

## NOAA-20 Algorithm Maturity Review October 2, 2018

**Review Team Members:** Mitch Goldberg (chair), Lihang Zhou, Satya Kalluri, Arron Layns, 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 calibrating/validating all the N20 products. In summary, the review team recommends:

- CrIS SDR is at Validated Maturity
- All NUCAPS EDRs are at Provisional Maturity with exception of CO<sub>2</sub> and CH<sub>4</sub> which are at Beta Maturity
- OMPS TO<sub>z</sub> EDR is at Provisional Maturity
- VIIRS Polar Winds EDR is at Provisional Maturity
- All Cloud EDRs are at Provisional Maturity pending resolution of the ECM LUT table
- All Cryosphere EDRs are at Beta Maturity

### CrIS SDR

CrIS SDR has met the Validated maturity requirements effective EP v115 implementation (8/14/2018).

Spectral uncertainty well-characterized by 3 different groups/techniques and demonstrates requirements are met. Geolocation and NEdN were also shown to meet requirements over a range of conditions.

Source of the Gain degradation is unknown, but the CrIS team suggests that other N20 instruments are also experiencing degradation. However, the CrIS team estimates that after 5 years on-orbit, CrIS will still meet the NedN requirements (in worse case (very conservative) scenario based on a linear extrapolation, which is not really a good assumption). Seems highly likely not to impact product performance over the life of the mission.

Good users' feedback from NCEP, showing positive impacts in general; NUCAPS also provided comprehensive feedback, and brought up the inter-satellites consistency between SNPP and NOAA-20. Recommend CrIS SDR team to work with NUCAPS and address it in reprocessing efforts.

**RFA: Originator** Tremblay and Guenther; **RFA Title:** Identification of CrIS N-20 responsivity spectral degradation. **Action/Recommendation:** Request sensor builder (Harris) team provide additional analysis on possible CrIS N-20 responsivity spectral degradation. We understand Harris staff have some ideas on possible contamination candidates and we desire that the Harris team be asked to further develop those ideas into potential root cause of degradation. A

comprehensive review of spectral contamination candidates is not requested at this time; this request is to focus only several of the current candidates of most likely contamination sources. The concern is in part a concern that some process or environment at Harris in development is adding a contaminant and the process may need to be corrected for degradation induced contamination. **Rationale:** Degradation of CrIS N-20 responsivity is 4X faster than is the degradation of S-NPP. The N-20 degradation also has a spectral signature that is also seen on S-NPP. Presence of a spectral signature in the degradation suggests possibility of a chemical contamination.

## **NUCAPS EDR Products**

### **Ozone Profile**

Given slide 34, in particular, N20 is very consistent with SNPP. Since SNPP is at validated maturity, **N20 NUCAPS Ozone has met the provisional requirements.** The N20 NUCAPS Ozone product is characterized against SNPP and ECMWF.

Recommendation: For validated review, Science team should show more validation statistics against a wider range of data.

### **Trace Gases (Carbon Monoxide, Carbon Dioxide, Methane)**

Recommend N20 CO<sub>2</sub> and CH<sub>4</sub> remain at Beta given the relatively large differences between N20 and SNPP. Recommend N20 CO has met provisional maturity. For validated maturity, the science team is recommended to show results for both SNPP and N20.

CO & CH<sub>4</sub> meeting accuracy and precision requirements in the sensitivity layer (between 400-600 hPa) compared to ATom and TCCON, but not outside these areas.

Recommend the science team make sure that there are legends on all the graphs (examples on slides 36-37, 42-43). Also recommend on slides 36-27, the science team indicate how many ozonesondes were validated against over what time period.

Recommend the science teams compare SNPP to N20 trace gases globally (monthly stats).

### **Outgoing Longwave Radiation**

N20 (as well as SNPP) CrIS OLR and N20 CERES OLR comparisons are remarkably consistent. Only showed 1 day of data though. Comparisons between SNPP and NOAA-20 CrIS OLR daily (focus day May 15 2018) and the monthly mean for May 2018 are consistent. N20 OLR has met provisional maturity requirements. For validated maturity recommends to show more focus days over multiple months for comparisons.

### **OMPS Ozone V8TOz EDR**

Recommend TOz meets provisional maturity with the validation against SNPP.  
Agree that provisional should be effective as of IDPS Block 2.1 Mx 3 TTO

## **Cloud Products**

Overall, the cloud products validated well against in situ and satellite sources, and therefore all have demonstrated provisional maturity.

### **Cloud Type/Phase**

Compared to Calipso, accuracy is 0.57 - 0.70 (requirement is 0.6). Very good characterization of the performance, including identification of conditions when VIIRS cloud phase works well and doesn't. Good comparison results against GOES-16 showing good agreement except in Mixed phase.

### **Cloud Mask**

Recommend cloud mask meets provisional maturity, but the science team needs to ensure the correct LUT is running in NDE.

There might also be a problem with SNPP Operational ECM, which needs to be resolved asap.

Good characterization of known issues and resolutions. The review team concurs with the path forward to reach validated maturity.

### **Cloud Top (Height/Temp/Pressure)**

Good validation comparison with CALIPSO/CALIOP and NASA MODIS showing Cloud top products meet the specs.

The results presented from the VIIRS Winds team also demonstrate high quality cloud height parameters

### **Cloud Base Height**

Good validation comparison with Calipso and MODIS.

## **VIIRS Polar Winds**

Excellent comparisons of accuracy, precision, and uncertainty against radiosondes (over about 24 days) as well as against GFS for both SNPP and N20.

VPW v2.1 was installed on NDE I&T on Sept 27, 2018. If the validation of the NDE installation can be completed soon, recommend this product is ready for Ops! (assuming N20 Clouds are stable)

Recommend VPW meets provisional maturity.

### **Cryosphere Products**

Overall, the cryosphere products have not met provisional requirements and the products should remain at Beta. Recommend the team take advantage of the 2018 NH winter to conduct more thorough validation (eg conduct their Provisional maturity review in March 2019). Recommend the v2r0 cryosphere products be promoted to the operational string at the beta maturity status so that the science team have a consistent data set for validation. However, it should be noted that the science team could have taken advantage of the ~80% data that was available over the past 5 months.

Overall, Validation for the ice composites should not be shown as official validation results because there are too many differences when using the composites. The science team is recommended to show validation against AMSR2 and consider how to incorporate AMSR2 into their product for check.

### **Ice Surface Temperature**

#### **Ice Concentration**

The comparisons were done with JRR v1r2, which is not the version on NDE. However, v1r2 meets uncertainty requirements. Science team should verify that v2r0 (which is version running in NDE) is no worse. The science team confirmed there are no algorithm changes to the Ice algorithms in v2r0 compared to v1r2.

#### **Ice Thickness/Age**

#### **Snow Cover**

These products are really still at beta because no additional quantitative analysis was performed.