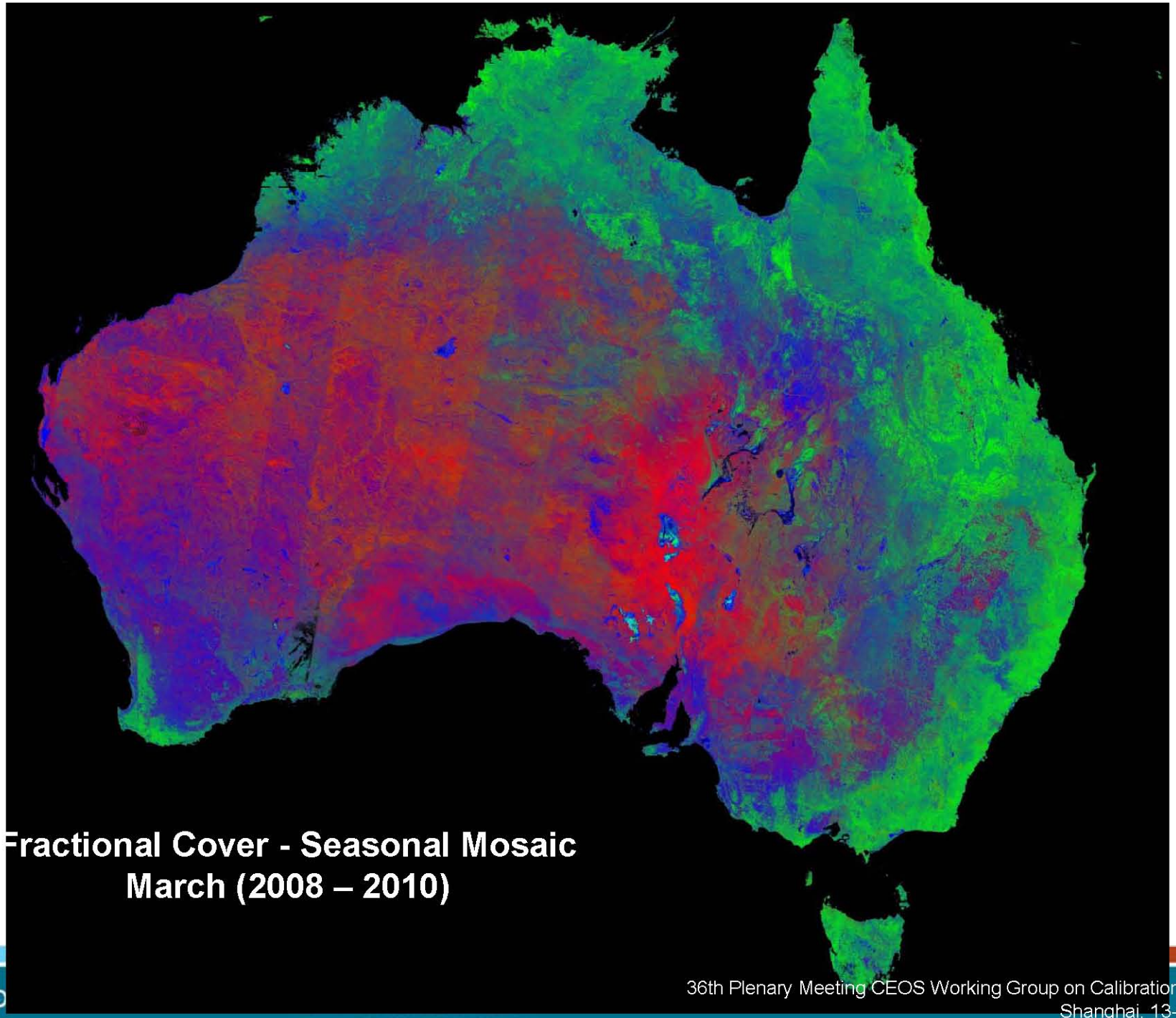




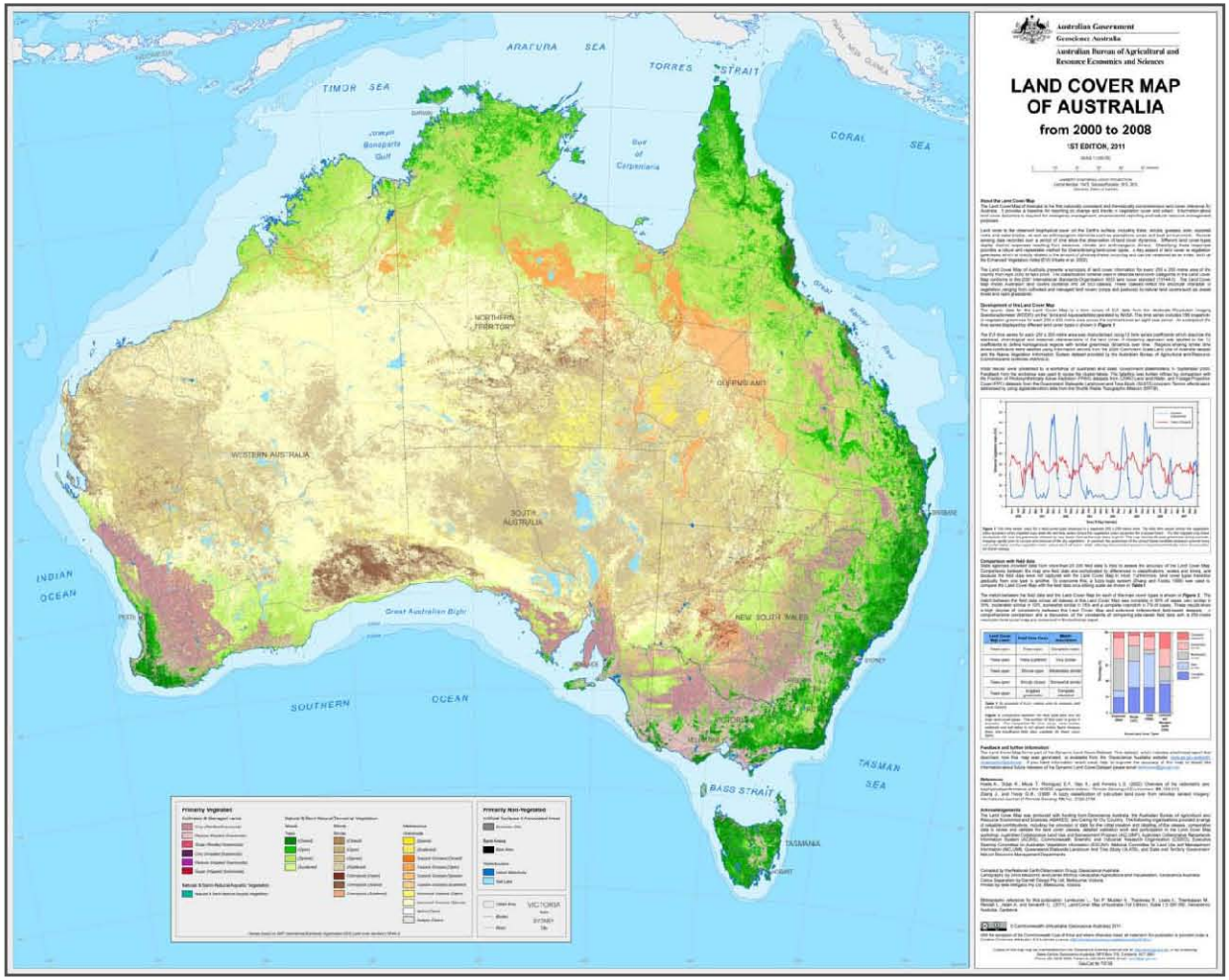
The Unlocking the Landsat Archive Project

Progress to Date



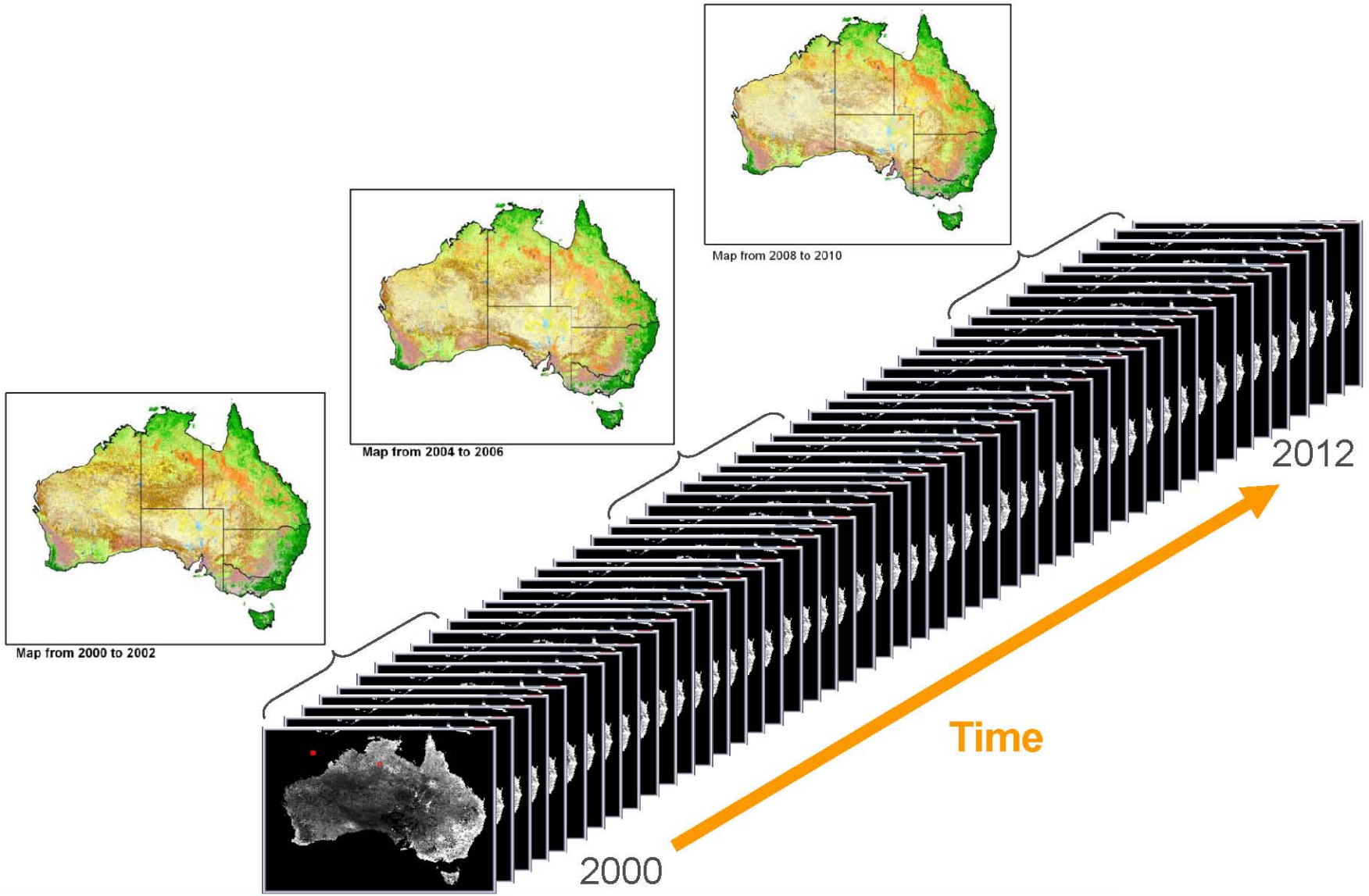

Fractional Cover - Seasonal Mosaic
March (2008 – 2010)

Dynamic Land Cover Dataset v1

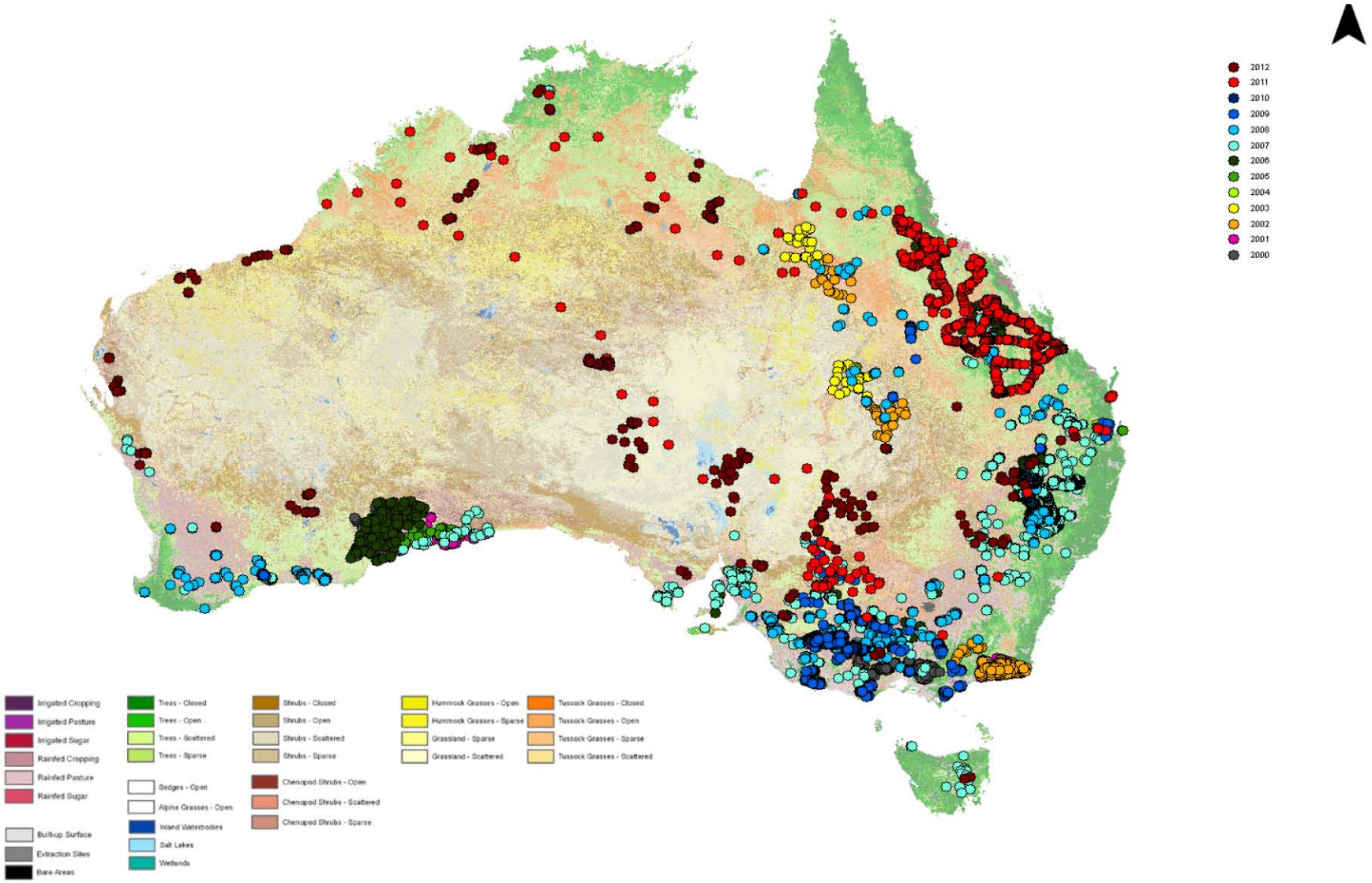


Released in November 2011

Dynamic Land Cover Dataset v2 beta



Validation : Field Data Points



National Flood Risk Information Project

Historical flood mapping using water observations from space:

- Landsat data from 1987 to 2012 nation wide
- MODIS data from 2000 to 2012 nation wide

Proof of concept launched November 2012 with web service delivery

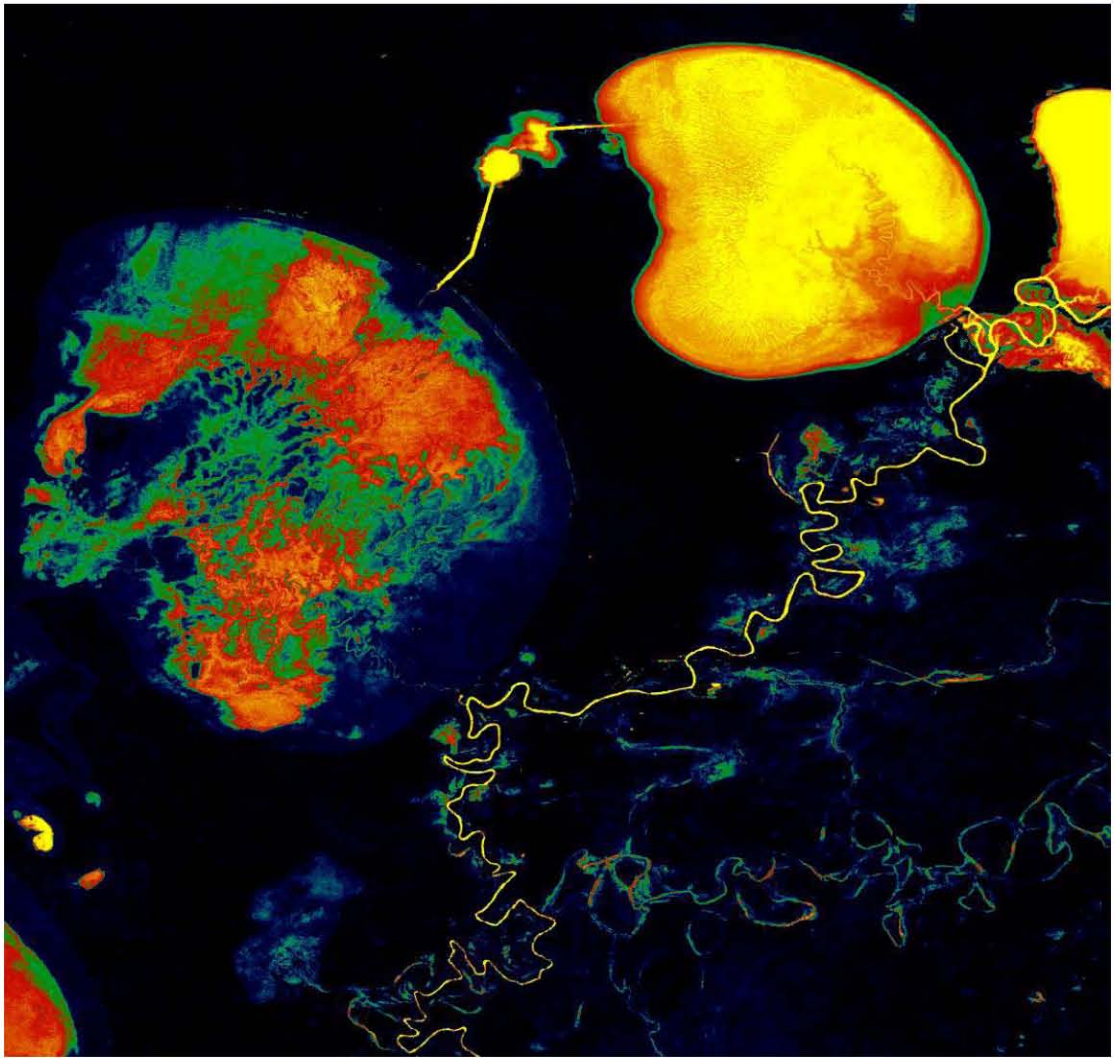
http://www.ga.gov.au/darwin-view/floods.xhtml

Priority areas to be released November 2013, followed by remainder of Australia for November 2014

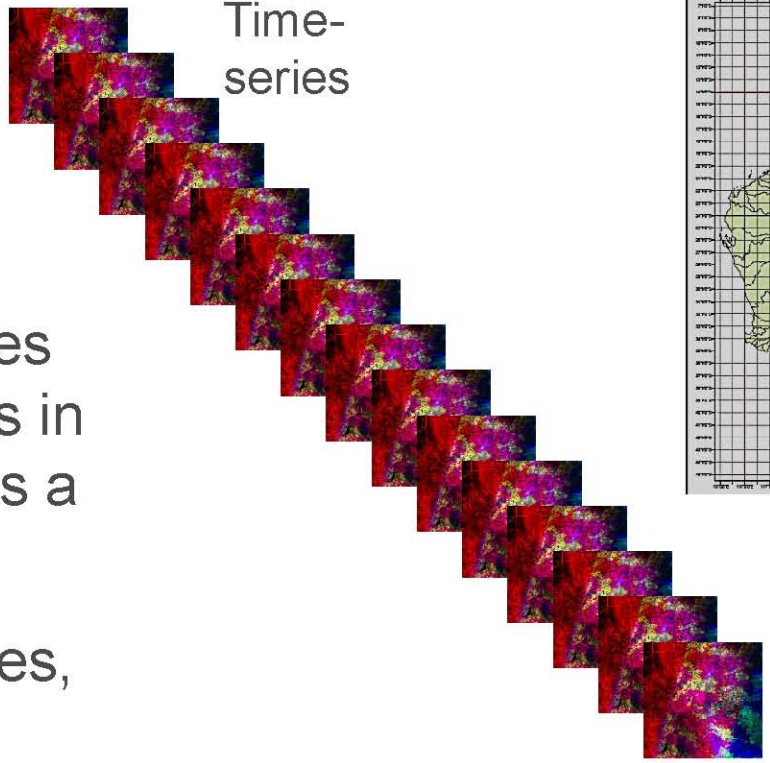
Landsat data processed using the Geoscience Australia 'Data Cube': a storage and processing system allowing massive computation on the entire archive

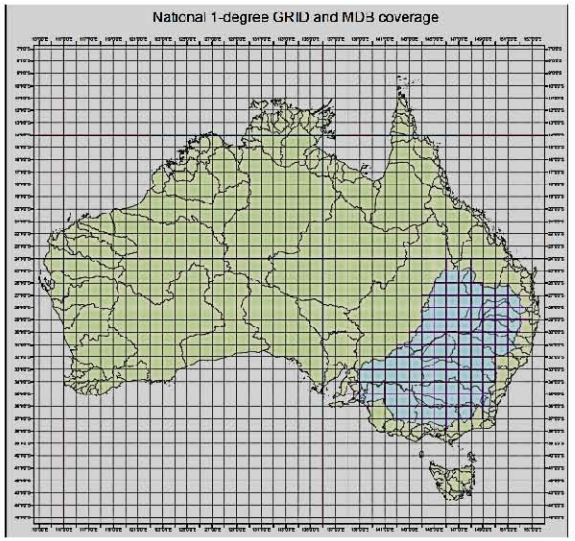
Surface Water Mapping

- Surface water through time observed by Landsat



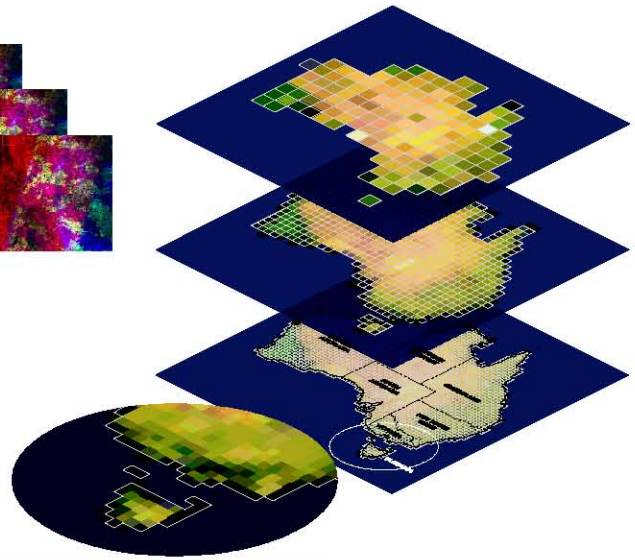
High Performance Computing (HPC) & 'Big Data'





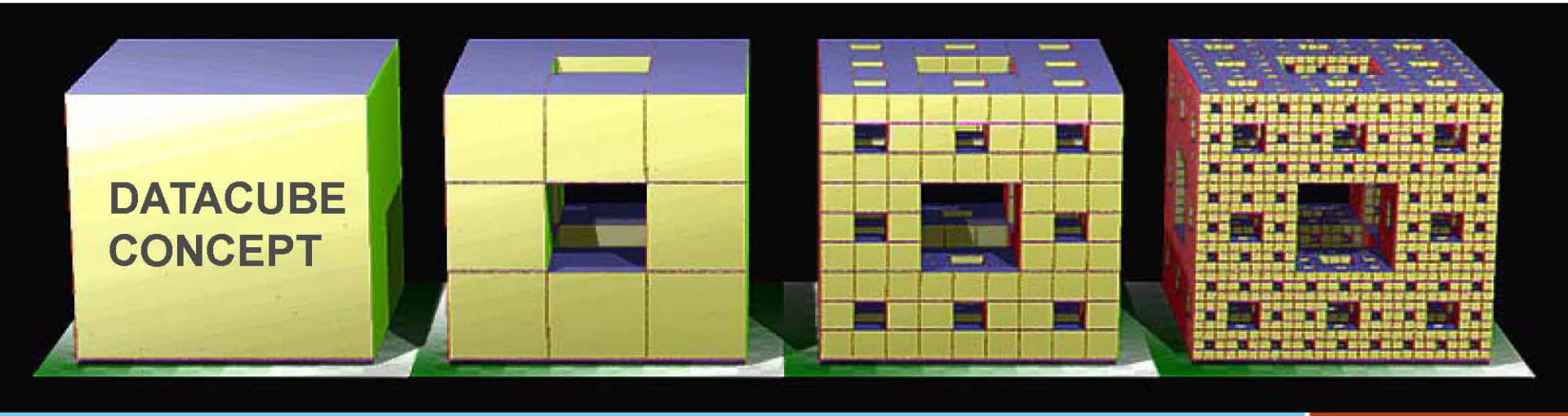
Organising decades of data for analysis in super-computers is a new challenge

Moving from images, to observations



Nested Grid and Data Cube Concept

- Projection and resolution agnostic : data interoperability and cross jurisdiction analysis
- Efficient generation of 3D time-series data for Landsat optical band reflectance and derived outputs (band indices)
- Efficient storage, reasonable price $1000/TB/year
- Application of pixel quality masks (clouds, NoData..)
- Open Geospatial Consortium (OGC) Standards compliance



Satellite Imagery:

Optical, Radar, Lidar,
Elevation, EM, etc..

DATACUBE

Derivatives:

Landcover

Vegetation Monitoring

Flood Mapping

Bathymetry

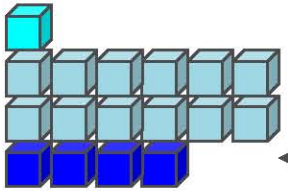
Fire Scars

Yearly,

Monthly,

Quarterly

Composites

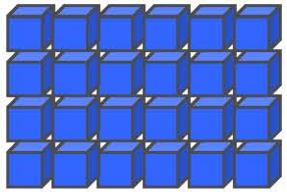


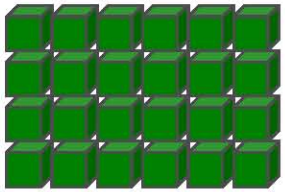
1-degree cells in GRID

Processing: Open Source

VRT's stored as XML

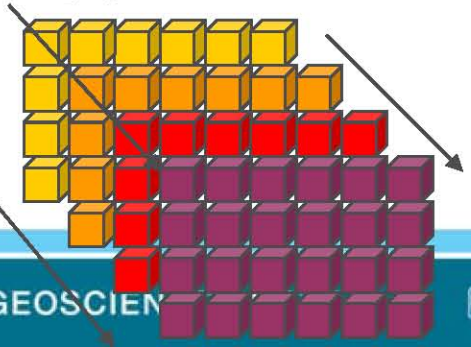
Statistics:

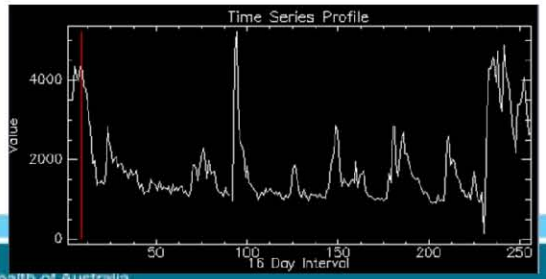


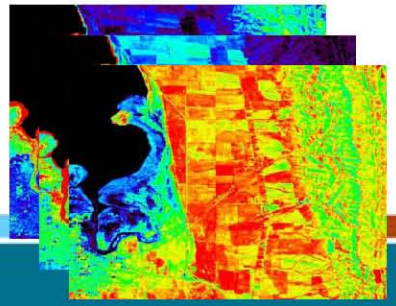


Statistics stacked per cell
(20 band ENVI file = ~1GB)

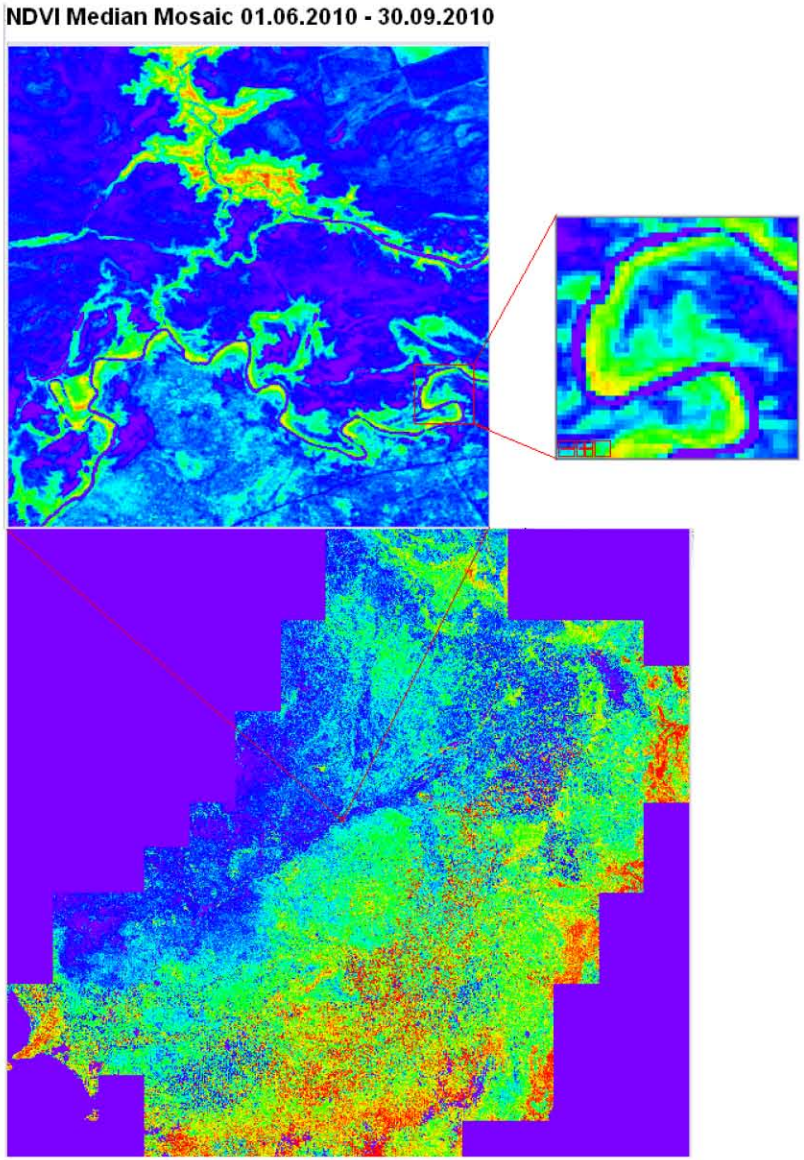
Applications: time series analysis

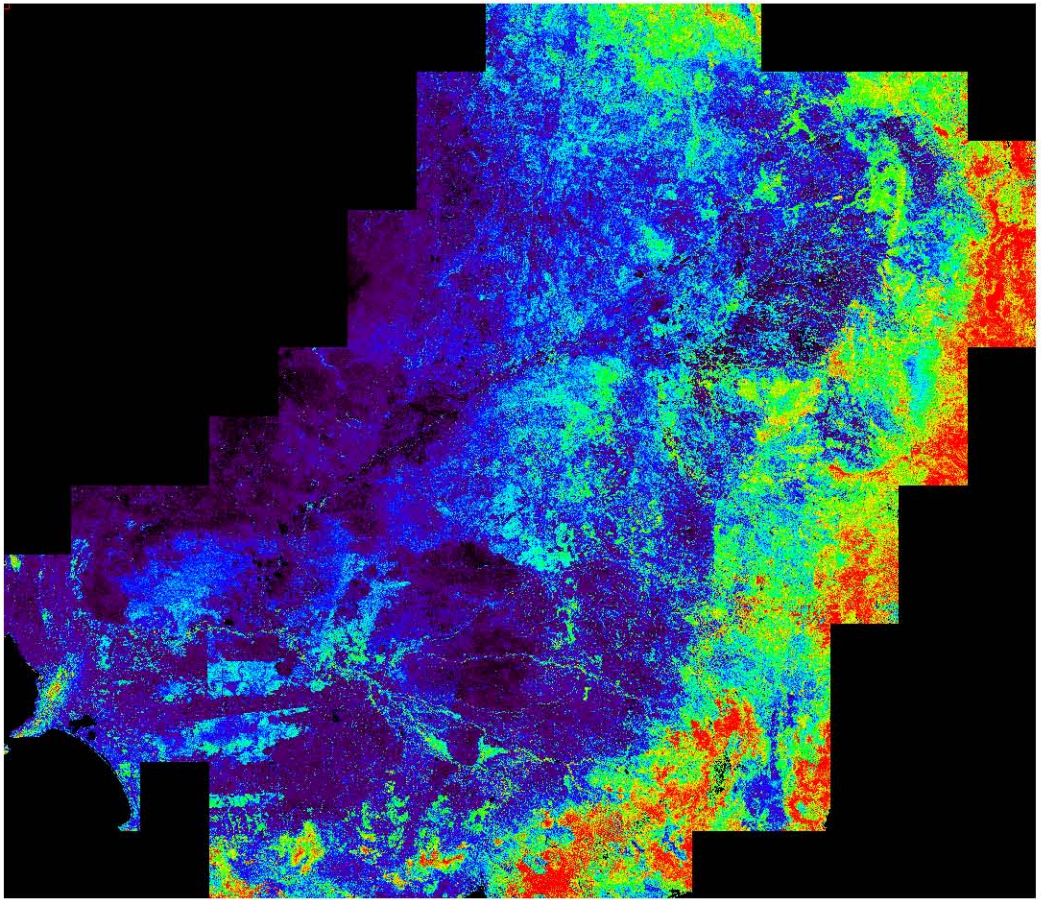






HPC Data – Example 1



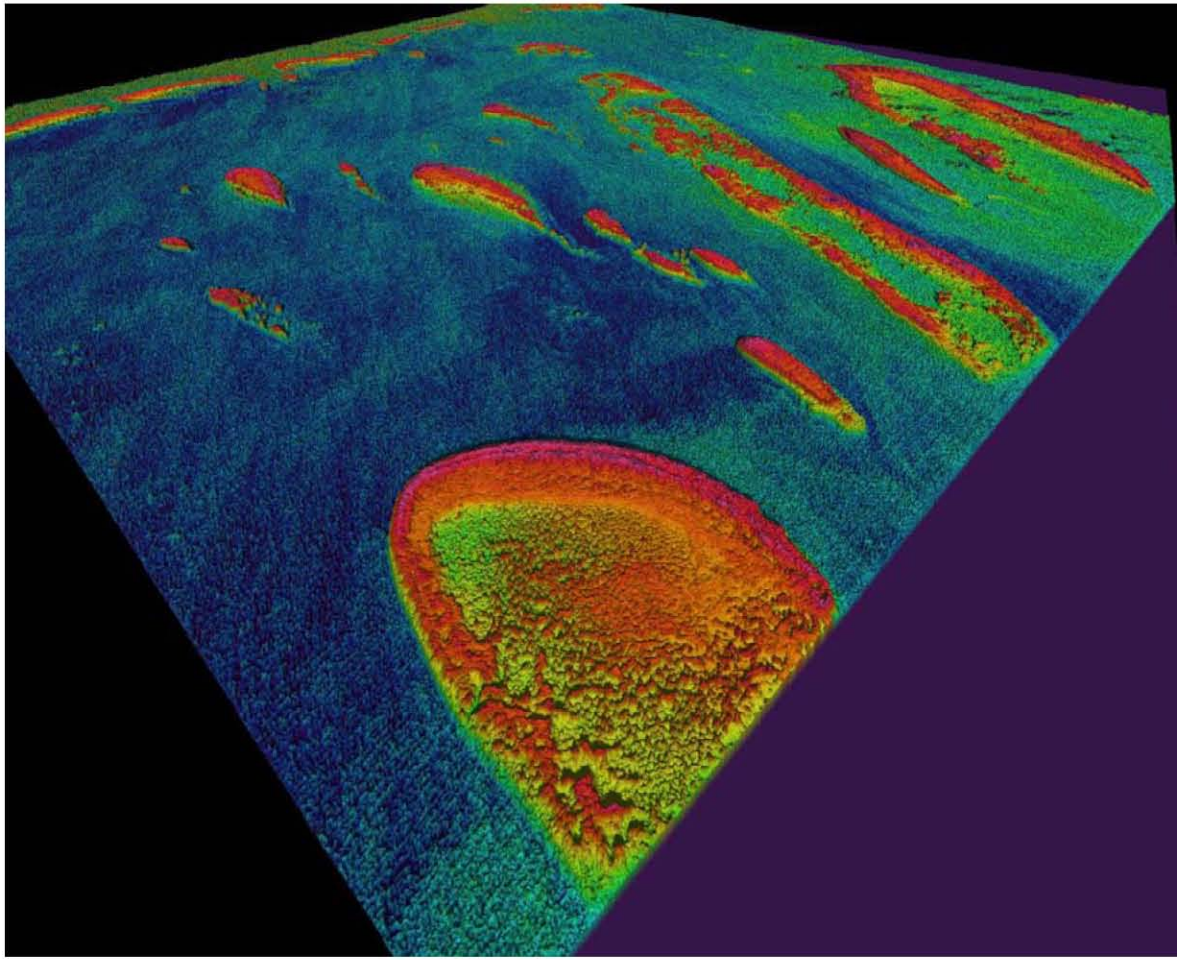


25m NDVI Mosaic (Jan-Apr 2009)

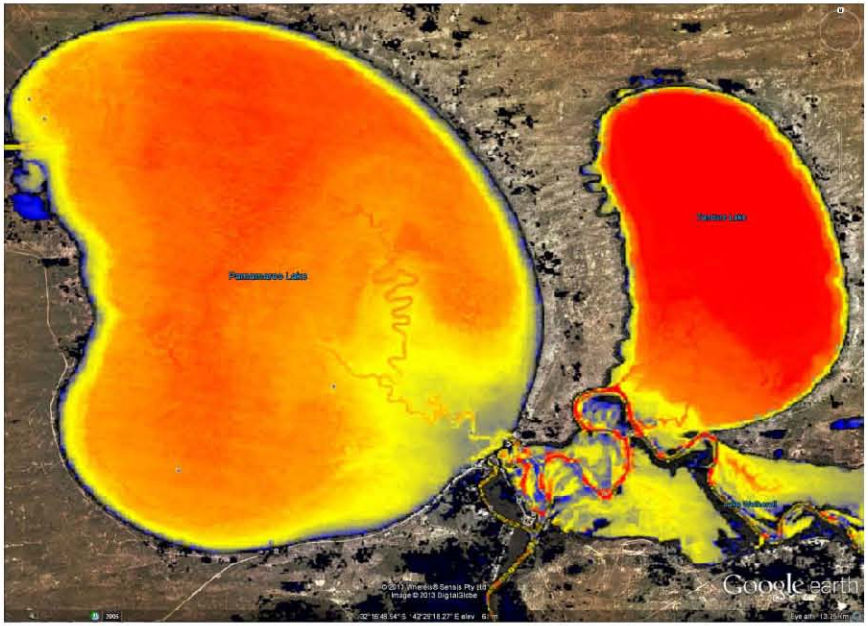
- Monitoring the land surface - vegetation greenness in the Murray Darling Basin

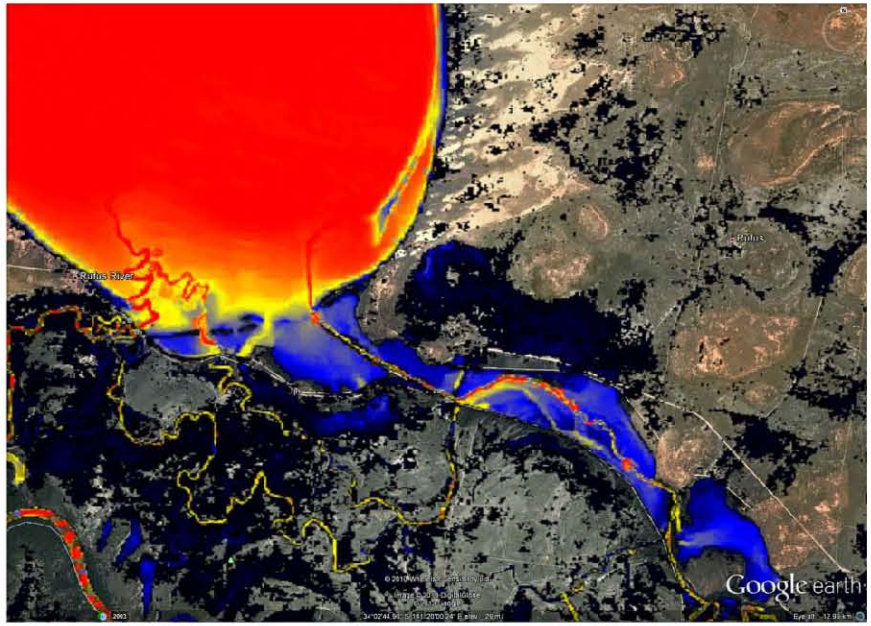
HPC Data – Example 2

- New assessment of marine and coastal zones



HPC Data – Example 3





- Summary of water recurrence

Access to Future Data Sources

Landsat-8 : Preparations for reception of data underway; GA is also represented on the Landsat Science Team (Leo Lymburner)

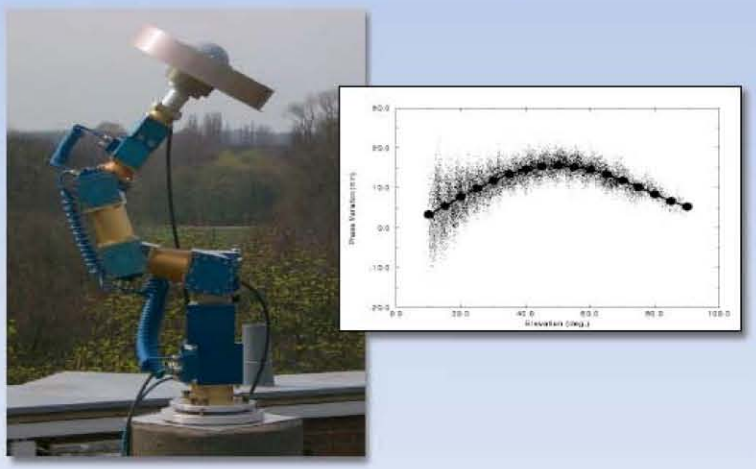
Copernicus (GMES): Discussions with ESA on access to data from Sentinels

CBERS-3: Early discussions, TBD

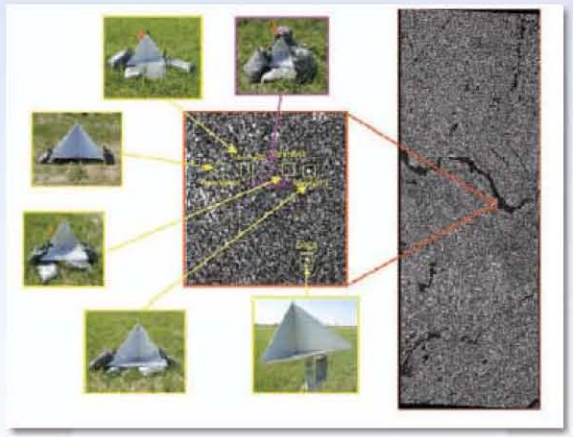
Australian Geophysical Observing System (AGOS)

Continuously operating GNSS stations

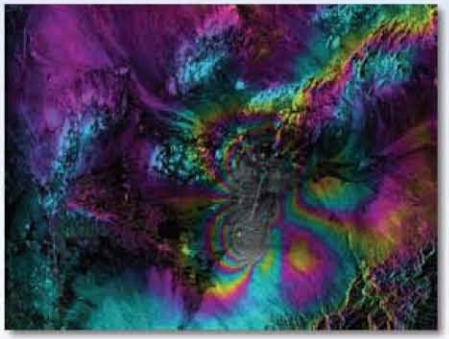
A Robotic antenna-calibration system



Design, construction and installation of the radar reflectors



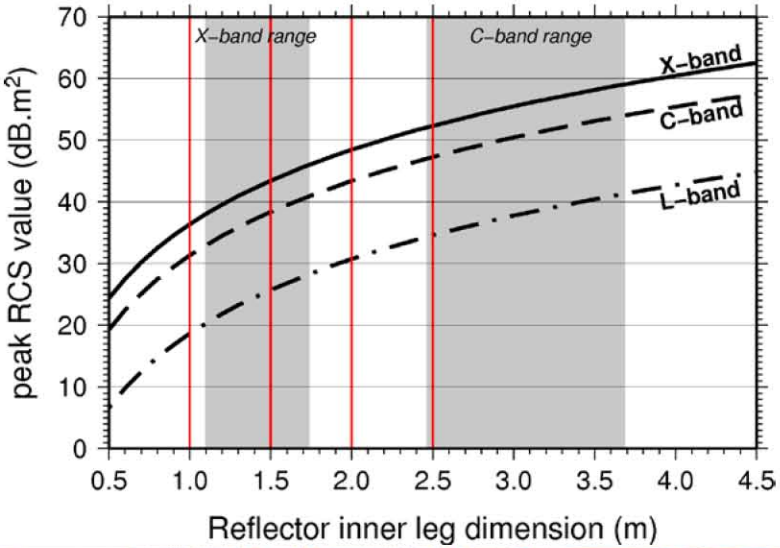
A remote sensing data portal

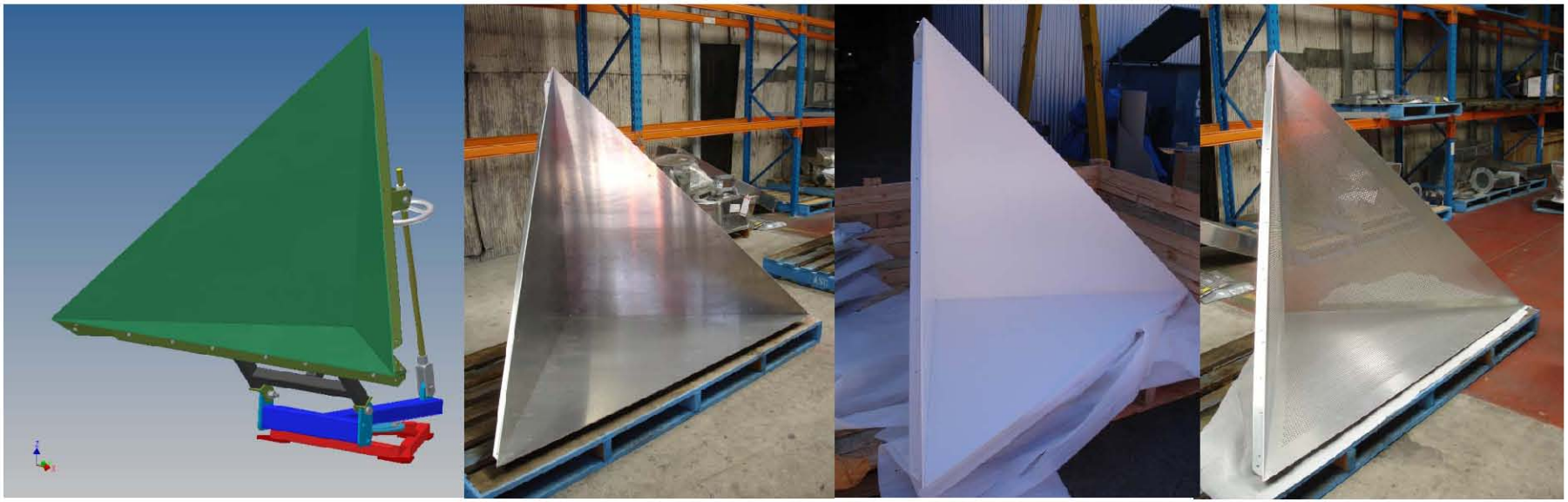


A deployable GNSS instrumentation pool

Radar Corner Reflectors for AGOS

- Design, prototype and manufacture a corner reflector network for measuring subtle ground deformation and contribute to SAR satellite calibration and validation





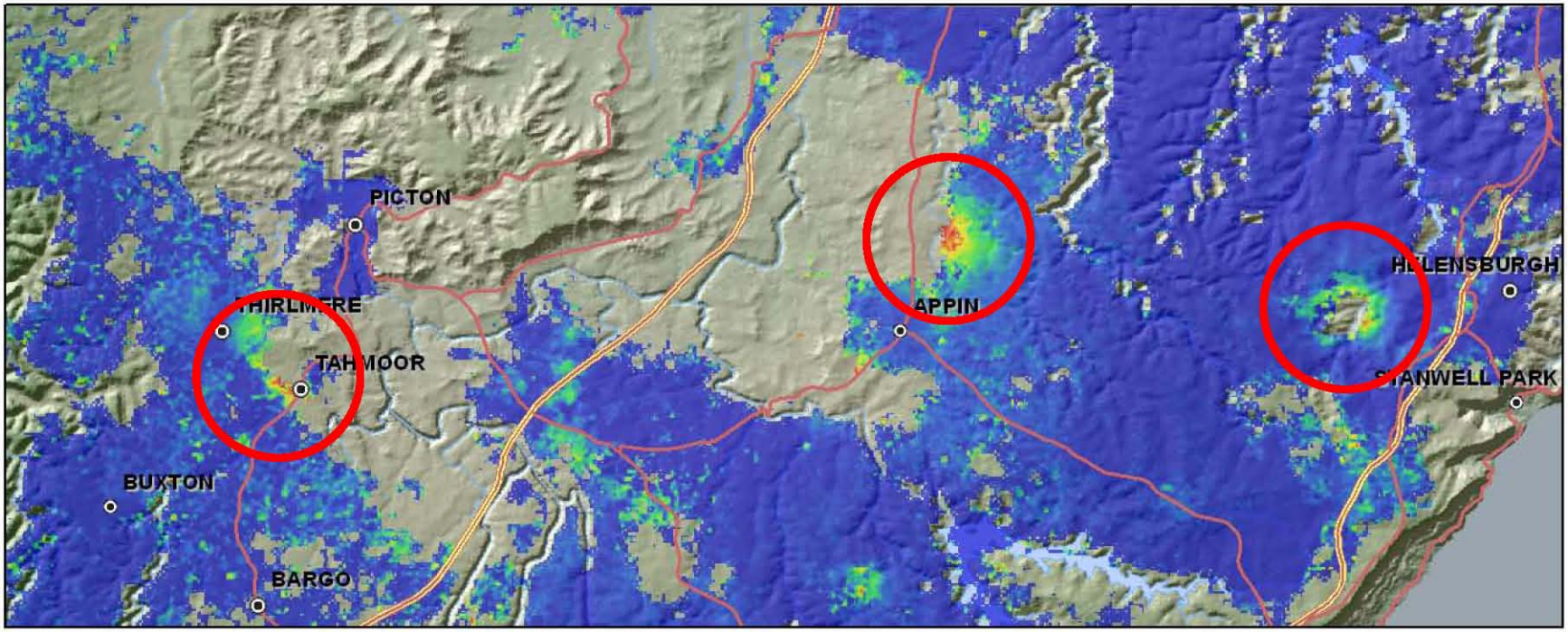
National GNSS Antenna Calibration Facility

- New AuScope funded National GNSS antenna calibration facility
- Antenna phase centre calibrations will underpin:
  - Crustal deformation surveys in Australia (seismic hazard, ground water and CSG related deformation surveys)
  - Equipment certification and legal traceability of position (for government and industry)

InSAR: Anthropogenic Subsidence

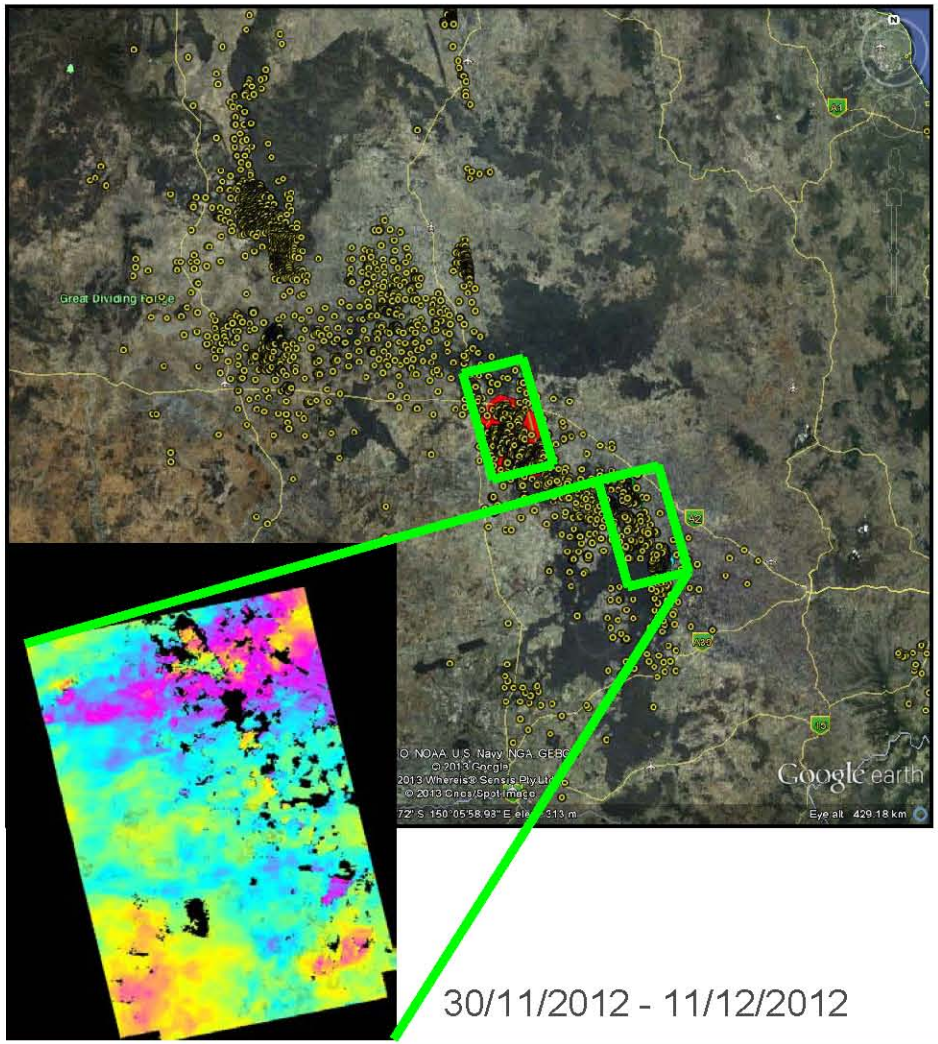
Southern coalfield, New South Wales

19-04-2010



InSAR: Subsidence from Coal Seam Gas extraction

Surat Basin, Queensland



- CSG resources are being exploited in Queensland
- Australian Geophysical Observing System (AGOS) area of interest
- Acquiring TerraSAR-X data over Surat since Dec 2012
- Combine conventional InSAR and persistent scatterers from corner reflectors with measurements from geodetic ground mark network
- Geodetic observations to be used to constrain poroelastic models of subsurface

Thank you

36th Plenary Meeting CEOS Working Group on Calibration & Validation
Shanghai, 13-17 May 2013