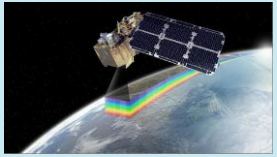
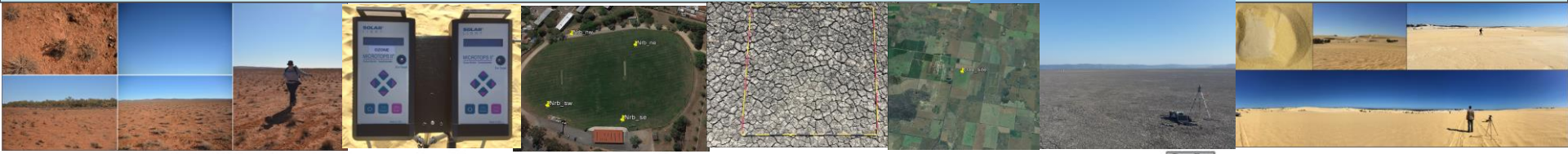
Australian Government
Geoscience Australia

Continental Validation of Digital Earth Australia's Landsat and Sentinel-2 Surface Reflectance Products

Medhavy Thankappan, Guy Byrne, Andrew Walsh, Fuqin Li,

Tim Malthus, Cindy Ong, Ian Lau, Peter Fearns





Team members and reviewers

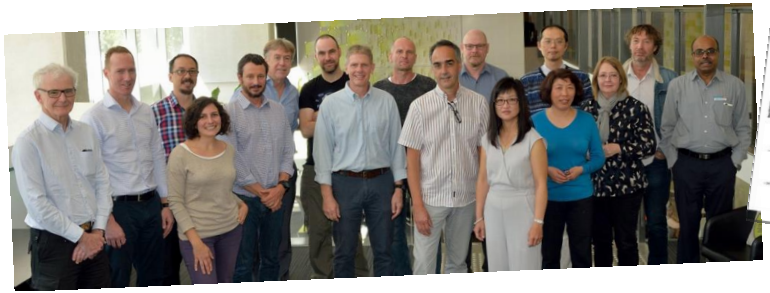
Janet Anstee
Hannalie Botha
Anjea Byrne
Mike Caccetta
Alicia Caruso
Laurie Chisholm
Ken Clarke
Claire Fisk
Erin Kenna
Fuqin Li
Stefan Maier
Glenn Newnham
Simon Oliver
Peter Scarth
Neil Sims
Kylie Smith
Liam Stephen
Lola Suarez
Dan Tindall
Lan-Wei Wang

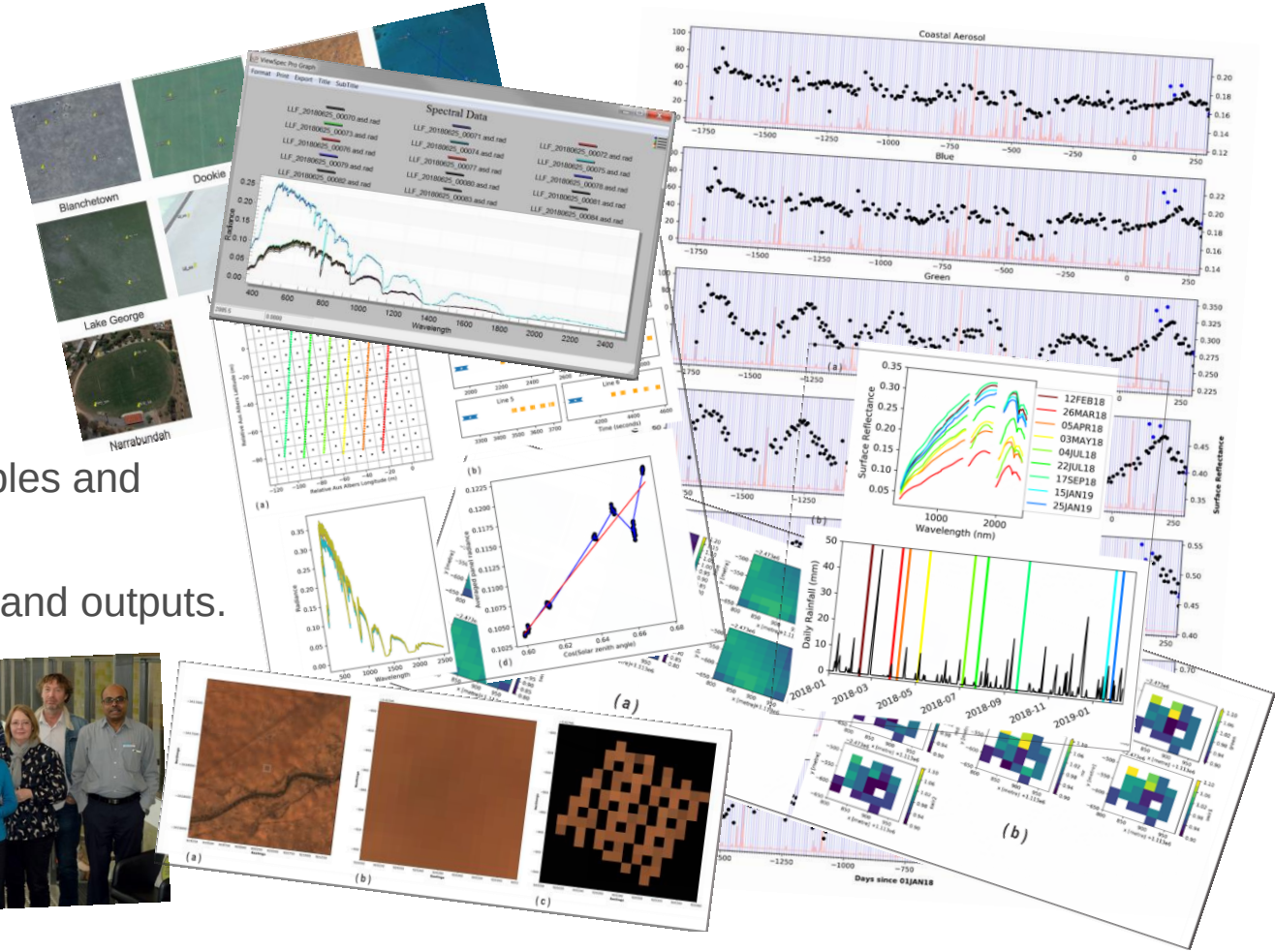
Reviewers:

Dennis Helder
Chris Maclellan
Kurt Thome
Stuart Phinn
Andreas Hueni
David Jupp

Quick overview

- Why this project?
- What we sampled.
- Description of the sites.
- Collection summary.
- Some interesting examples and future options.
- Summary of the results and outputs.





Project Background - analysis ready .. what ?

Validation in the context of this project was defined as ;

‘ the acquisition of surface reflectance data and associated supporting data to establish the quantitative accuracy of the DEA standard surface reflectance product’

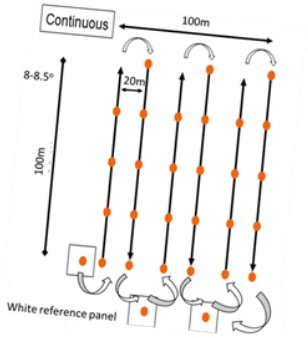
Try telling young people today how much time we spent hammering data into shape … just so you could do some analysis .. *and they wont believe you !*

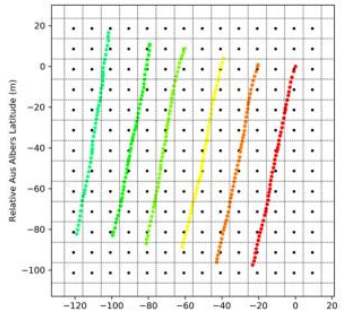
‘The advent of ARD data and ODC has revolutionised the science of Earth Observation.

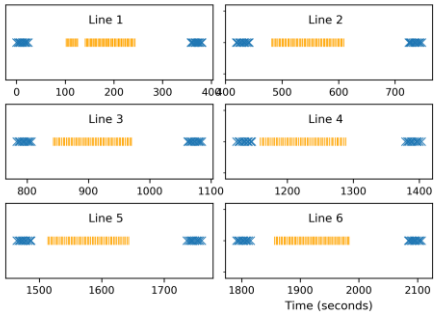
Geoscience Australia sees this project as an opportunity to establish meaningful benchmarks surrounding the performance of various ARD processing models.

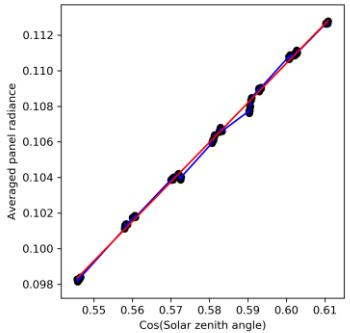
What we did … field sampling protocol

- All instruments and panels were characterised by CSIRO
- Used 100x100 metre sites, containing 6-11 transects lines with the orientation was based on the solar azimuth.
- At *time of overpass* took atmospheric readings with either micro tops or ASD RCR (diffuse and direct).
- Each transect was bookended by panel readings .. then ‘smearing’ the transect (xbar of 20 x ~30 scans) per line
- Protocol includes monitoring asd‘ wavelength calibration
- All data captured as radiances

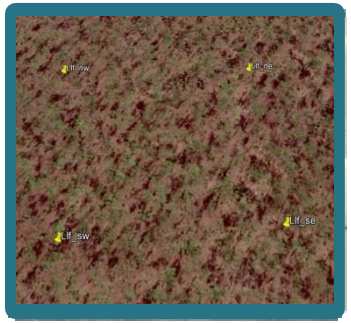






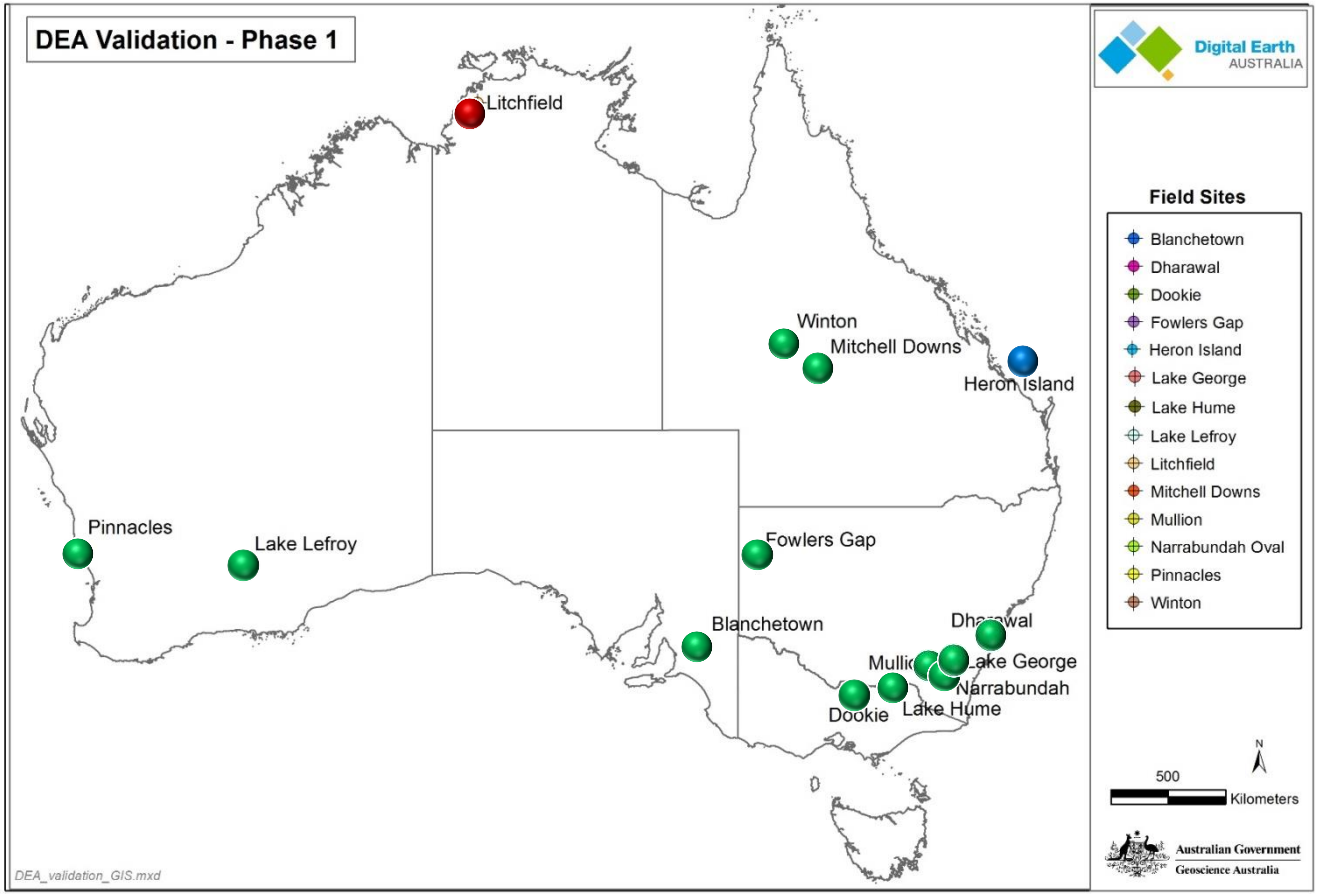


Validation sites



Surface types

- ‘mostly’ level
- bare or low vegetation
- spectrally homogeneous
- Tried to make them spectrally diverse



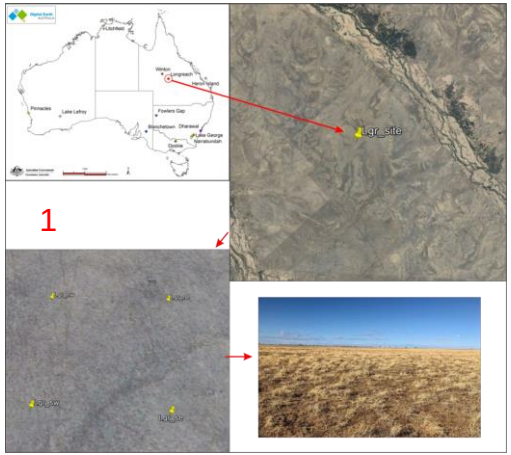
52 individual overpasses, multiple dual overpasses, and sampling events temporally offset from overpasses, trial UAS acquisition and two water sites.

Weather, **site proximity**, **site trafficability, equipment readiness** and **staffing** all impacted on the number of actual opportunities to deploy.

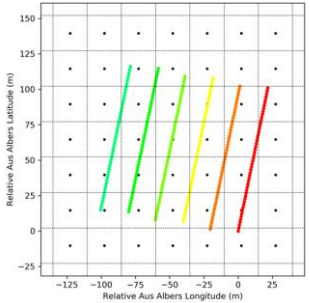
Collection Summary

	Site	Count	L8	S2A	S2B
1	Blanchetown - SA	1		1	
2	Dharawal - NSW	1	1		
3	Dookie - VIC	5	2	2	1
4	Fowler's Gap - NSW	2	1	1	
5	Heron Island - QLD	1		1	
6	Lake George - NSW	10	2	3	5
7	Lake Hume - NSW	1	1		
8	Lake Lefroy - WA	2	1	1	
9	Litchfield - NT	1		1	
10	Longreach - QLD	6	2	2	2
11	Narrabundah - ACT	4	1	2	1
12	Mullion - NSW	2		1	1
13	Pinnacles - WA	10	3	5	2
14	Winton - QLD	6	2	2	2
	Total	**52**	**16**	**22**	**14**

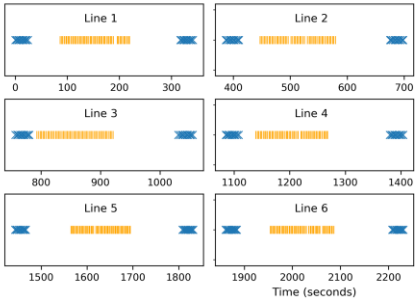
Example: Mitchell Downs – dual L8 and S2A overpass



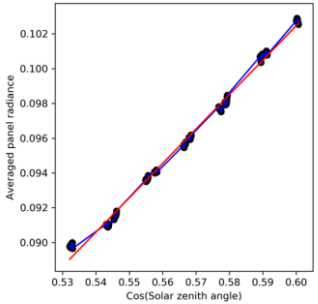
2

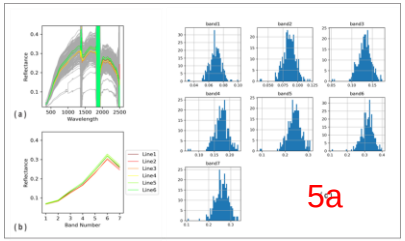


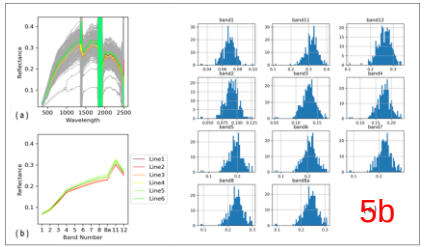
3

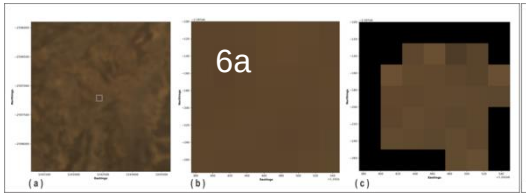


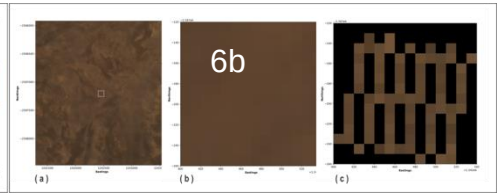
4



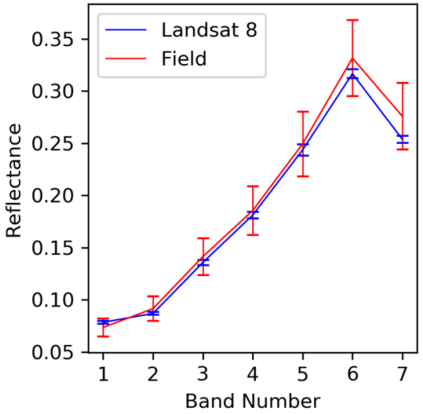




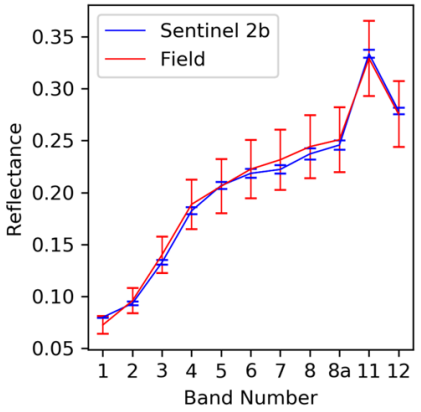




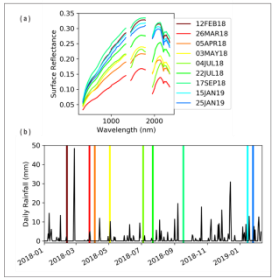
7a

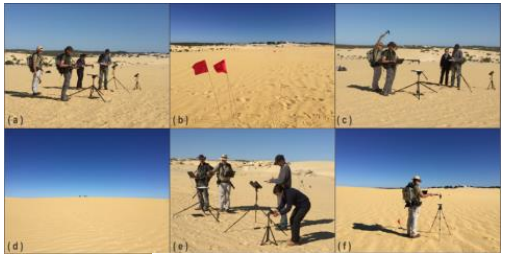


7b

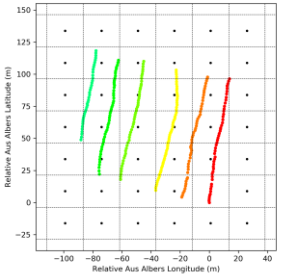


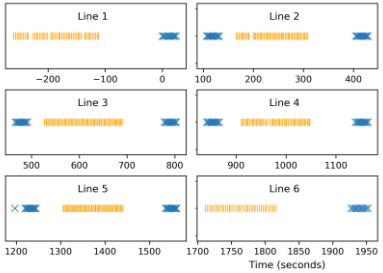
Example: Pinnacles dual sampling 20th May 2018 Landsat 8

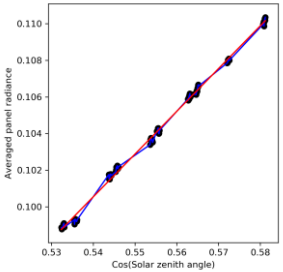


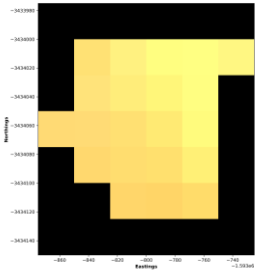


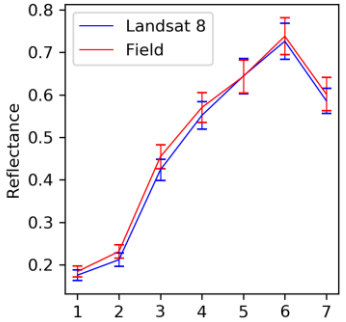
CSIRO



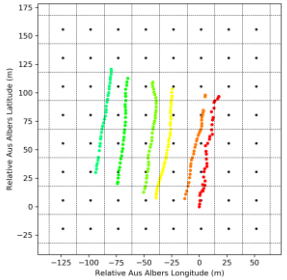


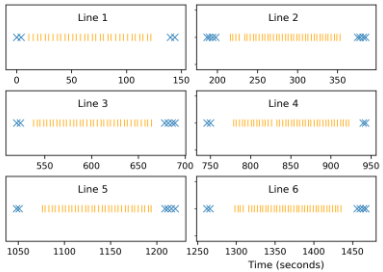


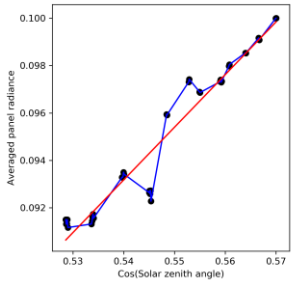


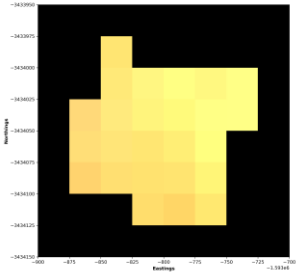


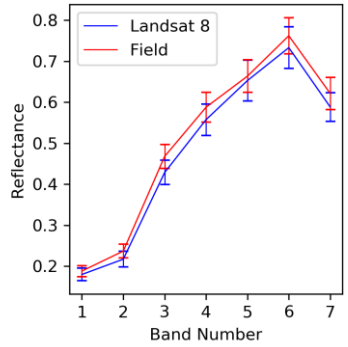
GA



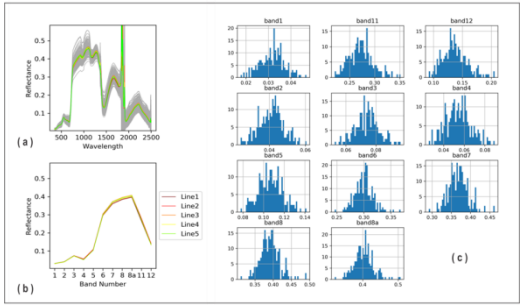


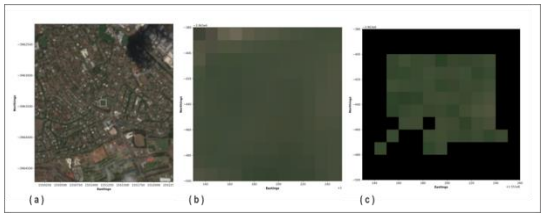


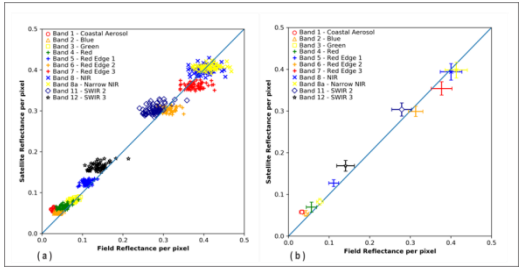




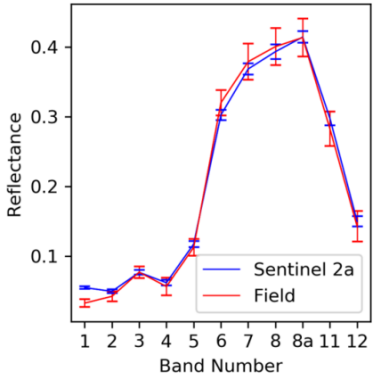
Sites of convenience ... Narrabundah Oval (invariance)

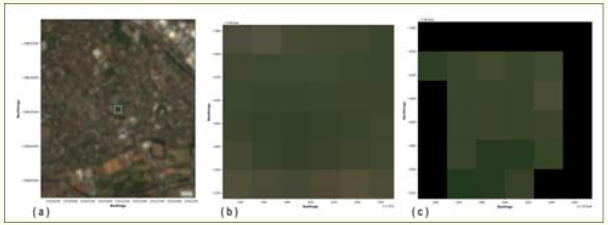


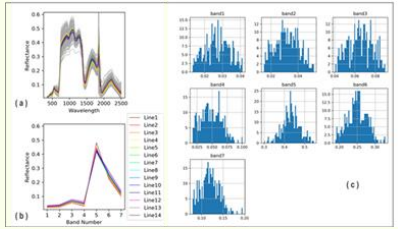


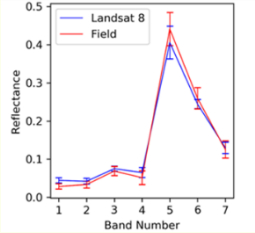


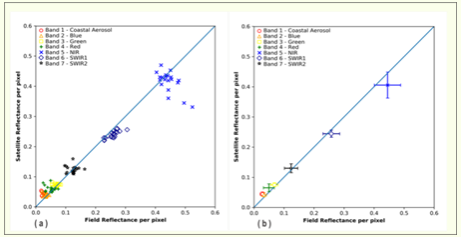
4 day offset





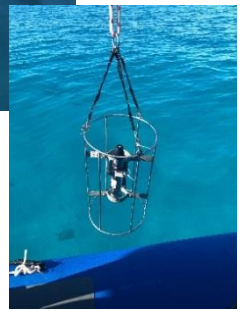


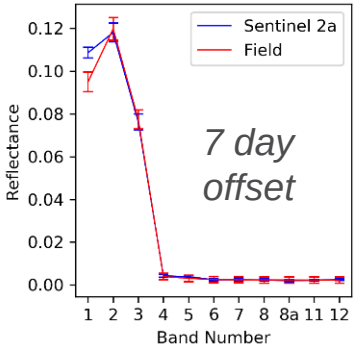


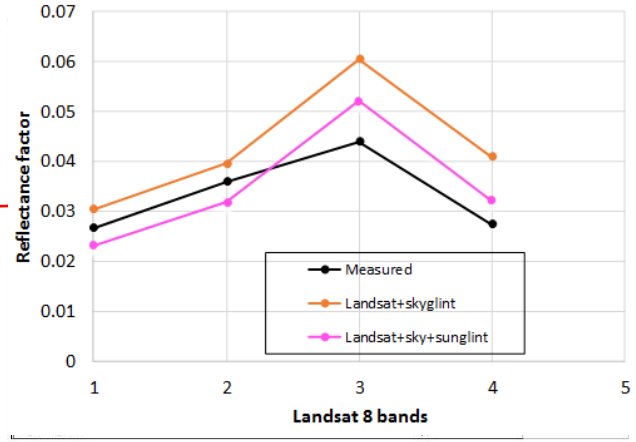


Work in progress … measuring water targets (Trios Ramses)

Heron Island





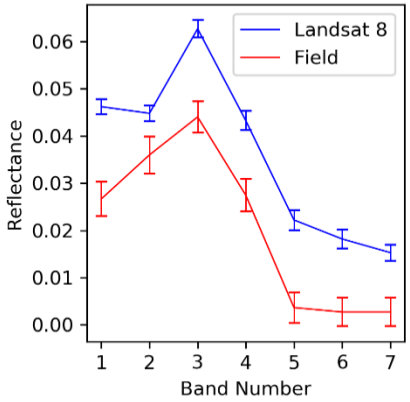


Nadir sampling

45 deg sampling

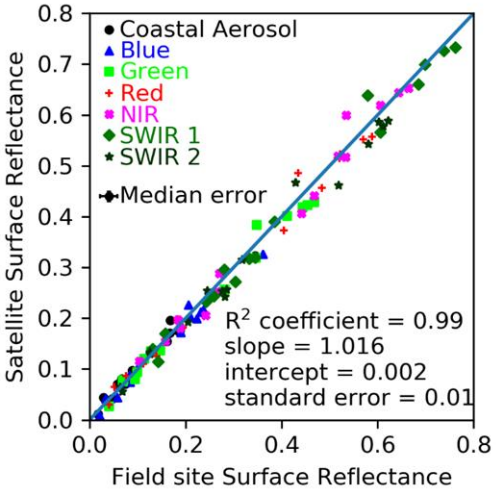
The results from Lake Hume are only indicative with new AOT model water leaving radiance coefficients still to be applied to the Ramses data

Lake Hume

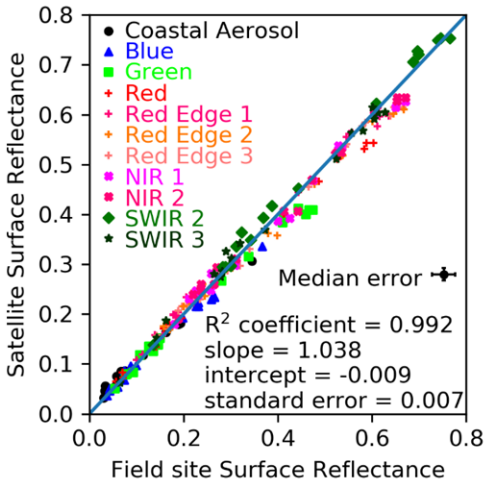


Results Summary - 52 coincident overpasses

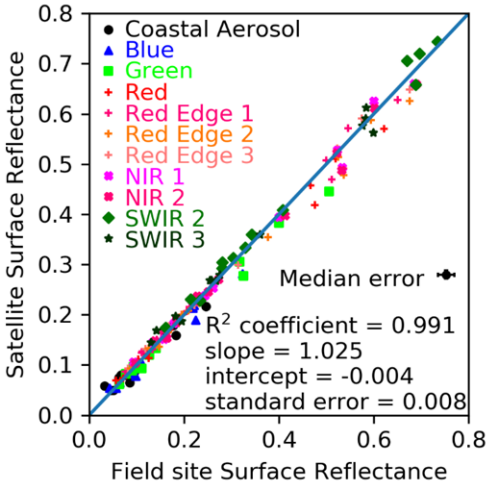
Landsat 8



Sentinel-2A



Sentinel-2B



Across all sites and averaged over all bands from the three sensors these results suggest the DEA SR is validated to a level of 10 %

Summary of Project Outcomes

- ✓ Successful validation of DEA SR products
- ✓ Community Guide to standardised validation techniques of SR data
- ✓ Full Data Summary and
- ✓ Final Science Report
- ✓ All validation data will be uploaded to National Spectral Database

Thank you

Questions ?