

**Minutes v1.0**  
**LSI-VC-11 Teleconference #1: CEOS-ARD for Land and LSI Updates**  
17 May 2022

## Participants

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<b>CNES:</b>	Mireille Paulin
<b>CONAE:</b>	Caroline Tauro, Homero Lozza
<b>ESA:</b>	Ferran Gascon, Frank Martin Seifert, Fabrizio Niro
<b>EC/JRC:</b>	Peter Strobl
<b>GA:</b>	Medhavy Thankappan, Andreia Siqueira
<b>GISTDA:</b>	Sitthisak, Panu
<b>ISRO:</b>	Keerthi, Radhika
<b>JAXA:</b>	Takeo Tadono, Ake Rosenqvist
<b>KARI:</b>	Seok Weon Choi, Daehoon Yoo, Dong Han Lee
<b>LSI-VC Sec:</b>	Matt Steventon, Libby Rose
<b>NOAA:</b>	Kevin Gallo
<b>SEO:</b>	Brian Killough
<b>Sinergise:</b>	Grega Milcinski, Marko Repse
<b>USGS:</b>	Steve Labahn, Tim Stryker, Chris Barnes
<b>VITO:</b>	Dennis Clarijs
<b>Orbital Sidekick:</b>	Tara Gattis

*[The presentation slides compiled for this meeting are here.](#)*

## Introduction

Andreia Siqueira (GA, LSI-VC Co-Lead) thanked everyone for joining and for providing slides on the upcoming topics. Peter Strobl (EC/JRC, LSI-VC Co-Lead) welcomed old and new faces to the meeting, and looks forward to the interesting meeting over the next few days. Steve Labahn (USGS, LSI-VC Co-Lead) reiterated the points of the other leads, and asked all members to think about what is next for LSI-VC. The group should think about where we have been, and all the things we have established over the last few years, and what we would like to establish next.

## Sinergise

Grega Milcinski (Sinergise) reported on the implementation of Sentinel-1 CARD4L into the SentinelHub.

- They have created a processor that takes the Sentinel-1 data and turns it into the CARD4L compliant NRB product. The user has a number of options in this process, and is done on-demand, with the result available almost immediately.
- Sinergise supported Digital Earth Africa with NRB CARD4L processing.
- Sinergise feedback on the CARD4L peer review process: need clearer timeline, understanding of status and who was performing the review, and what the reviewer is looking for.

## Discussion

- Ake Rosenqvist (JAXA) noted that there are several things we can do to improve the review process. It is difficult to produce products when the PFS is still changing. Ake recognised that the contribution from Marko from Sinergise to the CARD4L SAR group was very valuable to the process of developing the PFS.
- Medhavy Thankappan (GA) commented that we are designing the review process as we are trying to evaluate products. With the optical PFSs, we have done a number of revisions which make them clearer, however the SAR ones are not quite there yet.
- At the threshold level, the peer review process does not require a whole panel to be put in place. The full panel review will continue for the target level assessments. For the threshold level, Medhavy reviews the evaluations and provides feedback directly to the data provider. With this scaled back review process, the idea is that the threshold level product assessments can be turned around in 4-6 weeks.
- All that remains for the Sinergise CARD4L submission is for Medhavy to write a formal report back to LSI-VC. The product is essentially approved.
- Ake noted that one of the advantages of an API, such as the Sinergise CARD4L Tool, that generates products on-the-fly is allowing users to choose different parameters e.g. per-pixel metadata. He asked whether the metadata files would be different for sigma-0 and gamma-0 products from Sinergise? Grega noted that most users choose gamma-0, with Marko adding that they did implement a bit of robustness in the metadata file, but if the user deviates from the specifications too much, then the product will no longer be compliant.
- Ake suggested that it would be an advantage to have the metadata in a consistent form, such is the case for all SAR PFSs.

<b>LSI-VC-11-01</b>	LSI-VC Leads to connect with Sinergise to explore the potential utility of their CARD4L generation tools for assessments and automated metadata checking.	<b>ASAP</b>
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- Andreia Sequeira (GA, LSI-VC Co-Lead) asked whether what Sinergise has done is applicable to other datasets. Sinergise has put a lot of effort into integrating the service, and could work with a different dataset if the source is formatted appropriately.
- LSI-VC has received feedback from some industry contacts that ARD standards are needed before CEOS-ARD / the concepts in CEOS-ARD can see mass uptake. Matt asked if Sinergise had the same feeling. Grega is happy with the level of standardisation provided by CARD4L, and doesn't think more formal standards are needed. As Sinergise does the processing on demand, it is easy to change parameters as needed. The process of formal standardisation is too slow, and we just need something that suits a large portion of the user base. Formal standards could increase the number of users but maybe not by an order of magnitude.
- Sinergise would try and fit to any specifications that seem reasonable, and fit with what the users want. This could be understood through the development of use cases.

### **VITO / Proba-V Collection 2 Reprocessing**

Dennis Clarijs (VITO) reported on the reprocessing of the seven-year archive of PROBA-V products to Collection 2 (C2), where they are aiming for CARD4L Threshold compliance.

- Aiming to be done with reprocessing at the end of the year, with a public release planned for the first quarter of 2023.
- Their self-assessment has concluded they are almost at Threshold level. Target level is still a long way off and hence they will not focus on this for this reprocessing.
- VITO will aim to get the self-assessment to the review team by the end of June 2022 for peer review.

#### Discussion

- The data will be available via the OSCARS catalogue (API accessible), as well as the user interface Terrascope. They have also set up some Jupyter notebook access for the data.
- On their threshold level self assessment, they are only doubting the spectral lens specification units. They currently have the central wavelength in the metadata in nanometers, or should it be in metres? Medhavy confirmed that nanometers is fine, and suggested using some of the successful CARD4L products as an example for what needs to be in the sample data and metadata.

<b>LSI-VC-11-02</b>	Matt to add PROBA-V Collection 2 to the 'under assessment' datasets on ceos.org/ard	<b>COMPLETE</b>
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#### **CONAE**

Homero Lozza (CONAE) reported on how CARD4L can provide extra value to their catalogue of high-level products.

- Their high-level products are commonly used for agriculture applications.
- Offer users three ways to access data, and can download the format that best suits their project. Each platform gives different benefits to different types of users.

#### Discussion

- CEOS and OGC standards on ARD may converge in the end, however metadata should be a common language in both. The approach depends on the technology. Can also think of the STAC possibilities.
- CONAE is also planning for more freely available data.

<b>LSI-VC-11-03</b>	Ake to connect with Homero Lozza (CONAE) regarding CARD4L assessment of SAOCOM products.	<b>ASAP</b>
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#### **Geoscience Australia**

Medhavy Thankappan (GA) reported on the National Space Mission for Earth Observation (NSMEO), which will see Australia design, build, and operate four new satellite cross-calibration radiometers (SCR).

- These satellites will help to increase interoperability between satellite missions, bringing consistency across multiple data sources.

#### Discussion

- Steve asked about the uncertainty measurement requirements. Medhavy noted that this mission is similar to CLARREO and TRUTHS in a broad sense, however CLARREO and TRUTHS will have a much



highed radiometric calibration accuracy, providing very small uncertainties. SCR will use well characterised systems to cross calibrate with many different EO satellites. By increasing the number of collects between SCR and the other satellites, the transfer calibration uncertainty can be brought down to less than 2%.

- The Australian NSMEO will contribute to and accelerate the abilities of companies/governments to submit and more rapidly receive CARD4L compliance. Essentially the system will be able to provide this information in an open and free manner to anyone that wants to use the data to bring their radiometric uncertainties down. This system will be available to all, including commercials and small satellite operators, traceable to known standards. Being able to trace back to known standards like that brings them in line with reference data. The data policy states that the data will be open to everyone. Hopefully the mission will enhance public-private partnerships and allow CEOS agencies to use these new sources of commercial small satellite data and vice versa.
- SCR is seen as a way to give back to the international community and the global calibration effort.
- Regarding the spectrum, the mission will have 2.5 micron bands.
- Early simulations show a 640km orbit around 10:20 am local descending node crossing time can target a large percentage of EO satellites – more than 100 EO satellites. The timing and orbit for SCR has been chosen specifically for this. The orbit will be sun-synchronous, so can only support other sun-synchronous orbits around that LTDN.

## **JAXA**

Takeo Tadono (JAXA) reported on JAXA's potential CARD4L products

- The ALOS-2 PALSAR-2 Global Mosaic NRB product and ScanSAR NRB products are in the final stages of self assessment. JAXA is hoping to submit for peer-review in June 2022.
- ALOS-2 is past the post-operation phase #1, but has been extended to post-operation phase #2, to provide continuity until ALOS-4 is launched in Japanese Fiscal Year (JFY) 2023.
- The launch of ALOS-3 (optical) has been postponed to JFY 2022. The ALOS-3 Surface Reflectance product will aim to be CARD4L compliant.

## Discussion

- Regarding the updated geometry during reprocessing of the ALOS-2 global mosaics, the previous version products were corrected using SRTM, while the reprocessed ones use the AW3D, the 30m ALOS-PRISM DEM. The geometric update is due to a geometric uncertainty present in the previous version (plus or minus one pixel), which had some effects when doing change analysis on the time series of data. This is not directly an update of the DEM, it's more fixing a bug in the processor. The ALOS-2 mosaic products are now aligned on a pixel basis, which they were not previously. Reprocessing of the ALOS global mosaics is underway and is expected to be completed in 2022.

## **NOAA**

Kevin Gallo (NOAA) reported on recent mission updates.

- GOES-18 launched successfully on March 1. JPSS-2 is planned for launch in September 2022.
- No formal plans for GOES/JPSS-2/VIIRS CARD4L at this stage, but the possibility is being actively discussed.



Discussion

- Regarding NDVI and ARD definitions for higher level products, it would not be recommended as there are so many derived products. NDVI is used because it is a historical product and is readily produced, whereas NOAA and NASA are using more ‘experimental’ models. Brian Killough (NASA, SEO) noted that there is probably a sweet spot for where we should create PFSs - likely somewhere around the level 2 products. Beyond that there are so many derived products it would complicate.

**Nighttime Lights Surface Radiance**

Brian Killough (NASA, SEO) reported on the Nighttime Lights Surface Radiance PFS, which is nearly ready to be released as a baseline.

- NASA’s Black Marble dataset has provided an example for which the team has tested the PFS, and the team has completed a preliminary PFS assessment. 25 of the 26 threshold requirements have been met, and 27 of the 40 target requirements have been met.

Discussion

- The self assessment of the Black Marble dataset has provided confidence that the PFS is on target. It will be presented for endorsement shortly.
- The migration of the Black Marble dataset to the cloud has allowed for the development of some tools, including open data cube algorithms. This will make the community more aware of this dataset and make it more easily accessible.
- Steve Labhan (USGS, LSI-VC Co-Lead) acknowledged the great progress Brian and the team have made to get the Black Marble dataset accessible in the cloud and to write the corresponding PFS.

**ESA**

Ferran Gascon (ESA) reported on the status of ESA’s CARD4L products:

- ESA has a number of CARD4L products under development/definition, alongside the Sentinel-2 L2A Surface Reflectance product which has already been assessed as CARD4L. There are also a number of candidate ARD products.
- The Living Planet Symposium is being held next week, with a session on ARD to be held on Friday 27th.

<b>LSI-VC-11-04</b>	Matt to update ceos.org/ard with all of the in-progress ESA CEOS-ARD products. And to consider a more robust table/database for capturing this info on the website.	<b>COMPLETE</b>
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Discussion

- Steve Labhan (USGS, LSI-VC Co-Lead) asked whether there would be any opportunity for USGS to learn from ESA’s lessons on the DGGS topic. Ferran suggested that, in a similar manner to how USGS is involved in the Sentinel data quality fora, USGS could be involved in this too.

<b>LSI-VC-11-05</b>	USGS and ESA to connect on DGGS, in particular USGS active participation in ESA working groups on the topic.	<b>ASAP</b>
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- Peter Strobl (EC/JRC, LSI-VC Co-Lead) highlighted the [global grid agora at LPS](#)
- The current baseline for the reprocessing is the Copernicus 90m DEM, with the Copernicus 30m DEM potentially to come later.

### **LSI-GEOGLAM**

The LSI-GEOGLAM Subgroup provided a report, which can be read in the [slides](#). We will hear more from the LSI-GEOGLAM subgroup, including on the Essential Agriculture Variables (EAVs), at LSI-VC-12 in September.

### **DLR**

Martin Bachmann (DLR) provided a written update on CARD4L for EnMAP & DESIS, which can be read in the [slides](#).

### **Product Assessment Progress**

Medhavy Thankappan (GA) reported:

- The Sinergise NRB Sentinel-1 product assessment is almost complete, all that remains is to provide a written report to LSI-VC and WGCV.
- Element-84 Sentinel-2 SR product is awaiting confirmation from Element-84 on some queries that were raised about whether the product has undergone any changes or is being planned for any changes since the processing baseline updates to the Sentinel-2 product itself. There are some characteristics of this product that are inherited from the ESA Sentinel-2 ARD product.
- USGS U.S. ARD SR and ST: have done a preliminary review, and did not see any issues. Will do a detailed review shortly, and provide feedback to USGS.
- Assessments should speed up from this point as Medhavy now has more capacity. Additional POCs for the peer reviews would be helpful.

### Discussion

- Ake Rosenqvist (JAXA) noted that for SAR products, there is a big group of experts in the WGCV SAR Subgroup. Medhavy may reach out to this subgroup to help with the SAR peer reviews.
- Steve Labhan (USGS, LSI-VC Co-Lead) noted that the backup POCs for peer reviews need to come from WGCV.
- Phillipe Goryl (ESA) is the WGCV lead for the CEOS-ARD Oversight Group, with Medhavy providing support / observing.
- Matt Steventon (LSI-VC Sec) asked whether it would be feasible to automate any part of the CARD4L assessment process. Could we somewhat reverse-engineer the process Sinergise uses to create the product? Medhavy noted that we could use a process like that to assess the completeness of the metadata, but to check the actual requirements would require a human review. Furthermore, for sample data, documents need to be verified, and the information on the DOI landing page needs to be checked.
- Having redundancy for the peer reviews / assessments is key.



- Peter Strobl (EC/JRC, LSI-VC Co-Lead) suggested that eventually we should validate the content of archives, similar to the process OGC has to test standards. For this, we may need to look into developing some automation processes.

**Radar PFS Development**

Ake Rosenqvist (JAXA) reported:

- The first NRB CARD4L product has been approved – Sinergise’s Sentinel-1 RTC.
- A new PFS is under development for Ocean Radar Backscatter (ORB). Targeting the end of 2022 to have v1.0.
- GSLC (v1.0 targeted for Q4 2022/Q1 2023), INSAR and LiDAR PFS are under development. INSAR and LiDAR are both moving slowly.

Discussion

- Regarding the gridding of LiDAR ARD products, canopy top height is not gridded, but Ake would like to see some products that are gridded.
- Peter Strobl (EC/JRC, LSI-VC Co-Lead) asked whether we should add some requirements on gridding at the Oversight Group level.
- The format of the metadata file is a target specification, to allow those that do not have a fixed format an opportunity to align with other data providers.
- Having specifications for the metadata format is something to be discussed at the Oversight Group level. Some potential overlap with the standards discussions with IEEE and ISO-OGC.
- This discussion opens a new dimension of interoperability. So far we have been on the semantic level (definitions), but the defining of the encoding is a different field. This is not straightforward and would require further discussion.

<b>LSI-VC-11-06</b>	<p>Matt to add to the agenda for the next meeting of the CEOS-ARD Oversight Group:</p> <ul style="list-style-type: none"> <li>• Identifying backup / additional people to support CARD4L assessments.</li> <li>• Discussion regarding consistent metadata specifications to accompany all CEOS-ARD PFS, following the lead of the SAR products.</li> <li>• Discussion regarding requirements on gridding for all CEOS-ARD.</li> </ul>	<b>Next meeting of the CEOS-ARD Oversight Group</b>
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**Closing**

Matt thanked all for attending, especially the agencies that provided an update on their ARD products and LSI missions. LSI-VC-11 Teleconference #2 will be held Wednesday 18 May, at 7am US East.