Australian Government

Geoscience Australia

A brief summary of Landsat science in Australia

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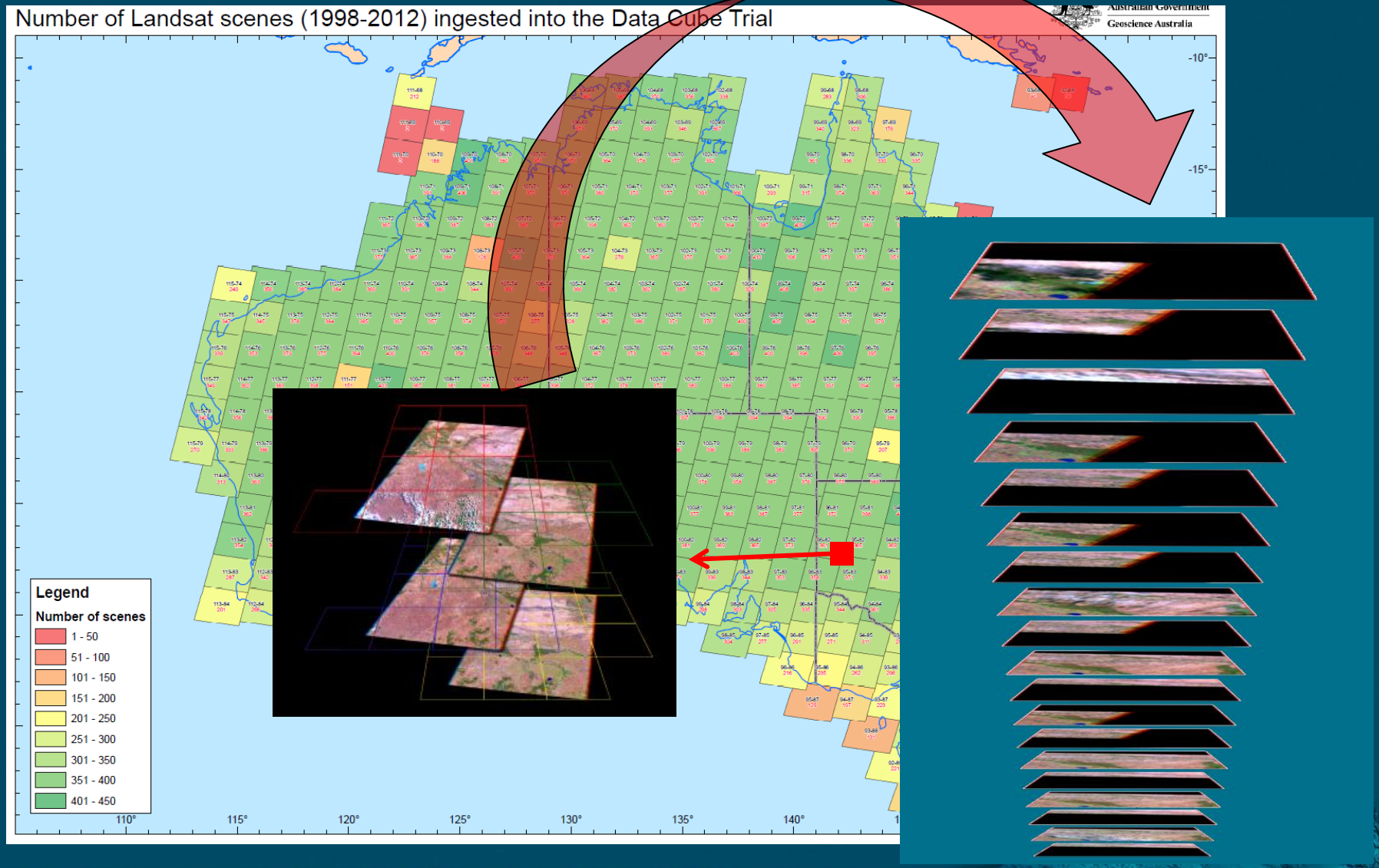
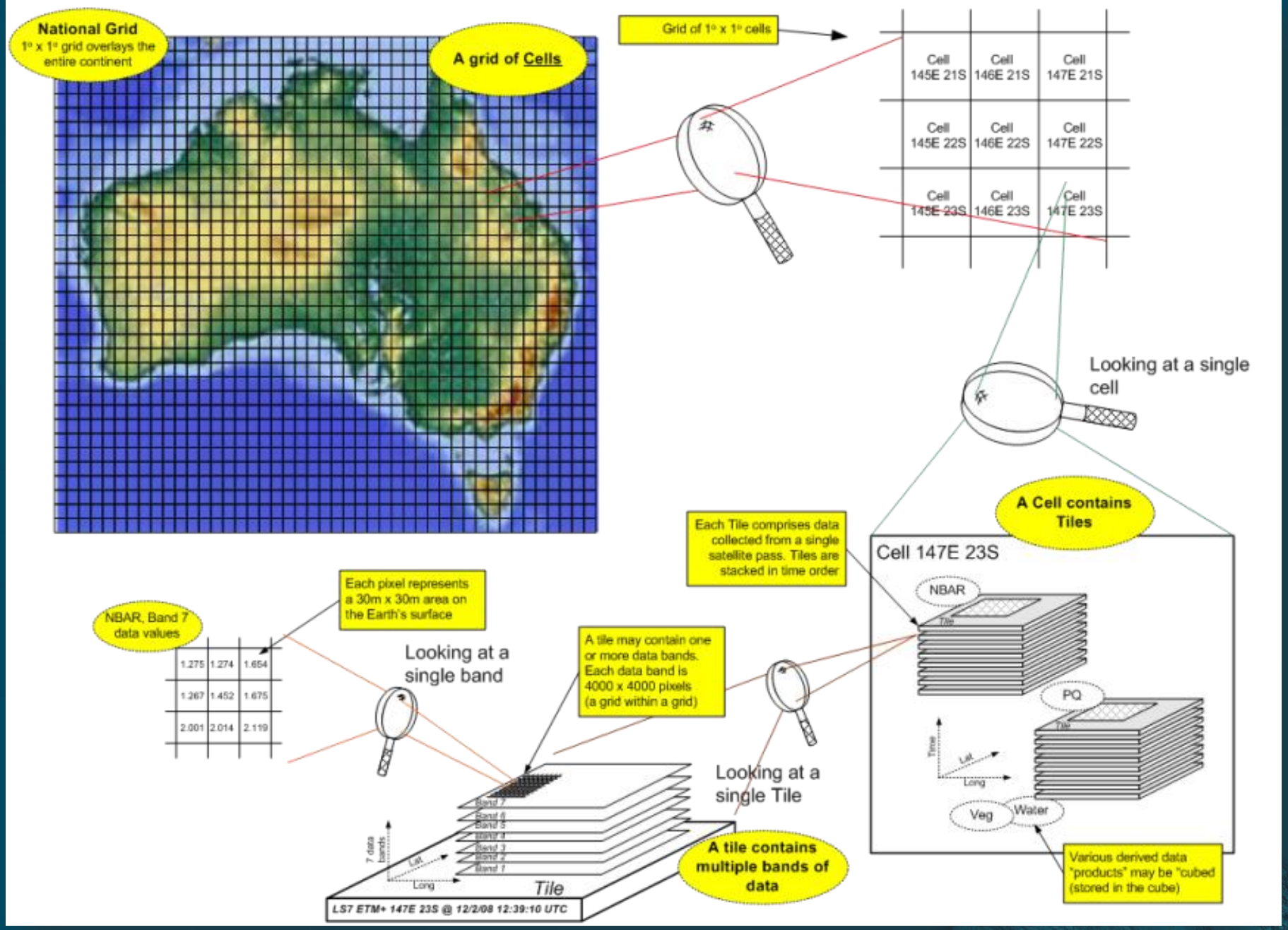
Overview

- Analysing the Australian Landsat archive
- Harnessing the LS5/7 archive to characterise
  - Inundation
  - Fractional cover
- Comparison of surface reflectance corrected LS7 and LS8 during ‘tandem mode’
  - Radiometric comparison
  - Geometric comparison
- Preliminary shallow water bathymetry for LS8
- Using LS8 to map wildfires

Analysing the Australian Landsat archive



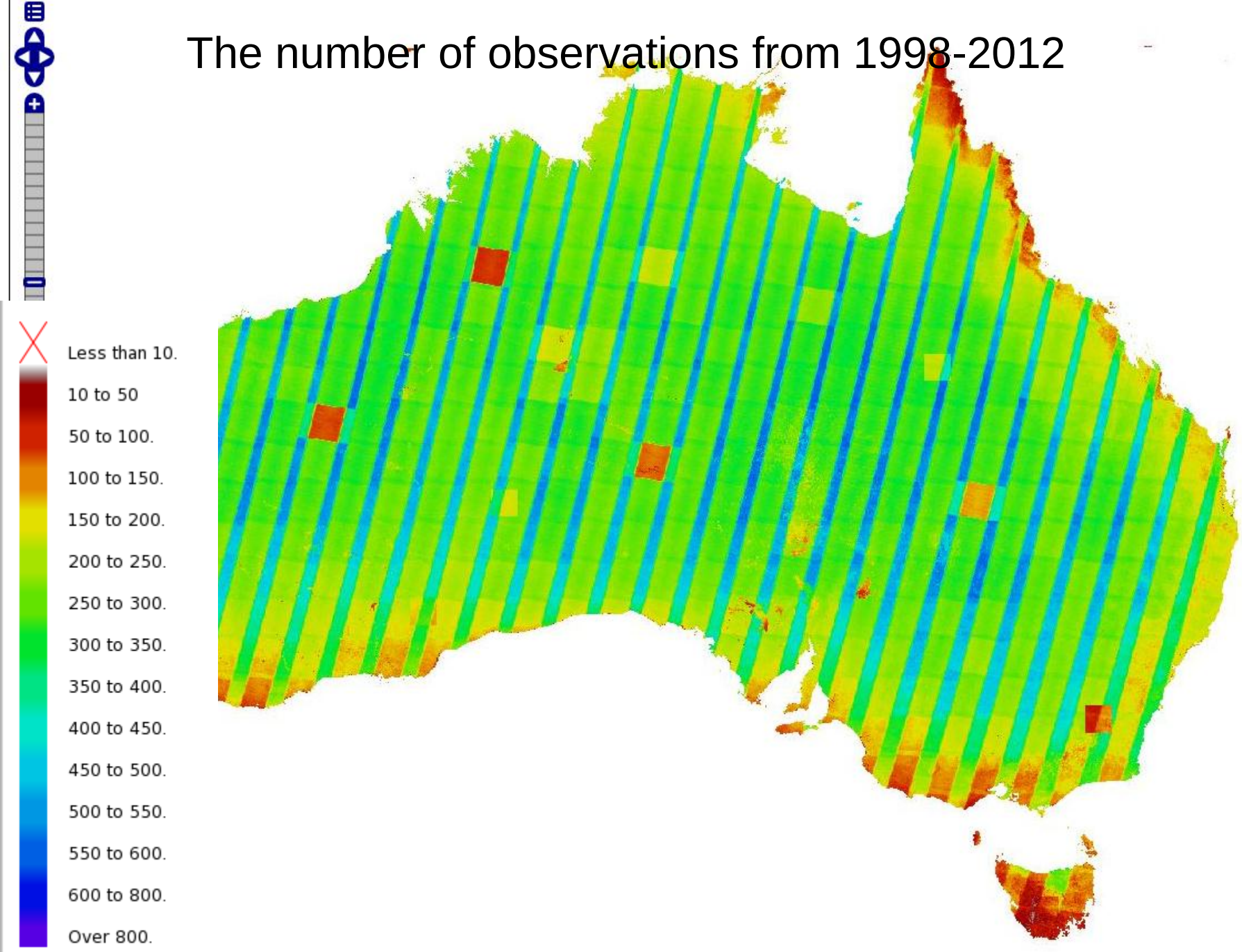

National Grid
1° x 1° grid overlays the entire continent
A grid of Cells
Grid of 1° x 1° cells
Cell 145E 21S
Cell 146E 21S
Cell 147E 21S
Cell 145E 22S
Cell 146E 22S
Cell 147E 22S
Cell 145E 23S
Cell 146E 23S
Cell 147E 23S
Looking at a single cell
A Cell contains Tiles
Cell 147E 23S
NBAR
PQ
Veg
Water
Time
Lat
Long
Tile
Each Tile comprises data collected from a single satellite pass. Tiles are stacked in time order
Various derived data "products" may be "cubed (stored in the cube)
NBAR, Band 7 data values
1.275 1.274 1.654
1.267 1.452 1.675
2.001 2.014 2.119
Each pixel represents a 30m x 30m area on the Earth's surface
Looking at a single band
A tile may contain one or more data bands. Each data band is 4000 x 4000 pixels (a grid within a grid)
Looking at a single Tile
Band 7
Band 6
Band 5
Band 4
Band 3
Band 2
Band 1
7 data bands
Lat
Long
Tile
LS7 ETM+ 147E 23S @ 12/2/08 12:39:10 UTC
A tile contains multiple bands of data

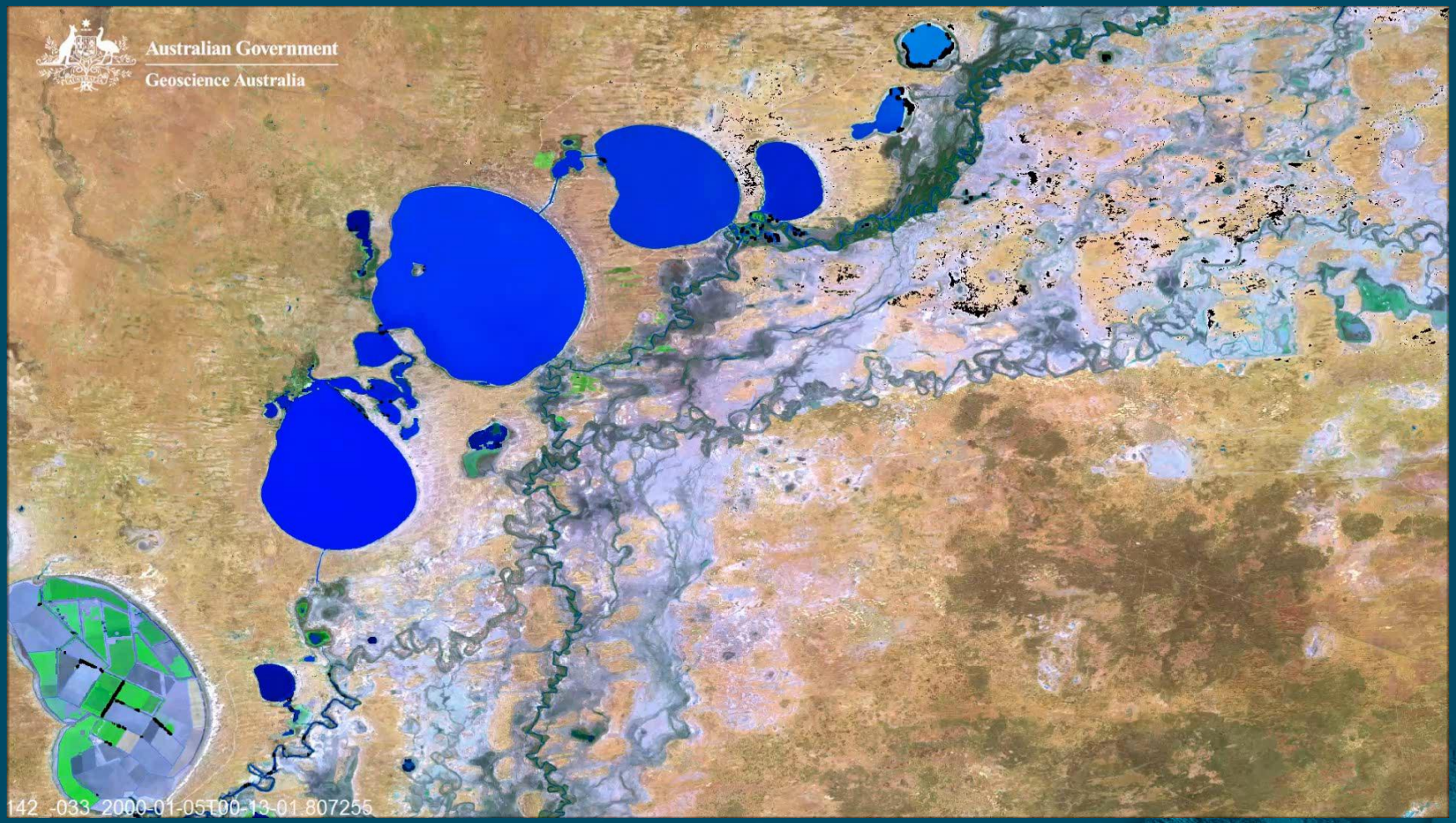
Using HPC to tackle continental Landsat archives

High performance computing - National Computational Infrastructure (NCI)

- **Raijin**
- Fujitsuhigh-density integrated cluster:
  - 57,000 cores
  - 160 terabytes of RAM
  - **10 petabytes of hard disc**
  - 1,200 teraflops
- Used by the Bureau of Meteorology, CSIRO, ANU, and GA.
- Addressing climate change, earth systems science and national water management issues.

The number of observations from 1998-2012

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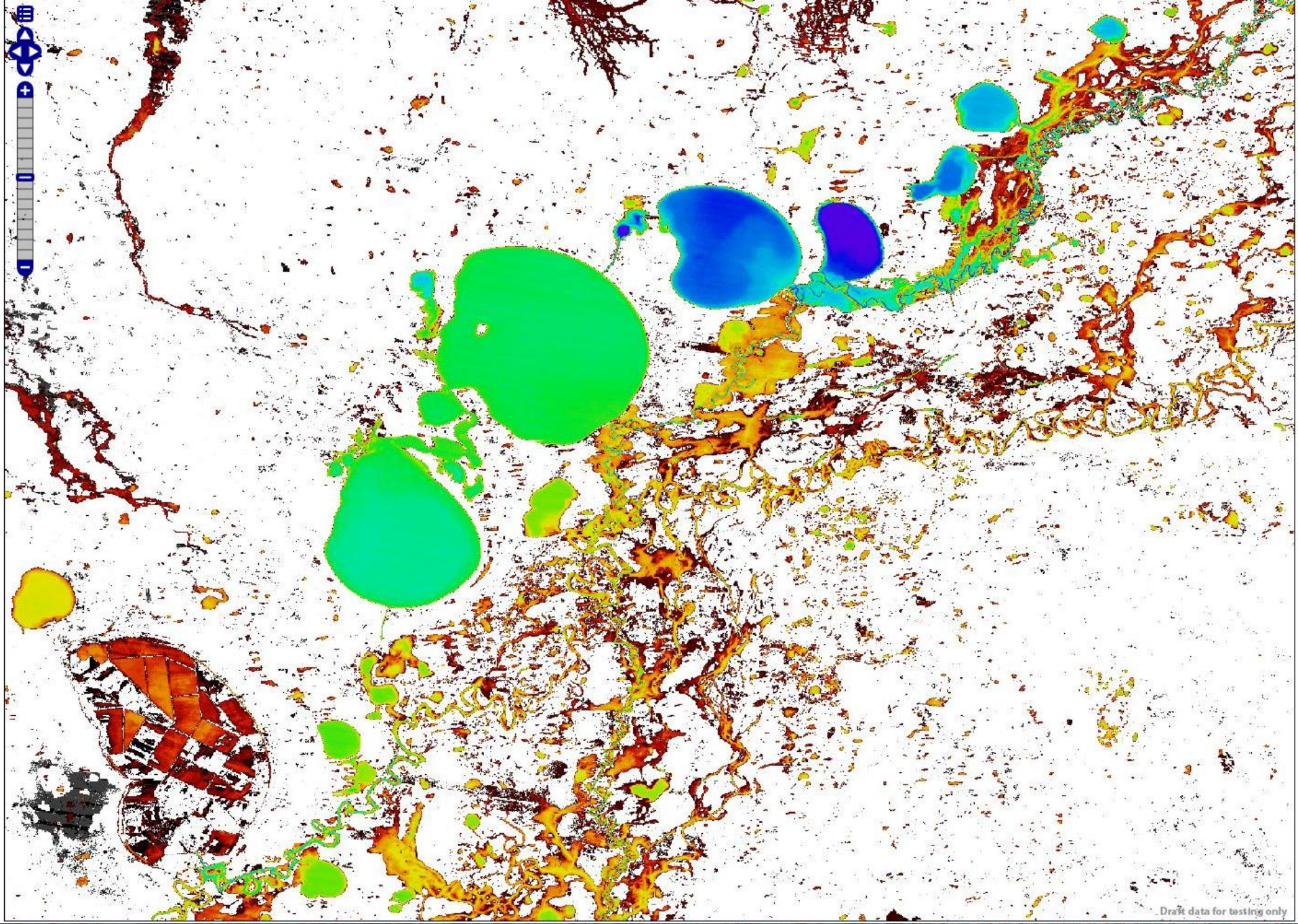
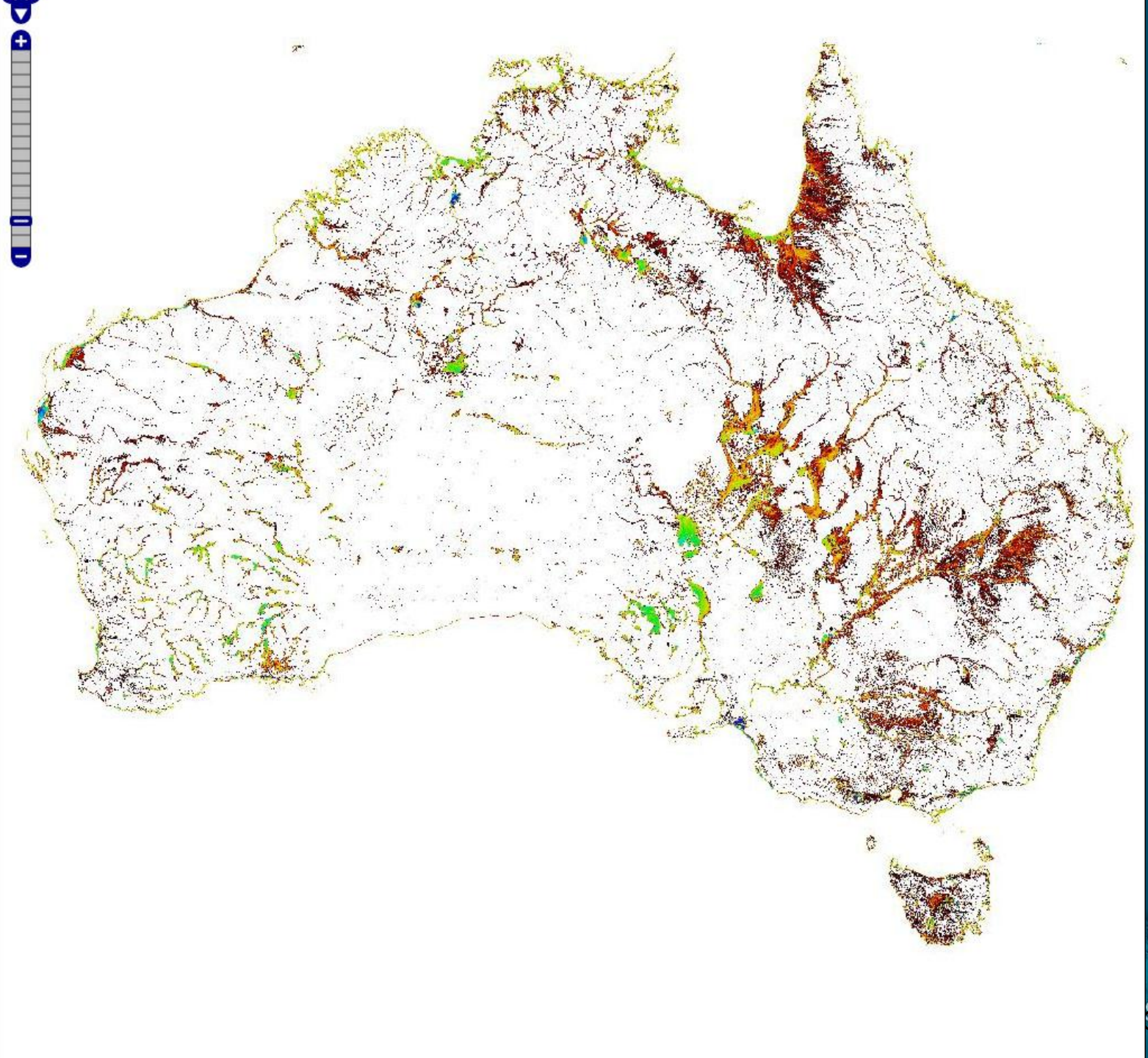

Draft data for testing only



October

Peter Scarth (Joint Remote Sensing Research Program)

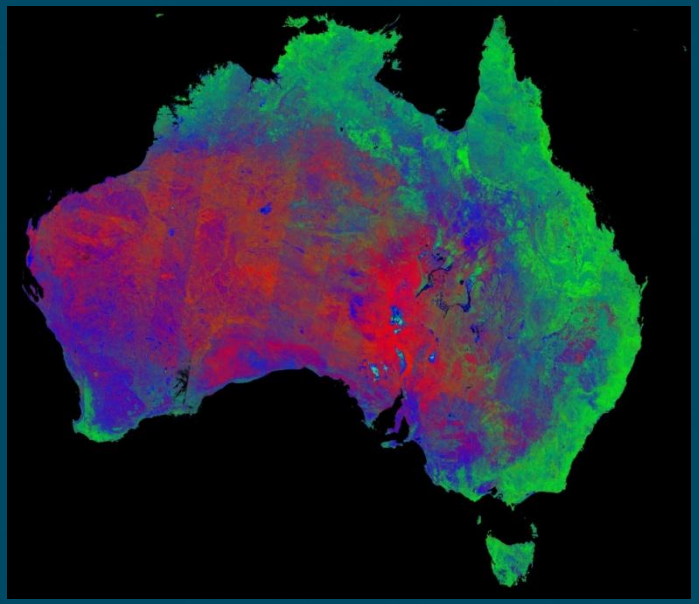
Queensland Government

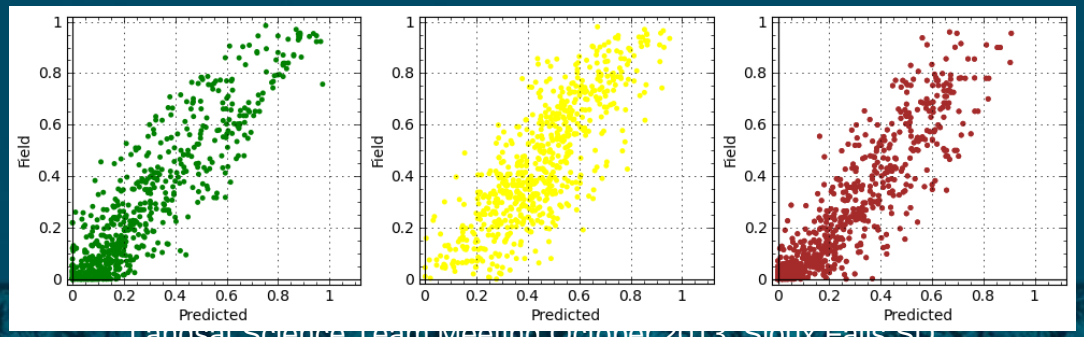
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

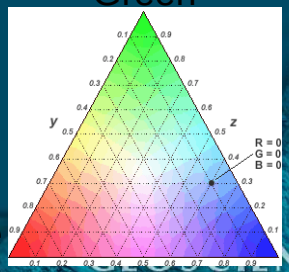
TERN
Terrestrial Ecosystem Research Network

National Fractional Cover Time Series

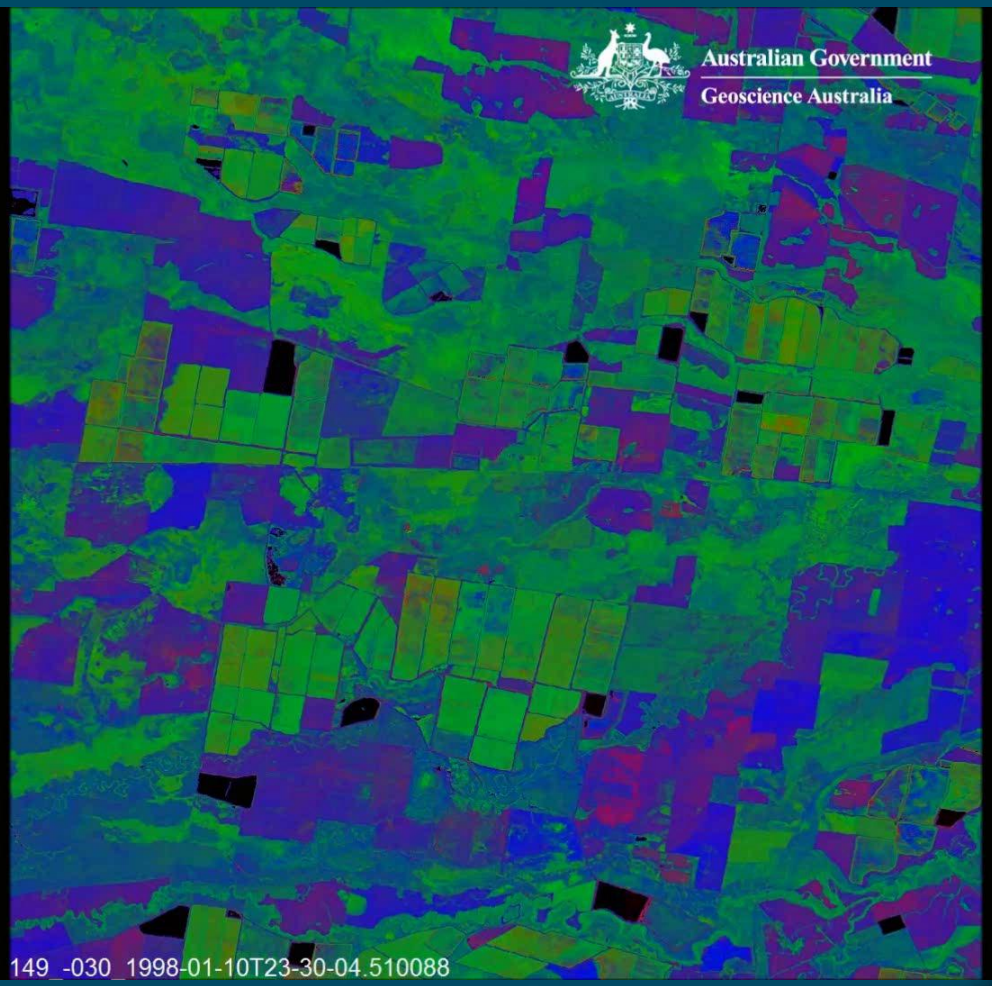
- Fractional cover uses a constrained un-mixing model with end-members derived from field sampling.
- Creates an image with the percentage of bare, green and non-green fractions
- Over 1100 field sites collected using consistent, nationally agreed protocol
- Overall RMSE of 11%
- Captures cover dynamics at 30m resolution
- Used by Geoscience Australia nationally







Landsat Fractional Cover animation– Land Management – Keytah Station

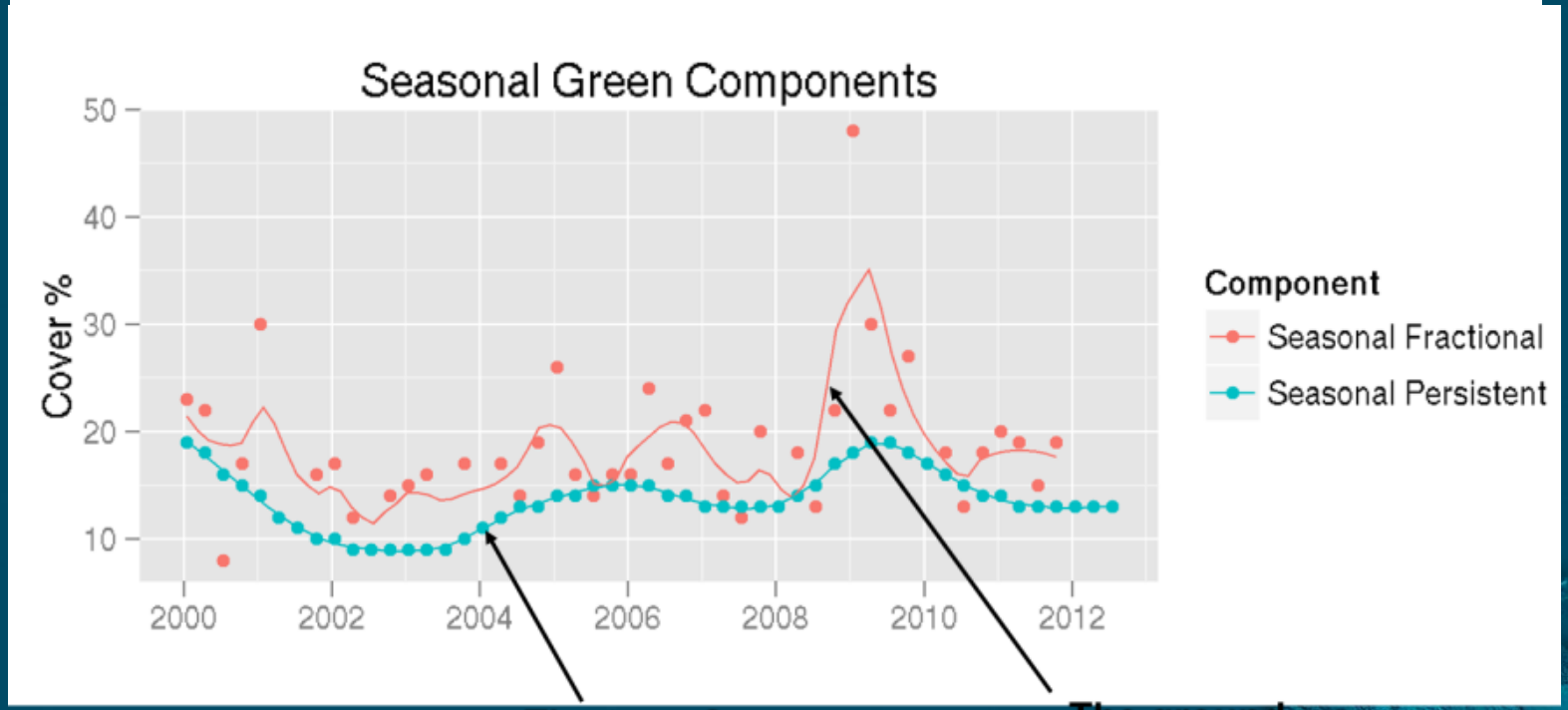


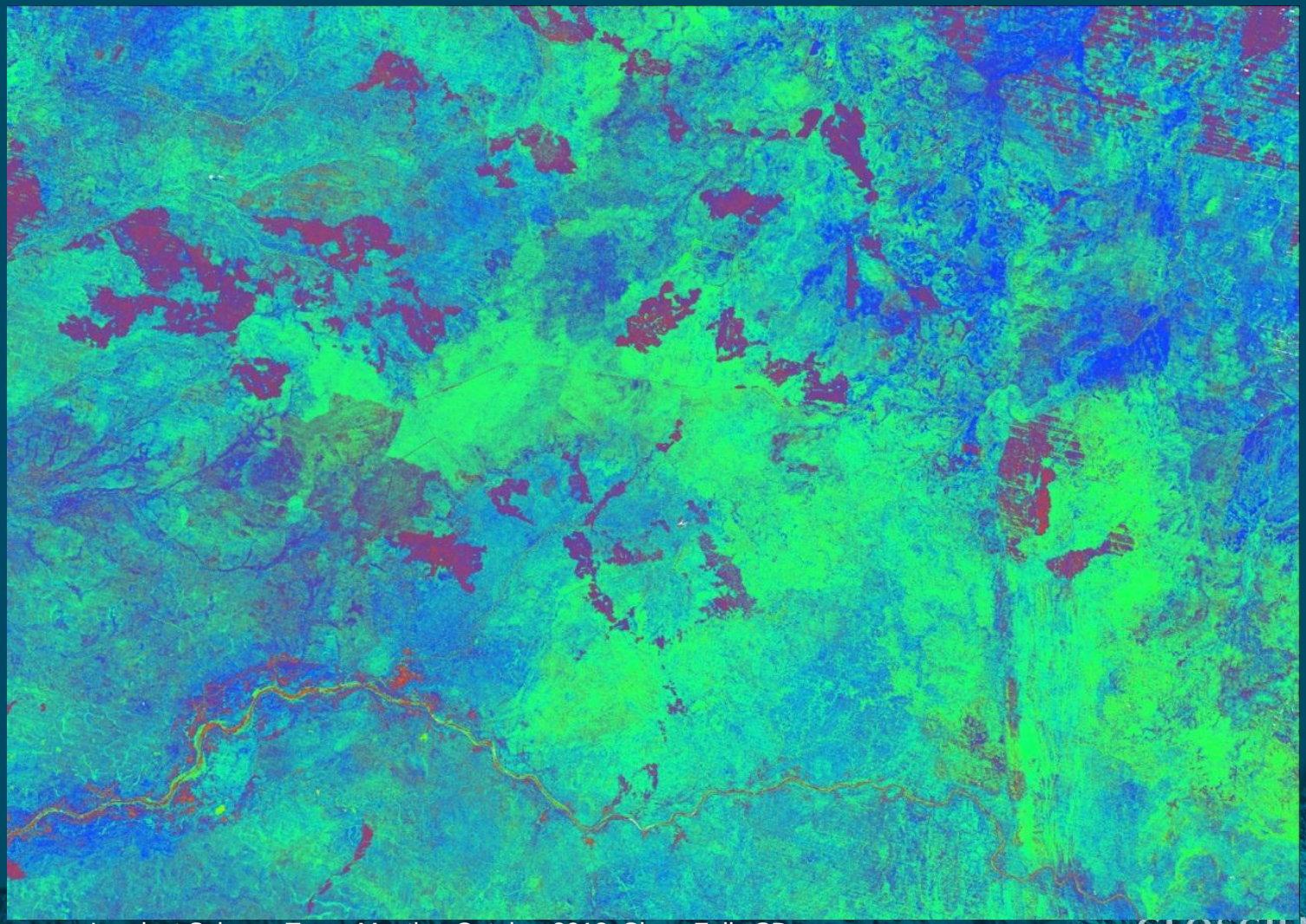
Cover under trees – using time-series and Fractional cover

$$fCI_{green} = Visible\ \ Ground_{green} + Persistent_{green}$$

$$fCI_{dry} = Visible\ \ Ground_{dry} + Persistent_{dry}$$

$$fCI_{bare} = Visible\ \ Ground_{bare}$$





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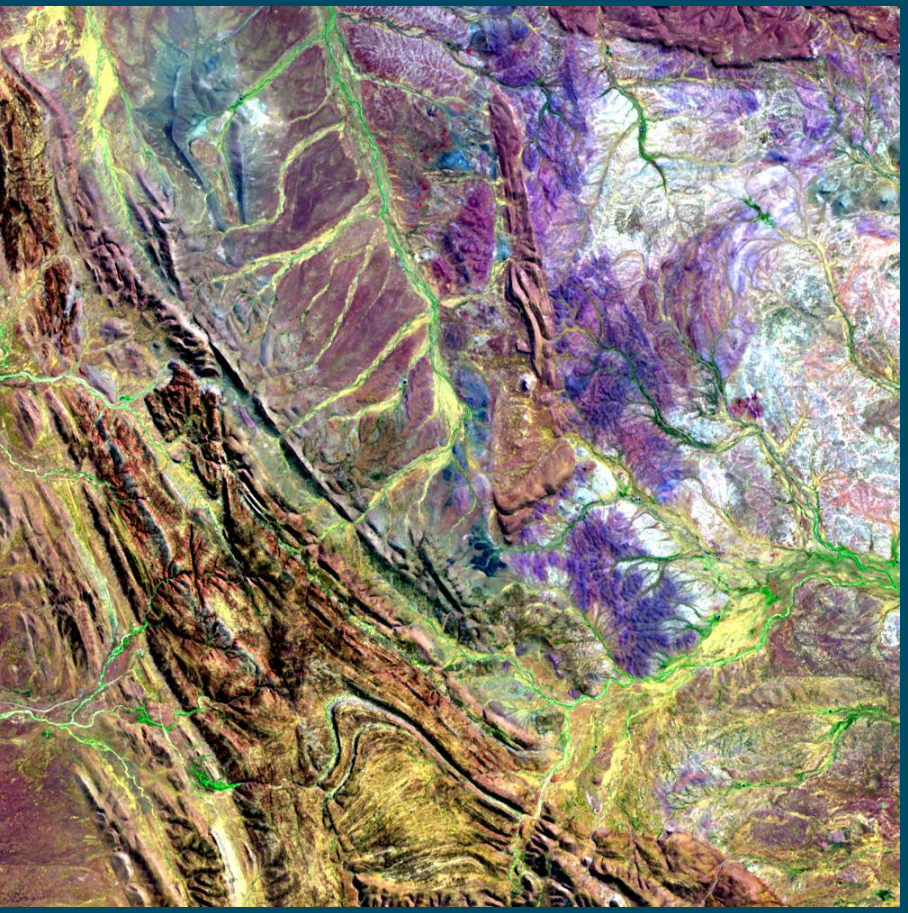
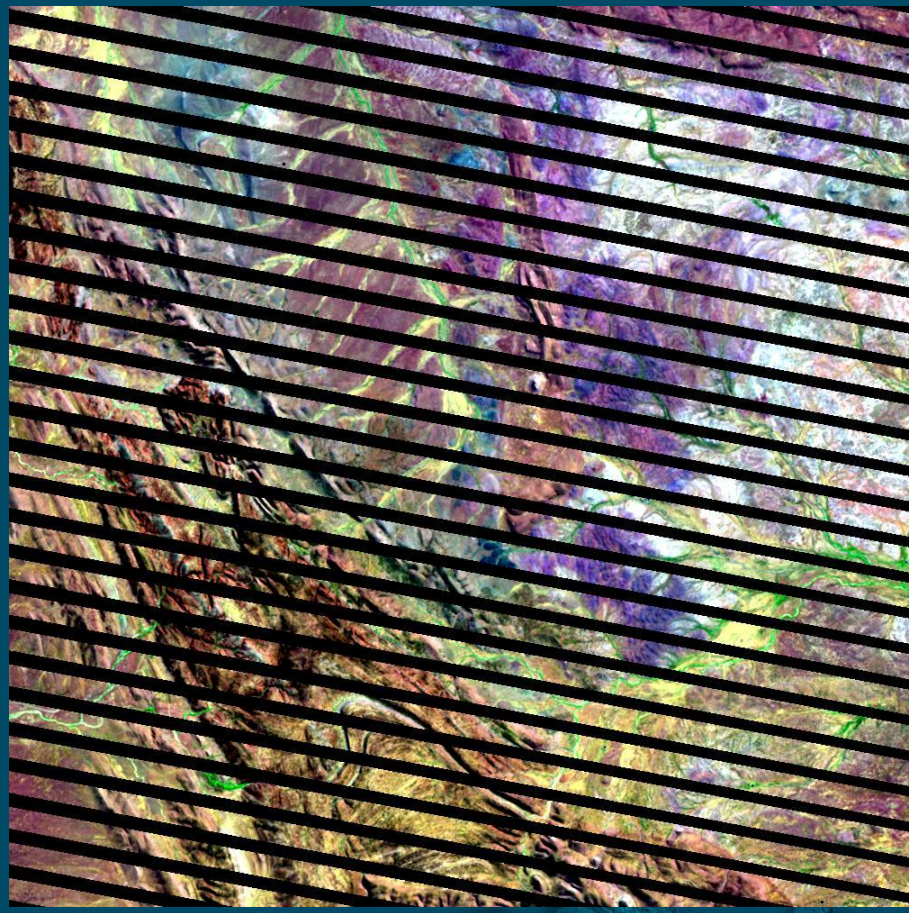
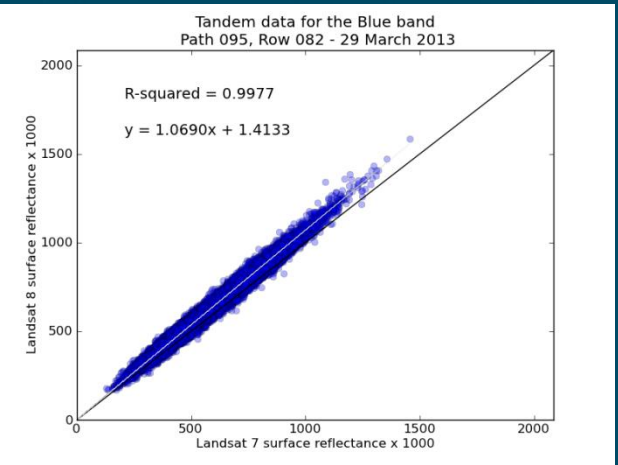
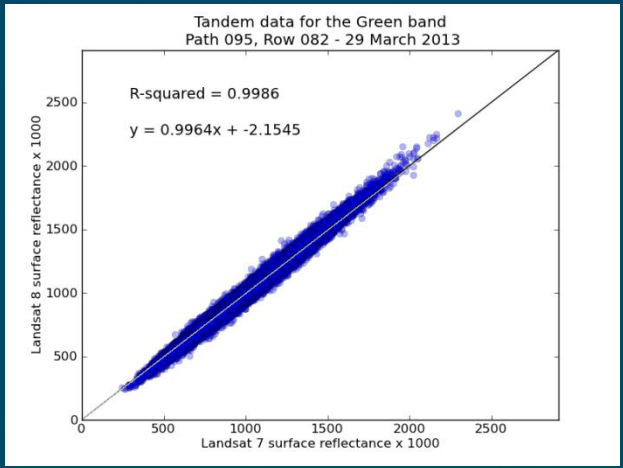
Tandem data analysis

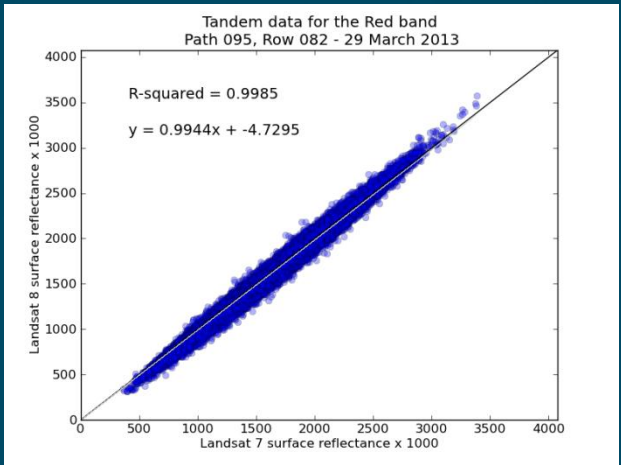


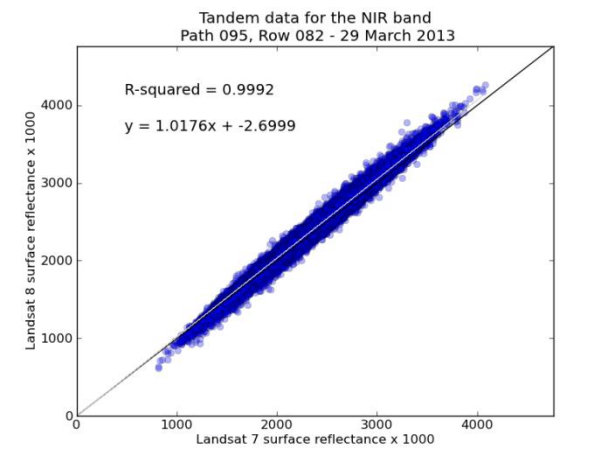


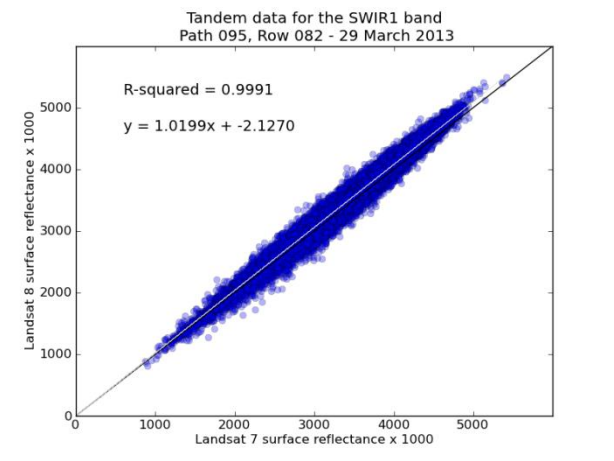
Comparing surface reflectance corrected ETM+ and OLI data

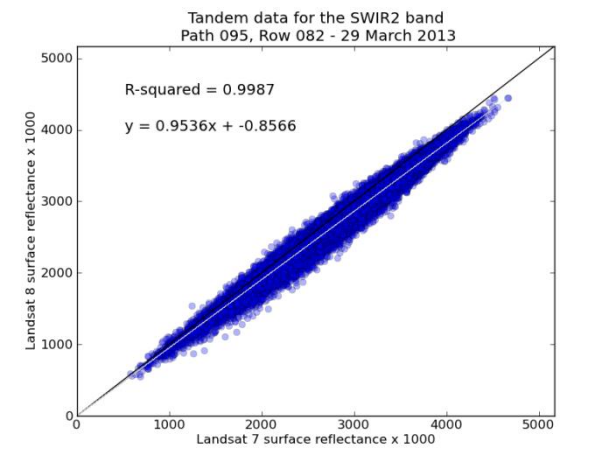




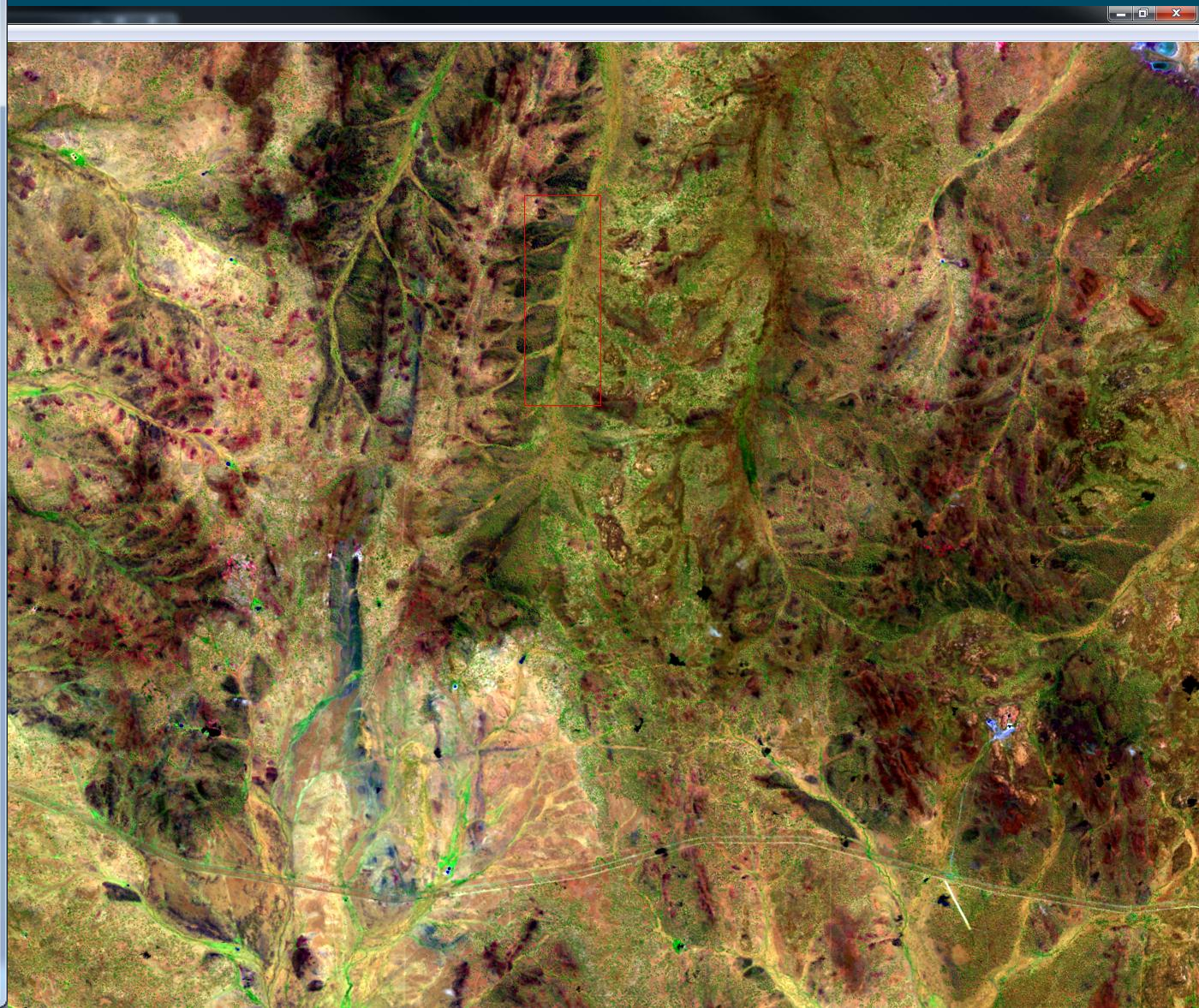




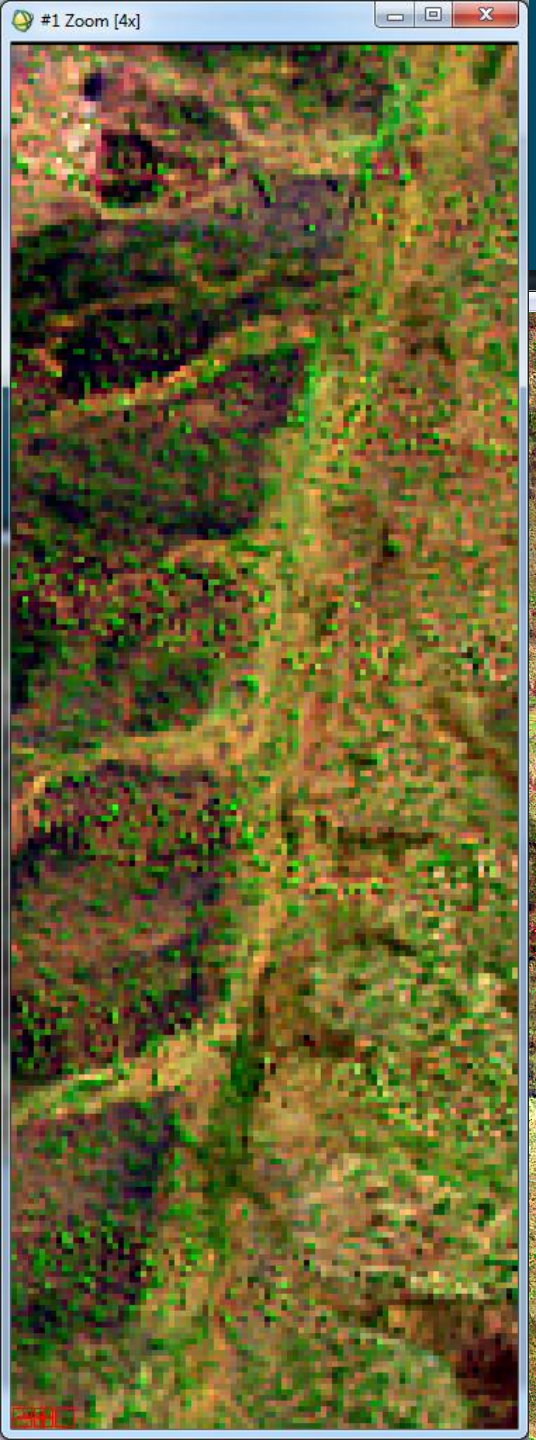


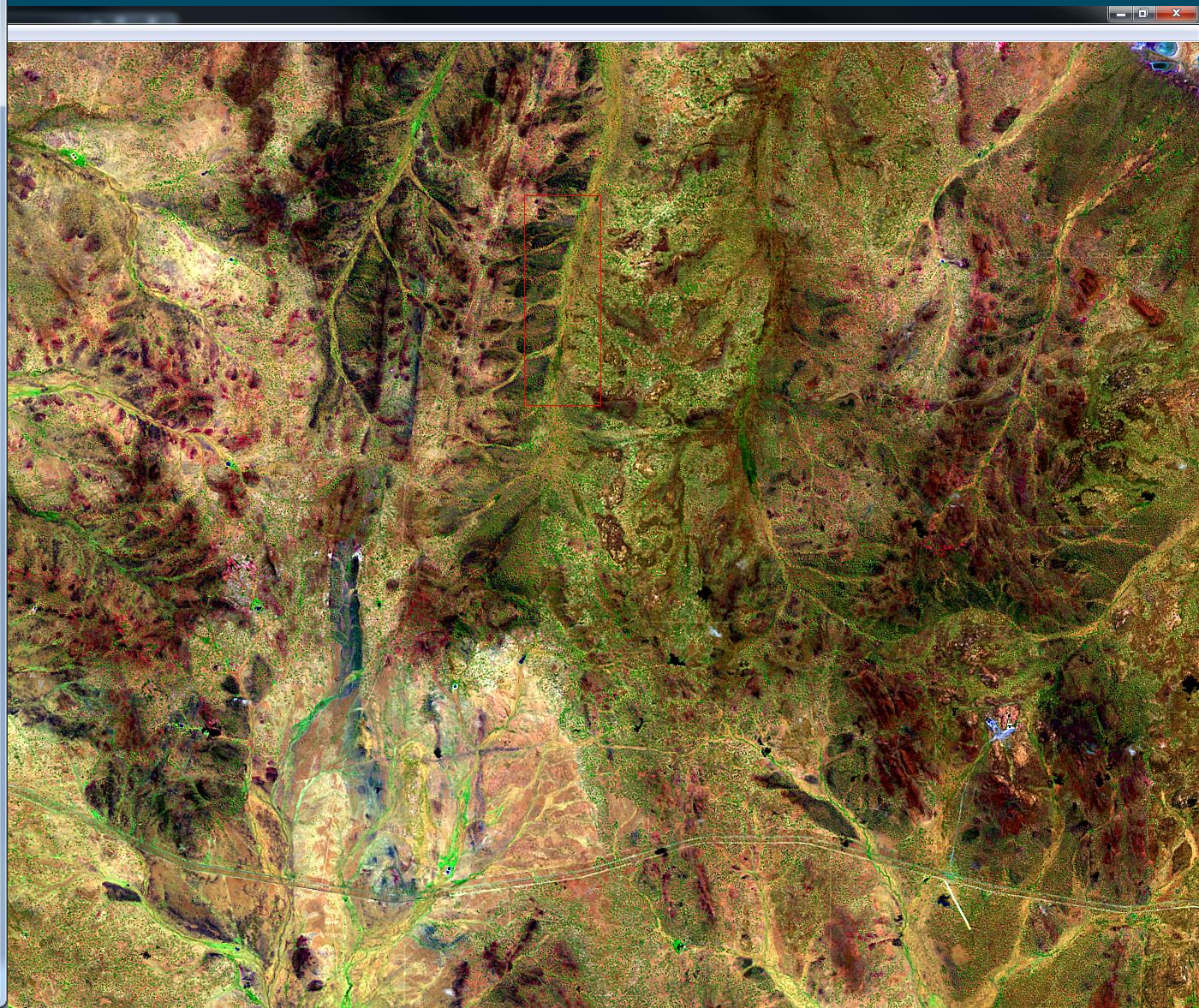


Reduced adjacency effects?



Reduced adjacency effects?





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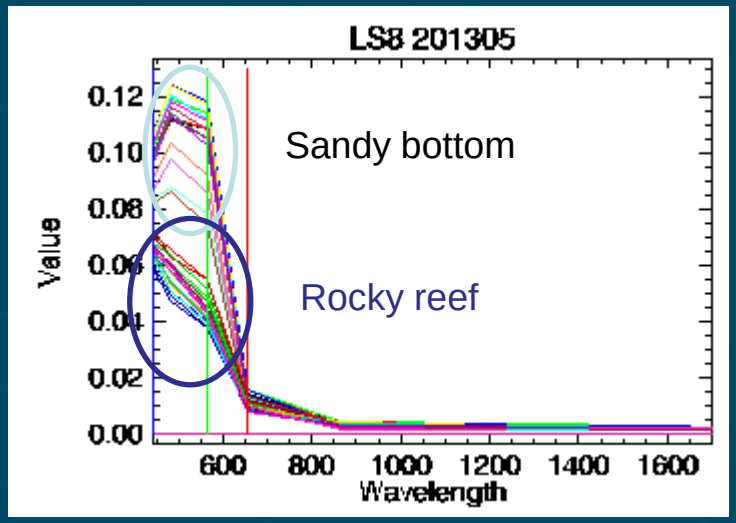
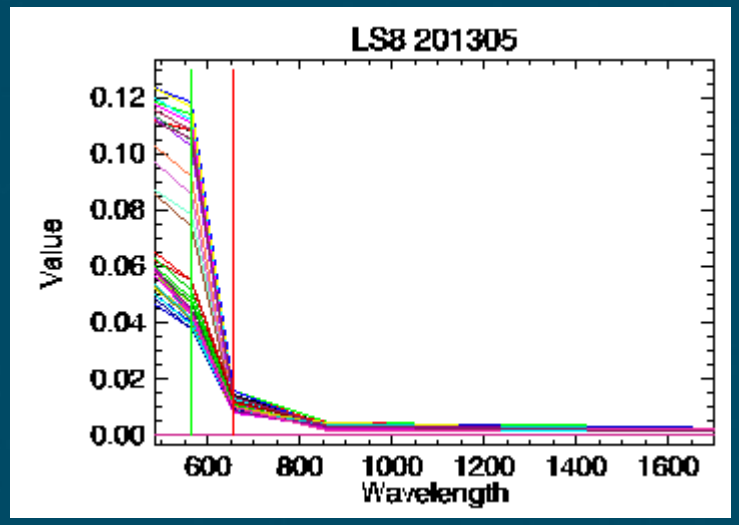
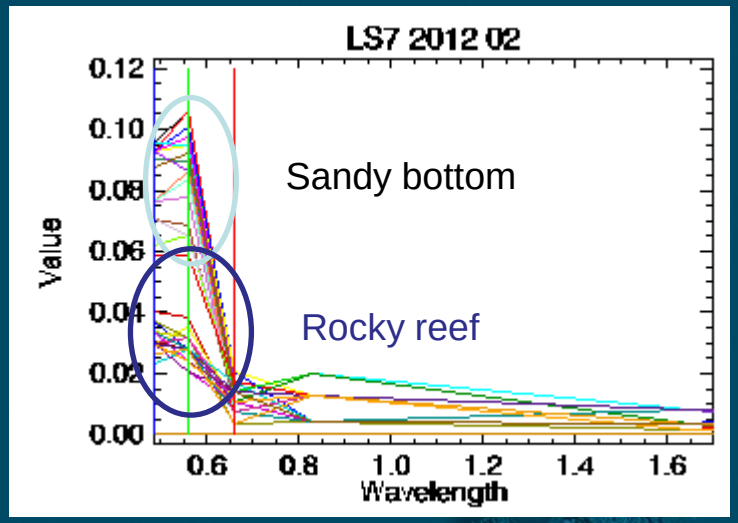
Landsat 8 Bathymetry-preliminary results

Processing step	Algorithm	Reference
1. Atmospheric/View Angle correction	NBAR	Li et al 2010
2. Air/water interface	Subsurface remote sensing reflectance	Brando et al. 2012; Lee et al., 2002
3. Optical water quality model	SAMBUCA	Botha et al., 2013; Brando et al., 2009
4. Bathymetry model	SAMBUCA	Botha et al., 2013; Brando et al., 2009

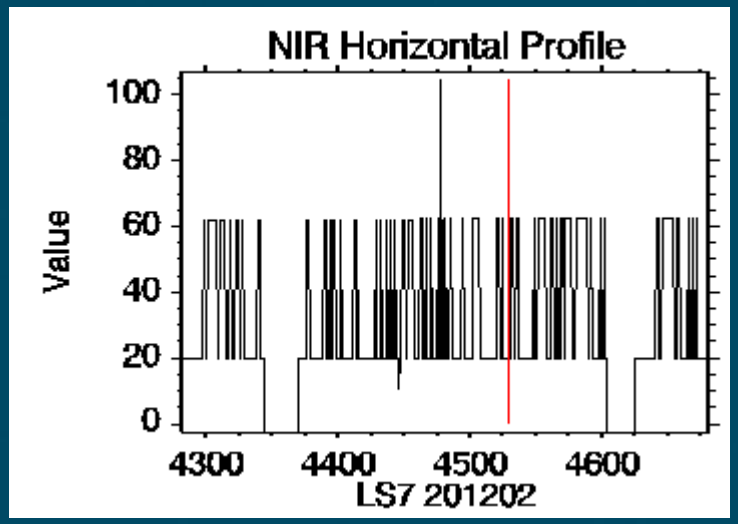
Spectra of substrates

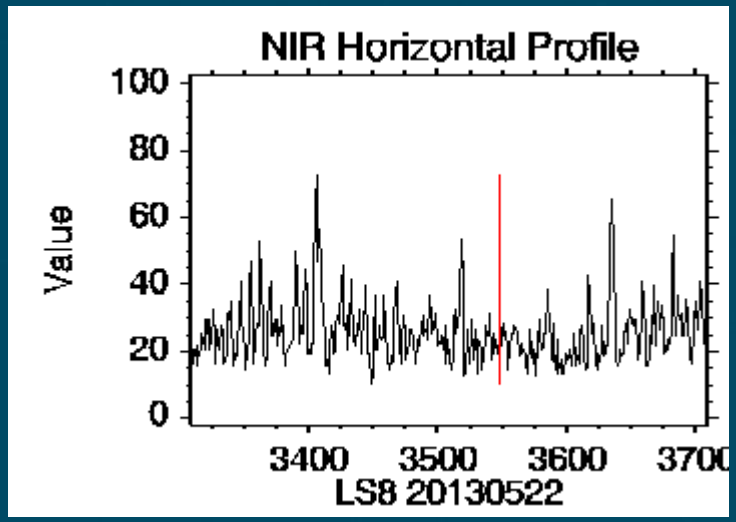


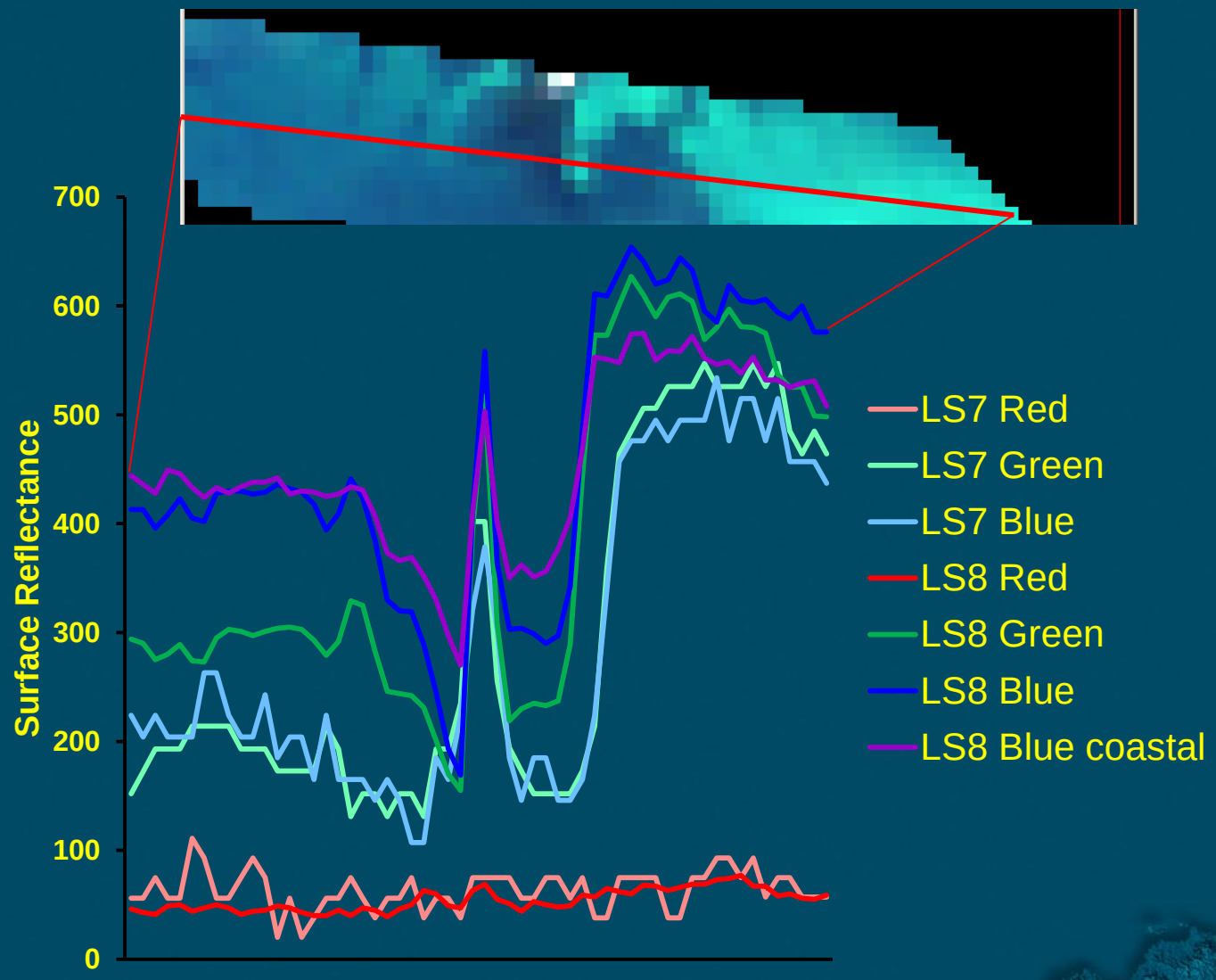




Horizontal profile NIR band

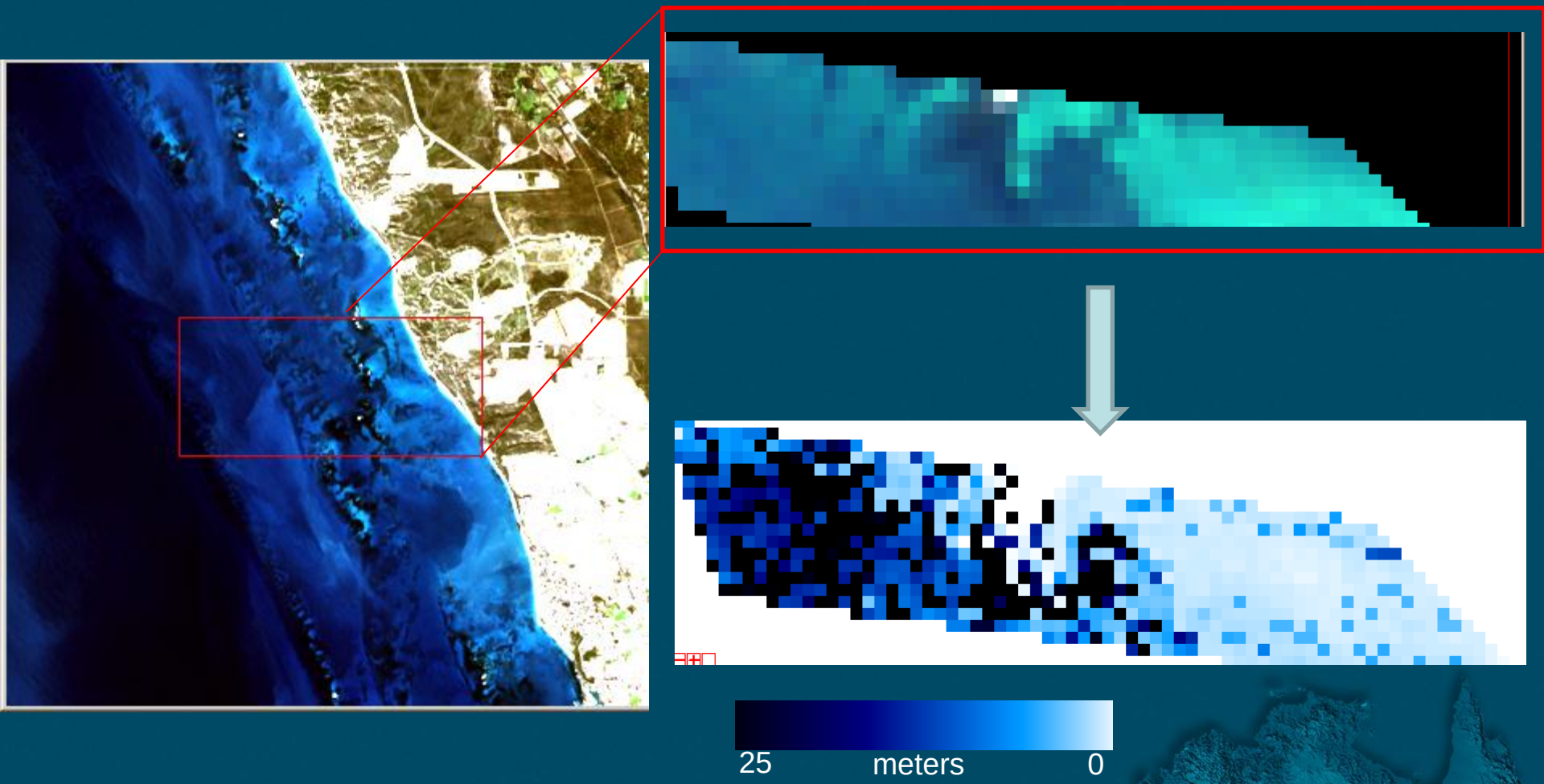




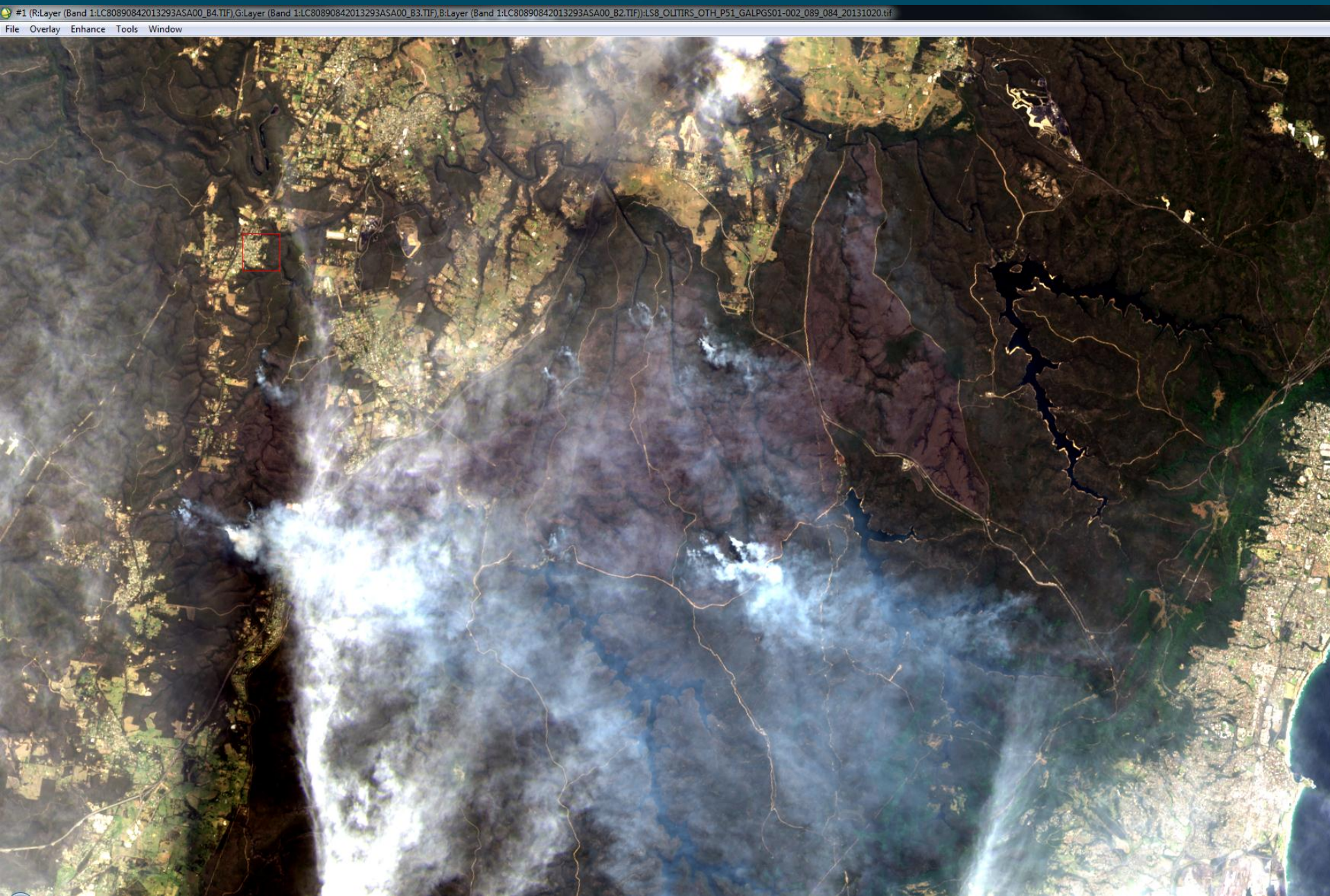


Horizontal profile of LS 7 & 8 bands (NBAR surface reflectance)

LS 8 Bathymetric retrieval



True colour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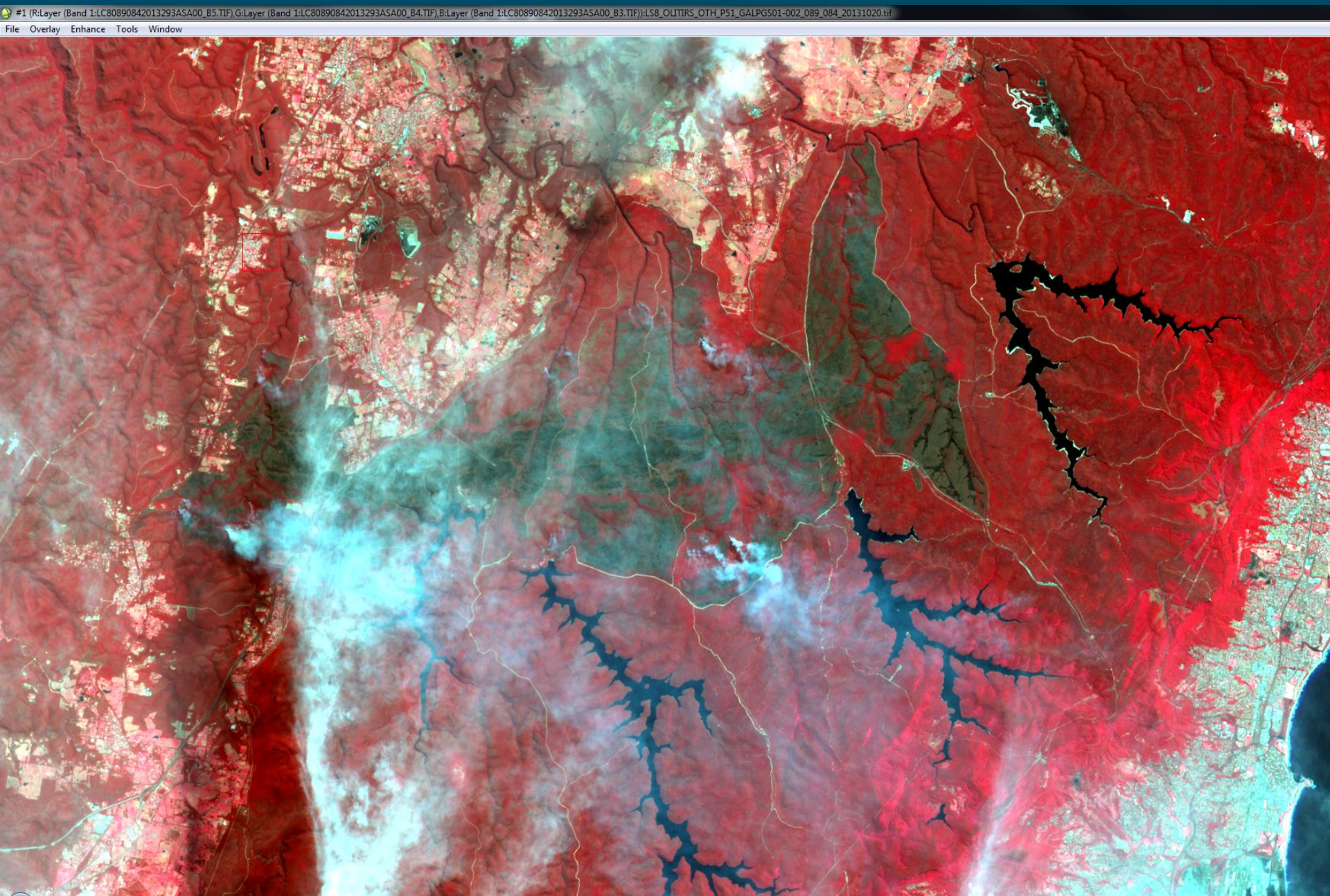
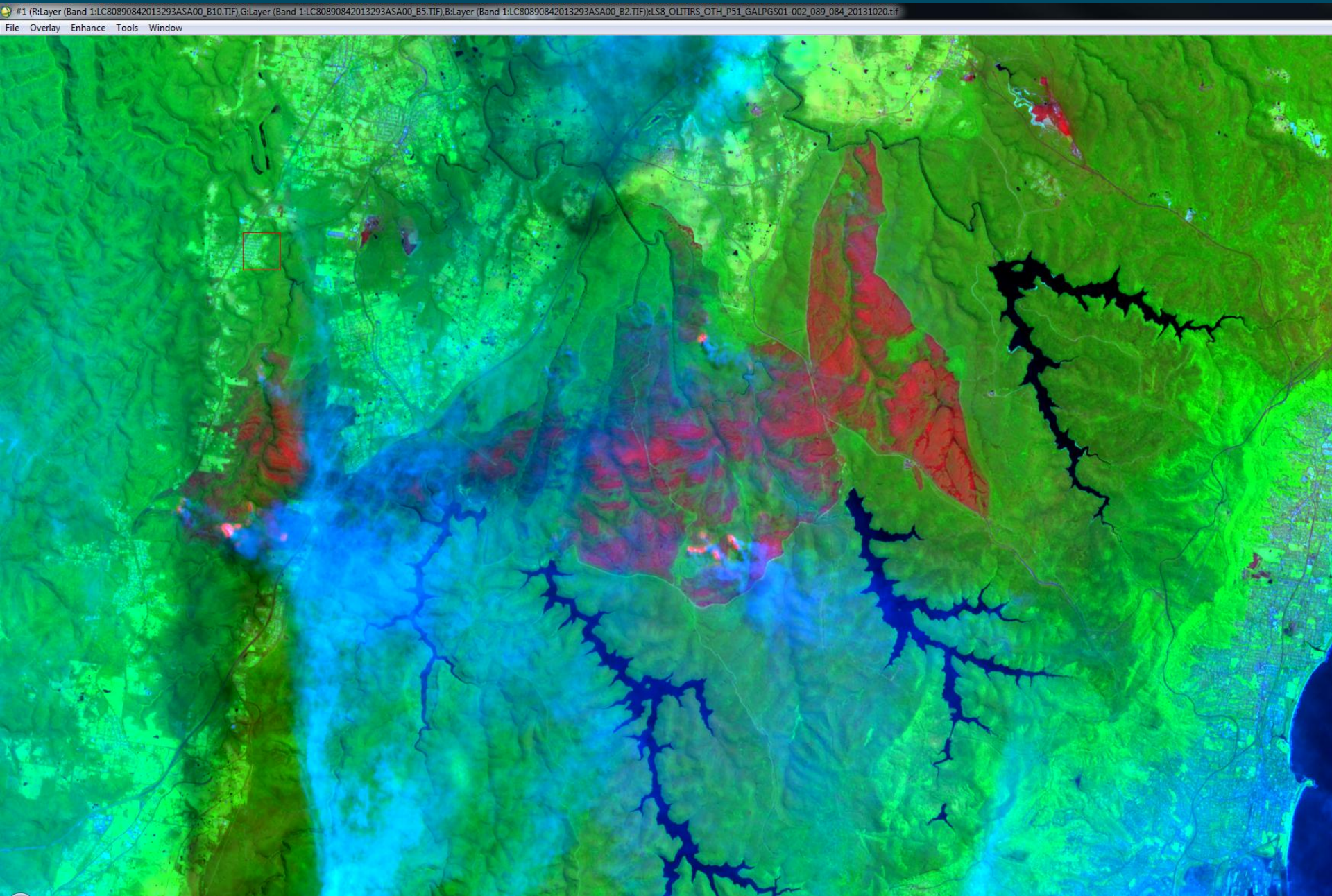
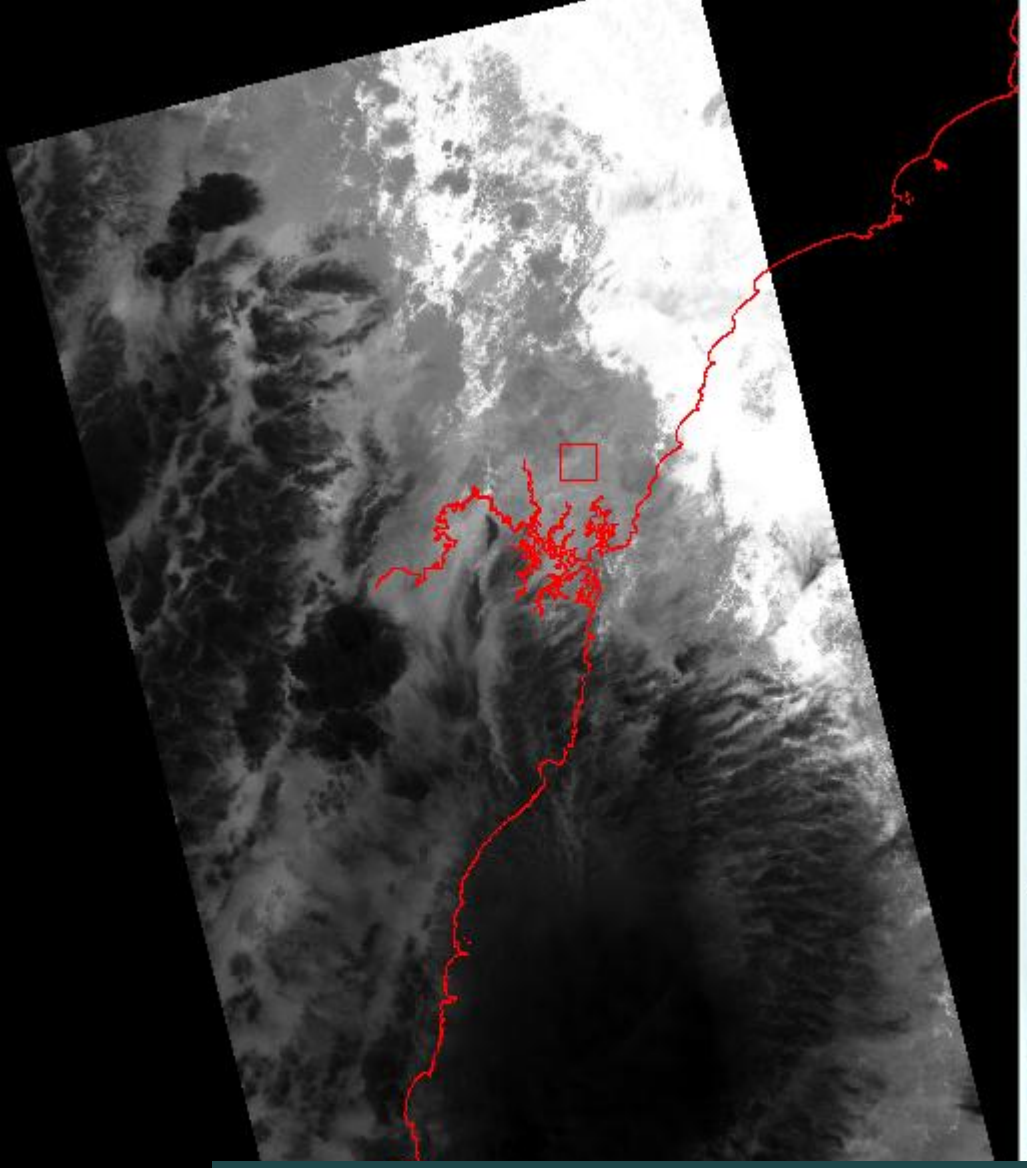
File
Overlay
Enhance
Tools
Window

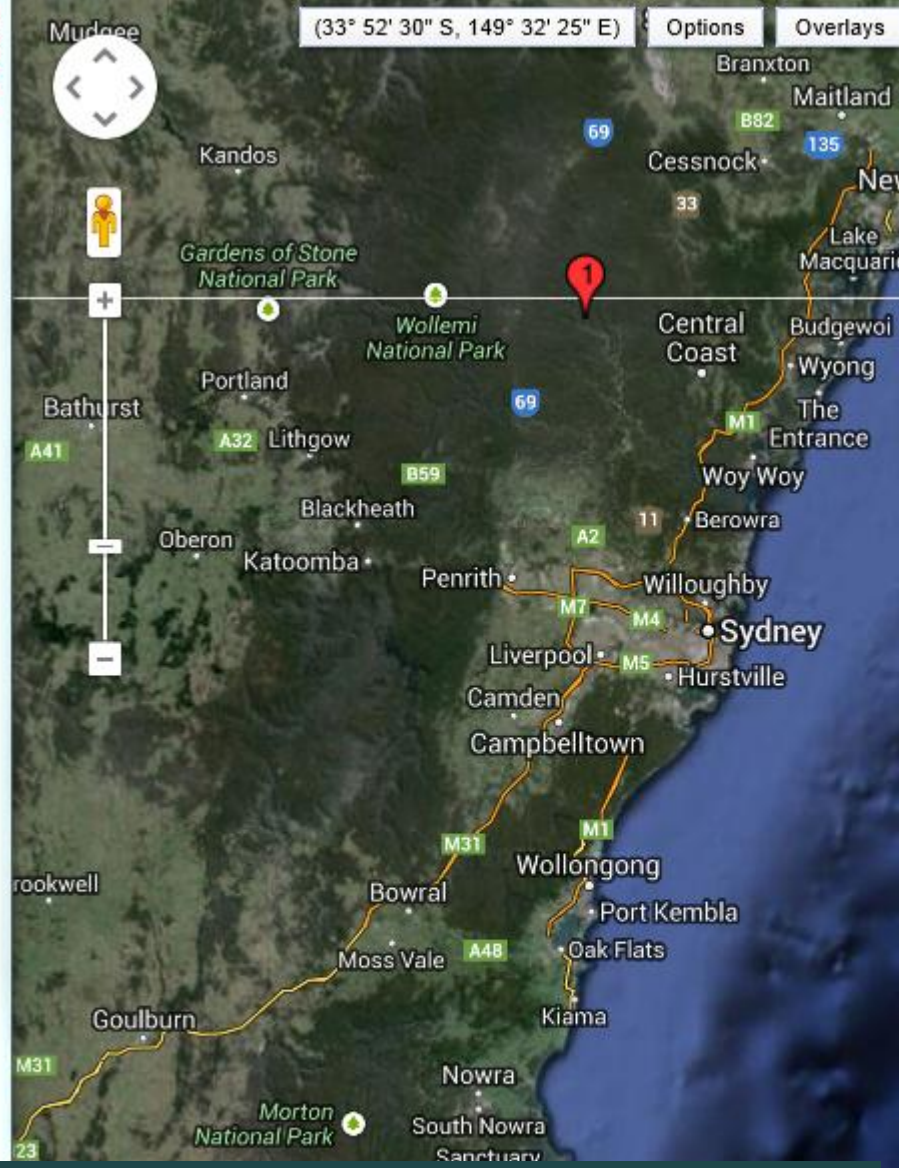
Colour Infra Red



Thermal, SWIR, green







Night time Landsat 8 pass THANK YOU!