

**April 2020 Calibration/Validation Maturity Review**  
**April 23<sup>rd</sup>, 2020**

**Review Team Members: Mitch Goldberg (chair), Lihang Zhou, Satya Kalluri, Ingrid Guch, Banghua Yan, Jim Yoe, Kevin Schrab, Rick Stumpf, Michael Ford, Gary Wick, Tom Renkevans, Jim Gleason**

**Summary**

The review team acknowledges all the science teams for their efforts and hard work in preparing for this review and progress made calibrating/validating all the N20 products. In summary, the review team recommends:

- NOAA-20 Vegetation Index reached Validated Maturity
- NOAA-20 Green Vegetation Fraction reached Validated Maturity
- NUCAPS CO2 product (S-NPP & NOAA-20) reached Provisional Maturity
- NUCAPS CH4 product (S-NPP & NOAA-20) reached Validated Maturity
- NOAA-20 OMPS NP SDR reached Validated Maturity

Actions for DPMS/JSTAR: 1). For future reviews, make sure the review materials are available to the review team at least 1 week before the review. 2). Coordinate reviews of the ATBDs and ensure the documents are consistent with the updated algorithms.

**NOAA-20 Vegetation Index and Green Vegetation Fraction (Validated Maturity)**

The presentation is well done. The global and regional statistics for VI and GVF are shown to meet requirements in general. Excellent comparisons of GI and VGF to not only other satellites such as SNPP but also land based systems such as PhenoCam as well as data from Google Earth. All show good results and comparisons and correlations over broad geographical areas and long time series. Slide 67 summarizes the validation results well. Good user feedback as well as understood issues and path forward.

Recommend team publish results since it will be very useful for the wider community.

**Recommend Validated Maturity for both N20 VI and N20 GVF.**

**RFA #1** (Ingrid Guch): Slide 70 - verify language in validation slides matches conclusions, for some reason I thought the validation slides indicated the high VI values had suspiciously high accuracy/precision, rather than low (low makes more sense)

**RFA #2** (Ivan Csiszar): The NOAA/ESRL user comment included on slide 63 appears to pre-date the current situation. It states, “We plan to introduce VIIRS GVF into the next implementation of RAP and HRRR (RAPv4 and HRRRv3) at NCEP”. RAPv4 and HRRRv3 were implemented in NCEP operations on July 12, 2018. The VIIRS GVF product has indeed been included in those updates. See [https://www.weather.gov/media/notification/pdfs/scn18-58rap\\_hrrr.pdf](https://www.weather.gov/media/notification/pdfs/scn18-58rap_hrrr.pdf). The next operational update at NCEP is RAPv5/HRRRv4, planned for June 2020.

Rationale for the action: It is important to note that the VIIRS GVF product is already indeed in operational use at NCEP.

Additional comments/questions for GVF/VI from the review team:

(From Jim Yoe): The product team has done a clear and complete job making the case that the NOAA-2- VIIRS GVF and VI products have attained validated maturity. Performance against requirements and comparisons with other data sources (MODIS, Phenocam, NPP VIIRS) are compelling. The evaluation and statement of intent to use the product by EMC (Helin Wei) and ESRL (Tanya Smirnova) for the next versions of the RAP/HRRR are noted.

Will be interested to hear about the outcomes of efforts to reduce processing time, and to increase the accuracy of high VI cases as these are pursued.

I recommend that the NOAA-20 GVF and VI products be considered to have attained validated maturity. (Jim Yoe)

### **NUCAPS CO2 and CH4 products (S-NPP & NOAA-20)**

The NUCAPS teams did a great job presenting N20 & SNPP calval results and following prior review team guidance for their products:

- Good review of prior RFAs and showing how they were responded to appropriately.
- Nice summary of the algorithms improvements over the provisional version on slide 14.
- Slide 19 and similar - showed significant improvements made for MW-only retrieval vs. ECMWF under cloudy conditions.
- Intercomparisons with AIRS and Tropomi showed good consistency, nice effort by the team to further extend the validation data source for the trace gases, including CAMS model outputs.
- Good seasonality of CO2 is shown for version. 2.7.2 vs 2.5.2 on slide 55. That plus the comparison slides such as 58 show the improvements in version 2.7.2
- Excellent results validate CO2, CH4, and CO against Atom and showing the improvements from the previous version.
- Good demonstration of using the Averaging Kernel for the trace gases' profiles validation.
- Nice demonstration of CO tracking of Australia Fire.

### **Recommend Provisional for CO2 and Validated for CH4.**

**RFA #1** (Mitch Goldberg): For the AI work, identify what is the problem the team is trying to use AI to solve, and why.

**RFA #2** (Lihang Zhou): Further extend the validation data source for the trace gases, including the in-situ and field campaign data if possible.

**RFA #3** (Lihang Zhou): Suggest the team to update the Metop-B/C and make it compatible with the retrievals from N20/SNPP; put together plans for reprocessing the SNPP mission long data sets with the Validated Maturity Algorithms.

Additional comments/questions for NUCAPS from the review team:

(from IG):

Slide ~68 - “well-known need for waiver” mentioned... validation indicates user needs have been addressed, it appears precision requirement is too stringent and does not indicate what user actually needs, thus validation is approvable, but as a review team we should identify more information about the status of this waiver (written? documented? Lesson learned? approved?) Recommend team publish results if have not already - will be very useful for wider community

User feedback from STAR and ESRL highlights the scientific or emerging nature of products (higher value for scientific users than real-time users? or too new for real-time users) - interested in perspective from other panel members RE other users availability to evaluate products in real-time applications..

(From Tom R):

- Good review of prior RFAs and showing how they were responded to appropriately.
- Slide 39 - new version 2.7.2 has a difference for ozone not centered on 0. This is a review of CO<sub>2</sub> and CH<sub>4</sub>, not O<sub>3</sub>, but want to make sure that the upgrade to 2.7.2 did not adversely affect O<sub>3</sub>. This is also on slide 142 in the backup material for a second focus day. It looks like a difference on average of 1-1.5 Dobson Units. How significant is that change?
- On slide 64, NOAA-20 CO<sub>2</sub> stated there are outliers that will be corrected once QA flags are available. When will that be? (*did I miss this?*)
- Good example of CO tracking of Australian fires.
- Overall, recommend the suggestions of Provisional for CO<sub>2</sub> and Validated for CH<sub>4</sub>.

### **NOAA-20 OMPS NP SDR (Validated Maturity)**

The NOAA\_20 OMPS NP SDRs meet the spec and at the validated maturity. The OMPS SDR team did a great job taking follow up actions from the previous review, and conducted detailed analysis to characterize the SNPP and N20 differences. Presentation is well-prepared and includes detailed results that are useful for references.

**The review team recommends NOAA-20 OMPS NP SDR reached Validated Maturity.**

**RFA #1** (Lihang Zhou): SDR team continues to work with the EDR team to characterize and understand the differences between SNPP and N20 OMPS NP SDRs and the impacts of such differences to the Ozone EDR products.

**RFA #2** (Larry Flynn): RFA Title: OMPS Instrument information at ICVS - A link to the OMPS NP and NM bandpasses data sets should be provided at the ICVS instrument website.  
<https://www.star.nesdis.noaa.gov/jpss/OMPS.php>

Rationale: This is part of the GSICS recommended content for instrument pages.

**RFA #3** (Larry Flynn): When will the new Wavelength Scale be in Operations: OMPS NP SDR Readme

The Readme file says:

8) A change was made to the OMPS-NP calibration constants in conjunction with adjustments to the wavelength scale. This is documented under DR9066. OMPS-NP SDR datasets prior to the implementation of DR9066 do not meet the validated requirements wavelength registration.

This needs to be revised.

Note: The SDR Team is working on getting a CCR for this DR.

Rationale: This should refer to a CCR not a DR and should give a date stating when the CCR was closed by implementation of the new tables in operations.

**RFA#4** (Larry Flynn): Radiances differences at high latitude Northern Hemisphere: OMPS NP SDR Readme

The statement in the Readme should be rewritten.

Current:

6) For a few wavelengths at a high latitude > 65 deg. region, there is inconsistency issue in radiances between the S-NPP OMPS-NP and the NOAA-20 OMPS-NP. This issue is under active investigation.

Revised:

6) There is an inconsistency issue in radiances between the S-NPP OMPS-NP and the NOAA-20 OMPS-NP. It occurs in the Northern Hemisphere at SZA > 63° in the cases investigated so far, and is likely due to In-Band Stray Light for the NOAA-20 OMPS NP. This issue is under active investigation.

Rationale: New analysis reveals a “bump” in NOAA-20 NP radiances turning on between SZA=63° and SZA=64°. See Slide #8 on IBLs for the EDR presentation. It is expected that this contamination of the measurements is present for all NOAA-20 OMPS NP channels but with decreasing relative impact for longer wavelength channels. The variations in the onset with season have yet to be investigated.

**RFA #5** (Larry Flynn): Comment on EDR Slides: OMPS EDR Slides #5, #9 and #10?

There was a comment from Chunhui Pan on the EDR slides regarding a 0.03 nm concern. This is a request for details on the comment.

Rationale: The line had static and it was unclear whether the issue was spectral smile in the spatial dimension, wavelength variations of the NP SDRs along an orbit or some other concern.

Additional comments/questions for OMPS NP SDRs from the review team:

(Tom R) - *(was not fully focused as running over time and pulled away to other duties... and the arguments on line from Larry and others were not helpful at all - should have been resolved prior to this meeting)*. That all said, from what I saw and reviewed, and based on NWS feedback as well, I am OK with recommended promotion.

(I can not participate in any further dialog today...)too many other conflicts.

(LZ) Team did a good job taking follow up actions from the previous review, and conducted detailed analysis to characterize the SNPP and N20 differences.

(IG Notes) - Agree with Tom R and LZ. Very good job and slide package, clear detailed results useful for references. Looking forward to the EDR review. Recommend validated level.

Jim Yoe:

For NOAA-20 OMPS SDR Validated Maturity (Based on slides from SDR Team and prelim slides from EDR Team as of 4/22/2020)

Implementation of RFA- changes to SDR processing since the review conducted in September 2019 have been implemented, with some improvements, though some vagaries continue to exist downstream in the EDR products, notably several (three) categories of differences between the NPP and J1 products. The EDR team (Flynn) recommends promotional to validated maturity for the SDRs, indicating that the current differences in the EDR products from S-NPP and N20 are inherently fixable.

(From an offline discussion with C. Long as an end user, I understand that normal practice for the EDR team to match instrument A with Instrument B is to compare the products over the tropics, where ozone variability is low. Usually, this works and the extra-tropical observations are in close agreement as well. In this instance NPP and N20 match in the tropics, but the extra-tropical observations remain large. This does not indicate an issue with the quality of N20 observations (SDRs) themselves.)

Presentation is well-prepared, clearly shows status/outcome of activities since last September. Given the end user assent (NWS/NCEP/CPC) and confidence of the EDR team to be able to generate high quality, useful products reliably, with paths to improvement viable, I recommend to promote to validated maturity status.

===== **below are notes I (Tom R) got from Jim Yoe last night (4/22) on behalf of NWS who can't be there:**

**Notes and Votes for Jim Yoe, NWS**

**Tom, adding you to the list of folks I've shared this with. Tied up tomorrow morning (as are Brian and Kevin), and wanted to share some NWS perspective in written form prior to the review.**

**I have not seen the Carbon retrievals, and will not have time to address them, I'm afraid.**

**Regards - Jim**

**For NOAA-20 GVF and NOAA-20 VI Validated Maturity (Based on Dry Run Slides)**

The product team has done a clear and complete job making the case that the NOAA-2- VIIRS GVF and VI products have attained validated maturity. Performance against requirements and comparisons with other data sources (MODIS, Phenocam, NPP VIIRS) are compelling. The evaluation and statement of intent to use the product by EMC (Helin Wei) and ESRL (Tanya Smirnova) for the next versions of the RAP/HRRR are noted.

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