



Performance of NOAA-20 and Suomi NPP ATMS Sensor Data

Quanhua (Mark) Liu¹ and Edward Kim²

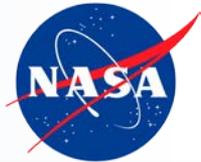
1. NOAA/NESDIS Center for Satellite Applications and Research, College Park, Maryland
2. NASA Goddard Space Flight Center, Greenbelt, Maryland

With contribution from NOAA/STAR, NASA/GSFC, MIT/LL, UMD/CICS, CSU/CIRA, Northrop Grumman, Raytheon

January 12, 2018



ATMS Updates for S-NPP and NOAA-20



ATMS SDR performance is better than the requirement in J1RD.

ATMS calibration using radiance has been operational since March 08, 2017 (block 2).

Suomi NPP

ATMS is healthy.

Scan drive main motor current had been dropped down to a “normal” level.

ATMS SDR has reached “long-term monitoring validated maturity”.

NOAA-20

ATMS is good in operational normal.

ATMS TDR has reached beta maturity and pending on approval for provisional maturity.

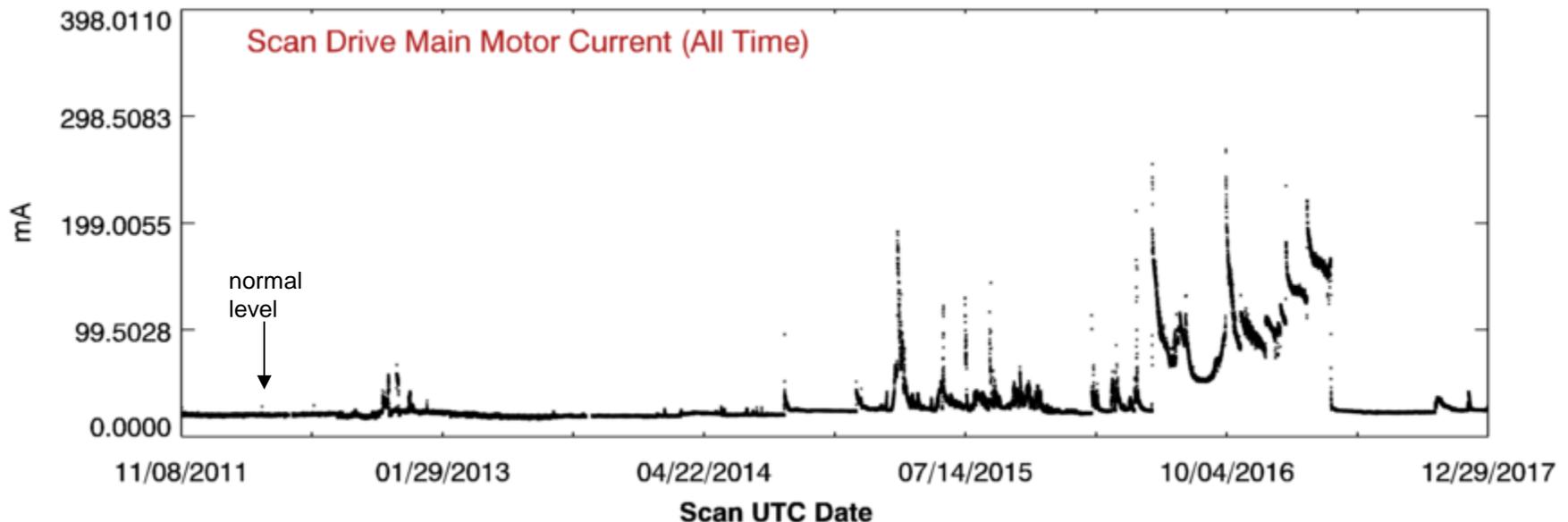
PCT 006 converting TDR to SDR is scheduled for this January 2018.

S-NPP ATMS Scan Drive Main Motor

S-NPP ATMS scan drive main motor experienced abnormal (high) current beginning 2014 Summer. Mitigation used:

- Once per day scan reversal from August 2015
- Once per orbit scan reversal from July 2016
- Twice per orbit reversal from August 2016.

The scan drive main motor current has been dropped down to a “normal” level since April 3, 2017.

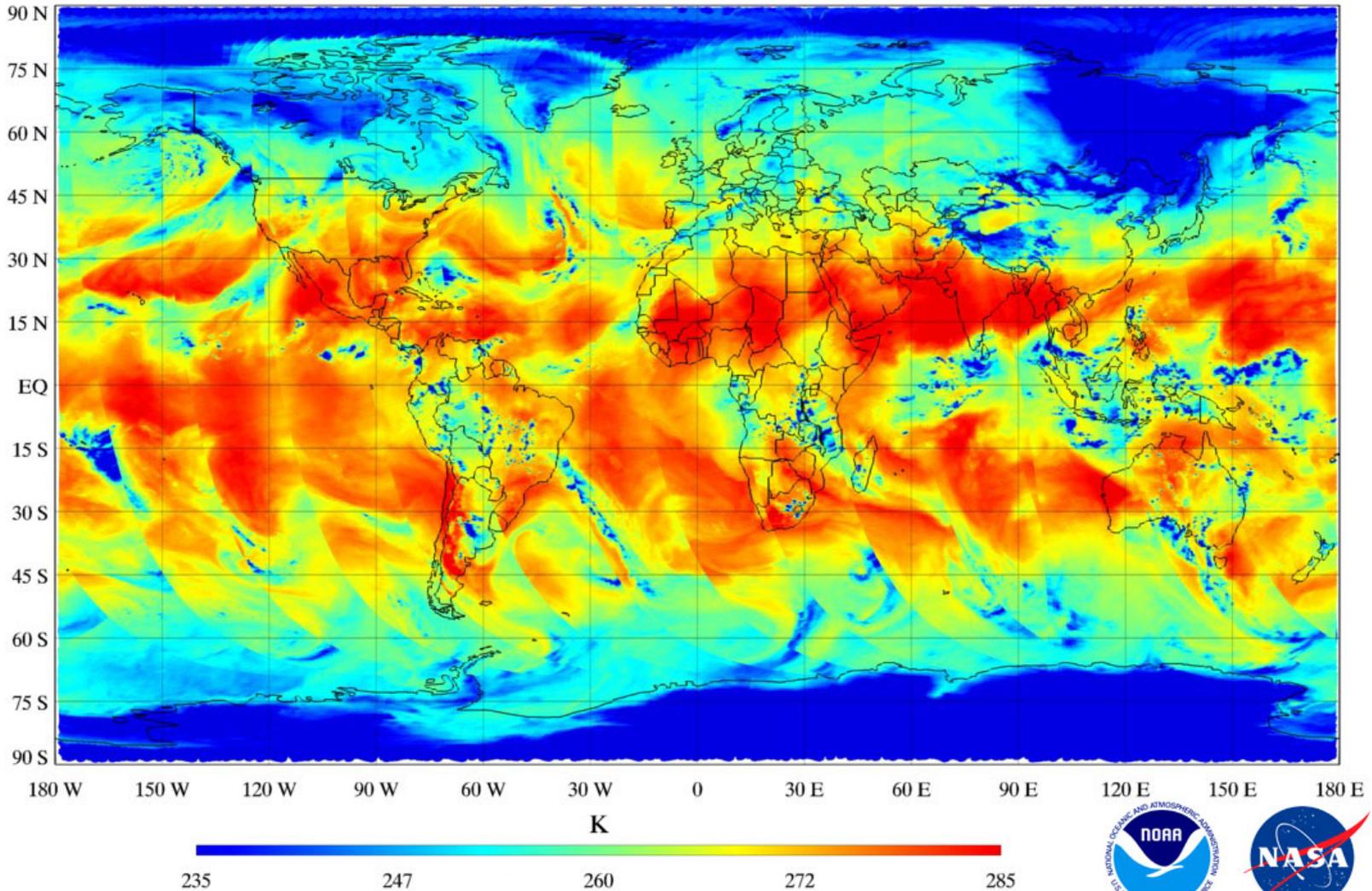


In comparison to S-NPP ATMS TVAC data, NOAA-20 ATMS data has been demonstrated better performance. Consistent performance between pre- (TVAC) and post-launch (onboard):

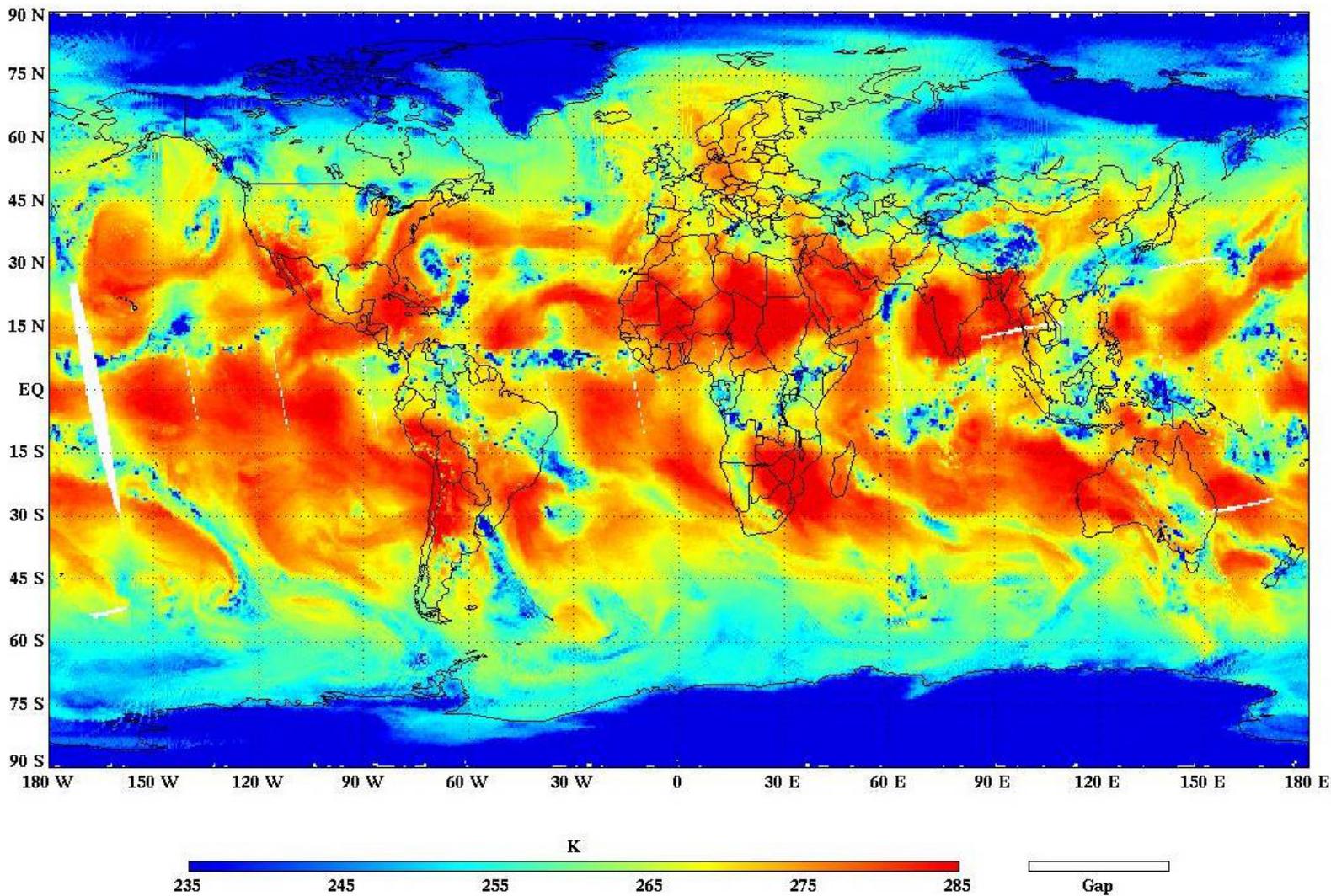
- ✓ Smaller sidelobes (i.e. higher antenna efficiency)
- ✓ Lower noise (i.e. NEdT)
- ✓ Much smaller inter-channel noise correlation (better independent information)
- ✓ Smaller $\Delta G/G$ (less striping)
- ✓ Larger non-linearity. After correction, residual NL is smaller and meet requirement.

NOAA-20 ATMS First Global Image (from ICVS)

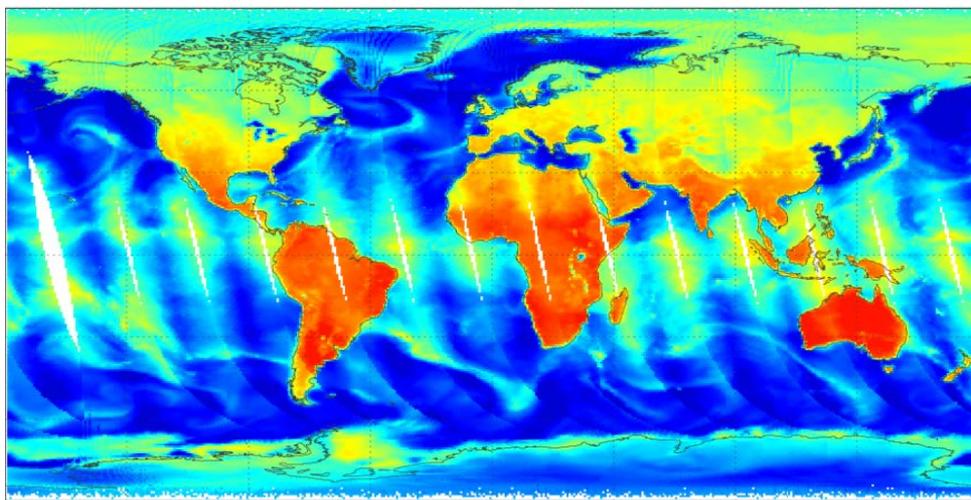
NOAA-20 ATMS Antenna Temperature (TDR) Ch.18 183.311 ± 7.0 GHz QH-POL
UTC Date: 2017-11-29



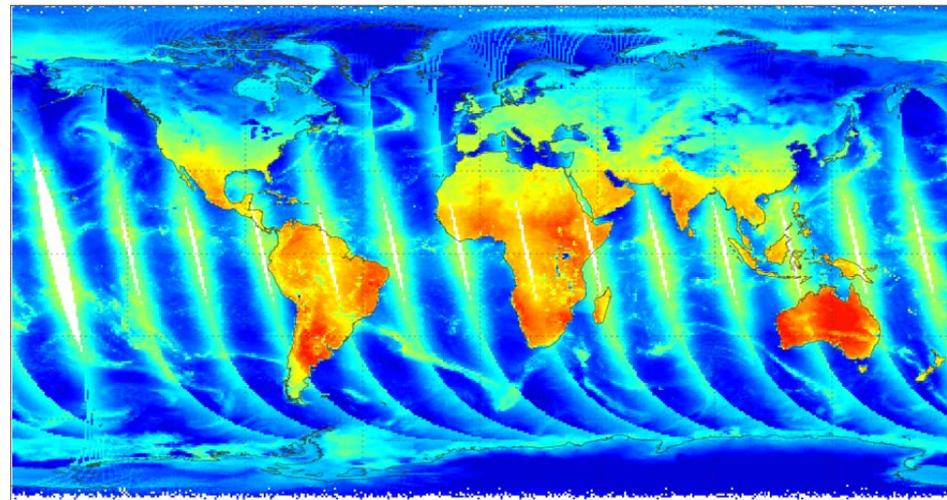
NPP First Global Image, Nov. 8, 2011



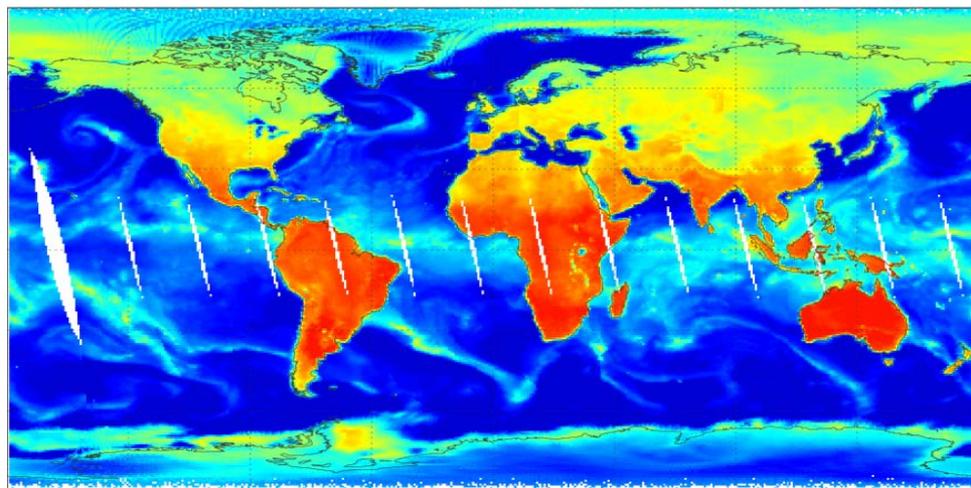
NOAA-20 - ATMS TDR - Channel 1 Ascending
25 Dec 2017



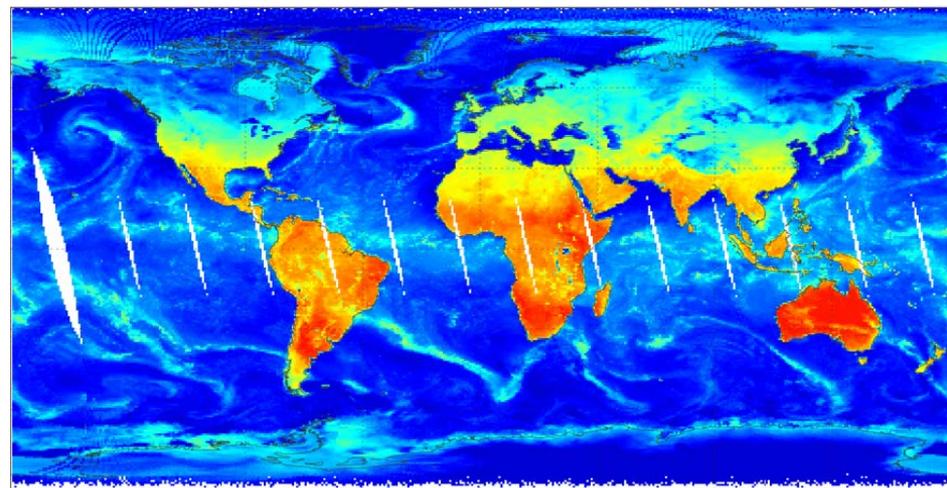
NOAA-20 - ATMS TDR - Channel 3 Ascending
25 Dec 2017



NOAA-20 - ATMS Limb-Corrected TDR - Channel 1 Ascending
25 Dec 2017



NOAA-20 - ATMS Limb-Corrected TDR - Channel 3 Ascending
25 Dec 2017

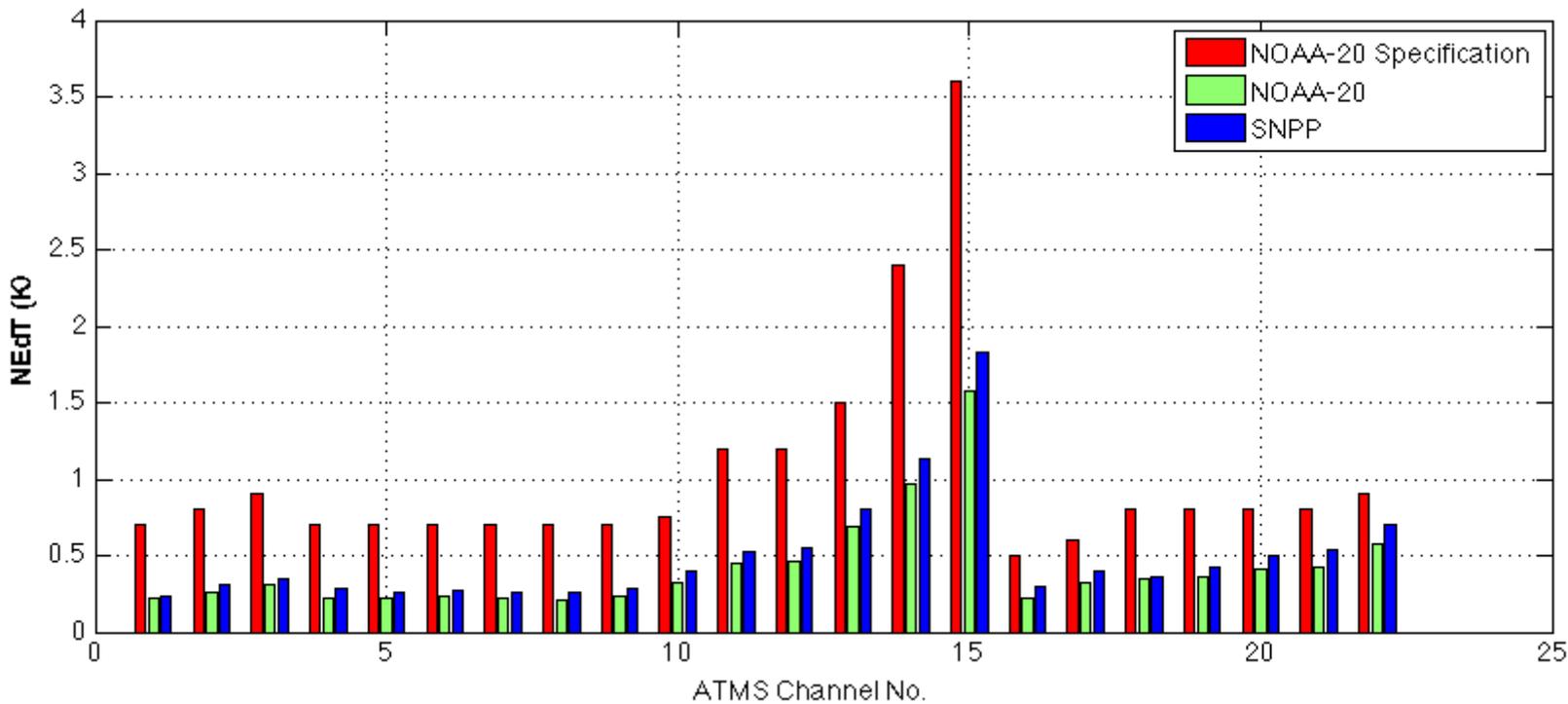


Missing / Out-of-range 150 175 200 225 250 275 300
Brightness Temperature (K)

NOAA-20 Preliminary, Non-Operational Data

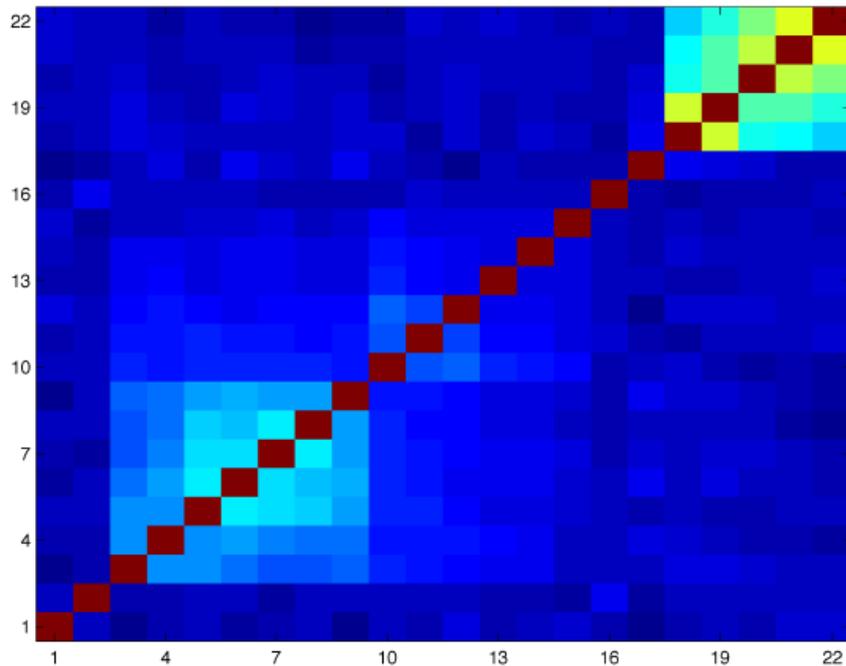
Missing / Out-of-range 210 225 240 255 270 285 300
Brightness Temperature (K)

NOAA-20 Preliminary, Non-Operational Data

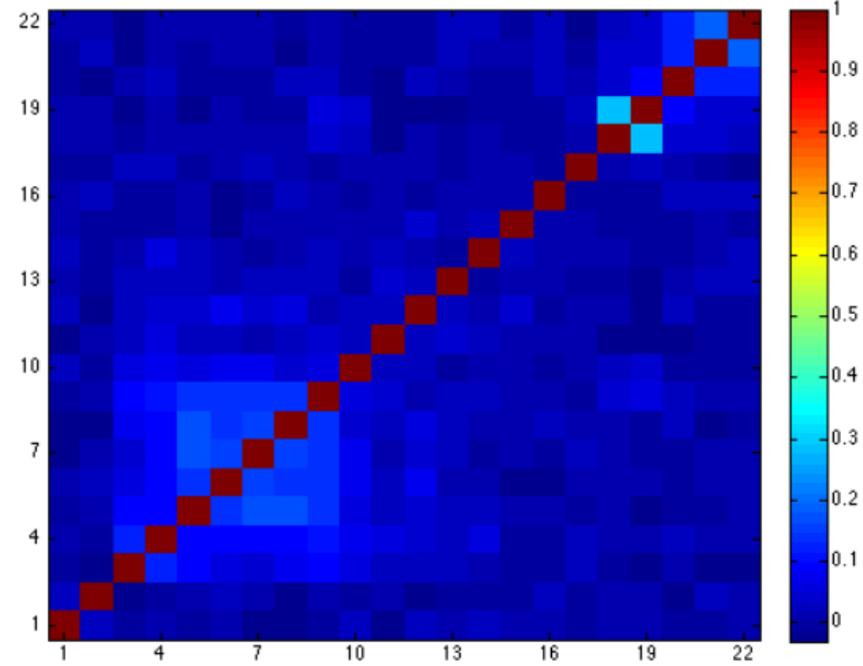


- One hour stable observations of warm load were calibrated
- Data noise can be derived from the difference between calibrated warm load temperature and PRT temperature
- Channel correlation of NOAA-20 is much smaller than that of S-NPP, especially in low V- and G-bands

NPP ATMS



N20 ATMS



GPS Radio Occultation Data for ATMS Accuracy Assessment

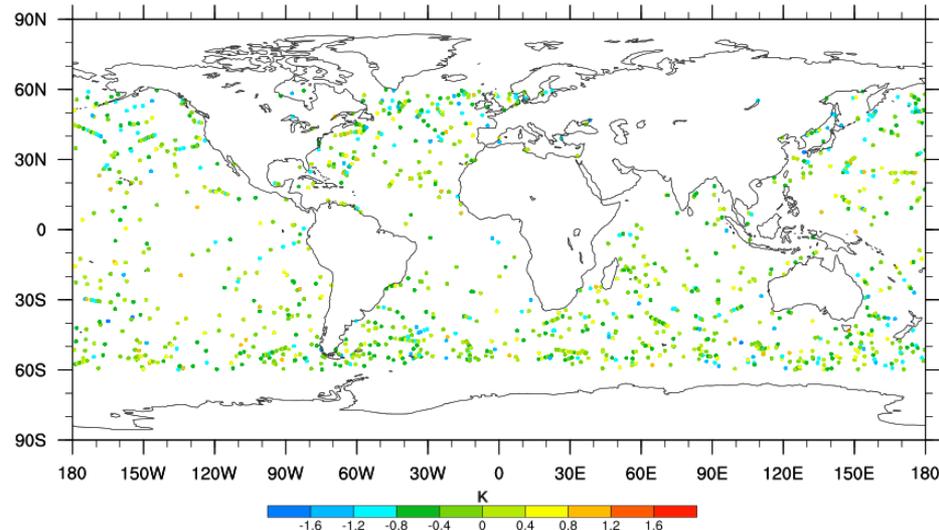
Over ocean, 60°S-60°N, Nov. 29 to Dec. 17, 2017

ATMS prelaunch data met the accuracy requirement with very good margin. Post-launch assessment of the accuracy is challenging, due to lack of traceable reference. GPS RO data may serve as unbiased inputs to radiative transfer models (e.g. CRTM) To evaluate the ATMS accuracy.

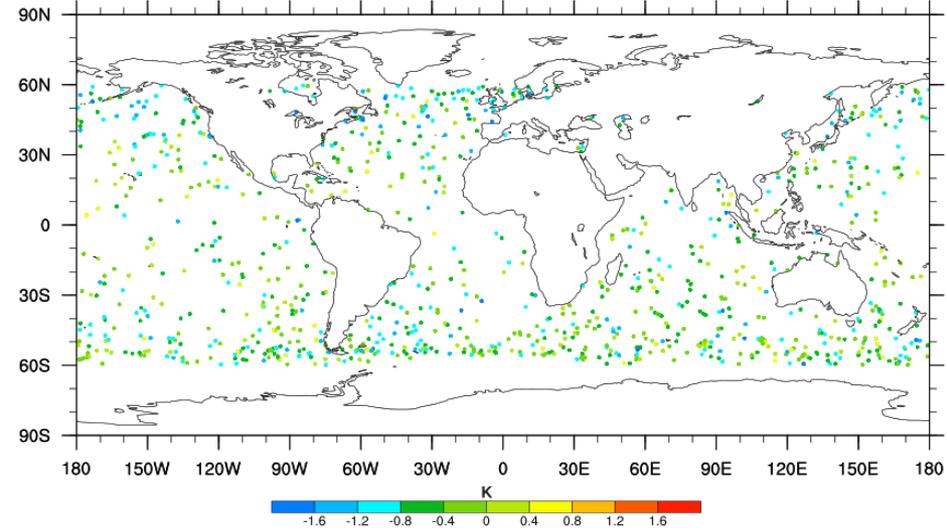
Figures below showed the collocated RO data points for NOAA-20 (left) and Suomi NPP (right).

Waiting for more RO data for accuracy assessment.

ATMS Ch.10 O-B^{GPS}
57.29034GHz, over ocean, 60°S-60°N



ATMS Ch.10 O-B^{GPS}
57.29034GHz, over ocean, 60°S-60°N





Conclusion



- ✓ NOAA-20 ATMS space view profile #1 is declared the optimal space view profile
- ✓ NOAA-20 ATMS has slightly lower NE Δ Ts than S-NPP
- ✓ NOAA-20 ATMS channel on-orbit effective field-of-view (EFOV), earth side lobe effects, and antenna pattern are derived from roll maneuver data
- ✓ NOAA-20 ATMS preliminary geolocation accuracy analysis results show an improvement from S-NPP
- ✓ NOAA-20 ATMS image striping is slightly less than S-NPP
- ✓ NOAA-20 ATMS channel noise correlation is much lower than that of S-NPP.
- ✓ NOAA-20 ATMS calibration and validation tasks are on schedule
- ✓ ATMS SDR achieved beta maturity and pending for approval of provisional maturity.
- ✓ ATMS Cal/Val is ongoing.