



MEMORANDUM FOR: The JPSS Program Record
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SUBJECT: NOAA-20 OMPS Ozone EDR beta maturity status
DATE: 03/22/2018

Beta maturity status declaration for OMPS Ozone EDR

Maturity Review Date: 03/22/2018
Effective Date: 02/13/2018

1. Background:

The Joint Polar Satellite System-1 (JPSS-1) was successfully launch on November 18, 2017 and renamed NOAA-20 after reaching polar orbit. With the same design as that of the Suomi NPP OMPS Nadir-only Sensors, the NOAA-20 OMPS consists of two spectrometers each with different spectral and spatial coverage. The OMPS Nadir Mapper (NM) SDR has spectral coverage from 300 nm to 380 nm with 196 channels and 1.1-nm bandpass. The OMPS Nadir Profiler (NP) SDR has spectral coverage from 250 nm to 310 nm with 150 channels and 1.1-nm bandpass. The OMPS nadir suite provides global measurements of total ozone, ozone profile, sulfur dioxide, UV reflectivity and an aerosol index.

Forty-eight days after launch, on January 5, 2018, the NOAA-20 Ozone Mapper Profiler Suite (OMPS) opened its door and started collecting science data. The initial data was in a high-spatial-resolution limited-spectra mode and was not compatible with the operational EDR algorithms. Since February 13, 2018 the instrument has been operated in a medium resolution mode and the NDE processing of the IDPS SDRs has created ozone EDR products.

The OMPS Ozone EDR team consists of experts from NOAA, NASA, IMSG, and industry partner Raytheon. The team has been working OMPS EDR pre- and post-launch calibration and validation for the Total Column Ozone EDRs from V8TOz and V8TOS, and the Ozone Profile EDRs from V8Pro as process operationally at NDE.

2. Beta maturity stage definition:

- 1) The product is minimally validated, and may still contain significant identified and unidentified errors.
- 2) Information/data from validation efforts can be used to make initial qualitative or very limited quantitative assessments regarding product fitness-for-purpose.
- 3) Documentation of product performance and identified product performance anomalies, including recommended remediation strategies, exist.

3. Justifications for declaring OMPS EDR data products beta maturity:

After NOAA-20 OMPS activation, the OMPS SDR and EDR team members immediately started analysis of OMPS science RDR, telemetry RDR, SDR and GEO and EDR data products. Based on

eight weeks of intensive evaluation and monitoring of OMPS data after door open on January 5, 2018, the following assessments of the OMPS SDR and EDR products were compiled:

- The NOAA STAR EDR team has successfully used the SDR data in total ozone and ozone profile retrievals and are generally positive about the measurement quality.
- OMPS SDR products for the Earth-view Nadir Mapper SDR & GEO and Nadir Profiler SDR & GEO were checked. The Nadir Mapper has a 2-km along-track difference from expected alignment in comparisons with NOAA-20 VIIRS. The Nadir Profiler has a 2-km along-track difference from the expected alignment with the Nadir Mapper. The EDRs use the same geolocation information as the SDRs;
- The OMPS solar measurements were compared to prelaunch model spectra and wavelength shifts were found. The SDR wavelength scales have been adjusted for these changes and the Nadir Mapper measurement-based intra-orbit wavelength scale adjustment is working well. The EDRs use the SDR solar and wavelength scale to compute the radiance/irradiance spectra;
- Dark current and LED calibration parameters were evaluated and compared to prelaunch measurements. The noise level are as expected and the weekly updates will maintain them adequately for the EDR processing;
- On-orbit SDR radiometric bias was estimated based on preliminary comparisons with Suomi NPP. This will form the initial basis for the initial EDR adjustments;
- Errors and artifacts in the SDR and EDR data products were documented. Solutions have been proposed and evaluated, but not necessarily implemented;
- The NOAA-20 EDR products from NDE were compared to S-NPP EDR products and to NOAA-20 EDR products from off-line processing at STAR – NOAA-20 ozone results are similar to those for S-NPP with differences and caveats as noted below; and
- NOAA-20 OMPS SDR and EDR data products can be used for making initial qualitative or limited quantitative assessments,

The presentations and ReadMes for the OMPS SDR and Ozone EDR products justifying their advances to beta maturity can be found at

<https://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>

4. NOAA-20 OMPS Ozone EDR beta maturity caveats

The following caveats are provided to beta EDR product users:

1) The NM SDRs have some cross-track biases which appear in the retrieved EDRs as striping in the V8TOz product maps. This problem will be reduced as new sample tables are put into IDPS processing but a final set of soft calibration adjustments will need to be devised for implementation at NDE to reduce the EDR biases to validated maturity levels.

2) The stray light correction and the solar spectra for the NM SDRs are still works in progress. Changes in these will impact the absolute accuracy of the V8TOz EDRs and affect the final EDR adjustments.

3) The current sample tables for the NM and NP do not give good alignment of the two instruments FOVs. This creates scene-dependent biases in the V8Pro EDR. The SDR team is working to provide better-aligned tables to IDPS for use with new on-board instrument tables. These are expected to be in use by the end of May 2018.

4) The NP SDR processing code has errors in two lines that lead to incorrect wavelength assignments and miscalculation of calibration constants. A fix has been tested offline and a CCR has been submitted but is not expected to be in operations at IDPS until July 2018. Until, then the V8Pro ozone profile EDRs will have significant errors. The development of soft calibration adjustments for the V8Pro at NDE will be developed by using off-line processing at STAR.

5) The smaller FOVs for the NOAA-20 V8Pro EDRs lead to poorer performance (noisier retrievals from transient spikes) in the South Atlantic Anomaly (SAA) than is seen for the S-NPP V8Pro EDRs. The SAA flag is not set for some of the affected retrievals beyond the edges of the currently defined region. We will need to use a lower energy threshold to define the SAA region or implement better outlier filter and removal techniques.

5. Path Forward

The team will work to continue with the following planned calibration and validation tasks to promote the OMPS EDR data products to provisional maturity:

- 1) Compare Equatorial Pacific regional means for V8TOz and V8Pro EDRs with those for S-NPP.
- 2) Estimate cross-track bias in the V8TOz EDRs from weekly statistics segregated by cross-track position.
- 3) Investigate methods to reduce the effects of transient signals in the medium resolution NP SDR on the V8Pro EDRs.
- 4) Track the impact of continued improvements in the SDR as planned by the SDR team.
- 5) Implement a code change to set the EDR content for Profile Error Code 8 – excessively large initial residuals – to fill or default values for retrieved parameters.
- 6) Provide deliveries of adjustment tables and code changes for V8Pro and V8TOz to NDE as SDR maturity progresses and stabilizes and validation results are analyzed.
- 7) Provide a delta delivery of code for the Linear Fit SO₂ algorithm (LFSO₂) to process NOAA-20 V8TOz to create V8TOS products with improved SO₂ estimates and corrected total column ozone for the smaller FOV NOAA-20 products.

Additional information is available in the OMPS V8TOz and V8Pro algorithm theoretical basis documents (ATBDs) and the SDR beta maturity review briefing, which can be accessed at:

<https://www.star.nesdis.noaa.gov/jpss/Docs.php>

and

<https://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>

Beta NOAA-20 OMPS SDR near-real-time status and performance monitoring web page are available by using the following password protected websites:

https://www.star.nesdis.noaa.gov/icvs-beta/status_J01_OMPS_NP.php

https://www.star.nesdis.noaa.gov/icvs-beta/status_J01_OMPS_NM.php

Provisional NOAA-20 OMPS SDR near-real-time status and performance monitoring web page will become available at the open website:

<https://www.star.nesdis.noaa.gov/icvs/index.php>

Pre-operational NOAA-20 OMPS EDR near-real-time status and performance monitoring web pages will become available at the following websites:

Archive https://www.class.ncdc.noaa.gov/saa/products/search?datatype_family=JPSS_OZONE

Operations <http://www.ospo.noaa.gov/http://www.ospo.noaa.gov/Products/atmosphere/index.html>

Long-term <https://www.star.nesdis.noaa.gov/smcd/spb/OMPSDemo/proOMPSbeta.php>

Daily maps https://www.star.nesdis.noaa.gov/jpss/EDRs/products_ozone.php

Activity <https://ozoneaq.gsfc.nasa.gov/omps/n20/activity>

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