



**OPEN DATA CUBE**

# OpenDataCubes and Coastal Observations

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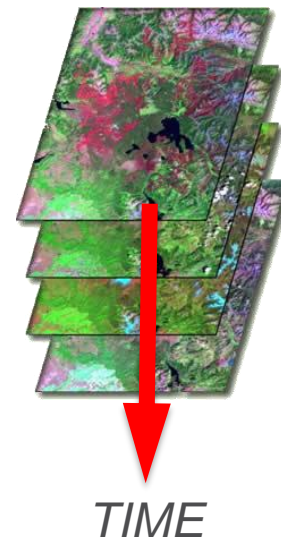
Hanoi, September 17 – 20, 2017



# What are Data Cubes?



- **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.





- 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>



## Harnessing the Power of Satellite Data ONE PIXEL AT A TIME

[Learn More >>](#)



The Open Data Cube (ODC) initiative seeks to increase the value and impact of global Earth observation satellite data by providing an open and freely accessible exploitation architecture and to foster a community to develop, sustain, and grow the technology and the breadth and depth of its applications for societal benefit.

### News and Events



**2017 IEEE International Geoscience and Remote Sensing Symposium July 23-28, 2017, Fort Worth, Texas Workshop: CEOS Open Data Cube** - A new way to manage satellite data utilizing an open source platform. This workshop will provide a hands-on introduction to the Open Data Cube including the topics of data acquisition and processing, ingestion of data into a gridded time series data cube, data interoperability, application analyses, and future plans. [Learn more>>](#)

### GitHub

We believe the Open Data Cube should be free and open. We hope the data cube motivates a vibrant community of data cube users. Please click below to go to our current GitHub Repository.

[More Info](#)

### PROJECTS

Please click below to get an understanding of how the Open Data Cube is used across the globe. We highlight our country engagement and success stories. We also share significant contributions made by our user base.

[More Info](#)

### LEARNING

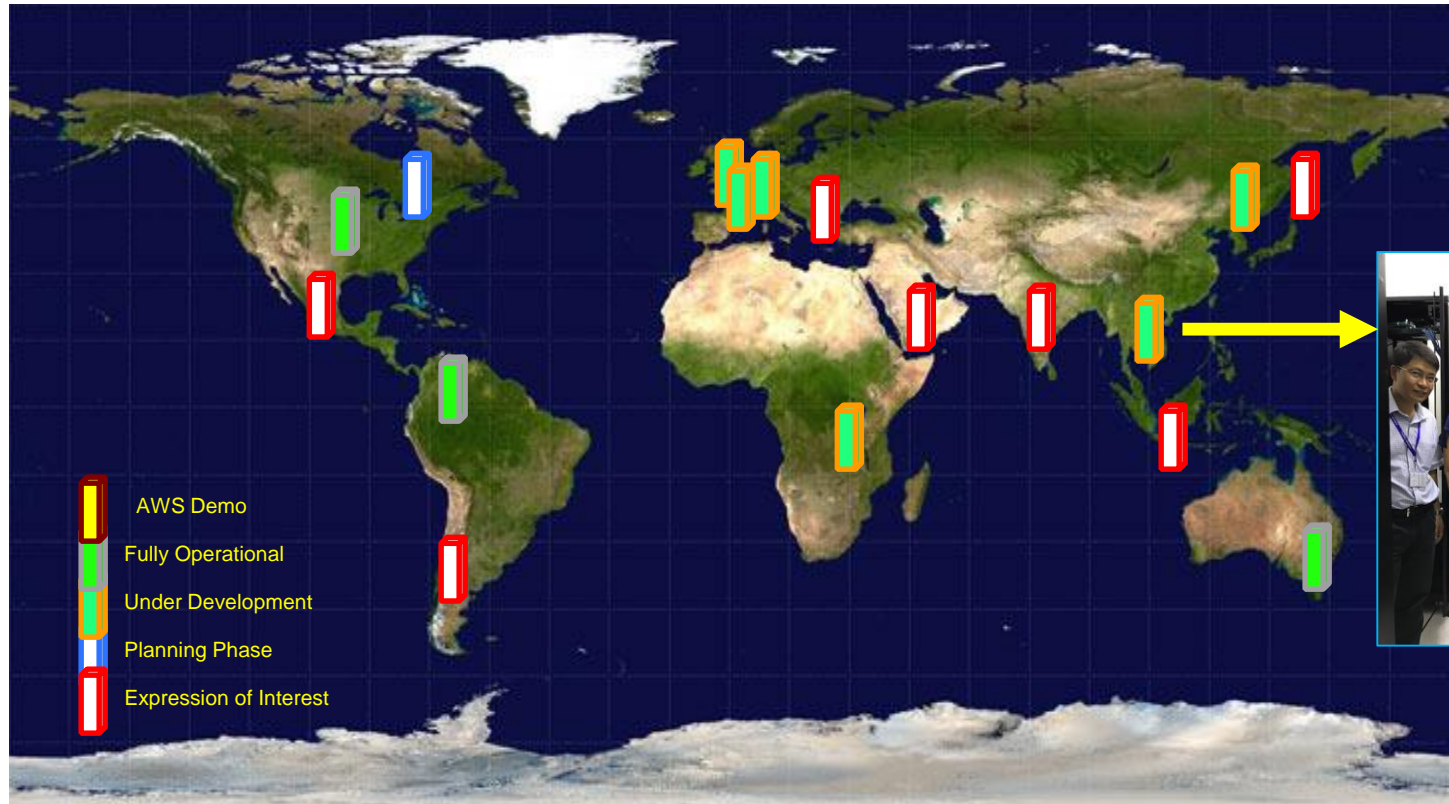
We believe that creating a Data Cube should make your GIS workflow simpler. In our learning center, we provide installation guides, tutorials, and other useful information to create your own data cube and get started quickly.

[More Info](#)

### About Us

The objective of the ODC is to increase the impact of satellite data by providing an open and freely accessible exploitation tool, and to foster a community to develop, sustain, and grow the breadth and depth of applications. This solution intends to support key objectives, which include building the capacity of users to apply EO satellite data and to support global priority agendas, such as those found in the United Nations Sustainable Development Goals (UN-SDG) and the Paris and Sendai Agreements. In order to ensure success, the ODC must establish a "brand" that users can trust and it must promote a positive user experience. This should be made possible through the development of an open source ODC community that is actively engaged and contributes to the core code, shares algorithms and provides support to each other for the resolution of problems.

# 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/>

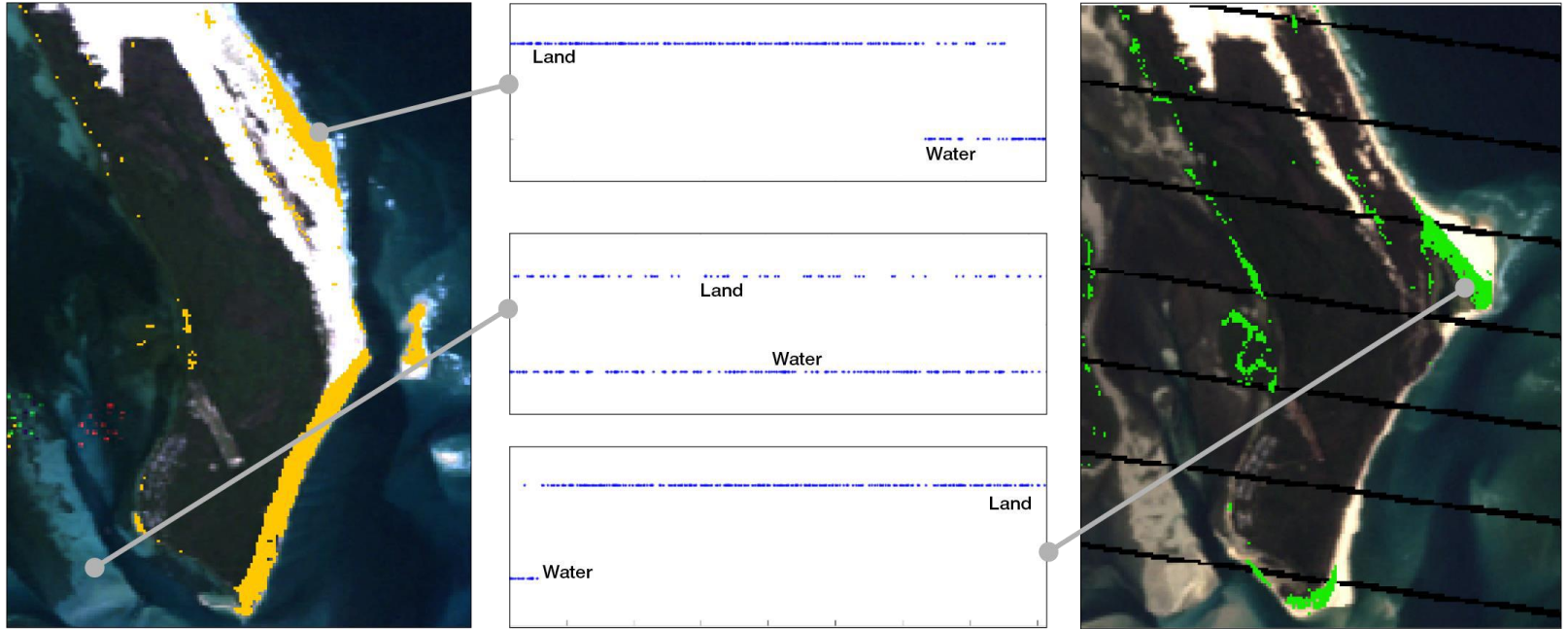






# Coastal Change Detection

Potential use for  
SDG #13; SDG #14:



1988 Landsat 5 First Water Observation Anomaly

2013 Landsat 7 Last Water Observation Anomaly

An aerial photograph of a coastal region, likely in the Pacific Northwest, showing a prominent river system (likely the Willamette River) flowing through a valley. The river is dark and winding, surrounded by green, forested hills. The coastline is visible on the right side, with a mix of land and water. The overall scene is captured from a high angle, showing the topography and the relationship between the river and the surrounding landscape.

1987



# Mapping of Mangrove Dynamics

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

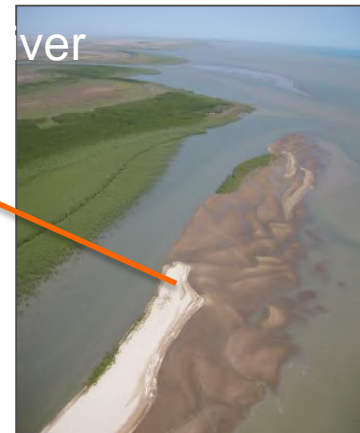


# Mangrove Maps Generated Using ALOS L-band SAR

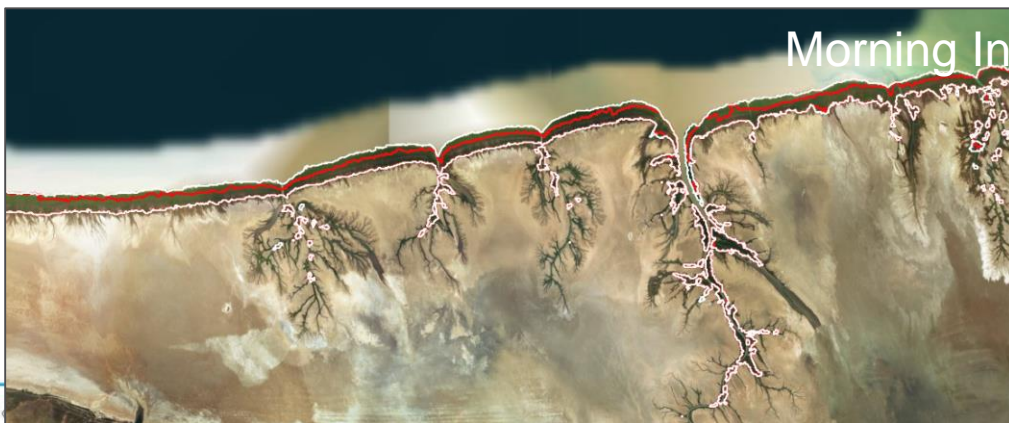


Maps generated by applying a random forest classification algorithm to 25 m resolution JERS-1 SAR (1996), ALOS PALSAR (2007, 2008, 2009, 2010) and ALOS-2 PALSAR-2 (2015, 2016)

# Change Detection Using ALOS L-band SAR data



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



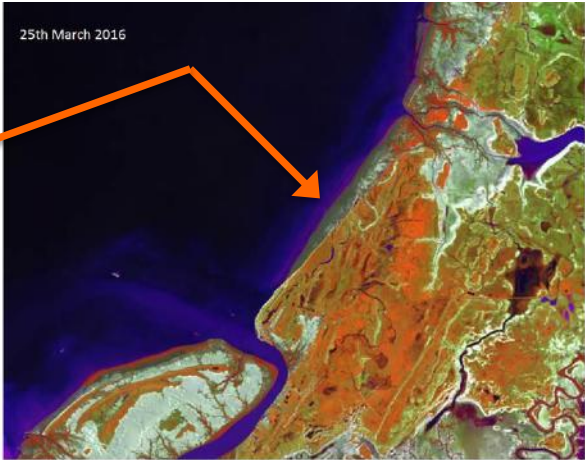
Extent in 1996

(based on JERS-1 SAR data; RED)

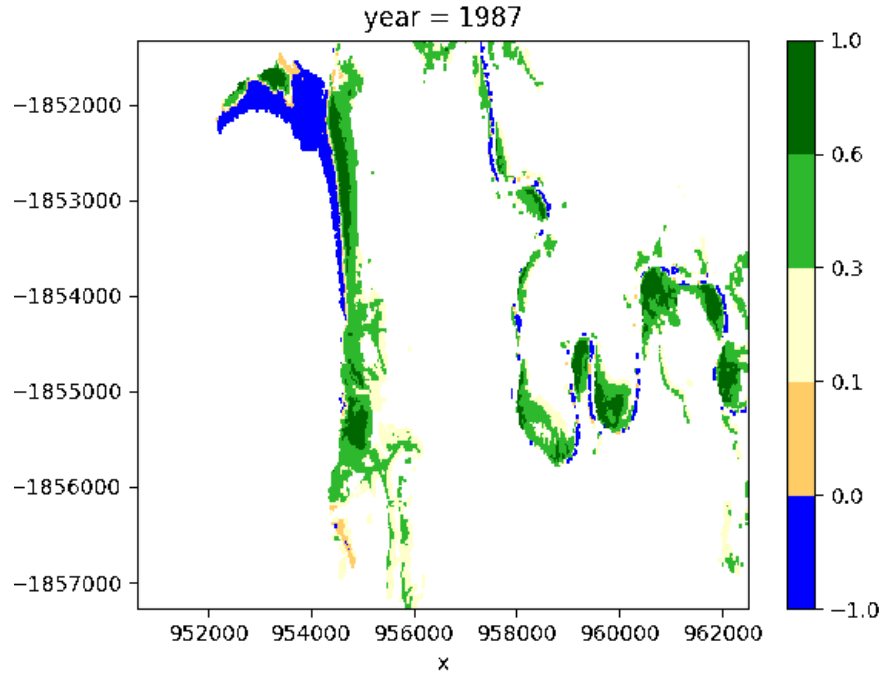
Extent in 2016

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

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



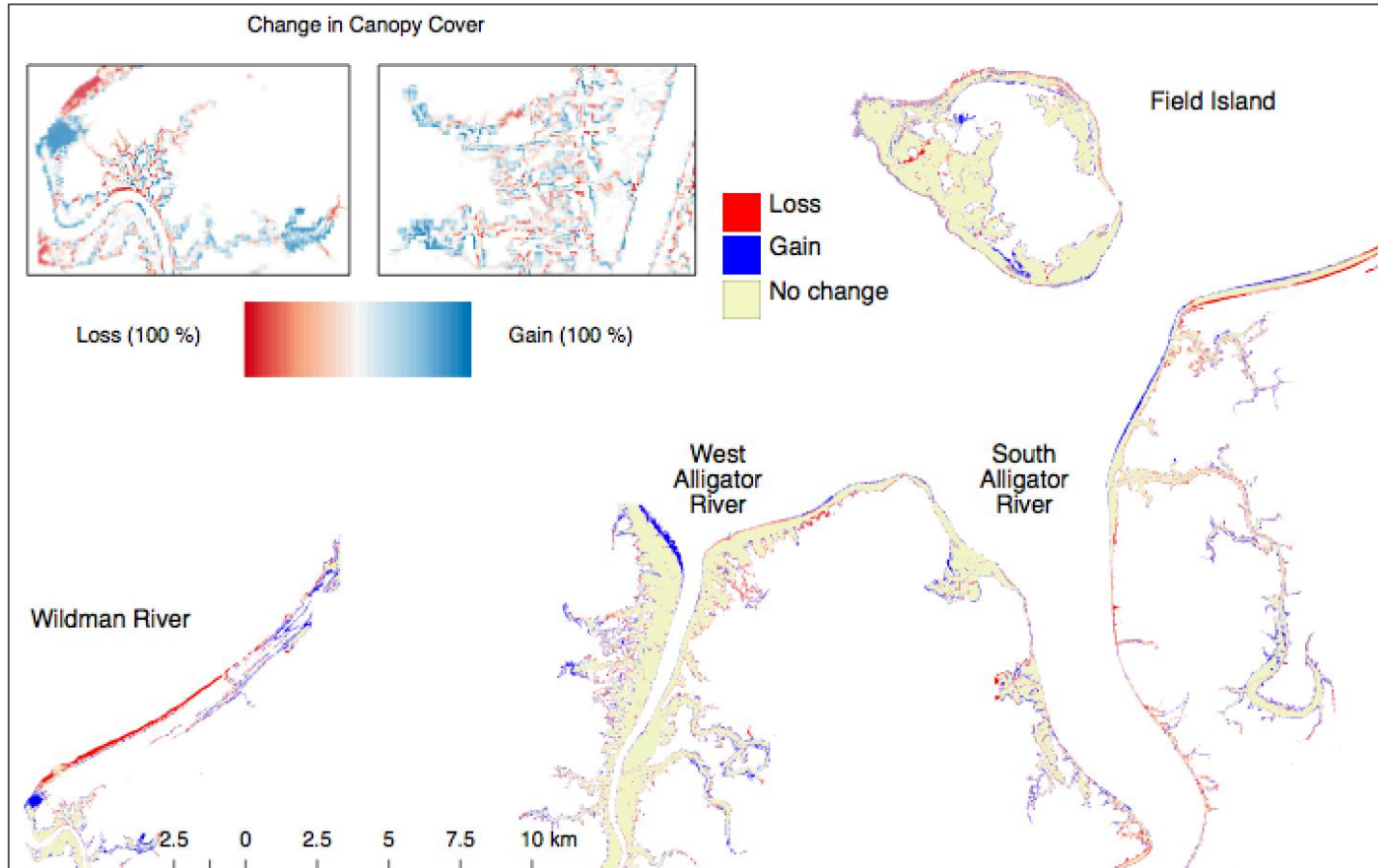
# Demonstration of methods over selected coastal zones of mangroves and integration within the AGDC



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

1987

2001

2013



325

0



Potential use for  
SDG #6:



## Current Applications for the Open Data Cube:

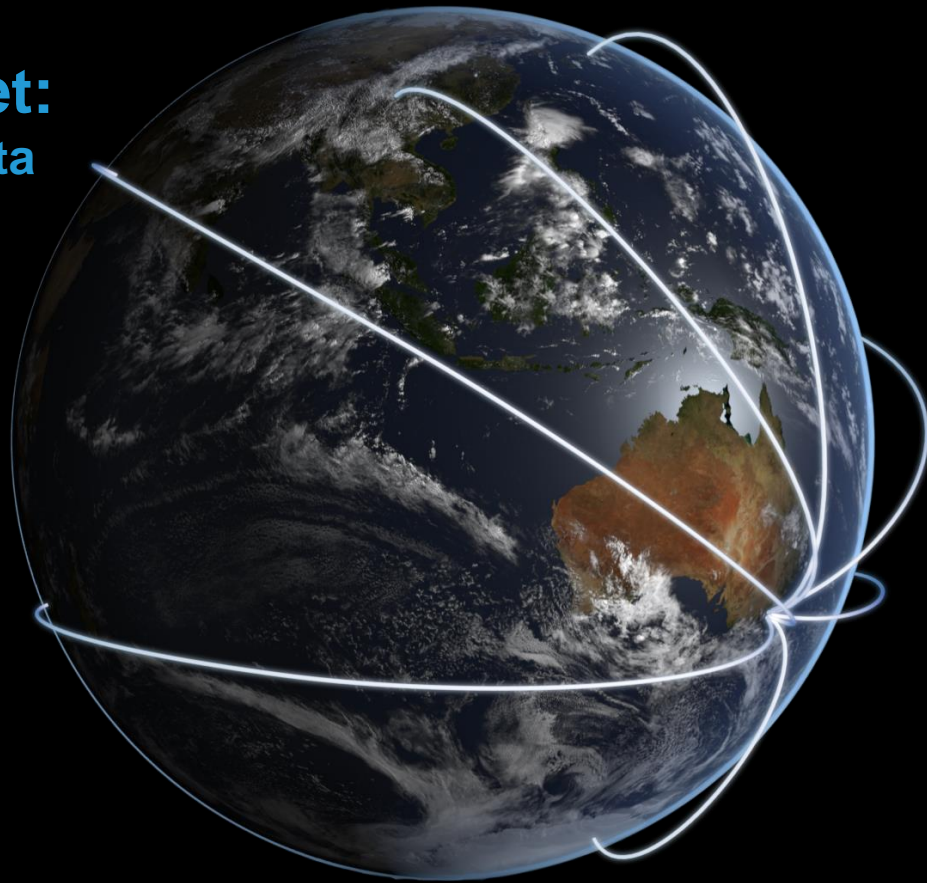
- Vegetation change, agricultural production
- Flood inundation mapping, farm dam development
- Wetland management and characterisation
- Carbon accounting
- Seagrass and substrate mapping
- Coastal change and water quality
- Shallow water bathymetry
- Mining footprint and urban development
- Bushfire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





**Thankyou**

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[www.opendatacube.org](http://www.opendatacube.org)



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