Australian Government
Geoscience Australia

CEOS WGCV-38 Plenary
Agency Report: Geoscience Australia

Medhavy Thankappan

Earth Observation at GA

SECURING AUSTRALIA'S WATER RESOURCES

MANAGING AUSTRALIA'S MARINE JURISDICTIONS

PROVIDING FUNDAMENTAL GEOGRAPHIC INFORMATION

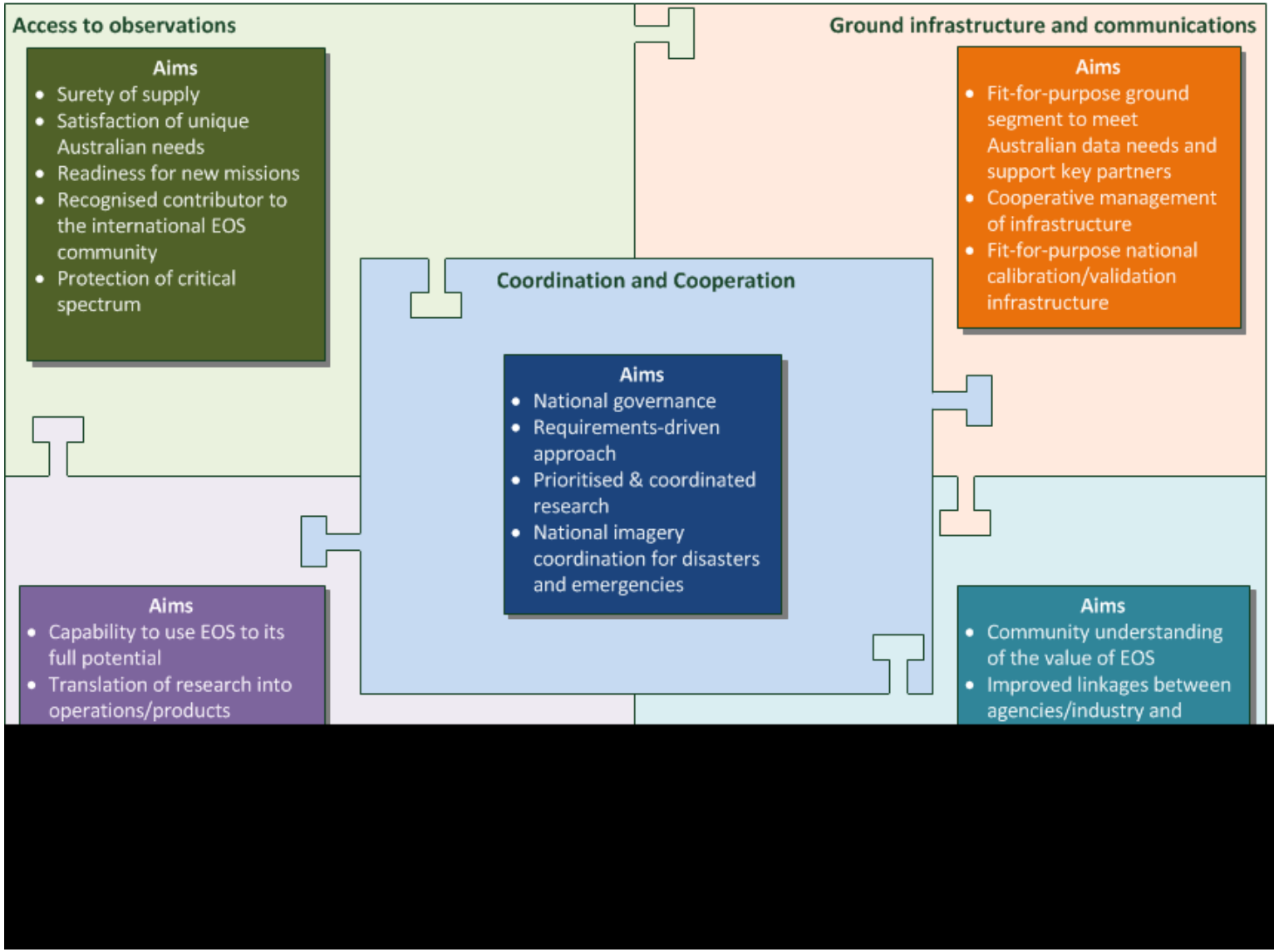
MAINTAINING GEOSCIENCE KNOWLEDGE AND CAPABILITY

BUILDING AUSTRALIA'S RESOURCE WEALTH

ENSURING AUSTRALIA'S COMMUNITY SAFETY

Strategy: Improve the frequency, reliability, quality and impact of Earth observations for Australia

National Earth Observations from Space Infrastructure Plan



Key Points

"A plan to maintain Australia's Earth observation infrastructure as fit-for-purpose"

- Endorsed by Government late 2013
- Key component of *Australia's Satellite Utilisation Policy*
- Recognises current, and potential, value of EOS to Australia
- Recognises Australia's dependence on international EOS
- Identifies five priority areas for action (see diag.)
- Provides a framework for alignment & prioritisation
- Development driven by community input
- Clarifies agency roles: BoM/CSIRO/GA
- Emphasises importance

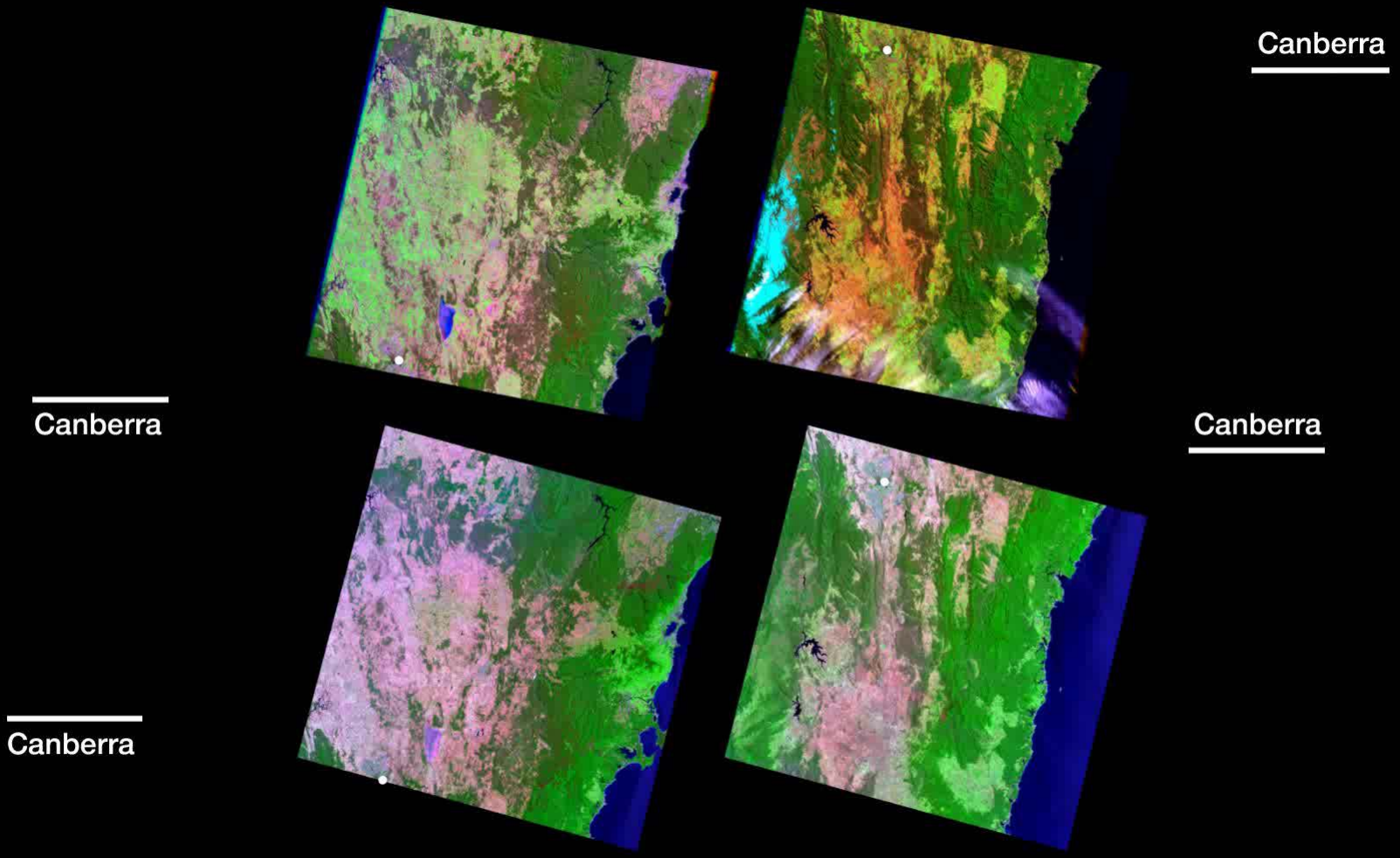
Australian Geoscience Data Cube

The Australian Geoscience Data Cube (AGDC) :

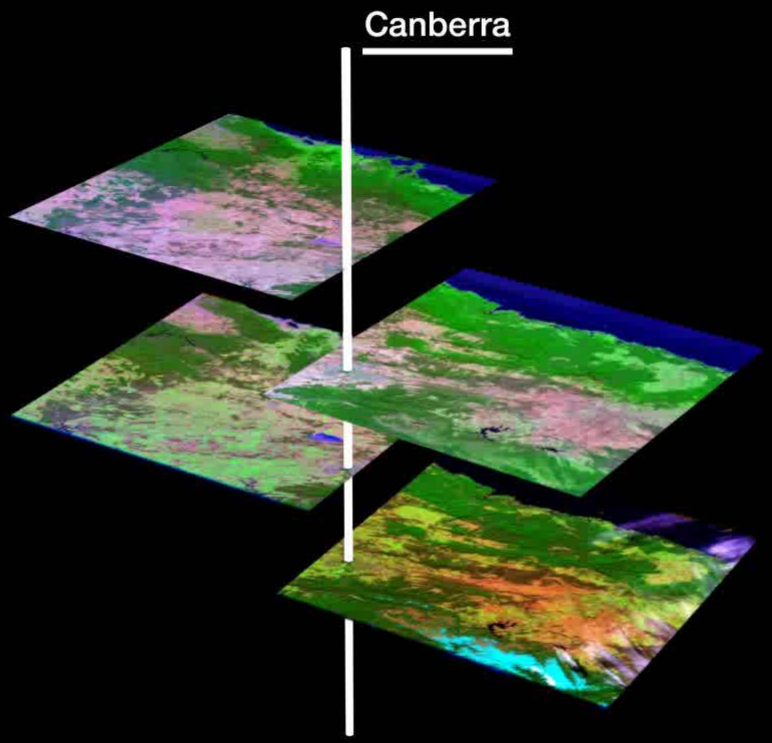
- is a partnership of Geoscience Australia (GA), Australia's National Computational Infrastructure (NCI), and the Commonwealth Science and Industrial Research Organisation (CSIRO)
- supports the management and quantitative analysis of massive volumes of Earth observation (EO) and other geoscientific data.
- EO data are calibrated to surface reflectance observations,
- organised as regular geographic tiles rather than scenes or images,
- co-located high performance data (HPD) and high performance compute (HPC)
- This approach positions the AGDC to become a sensor-independent system for management, analysis and sharing of EO data, and is also well suited to parallel processing in a high performance computing (HPC) / high performance data (HPD) environment.

Australian-Geoscience-Data-Cube@ga.gov.au

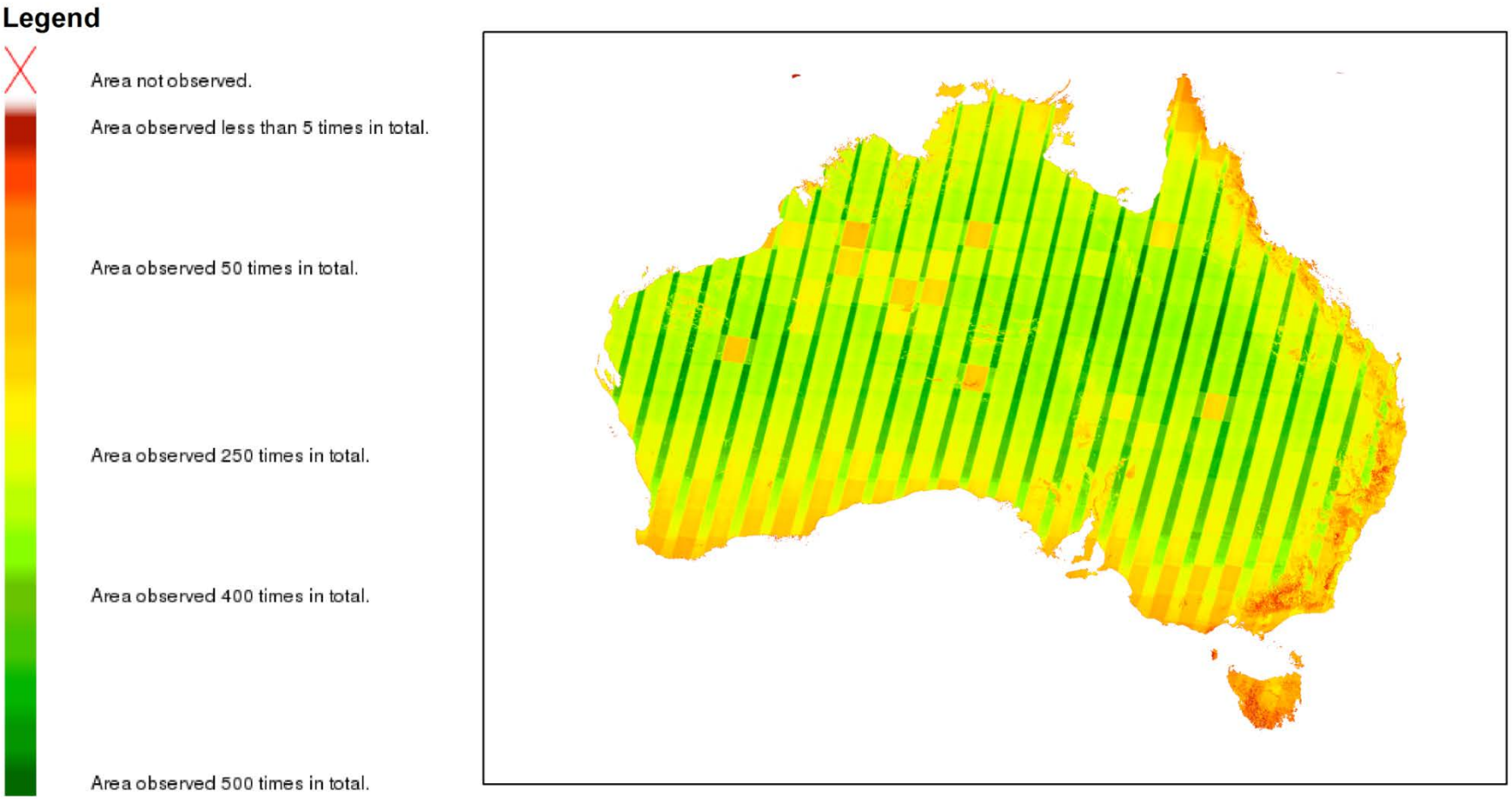
‘Cubing’ Landsat images



‘Cubing’ Landsat images



Quality Assured Observations



NCI

Australian Government
Geoscience Australia

CSIRO

Water Observations from Space

http://www.ga.gov.au/flood-study-web/#/water-observations

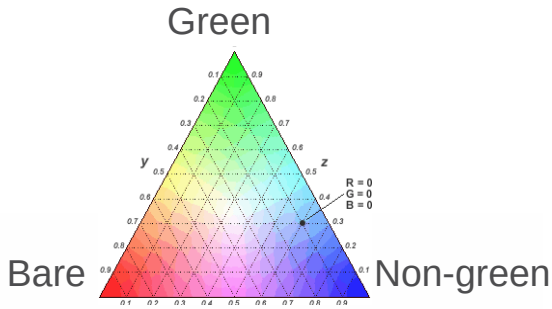
NCI

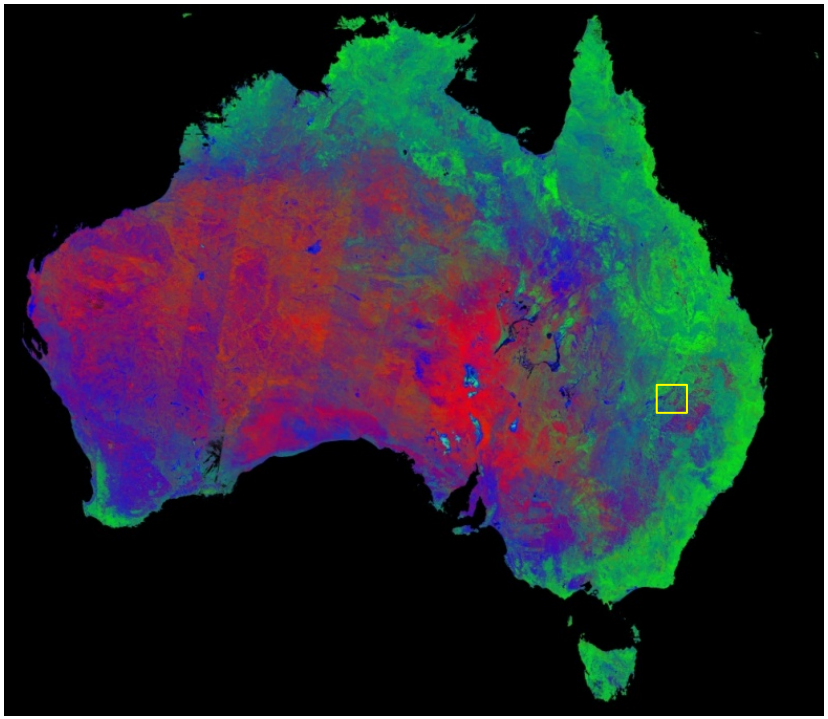
Australian Government
Geoscience Australia

CSIRO

National Fractional Cover

Joint Remote Sensing Research Program





OGC Standards Activities Relevant to AGDC

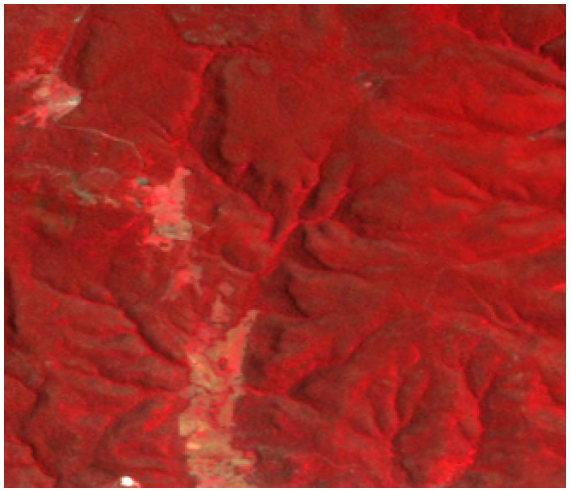
Domain Working Groups

Big Data
Earth Systems Science
Temporal
Coverages
Coordinate Reference Systems

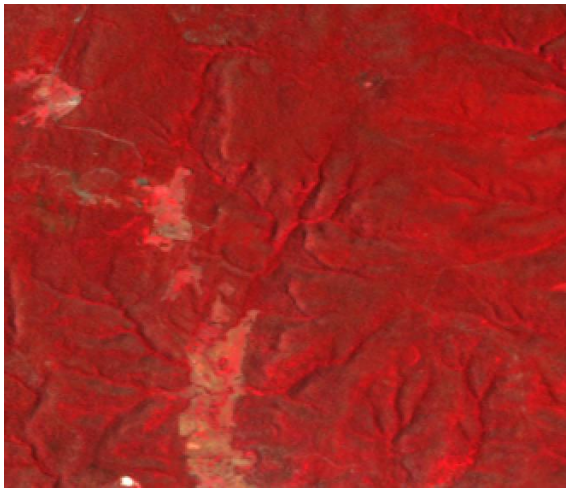
Standards Working Groups

Discrete Global Grid Systems (GA Leading)	Web Processing Service 2.0
NetCDF	Web Coverage Tile Service
GeoTIFF	Web Map Tile Service
Web Coverage Services	EO Product Metadata and OpenSearch
Web Mapping Service 1.4	

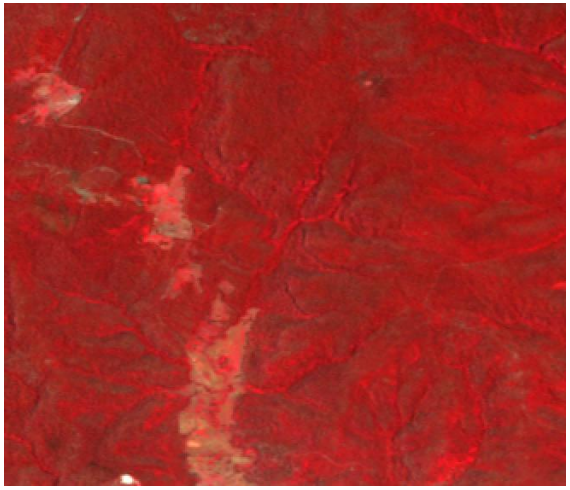
Terrain Correction with TanDEM-X IDEM



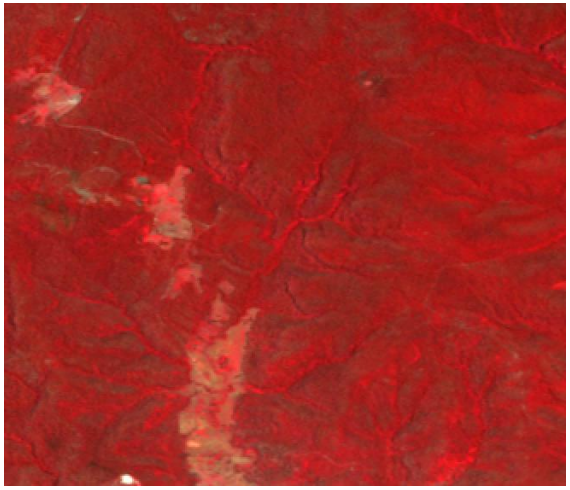
Without correction



Corrected using SRTM 1sec



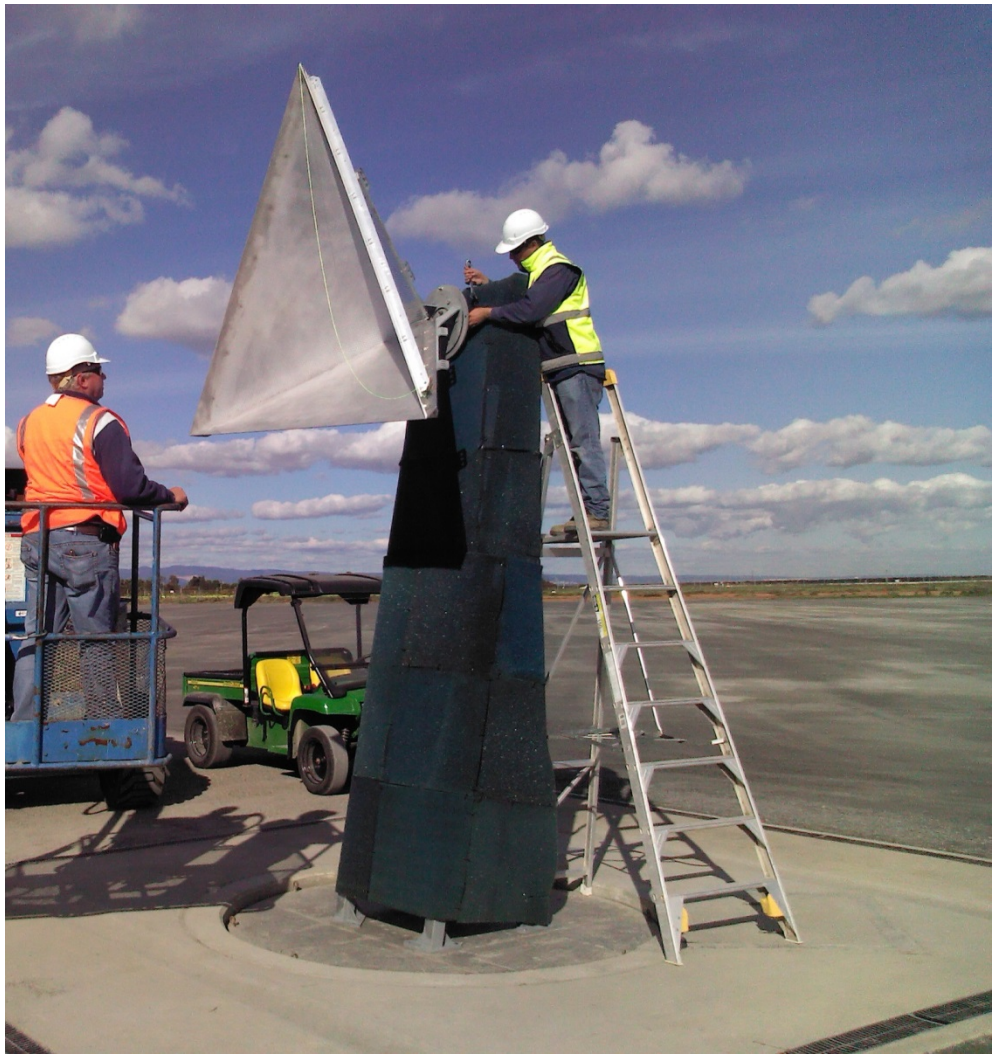
Corrected using IDEM 12m



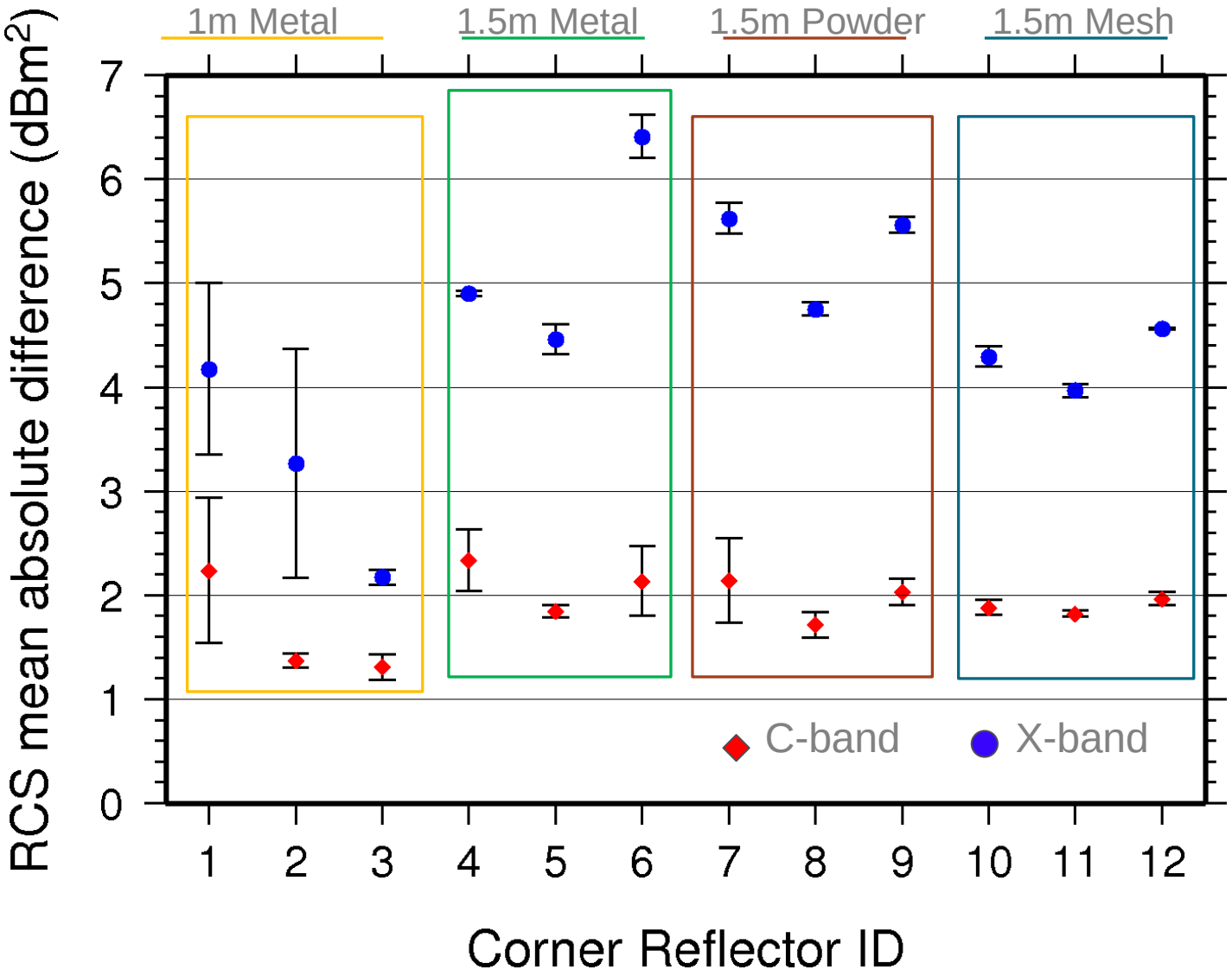
Corrected using IDEM 30m

Corner Reflectors for SAR Calibration

- The Australian Geophysical Observing System (AGOS) includes Corner Reflector (CR) infrastructure that could be used for calibrating SAR sensors
- GA designed and manufactured 18 triangular trihedral CR prototypes of three different material finishes and 4 sizes: 1, 1.5, 2, and 2.5m leg dimension.
- The Defence Science and Technology Organisation's Radar Ground Reflection Range near Adelaide was used for characterising 12 prototype CRs (1 and 1.5m)

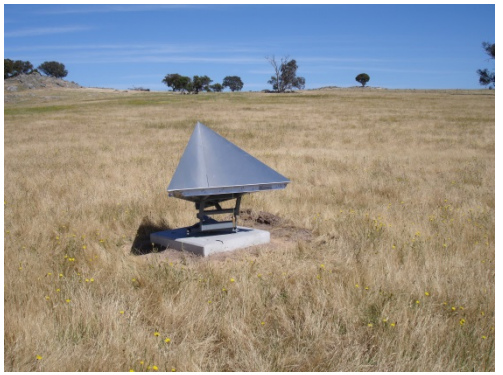


Characterisation of CRs - Results



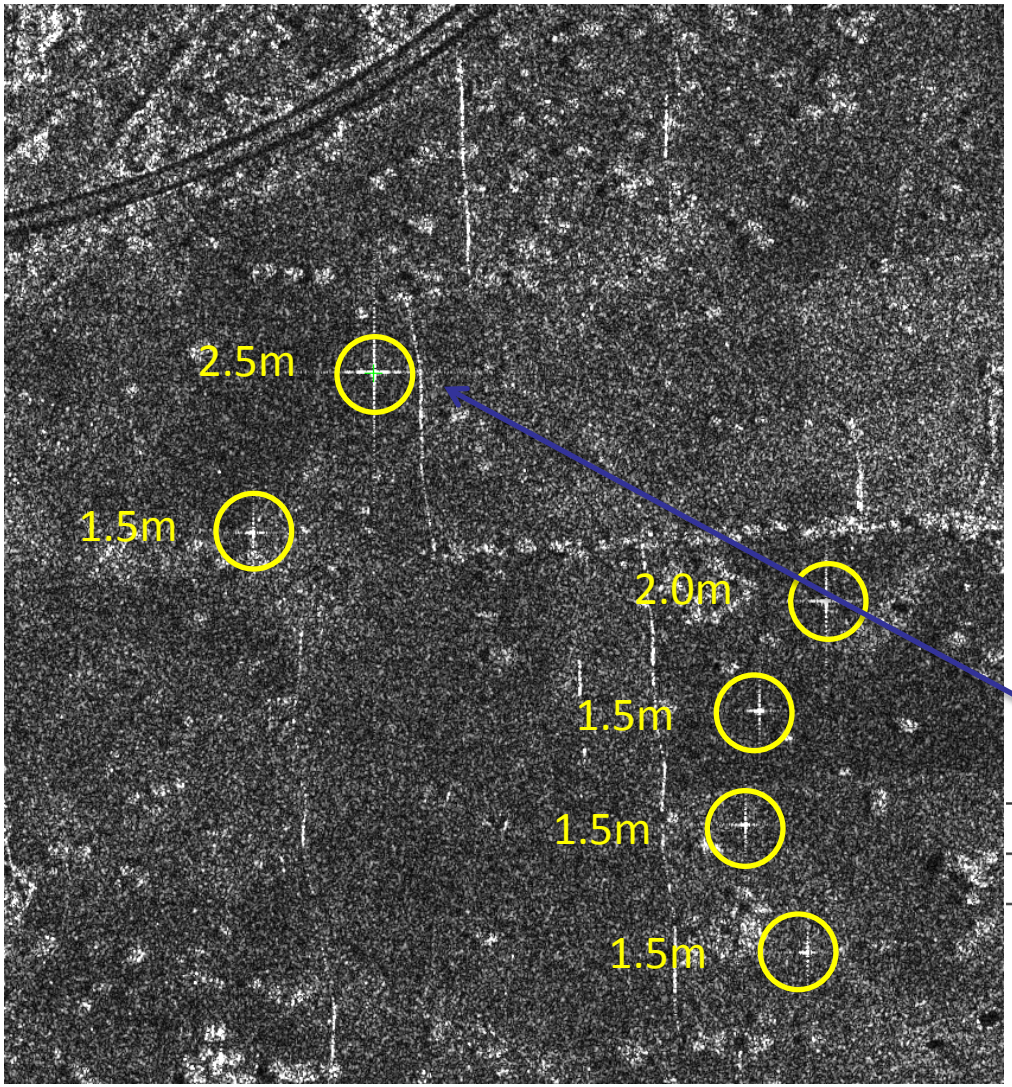
Field Performance Testing of CRs

- 18 CR prototypes deployed at a site in Gunning near Canberra; SAR data acquisition over the site by TerraSAR-X, RADARSAT-2, COSMO-SkyMED and RISAT from Dec 2013 to Mar 2014
- CRs are being deployed permanently and will serve as an independent means of evaluating SAR sensor performance
- Australian contribution to the international EO cal/val effort

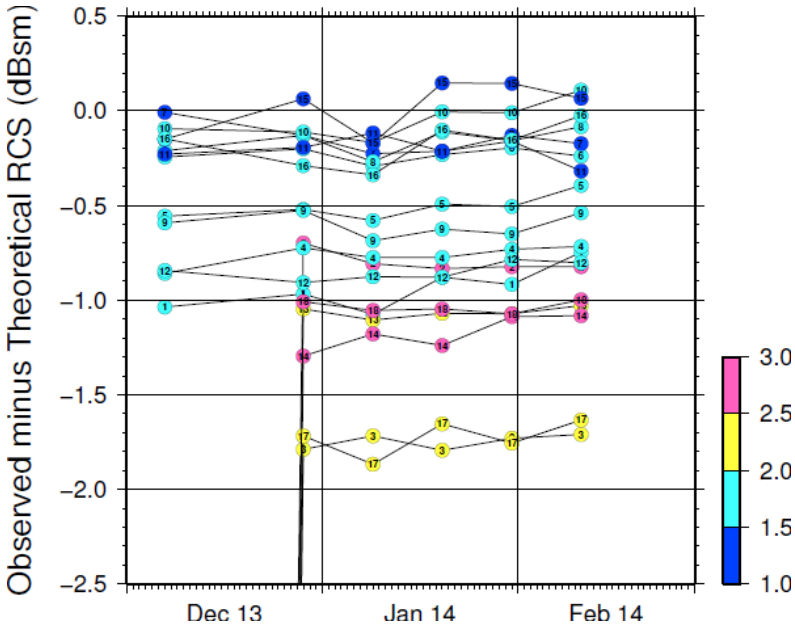


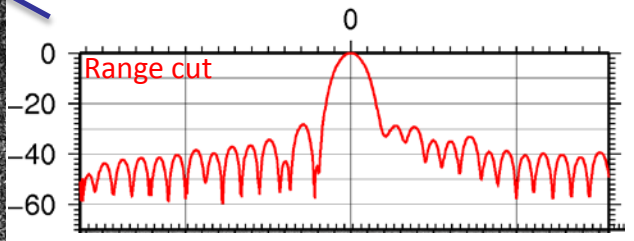
TerraSAR-X

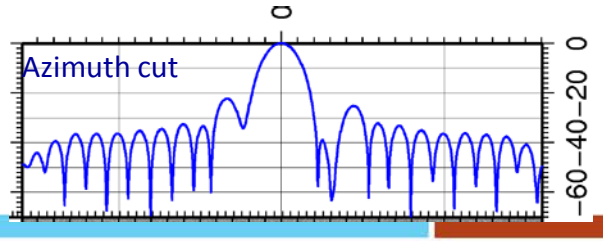
Thanks to DLR for supporting data acquisitions through the AO science proposal LAN1499



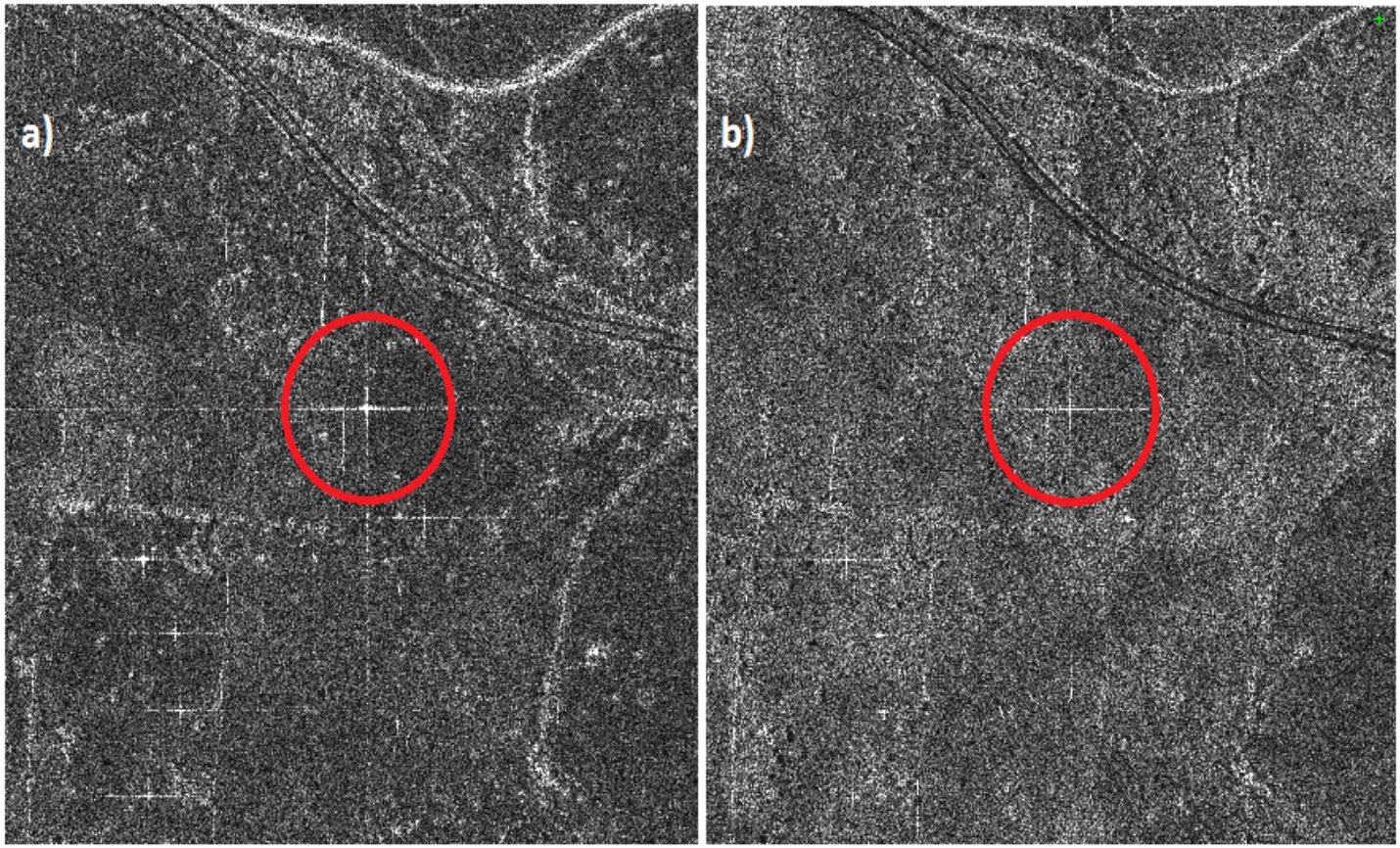
29 Dec 2013







COSMO-SkyMed



			CSK1 - 20140213		CSK2 - 20140325	
CR site	CR size (m)	Theoretical RCS (dBsm)	Derived RCS (dBsm)	RCS Difference (dBsm)	Derived RCS (dBsm)	RCS Difference (dBsm)
2	2.5	52.31	52.86	-0.55	51.97	0.34
7	1.0	36.39	36.10	0.29	36.41	-0.02
13	2.0	48.43	48.42	0.01	47.88	0.55
16	1.5	43.44	44.16	-0.72	42.73	0.70

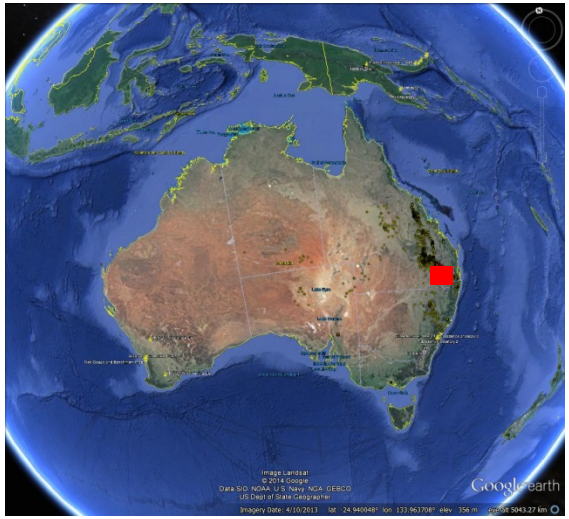
Permanent CR Deployment : Surat Basin, Queensland

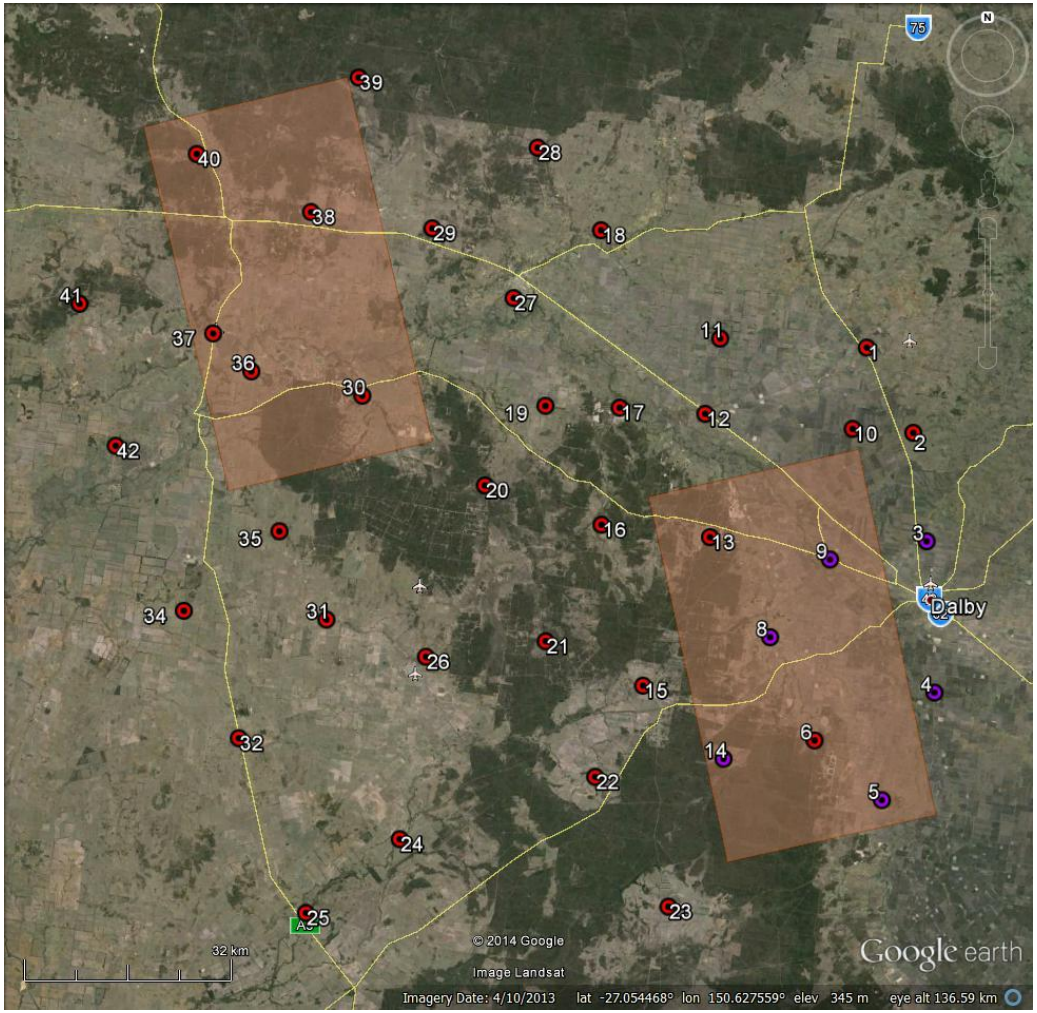
A network of 40 corner reflectors to be completed by end of 2014, consisting of:

34 x 1.5m trihedrals

3 x 2.0m trihedrals

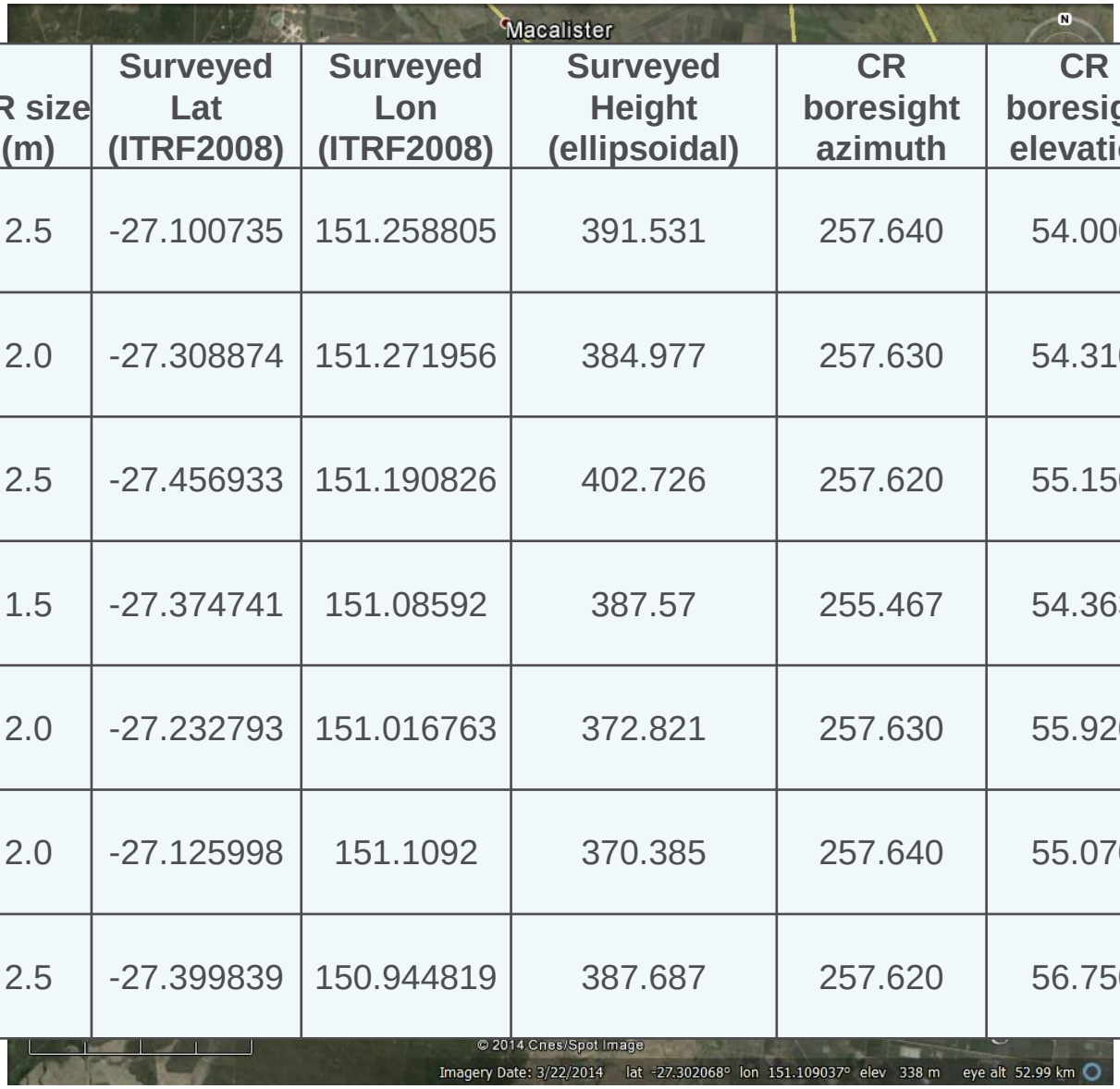
3 x 2.5m trihedrals





CRs Supporting ALOS-2 CVST

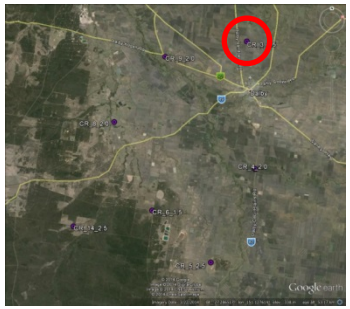
Site number	Location Name	Install Date	CR size (m)	Surveyed Lat (ITRF2008)	Surveyed Lon (ITRF2008)	Surveyed Height (ellipsoidal)	CR boresight azimuth	CR boresight elevation
3	Hills Road	4/09/2014	2.5	-27.100735	151.258805	391.531	257.640	54.000
4	Cecil Plains Rd	2/09/2014	2.0	-27.308874	151.271956	384.977	257.630	54.310
5	Percy Jurgs Road	4/09/2014	2.5	-27.456933	151.190826	402.726	257.620	55.150
6	Lake Broadwater	5/09/2014	1.5	-27.374741	151.08592	387.57	255.467	54.363
8	Ducklo School Rd	7/09/2014	2.0	-27.232793	151.016763	372.821	257.630	55.920
9	Old Warrego Hwy	3/09/2014	2.0	-27.125998	151.1092	370.385	257.640	55.070
14	Halliford	6/09/2014	2.5	-27.399839	150.944819	387.687	257.620	56.750



Site 3 – 2.5m CR Hills Road

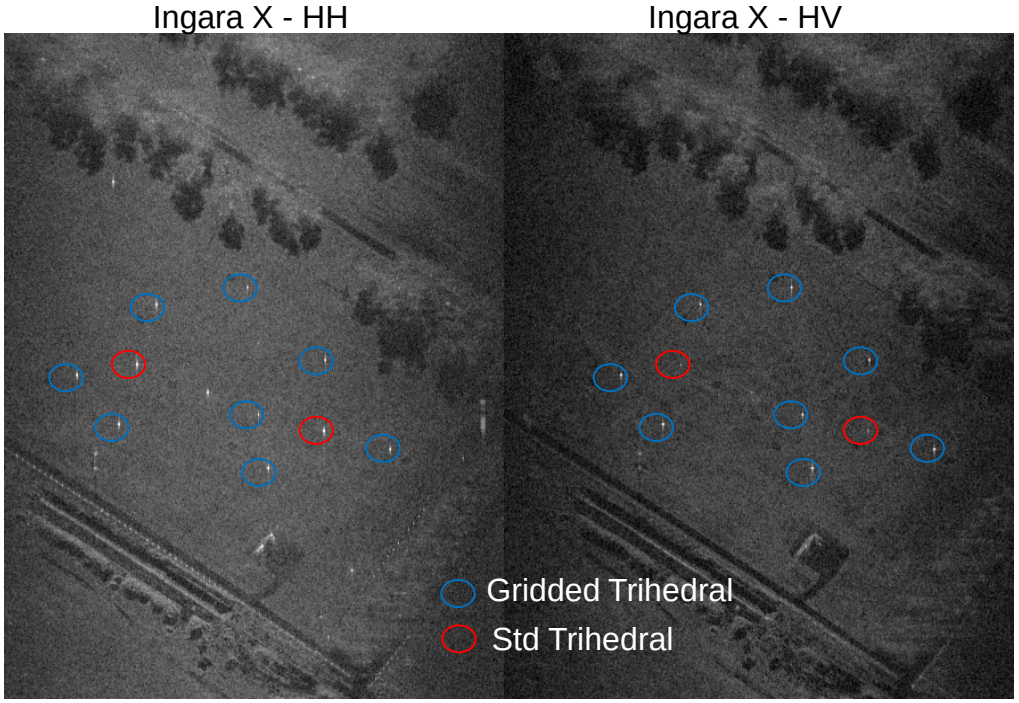
Latitude -27.100724, Longitude 151.258798, Height 350.49m

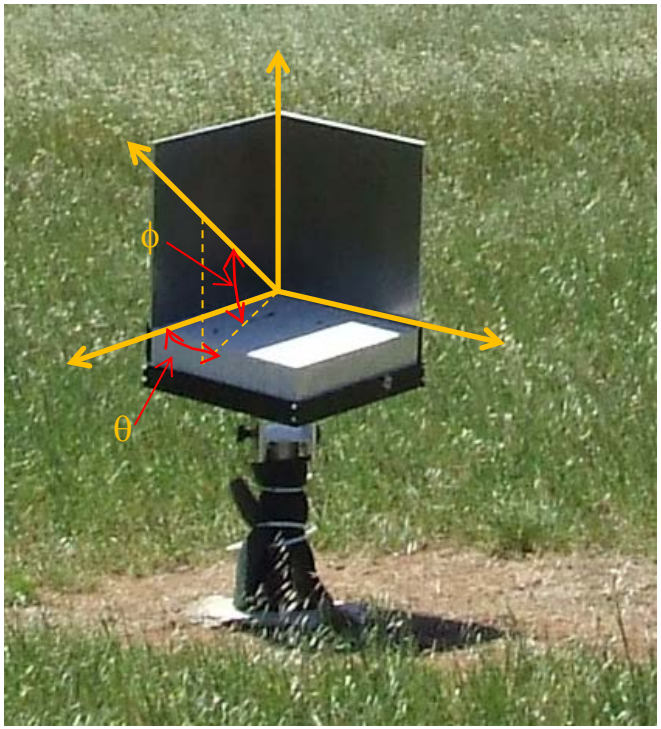
Boresight Azimuth 257.640, Boresight Elevation 54.000



Cross Polarising Calibration Targets

- Gridded Trihedral design developed in collaboration with Naval Research Laboratories based on Sheen et al. design.[1]
  - Standard trihedral with lower plate replaced with vertical fins resting on top of layer of Radar Absorbing Material (RAM)
  - Provides a large, broad beam cross-pol. response dependent on viewing geometry.
  - Suitable for calibration of quad and dual-pol. SAR.
  - Trials of various designs using DSTO's Ingara X and L band SAR





$$\begin{bmatrix} S_{HH} & S_{VH} \\ S_{HV} & S_{VV} \end{bmatrix}_{IDEAL} \propto \begin{bmatrix} \sin^2(\theta) & -\sin(\theta)\cos(\theta)\sin(\phi) \\ -\sin(\theta)\cos(\theta)\sin(\phi) & \cos^2(\theta)\sin^2(\phi) \end{bmatrix}$$

[1]Sheen et al., "The Gridded Trihedral: A New Polarimetric SAR Calibration Reflector", IEEE TGRS Vol. 30, No. 6, 1992

DSTO

MONASH University

Engineering

Towards Validation of SMAP Downscaled Soil Moisture

J Walker, R DeJeu, D Entekhabi, TJ Jackson, E Kim, O Merlin, A Monerris, L Renzullo, C Rüdiger, F Winston, X Wu, N Ye

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USDA United States Department of Agriculture

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Questions

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38th Plenary Meeting CEOS Working Group on Calibration & Validation, Maryland, USA, 30 September - 4 October 2014