

Minutes of the Meeting of the CEOS-ARD Oversight Group

Hosted by USGS EROS, Sioux Falls, South Dakota, United States

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Day 1: Friday, April 24, 2026

Session A1: Opening

A1.1: Welcome

Ferran Gascon (ESA, CEOS-ARD Oversight Group Lead) opened the meeting and reviewed the objectives.

Session A2: PFS Building Blocks

A2.1: Confirm GitHub Implementations of CEOS-ARD PFS [slides: [Optical](#), [SAR](#)]

Following the proceedings of the CEOS-ARD Oversight Group Meeting held on 2 September 2025, the CEOS-ARD Product Family Specifications (PFS) were copied to the CEOS-ARD GitHub repository, where they would be endorsed as new 'patch' versions. The accuracy and consistency of these patch versions was reported.

- Chris Barnes (USGS/KBR) reported on the transition of the optical PFS to GitHub, noting no major discrepancies identified for Surface Reflectance, Surface Temperature, Nighttime Lights Surface Radiance, and Aquatic Reflectance PFS. All minor discrepancies have been identified and resolved.
- There is synchronisation required between the PFS, to ensure that the Building blocks can be used unilaterally where possible. Future discussions are needed on how to organise the PFS, including the layout of the introduction, background on CEOS-ARD, and annexes.

April 2026 Decision 01	Endorsed new 'patch' versions of the optical Product Family Specifications (SR, ST, NLSR, and AR) confirming the transition of the PFS to GitHub is accurate and consistent.	
April 2026 Action 01	CEOS-ARD Secretariat and Matthias to publish the new GitHub-based patch versions of the optical PFS on the Github and ceos.org/ard website.	May 2026

- It was proposed to share only the first two version numbers (Major.Minor) on the CEOS-ARD website. Matthias Mohr (SEO) noted that after PFS are endorsed and released, they will be assigned a version number. Any other versions opened in the

CEOS-ARD Editor tool will be issued a warning stating they are draft versions, referring to the CEOS-ARD website for the latest endorsed version.

- Currently, there is no semantic integration between the Building Blocks and the CEOS EO Glossary, although the building Blocks contain a ‘dependency’ attribute to link terms currently existing in the glossary.

April 2026 Action 02	Chris to migrate any outstanding editorial issues from the optical PFS building block transition consistency check to the CEOS-ARD GitHub issue tracker.	May 2026
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- Ake Rosenqvist (JAXA) reported on the SAR PFS consistency check, prefacing that requirements for the SAR measurands currently exist under one combined PFS. The Combined SAR PFS is planned to be split into individual PFS in the May-June 2026 timeframe, with each to be incremented a minor version (e.g. NRB Version 5.5.0 will become 5.6.0).
- Building blocks have been established for the individual SAR PFS except Interferometric SAR and Composite Backscatter. Ake proposed to revisit the transition at the next LSI-VC meeting to allow the issues identified to be addressed by the SAR team.
- Matthias noted that the Word (DOCX) versions of the PFS published on the CEOS-ARD website will look the same as the current versions, with self-assessment columns beside the metadata requirements. The PFS and HTML versions, however, will be printed without self-assessment columns. He suggested that the website makes clear where users can fill out self-assessments or view the PFS.

A2.2: Composite Backscatter PFS Endorsement [\[slides\]](#)

Ake Rosenqvist presented the Composite Backscatter PFS for endorsement.

Issues were raised on the wording of Goal requirement 4.2: Digital Elevation Model, which led to the following revision: *“For mosaic or composite products, specify the DEM and EGM used for each input data source, if different.”*

Discussion

- The availability of DEMs was discussed, as well as the per-pixel DEM requirement. Providers could provide a resampled DEM as it has been used. There is an explicit requirement to have a DOI link for all PFS, though the need to revisit DOI requirements across all PFS was noted.

- Matthias and Brian Terry (SEO) discussed the durability of DOIs over time, noting that the CEOS Interoperability Handbook could build on its DOI recommendation to ensure DOIs are maintained.
- Peter Strobl (EC) and Ake discussed the terminology of composites and mosaics within the PFS and across CEOS-ARD broadly. Agreed definitions should be added to the CEOS EO Glossary.

**April 2026
Decision 02**

Endorsed version 1.3 of the Synthetic Aperture Radar (SAR) PFS which incorporates additional requirements for composite backscatter products.

Session A3: 2026 CEOS-ARD Strategy Pillar: Compliance Automation & Scalable Peer Review

A3.1: Introduction [\[slides\]](#)

Matt Adams (GA) overviewed the CEOS-ARD Strategy pillar, aiming to reduce the burden of compliance assessments for data providers and assessors, enabling CEOS-ARD to scale across a growing number of providers.

A3.2: GitHub Tools for PFS Editing and Automated Self-Assessment Validation [\[slides\]](#)

Matthias Mohr (SEO) reported updates and plans for the CEOS-ARD GitHub Repository, including the CEOS-ARD Command Line Interface (CLI) used to generate PFS from the Building Blocks, the CEOS-ARD Editor, and CEOS-ARD Assessor tools.

The need to establish governance and stability for the CEOS-ARD Editor and Review tools was raised. Currently, there is no option to share workspaces with others, and questions were raised around the security of sensitive data shared by commercial providers for CEOS-ARD assessment.

Matthias shared a demonstration of the CEOS-ARD Editor tool.

Discussion

- Future tasks were discussed, including the alignment of Building Blocks, governance, updates to the PFS glossary, restructuring the PFS layout, UML building block structure, documentation and training, and metadata-building block mapping.
- Ake Rosenqvist (JAXA) asked how new PFS can be created now that the Combined SAR PFS will be split up into individual PFS. Historically, new SAR PFS would use the Combined PFS as a starting point and add or remove requirements as needed.

- Matthias recommended starting from an existing individual PFS e.g. NRB to create the CB PFS. Creating a new PFS needs more work up front, as you would need to search for existing requirements.
- The ARD Oversight Group leads discussed the need for continued support to the CEOS-ARD Building Blocks development and governance, as not to rely on a single point of failure.

April 2026 Action 04	CEOS-ARD Oversight Group and LSI-VC Leads to prepare a statement that can be communicated to CEOS Principals via the SIT Chair regarding the need for additional funding, support, and developers to advance and provide redundancy for the CEOS-ARD GitHub and Building Blocks development.	May 2026
April 2026 Action 05	Harvey to publish the recording of Matthias' overview of the CEOS-ARD GitHub and tools as a tutorial.	May 2026

A3.3: Latest Feedback from the CEOS-ARD Peer Review Process [\[slides\]](#)

Medhavy Thankappan (GA) (on behalf of Alex Brooks) overviewed the CEOS-ARD self-assessment peer review process. The current process is largely manual but this is expected to change with development of automated tools.

He noted the issue of data providers not having a read of how many of the submissions and metadata requirements meet the goal level. This could be handled to a degree by the Assessor tool. With the development of the Assessor tool, it was confirmed that WGCV will continue to conduct CEOS-ARD compliance checks.

A3.4: Discussion [\[slides\]](#)

- The potential revision of the Goal-level CEOS-ARD Assessment review panel was discussed, in the context of moving toward dedicated tooling and breaking down barriers to speed up assessments.
- Medhavy and Nigel Fox (NPL) noted the worth of the review panel, e.g. to assess traceability and uncertainty metadata which requires significant knowledge to interpret the evidence provided. If the CEOS-ARD Goal level is 'climate-ready,' climate rigour is needed.
- Matthias Mohr (SEO) suggested an addition to the Building Blocks to note whether specific requirements need panel review.

- Cody Anderson (USGS) supported the addition of an intermediate compliance level (for certain requirements) to allow the commercial sector to meet the same standard as Landsat and Sentinel.
- Peter Strobl (EC) encouraged that uncertainty information be included at the threshold level for all PFS. To state no uncertainty is unacceptable. We should agree on a way to allow a statement of uncertainty that allows an expression of confidence. The EDAP and CEOS-FRM assessments have criteria that allow a basic declaration of uncertainty, and later on evidence that is independently assessed. Nigel Fox (NPL) also noted the need for CEOS-ARD to evidence some level of pre-flight characterisation.
- Rob Waterman (Esri) noted that today's requirements are not necessarily those needed in five years. Regarding the Landsat and Sentinel gold standard, it makes a lot of sense to have them drive the high level requirements. Rob flagged the value of leveraging the CEOS-ARD framework for Esri's assessments, particularly if CEOS-ARD covers quality checks more comprehensively in future. They are keen to work with us to promote CEOS-ARD.
- There was consensus that CEOS-ARD should leverage existing quality assessment frameworks, referencing them as the statement for data quality. The potential to adopt the EDAP framework was discussed, in a CEOS-ARD requirement that mandates a self-declaration of uncertainty at Threshold and evidence of following the EDAP process at Goal. With the CEOS SIT Chair, the CEOS-ARD Oversight Group agreed to explore the broader adoption of the ESA-NASA-USGS Quality Assessment Framework.
- It was clarified that EDAP does not specify requirements, but rather provides guidelines for assessment. CEOS-ARD dictates requirements to be analysis ready, and those pertinent to quality can be evidenced by the EDAP assessment framework. Metadata, processing steps/corrections, and quality are currently fused in CEOS-ARD. It would be clearer if there was separation. Hence the suggestion to 'outsource' the quality aspects to the NASA-ESA QAF.

April 2026 Action 06	CEOS-ARD Secretariat to add to the 2026 CEOS-ARD Strategy an initiative/task regarding the need to consider partial Goal compliance / implementing different gradations of requirement. <i><u>Note:</u> There is also a need to understand which requirements are able to be assessed automatically and those that need a full panel assessment, and to adjust rules about review panel necessity. There could be an additional flag in the building</i>	May 2026
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	<i>blocks noting that the specific requirement needs to be reviewed by an expert panel.</i>	
April 2026 Action 07	WGCV Chair and Vice Chair to work with WGCV to provide to the CEOS-ARD Oversight Group a list of the (approx. 4) specific requirements that require expert assessment at the Goal level.	June 2026
April 2026 Action 08	CEOS-ARD Secretariat to add to the 2026 CEOS-ARD Strategy an initiative/task regarding the need to require some level of uncertainty in the CEOS-ARD PFS. To be delegated to the WGCV and Cody Anderson. <i><u>Note:</u> Providing uncertainty metrics is necessary to give users confidence in data, and will provide an alternate means for addressing issues with the need to provide proprietary information to meet e.g., requirement 1.13 on Algorithms. Evidencing uncertainty is the core requirement of users, not necessarily seeing inside the proprietary 'black box' that generates the data.</i>	May 2026
April 2026 Action 09	CEOS-ARD Secretariat to add to the 2026 CEOS-ARD Strategy an initiative/task regarding alignment of CEOS-ARD and the ESA-NASA-USGS Joint Quality Assessment Framework, as a means to implement a grading approach, either recognising partial goal compliance or introducing intermediate compliance levels.	May 2026

- The boundaries of parameters for fitness for purpose was discussed, including its application for the FRMsat concept in climate quality data. For other applications, we can provide guidance but should not prescribe specific requirements.

Session A4: CEOS-ARD Governance

A4.1: CEOS-ARD Governance Framework Update (ref: LSI-VC-18-02/23) [[slides](#)]

Harvey Jones (CEOS-ARD Secretariat) shared updates on CEOS-ARD Governance Framework, currently being updated and framed as the practical counterpart to the long-term CEOS-ARD Strategy. The update covers the various new aspects that have emerged over recent years, such as the Building Blocks, Editor and Assessor Tools, GitHub, Semantic Versioning Convention, Processing Level Typology, etc.

Discussion

- The need to establish governance for GitHub functions, like editing Building Blocks, authoring PFS, and opening discussions was raised.

- When proposing a change to a Building Block, the author has to justify the change and tag it as a major, minor, or patch issue. This is then reviewed and assessed. The question is whether we do releases every year, six months, or quarter etc. Matthias recommended following the STAC approach, pushing releases on demand / as needed.
- WGCV recommended implementing a grading approach to CEOS-ARD assessment, either recognising partial goal compliance or introducing intermediate compliance levels. The inclusion of this in the CEOS-ARD Strategy and Governance Framework was proposed as a primary initiative for the Quality Pillar.

April 2026 Decision 03	It was agreed that ‘patch’ updates (i.e., 1.1.X) to make minor non-breaking updates such as typos and grammar do not need CEOS-ARD OG approval. These updates can be handled via a notification only.
April 2026 Decision 04	Major (i.e., X.0.0) and minor (1.X.0) PFS version updates require endorsement by the CEOS-ARD Oversight Group, and where necessary, the relevant CEOS Virtual Constellation or other authoring group. The proposal should be submitted as a pull request via the CEOS-ARD GitHub Editor Tool and via email to the CEOS-ARD Oversight Group. These PFS version updates may consist of a bundle of changes, taking the version (major, minor, patch) of the highest precedence change.

Session A5: 2026 CEOS-ARD Strategy Pillar: Adoption, Enablement & Impact

A5.1: Introduction [\[slides\]](#)

Matt Adams (GA) introduced the strategy pillar, which aims to maximise CEOS-ARD adoption across public procurement, commercial markets, and end user communities. The strategy needs to ensure CEOS-ARD generates adoption and impact. We want to see CEOS-ARD supporting data procurement, thematic users and real world impacts, and start seeing more CEOS-ARD compliant datasets.

A5.2: Resilience Interoperability Demonstrator [\[slides\]](#)

Dave Borges (SEO) reported on the ‘Connected Data for Community Resilience’ priority for the 2026-2027 NASA SIT Chair, and plans to conduct a Resilience Interoperability Demonstrator that follows the recommendations of the CEOS Interoperability Handbook.

The demonstrator aims to stress test CEOS interoperability and ARD principles through downstream WGDIs activities, such as the GEO Geohazard Supersites and Natural Laboratory initiative (GSNL), using findings to improve/update the Interoperability Handbook or inform the Maturity Matrix and CEOS-ARD development.

The CEOS Analytics Lab (CAL) has been used to test the ingestion of commercial data procured through CSDA, and could be applied for GNSL datasets to explore the benefits of following the Interoperability Handbook principles.

Ake Rosenqvist (JAXA) supported the digestion of commercial SAR data from CSDA into CAL, and found that CEOS-ARD compliant ALOS-2 data was seamlessly accessible through CAL. ICYEYE data could be ingested, however was far from analysis ready due to lack of geometric and radiometric calibration. This presents a strong, tangible case for the Interoperability Handbook and CEOS-ARD, and further engagement with the private sector.

Discussion

- Datasets from two different supersites that agencies provide data over will be evaluated.
- CEOS-ARD aims to get ARD to users faster, accelerating the time to science. The potential to identify quantifiable time metrics of using CEOS-ARD was discussed. Findings from the CAL analysis noted the significant time and resources saved by the Handbook's recommendation that data be provided in an unzipped format. This has been a game-changer for JAXA, who have implemented the recommendation.

A5.3: Precision Agriculture [\[slides\]](#)

Sharon and David Clay (South Dakota State University) reported on precision agriculture aspects related to data collection, decisions, implementation, and measuring impacts. They expressed the need to better link information to decisions, linking satellite information to soil, weather, and water information and what farmers can do. If information goes against their logic, it will be ignored. By understanding the data, we can increase adoption.

New tools in precision farming are available through increased understanding of molecular biology to identify mechanisms impacting yield. AI can be effective for some issues, but doesn't take account of unknowns.

Discussion

- Space-based information at 30 m resolution would drive decisions and provide easier access for insights for farmers.
- Landsat has been open to the public since 2008, providing a natural support mechanism for agronomy. What are the barriers to uptake? Initially, it was difficult for farmers and users to process the information. Getting this down to ARD is a solution.
- For precision agriculture, the temporal frequency is important to assess, with two weeks old imagery having little use.

- Data services and portals for agriculture were referenced, including NASA Acres, NASA Harvest, and the USDA Hydrology and Remote Sensing Laboratory.

A5.4: Global Mangrove Watch

Ake Rosenqvist (JAXA) reported updates from the Global Mangrove Watch, providing optical and radar satellite imagery since 1996. GMW v4.0 is planned for release on global mangrove day 2026 (26 July), with updates to include Landsat data from 1985 and the capability to separate mangrove gains and losses. GMW also offers aboveground biomass and soil organic carbon stock maps.

All radar data used is CEOS compliant for NRB SAR, requiring no additional processing. This is a huge benefit of CEOS-ARD for SAR. The non-CEOS-ARD compliant data used has been much more difficult to process.

Session A6: CEOS-ARD PFS Updates and Other Technical Topics

A6.1: Discussion: Product Family Specification Updates that Require CEOS-ARD Oversight Group Decision [[slides](#)]

Harvey Jones (CEOS-ARD Secretariat) reported issues captured in the CEOS-ARD GitHub tracker related to metadata requirements spanning multiple PFS, that have been raised to the CEOS-ARD Oversight Group for resolution. The full issue descriptions and context are available in the given slides.

- There was a proposal to add metadata requirement 1.0: CEOS-ARD Compliance Version to all PFS, specifying the type and version of PFS a product is assessing against. Matthias Mohr (SEO) noted that this would constitute a breaking change for all PFS and is not aligned with the existing approach taken by the SAR PFS.
- For future discussion is whether we want to introduce a category that covers all metadata categories, as currently, requirements must fit into general metadata, perpixel metadata, etc., which might not well describe some of the requirements. A requirement for data to be provided as a DOI landing page, for example, would not fit in a single existing category.
- Chris Barnes (USGS) proposed an update to the geometric correction metadata requirement, which has been achievable by high resolution data providers due to its sub-pixel uncertainty requirement.

- Ferran Gascon (ESA) suggested avoiding setting absolute performance requirements, though noted that the existing requirement is the only one with specific bounds. Providers reporting their reference and uncertainty should be the limit.
- Issues pertinent to metadata requirement 1.13 Algorithms were discussed, including limitations for commercial sector compliance in disclosing proprietary information. Providing uncertainty metrics is necessary to give users confidence in data, and will provide an alternate means for addressing issues with the need to provide proprietary information to meet e.g., requirement 1.13 on Algorithms. Evidencing uncertainty is the core requirement of users, not necessarily seeing inside the proprietary ‘black box’ that generates the data.
- It was noted that in the SR PFS, geolocation accuracy is the one requirement that places specific quantitative bounds on a requirement. This is an outlier, and due to the original motivation for CEOS-ARD, which was to facilitate temporal stacking in the Data Cube context. Perhaps the definition of CEOS-ARD itself needs a revision with regard to ‘stacking through time’, geolocation, co-registration, etc. GISTDA again flagged issues with this requirement for THEOS-2. Having some sort of stratified requirement might be the way forward.

April 2026 Decision 05	Rename requirement 3.1 (‘Measurement’) in all optical PFS to ‘Measurand’ as a patch update (issue #67).
April 2026 Decision 06	Rename the ‘Traceability’ requirement to ‘Metrological Traceability of the Measurand to SI’ and add a note referring to requirement 3.1 (Measurand) as a patch update (issue #66).
April 2026 Decision 07	Agreed the need to add a parameter/requirement to capture self-assessment PFS version in CEOS-ARD product metadata (as done in the AR PFS), however this is a breaking change for the SAR PFS and should also wait until we have a mechanism to reference the URI of the PFS version used (issue #41).
April 2026 Decision 08	Remove the ‘Metadata Machine Readability’ requirement from the Per-Pixel Metadata section of all PFS, since it is redundant with the General Metadata section. This is a non-breaking change that can be covered by a Patch update (issue #61).

April 2026 Action 10	CEOS-ARD Secretariat to work with Matthias to see if the legacy PFS versions can be published on the CEOS-ARD GitHub for the purposes of URI and facilitating addition of a	June 2026
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	compliance version requirement to the PFS (see Decision 07 above).	
April 2026 Action 11	Ake to propose a statement that could be added to PFS regarding recommendation for Cloud-Optimised GeoTIFF to be adopted for CEOS-ARD products.	June 2026
April 2026 Action 12	Ferran and Peter to propose a revision to requirement 4.1 of the Surface Reflectance PFS (Geometric Correction) to resolve the issue of having absolute performance requirements, which is unique to this requirement and causing issues with compliance for high resolution datasets.	June 2026
April 2026 Action 13	CEOS-ARD Secretariat to submit the various changes to PFS agreed in the Decisions record of this meeting and close the associated issues in the GitHub.	July 2026

ISO Decisions

Dave Borges shared a letter of CEOS recommendation to discontinue the parallel ISO 19176-1 effort to avoid duplication and allow the CEOS-ARD framework to mature further before formal standardisation. The recommendation was put forward as a resolution to the ISO/TC 211 62nd Plenary on Friday, 8 May 2026.

April 2026 Action 03	Dave and Chris to share the boilerplate text for engaging national standards bodies on the issue of the ISO 19176-1 discontinuation motion, and ARD Oversight Group to provide further edits and share with national standards body contacts.	April 2026
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A6.2: SAR RTC issues and cloud-optimisation requirements

Ake Rosenqvist (JAXA) reported on the SAR PFS group's discussions regarding very high resolution SAR, noting a lack of consensus on what a VHR SAR PFS should look like.

- In some environments, some radiometric terrain corrections do not make sense, and for high resolution digital surface models, attempting RTC creates disturbance. A VHR SAR PFS could be created that doesn't require RTC, but it could not be classed as analysis ready.
- The group decided not to produce a VHR SAR PFS. VHR commercial providers are directed to assess against the NRB PFS.

- There are no current requirements on quality assessment, so it's up to the provider if they believe the product is good enough as an NRB. Synspective have opted to include both an RTC measurand as well as a sigma naught image.
- The IEEE P3397 SAR Image Quality Metrics WG was referenced.

Appendix A: List of Participants

In person		Virtual	
Agency	Full Name	Agency	Full Name
CEOS-ARD Secretariat	Harvey Jones	ASI	Giovanni Blasono
CEOS-ARD Secretariat	Matt Steventon	CEO Team	Julia Caufape
Constellr	Andreas Brunn	GISTDA	Pawarin Kuha
EC	Peter Strobl	JPL	Rob Rosenberg
ESA	Ferran Gascon	Planet	Jessica Bobeck
Esri	Rob Waterman	SEO	Matthias Mohr
GA	Matt Adams	USGS	Todd Taylor
GA	Medhavy Thankappan		
IEEE	Siri Jodha		
JAXA	Ake Rosenqvist		
JAXA	Takeo Tadono		
MYSIA	Adhwa Amir Tan		
NASA	Margaret Wooten		
NASA	Rodrigo Vieira Leite		
NPL	Nigel Fox		
SDSU	David Clay		
SDSU	Sharon Clay		
SEO	Brian Terry		
SEO	Dave Borges		
USGS	Chris Barnes		
USGS	Megan Rush		

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