



Field-based Validation of the Digital Earth Australia Sentinel-2 Surface Reflectance Product

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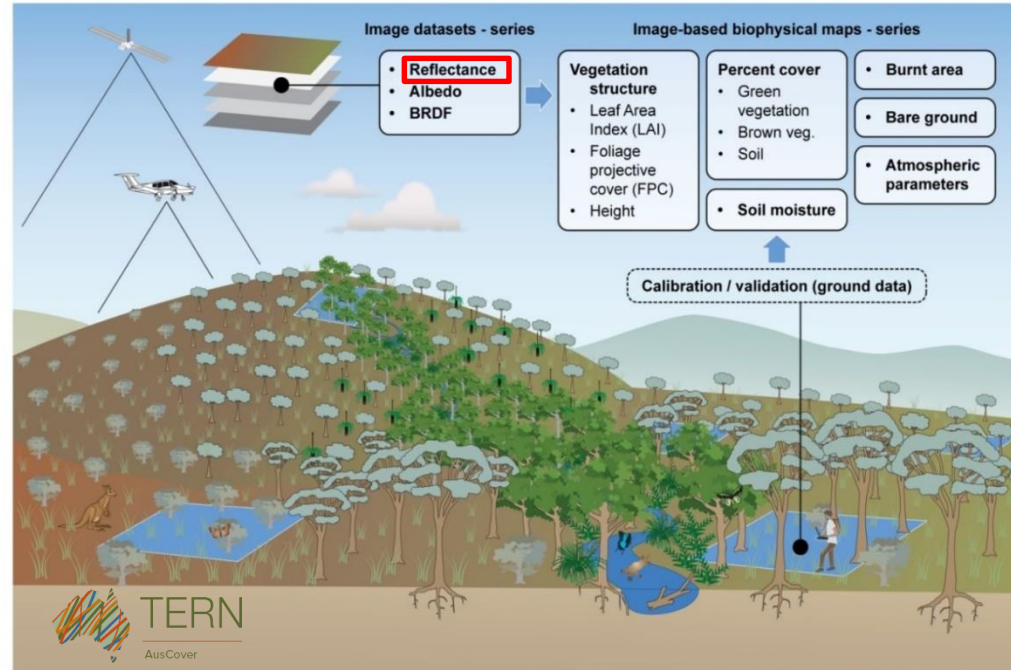
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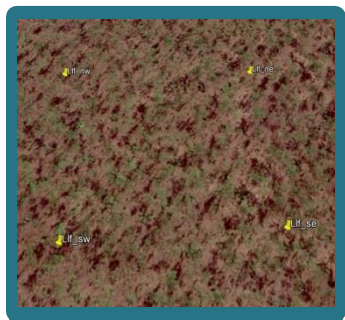


Project background

- Field data collection for continental scale validation of surface reflectance
- Coordinated by CSIRO under a Project Agreement, funded through Digital Earth Australia (DEA)
- Field data acquisition, near-coincident with satellite overpass (L8, S2a, S2b), from March 2018 to June 2019 – Phase 1
- Phase 2 to cover more complex sites
- Field based validation using best practice protocols seen as critical to ensure generation of consistent multi-sensor ARD products (e.g. surface reflectance)
- Reliability, consistency of downstream products, user confidence and uptake

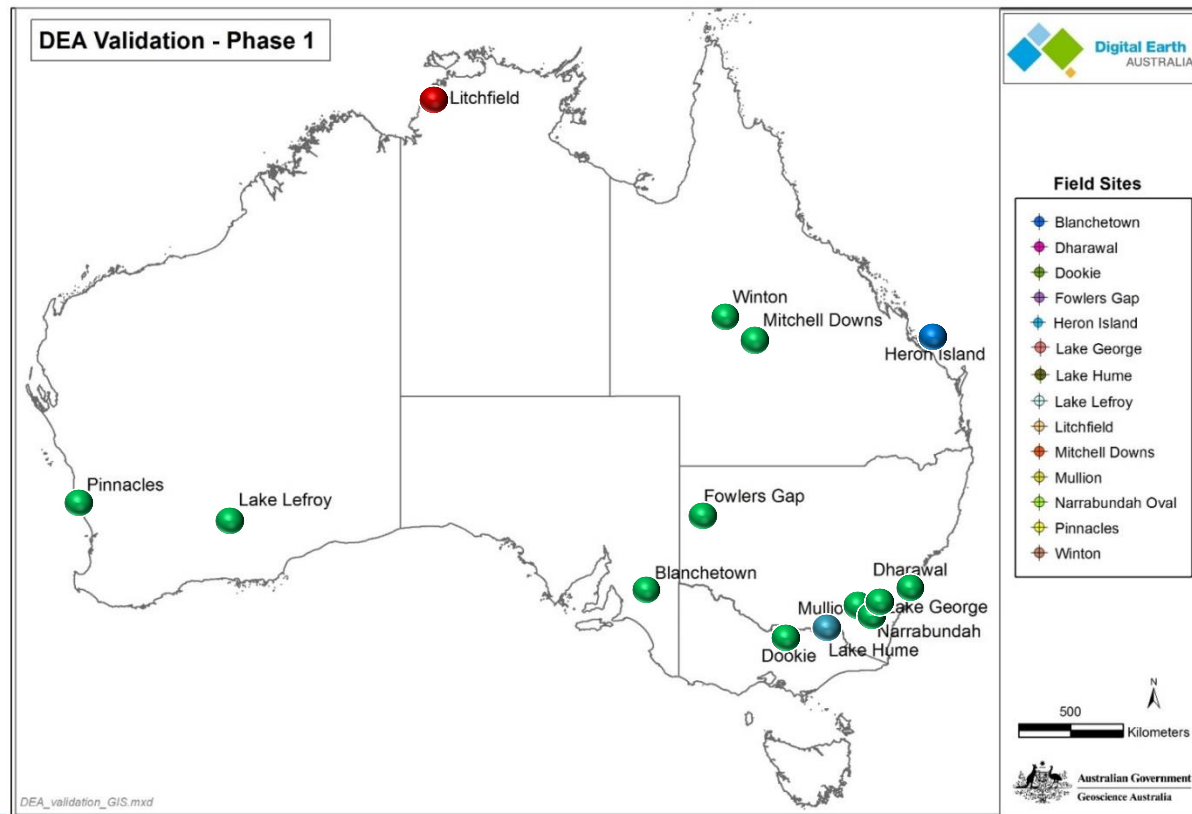


Phase 1 surface reflectance validation sites



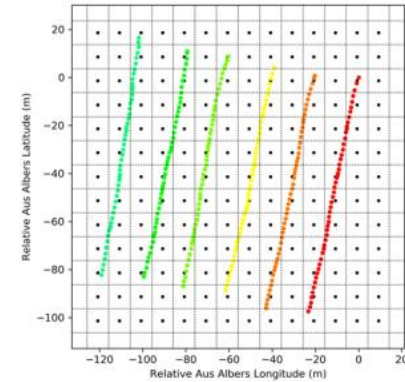
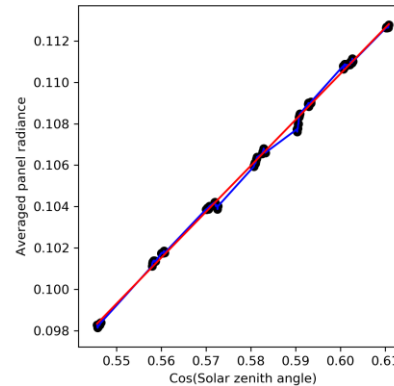
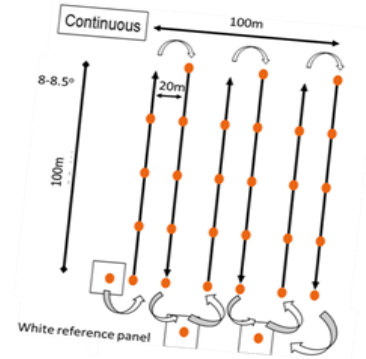
Surface types

- 'mostly' flat
- bare or low vegetation
- homogeneous
- spectrally diverse



Field sampling protocols

- All instruments / reference panels characterised by CSIRO
- 100 x 100m sites for field measurements
- 6 transects in each site
- Atmospheric readings coincident with overpass using MicroTops or ASD Spectroradiometers
- Transects bookended by panel readings
- Field validation protocols documented



Phase 1 field data collection status

CSIRO CENTRE FOR EARTH OBSERVATION
www.csiro.au



A community approach to the standardised validation of surface reflectance data

Final Project report – June 2019

Tim J Malthus, Cindy Ong, Ian C Lau, Peter Fearn

30th June 2019

Report for Digital Earth Australia, Geoscience Australia



Total field data acquisitions at all sites

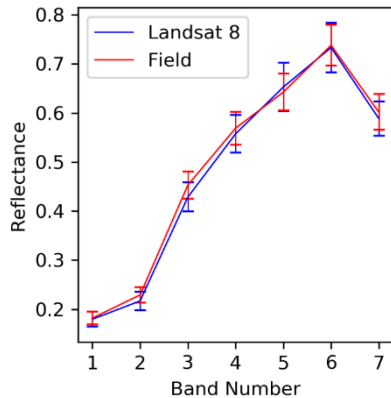
	Site	Count	L8	S2A	S2B
1	Blanchetown - SA	1		1	
2	Dharawal - NSW	1	1		
3	Dookie - VIC	5	2	2	1
4	Fowler's Gap - NSW	2	1	1	
5	Heron Island - QLD	1		1	
6	Lake George - NSW	10	2	3	5
7	Lake Hume - NSW	1	1		
8	Lake Lefroy - WA	2	1	1	
9	Litchfield - NT	1		1	
10	Longreach - QLD	6	2	2	2
11	Narrabundah - ACT	4	1	2	1
12	Mullion - NSW	5	1	2	2
13	Pinnacles - WA	10	3	5	2
14	Winton - QLD	6	2	2	2
	Total	55	17	23	15

More details on the validation approach at Cindy Ong's talk on Thursday

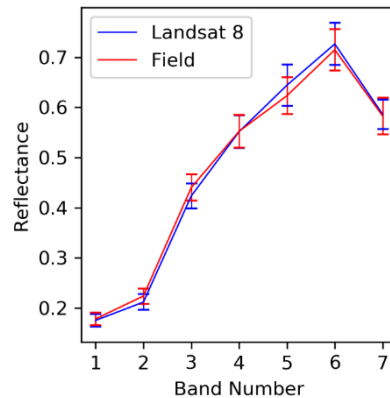
Coincident measurements with two spectroradiometers

- Coincident measurements with two instruments at Pinnacles site
- Landsat 8 overpass on 20 May 2018
- Sentinel-2A overpass on 22 May 2018

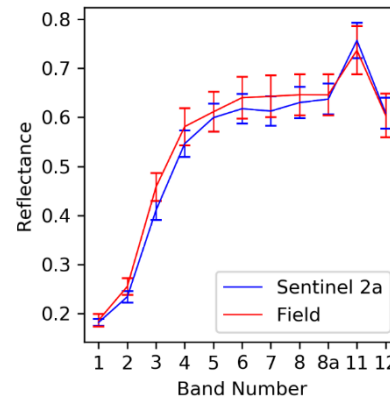
GA ASD



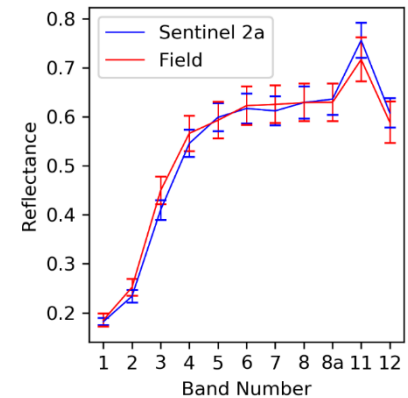
CSIRO ASD



GA ASD

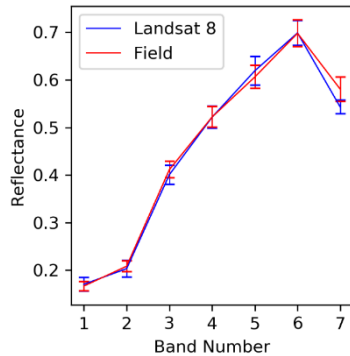


CSIRO ASD

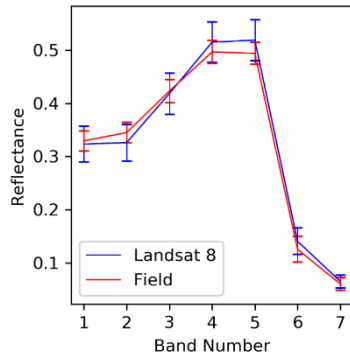


Validation for simultaneous L8 / S2 overpasses

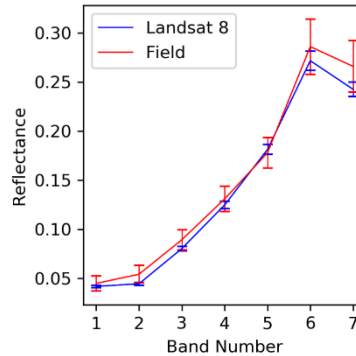
Pinnacles 2 April 2018



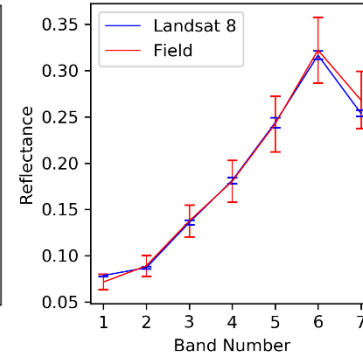
L. Lefroy 25 June 2018



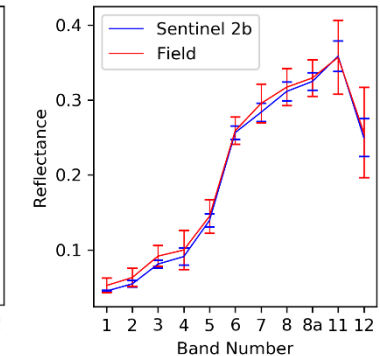
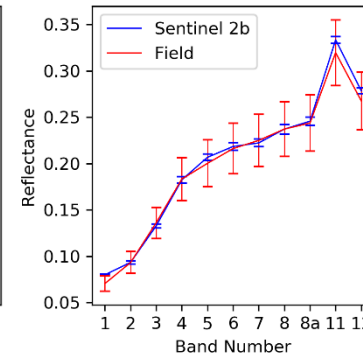
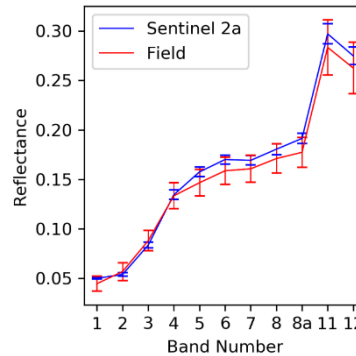
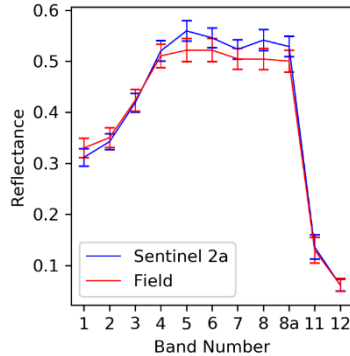
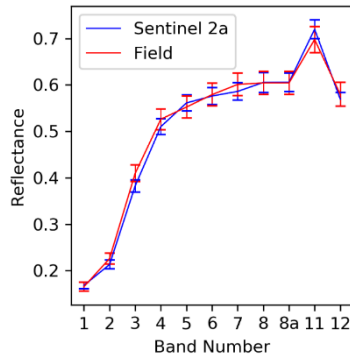
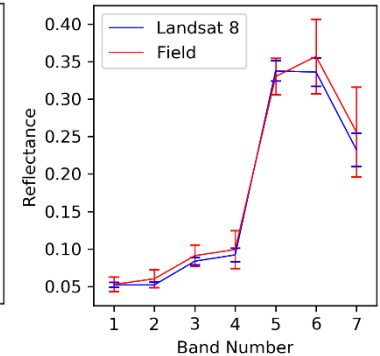
Dookie 2 June 2018



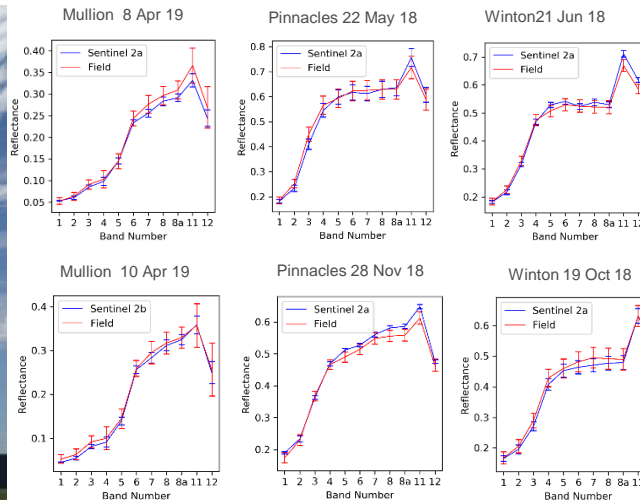
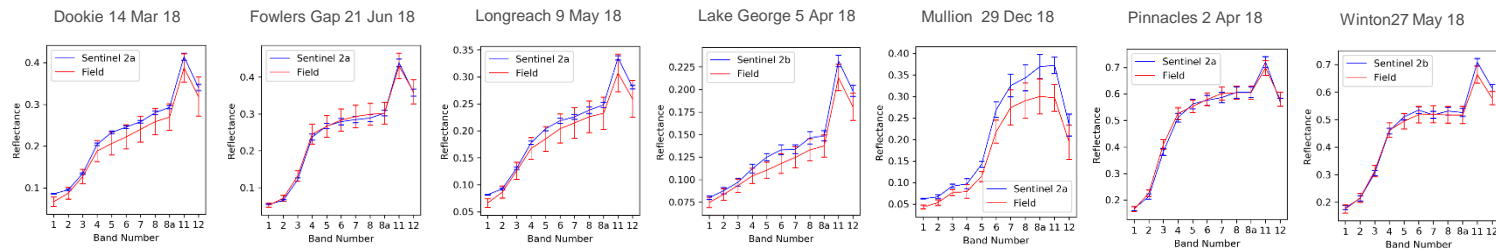
Longreach 23 June 2018



Mullion 10 April 2019

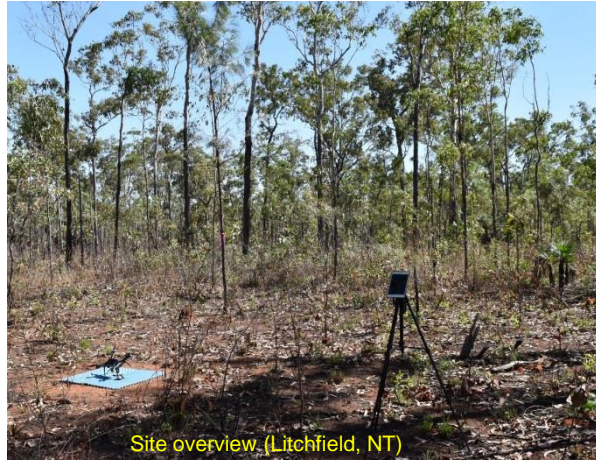
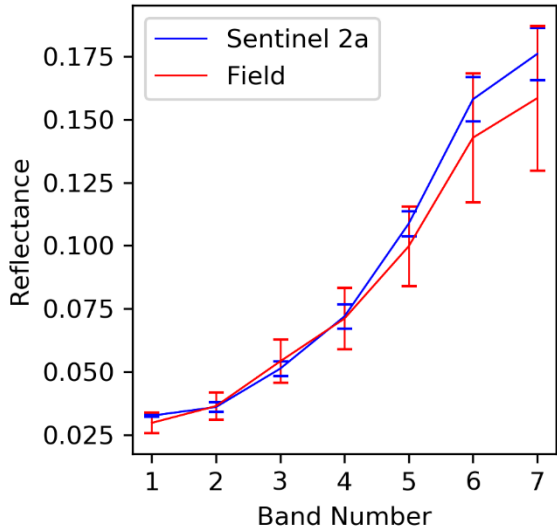


Temporal measurements for Sentinel-2



Drone based validation at Litchfield

Drone based spectral data collection trial over Litchfield site, synchronous with a Sentinel-2A overpass

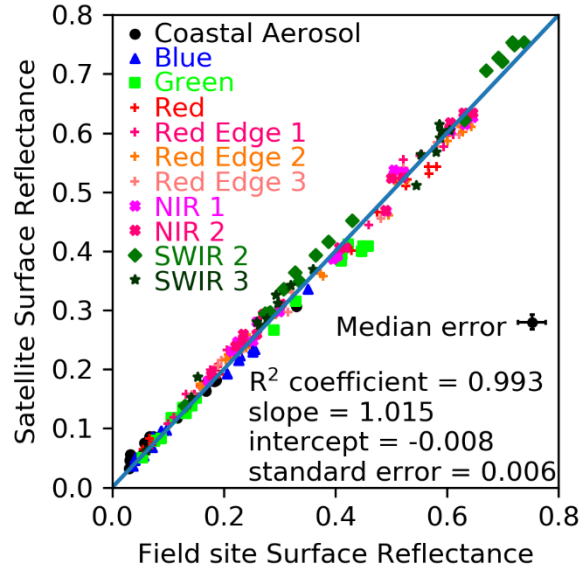


Miniature Spectrometer

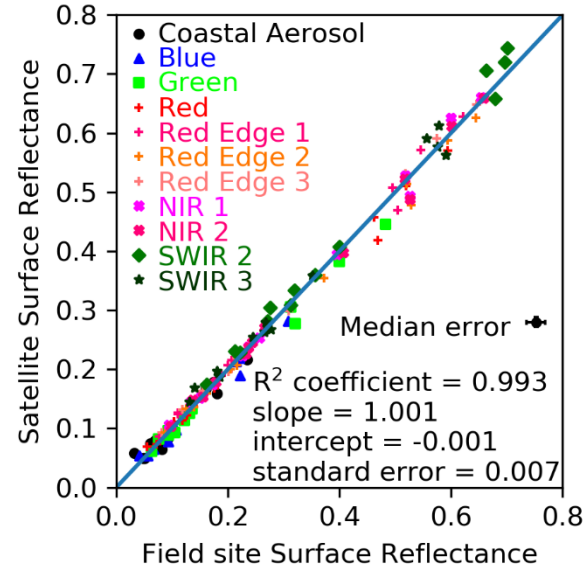


Field validation summary results for Sentinel-2

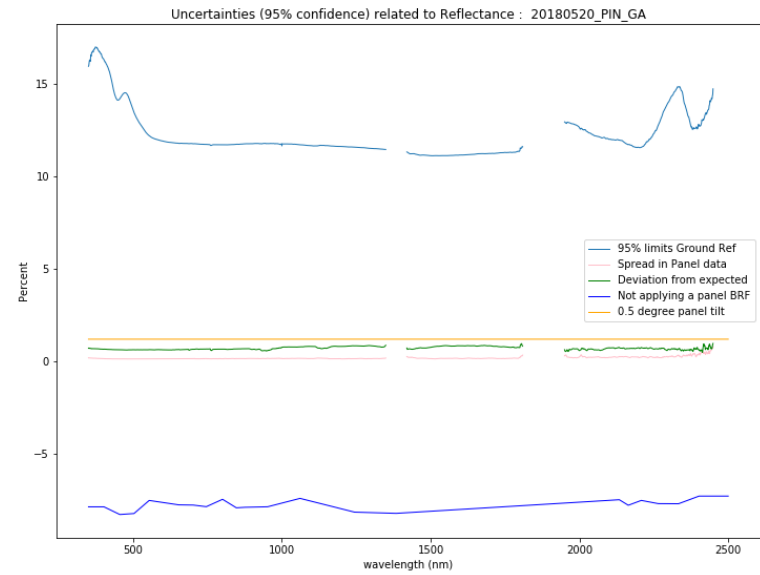
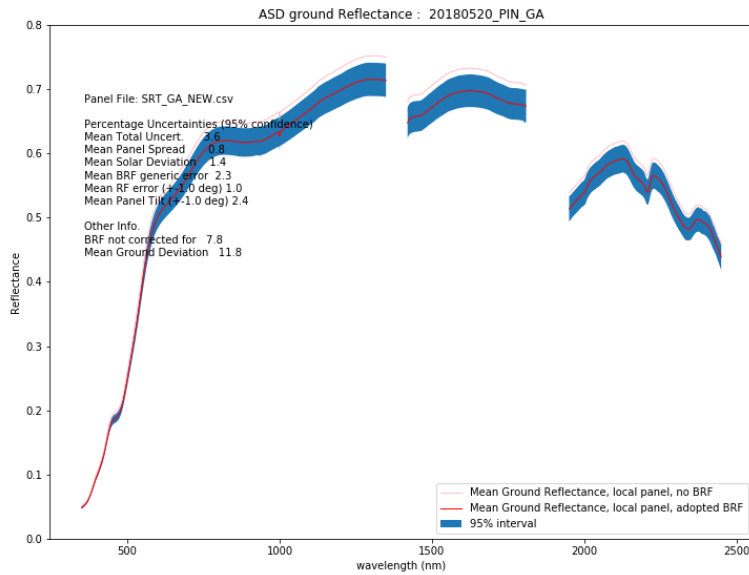
Sentinel-2A



Sentinel-2B



Traceable measurement uncertainties



Phase 2 validation of surface reflectance

Scoping for Phase 2 has commenced; use of instrumented sites and automation for data over complex sites

Training to fly UAS completed; UAS platform and payload acquired

Validation sites being determined; working with the USGS



Recent UAS field work

Tumbarumba
TERN supersite:
17-18 Sep 2019

UAS based
measurements:
hyperspectral,
LIDAR



TERN

SuperSites
Ecosystem Change Observatory



UNIVERSITY of
TASMANIA



Summary

Ongoing field based validation is critical to ensure consistency in generation of SR products from multiple sensors

Protocols developed for continental-scale field validation of SR, can be adapted for global use

Planning for Phase 2 SR validation is underway, synergies with USGS, CEOS LPV, IVOS, ESA FRM4VEG initiatives will be explored for collaboration



Australian Government
Geoscience Australia



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