

# Australian Perspective on HysplRI and Opportunities for Collaboration

HysplRI Science Workshop – Washington DC Oct. 2012

Dr Alex Held | CSIRO Marine and Atmospheric Research  
18 October 2012

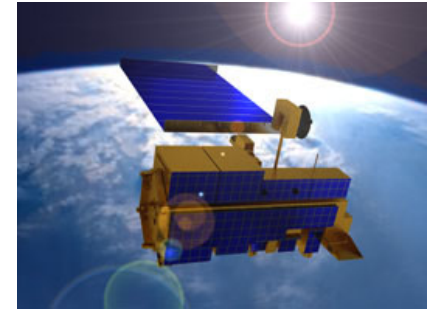
CSIRO  
[www.csiro.au](http://www.csiro.au)



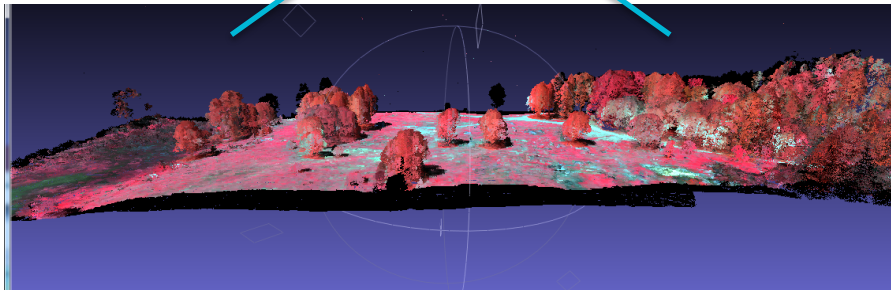
# Australia is one of largest users in the world of EO Data (incl. imaging spectrometry)



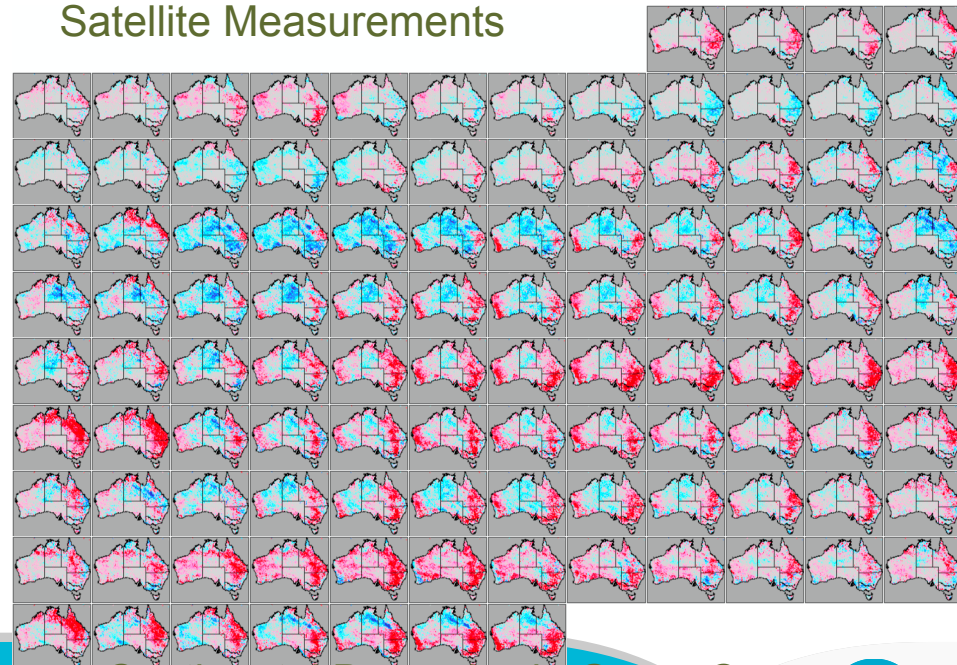
Airborne Systems  
and new sensor  
Technologies;  
Hymap HSI build  
in Australia



Low-, and medium spatial resolution,  
high temporal resolution  
Satellite Measurements



High-Resolution, Field-based Measurements



Continental Dynamics in Green Cover



2008

2009

2010

The Senate

Standing Committee on Economics

Lost in Space? Setting a new direction for Australia's space science and industry sector

November 2008



AN AUSTRALIAN STRATEGIC PLAN  
FOR EARTH OBSERVATIONS FROM SPACE

July 2009



A National Space Policy:  
Views from the Earth Observation Community



National Earth Observation Group



ANALYSIS OF AUSTRALIAN GOVERNMENT SPACE ACTIVITIES

MAY 2010

Space Policy Unit  
Department of Innovation, Industry, Science and Research

The economic value of earth  
observation from space

A review of the value to Australia  
of Earth observation from space

Prepared for the Cooperative Research Centre for Spatial  
Information (CRC-SI) and Geoscience Australia  
8 September 2010



ACIL Tasman  
Economic Policy Strategy

Process of gathering quantitative evidence for new Space Policy formulation and associated coordination

2011

2013



Earth Observations from Space (EOS)  
National Infrastructure  
Priorities for Australia's Space Policy

DRAFT V2.6

9 JUNE 2011



Continuity of Earth Observation  
Data for Australia

Operational Requirements to 2015 for Lands, Coasts and Oceans



Continuity of Earth Observation Data for Australia:  
Research and Development Dependencies to 2020

January 2012



Australian Government

National Space Policy



Australian Government

National Earth Observations  
from Space Infrastructure Plan



# Major Advances in National Space Policy

- New Policy endorsed by federal cabinet, and currently undergoing state-, & community consultation
  - Acknowledges the importance of EO to Australia's economy and wellbeing, as well as critical dependencies in EO data.
  - Initiates establishment of high-level inter-agency coordination committees for EO data coordination and new infrastructure investment
  - New National Plan for Earth Observation Infrastructure will stimulate future coordinated investment into downlink stations, data processing, archival, cal/val and sensor-development. Leverages off-current infrastructure investments into Terrestrial and Marine Observation Networks, as well as high-performance computational and network infrastructure.
  - Possible international partnerships and co-investment opportunities (in progress).





# Study Objectives

- Determine importance EOS data in support of R&D project needs
- Identify role and magnitude of R&D effort, in support of operational government or commercial programs
- Identify EOS missions and priority data types of special importance to the R&D sector.
- Identify current relationships, space agency data providers and other research partners, are a priority
- Highlight opportunities for potential expansion of national/international collaborations and partnerships
- Identify ways in which the Australian EO R&D sector can contribute and support foreign programs (eg. Cal/Val, science team members, processing, etc.).
- Provide likely EOS access scenarios and continuity risks which face the R&D sector, and offer contingency scenarios



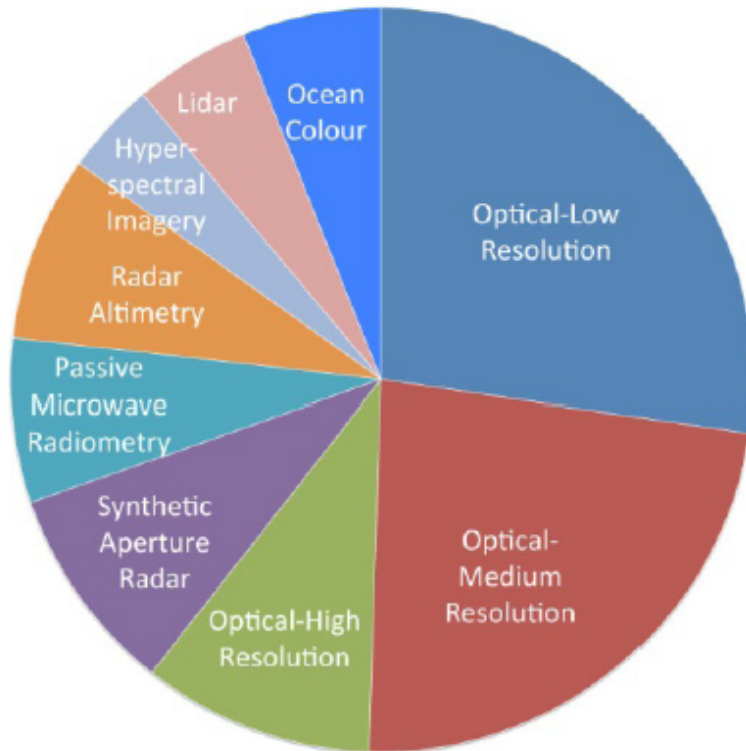
Continuity of Earth Observation Data for Australia:  
Research and Development Dependencies to 2020

January 2012

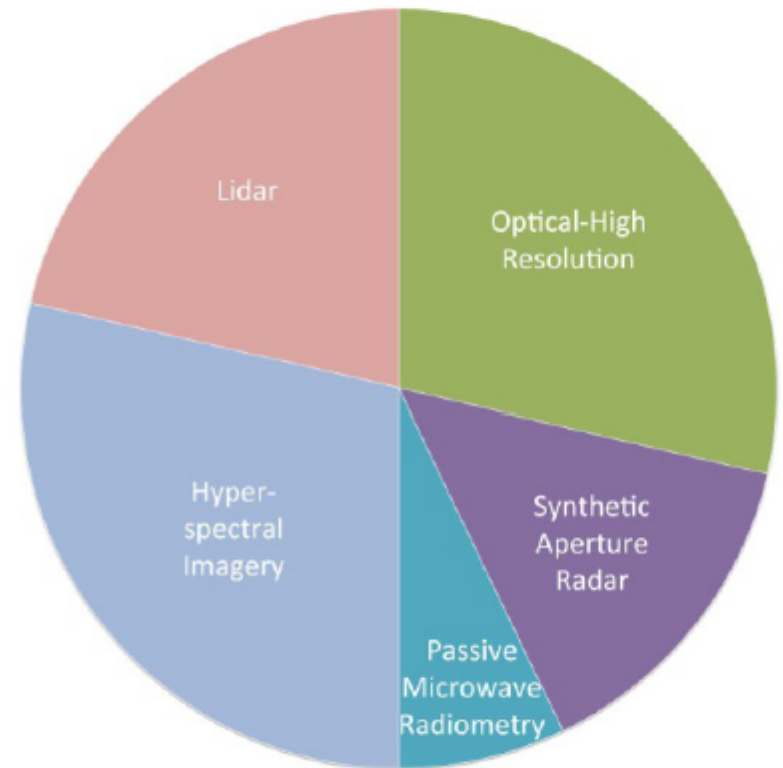
Report available via: [www.space.gov.au](http://www.space.gov.au)

# Priority Data Types based on No. of Projects in Survey

a. Satellite Data



b. Airborne Data



**Table 5-9 Priority Data Types: Satellite Supply Continuity Risk & Key providers\***

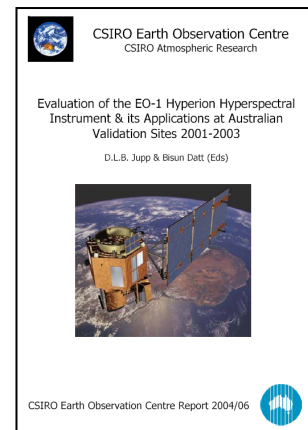
Priority EO Data Type	5-year continuity risk	Current key providers (and missions)	Future key providers (and missions)	Predominant Latency Requirement
Optical: Low Resolution	Low	NASA (MODIS) NOAA/EUMETSAT (AVHRR) JMA (MTSAT series)	ESA/EC (Sentinel-3 series) NOAA (NPP/JPSS series) JAXA (GCOM-C series) JMA (MTSAT series)	Hours/Weeks
Optical: Medium Resolution	High	USGS (Landsat-5/7)	USGS (LDCM) ESA/EC (Sentinel-2 series)	Days/Weeks
Optical: High Resolution	Low	USA commercial providers (Worldview, GeoEye)	USA & European commercial providers (Worldview, GeoEye, Pleiades) Airborne operators	Days/Weeks
SAR: C-band	Low	ESA (Envisat) CSA (Radarsat)	ESA/EC (Sentinel-1 series) CSA (Radarsat & RCM)	Weeks
SAR: L-band	No current supply	-	CONAE-ASI (SAOCOM-1A) JAXA (ALOS-2)	Weeks
SAR: X-band	Low	ASI (COSMO-SkyMed) DLR (TerraSAR-X)	ASI (COSMO-SkyMed series) DLR (TerraSAR-X series)	Weeks
Passive Microwave Radiometry	Medium	NASA (Aqua – just concluded) NOAA/DOD (DMSP series) JAXA/NASA (TRMM) ESA (SMOS)	JAXA/NASA (GCOM-W series) NASA (GPM, Aquarius, SMAP) NOAA/DOD (DMSP series) ESA (SMOS) ISRO (Megha-Tropiques, RISAT-3)	Hours
Radar Altimetry	Medium	EUMETSAT-NOAA (Jason series) ESA (Envisat)	EUMETSAT-NOAA (Jason series) ESA/EC (Sentinel-3 series)	Hours
Hyperspectral Imagery	High	NASA (EO-1)	DLR (EnMAP) ASI (PRISMA) METI/JAXA (ALOS-3)	Weeks
Lidar	High	NASA (CALIPSO)	ESA/JAXA (EarthCARE)	Weeks
Ocean Colour	Low	ESA (MERIS) NASA (MODIS) ISRO (OCEANSAT)	ESA/EC (Sentinel-3 series) JAXA (GCOM-C series) ISRO (OCEANSAT) NOAA (NPP/JPSS series)	Hours

\*Based on number of projects using the data type not data volume or size/impact of project



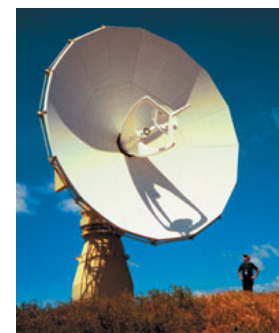
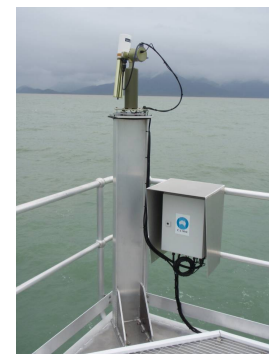
# Australia International Collaborations & Partnerships

- By virtue of our geography, Australia offers a “clean”, southern hemisphere atmosphere, access to Antarctica and many pristine coastal waters for use in validation of algorithms and level 2,3, 4 products.
- Extensive experience in Applications Development, as demonstrated during NASA EO-1 Science Validation Team participation and other field campaigns, and ongoing use of Hyperion data.
- Radiometric calibration/validation laboratories and field instrumentation: Part of federal research infrastructure programs (e.g. TERN, IMOS, etc.)



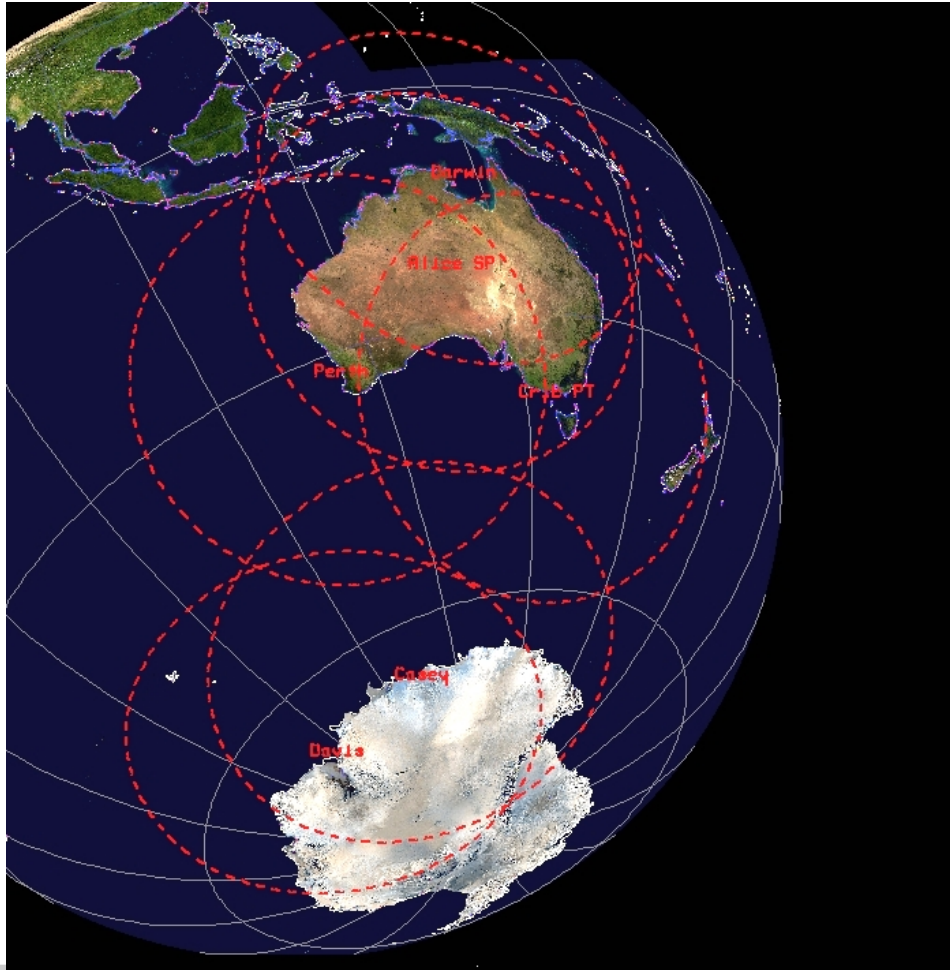
# Australia International Collaborations & Partnerships (2)

- A National Satellite Calibration Working Group, supported by DIISRTE SPU, CSIRO and Geoscience Australia
- Science-quality data sharing/exchange of field in-situ, airborne hyperspectral (Hymap, Specim) and lidar data collected by TERN, IMOS and other programs –links to NEON and HyspIRI preparatory program.
- Direct-readout capabilities, and processing via planned upgrades in dual-pol X-, Ka-band stations (Hobart & Darwin)
- Future mission partnerships & co-investment into sensors???

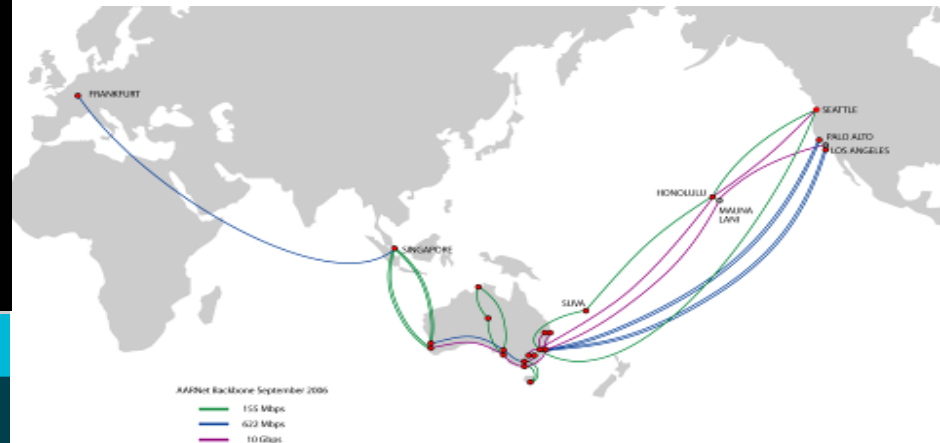




# Current Satellite Reception Facilities & National Data Networks

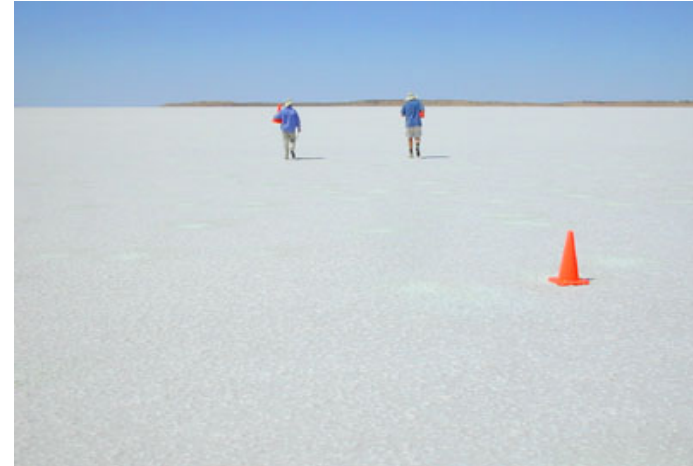
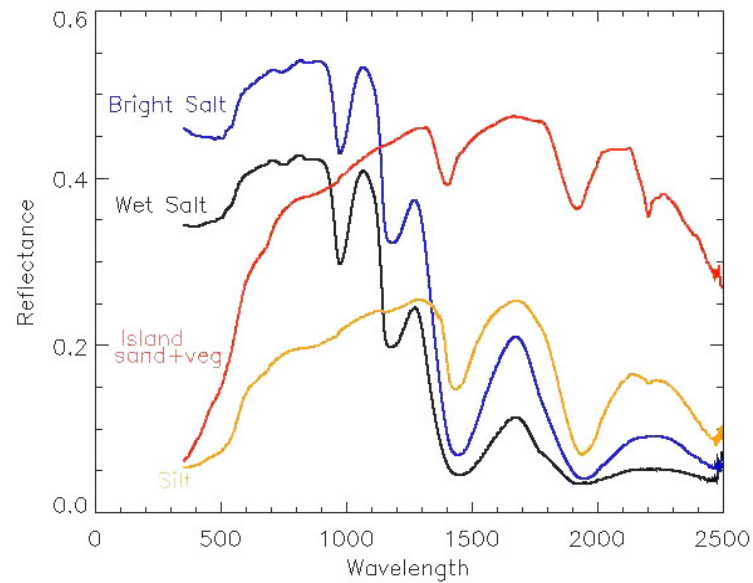


- Facilities will come online in late 2012-early 2013 in Darwin, with dual-pol X-band and future Ka-band downlink
- Science program on satellite – ground lidar communications
- Interconnected national broadband to international data centres
- Mass-data processing R&D

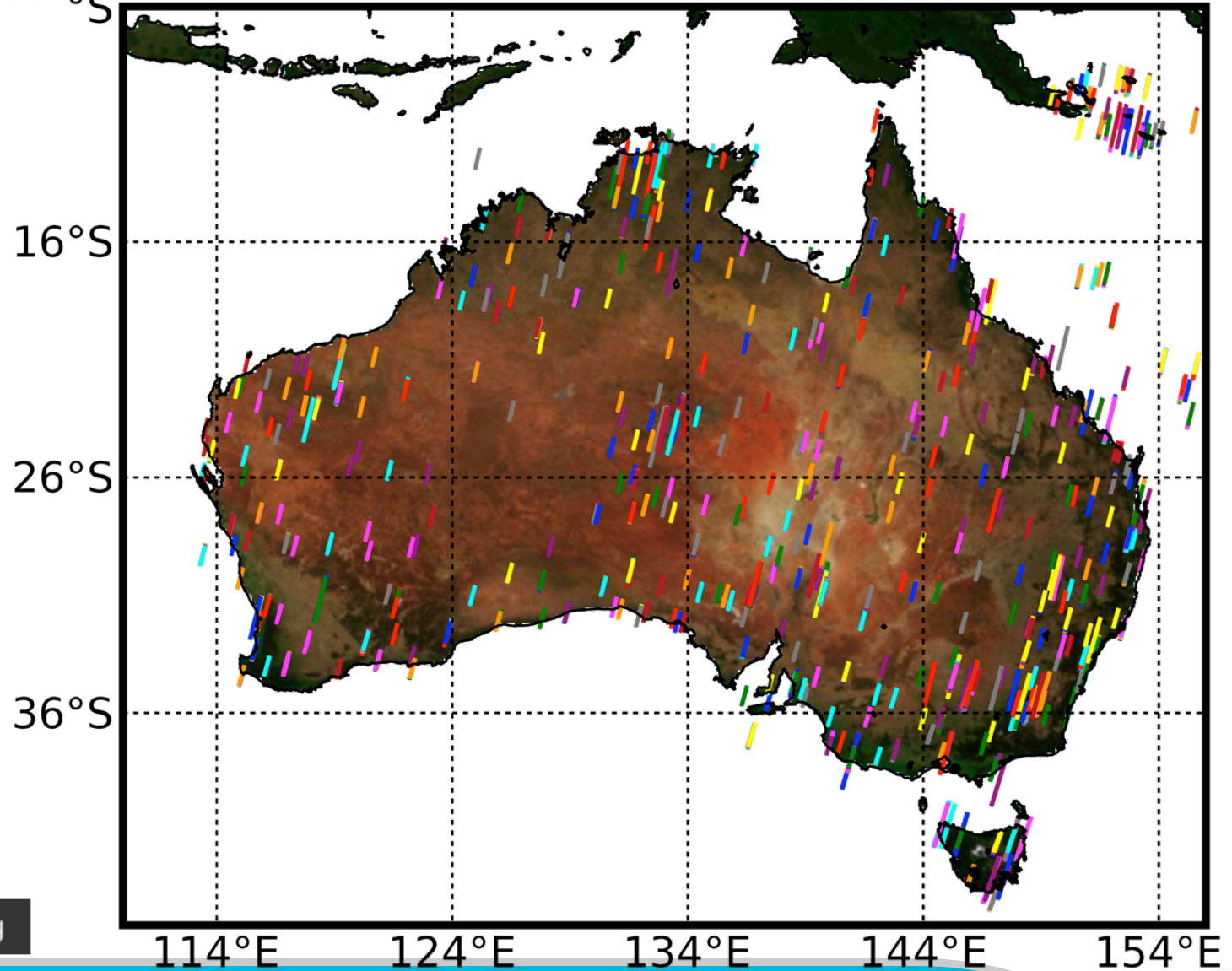




# Post-launch Satellite Testing & Validation – e.g. Lake Frome, South Australia

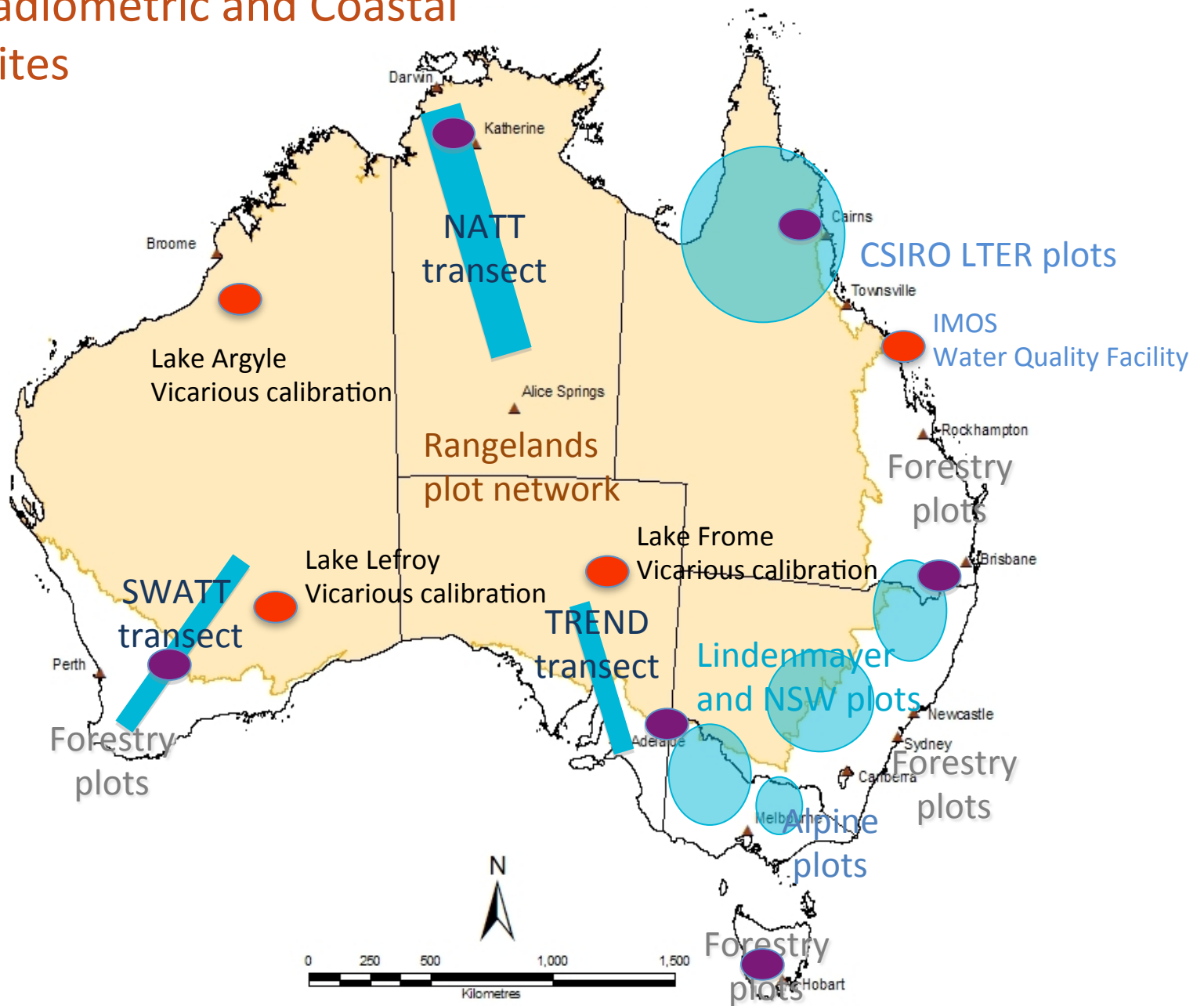


# Australian Hyperion Swaths 2001 - 2011



Processing by:

# Several Radiometric and Coastal CAL/Val Sites





# Sites Cover Large Variety of Ecosystem Types and Coastal Water Quality for Algorithm Development/Validation (across TERN Supersites, IMOS Sites and other cal/val Sites)

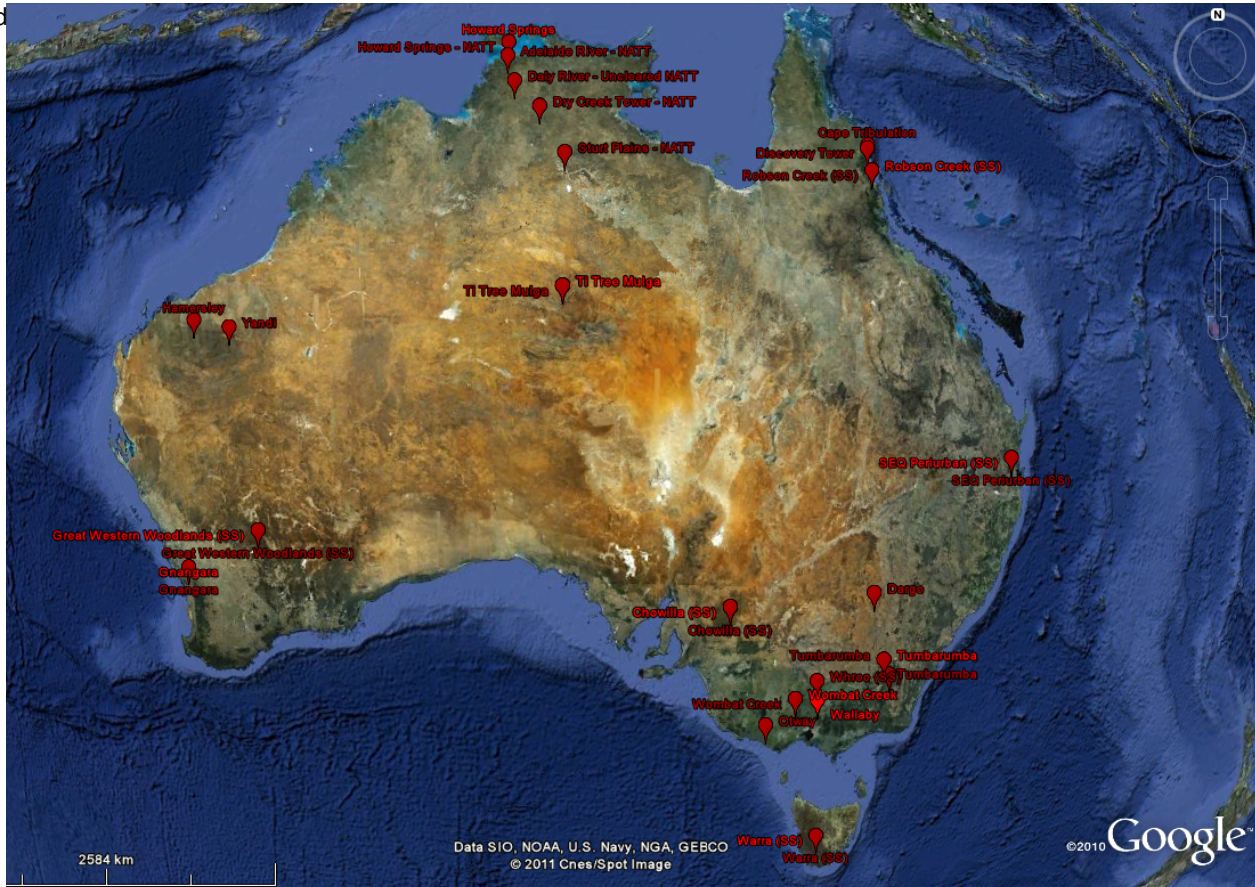
Spinifex Hummock Grassland



Acacia Shrubland



Tussock Grassland



Rain Forest



Eucalypt Open Woodland



Tall Eucalypt Forest

Chenopod Shrubland



Mallee



Mulga Shrubland



Tropical Savanna





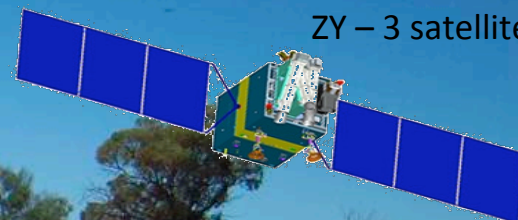
# HYPER project

MENU

Joint research

topographic mapping and  
environmental applications

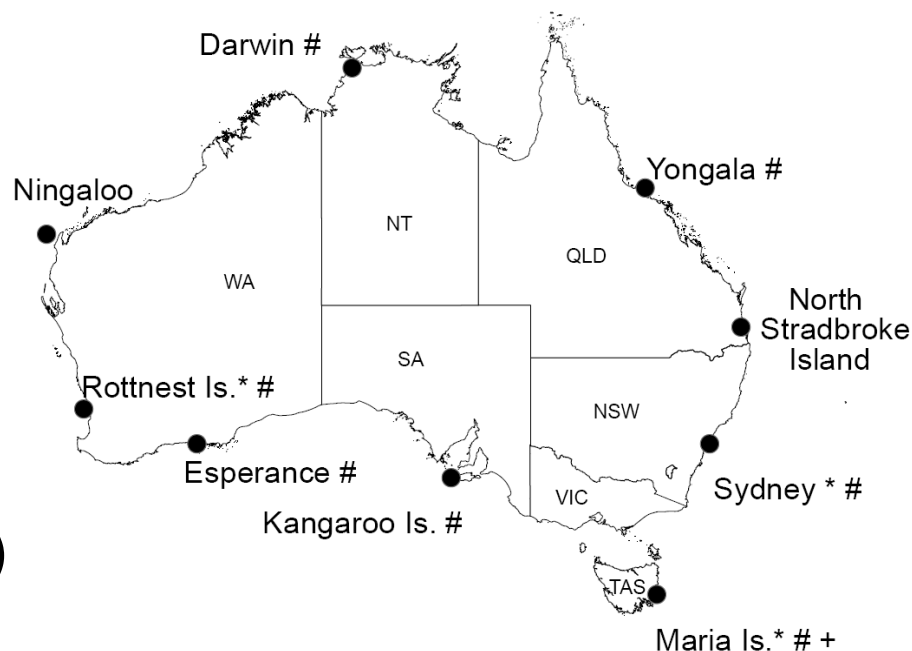
ZY – 3 satellite



With German, Japanese and Chinese space agencies: influence in satellite design and the development of algorithms to guide the new suite of hyperspectral satellites. Better effectiveness for Australian crops, pastures and soils

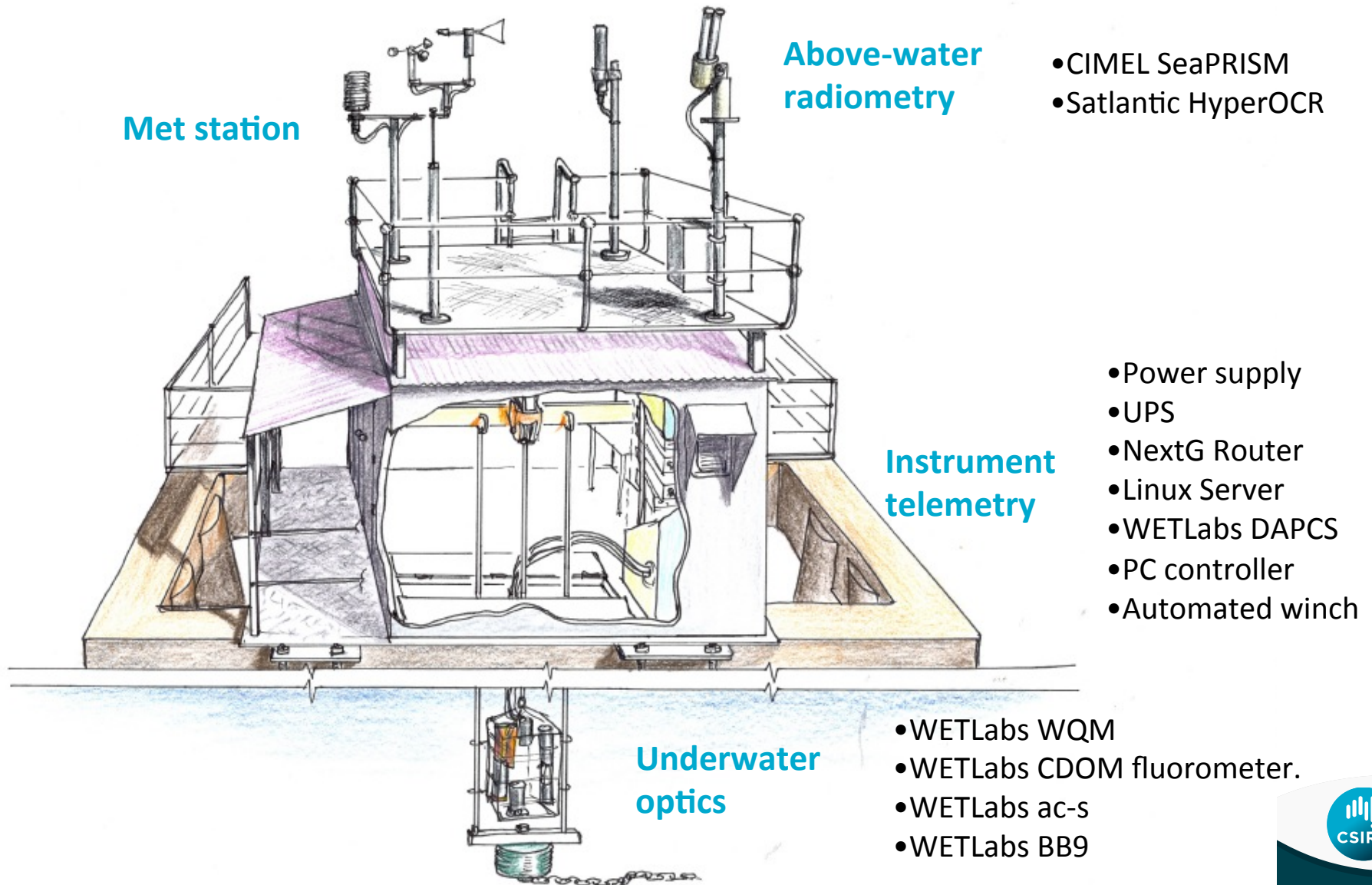
# 9 Coastal Reference Stations

- Bio-optical instrumentation and monthly sampling at 9 moorings to provide sustained observation of key bio-optical variables for Australia's shelf waters:
  - WQMs
    - Chlorophyll-a fluorescence
    - Backscattering at 700 nm
  - EcoTriplets
    - CDOM fluorescence
    - Backscattering at 440 and 550nm
  - Monthly sampling for :
    - phytoplankton pigments by HPLC
    - total suspended solids (organic and mineral fractions)
    - Nutrients
    - TOC, DOC and POC
- WQMs and sampling active since 2009





# Sketch of LCO facility



## Next Steps: Establishment of a “New Satellite Preparatory Program (NSPP)”, across CSIRO and Partners

- National Satellite CAL/Val Working Group (multiple sensor systems LTM-8, Sentinel-2, EnMAP, Hisui, HypSIRI, etc.)
- Coordinated airborne hyperspectral and lidar acquisition campaigns, across several TERN & IMOS Supersites
- Field Cal/Val Protocol Document & Sample Data Sets
- Hyperion archive processing project (funded by TERN) (initially 2000 scenes for Australia - ongoing)
- Spectral library consolidation across various application domains
- Implementation of high-performance supercomputing facilities for time-series and high-volume satellite data processing (NCI-Canberra, Pawsey Centre – WA, etc.)

# Thank you

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