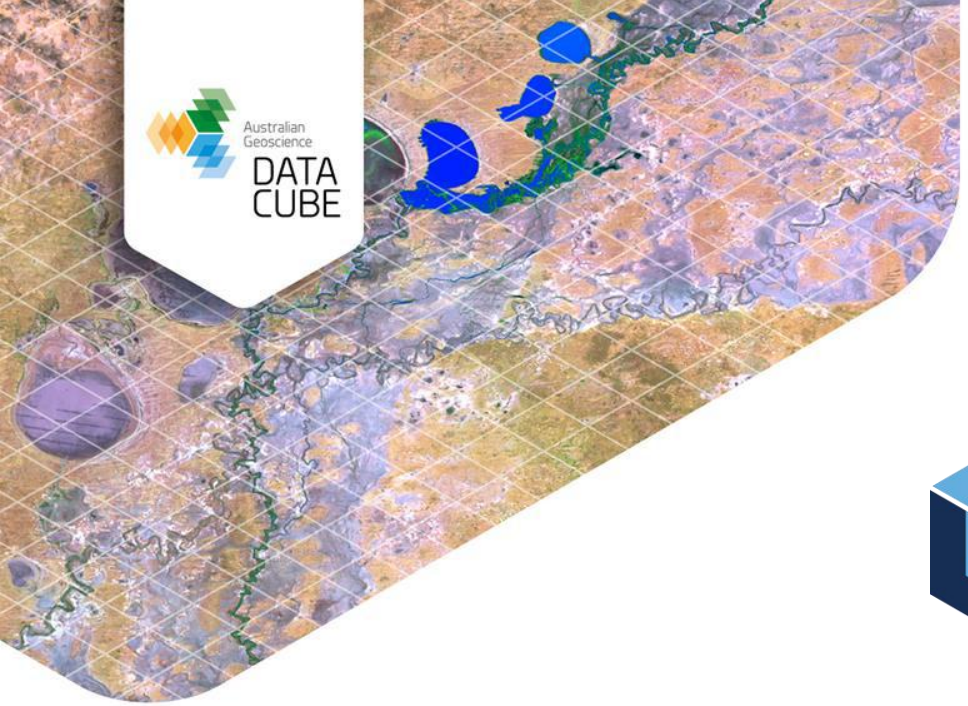

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OPEN DATA CUBE

OpenDataCubes and Coastal Observations

Dr. Alex Held – CSIRO

Hanoi, September 17 – 20, 2017

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Satellite Data Trends

- More and more free and open data
- Growing data volumes
- Improved computing technologies
- Open source software
- Pre-processed products

What are Data Cubes?

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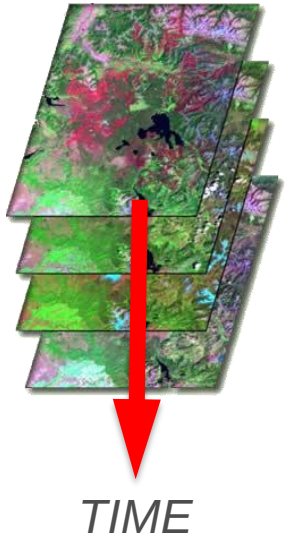
- **Data Cube** = Time-series multi-dimensional (space, time, data type) stack of spatially aligned pixels ready for analysis
- **Proven concept** by Geoscience Australia (GA) and the Australian Space Agency (CSIRO) and planned for the future USGS Landsat archive.
- **Analysis Ready Data (ARD) ...** Dependent on processed products to reduce processing burden on users
- **Open source** software approach allows free access, promotes expanded capabilities, and increases data usage.
- **Unique features:** exploits time series, increases data interoperability, and supports many new applications.



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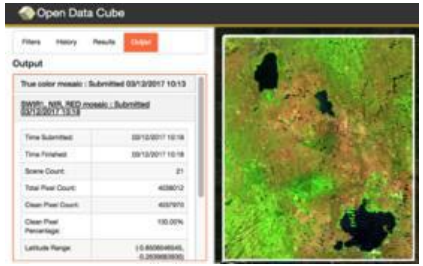
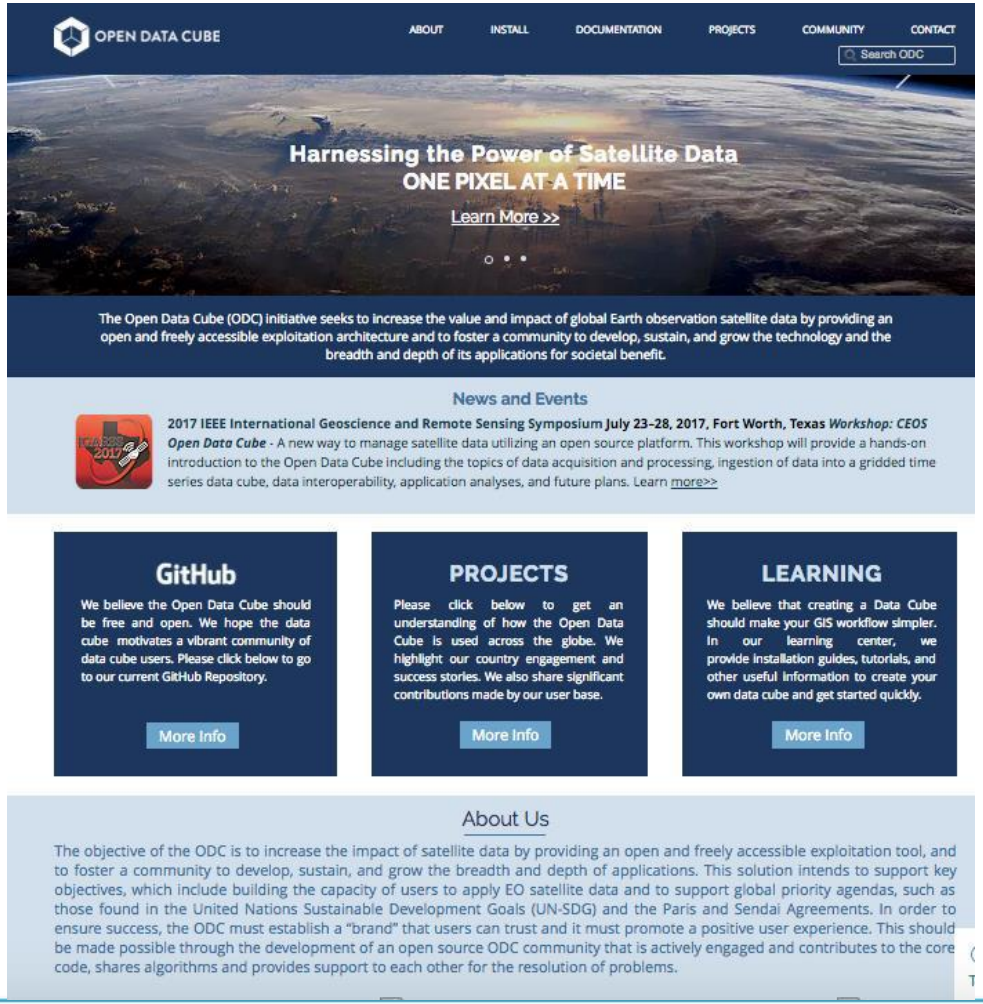
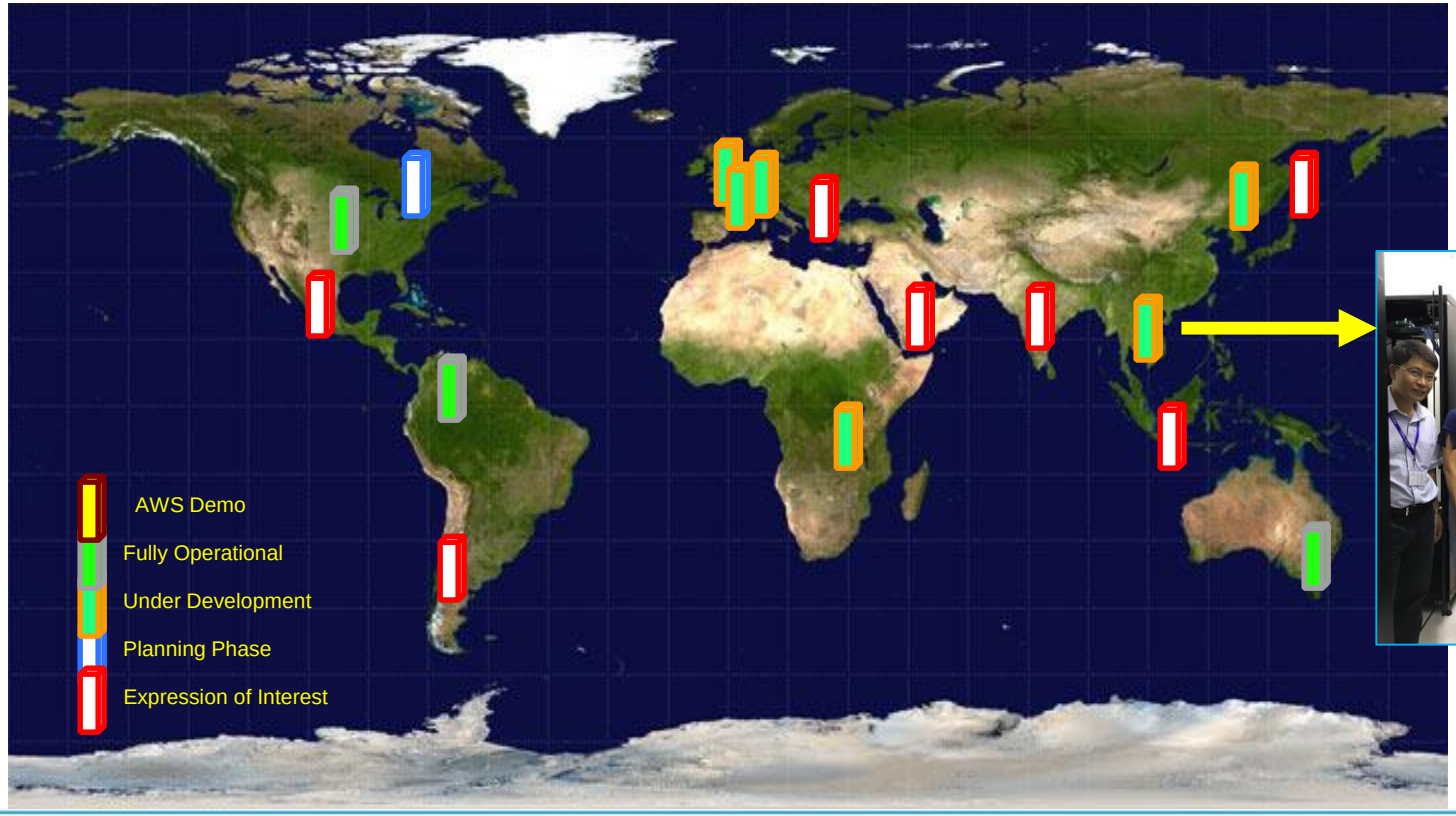
- Growing partnership based on an open source operational system: Australian Geoscience Data Cube (AGDC)
- **Open Data Cube**, is a comprehensive solution that builds the capacity of global users to apply satellite data
- Based on **Analysis Ready Data (ARD)** products that contribute to the increased uptake and impact of growing data volumes
- Coordination between GA, CSIRO, NASA, USGS to manage an **open source** software repository: https://www.opendatacube.org
- Scalable solution targeting 20 countries by 2022 with the support of key global stakeholders (e.g., GEO, World Bank)
- Current prototype testing in Colombia, Switzerland, and Vietnam, with more planned
- Free/Open demo available on Amazon AWS with 14 sample data cubes and applications: https://www.opendatacube.org





OpenDataCube.org: Growing a Network of Compatible Open DataCubes



Australia used High-Performance Computational Capacity via the National Computational Infrastructure (NCI)

Raijin @ National Computational Infrastructure

57,472 cores (Intel Xeon Sandy Bridge technology, 2.6 GHz) in 3592 compute nodes;

160 TBytes (approx.) of main memory;

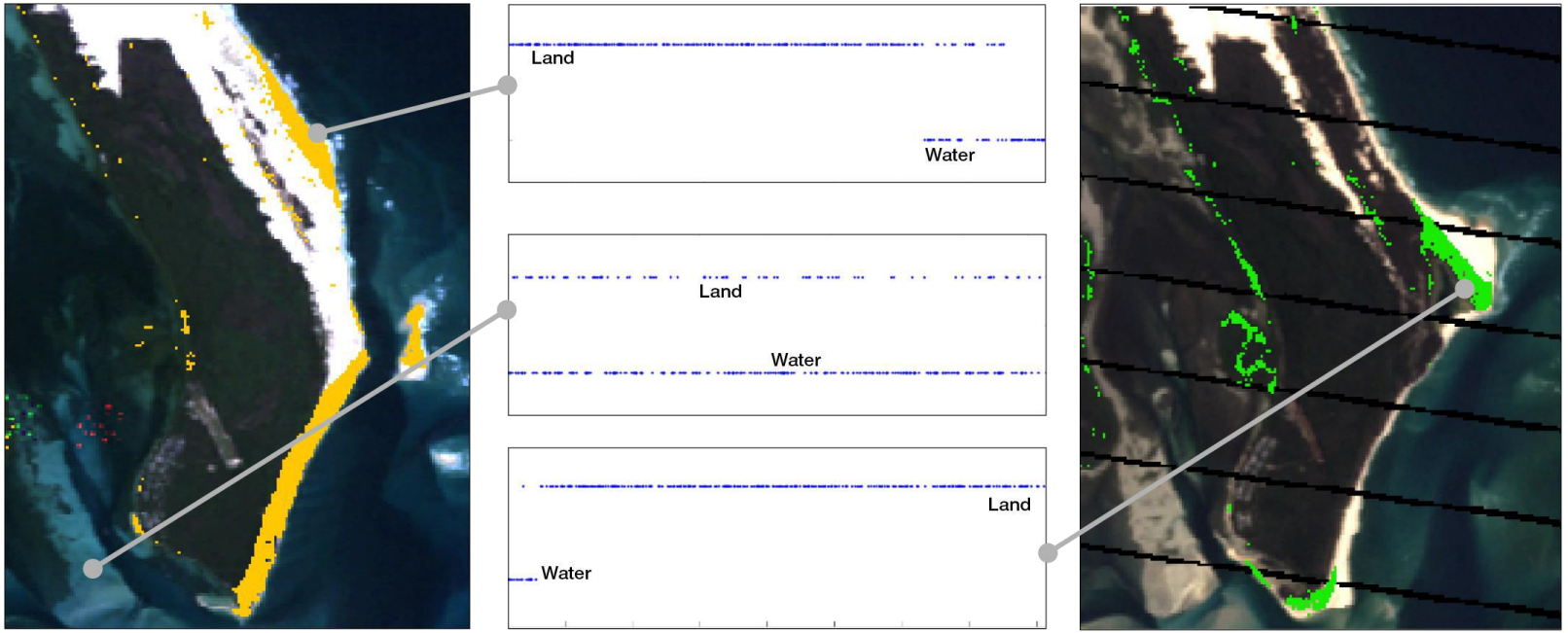
10 PBytes (approx.) of usable fast filesystem (for short-term scratch space).

37	Research Institute for Information Technology, Kyushu University Japan	**QUARTETTO** - HA8000-tc HT210/PRIMERGY CX400 Cluster, Xeon E5-2680 8C 2.700GHz, Infiniband FDR, NVIDIA K20/K20x, Xeon Phi 5110P Hitachi/Fujitsu
38	National Computational Infrastructure, Australian National University Australia	Fujitsu PRIMERGY CX250 S1, Xeon E5-2670 8C 2.600GHz, Infiniband FDR Fujitsu
39	Purdue University United States	**Conte** - Cluster Platform SL250s Gen8, Xeon E5-2670 8C 2.600GHz, Infiniband FDR, Intel Xeon Phi 5110P Hewlett-Packard

*http://top500.org/

Coastal Change Detection

Potential use for
SDG #13; SDG #14:



1988 Landsat 5 First Water Observation Anomaly

2013 Landsat 7 Last Water Observation Anomaly


1987

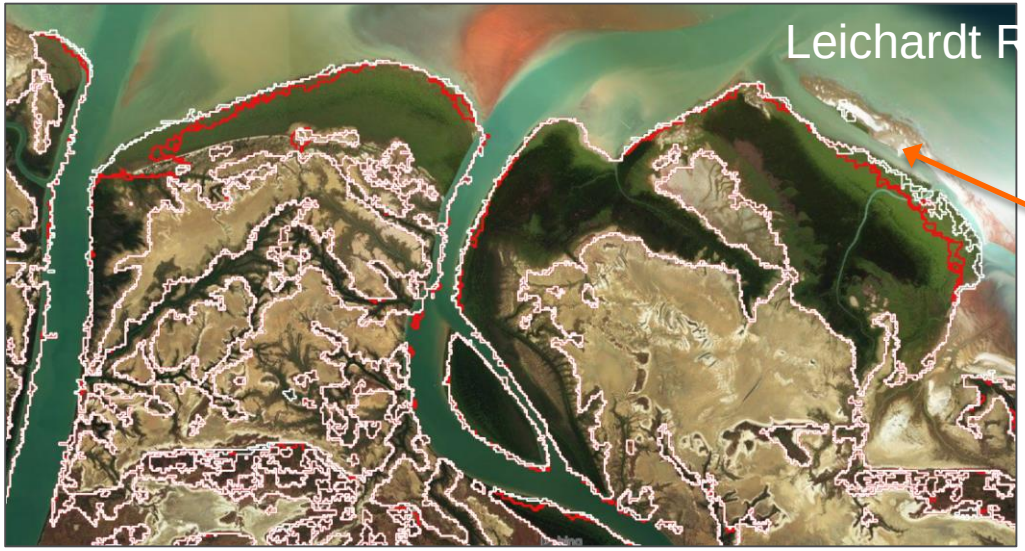
Mapping of Mangrove Dynamics

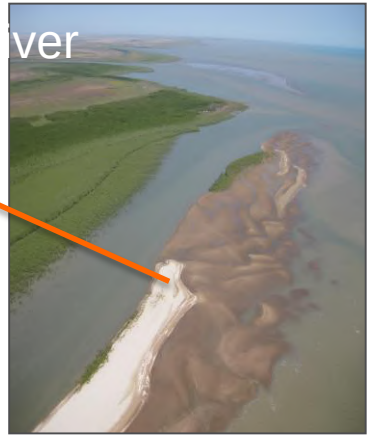
Courtesy R. Lucas (U. Wales, and TERN AusCover)

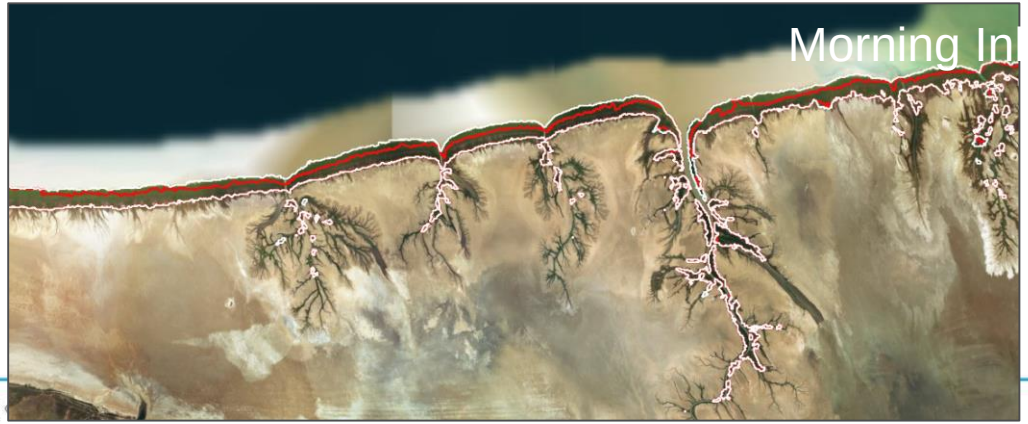
Mangrove Maps Generated Using ALOS L-band SAR

Maps generated by applying a random forest classification algorithm to 25 m resolution JERS-1 SAR (1996), ALOS PALSAR (2007, 2008, 2009, 2010) and ALOS-2 PALSAR-2 (2015, 2016) data

Change Detection Using ALOS L-band SAR data







Examples of mangrove change for the Leichardt River and Morning Inlet, Gulf of Carpentaria

Extent in 1996

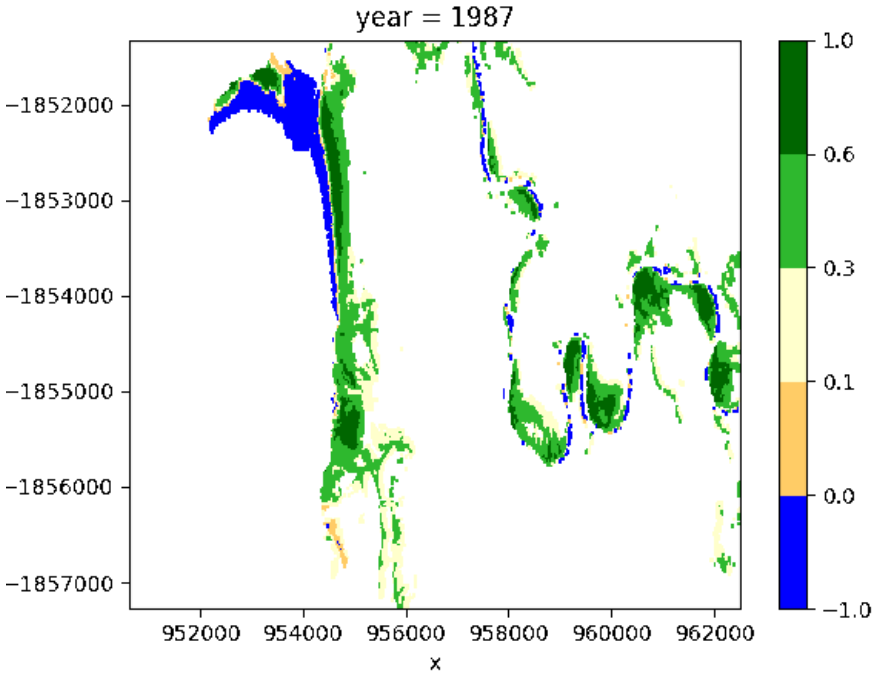
(based on JERS-1 SAR data; RED)

Extent in 2016

(based on ALOS-2 PALSAR-2 data; WHITE)

Time-series of Landsat and Sentinel-2 data
Mangrove Dieback Gulf of Carpentaria (2015/2016)

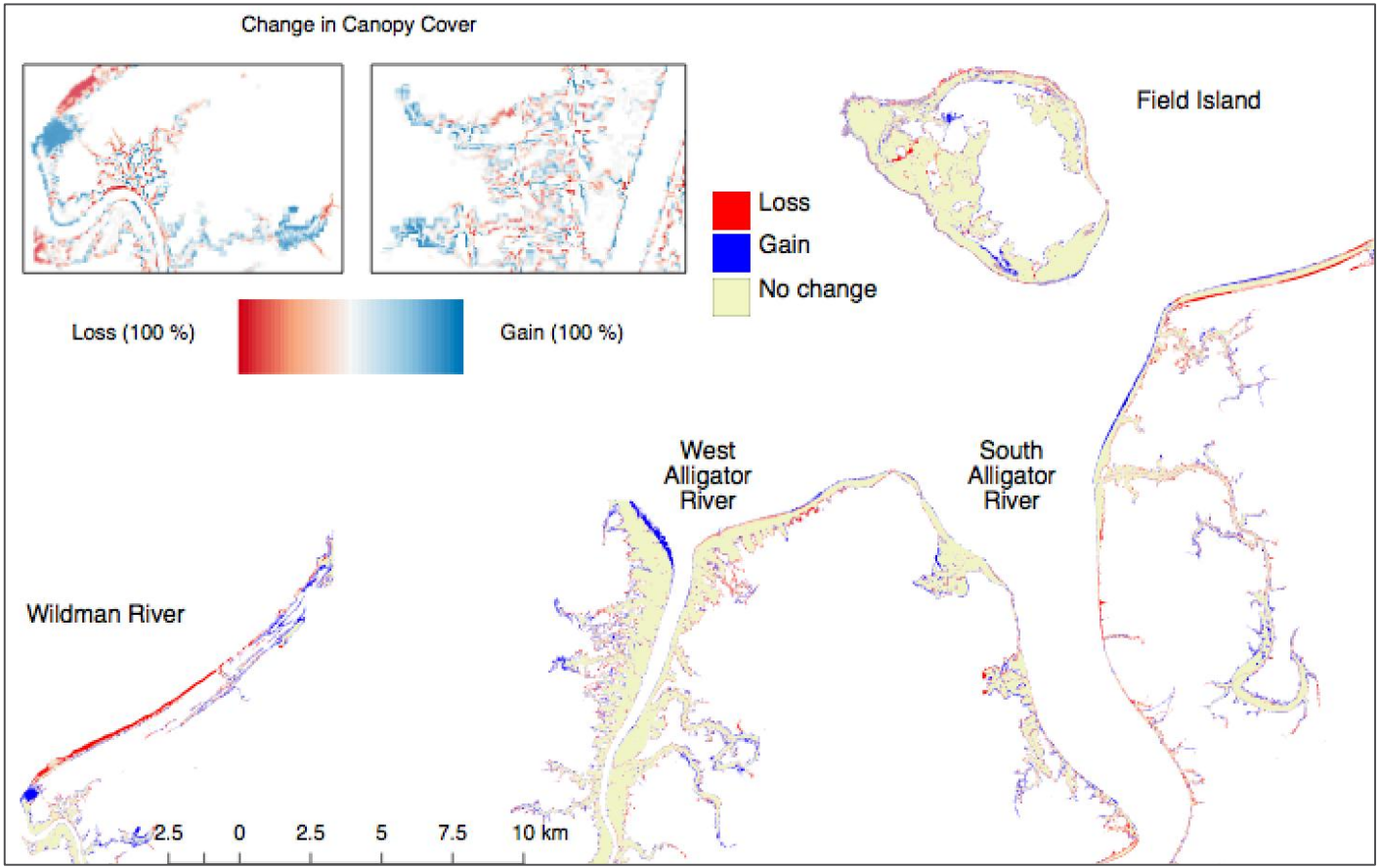
Demonstration of methods over selected coastal zones of mangroves and integration within the AGDC



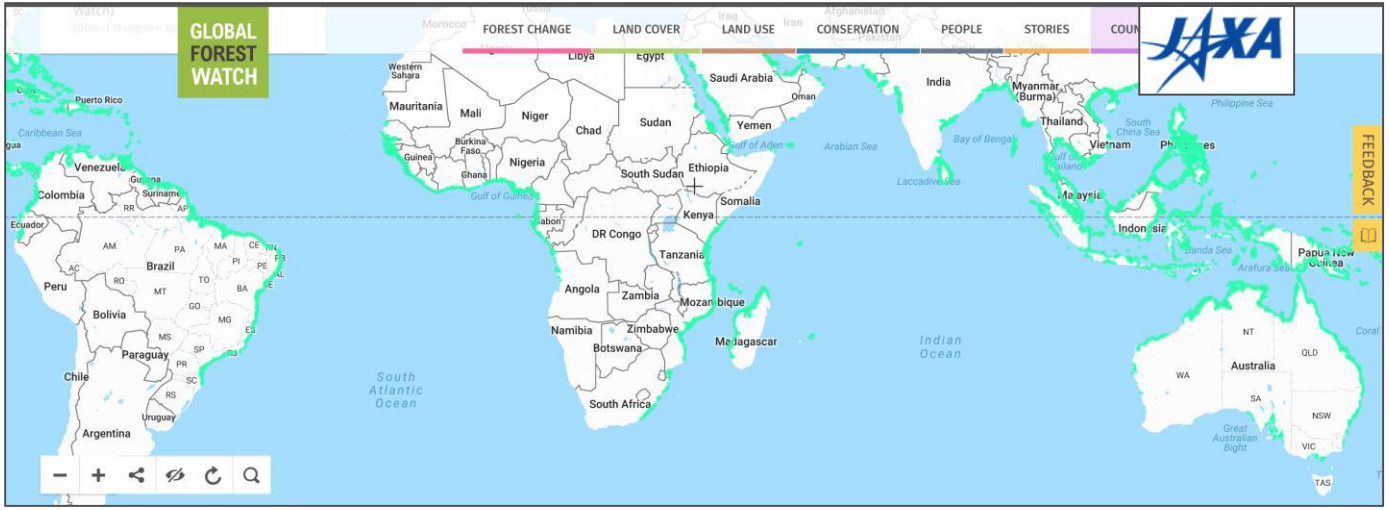
Mangroves maps generated at a national level (Australia-wide) within the AGDC for each year from 1987 to 2016 (30 in total) and within a GMW ‘mangrove potential area’ mask

Based on NDVI fixed threshold of

Changes in mangrove extent and cover between 1991 and 2012, Kakadu National Park

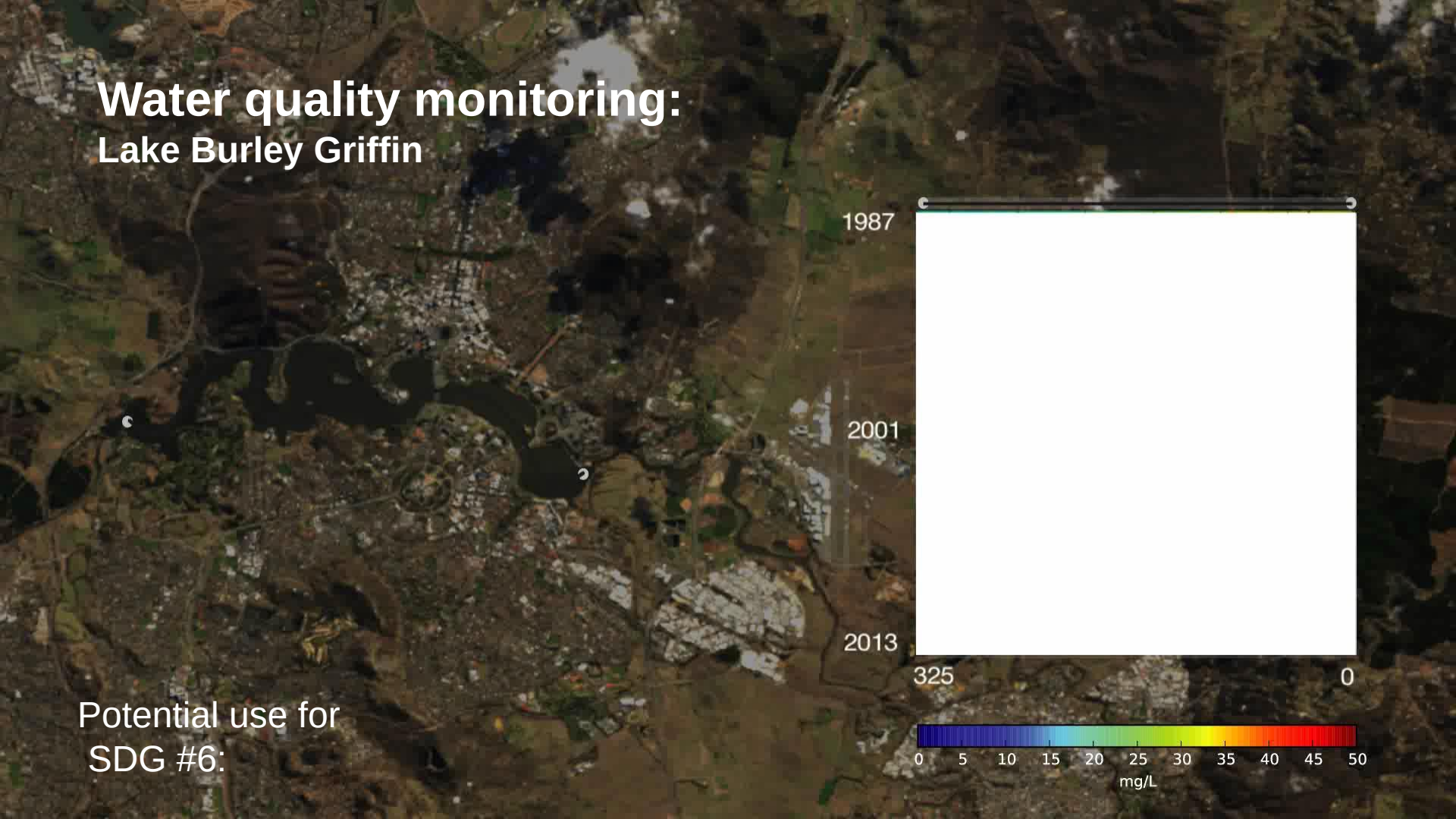


The JAXA K&C Global Mangrove Watch



Maps of mangrove extent (50 m) for 1996, 2007, 2008, 2009, 2010, 2015, 2016 etc.

Water quality monitoring:
Lake Burley Griffin



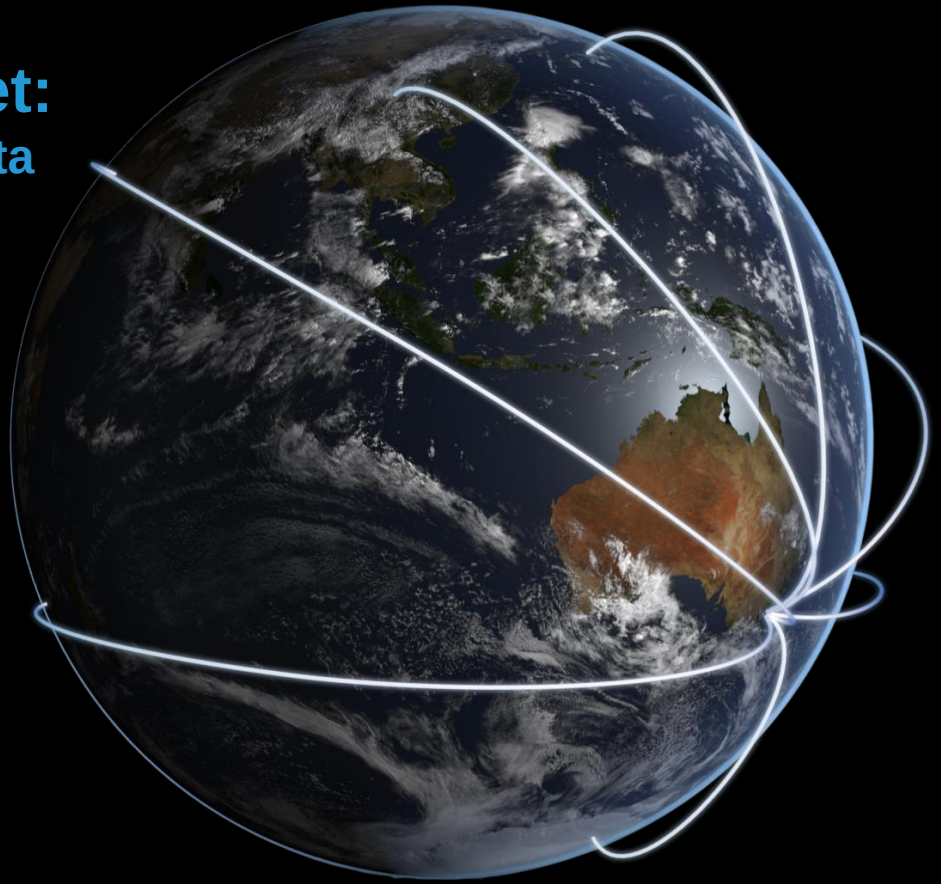
Potential use for
SDG #6:

Current Applications for the Open 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

Big Data for a Big Planet:

a global network of regional data cubes, serving the needs of Sustainable Development



Data Cubes for:

Africa, Asia, Europe, North America, …

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

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Thankyou

Alex.Held@csiro.au

www.opendatacube.org

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