NOAA-20 ATMS Beta Maturity Status Report

December 8, 2017

ATMS SDR Team

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

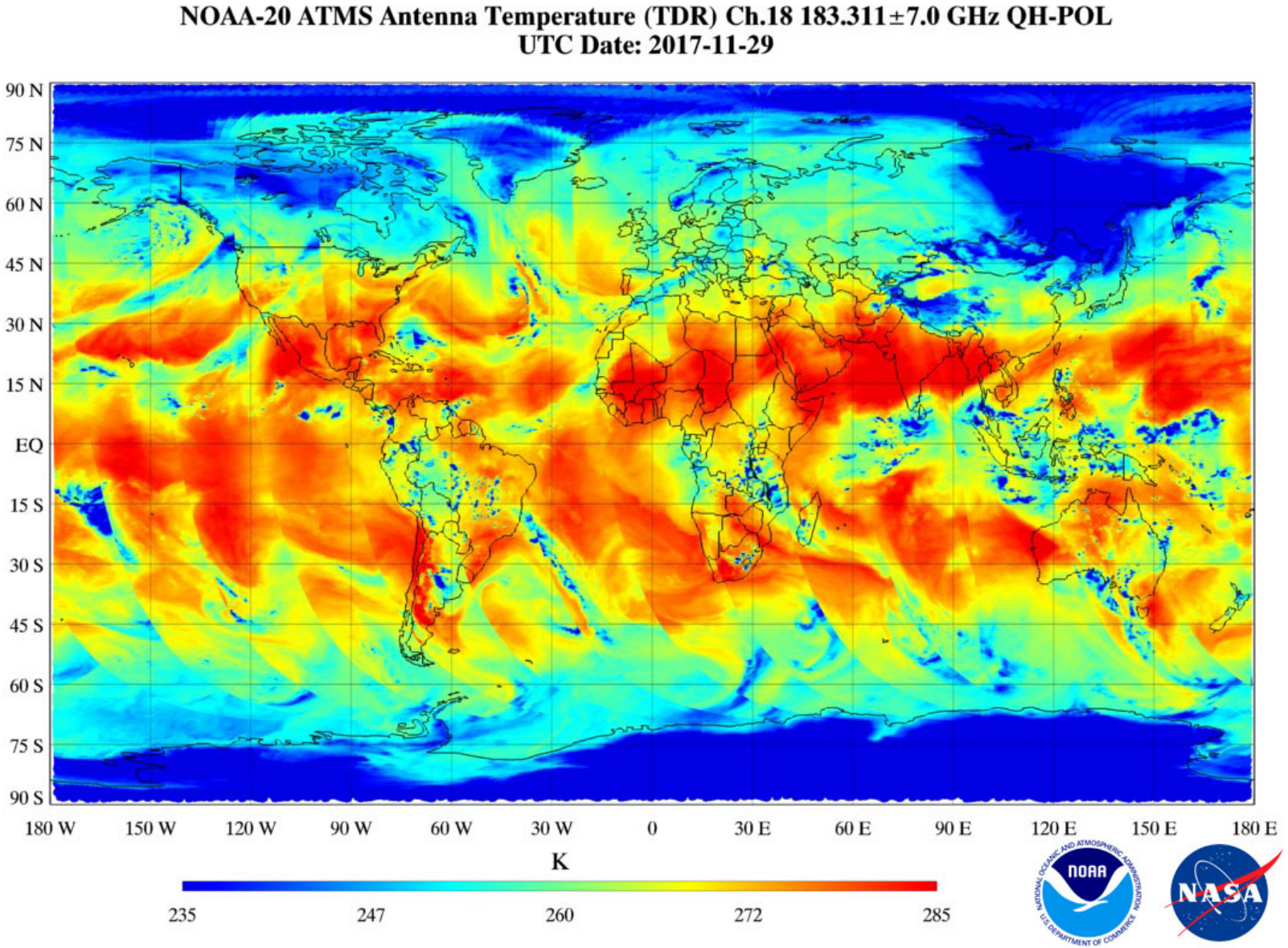
NOAA-20 ATMS Activation Time Line

Orbit #	AOS	LOS	Spacecraft	ATMS
151	SVL: 17/333 00:28:48 TDRSS: 17/333 01:30:41	17/333 00:42:22 17/333 01:40:41		
152	17/333 02:09:28	17/333 02:24:18		
153	SVL: 17/333 03:50:21 TDRSS: 17/333 04:15:30	17/333 04:05:23 17/333 04:27:30		ATMS_100a - ATMS Activation Part 1
154	17/333 05:30:35	17/333 05:45:26		ATMS_100b - ATMS Activation Part 2
155	17/333 07:10:17	17/333 07:25:19		ATMS_105 - Functional Eval
156	17/333 08:50:04	17/333 09:05:22		ATMS_110 - Functional Eval End
157	17/333 10:31:08	17/333 10:45:44		SP1 Data collect
158	SVL: 17/333 12:12:07 TDRSS: 17/333 12:47:00	17/333 12:26:34 17/333 12:59:00		SP1 Data collect
159	SVL: 17/333 13:53:34 TDRSS: 17/333 14:17:15 TDRSS: 17/333 15:02:00	17/333 14:07:35 17/333 14:32:15 17/333 15:22:00		SP1 Data collect
160	SVL: 17/333 15:36:20 TDRSS: 17/333 16:04:00	17/333 15:49:00 17/333 16:24:00		SP1 Data collect
161	SVL: 17/333 17:19:41 TDRSS: 17/333 17:53:00	17/333 17:31:05 17/333 18:03:00		SP1 Data collect
162	17/333 19:02:46	17/333 19:13:39		SP1 Data collect
163	SVL: 17/333 20:44:51 TDRSS: 17/333 21:31:00	17/333 20:56:41 17/333 21:41:00		SP1 Data collect
164	17/333 22:26:27	17/333 22:39:59		SP1 Data collect

NOAA-20 ATMS Data Starting Time

Data Type	Starting Time	Starting Orbit
ATMS Telemetry RDR	3:53:33 UTC	153
ATMS Science RDR	5:34:11 UTC	154
ATMS TDR	5:34:43 UTC	154
ATMS SDR	5:34:43 UTC	154
ATMS SDR GEO	5:34:43 UTC	154

NOAA-20 ATMS First Global Coverage Image



Dynamic Range (Task #7)

- **Objective:** To verify that the radiometric counts:
  - Do not exceed specified limit of 45,150 to be within the allowable range of the A/D converter
  - Do not zero out when viewing the SVS

- **Results:** Counts were extrapolated to 330 K and still maintained a large overhead margin and there is sufficient margin in SVS

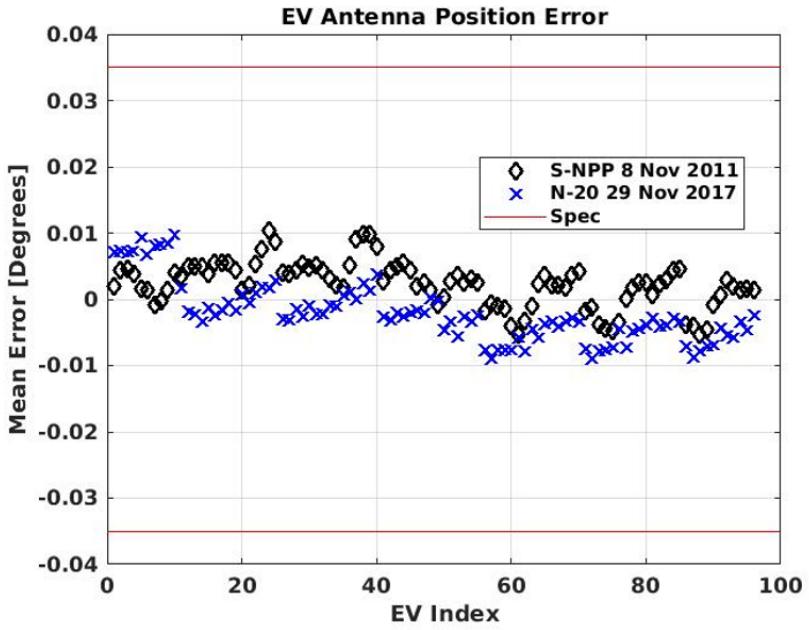
Channel	1	2	3	4	5	6	7	8	9	10	11
SVS	11088	5356	13113	13643	11906	13025	10854	10038	11518	11977	10250
ICT	24194	16061	26050	26555	24353	25938	21923	21212	24185	23077	20361
330K	26806	18195	28628	29129	26835	28512	24129	23439	26710	25290	22377
Margin	18344	26955	16522	16021	18315	16638	21021	21711	18440	19860	22773

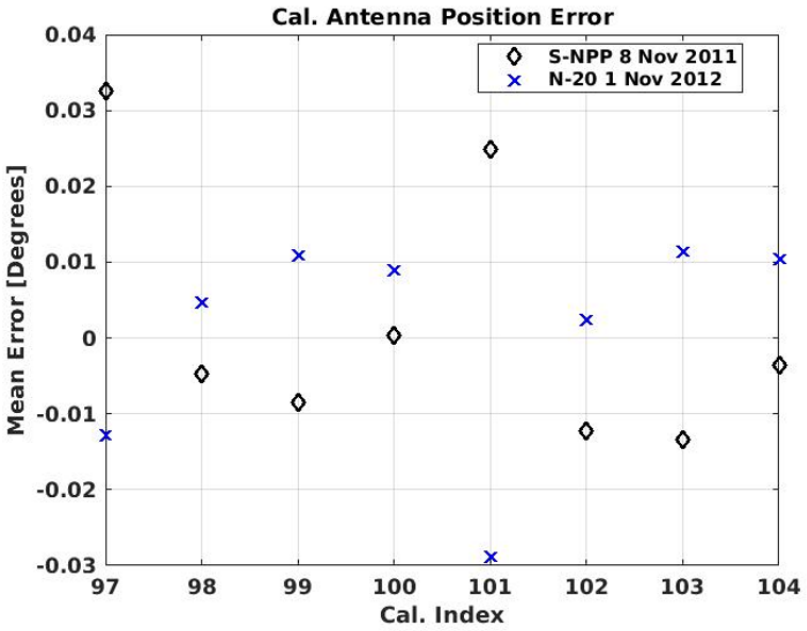
Channel	12	13	14	15	16	17	18	19	20	21	22
SVS	11140	10790	13998	13531	15127	19329	23055	18914	19561	20882	18062
ICT	22790	21685	27868	25779	25423	24861	27415	22601	23588	25353	21726
330K	25112	23857	30633	28220	27475	25964	28284	23336	24391	26244	22456
Margin	20038	21293	14517	16930	17675	19186	16866	21814	20759	18906	22694

Units are radiometric counts or digital numbers

Scan Angle Error (Task #10)

- NGES EV requirements: ± 0.035 deg.
- NGES SV and ICT req.: ± 2.25 deg.
- RE-13676 (14Apr2006)
- Data analyzed were within limits



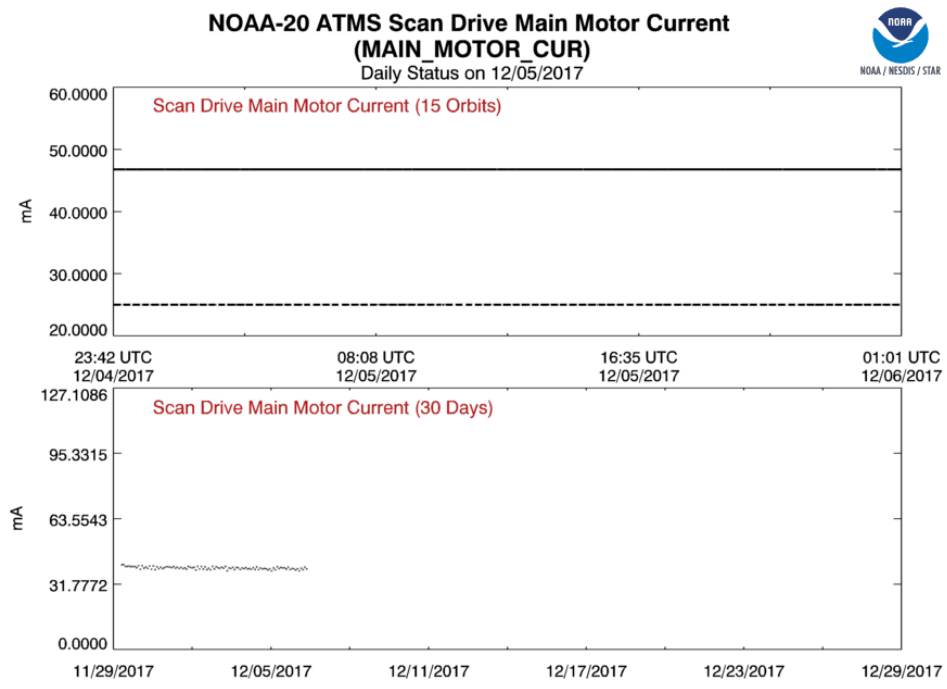


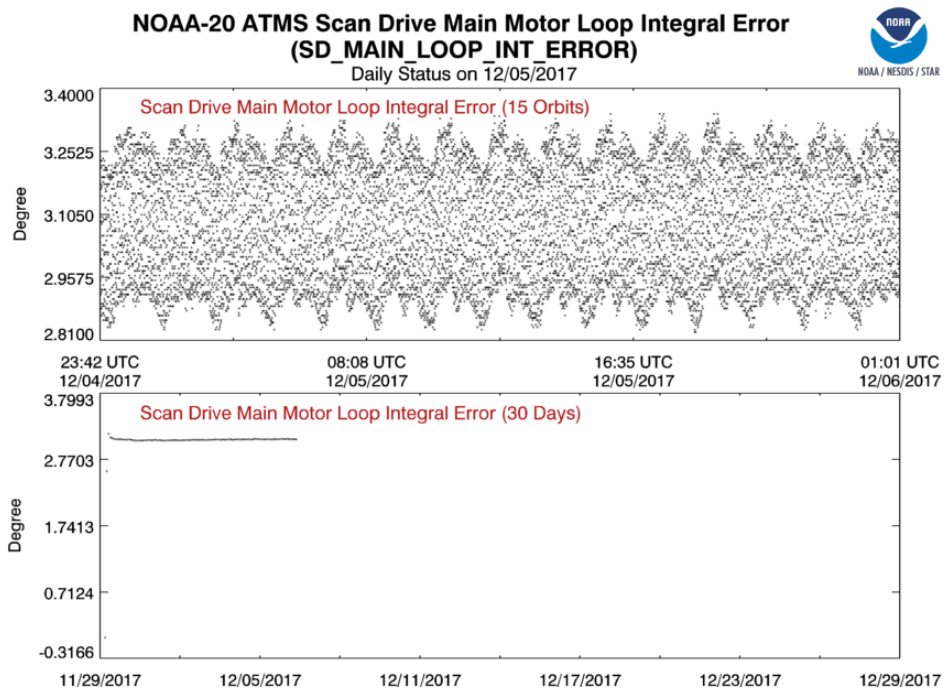
Timing and Synchronization Results

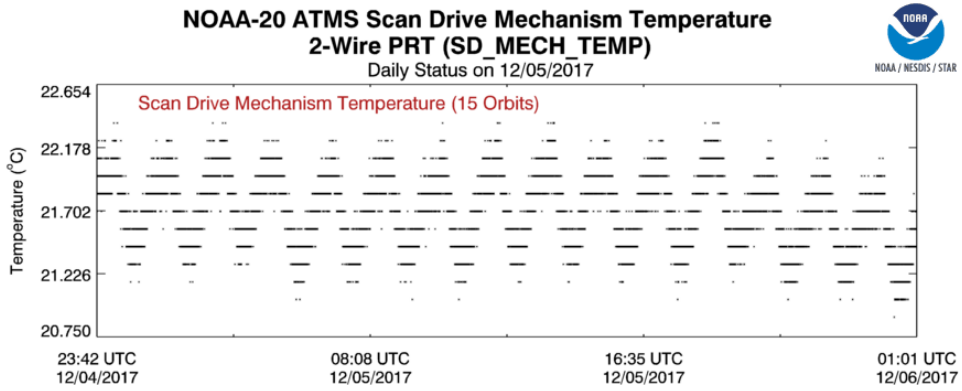
Timing Value	Expected Value	N-20 ATMS	S-NPP ATMS
Start-of-scan to BP1	11.25 ± 0.16 ms	11.244 ms	11.239 ms
Sync Pulse to BP1	±0.05 ms	0.059 ms	0.055 ms
Start-of-scan to Sync.	11.25 ± 0.05 ms	11.185 ms*	11.184 ms

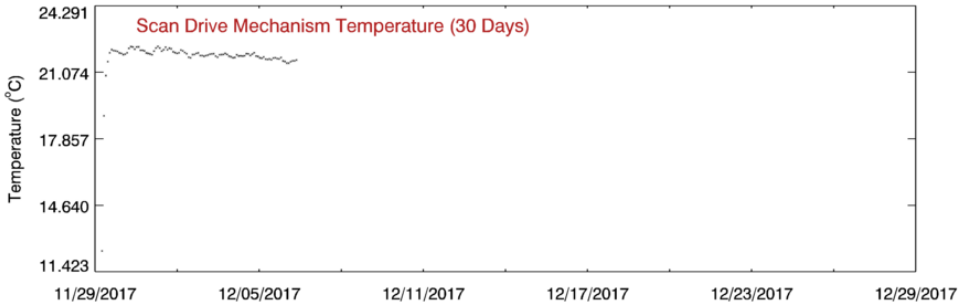
Measured values are within expected tolerances

NOAA-20 ATMS Scan Drive

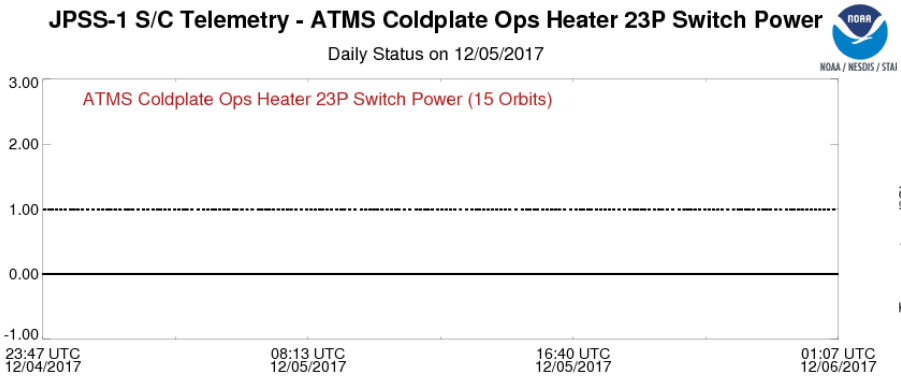


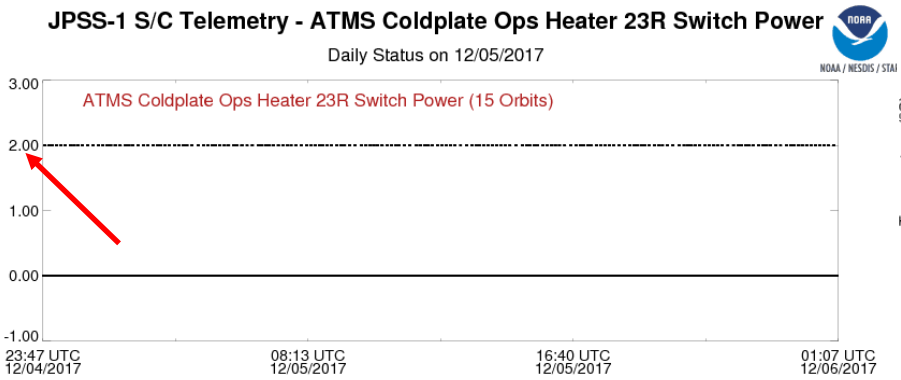


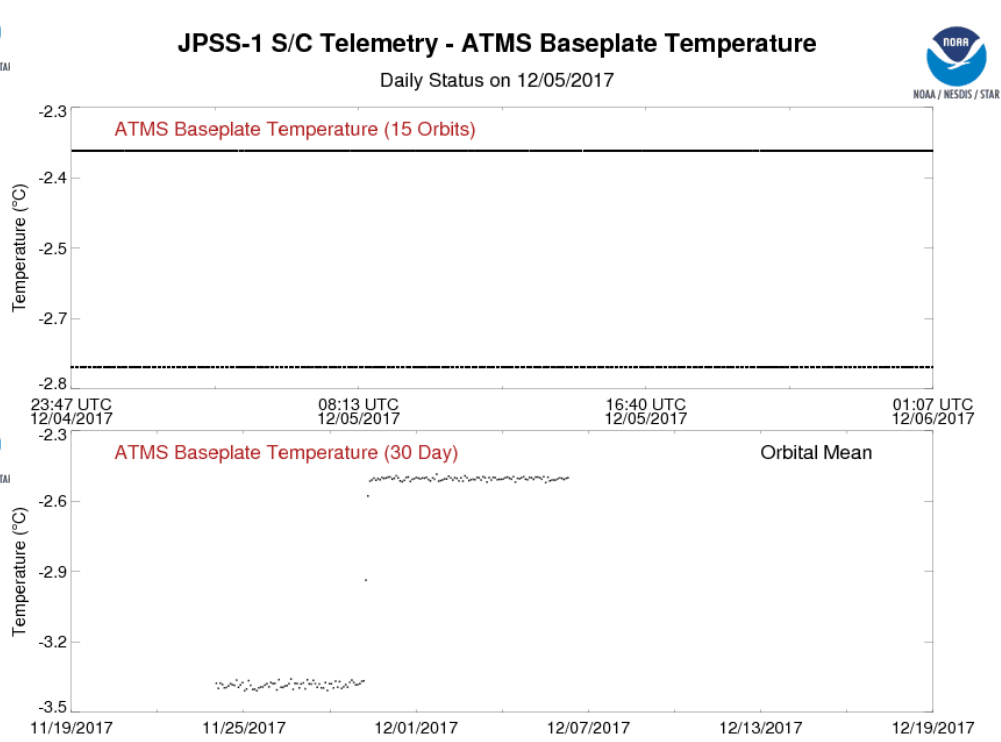




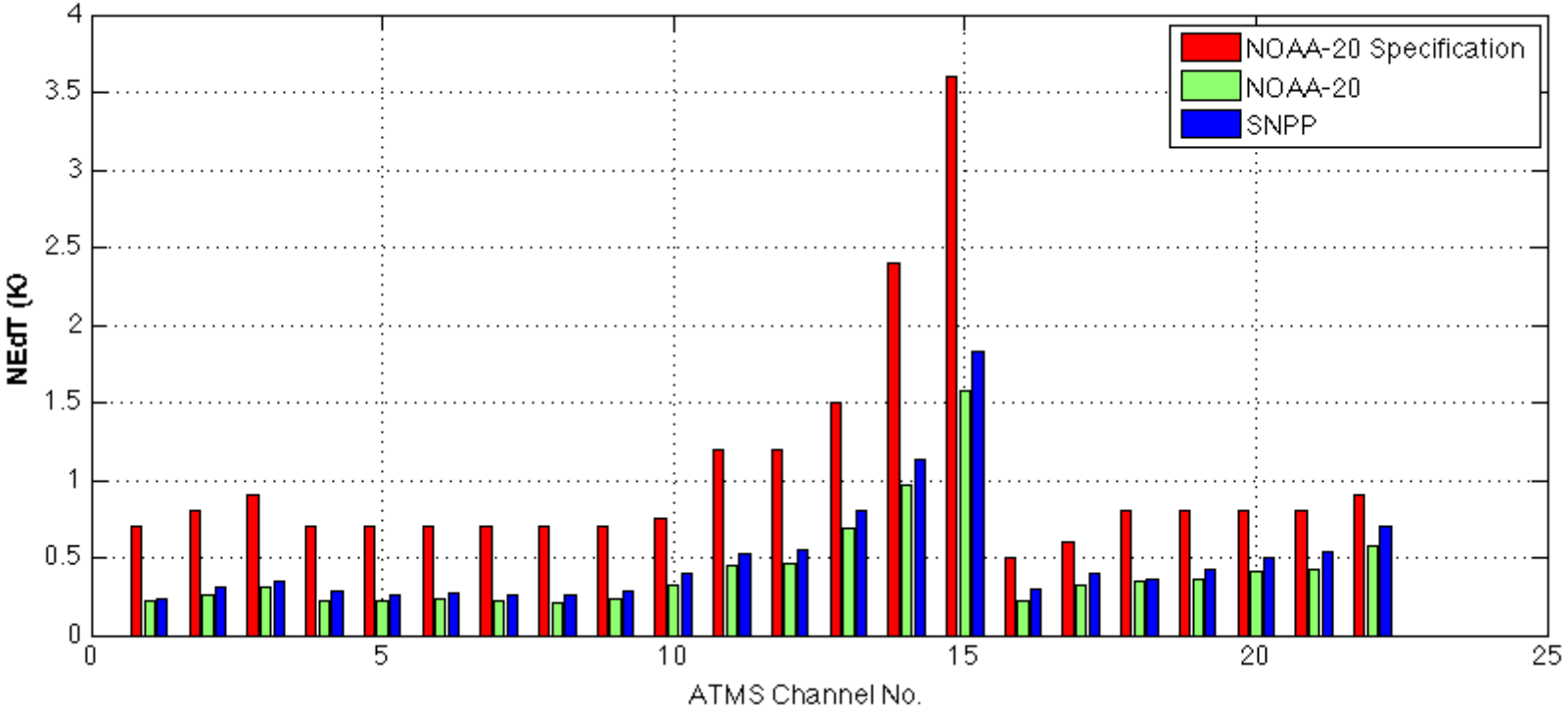
NOAA-20 ATMS Coldplate Heater Switch Power







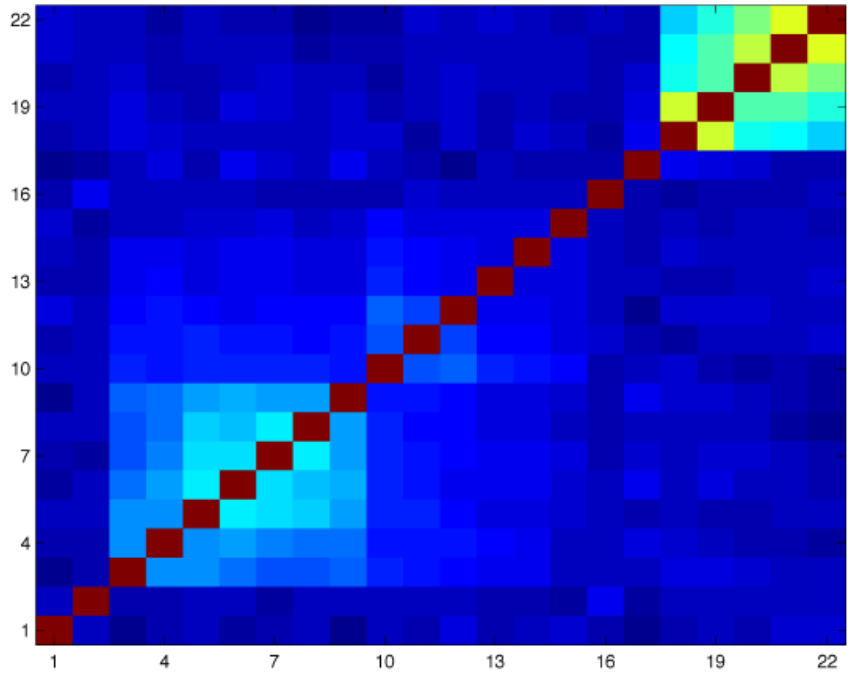
NOAA-20 ATMS Channel NEΔT



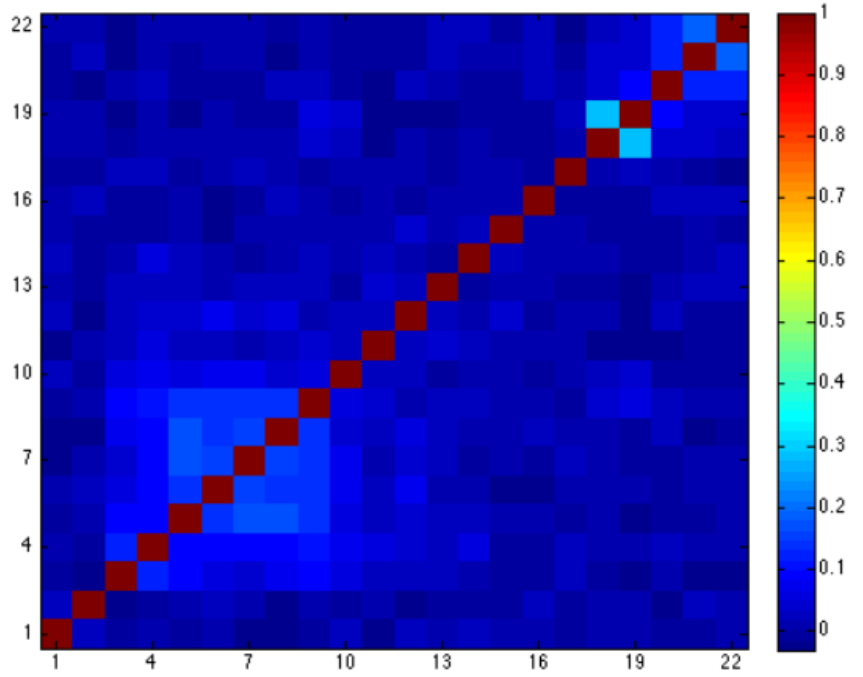
NOAA-20 ATMS Channel Correlation

- 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

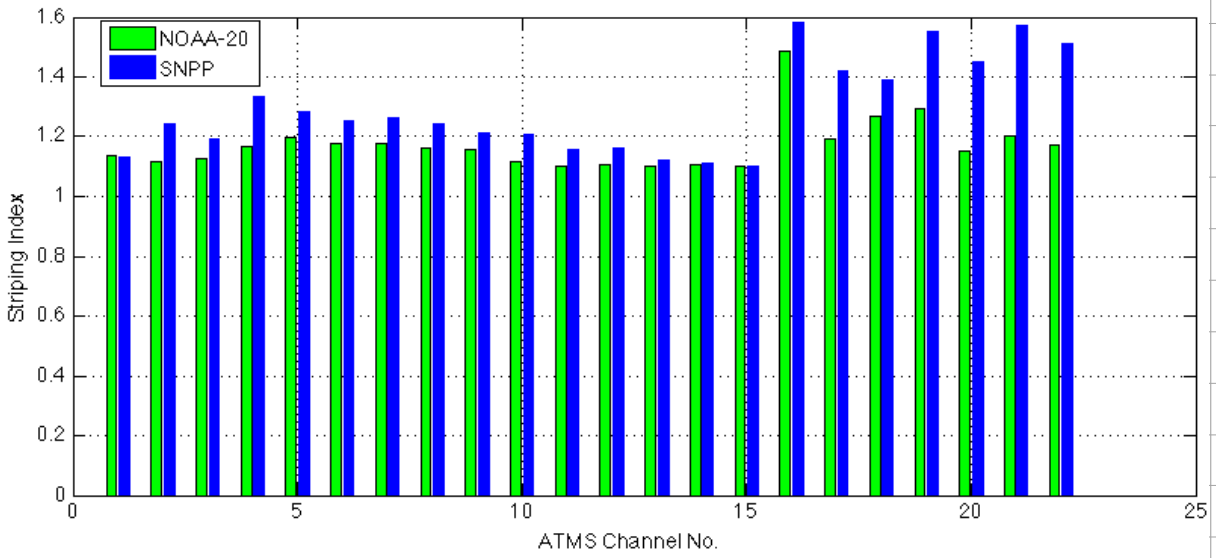
NPP ATMS



N20 ATMS



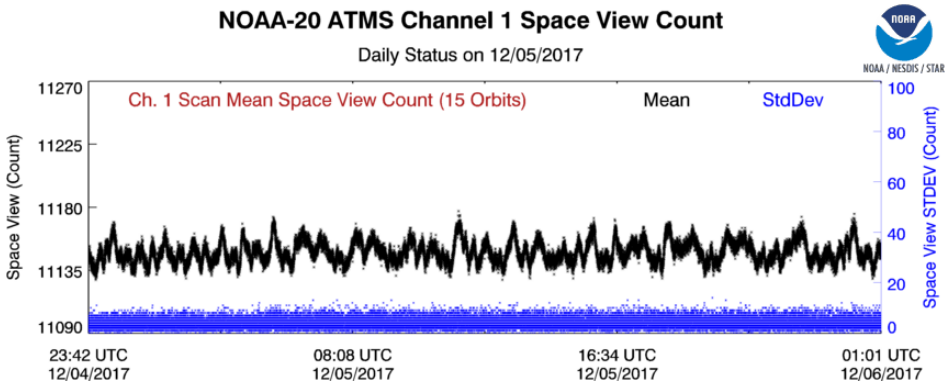
NOAA-20 ATMS Channel Striping Noise

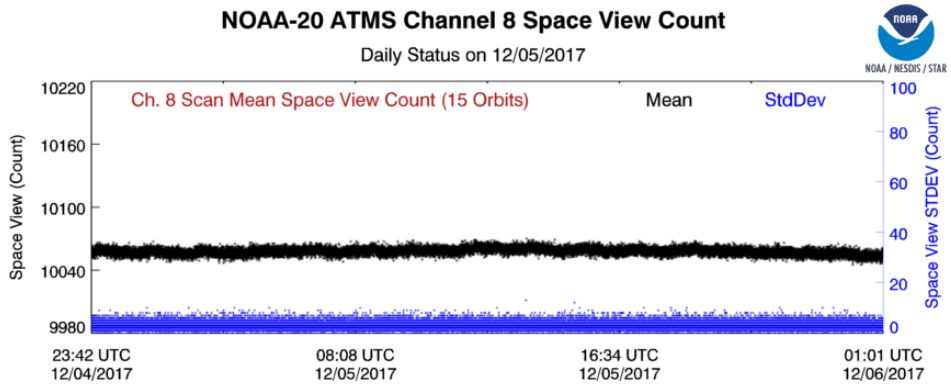


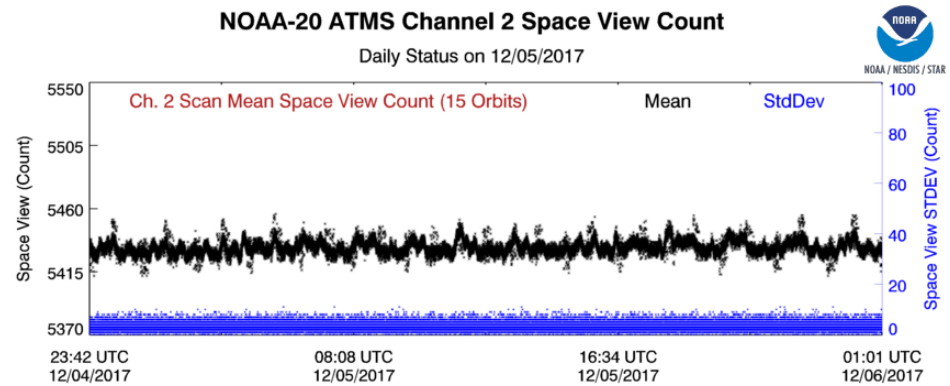
Chan. No	n20 strip index	npp strip index
1	1.14	1.13
2	1.12	1.24
3	1.13	1.19
4	1.17	1.33
5	1.20	1.28
6	1.18	1.25
7	1.18	1.27
8	1.16	1.24
9	1.16	1.21
10	1.11	1.21
11	1.10	1.16
12	1.11	1.16
13	1.10	1.12
14	1.11	1.11
15	1.10	1.10
16	1.49	1.58
17	1.19	1.42
18	1.27	1.39
19	1.29	1.55
20	1.15	1.45
21	1.20	1.57
22	1.17	1.51

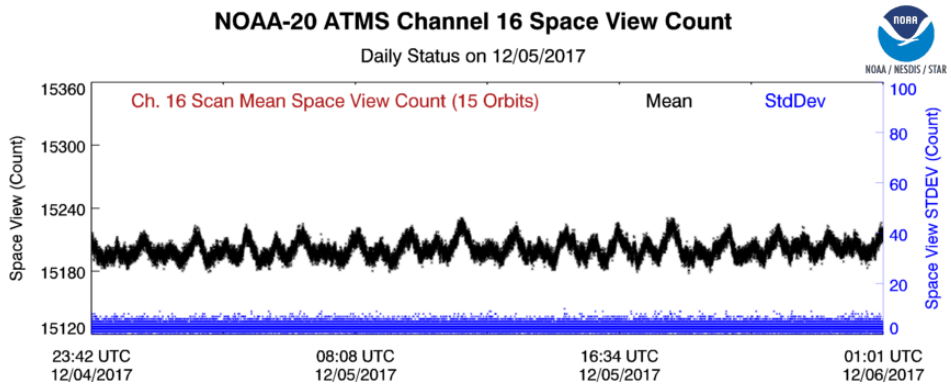
Note: There is no striping phenomena when striping index equal 1

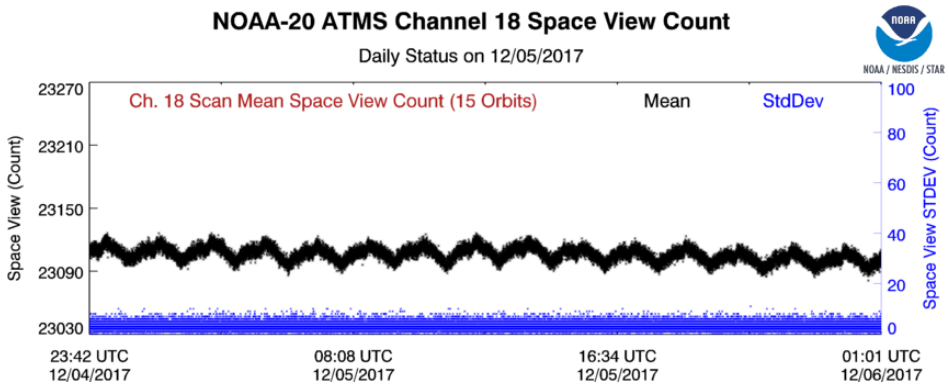
NOAA-20 ATMS Calibration Target - Spaceview

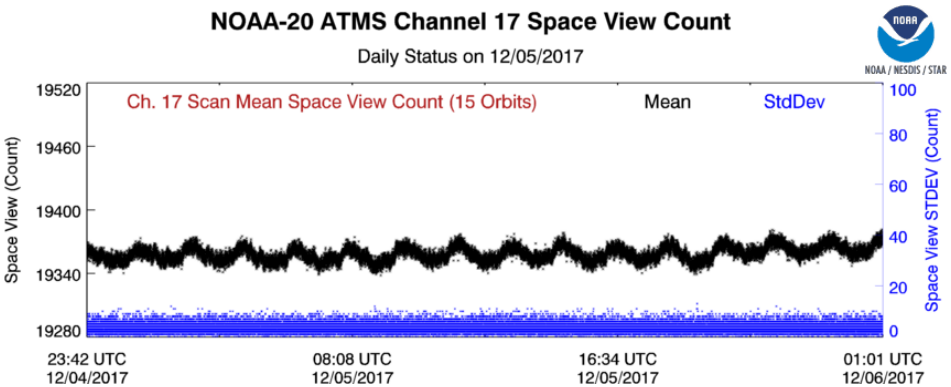




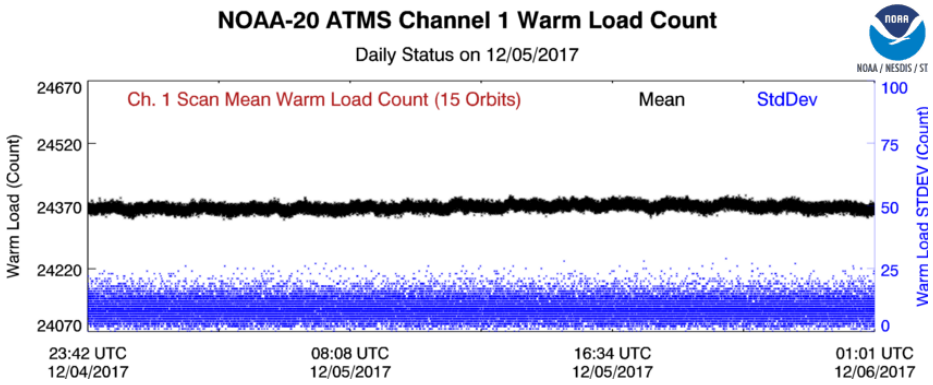


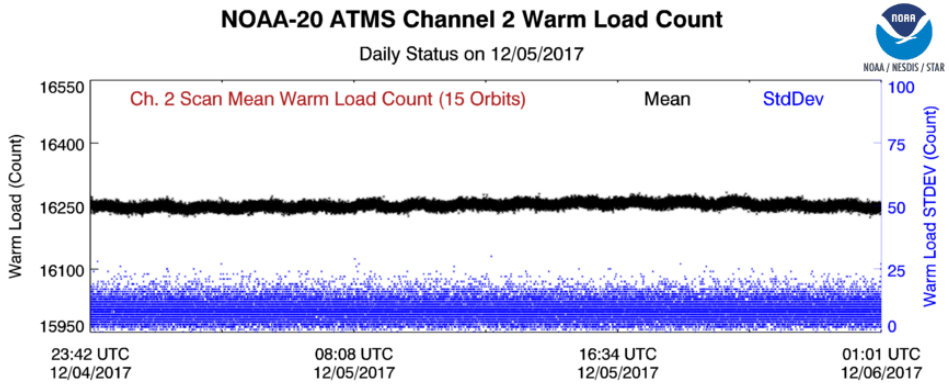


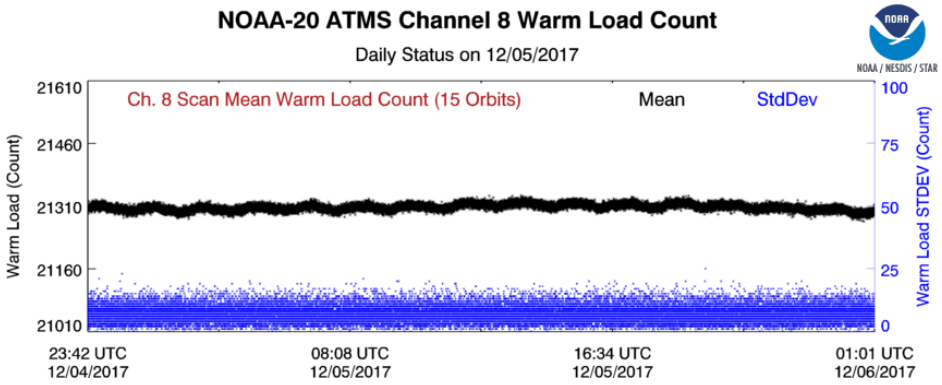


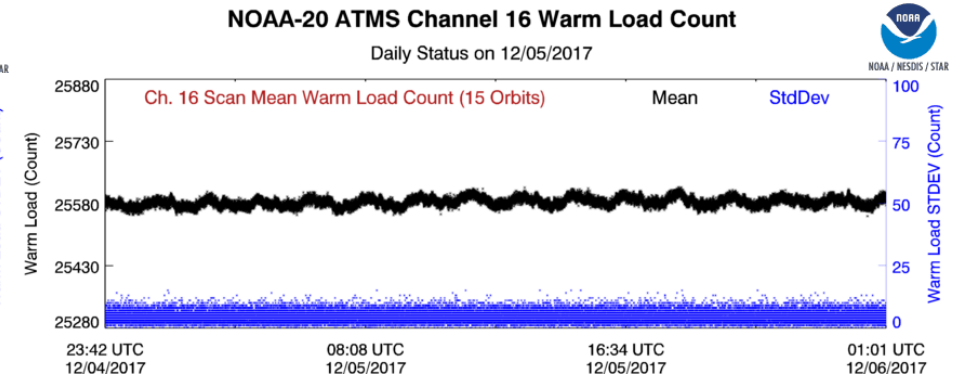


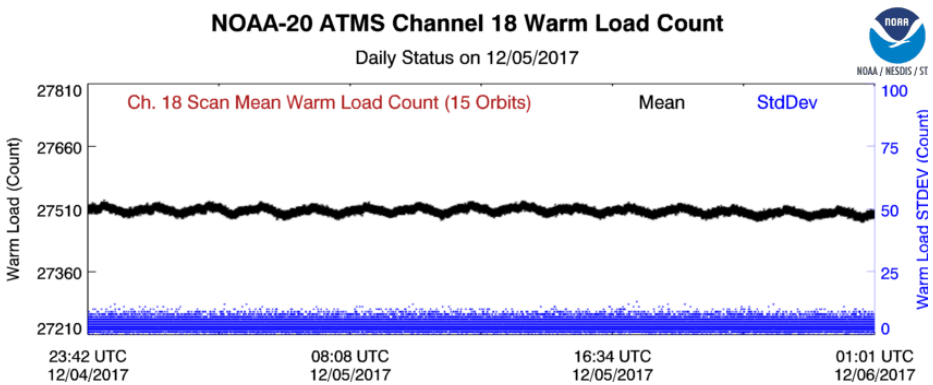
NOAA-20 ATMS Calibration Target – Warm Load

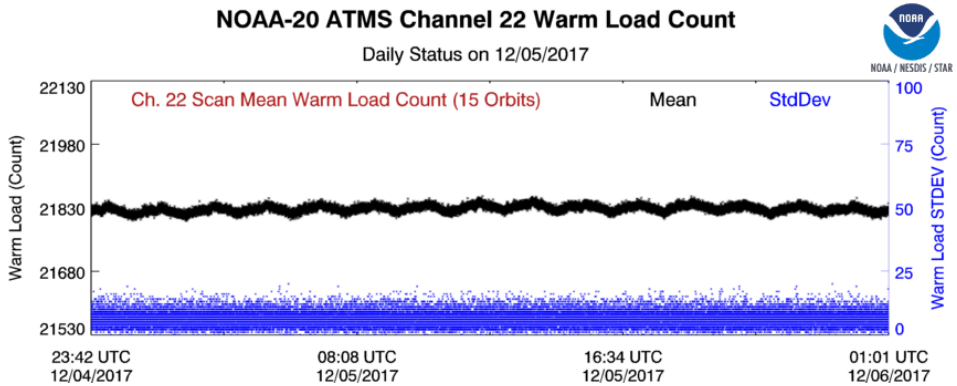




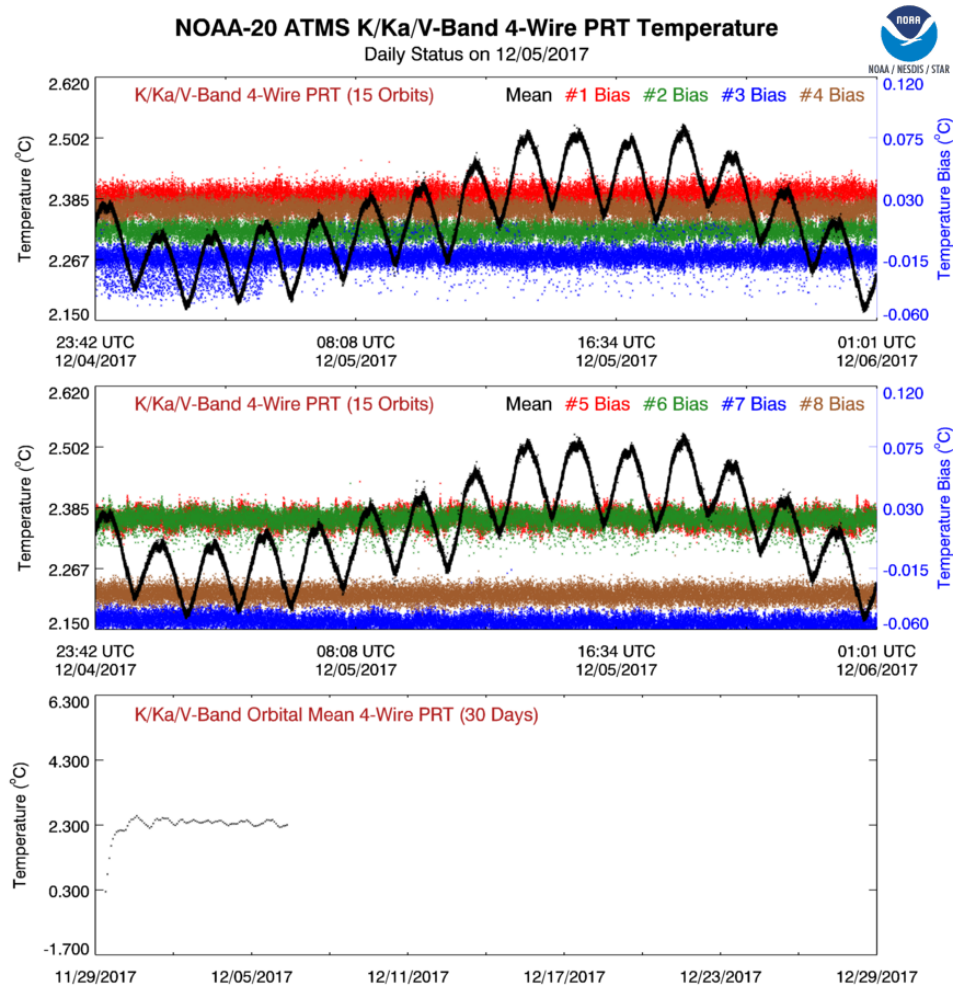


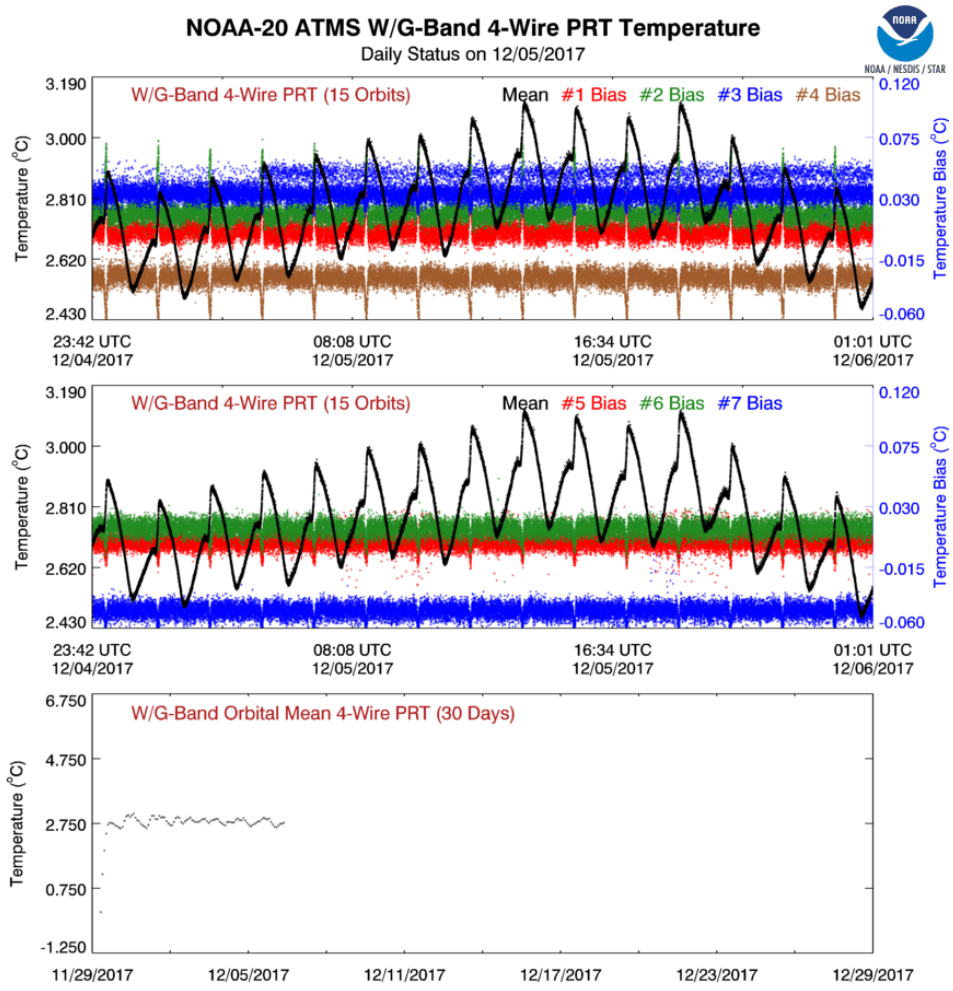




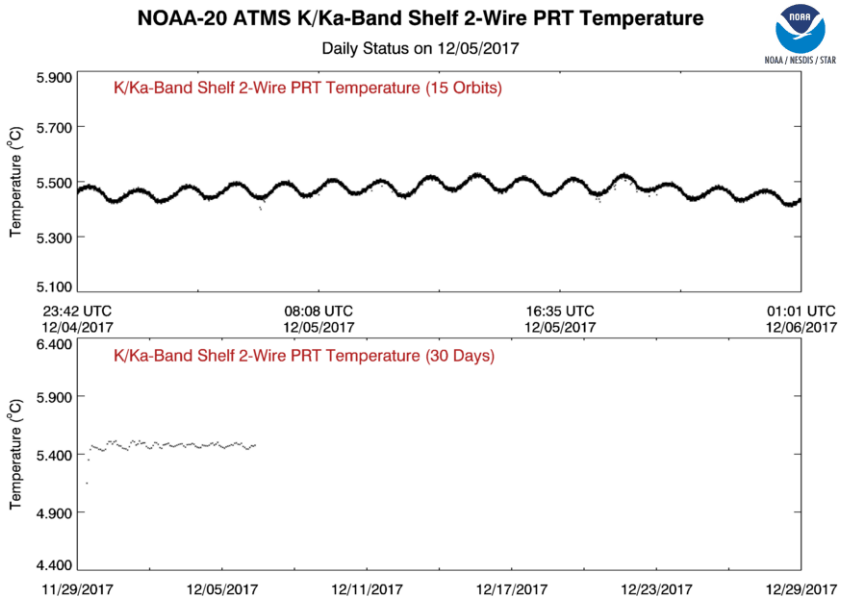


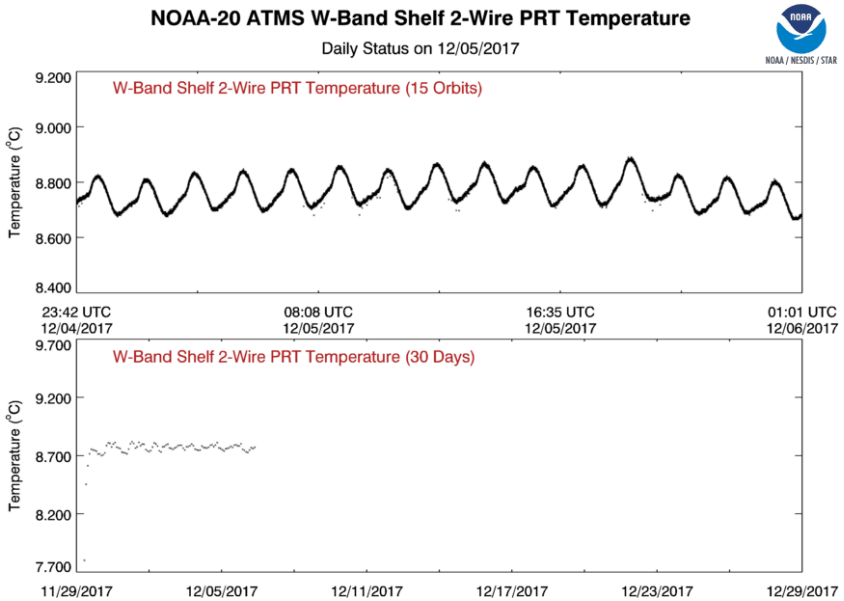
NOAA-20 ATMS Calibration Warm Load Temperature

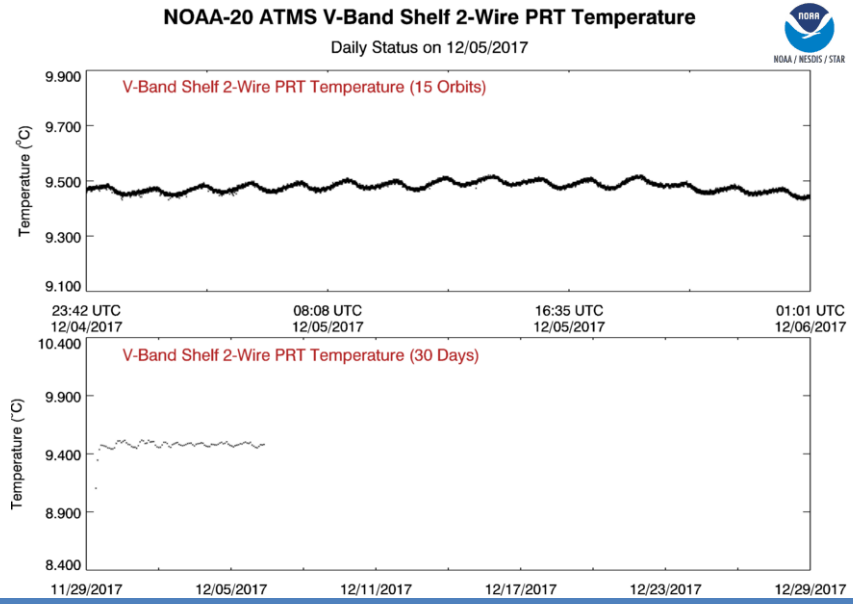


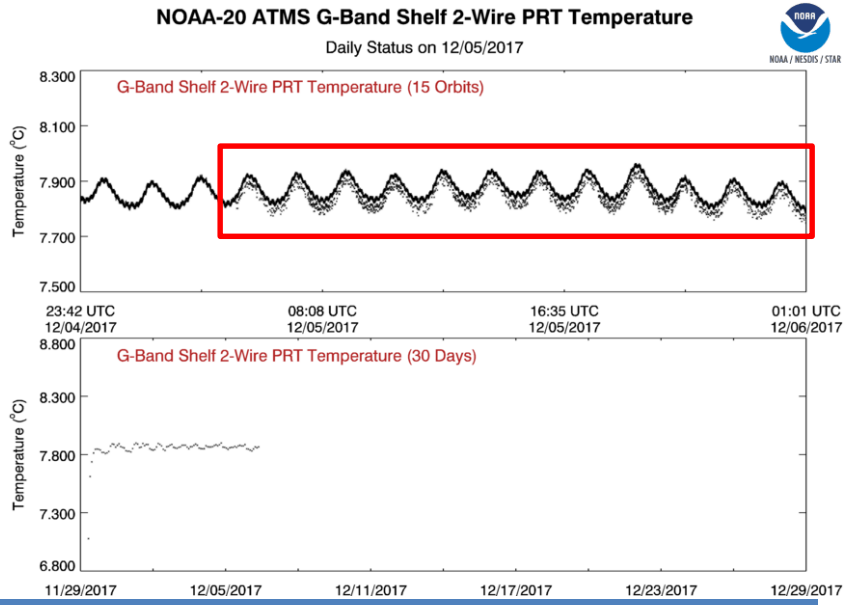


NOAA-20 ATMS Shelf Temperature

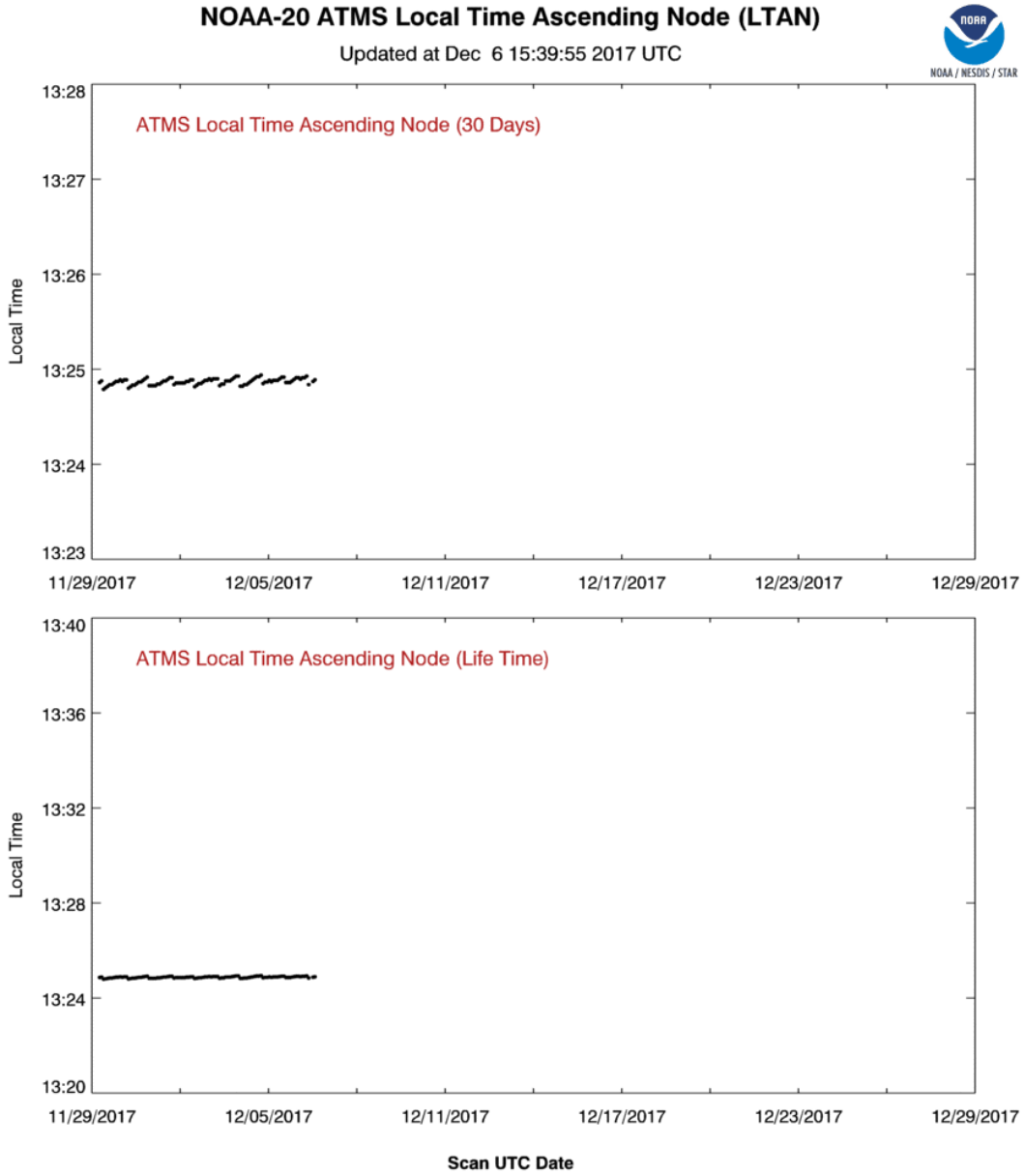






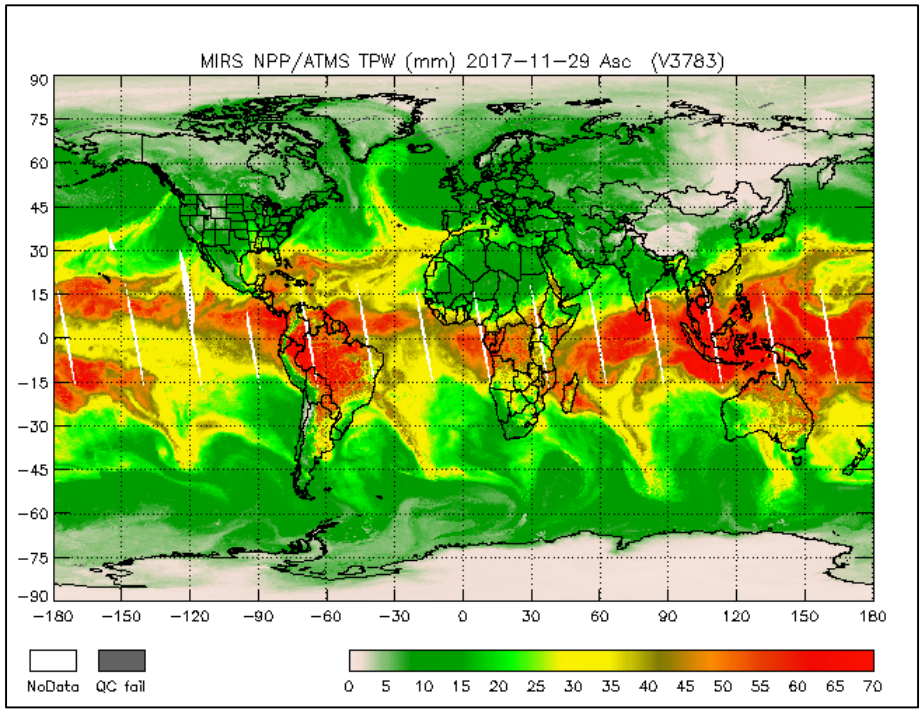


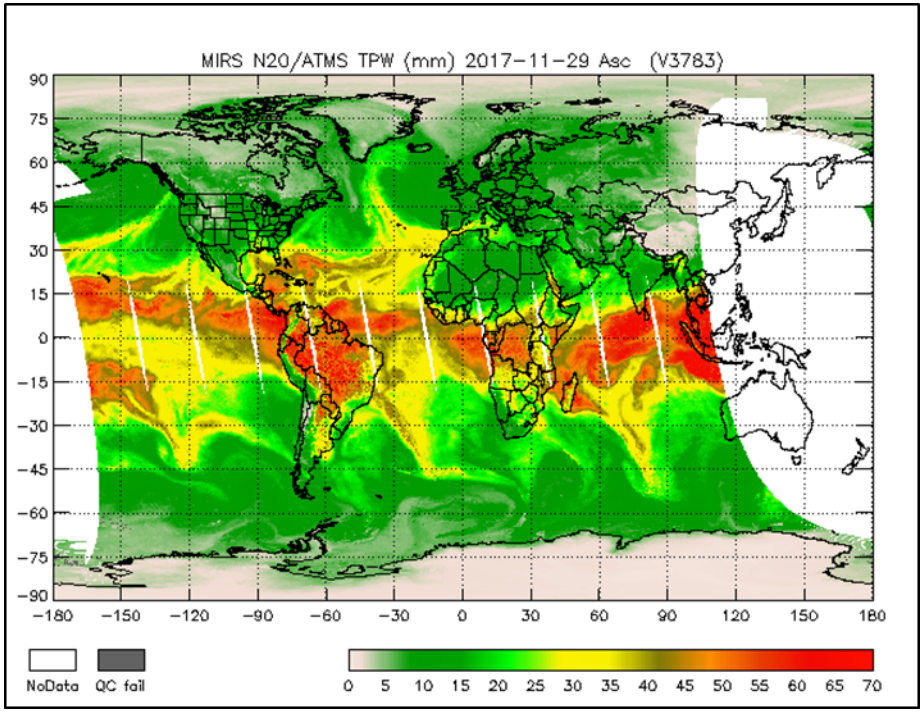
NOAA-20 ATMS LTAN



NOAA-20 ATMS MiRS Retrieval Products

S-NPP vs NOAA-20 Total Precipitable Water





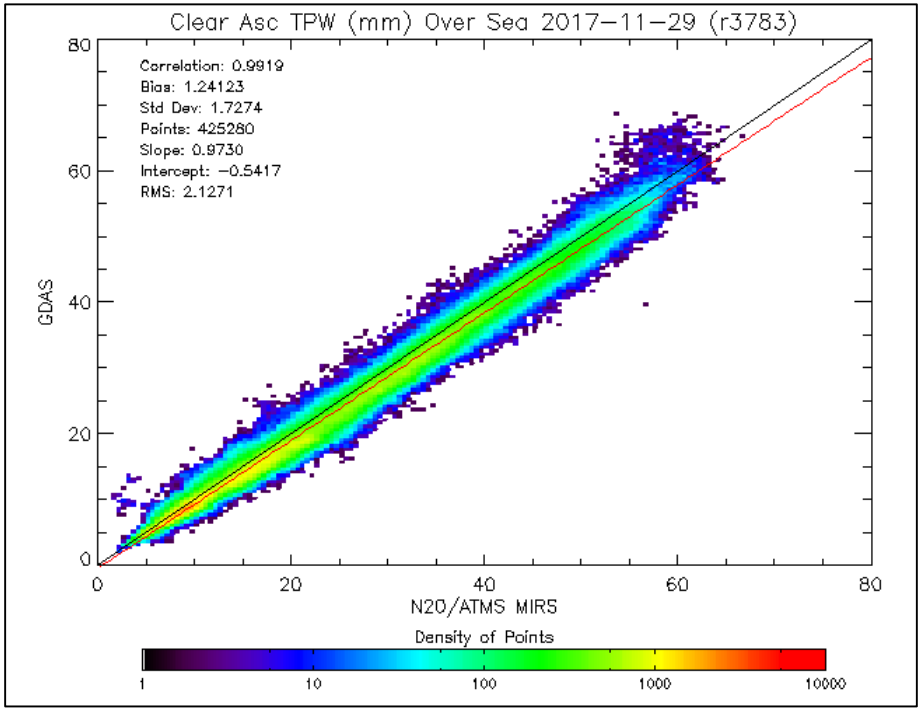
Produced by the MiRS Algorithm Development Team at NOAA/NESDIS/STAR

NOAA-20 ATMS MiRS Retrieval Products

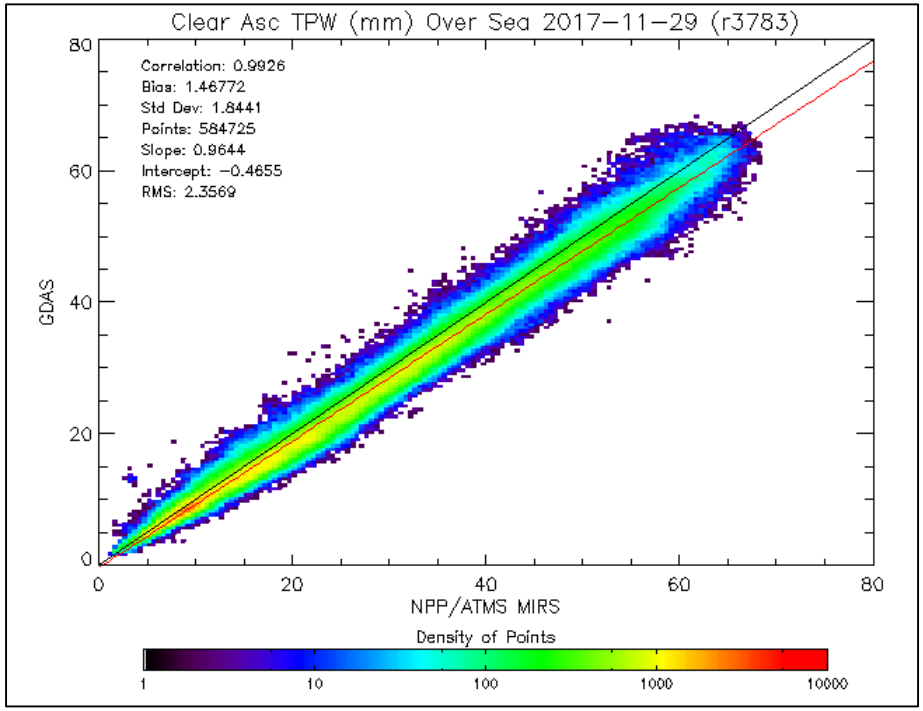
Total Precipitable Water: Comparison with GDAS

Clear Ocean

JPSS-1/N20



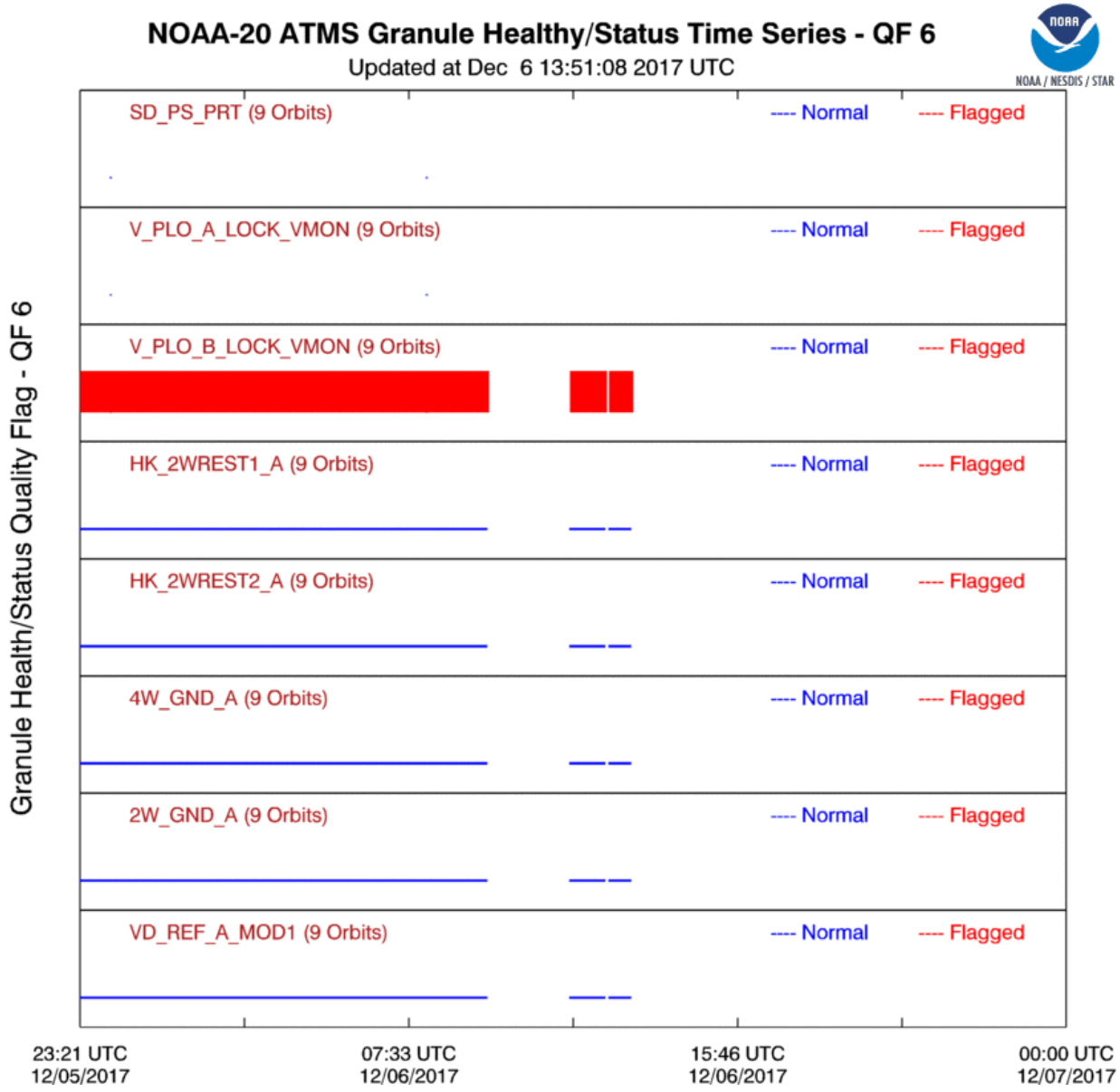
SNPP



Note: differing sample sizes due to incomplete global coverage of N20 data

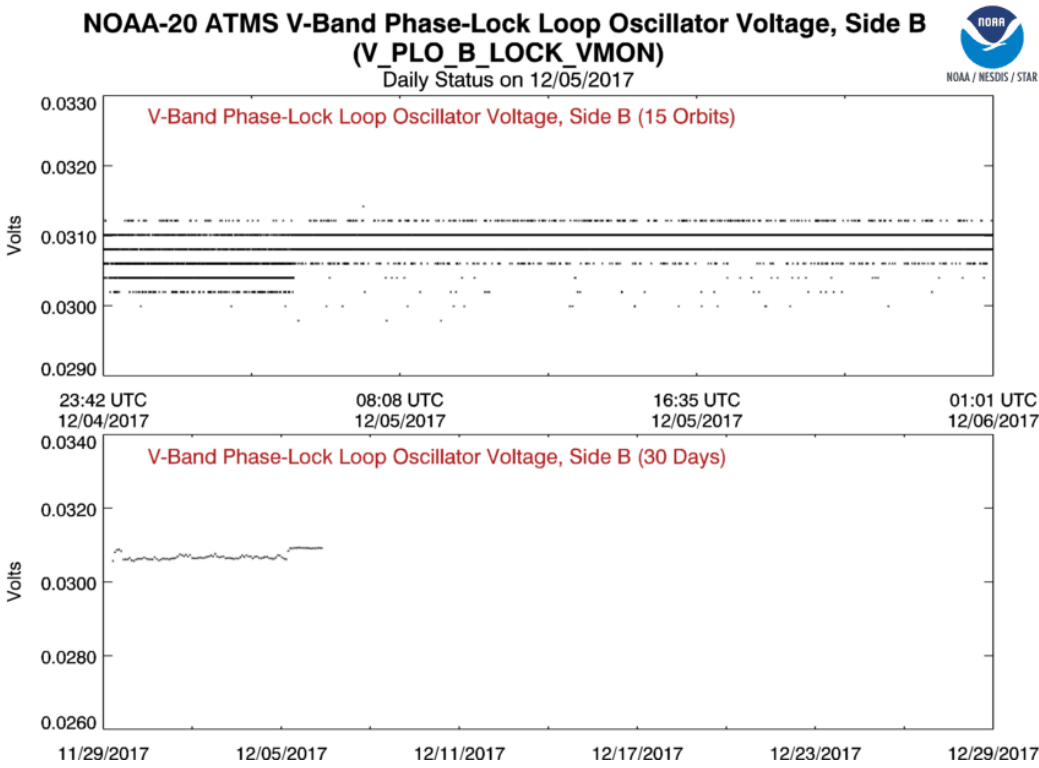
Produced by the MiRS Algorithm Development Team at NOAA/NESDIS/STAR

NOAA-20 ATMS SDR QF-6 Status



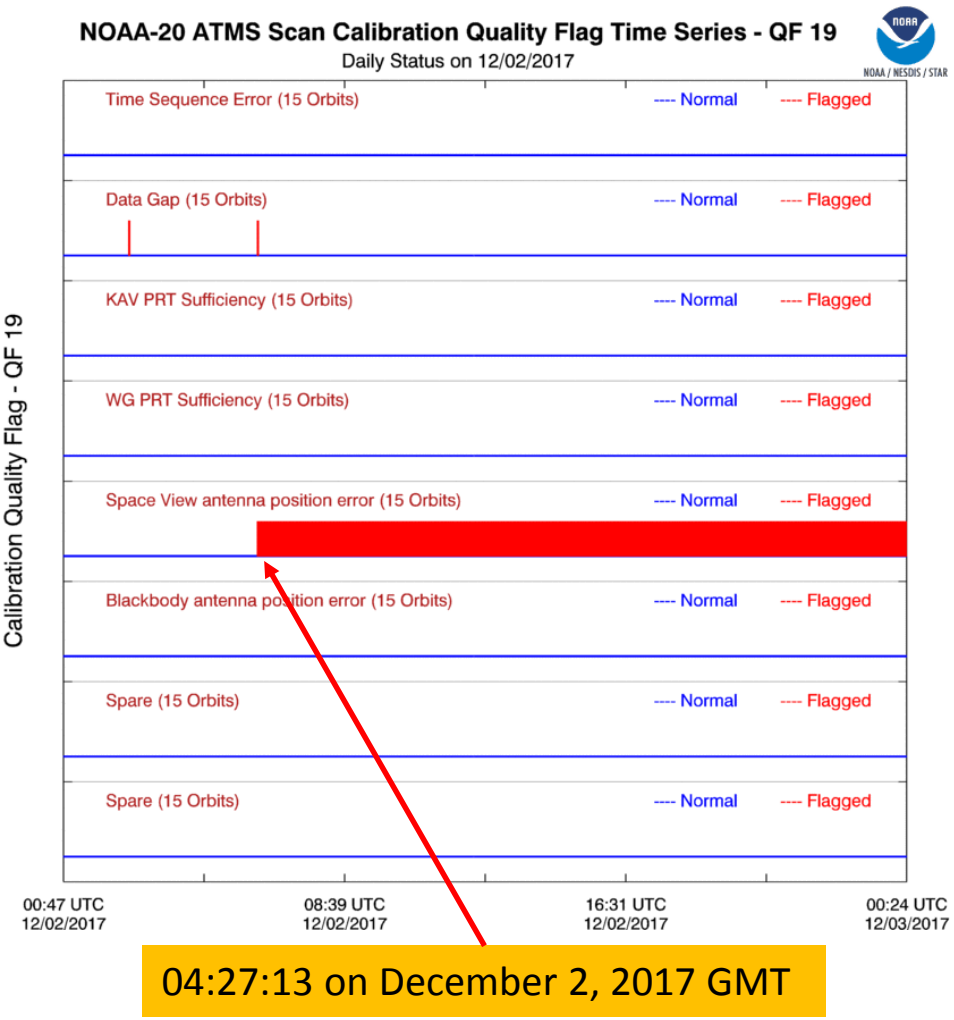
NOAA-20 ATMS SDR QF-6 Analysis

- ✓ V-Band PLO voltage is higher than nominal high in calibration data book
- ✓ Yellow Limit high is not given in calibration data book
- ✓ dataLimit high for V-Band PLO voltage is set to 0.022, which is lower than on-orbit values
- ✓ Solution: Update dataLimit high to a higher number according to on-orbit values in PCT

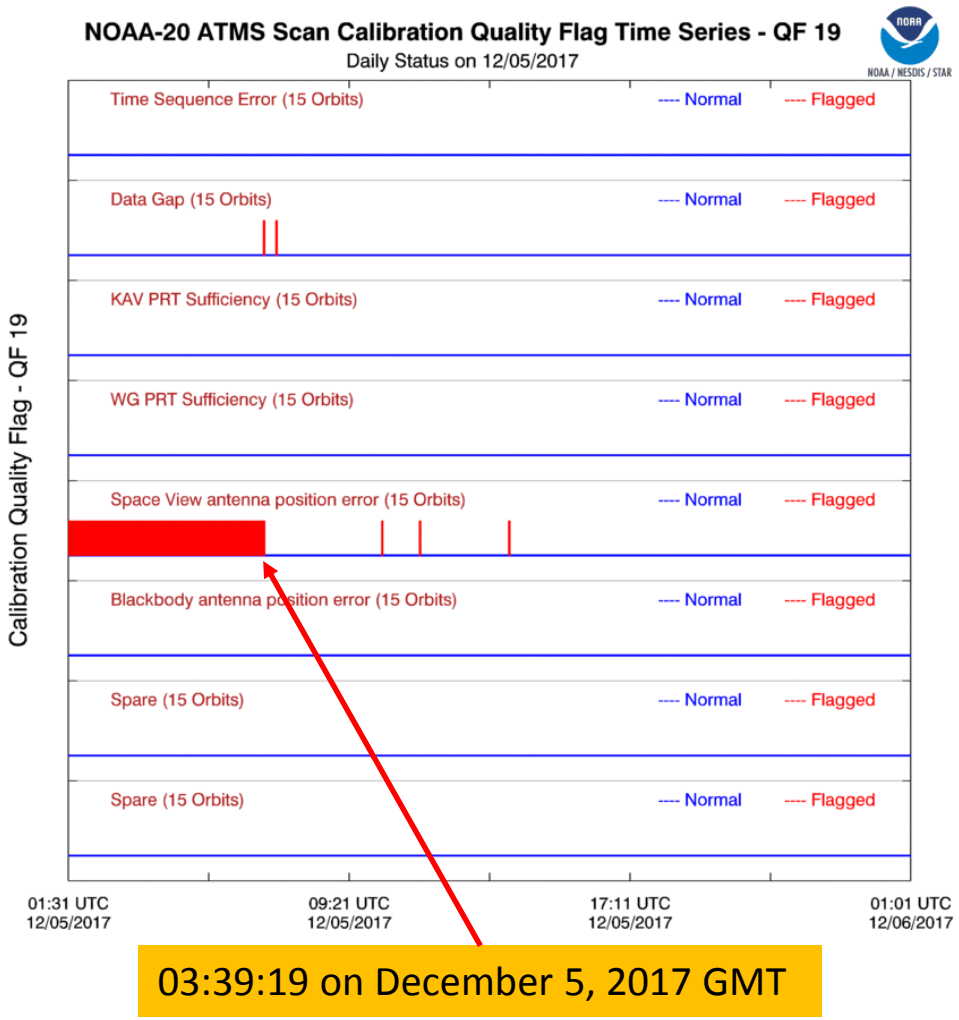


Name	Description	Red Limit (low)	Yellow Limit (low)	Performance Limit (low)	Nominal (low) [1]	Nominal (high) [1]	Performance Limit (high)	Yellow Limit (high)	Red Limit (high)
SD_PS_PRT		-25	-15	-10	0	30	49	55	65
V_PLO_A_LOCK_VMON	Volts	NA	NA	0.002	0.02	0.02	NA	NA	NA
V_PLO_B_LOCK_VMON		NA	NA	0.002	0.02	0.02	NA	NA	NA

NOAA-20 ATMS SDR QF-19 Status



04:27:13 on December 2, 2017 GMT



03:39:19 on December 5, 2017 GMT

SV antenna position error QF is triggered during SVS #2

NOAA-20 ATMS SDR QF-19 Artifact Analysis

spaceViewresolverCount in current PCT

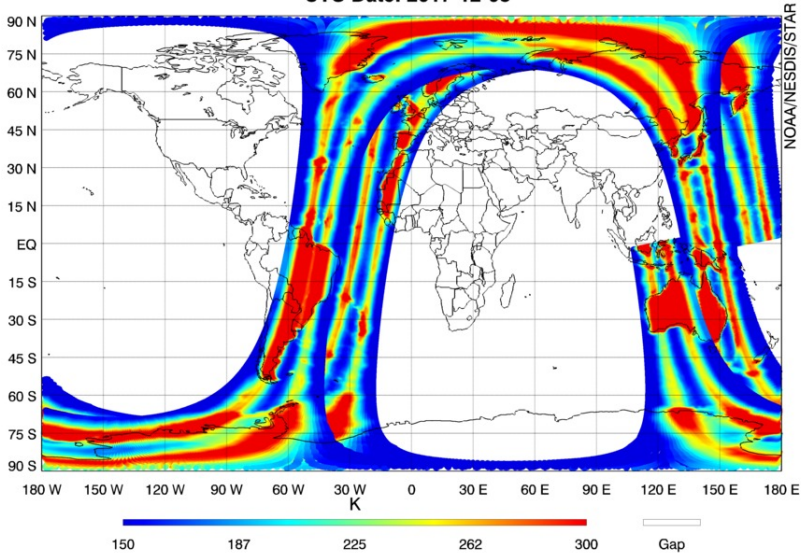
	SV Profile #1	SV Profile #2	SV Profile #3	SV Profile #4
FOV97	14639	14335	14031	13426
FOV98	14842	14538	14234	13629
FOV99	15046	14603	14438	13833
FOV100	15249	14945	14641	14036

- ✓ Caused by error in spaceViewresolverCount in current PCT
- ✓ Solution: Update spaceViewresolverCount for SV Profile #2 at FOV99 to the correct number (14742) in PCT
- ✓ Will be implemented in operational ground system in the next PCT upgrade

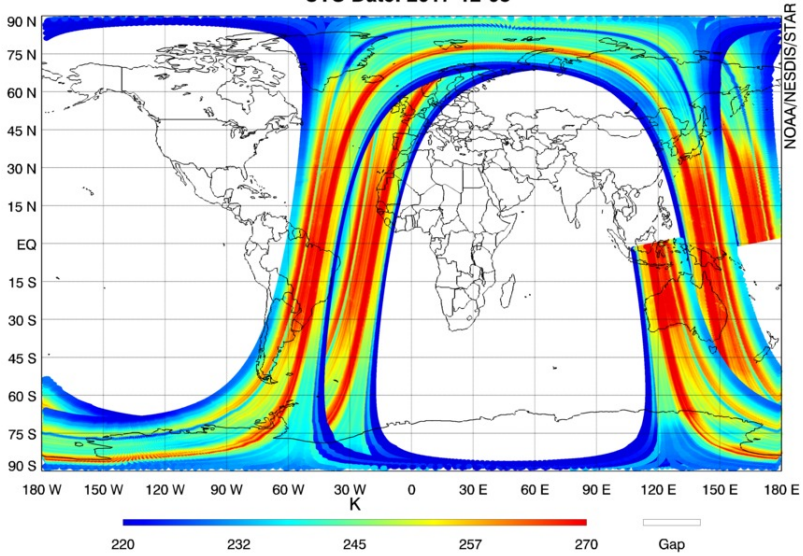
SV antenna position error QF is triggered during SVS#2.

NOAA-20 ATMS SDR Artifacts

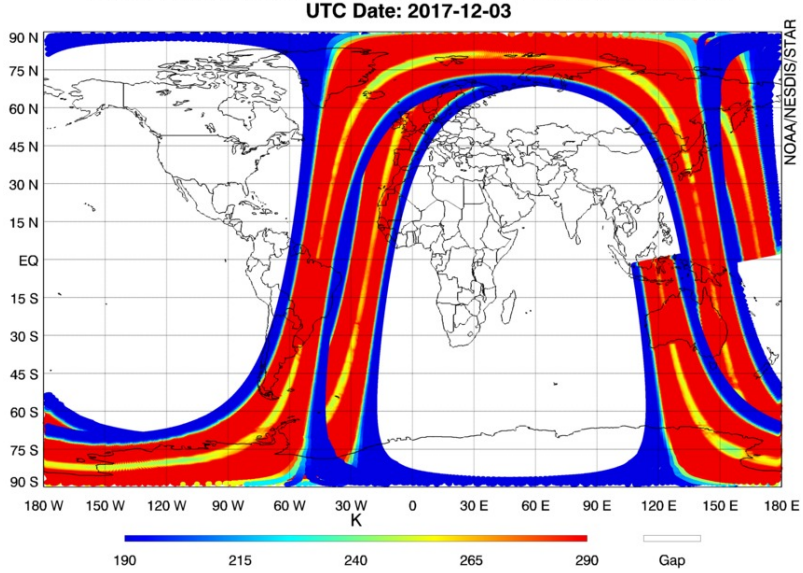
NOAA-20 ATMS Sensor Temperature (SDR) Ch.2 31.4 GHz QV-POL
UTC Date: 2017-12-03



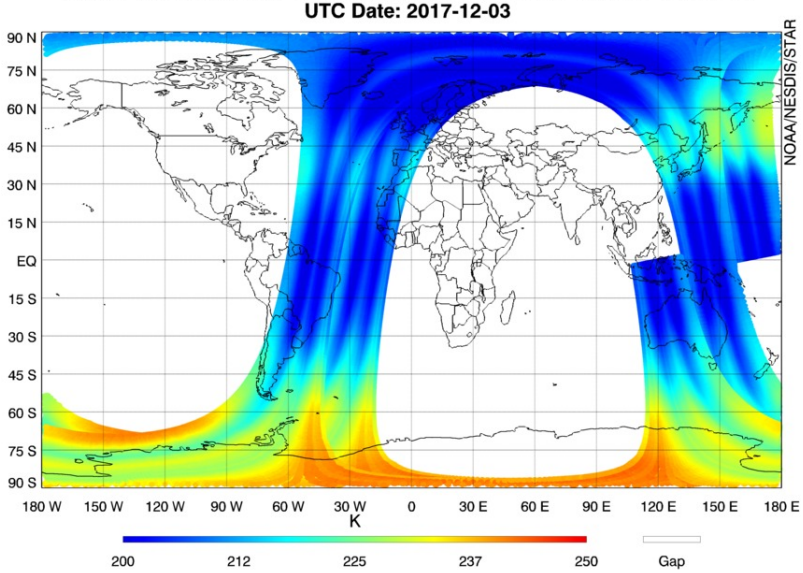
NOAA-20 ATMS Sensor Temperature (SDR) Ch.6 53.596±0.115 GHz QH-POL
UTC Date: 2017-12-03



NOAA-20 ATMS Sensor Temperature (SDR) Ch.4 51.76 GHz QH-POL
UTC Date: 2017-12-03



NOAA-20 ATMS Sensor Temperature (SDR) Ch.10 57.29034 GHz QH-POL
UTC Date: 2017-12-03

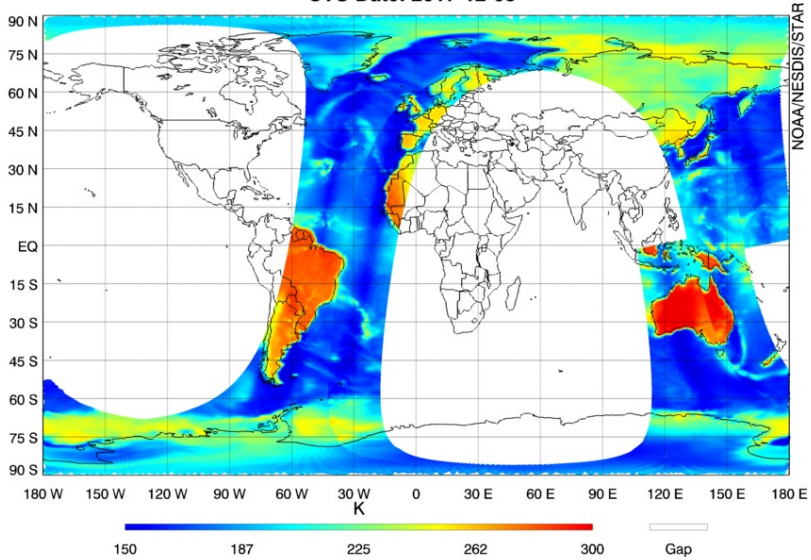


NOAA-20 ATMS SDR Artifacts Analysis

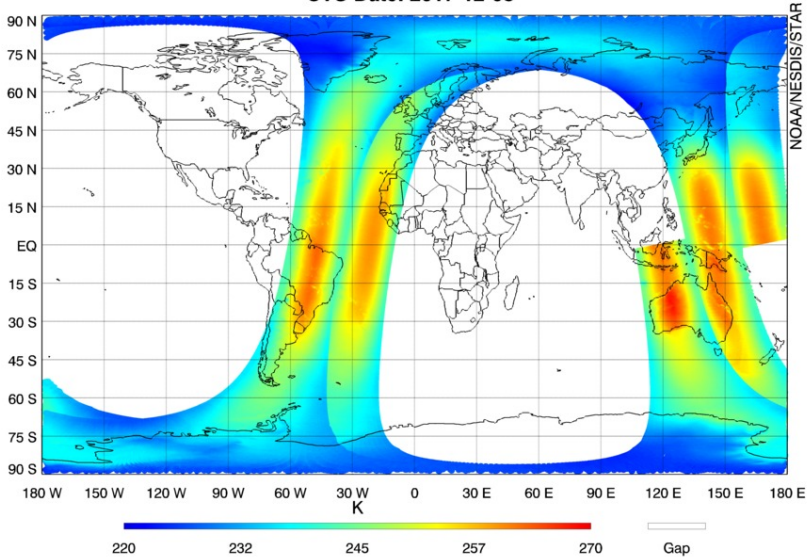
- ✓ Caused by the error in TDR to SDR conversion coefficients (beamEfficiencyCorrection and scanBias) in PCT
- ✓ Analysis indicates that SDR data at channel 2~16 are affected but magnitudes are different
- ✓ Solution: update both coefficients in PCT
- ✓ Will be implemented in operational ground system in the next PCT upgrade
- ✓ Preliminary upgrade testing results for the four selected channels are shown for verification purpose

NOAA-20 ATMS SDR Artifacts Analysis

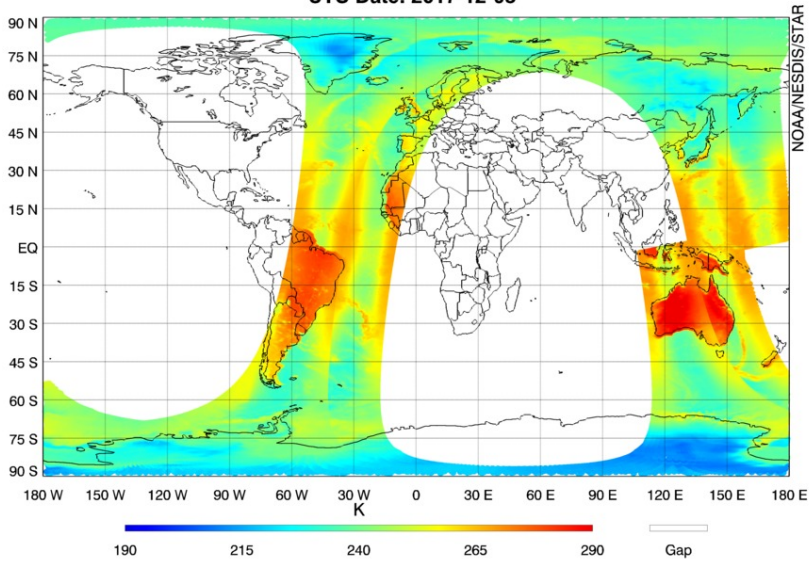
NOAA-20 ATMS Sensor Temperature (SDR) Ch.2 31.4 GHz QV-POL
UTC Date: 2017-12-03



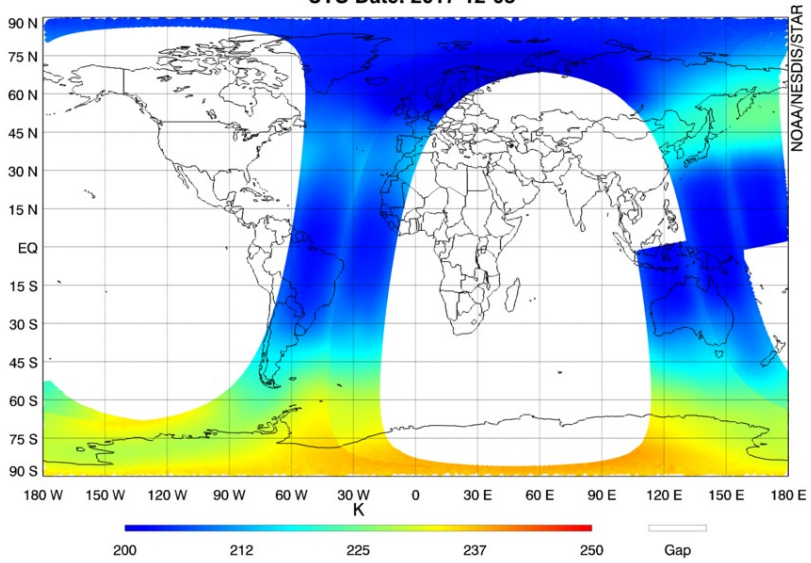
NOAA-20 ATMS Sensor Temperature (SDR) Ch.6 53.596±0.115 GHz QH-POL
UTC Date: 2017-12-03



NOAA-20 ATMS Sensor Temperature (SDR) Ch.4 51.76 GHz QH-POL
UTC Date: 2017-12-03



NOAA-20 ATMS Sensor Temperature (SDR) Ch.10 57.29034 GHz QH-POL
UTC Date: 2017-12-03



NOAA-20 ATMS Beta Status Summary

- ✓ NOAA-20 ATMS starts getting engineering telemetry RDR data from orbit 153 as scheduled
- ✓ NOAA-20 ATMS starts getting science RDR data from orbit 154 as scheduled
- ✓ NOAA-20 ATMS starts generating radiance data (TDR/SDR/GEO) from orbit 154
- ✓ ATMS scan drive shows a normal condition after activation
- ✓ ATMS channel NEΔTs are stable since activation
- ✓ NOAA-20 ATMS channel striping index is lower than S-NPP
- ✓ NOAA-20 ATMS channel correlation is lower than S-NPP
- ✓ ATMS TDR/SDR quality flags, V_PLO_B_VMON and space view antenna position error, are triggered due to the error in PCT. They can be fixed by PCT update.
- ✓ ATMS SDR data shows anomaly also due to the error in PCT. Such anomaly can be fixed by PCT update.
- ✓ No additional QFs are triggered after setting both chkConsistWcCc and chkConsistPRT to 1. Such change will be also included in the next PCT update
- ✓ NOAA-20 ATMS near real time status can be viewed in password protected ICVS web pages
- ✓ NOAA-20 ATMS TDR data can be used to make initial qualitative or very limited quantitative assessments regarding product fitness-for-purpose