Australian Government
Geoscience Australia

CSIRO

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NATIONAL COMPUTATIONAL INFRASTRUCTURE

Big Data for a Big Country:
The Australian Geoscience Data Cube

Dr. Stuart Minchin, Geoscience Australia

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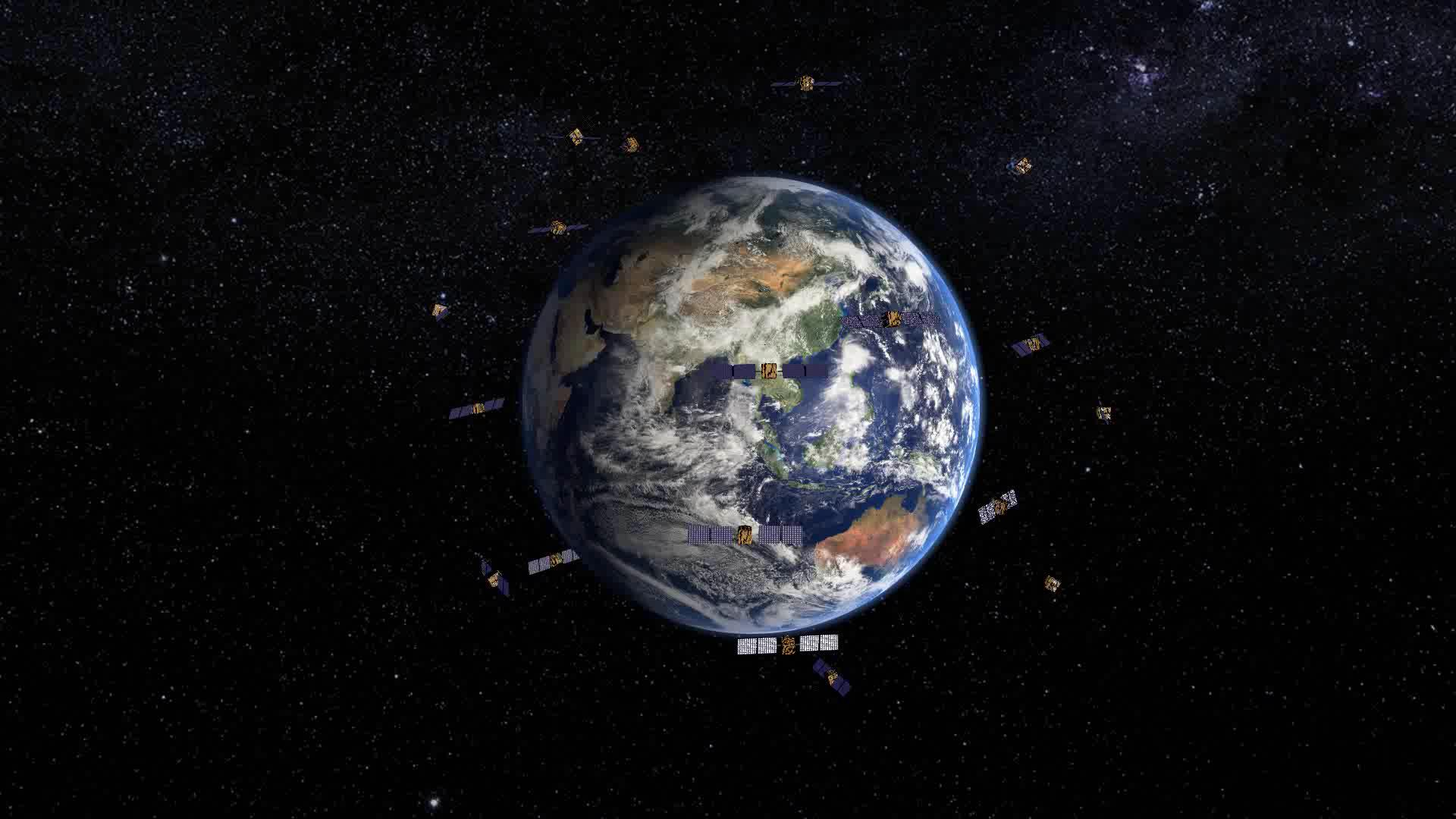
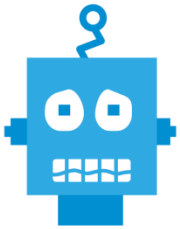


Traditional remote sensing process

Petabyte hierarchical archive:

Millions of individual scenes. Tape store accessed by robot.



Search catalogue order scenes.

Identify footprint of product in space or time.

Client requests product.

Orthorectification calibration, cloud masking, atmospheric correction, mosaicing.

Feature extraction, algorithm application spectral unmixing.

Product packaging and delivery.

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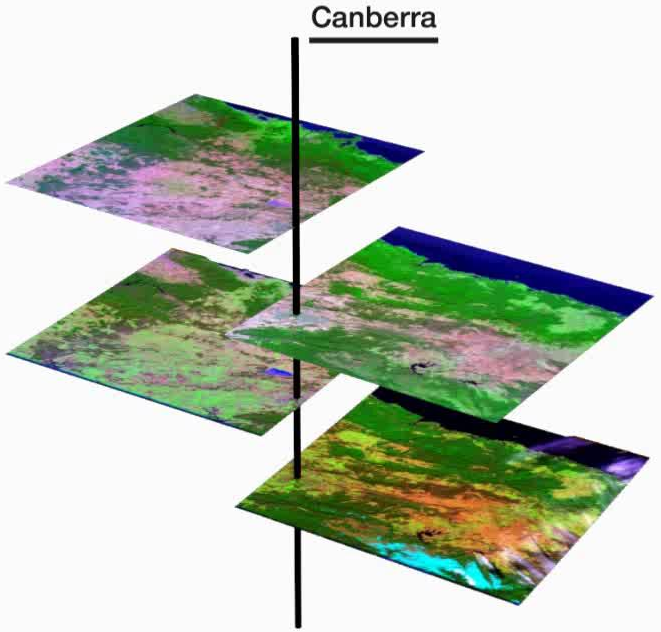
Developing the Australian Geoscience Data Cube

Orthorectification

Calibration

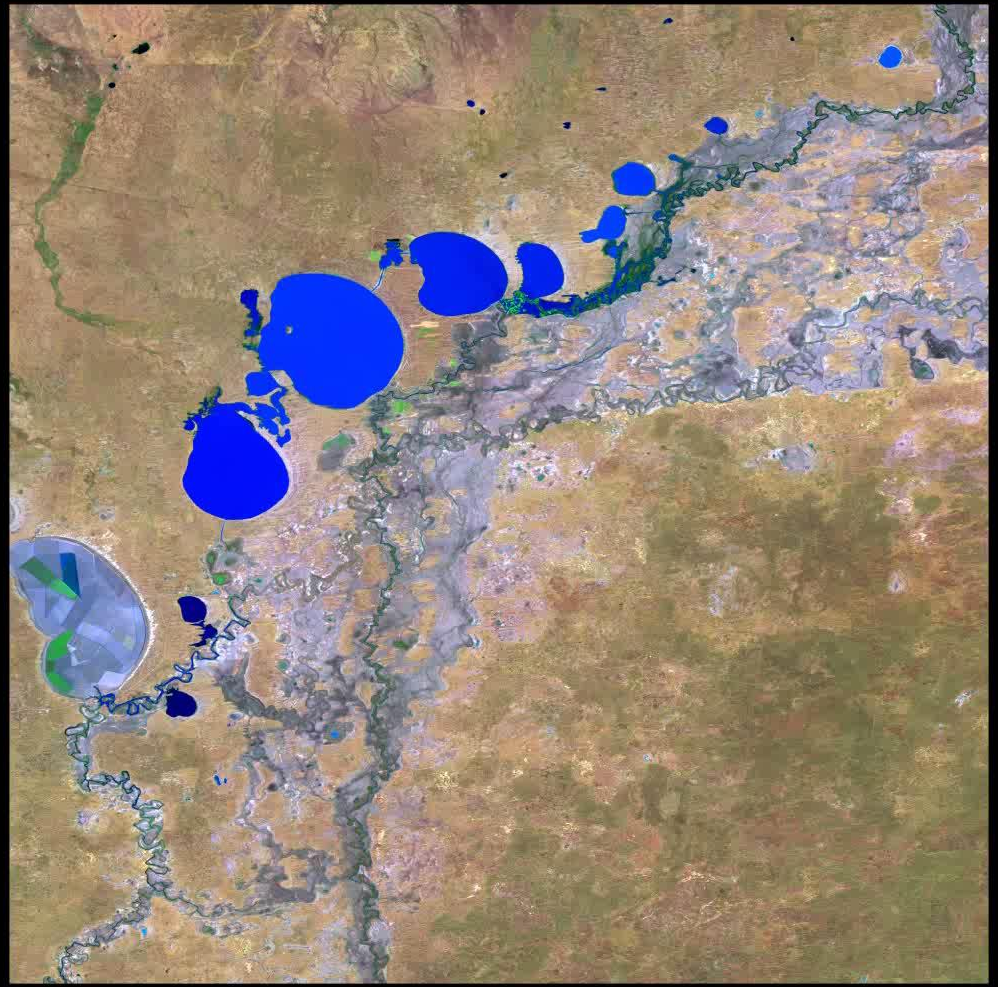
Time series



Surface Water
Menindee lakes

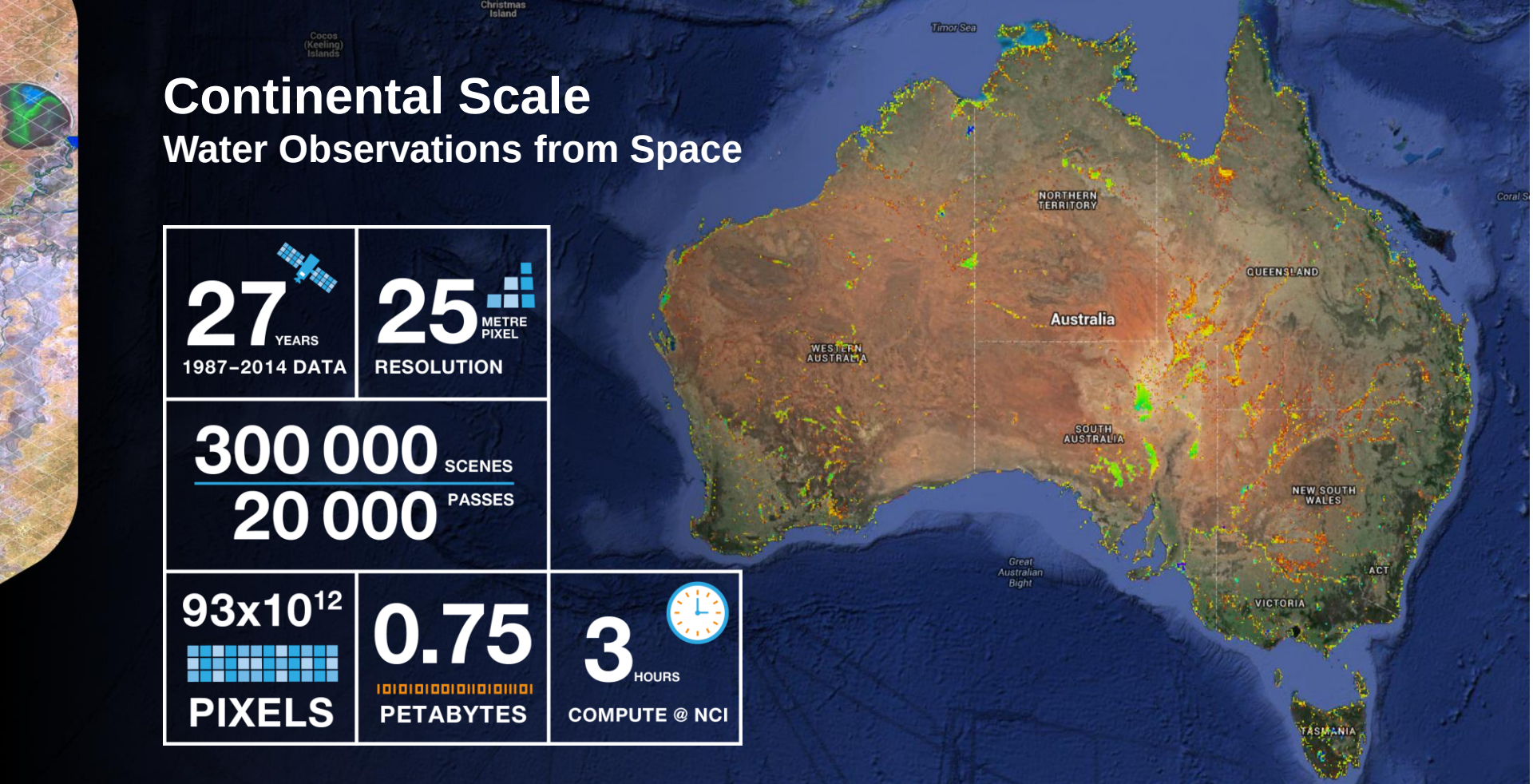
40 billion observations

15 minutes processing time



Continental Scale

Water Observations from Space



27 YEARS
1987–2014 DATA

25 METRE PIXEL
RESOLUTION

300 000 SCENES
20 000 PASSES

93x10^{12}
PIXELS

0.75
PETABYTES

3 HOURS
COMPUTE @ NCI

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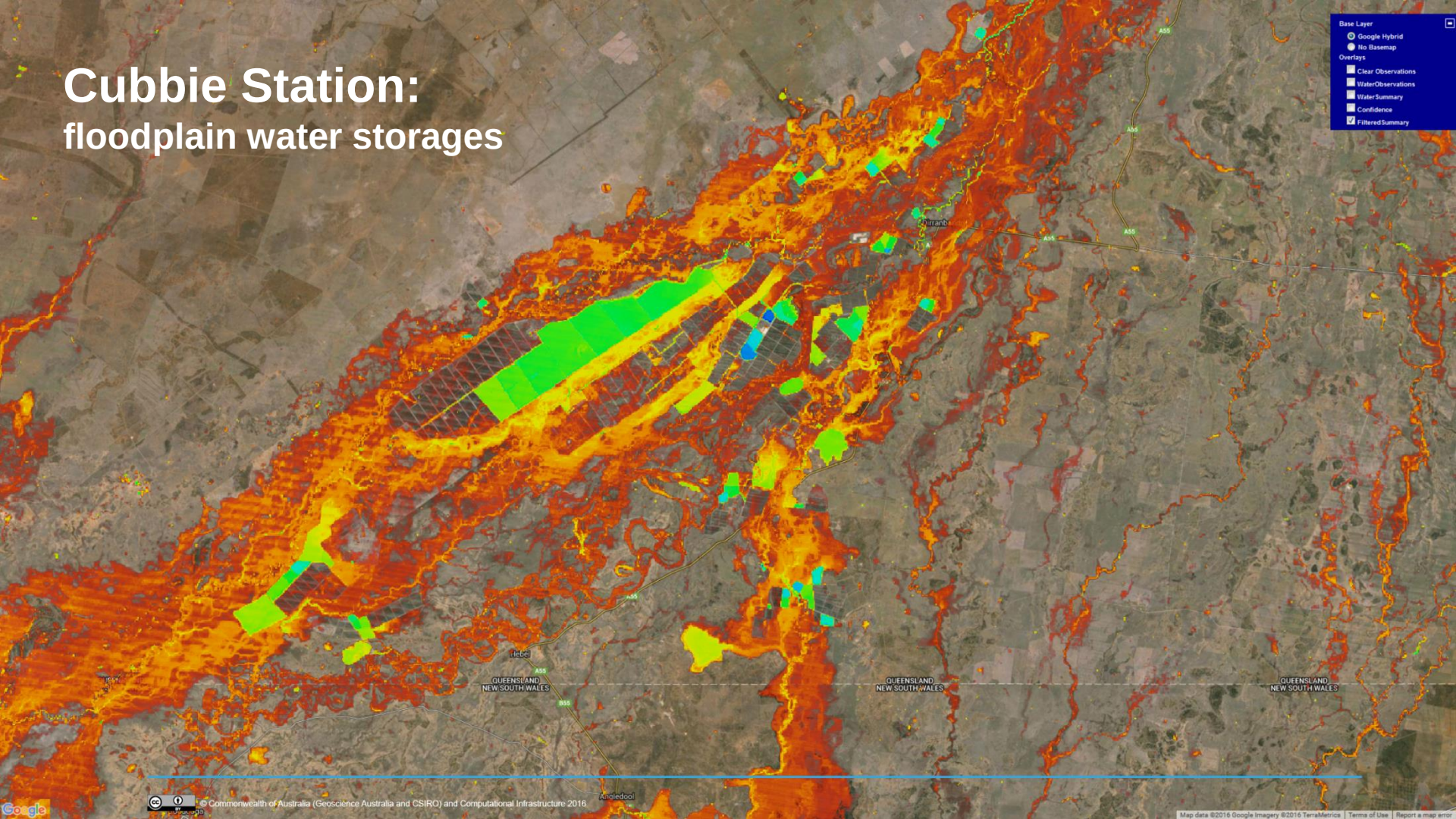
Cubbie Station:
floodplain water storages



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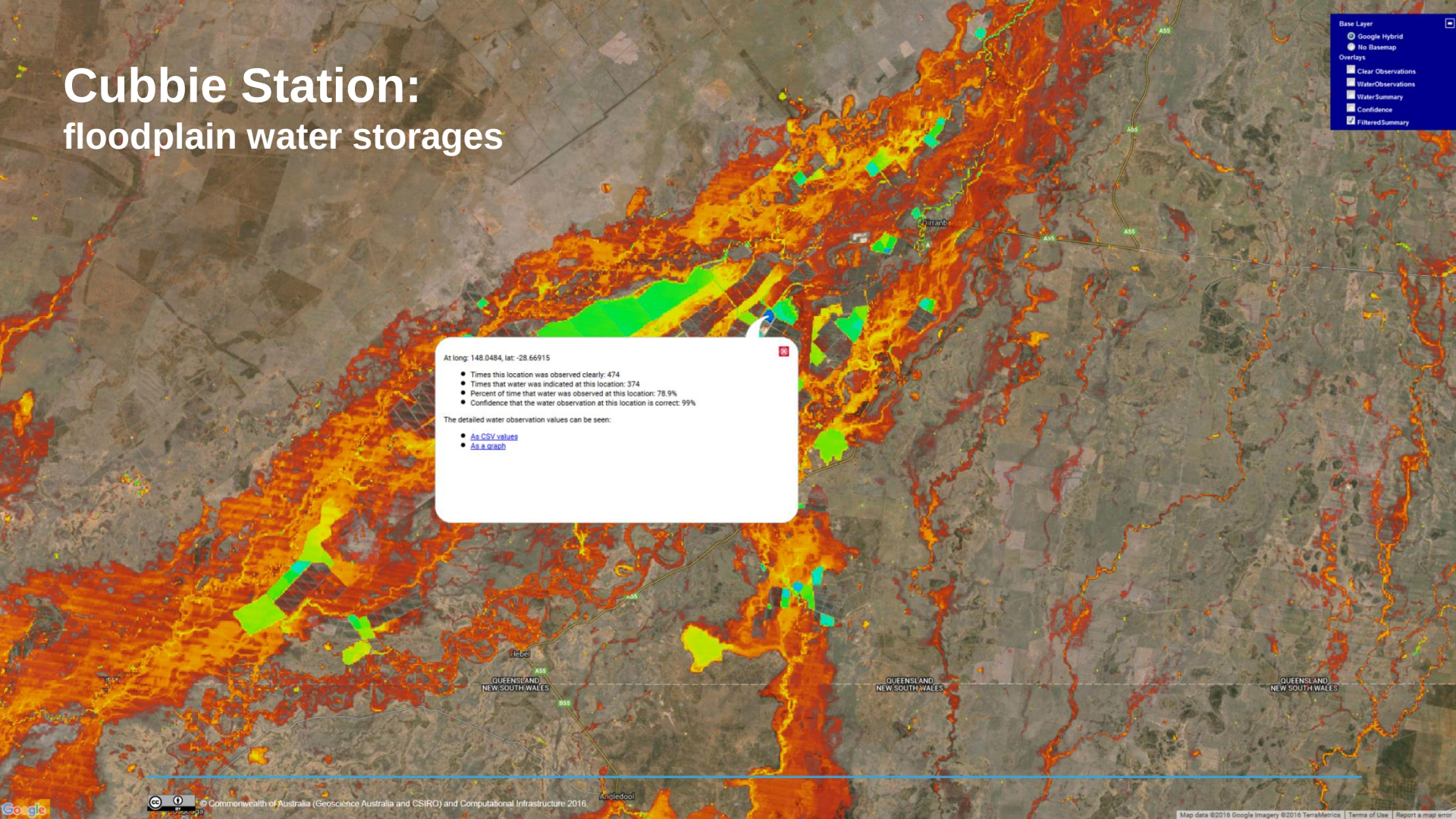

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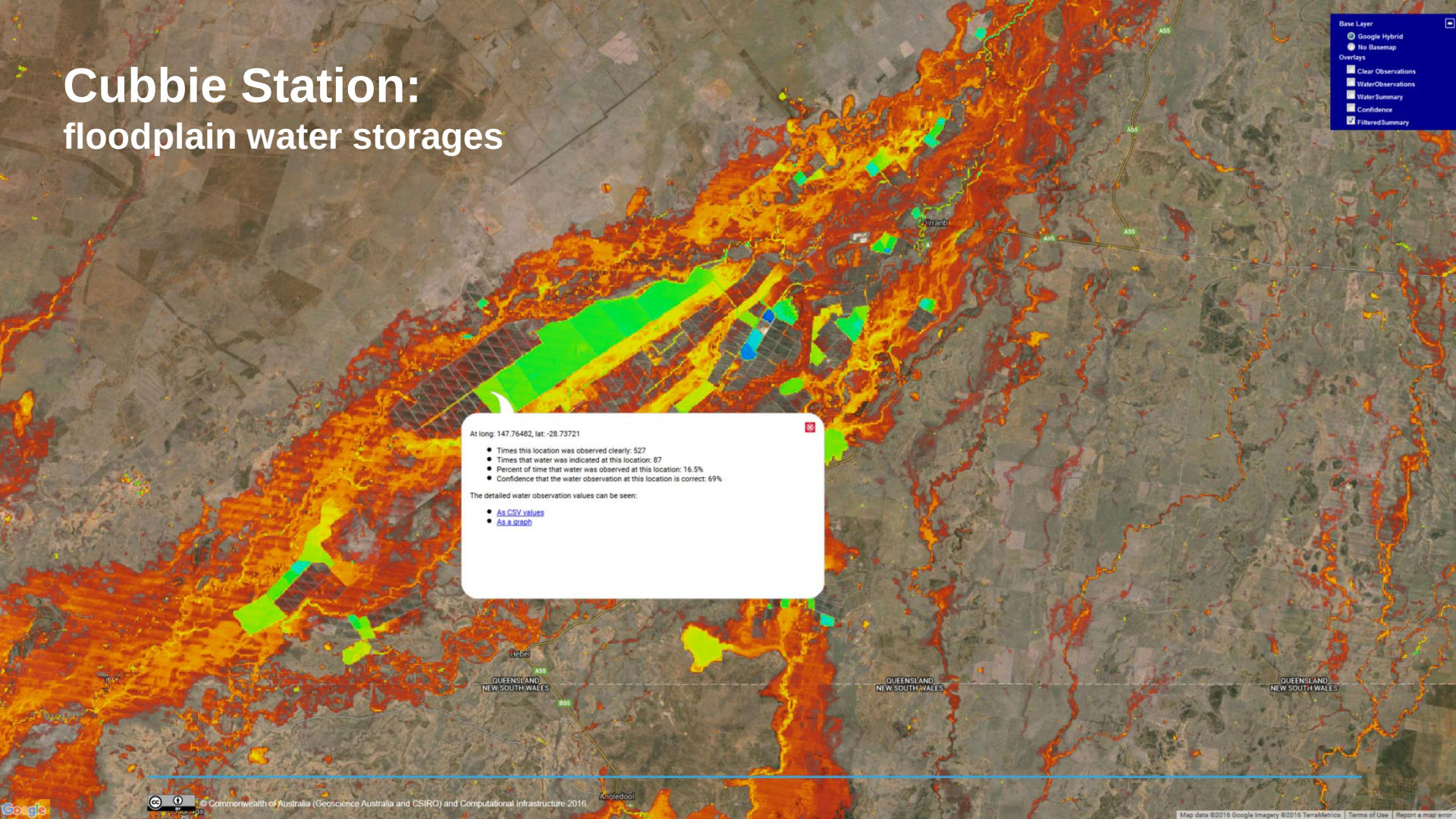

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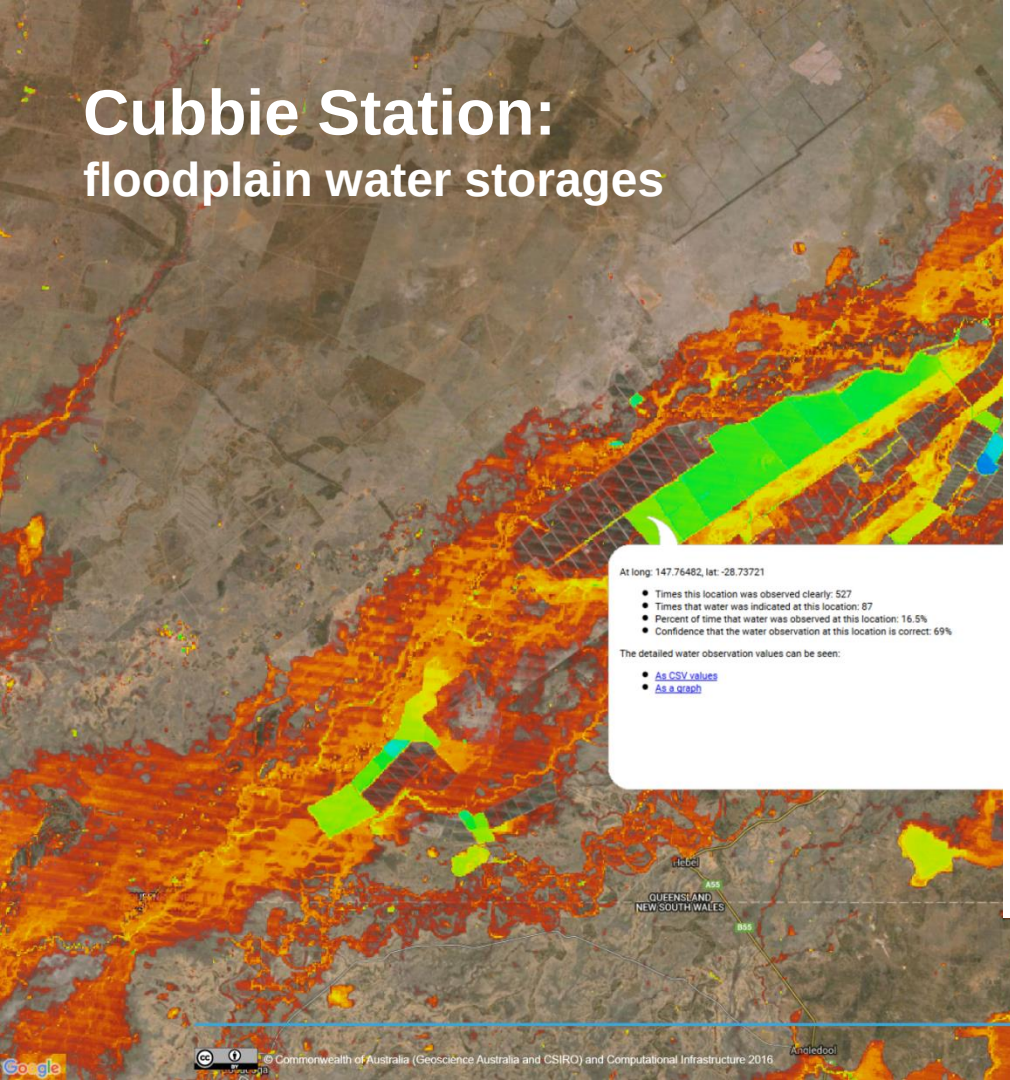
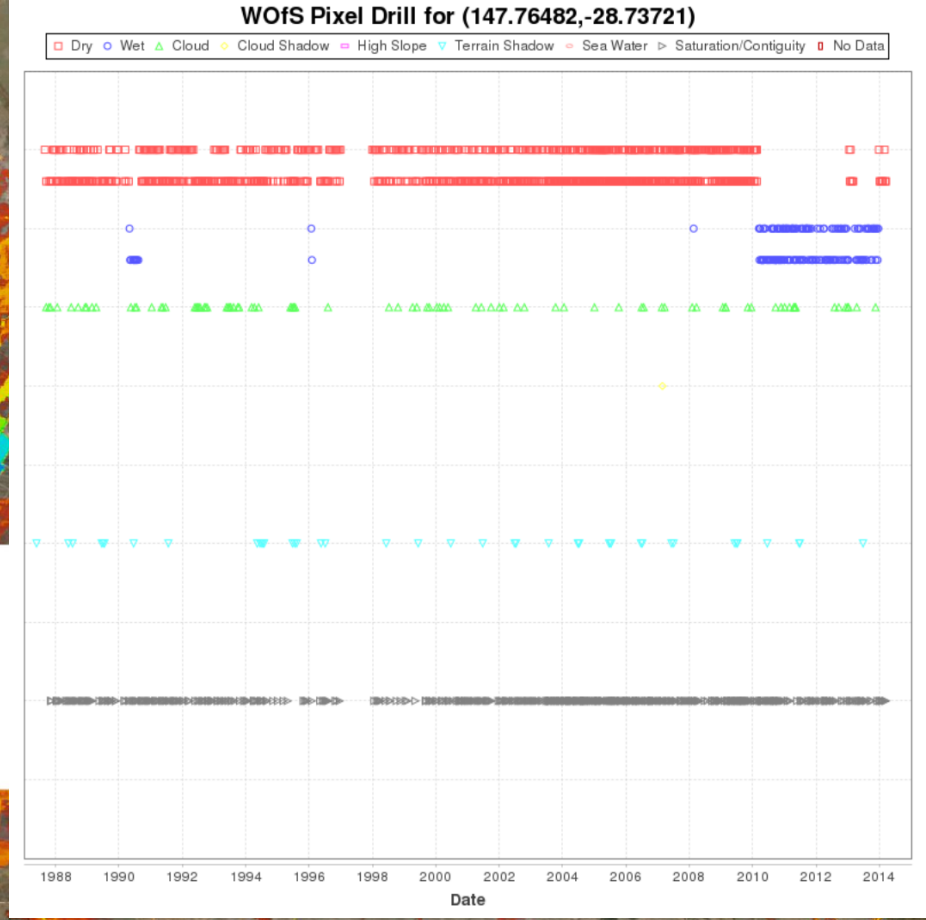
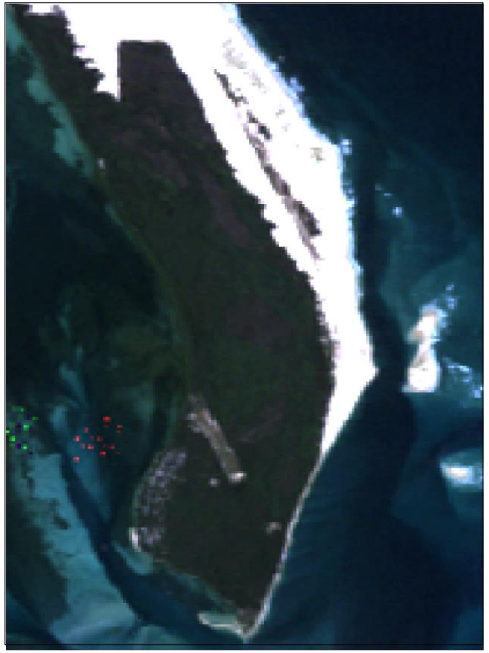
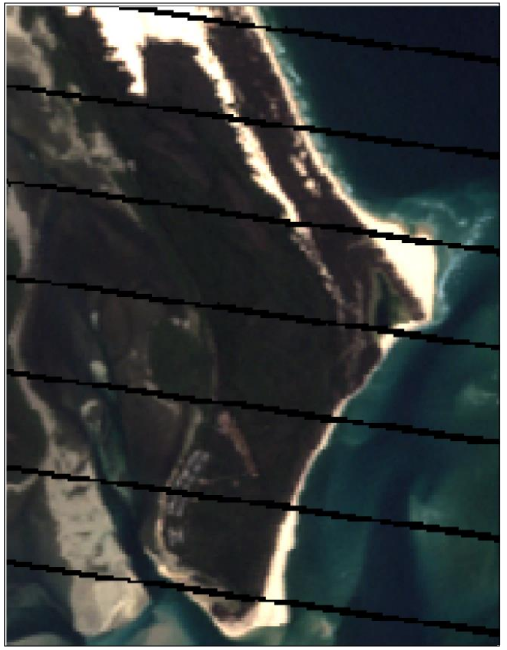




Coastal Change Detection



1988 Landsat 5 First Water Observation Anomaly



2013 Landsat 7 Last Water Observation Anomaly

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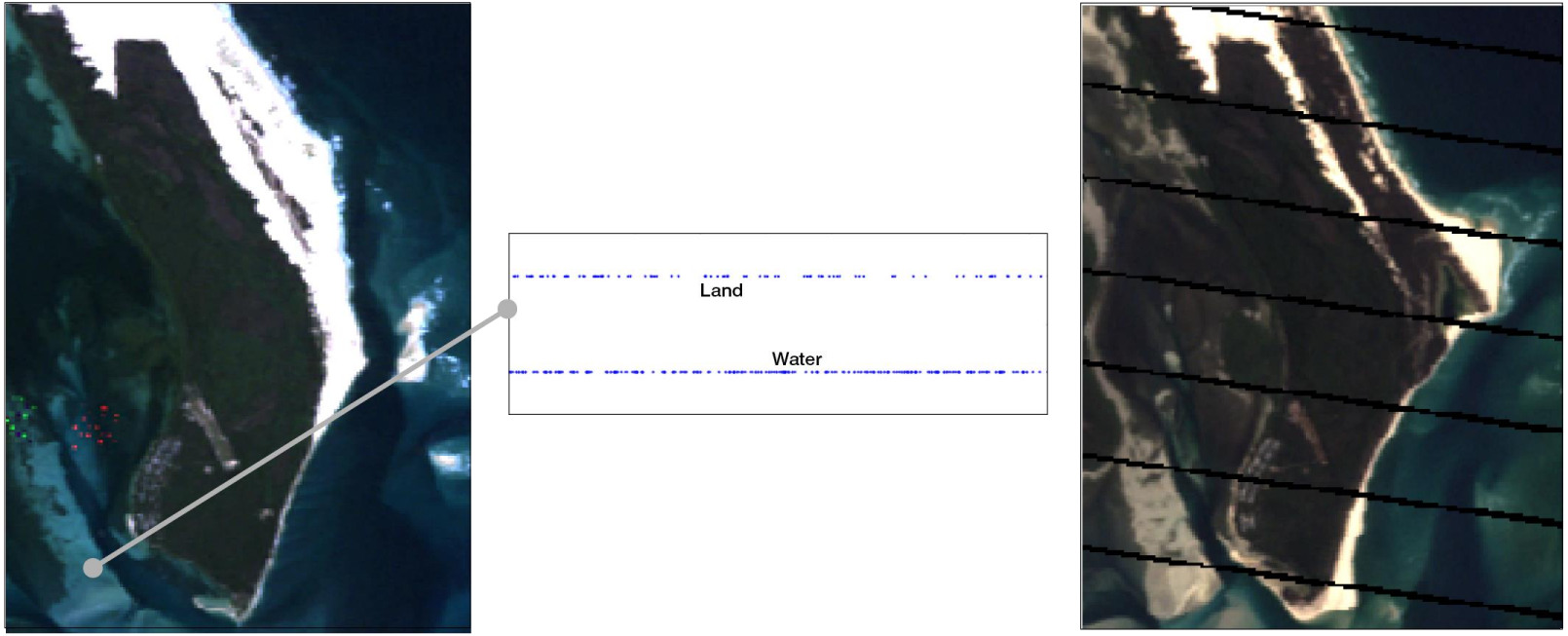
Coastal Change Detection



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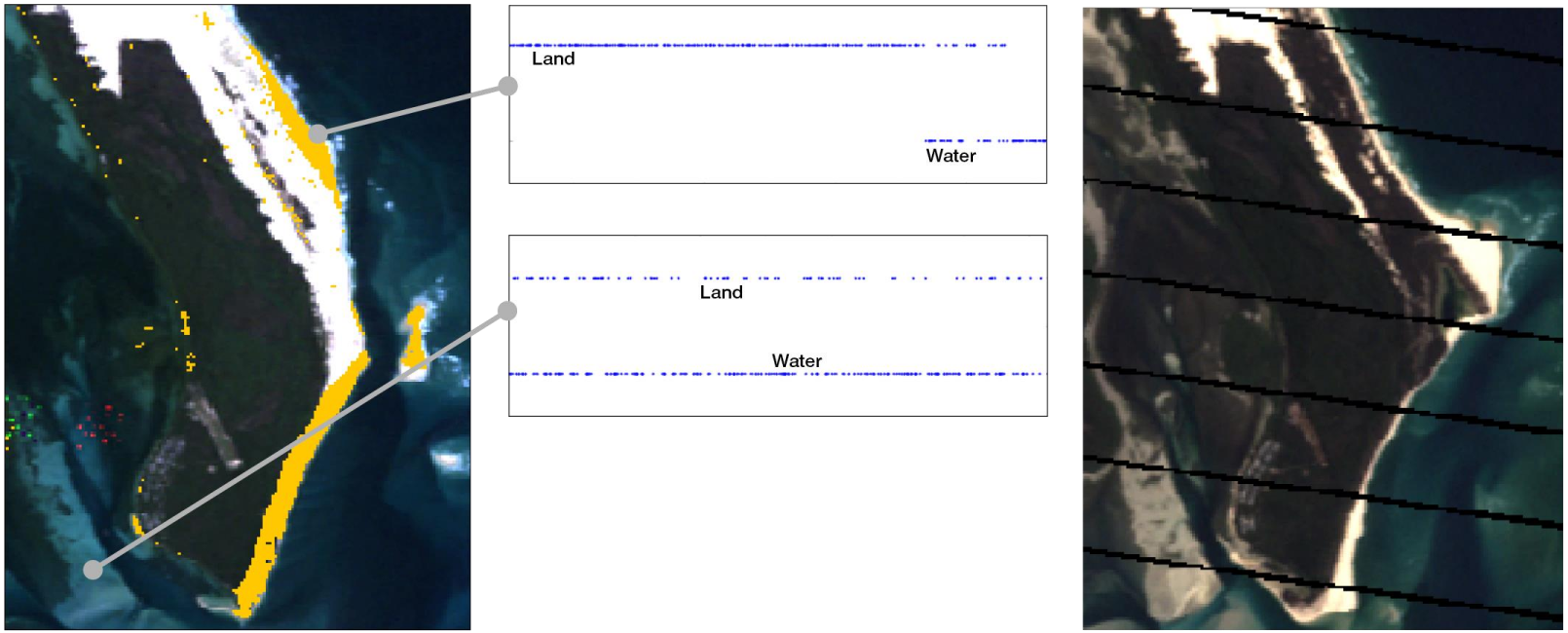
Coastal Change Detection



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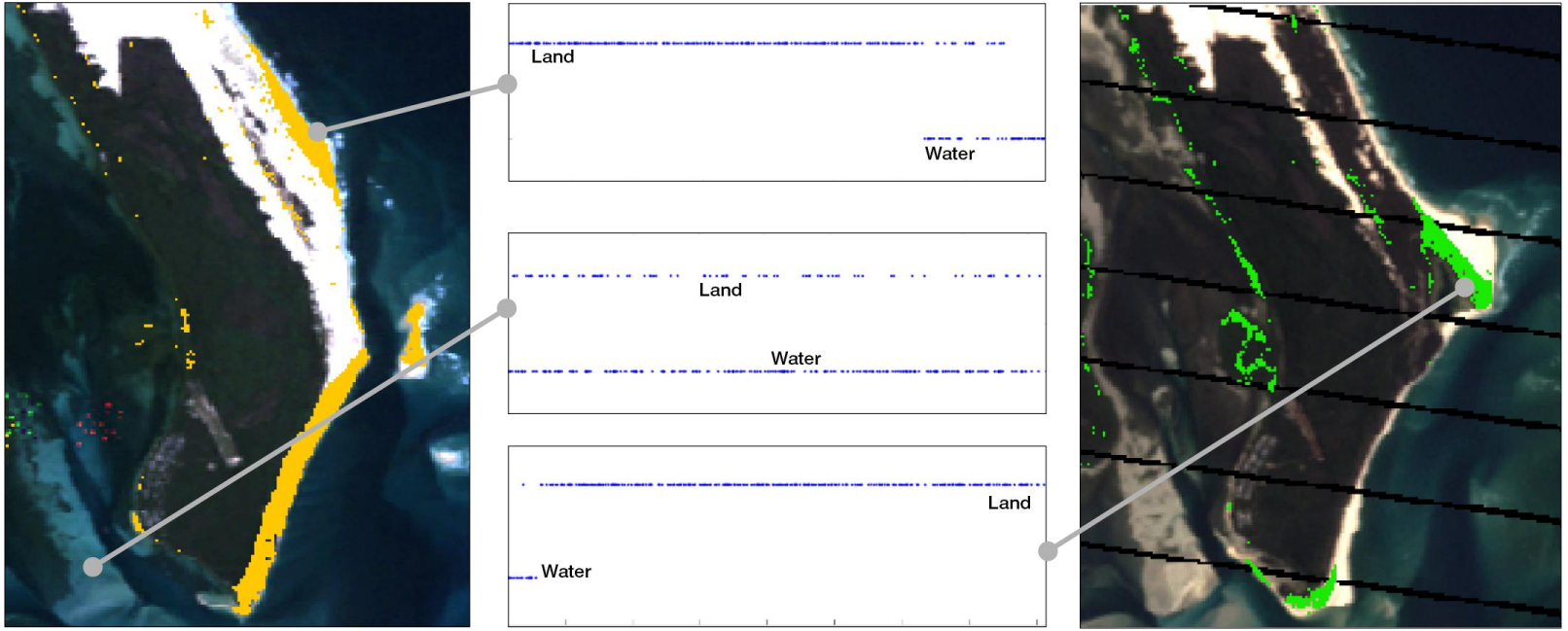

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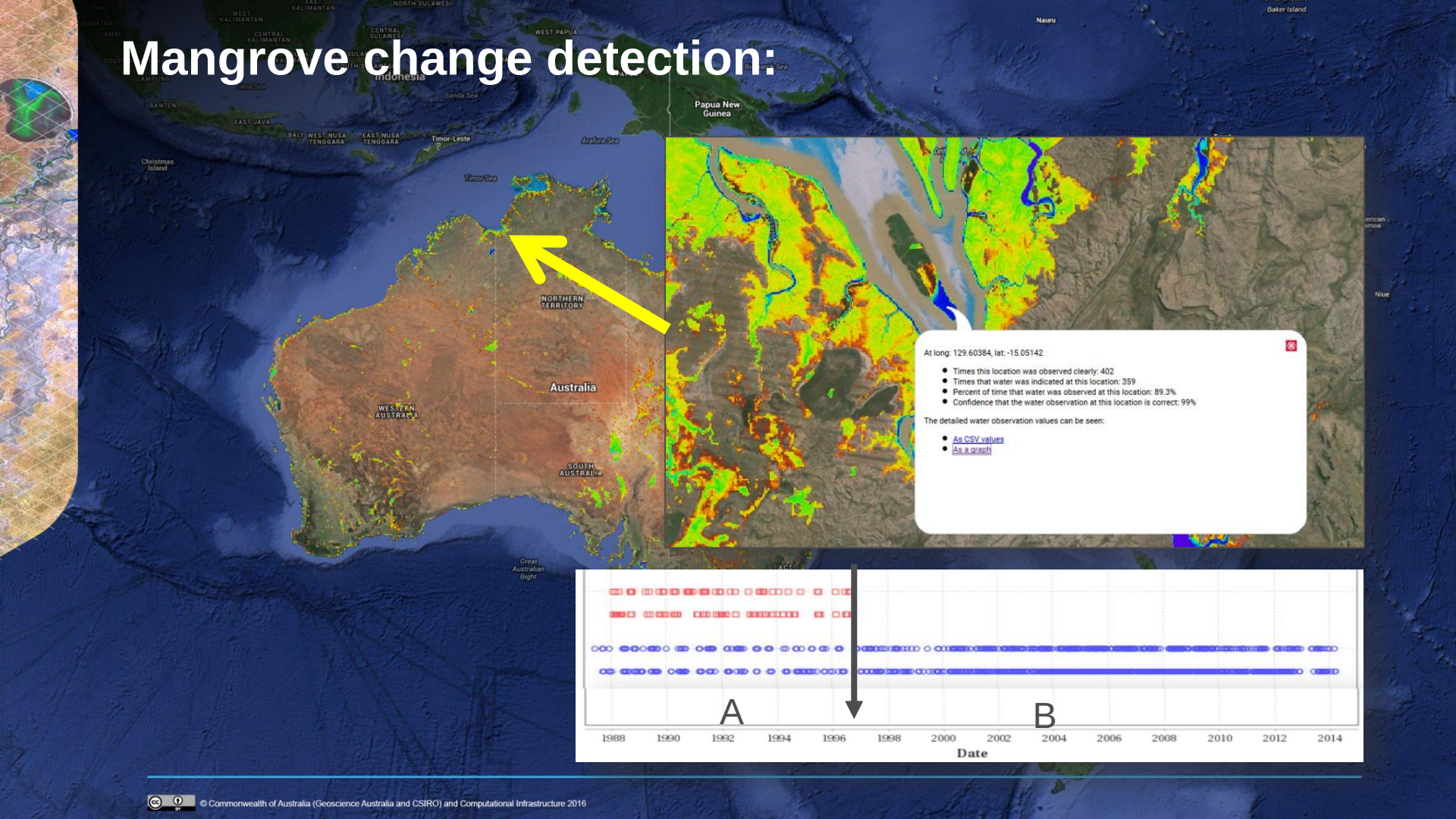
Mangrove change detection:



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Multiple Algorithms: Time series data extraction

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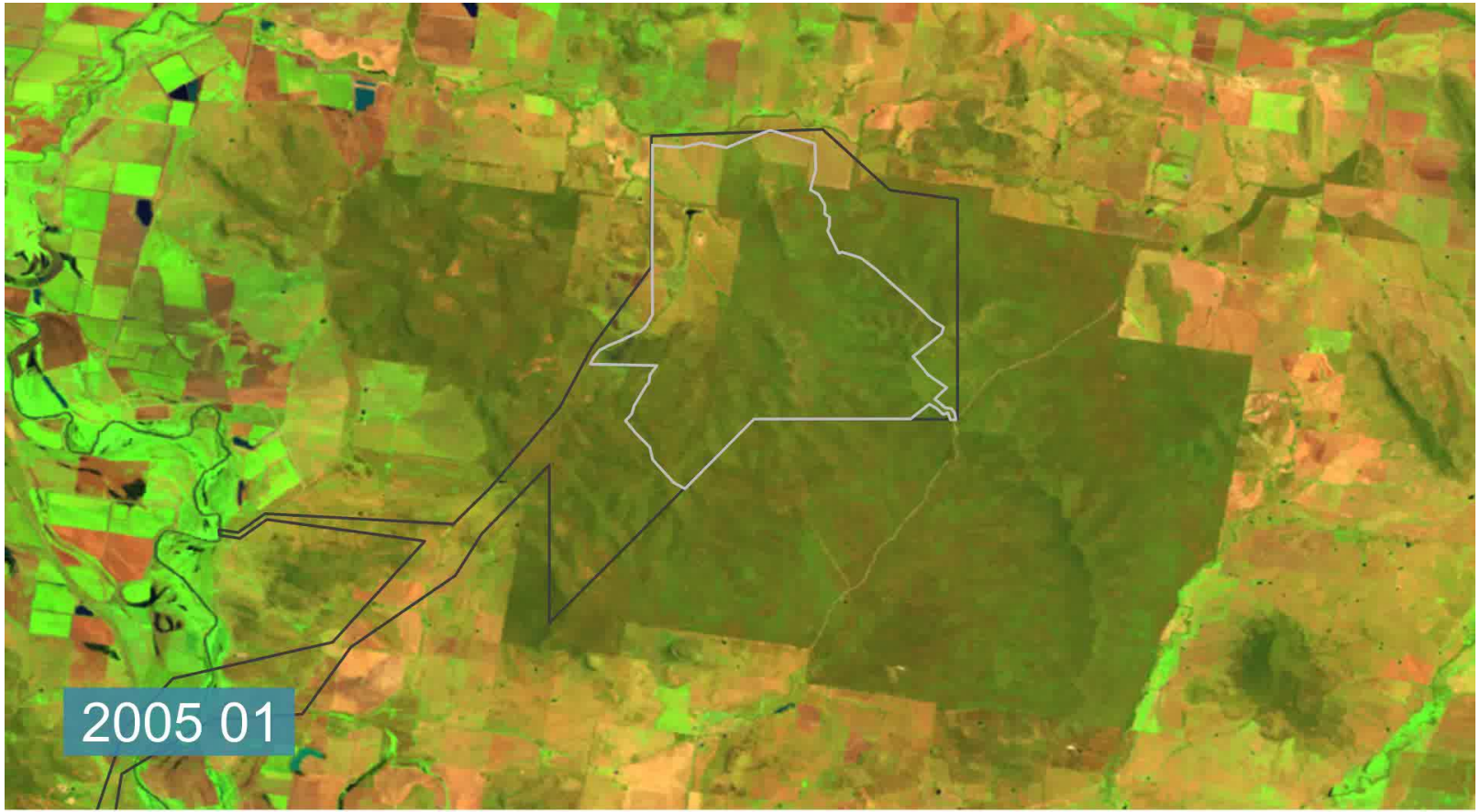
Tracking agricultural change

Water quality monitoring:
Lake Burley Griffin

Tracking development conditions



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Some prototyped applications for the data cube:

- Vegetation change, agricultural production
- Flood inundation mapping, farm dam development
- Wetland management and characterisation
- Carbon accounting
- Seagrass and substrate mapping
- Coastal change and water quality
- Shallow water bathymetry
- Mining footprint and urban development
- Bushfire scar mapping and forestry inventory

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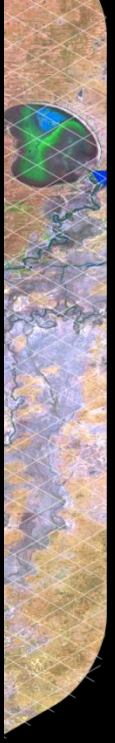
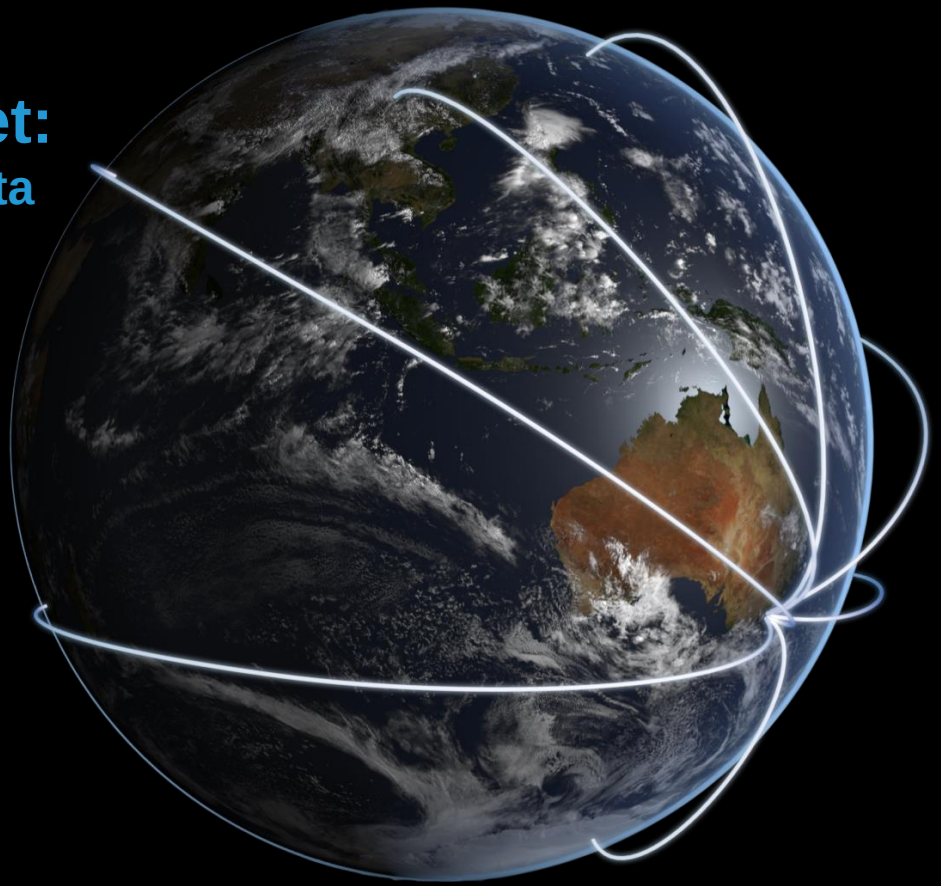
Big Data for a Big Planet:
a global network of regional data cubes?





Data Cubes for:
Africa, Antarctica, South America, Europe, North America, …

Connecting the EO, Spatial and Statistical world to support global SDGs?

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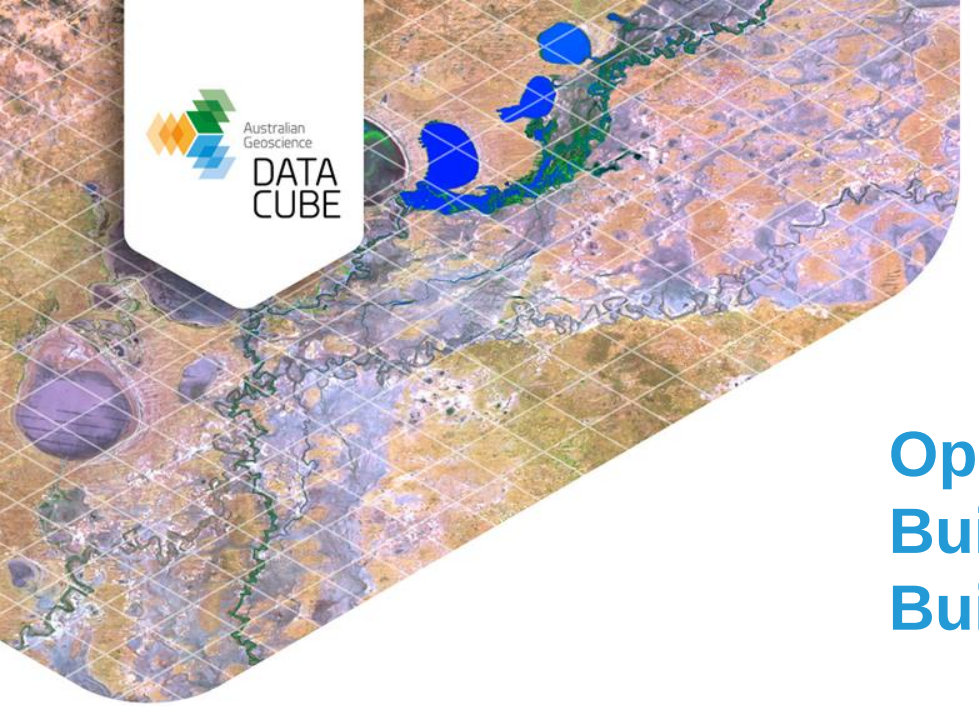

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Open source code
Built with open data
Built with open standards

OGC®
Making location count.

Thankyou

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