



CSIRO

Report on Cal/Val Activities

Tim Malthus

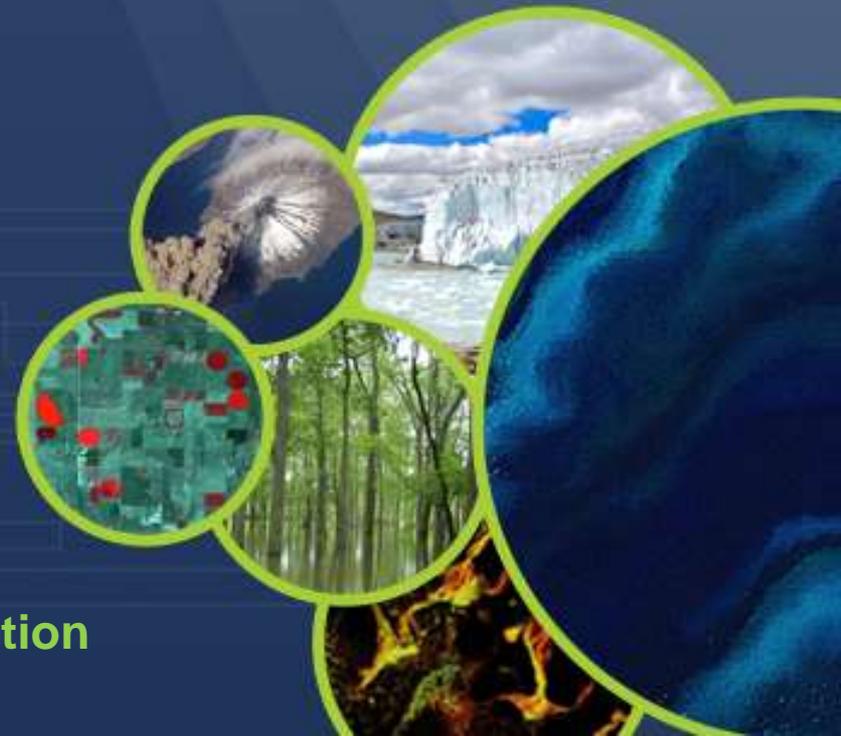
CSIRO, Australia

Agency Report

WGCV Plenary # 41

Tokyo, Japan

Sept 5 - 7, 2016



Working Group on Calibration and Validation

- Activities
- Risk to CSIRO's cal-val facilities
- Vicarious calibration – Pinnacles site update
- Highlights
 - CosmOz – Soil moisture network
 - Lucinda Jetty Coastal Observatory

- Current CEOS Chair, CEOS Plenary, Brisbane, early November
 - Leading non-met applications of GEO
- ASCWG
 - Will meet in second week of October:
 - <http://www.aeoccg.org.au/ascwg>
- Discussion paper:
 - Malthus, T., Ong, C., Thankappan, M. & Grant, I. (2016). Sustainability Of Critical Calibration Facilities To Support Earth Observations From Space, submitted to AGEOSWG
 - o 10 calibration facilities;
 - o Activities range from optical, SAR, satellite altimetry
- ISIS TC activity in cal-val (UK and China)



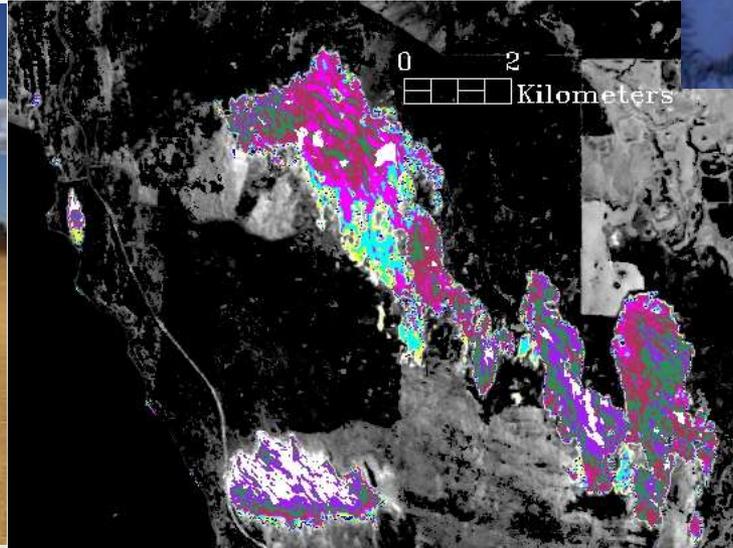
- Optical Cal/val
- CosMoz Sensor Network
- Satellite Altimetry Calibration and Validation
- AeroSpan
- Lucinda Jetty Coastal Observatory
- DALEC radiometer on RV Solander
- Calibration laboratories
- Geometric Cal/Val

Threat to CSIRO cal/val facilities

- FSP in Earth Observation Informatics - funded until December 2016
- After this, pan-CSIRO EO activity funded:
 - Will continue some of the existing EOI FSP functions particularly around domestic and international coordination
- Letters of support from CEOS WGCV / NASA and Australian EO community through the AEOCCG
- Has partially kept key calibration facilities and activities going, but future support of these facilities is currently uncertain
- Most facilities still 'at risk'

Second vicarious cal-val site Australia

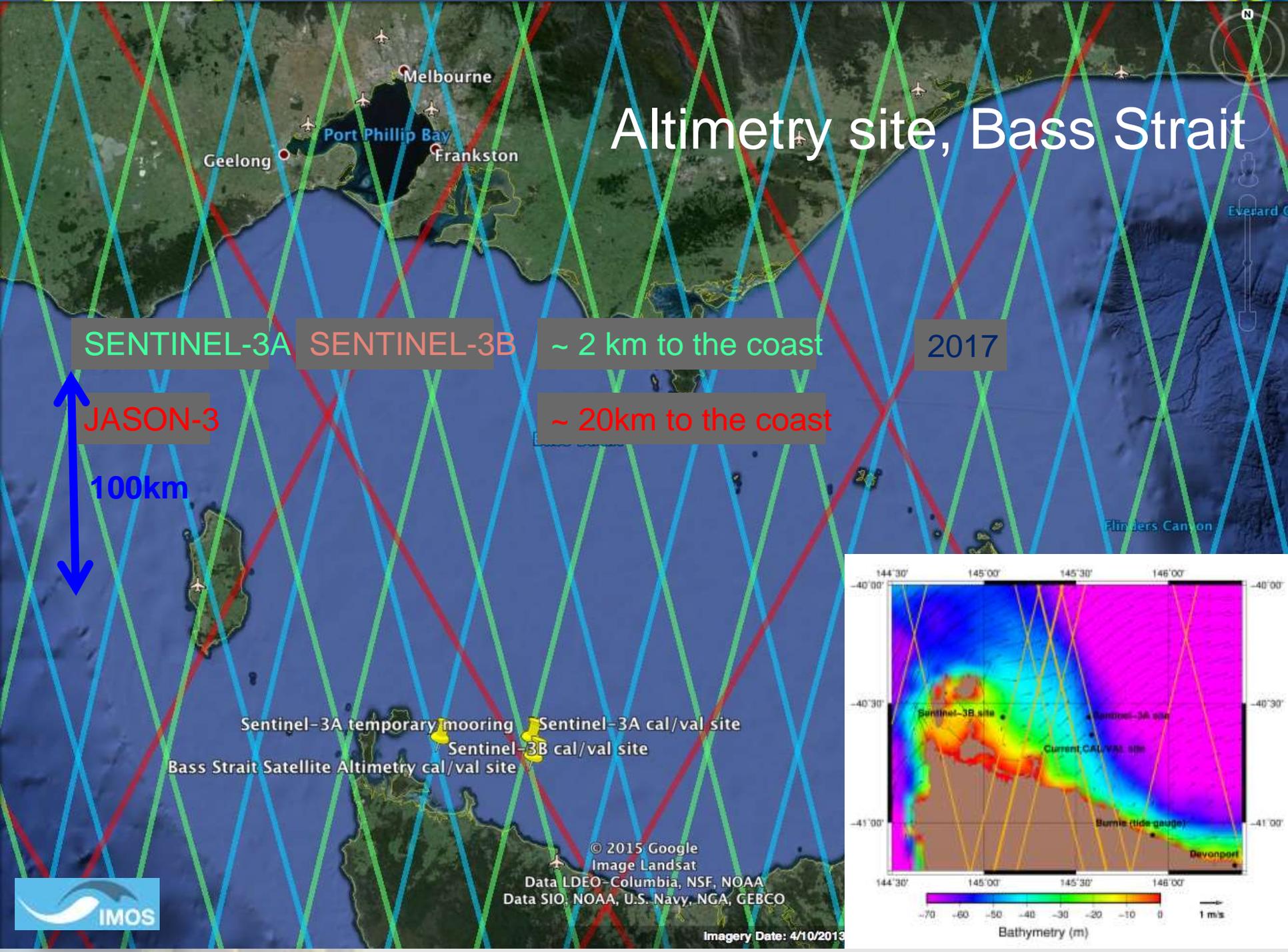
- To build a vicarious calibration site(s) specifically for imaging spectroscopy missions.
- To meet current CEOS endorsed vicarious calibration sites
- Serve multiple purposes for optical sensors beyond just imaging spectroscopy
- Underpinned by NIST traceable calibration facilities
- Field campaign for site characterisation, sample collection, field spectral measurements, trial new instruments
- Potential for automated acquisition of VNIR-SWIR spectral measurements



- ~ 250 km N of Perth, sealed roads all the way from Perth
- All forms of communication **Permissions**
- Department of Parks and Wildlife

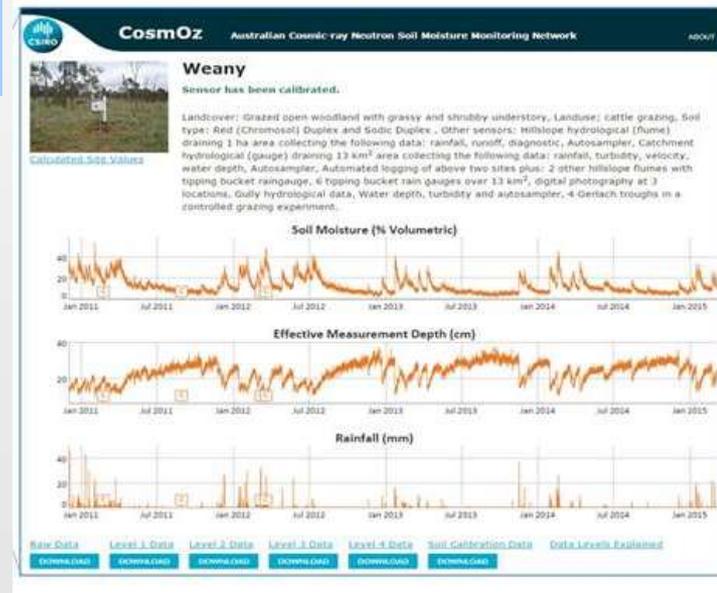
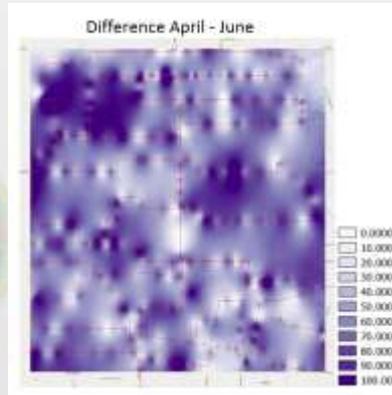
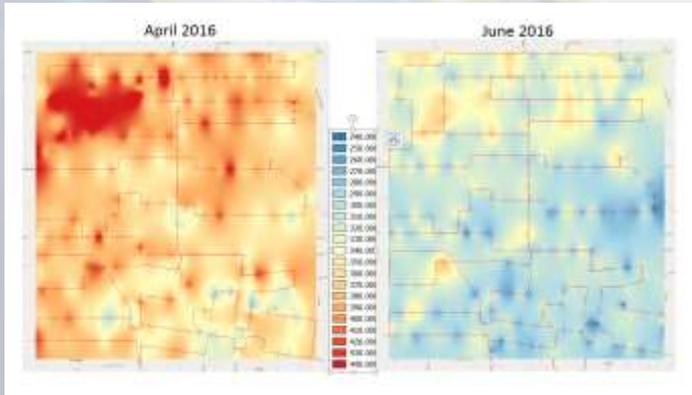
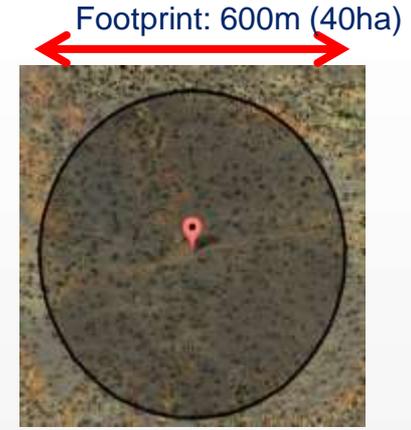
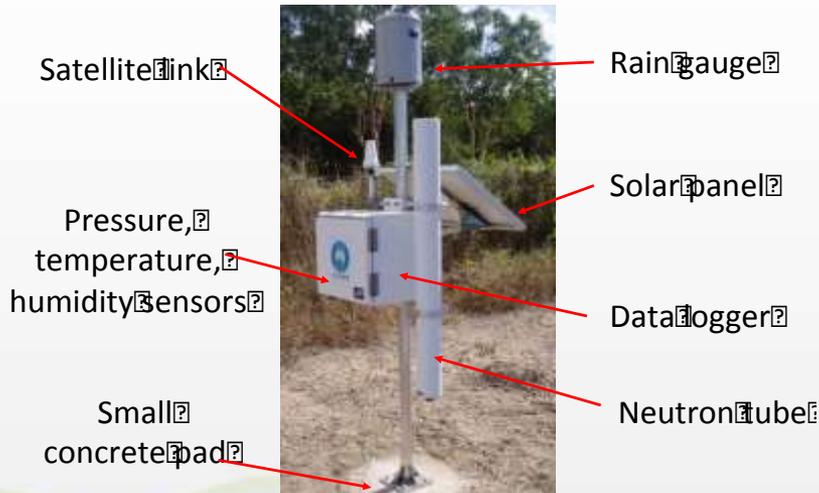
- Awaiting planning approvals to site a structure and equipment from Department of Parks and Wildlife
- Current plan is to deploy:
 - Cimel system similar to ESA RadCalNet site in Namibia
 - Met station
 - Cosmos sensor
- Yet to undertake:
 - Complete site characterisation - lab and RS data analysis
 - Design of structure for the radiometer
 - Radiometer for full spectral measurement

Altimetry site, Bass Strait





- <http://cosmoz.csiro.au/>



working Group on Calibration and Validation

IMOS validation support at LJCO ongoing 2016-17

Continuous above and in-water optical
measurements

Fortnightly water quality sampling

Lucinda



Above-water measurements

Weather Station

- Temperature
- Pressure
- Humidity
- Dew point
- Wind speed etc



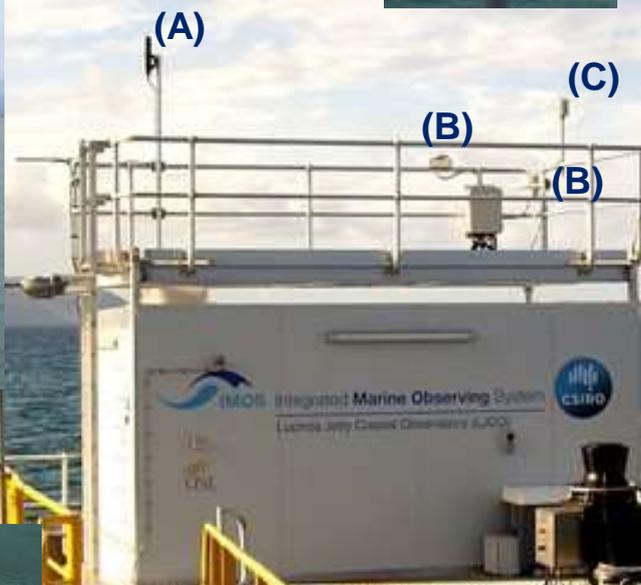
Satlantic

Spectral irradiance



Webcams

Sky and Sea



SeaPRISM (7 wavelengths)

- Water-leaving radiance
- Aerosol optical thickness
- Aerosol absorption
- Aerosol size distribution
- Refractive index
- Single scattering albedo
- Phasefunction
- Water vapor
- Spectral flux
- Radiative forcing

In-water optical measurements

WetStar fluorometer
CDOM absorption
Chlorophyll-a
Uranine
Phycocerythrin

Automatic winch controller
keeps cage at a constant depth

ACs (80 wavelengths)
Total absorption
Total attenuation

WQM
Temperature
Salinity
Depth
Dissolved oxygen
Turbidity
Back scattering
Chlorophyll fluorescence

DAPCS
Network enabled
real-time data
logger

BB9 (9 wavelengths)
Back-scattering

ACs switching unit
(filtered/unfiltered)

Fortnightly servicing and water sampling



Level 2 validation

Focus on radiometric measurements
Lucinda Jetty, Ship-borne



SeaPRISM AERONET-OC



DALEC



Lucinda Jetty Coastal Observatory



Hyperspectral measurements (DALEC) added to Lucinda in May
Funding secured to continue radiometric measurement under IMOS until June 2017
Anticipated +5 years until 2022

Level 2 validation

Focus on radiometric measurements

Lucinda Jetty, Ship-borne



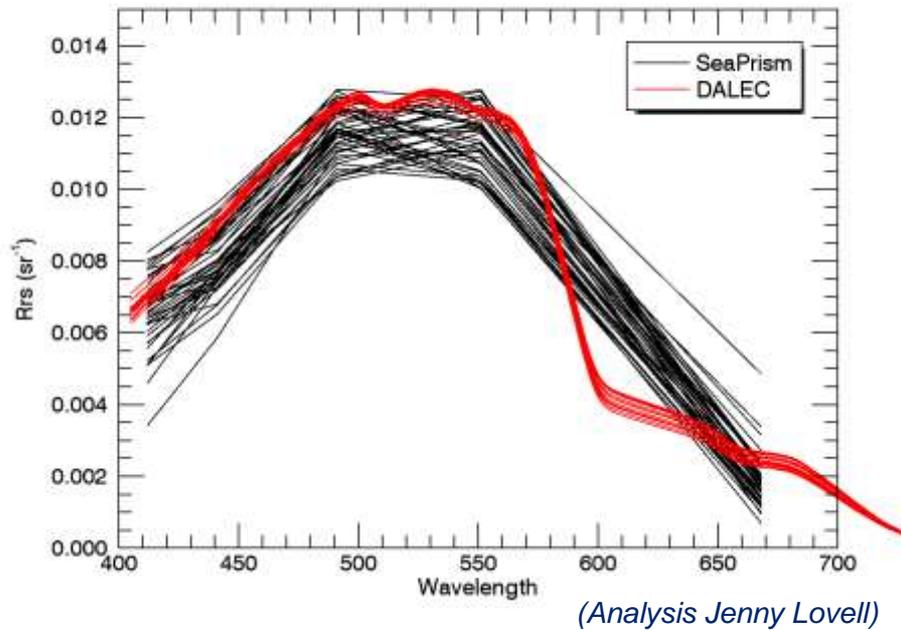
SeaPRISM AERONET-OC



DALEC

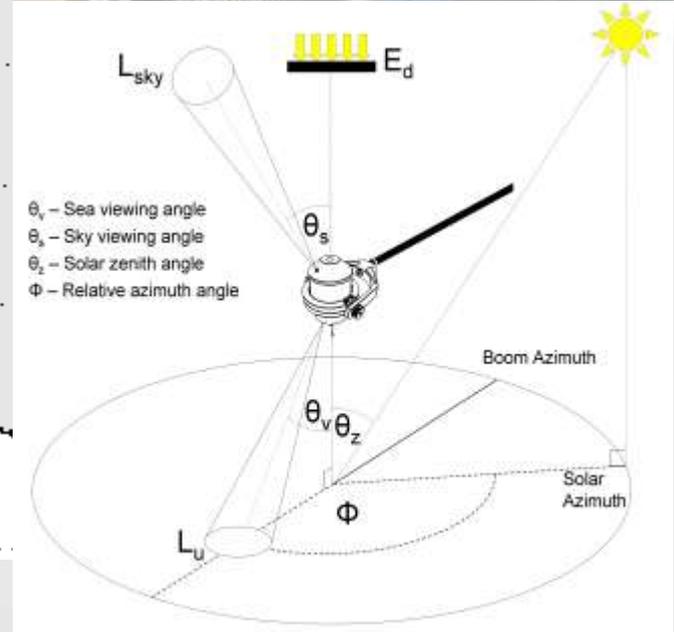
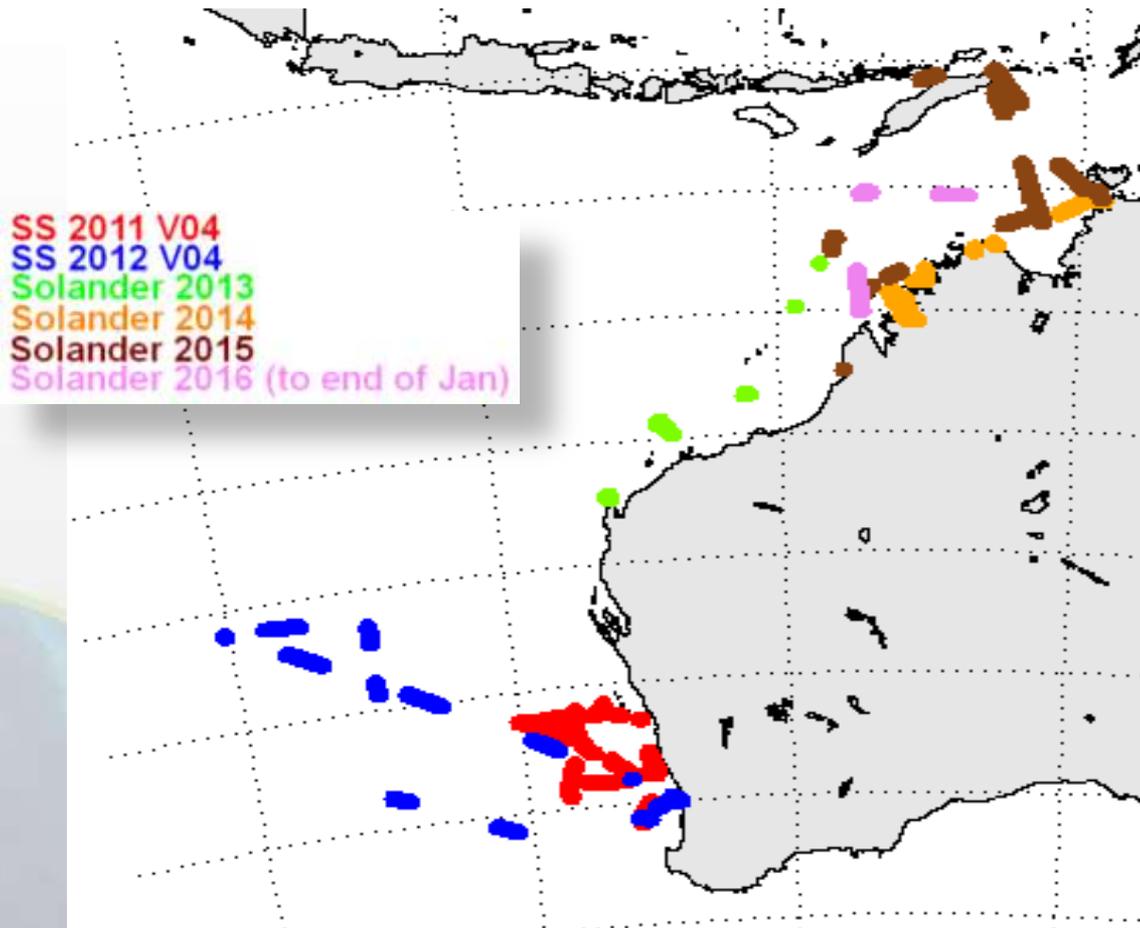


Radiometric Inter-comparison started ...
Dedicated Task Team – incl. lab calibrations
and community owned instruments



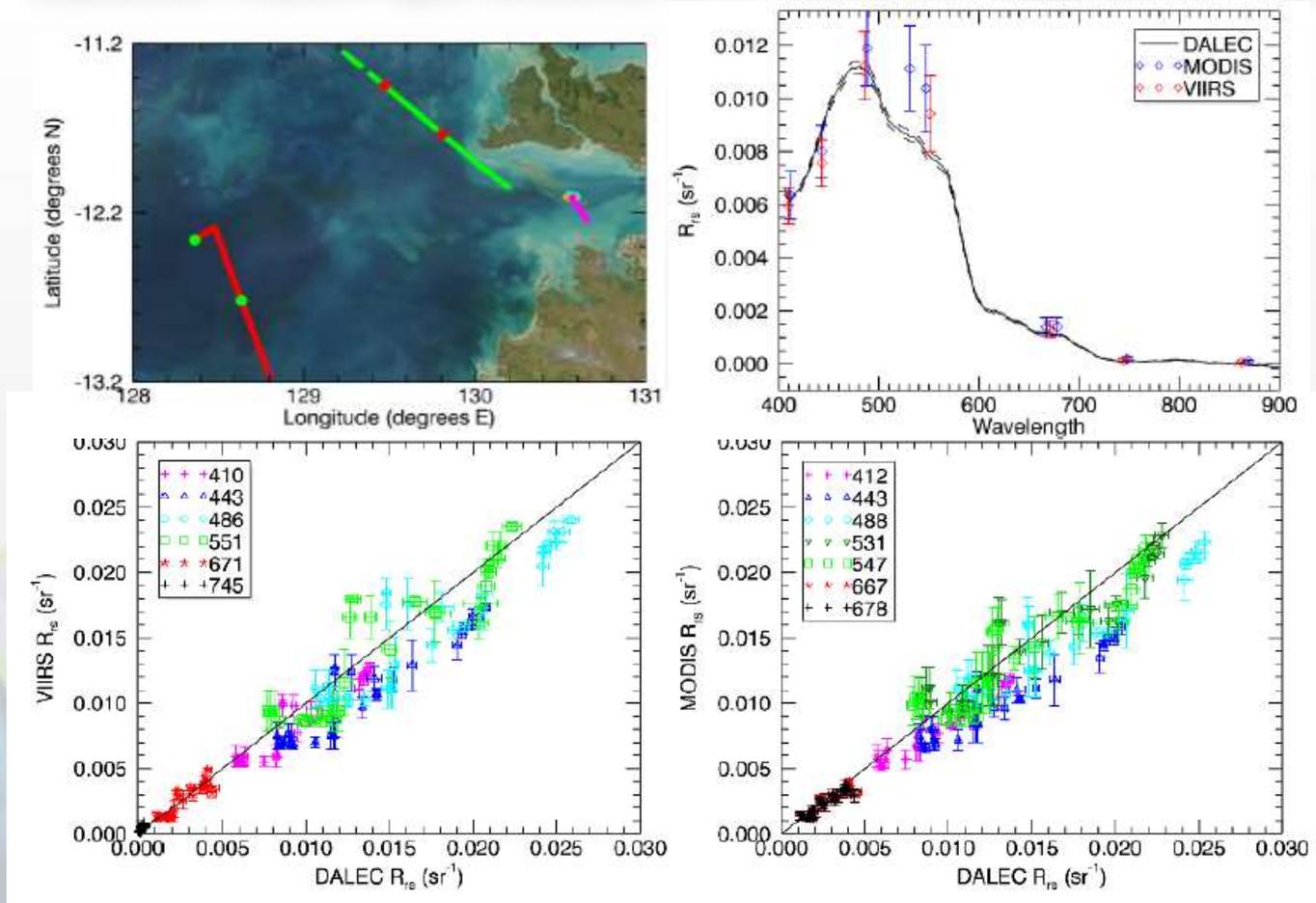
Hyperspectral measurements (DALEC) added to Lucinda in May
Funding secured to continue radiometric measurement under IMOS until June 2017
Anticipated +5 years until 2022

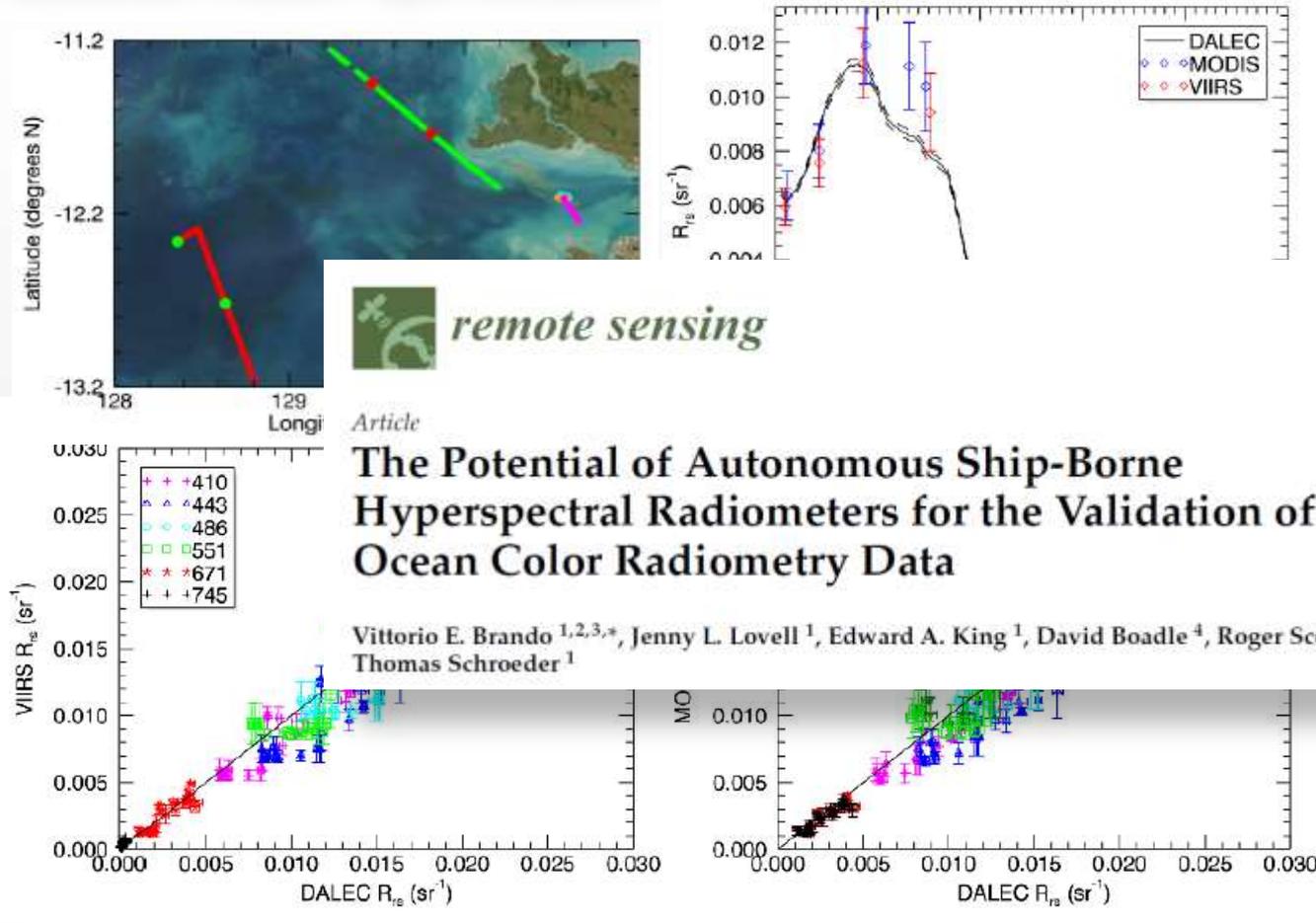
Continuous ship-borne above-water



DALEC - Continuous above-water radiometry

Satellite match-ups MODIS and VIIRS 24 May 2015 – Beagle Gulf





Article
The Potential of Autonomous Ship-Borne Hyperspectral Radiometers for the Validation of Ocean Color Radiometry Data

Vittorio E. Brando^{1,2,3,*}, Jenny L. Lovell¹, Edward A. King¹, David Boadle⁴, Roger Scott¹ and Thomas Schroeder¹

<https://portal.aodn.org.au/>

AODN Open Access to Ocean Data
Australian Ocean Data Network

IMOS
Integrated Marine
Observing System

All optical measurements online at:

AODN Portal

"The gateway to Australian marine and climate science data"

Get Ocean Data Now

NCRIS
National Research
Infrastructure for Australia
An Australian Government Initiative

 **UNIVERSITY of TASMANIA**



IMOS OceanCurrent

The latest ocean information
around Australia

The **AODN Portal** provides access to all available Australian marine and climate science data and provides the primary access to IMOS data including access to the IMOS metadata.

IMOS is a national collaborative research infrastructure, supported by Australian Government. It is led by **University of Tasmania** in partnership with the Australian marine & climate science community.

Contact [☞](#) Acknowledgement [☞](#)
Disclaimer [☞](#) AODN [☞](#) IMOS [☞](#)
Contributing [☞](#)

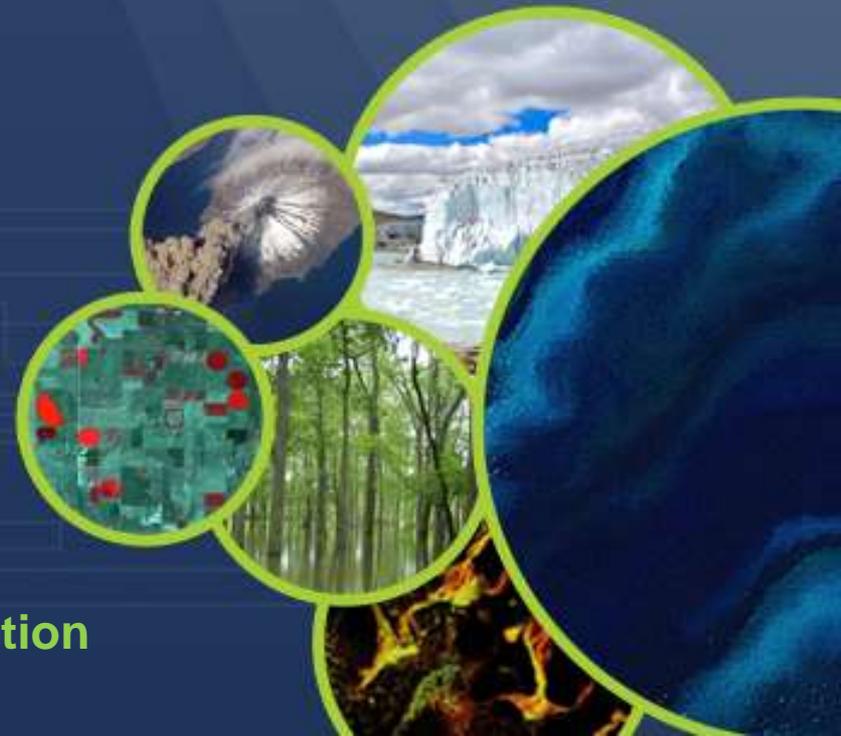
- Laboratory
- Relative
- Field at Lucinda Jetty



CSIRO Oceans
and Atmosphere
Business Unit

- Tim Malthus
- Research Group Leader
 - o t +61 7 3833 5583
 - o E tim.malthus@csiro.au
 - o W www.csiro.au

Thank you

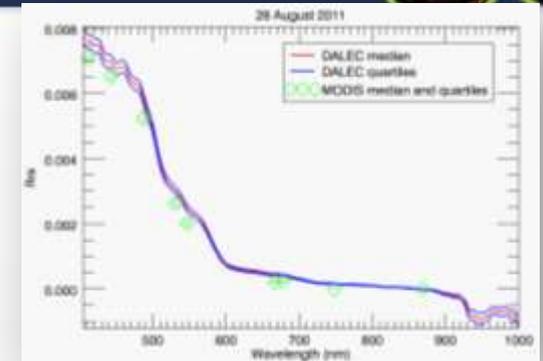


Working Group on Calibration and Validation

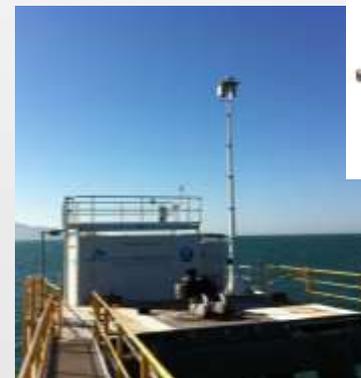


IMOS activities

- Lucinda Jetty Coastal Observatory – Southern hemisphere vicarious aquatic cal-val site – now fully re-instated
- Ship mounted DALEC radiometers
- <http://imos.aodn.org.au/webportal/>



Dalec v MODIS comparison





AusCover Good Practice Guidelines

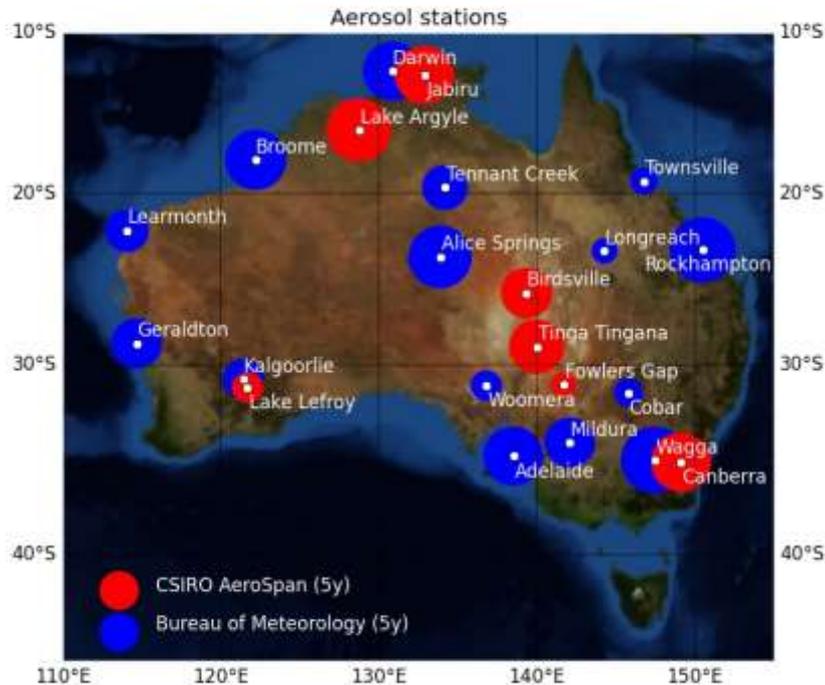
A technical handbook supporting calibration and validation activities of remotely sensed data products



Version 1.2
December 2015

www.auscover.org.au

- <http://www.auscover.org.au/node/227>



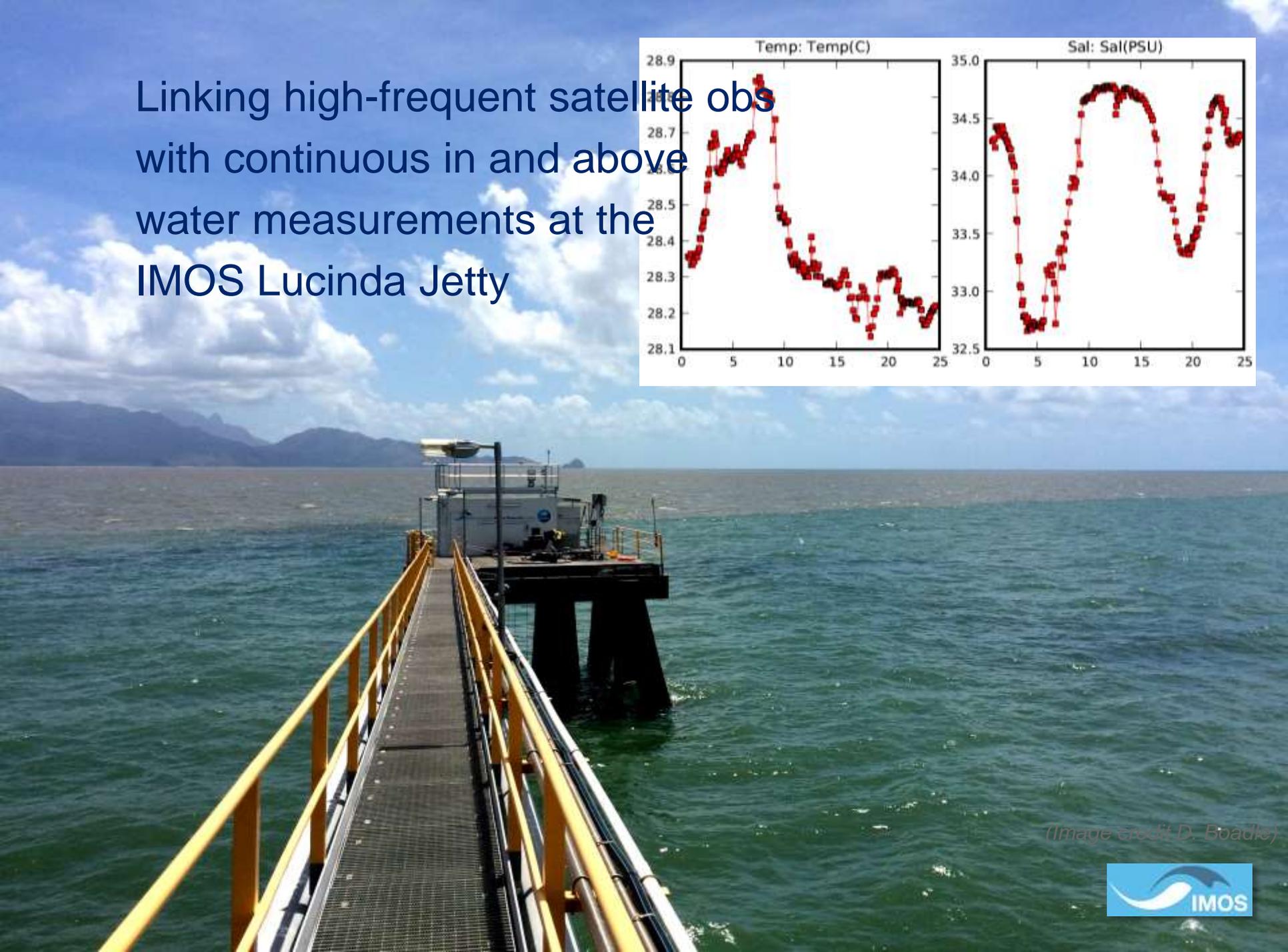
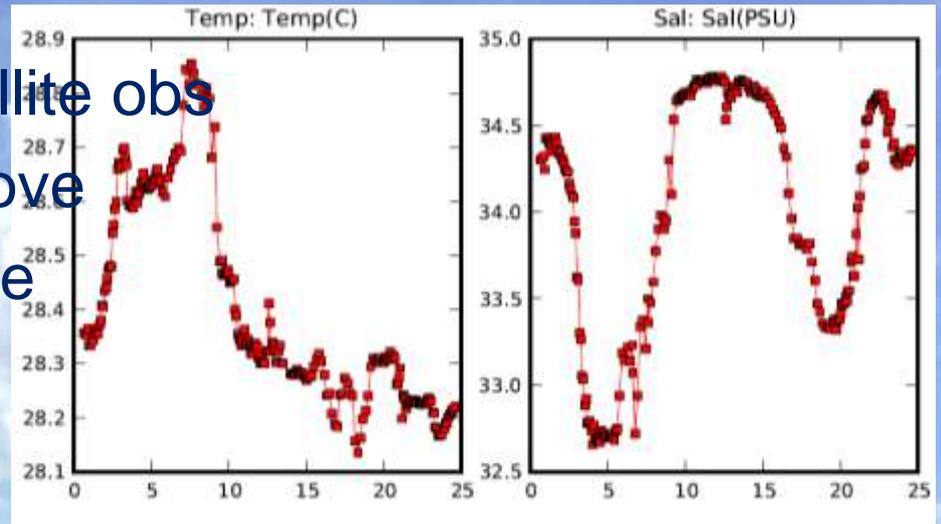
- Ross Mitchell, Susan Campbell – CSIRO
- Bruce Forgan – Bureau of Meteorology

Bureau stations:
Aligned with WMO/GAW

CSIRO Stations:
AeroSpan-federated with
NASA 's AERONET

WMO/GAW: World Meteorological Organisation / Global Atmospheric Watch
 AeroSpan: Aerosol characterisation via Sun Photometry: Australian Network
 AERONET: Aerosol Robotic Network (NASA/GSFC)

Linking high-frequency satellite observations with continuous in and above water measurements at the IMOS Lucinda Jetty



(Image credit D. Boadle)

