



# NOAA-20 SDR OVERVIEW

20 August, 2018

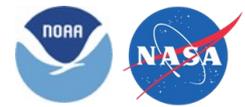
**Satya Kalluri**

Chief, Satellite Meteorology and Climatology Division,  
NOAA/NESDIS/STAR  
SDR Team Lead

*With contributions from SDR Team*



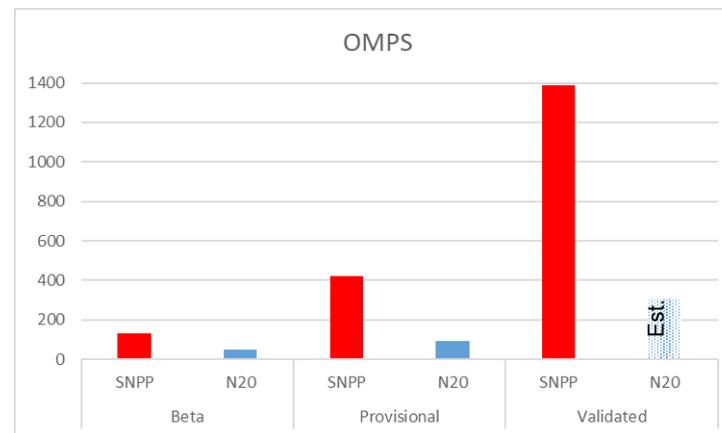
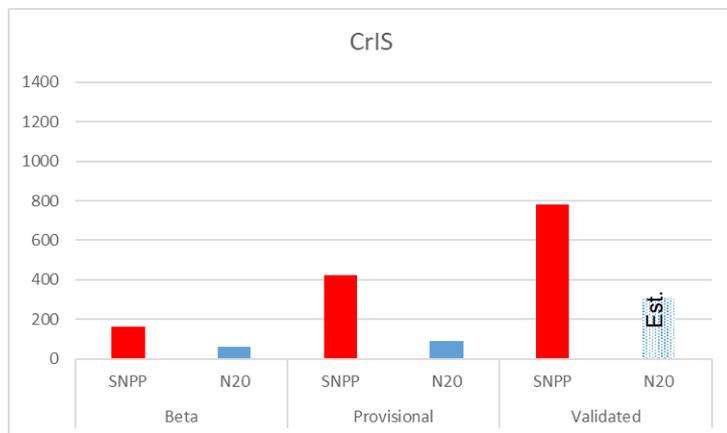
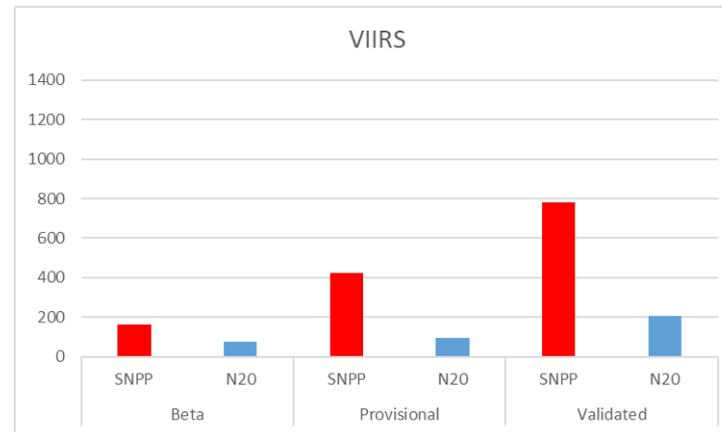
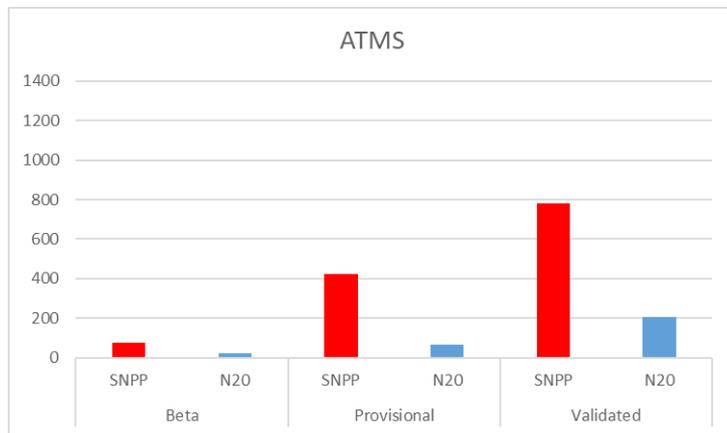
# NOAA 20 SDR Maturity Status



- ATMS – Validated
- VIIRS – Validated
- CrIS – Provisional
- OMPS Nadir Mapper- Provisional

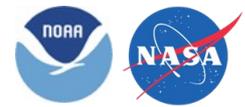
## Review Timeline Comparison

NOAA-20 SDR Maturity Achieved in Record Time!



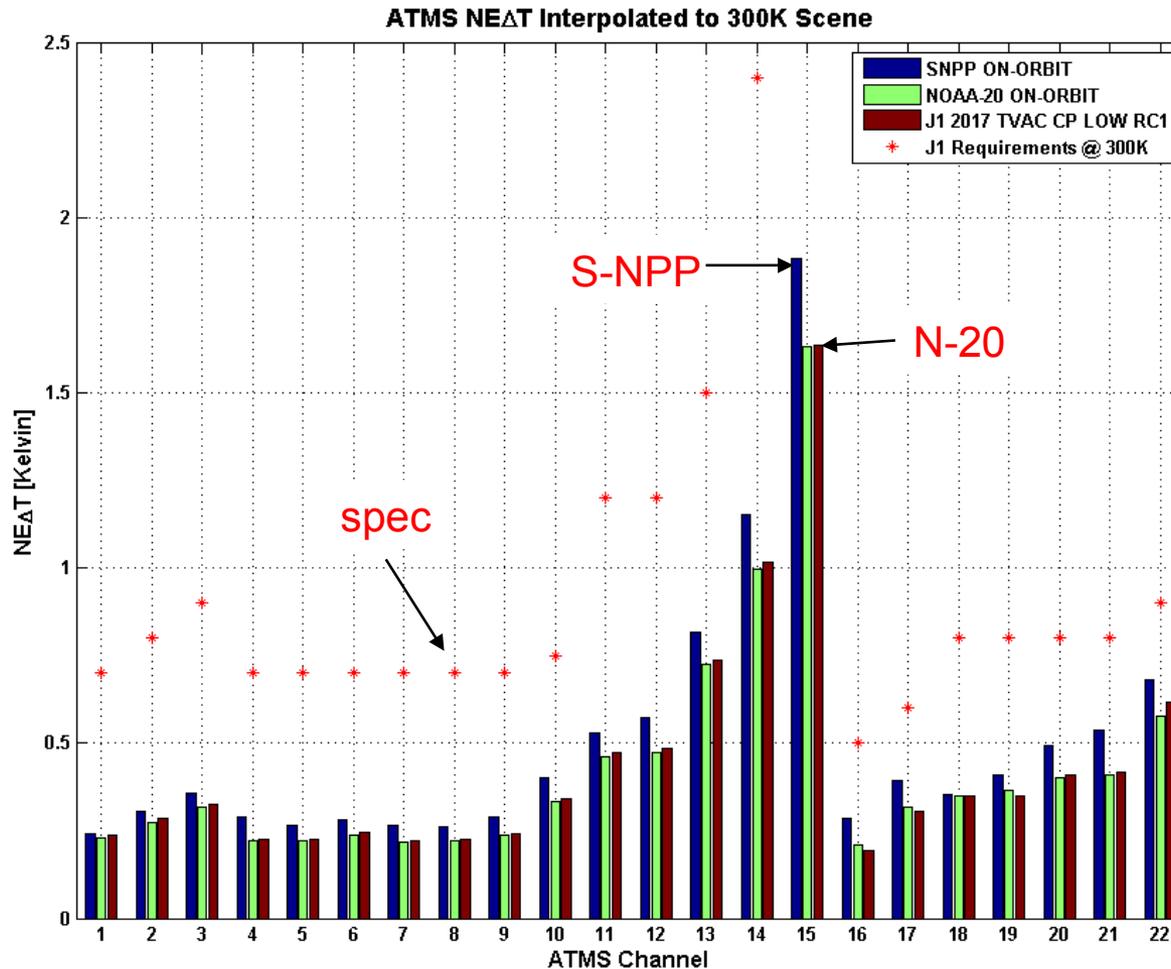


# NOAA 20 ATMS Progress Since Launch



- ATMS TDR/SDR performance has been demonstrated globally for months
- Cross satellites and sensors comparisons (N20 vs SNPP; ATMS vs GMI)
- Measurements vs RT simulations (CRTM, NWP data; RO data)
- NOAA-20 ATMS TDR in operations @NCEP/NOAA; NOAA-20 ATMS TDR in operations @ECMWF; NOAA-20 ATMS SDR cross scan asymmetry is way better (Simon and Swadley @NRL; Peter Weston and Niels Bormann)
- Delivered 6 Processing Coefficient Tables (PCTs) and updated 8692 (4346\*2) coefficients right before launch, 8448 coefficients for Provisional and 8448 coefficients for Validated maturities.

## Comparison of J1 Pre-Launch, NOAA-20 on-orbit, SNPP on-orbit



V. Leslie & I. Osaretin, MIT LL

N-20 NEDT on-orbit ~ same as pre-launch and better than S-NPP

# Assimilation experiment results – From two and half months

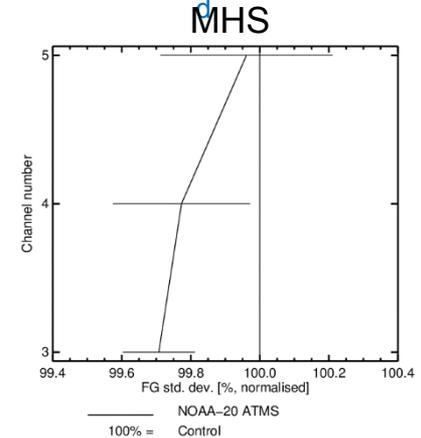
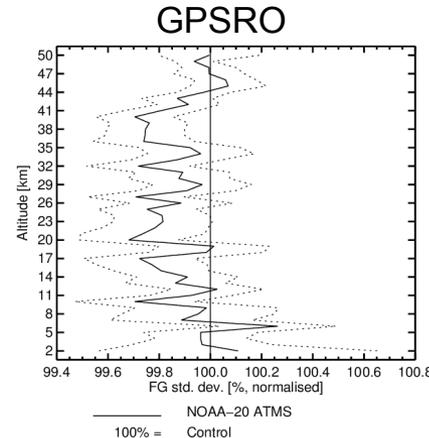
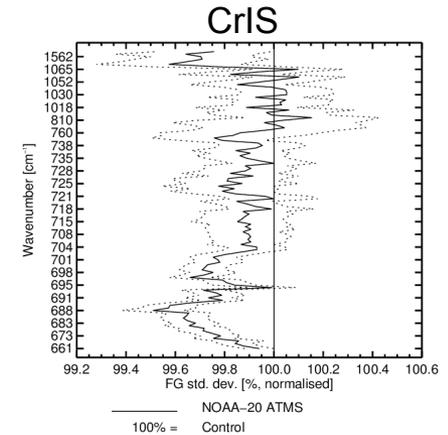
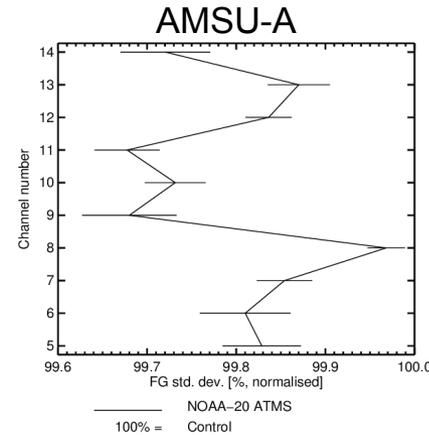
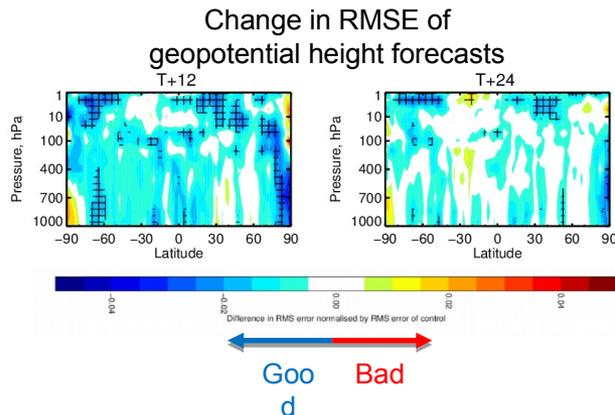
## Improved first guess fits to:

- Temperature observations (AMSU-A, CrIS, GPSRO)
- Humidity observations (MHS, GEO CSRs)

## Indicates improved accuracy of short range temperature and humidity forecasts

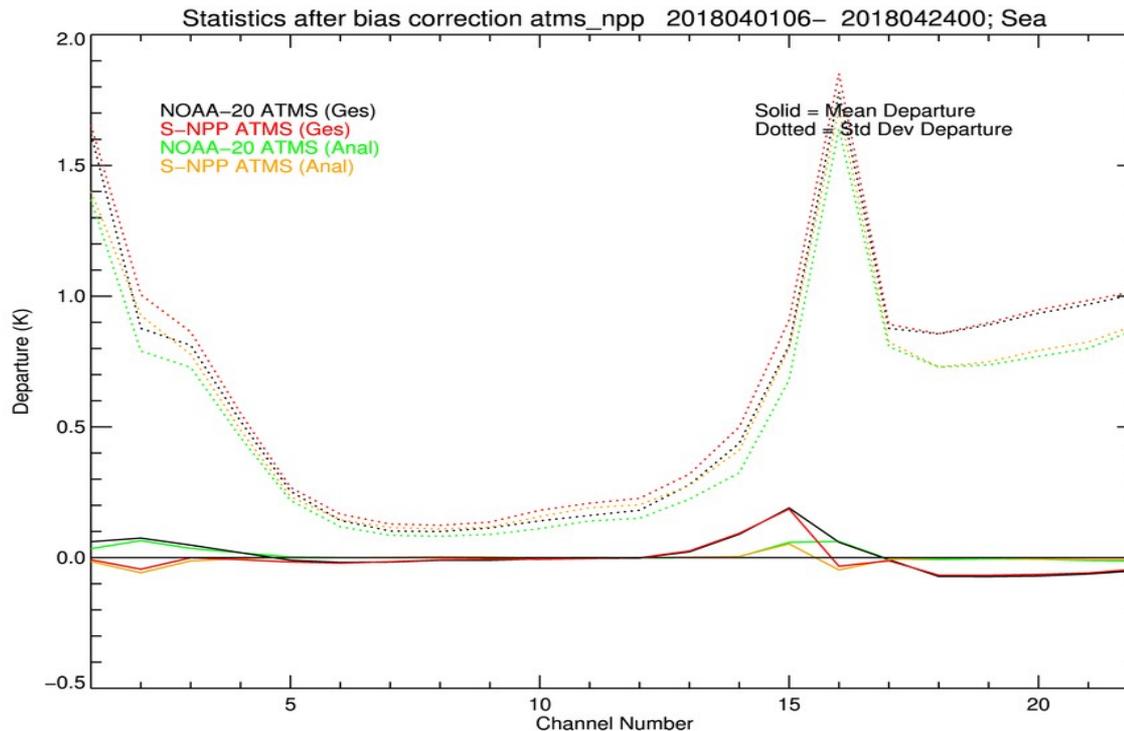
## Neutral to slightly positive forecast scores:

- Smaller geopotential height analysis increments



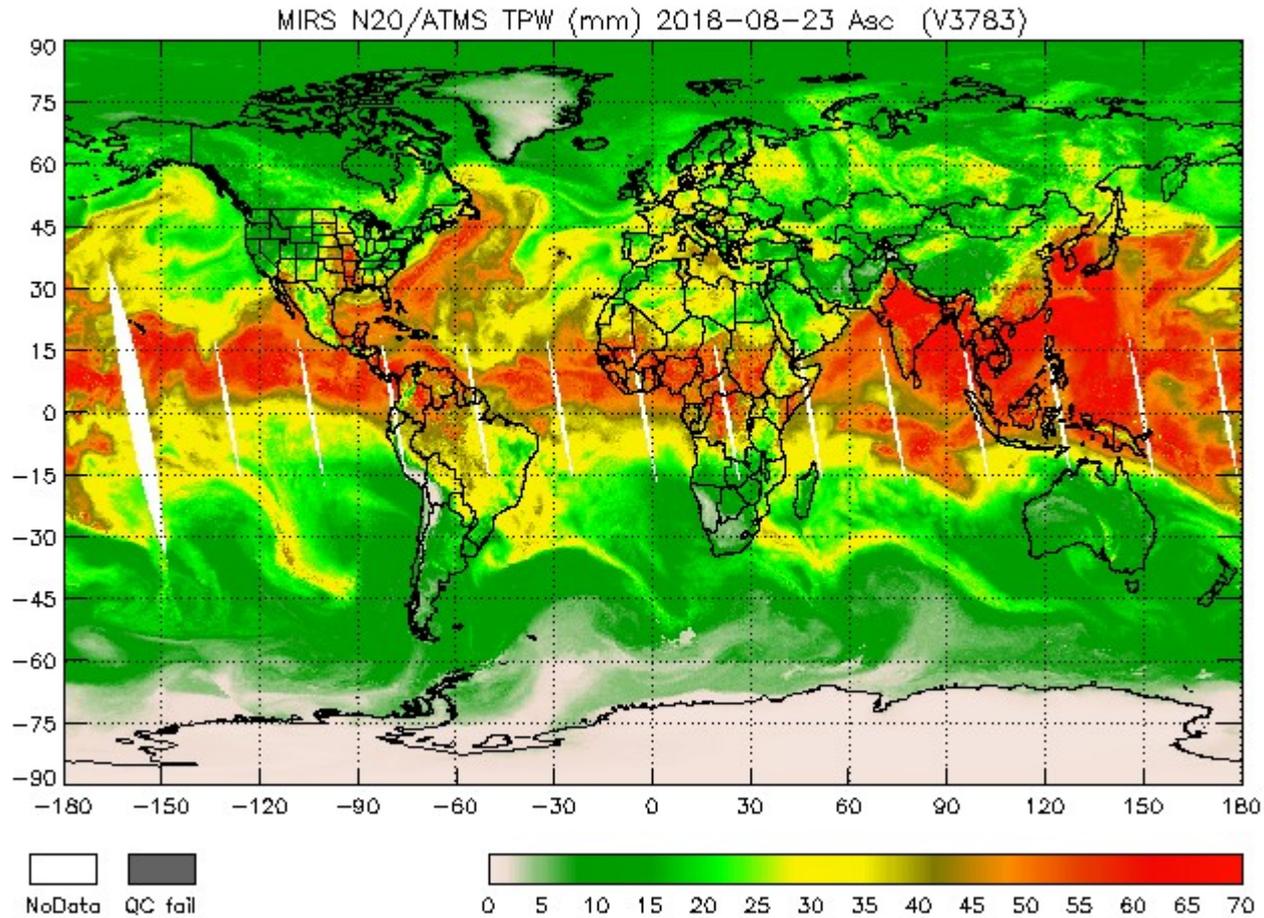
N20 ATMS TDR data look good;  
Striping appears to be less of an issue compared to S-NPP  
Number of observations between N20 and S-NPP passing QC is comparable.

NOAA-20 ATMS bias-corrected departure is comparable/slightly less than that of SNPP ATMS



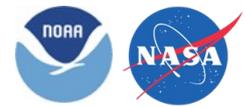
Courtesy: Andrew Collard, John Derber, Yangrong Ling

# Total Precipitable Water (2018-08-23)



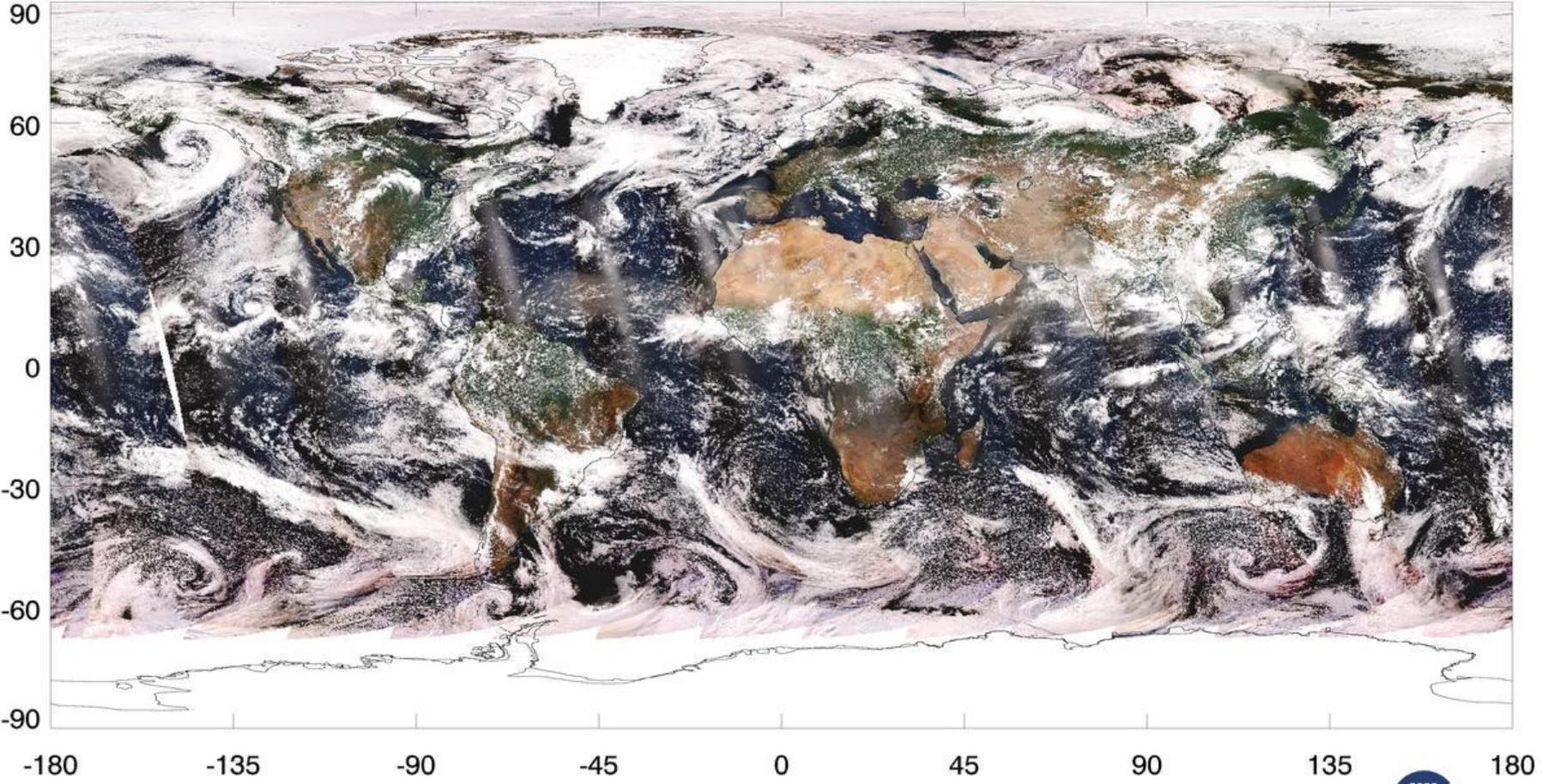


# NOAA20 VIIRS - Progress Since Launch



- Code and LUT corrections to enable the IDPS production of VIIRS First Light Image
- Developed and delivered updated LUTs (> 40) to operations to achieve Validated Maturity of NOAA-20 VIIRS SDR as scheduled
- Completed all major Post Launch Test (PLT) tasks to ensure the quality of SDR produced by IDPS
- Developed and delivered monthly precision lunar position predictions for operational lunar calibration maneuver (ongoing)
- Developed and delivered monthly DNB, RSB LUT calibration updates, and DNB straylight correction (ongoing)
- Developed and delivered postlaunch mounting matrix updates to IDPS and improved the geolocation uncertainty from a few kilometers to <200m.

# NOAA-20 VIIRS Global True Color Image, 2018-08-03



Red:SVM05, Green:SVM04, Blue:SVM03



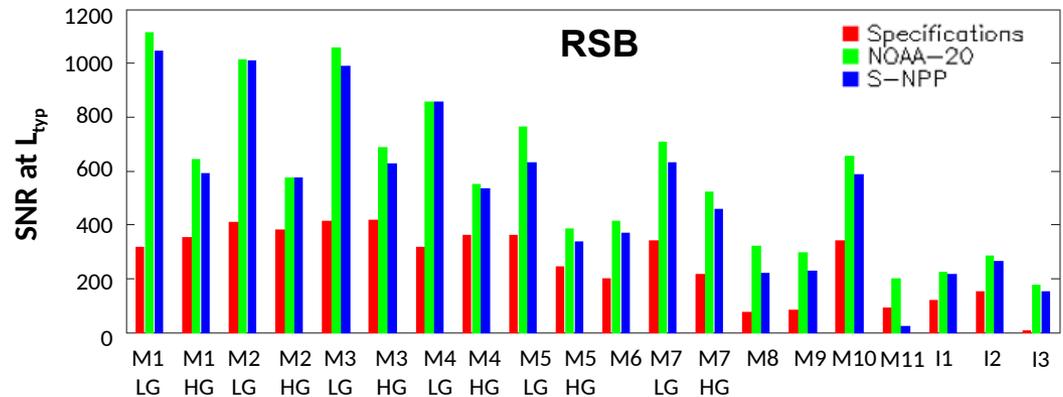
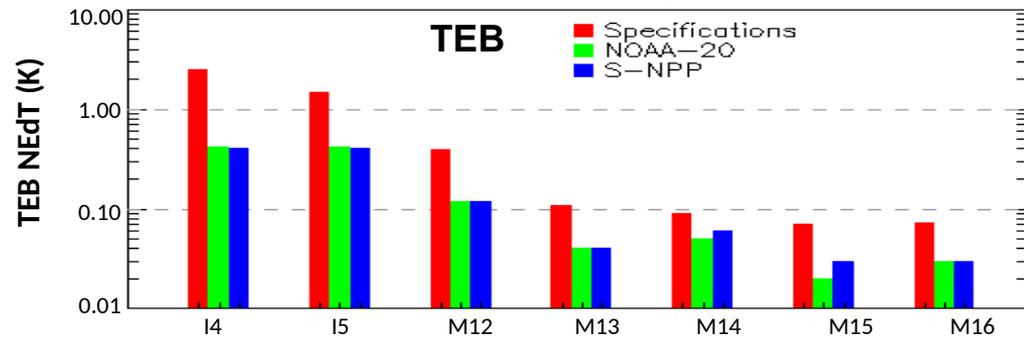
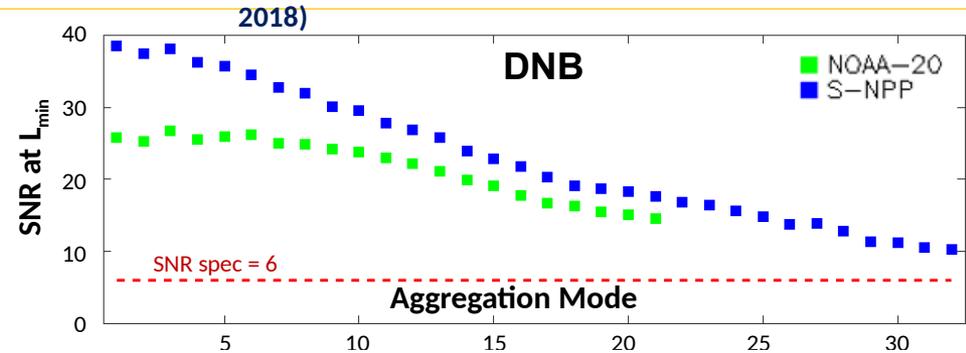
| Band  | L <sub>typ</sub> | SNR Spec | NOAA-20 (on-orbit) | S-NPP (on-orbit) |
|-------|------------------|----------|--------------------|------------------|
| M1 LG | 155              | 316      | 1115               | 1045             |
| M1 HG | 44.9             | 352      | 644                | 588              |
| M2 LG | 146              | 409      | 1012               | 1010             |
| M2 HG | 40               | 380      | 573                | 572              |
| M3 LG | 123              | 414      | 1057               | 988              |
| M3 HG | 32               | 416      | 686                | 628              |
| M4 LG | 90               | 315      | 857                | 856              |
| M4 HG | 21               | 362      | 551                | 534              |
| M5 LG | 68               | 360      | 762                | 631              |
| M5 HG | 10               | 242      | 383                | 336              |
| M6    | 9.6              | 199      | 413                | 368              |
| M7 LG | 33.4             | 340      | 708                | 631              |
| M7 HG | 6.4              | 215      | 523                | 457              |
| M8    | 5.4              | 74       | 319                | 221              |
| M9    | 6                | 83       | 297                | 227              |
| M10   | 7.3              | 342      | 653                | 586              |
| M11   | 1                | 90       | 198                | 22*              |
| I1    | 22               | 119      | 224                | 214              |
| I2    | 25               | 150      | 285                | 264              |
| I3    | 7.3              | 6        | 174                | 149              |

| Band | T <sub>typ</sub> | NEDT Spec | NOAA-20 (on-orbit) | S-NPP (on-orbit) |
|------|------------------|-----------|--------------------|------------------|
| M12  | 270              | 0.396     | 0.12               | 0.12             |
| M13  | 300              | 0.107     | 0.04               | 0.04             |
| M14  | 270              | 0.091     | 0.05               | 0.06             |
| M15  | 300              | 0.07      | 0.02               | 0.03             |
| M16  | 300              | 0.072     | 0.03               | 0.03             |
| I4   | 270              | 2.5       | 0.42               | 0.4              |
| I5   | 210              | 1.5       | 0.42               | 0.4              |

| Band  | L <sub>min</sub> | SNR Spec | NOAA-20 (on-orbit) | S-NPP (on-orbit) |
|-------|------------------|----------|--------------------|------------------|
| DNB** | 3                | 6        | >10                | >10              |

\* For S-NPP M11, L<sub>typ</sub> = 0.12 W/m<sup>2</sup>-sr-μm

\*\* On-orbit SNR of DNB at L<sub>min</sub> was evaluated by using the DNB OBC-BB data



**All channel noise performance meet specification, comparable to SNPP (I3 bad detector excluded)**

NOAA20 4 August 2018

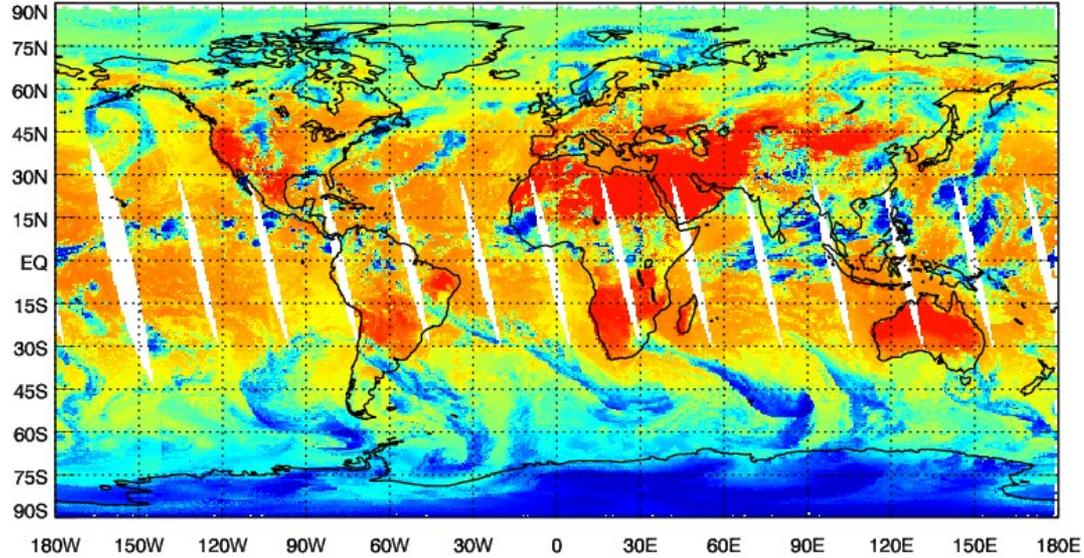




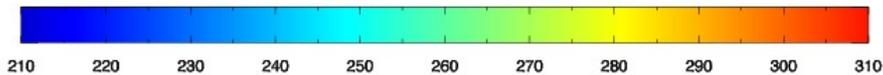
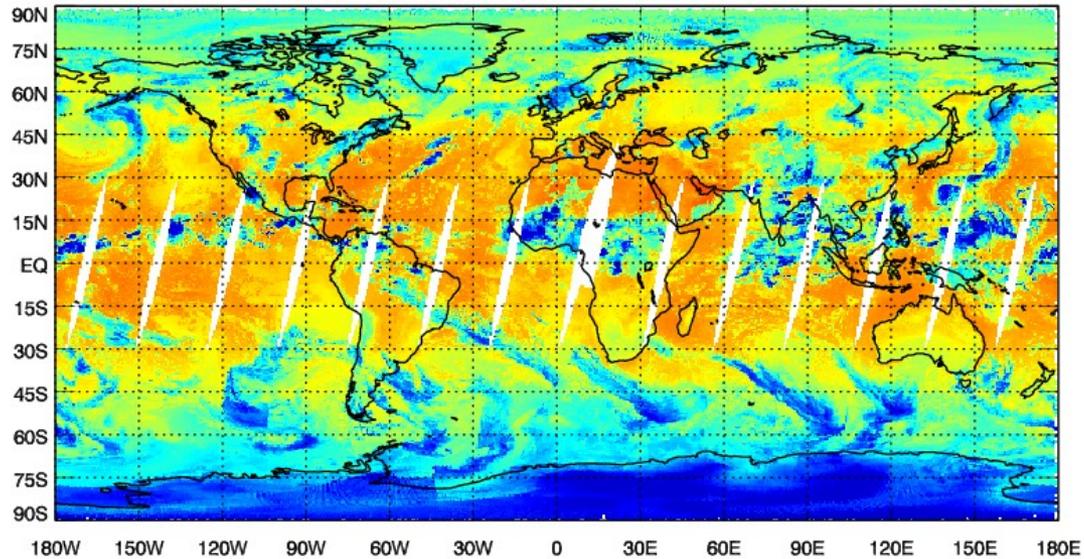
- NOAA-20 CrIS SDR products have been reliably produced by IDPS since detectors first went cold on 01/04/2018.
- Delivered 5 DAPs to IDPS
- RDR generator software package development: (1) STAR NL correction coefficient generator; (2) STAR ILS parameter generator; (3) STAR CITS unpacker to generate level 1a product; (4) STAR CITS geolocation to generate geolocation data; (5) STAR RDR generator

# N20 CrIS Brightness Temperature, 11 $\mu\text{m}$ ( $900\text{ cm}^{-1}$ ), Mapped, Ascending, 08/18/2018

Updated at Aug 19 12:38:46 2018 UTC

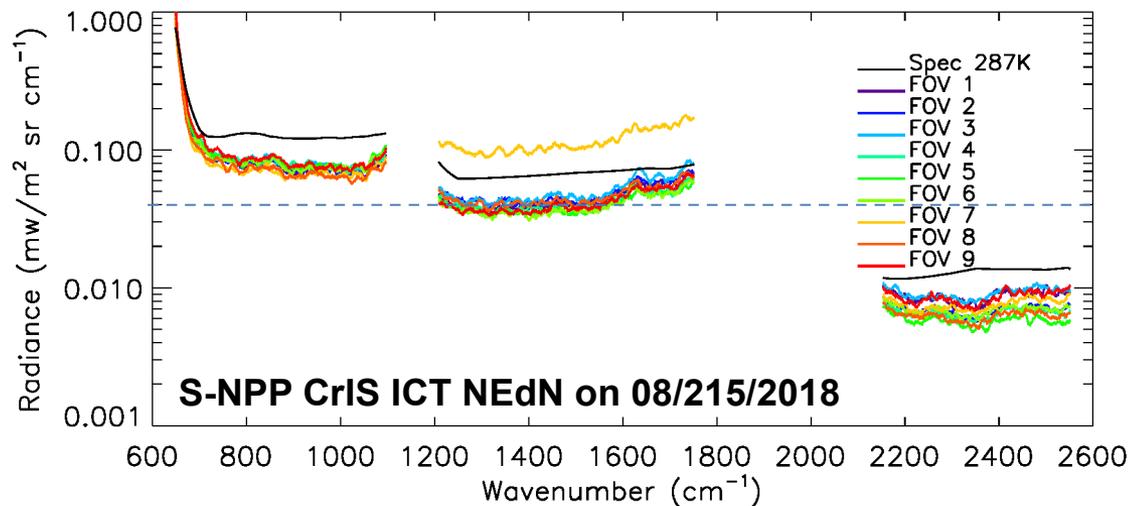
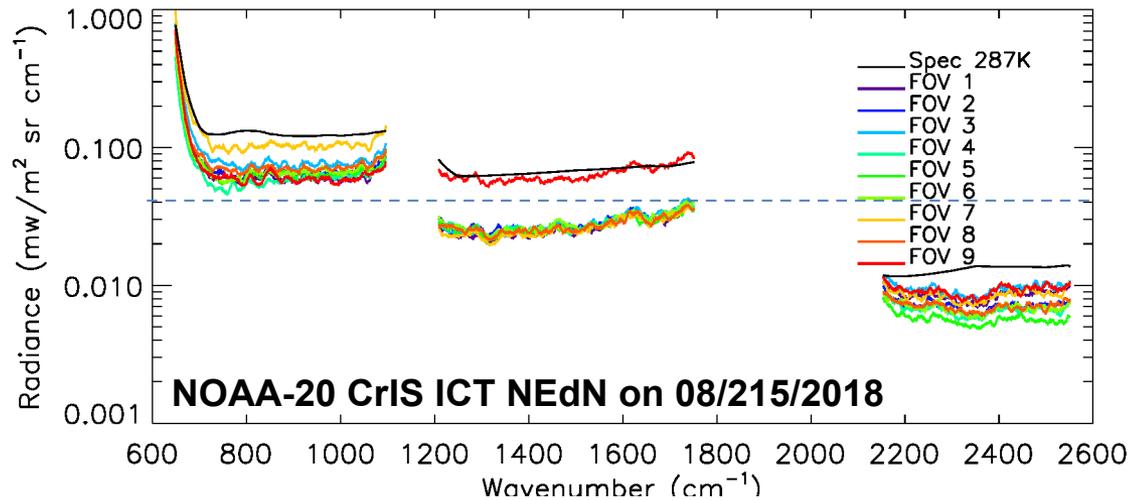


# N20 CrIS Brightness Temperature, 11 $\mu\text{m}$ ( $900\text{ cm}^{-1}$ ), Mapped, Descending, 08/18/2018



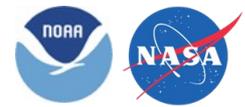
# Comparison Between S-NPP and NOAA-20 CrIS NEdN

## NOAA-20 CrIS MWIR NEdN shows better performance than S-NPP for FOVs 1-8

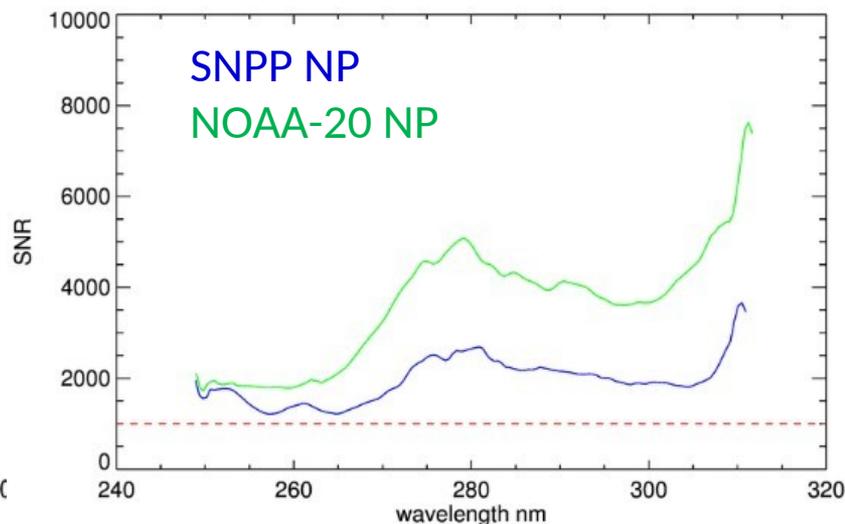
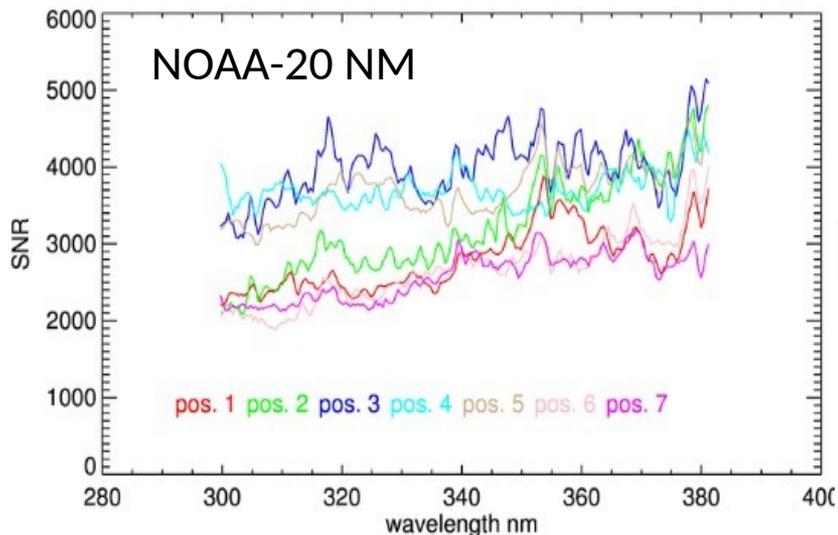




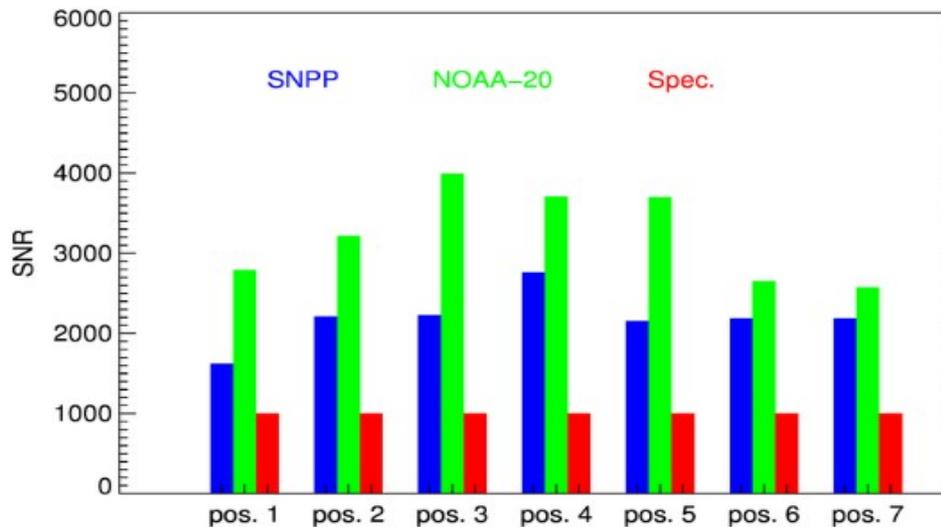
# NOAA20 OMPS Progress Since launch



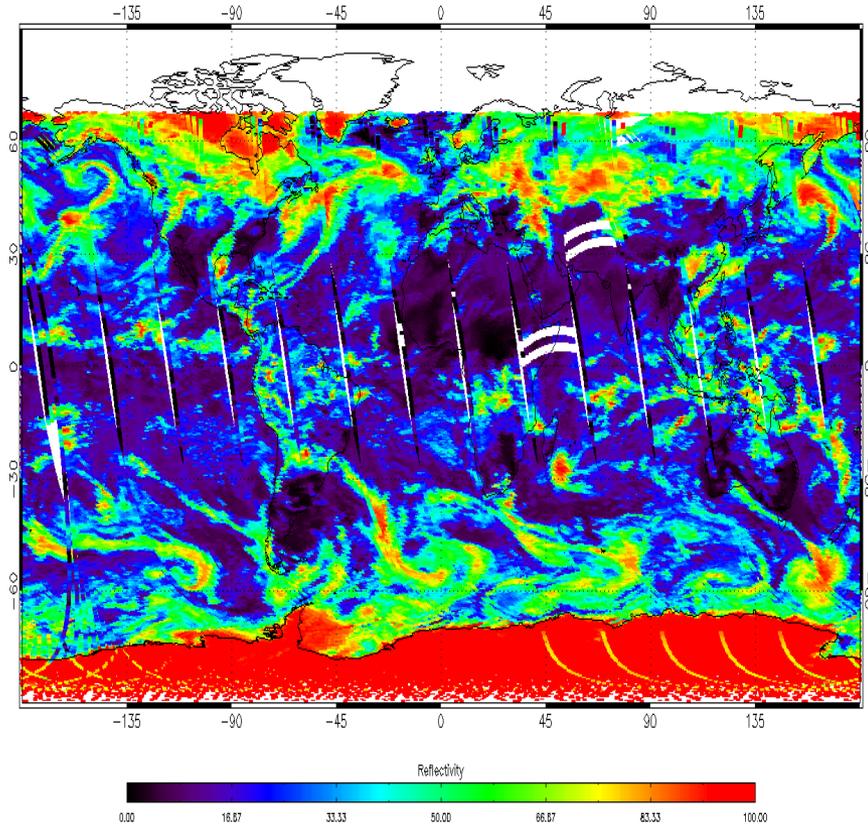
- Delivered 66 tables
- Code Change Deliveries: 4
- EDRs are being successfully retrieved from the SDRs/  
GEOs.



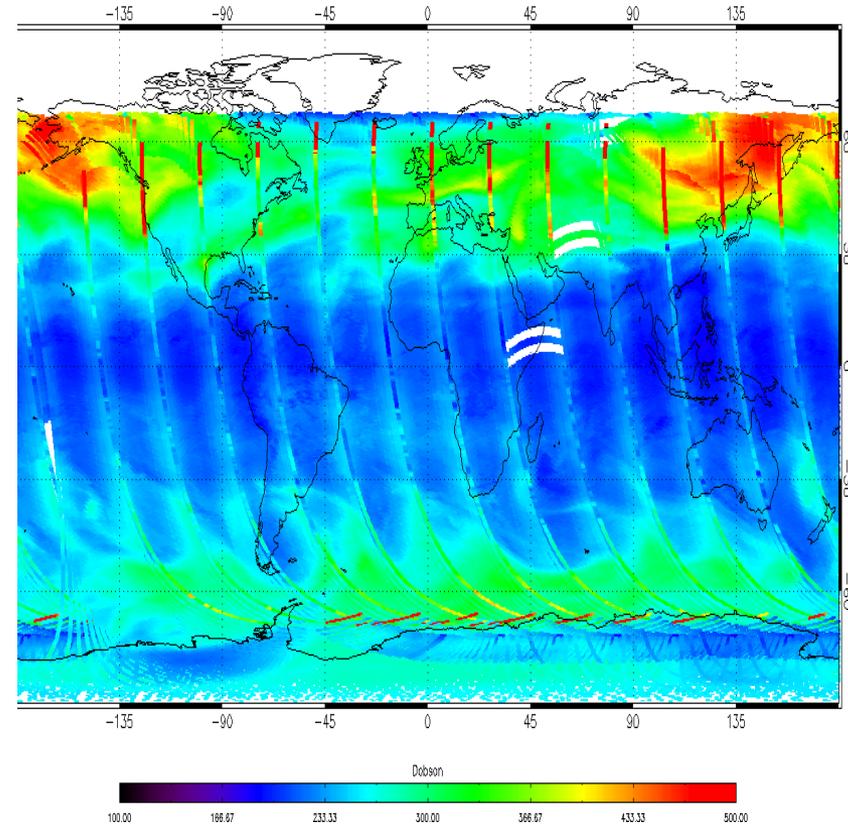
- Sensor SNR comparison with SNPP and Spec.
- Spec. SNR = 1000
- NOAA-20 shows a better performance



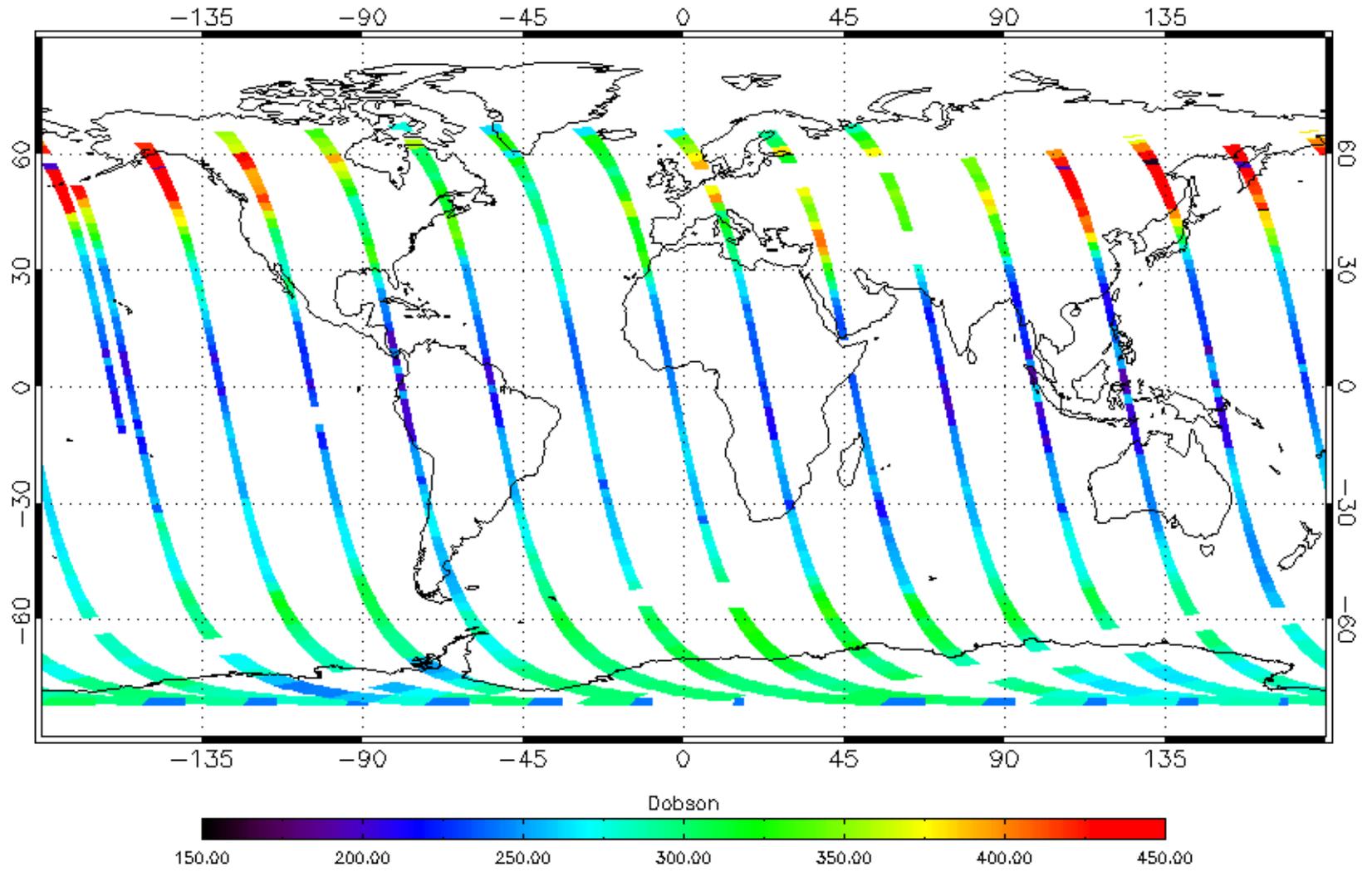
V8TOZ Reflectivity current NDE-npp 20180119



V8TOZ Total Column Ozone current NDE-npp 20180119



## Total Ozone Profile from N20 V8PR0 20180119



- At the current stage, the NOAA-20 OMPS on-orbit performances are doing well. Main performance parameters were compared for before and after launch, as well as between SNPP and N-20. The results are consistent and are expected.
- CCD performance, in terms of electronic bias, readout noise, LED signal drifting, nonlinearity and change in dark currents are all normal.

- **Big thanks for the dedicated and hard work of each of the contributing organizations**
- **Team work has been and continues to be exceptional**



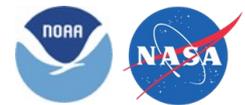
# NOAA-20 VIIRS SDR Cal/Val Team



| PI                       | Organization | Team Members  | Roles and Responsibilities   |
|--------------------------|--------------|---|--|
| C. Cao                   | STAR         |   | Team lead, calibration/validation, SDR science, coordination, oversight  |
| S. Blonski /<br>W. Wang  | STAR/ERT     | J. Choi,<br>Y. Gu,<br>B. Zhang,<br>A. Wald                | Flight & operations interface; maneuver support; VIIRS SDR cal/val (prelaunch studies; software code changes and ADL tests; postlaunch analysis, monitoring and LUT update; operations support; anomaly resolution); postlaunch cal/val tasks. |
| X. Shao <sub>(1/2)</sub> | UMD/CICS     | S. Uprety,<br>Y. Bai,<br>E. Lynch,<br>and students        | DNB operational calibration, straylight correction, geolocation validation, intercomparisons, solar/lunar calibration; image analysis& quality assurance; postlaunch cal/val tasks, documentation.   |
| I. Guch                  | Aerospace    | G. Moy, E. Haas,<br>S. Farrar, F. Sun,<br>and many others | Postlaunch cal/val tasks; independent analysis.  |
| J. Xiong                 | NASA/VCST    | G. Lin, N. Lei,<br>J. McIntire, and others                | Flight support, geolocation, postlaunch cal/val tasks; independent analysis,   |
| C. Moeller               | U. Wisconsin | C. Moeller, J. Li   | VIIRS RSR, CrIS comparison, DCC calibration  |
| JPSS                     | JPSS         | R. Marley,<br>C. Rossiter<br>B. Guenther                  | Collaboration  |



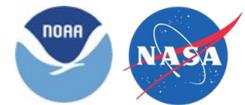
# ATMS Cal/Val Team Members



| PI                 | Organization | Team Members  | Roles and Responsibilities  |
|--------------------|--------------|---|---|
| Quanhua (Mark) Liu | NOAA/STAR    | Ninghai Sun (technical lead), Hu Yang, Xiaolei Zou, Lin Lin | Project management, SDR team coordination and algorithm test in IDPS, ATMS calibration/validation and geolocation science support, ATMS TDR/SDR data quality and monitoring |
| Edward Kim         | NASA         | Craig Smith, Joseph Lyu, Lisa McCormick                     | Liaison NASA flight team and NG Azusa, and independent SDR assessments, manage PLT and data analyze   |
| Vince Leslie       | MIT/LL       | Idahosa Osaretin, Mark Tolman                               | ATMS instrument performance and data quality assessments, PLT data evaluation   |
| Wesley Berg        | CSU/CIRA     |   | ATMS and GPM WG band cross-calibration  |
| Deirdre Bolen      | JPSS/JAM     |   | ADR/PCR support   |
|                    |              |   |   |



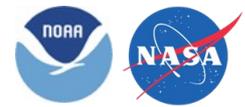
# CrIS Cal/Val Team Members



| PI                         | Organization                           | Major Task  |
|----------------------------|--|---|
| Flavio Iturbide-Sanchez    | NOAA/STAR                              | Project management, SDR team coordination and algorithm test in IDPS, calibration and geolocation science support, inter-comparison, CrIS SDR data quality and monitoring |
| Changyong Cao (was acting) |  |   |
| Yong Chen                  | CICS/UMD                               | Project management, SDR team coordination and algorithm test in IDPS  |
| Dave Tobin                 | U. of Wisconsin (UW)                   | Radiometric calibration, non-linearity coefficients, polarization, inter-comparison, simulation   |
| Larrabee Strow             | U. of Maryland Baltimore County (UMBC) | Spectral calibration, ILS parameters, inter-comparison, simulation  |
| Deron Scott                | Space Dynamic Lab (SDL)                | Noise characterization, bit trim and impulse noise mask, anomaly analysis   |
| Dan Mooney                 | MIT/LL                                 | Correlated/uncorrelated noise characterization, residual analysis and ringing, simulation   |
| Dave Johnson               | NASA Langley                           | NASA flight support, instrument science   |
| Lawrence Suwinski          | Harris                                 | PLT tests, on-orbit instrument performance  |
| Joe Predina                | Logistikos                             | Optimal laser wavelength setting, noise, calibration algorithm  |
| Deirdre Bolen              | JPSS/JAM                               | DR support  |
|                            |  |   |



# OMPS Cal/Val Team Members



| PI                          | Organization      | Team Members   | Roles and Responsibilities   |
|-----------------------------|-------------------|--|--|
| Trevor Beck,<br>Chunhui Pan | NOAA,<br>UMD-CICS | Eve-Marie Devaliere,<br>Shouguo Ding, Sri<br>Madhavan, Ding<br>Liang | Coordination; instrument and<br>product performance<br>monitoring.             |
| Glen Jaross                 | NASA              | Tom Kelly, Rama.<br>Mundakkara, Mike<br>Haken, Colin Seftor          | Instrument scientist; TVAC<br>data acquisition and analysis;<br>SDR algorithms |
| Laura Dunlap                | STC/AMP           |  | Algorithm Changes; DR and<br>issues tracking                                   |
| Sarah Lipsy                 | BATC              |  | Instrument Scientist;<br>prelaunch test  |
|                             |                   |  |  |