

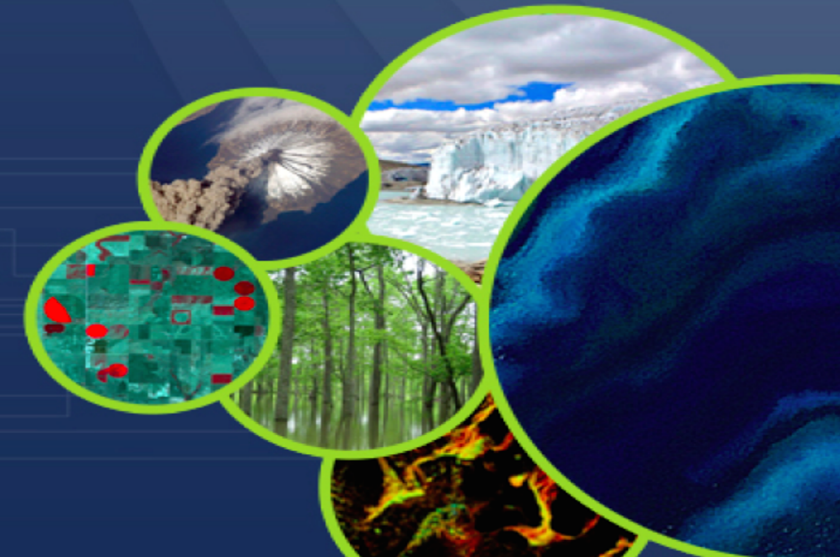


Committee on Earth Observation Satellites

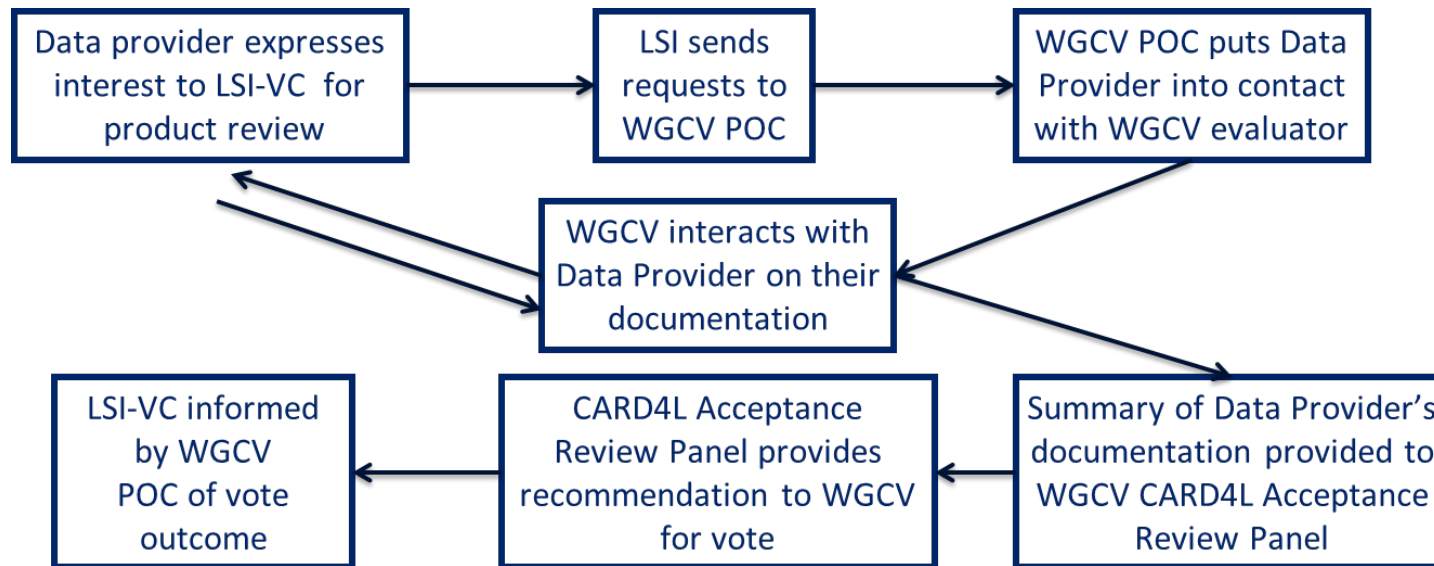
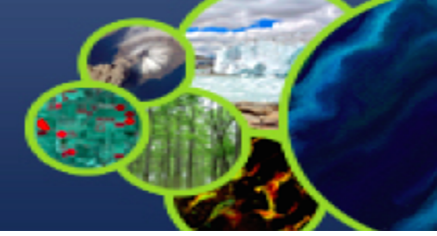
Report on CARD4L Assessments

Medhavy Thankappan, PoC WGCV CARD4L Peer Review

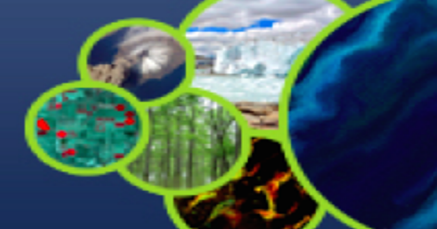
WGCV-47 Virtual
14-17 July 2020



Review of steps in the CARD4L assessment process



- Data provider completes self-assessment against CARD4L
- Data provider submits request for CARD4L endorsement to LSI-VC
- **WGCV receives CARD4L peer-review request from LSI-VC**
- **WGCV verifies submitted CARD4L documentation**
- **WGCV Acceptance Review Panel specific to PFS is set up**
- **WGCV PoC interacts with data provider for any clarifications**
- **Review Panel provides recommendation for a vote by WGCV**
- **WGCV membership votes on recommendation**
- **WGCV communicates outcome to LSI-VC**
- Data provider notified of outcome by LSI-VC



- **USGS Landsat Surface Reflectance (Collection 2)**
- **USGS Landsat Surface Temperature (Collection 2)**
- **ESA Sentinel-2 Surface Reflectance (self-assessed at 'Threshold' only)**
- **CARD4L Review Panels for Landsat and Sentinel-2 products**

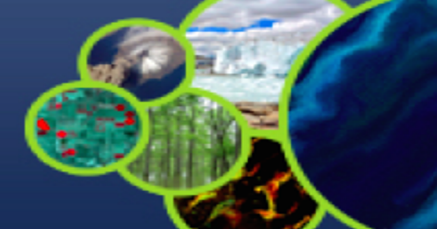
Landsat CARD4L Review Panel

Nigel Fox
Valentina Boccia
Darren Ghent
Jeffrey Czapla-Myers
Medhavy Thankappan

Sentinel-2 CARD4L Review Panel

Nigel Fox
Cody Anderson
Darren Ghent
Fernando Camacho
Medhavy Thankappan

CARD4L Review Status: USGS Landsat Surface Reflectance (Collection 2)



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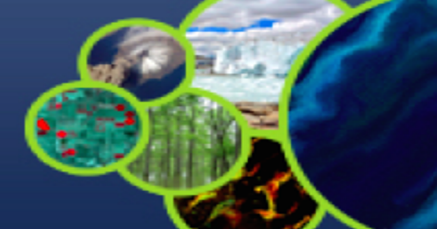
USGS CARD4L self-assessment of Surface Reflectance (Collection 2)

Summary Table: WGCV CARD4L Review Panel evaluation

	Threshold	Target
1. General Metadata		
1.1 Traceability	Not applicable	Not assessed
1.2 Metadata Machine Readability	Verified	Not assessed *
1.3 Data Collection Time	Verified	Verified
1.4 Geographical Area	Verified	Verified
1.5 Coordinate Reference System	Verified	Verified
1.6 Map Projection	Verified	Verified
1.7 Geometric Correction Methods	Not applicable	Verified
1.8 Geometric Accuracy of the Data	Not applicable	Verified
1.9 Instrument	Verified	Verified
1.10 Spectral Bands	Verified	Verified*
1.11 Sensor Calibration	Not applicable	Verified
1.12 Radiometric Accuracy	Not applicable	Verified*
1.13 Algorithms	Verified	Verified
1.14 Ancillary Data	Verified	Verified
1.15 Processing Chain Provenance	Not applicable	Verified
1.16 Data Access	Verified	Not assessed
1.17 Overall Data Quality	Not applicable	Verified*
2. Per-Pixel Metadata		
2.1 Metadata Machine Readability	Verified	Not assessed
2.2 No Data	Verified	Verified
2.3 Incomplete Testing	Verified	Verified
2.4 Saturation	Verified	Verified
2.5 Cloud	Verified	Verified
2.6 Cloud Shadow	Verified	Verified
2.7 Land/Water Mask	Not applicable	Verified
2.8 Snow/Ice Mask	Not applicable	Verified
2.9 Terrain Shadow Mask	Not applicable	Not assessed
2.10 Terrain Occlusion	Not applicable	Verified
2.11 Illumination and Viewing Geometry	Verified*	Not assessed
2.12 Aerosol Optical Depth Parameters	Not applicable	Verified
3. Radiometric and Atmospheric Corrections		
3.1 Measurement	Verified*	Not assessed
3.2 Measurement Uncertainty	Not applicable	Not assessed
3.3 Measurement Normalisation	Not applicable	Verified*
3.4 Directional Atmospheric Scattering	Verified	Verified
3.5 Water Vapour Corrections	Verified	Verified
3.6 Ozone Corrections	Not applicable	Verified
4. Geometric Corrections		
4.1 Geometric Correction	Verified	Verified*

*See explanation provided in the notes below

CARD4L Review Status: USGS Landsat Surface Temperature (Collection 2)



USGS CARD4L self-assessment of Surface Temperature (Collection 2)

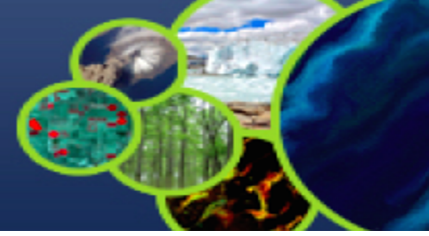
Summary Table: WGCV CARD4L Review Panel evaluation

	Threshold	Target
1. General Metadata		
1.1 Traceability	Not required	Not verified*
1.2 Metadata Machine Readability	Verified	Not assessed
1.3 Data Collection Time	Verified	Verified
1.4 Geographical Area	Verified	Verified
1.5 Coordinate Reference System	Verified	Verified
1.6 Map Projection	Not required	Verified
1.7 Geometric Correction Methods	Not required	Verified
1.8 Geometric Accuracy of the Data	Verified	Verified
1.9 Instrument	Verified	Verified
1.10 Spectral Bands	Verified	Verified
1.11 Sensor Calibration	Not required	Verified
1.12 Radiometric Accuracy	Not required	Verified
1.13 Algorithms	Verified	Verified
1.14 Ancillary Data	Verified	Verified
1.15 Processing Chain Provenance	Not required	Verified
1.16 Data Access	Verified	Not assessed
1.17 Overall Data Quality	Not required	Not verified*
2. Per-Pixel Metadata		
2.1 Metadata Machine Readability	Verified	Not assessed
2.2 No Data	Verified	Verified
2.3 Incomplete Testing	Verified	Verified
2.4 Saturation	Verified	Verified
2.5 Cloud	Verified	Verified
2.6 Cloud Shadow	Verified	Verified
2.7 Snow/Ice Mask	Not required	Verified
2.8 Illumination and Viewing Geometry	Verified	Not assessed
3. Radiometric and Atmospheric Corrections		
3.1 Measurement	Verified	Not verified*
3.2 Corrections for Atmosphere and Emissivity	Verified	Verified
3.3 Measurement Uncertainty	Not required	Not verified*
4. Geometric Corrections		
4.1 Geometric Correction	Verified	Verified

*See explanation provided in the notes below

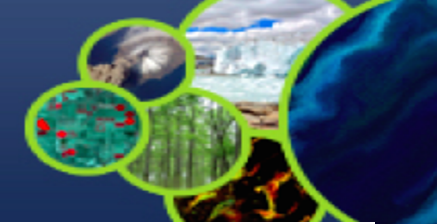
- ✓ Data provider completes self-assessment against CARD4L
- ✓ Data provider submits request for CARD4L endorsement to LSI-VC
- ✓ WGCV receives CARD4L peer-review request from LSI-VC
- ✓ WGCV verifies submitted CARD4L documentation
- ✓ WGCV Acceptance Review Panel specific to PFS is set up
- ✓ WGCV PoC interacts with data provider for any clarifications
- ✓ Review Panel provides recommendation for a vote by WGCV
- ✓ WGCV membership votes on recommendation
- ✓ WGCV communicates outcome to LSI-VC
- ✓ Data provider notified of outcome by LSI-VC





- **USGS Landsat Surface Reflectance (Collection 2)**
- **USGS Landsat Surface Temperature (Collection 2)**
 - Request received by LSI-VC: **7 Oct 2019**
 - Clarification on documents sought from USGS: **5 Dec 2019**
 - Clarification on SR/ST received from USGS: **30 Jan 2020**
 - Access to sample data organised : **2 Mar 2020**
 - Panel feedback received (from 4 members): **27 Mar 2020**
 - Final report for Panel : **6 May 2020**
 - WGCV vote concluded: **24 June 2020**
 - WGCV and LSI-VC feedback session: **8 July 2020**
 - CARD4L Review outcome notified to LSI-VC: **9 July 2020**
- **WGCV-47 Plenary virtual meeting: 14-17 July 2020**

CARD4L Review Status: ESA Sentinel-2 Surface Reflectance

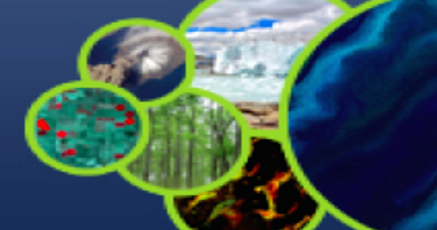


- ✓ Data provider completes self-assessment against CARD4L
- ✓ Data provider submits request for CARD4L endorsement to LSI-VC
- ✓ WGCV receives CARD4L peer-review request from LSI-VC
- ✓ WGCV verifies submitted CARD4L documentation
- ✓ WGCV Acceptance Review Panel specific to PFS is set up
- ✓ Interactions with data provider for clarifications
- Review Panel provides recommendation for a vote by WGCV
- WGCV membership votes on recommendation
- WGCV communicates outcome to LSI-VC
- Data provider notified of outcome by LSI-VC

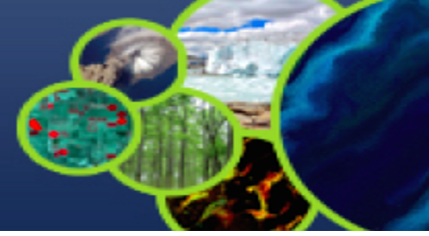
**PENDING
REVIEW**

Summary Self-Assessment Table

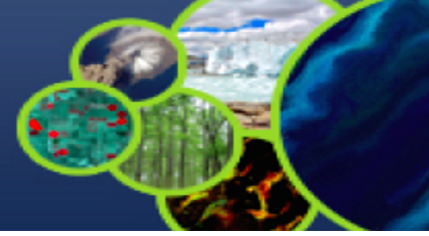
	Threshold	Target
1. General Metadata		
1.1 Traceability	Yes	
1.2 Metadata Machine Readability	Yes	
1.3 Data Collection Time	Yes	
1.4 Geographical Area	Yes	
1.5 Coordinate Reference System	Yes	
1.6 Map Projection	Yes	
1.7 Geometric Correction Methods	Yes	
1.8 Geometric Accuracy of the Data	Yes	
1.9 Instrument	Yes	
1.10 Spectral Bands	Yes	
1.11 Sensor Calibration	Yes	
1.12 Radiometric Accuracy	Yes	
1.13 Algorithms	Yes	
1.14 Ancillary Data	Yes	
1.15 Processing Chain Provenance	Yes	
1.16 Data Access	Yes	
1.17 Overall Data Quality	Yes	
2. Per-Pixel Metadata		
2.1 Metadata Machine Readability	Yes	
2.2 No Data	Yes	
2.3 Incomplete Testing	Yes	
2.4 Saturation	Yes	
2.5 Cloud	Yes	
2.6 Cloud Shadow	Yes	
2.7 Land/Water Mask	Yes	
2.8 Snow/Ice Mask	Yes	
2.9 Terrain Shadow Mask	Yes	
2.10 Terrain Occlusion	Yes	
2.11 Illumination and Viewing Geometry	Yes	
2.12 Aerosol Optical Depth Parameters	Yes	
3. Radiometric and Atmospheric Corrections		
3.1 Measurement	Yes	
3.2 Measurement Uncertainty	Yes	
3.3 Measurement Normalisation	Yes	
3.4 Directional Atmospheric Scattering	Yes	
3.5 Water Vapour Corrections	Yes	
3.6 Ozone Corrections	Yes	
4. Geometric Corrections		
4.1 Geometric Correction	Yes (in 2020)	



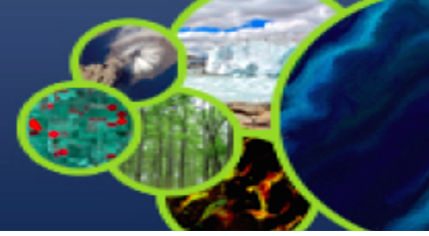
- **ESA Sentinel-2 Surface Reflectance (self-assessment at ‘Threshold’ only)**
 - Request received by LSI-VC: **6 Feb 2020**
 - Sentinel-2 Review Panel confirmed: **17 Apr 2020**
 - Review of self-assessment documents: **24 Apr 2020**
 - Clarification sought from ESA: **5 May 2020**
 - Awaiting ESA response:



- **Need to modify items in the requirements document for clarity**
- **Clear evidence to support compliance claims**
- **Partially complete self-assessments, need for gate-keeping**
- **Terminology used in self-assessment**
- **Timely assessment to support product development**



- Panel assessment turnaround: *6 weeks from receiving documents / summary from PoC*
- Format / content of self-assessment documentation: *current PFS documents*
- Format and content of Review Panel summary: *latest is USGS assessment summary*
- Lead time for vote by WGCV membership: *documents submitted 4 weeks in advance*
- Reporting at LSI-VC meetings: *by WGCV PoC + LSI-VC feedback session with Panel*
- Anticipated future CARD4L requests from Industry: *what is our position ?*
- CARD4L Review Panel: *currently drawn from an existing pool of members, need more*



Initial member pool identified at WGCV-45

- Evaluation Lead (M Thankappan)
- WGCV member at large (N Fox)
- IVOS subgroup (J Czapla-Meyers, C Anderson, L Ma)
- LPV subgroup (F Gascon, F Camacho)
- SAR subgroup (B Chapman, D Guedtner, N Miranda, T Tadono)
- Land Surface Temperature (D Ghent, F Goettsche)

CARD4L Peer Review Guideline: suggested total of five members on the panel

- One WGCV member
- Three members who are either WGCV members or sub-group members nominated by the sub-group Chairs
- Not more than one member from a given sub-group
- Two-year terms for all members