APPENDIX G: DATA CHANGES AND PROBLEM RECORD

This appendix is considered outdated and no attempt will be made to keep it current. However, since it contains a historical record of events that affected the NOAA KLM Level 1b data and some of its products up through around 2003, the appendix continues to be accessible. To obtain a complete history of mission and operational changes please see the Level 1b Notices website at http://www.ospo.noaa.gov/Products/ppp/index.html. Also, users can contact the National Climatic Data Center's Satellite Services Group at NCDC.satorder@noaa.gov with any questions regarding Level 1b data and its products.

G.1 CHANGES MADE TO NOAA KLM LEVEL 1B DATA

The following is a chronological list of changes that were made to the Level 1b data.
01 Sep 1999
On September 15, 1999, we plan to update the NOAA-K/15 Level 1b preprocessor to correct AVHRR Telemetry Time Code array Words 1 & 2. The implementation should be transparent to both the Level 1b and the Level 1b* users. Parallel testing was executed from 08/25/99 1400L to 08/26/99 1100L. No anomalies occurred during testing.

14 Sep 1999
On Wednesday, September 15, 1999 Release 2.4.1 of the NOAA-K Preprocessor will be put into operation. The release includes CCR#1310, CCR#1311 and WR#1188. A new load module for the AVHRR preprocessor and an updated version of the CPIDS database will be installed into operations between 1100L and 1300L. The first orbit to be processed will be NSS.HRPT.NK.D99258.S1718.E1730.B0696969.GC scheduled to be ingested at 1318 L.

CCR#1310: Corrects an intermittent problem which causes the AVHRR preprocessor to abort when an invalid Frame Number is received during the extraction of TIP Housekeeping Analog data.
CCR#1311: Corrects formatting errors in items ID_AVHRR word(1) and TIME_CODE words (1 & 2)

WR#1188: Updates the NOAA-K CPIDS AMSU-B bias correction table for STX-2

27 Sep 1999
At 0100 on September 28th the STX-2, and STX-4 antennas on the AMSU-B instrument aboard NOAA-15 will become the new operational antennae. This will be done to stabilize the biases that have been occurring since the launch of NOAA-15. The current bias values in the Level 1b header for STX-2 are compatible with this new configuration. This new configuration will reduce the amount of LAC data from NOAA-15. Also by switching to STX-2 the HRPT data will be less noisy.

03 Jan 2000
After re-configuring the STX antennas on NOAA-15, the previous AMSU-B bias has been minimized and stabilized. The monitoring of this new configuration since September 28,1999 has shown little change in the bias. Therefore, it has been decided to declare the NOAA-15 Level 1b, 1b* AMSU-B an operational product as of January 6, 2000. Bias correction updates will still be implemented to perform bias corrections as deemed necessary by the instrument scientists.

11 Feb 2000
The following updates to the CPIDS file (calibration parameters instrument data set) will be put into operation on February 16 as planned. This update includes (data changes only):
1. AMSU-B STX antenna bias corrections updated in the Level 1b/1b* header record

2. CPIDS Coefficient Correction - One of the NOAA-15 AMSU-A2 PRT conversion coefficients (which are output into Header Record in AMSU-A Level 1b data) was found to be incorrect. The AMSU-A Level 1b Header Record location is (AMSU-A2 Warm Load 1 Temp. Conv. Coeff. 3) at bytes: 2141-2144. The current incorrect value is 2.812463E-14 and the correct value is 2.824335E-14.

On February 23, 2000, the remainder of the updates will be put into operations. The following updates are included (software changes):

AMSU-A:
AMSU-A PLLO2 Coefficients. Fixes problem which causes incorrect coefficients to be applied to channels 6, 7 and 15.

Corrects AMSU-A data corruption reported by Nigel Atkinson - where on some occasions data to be filled into a portion of the calibration scan were not filled in causing bogus data.

AMSU-B:
Correction of AMSU-B Level 1b to 1b* Retro Converter to return correct values for SARR_A_POWER and SARR_B_POWER.

HIRS:
Corrects problem where HIRS scan line numbers repeat in Level 1b* after a data gap.

07 Mar 2000
On Wednesday March 8, 2000 release 2.5 of the NOAA-K Preprocessor will be put into operation as announced on February 28, 2000. The release includes software changes for

AMSU-A and HIRS, the AMSU-B 1b* to 1b converter, and the AMSU-B 1b to 1b* retro converter. It also includes an updated version of the calibration parameter database with STX bias updates and AMSU-A coefficient changes. The installation of these changes will occur between 1045L and 1230L.

The first orbits to be processed will be
NSS.GHRR.NK.D00068.S1553.E1725.B0945758.GC
NSS.HRPT.NK.D00068.S1726.E1739.B0945858.GC .
The scheduled ingest time for the HRPT orbit is 1226L.

18 May 2000
We are ready to implement changes to the Level 1b data that will correct the anomalies listed in an earlier notice. We are in the process of reviewing the test data internally. This is just a reminder that the change is coming. Below is specific information that you need to update your software. In order to be ready for the NOAA-L launch, our plan is to implement this change along with internal NOAA-L specific changes on July 11, 2000.

SPECIFIC CHANGES
Level 1b users must update their software to utilize the corrections for moonglint detected in the HIRS data.

Correction of NOAA-K HIRS Moon in Space View (CCR 1197): This update requires a change in the HIRS Level 1b data file.

Level 1b data users: A one-bit field per scan line has been inserted in the Level 1b file record format under “QUALITY INDICATORS”; scan line quality flags “CALIBRATION PROBLEM CODE” (to be renamed CALIBRATION ANOMALY CODE); in spare bit 9. The new item indicates moonlight detected in space views for this scan.

Impact on accuracy of data: As reported by Michael Chalfant, the magnitude of this problem becomes apparent when a comparison is made between the calibrated earth measurements using the current operationally generated calibration coefficients and those using the new coefficients.

Table G.1-1 displays the magnitude (in K) of the error for each of the HIRS/3 channels resulting from the incorrect generation of the in-flight thermal calibration coefficients. Please note that the brightness temperatures errors measured for channels # 11-19 using the appended calibration coefficients are greater than indicated by this table because the on-line ATOVS software has a cutoff so that ridiculously low radiances do not cause the Planck function to fail during processing.

Table G.1-1. Comparison of Error in the HIRS/3 Channels Resulting from Incorrect Generation of In-flight Thermal Calibration Coefficients.

Channel #	Full Moon Operational Error (K)	Partial Moon Operational Error (K)
1	39	4

2	43	4
3	44	4
4	46	4
5	42	3
6	40	3
7	36	3
8	42	5
9	115	5
10	36	3
11	>120	7
12	>107	12
13	>93	11
14	>77	15
15	>72	23
16	>82	28
17	>91	11
18	>104	8
19	>85	8

Testing of a second moonglint event where there was only a partial moon contamination of the HIRS/3 calibration Space View revealed that some channel brightness temperatures were affected by as much as 28 K. Since only the colder end of the spectrum (for each channel) is affected and the nearest cold area was a large cloud (which was not close to the contaminated calibration cycle), there was a smaller (but still unacceptable) impact than the full moon contamination test.

26 May 2000

Beginning sometime after May 19th, we noticed that the earth location error seen in the NOAA-14 AVHRR data is consistently about 1 to 2 kilometers. has not changed and if used with the current data will increase the error. We are observing the Level 1b data to determine if this is a consistent change and to get some idea of why it has occurred. Data for the other NOAA satellites have not changed. If our continued investigation next week indicates that the clock drift data should be updated, the Navigation website will be updated.

01 Jun 2000
On May 24, 2000 at 23:59:00, a clock error of +500 milliseconds occurred on NOAA-15 due to a change in the Flight Software.

05 Jun 2000
In an effort to improve our ability to update and manage clock adjustments, SOCC has conducted a test on the NOAA-15 orbit number 10724. The test began around 1739Z and lasted through 1745Z. During this test time period, adjustments were made every 45 seconds in the following sequence.
+ 100 milliseconds (ms)

- 100 ms
+900 ms
- 900 ms
+ 250 ms
- 250 ms
+ 750 ms
- 750 ms
At the end of the test, data should have returned to the pretest condition.

07 Jun 2000
The NOAA-15 HIRS Channel 1 Period Monitor over the past 24 hours has reflected sporadic limit violations and an increased filter motor current. The limit violations are for those already expanded due to previous anomalies. There has also been a loss of sync with the filter wheel for 2-3 hours (since 6:30 am). The next pass is expected between 9:30 and 10 am and SOCC, NASA and ITT engineers are monitoring/investigating. FYI: Symptoms at this time are more representative of an intermittent contaminant within the bearing lubrication vs. an end-of-life scenario.

09 Jun 2000
As of 16:07 UTC June 9, 2000 the HIRS Filter Wheel Motor on NOAA-15 was placed in the nominal operation mode. This is an effort to correct the previously observed anomaly on NOAA-15. The motor has been operating in the high mode for approximately the last 36 hours.

09 Jun 2000
At 19:46 UTC June 8, 2000, the ATOVS system was modified to not use the HIRS data in processing. This was done by modifying cloud detection thresholds to flag all retrievals as cloudy and by removing the HIRS channel 2 from the retrieval generation step. We continue to use the HIRS to co-locate the AMSU-A to the HIRS footprint, but we do not use the channel data in our processing. Again, the high quality of the cloudy AMSU-A only soundings continues.

The HIRS instrument has not improved it's status after the filter wheel was put in high power mode. The filter wheel continues to slip which causes a shift in the brightness temperatures. The instrument scientists continue to troubleshoot the problem.

13 Jun 2000
This morning a telecon was held with ITT, SAO, NASA, OSO, OSDPD and OSD participants to review the latest status of the HIRS Filter Wheel (FW) anomaly on NOAA-15.

-The FW motor has generally stabilized since we went back to nominal power mode around noon on Friday. There remain some periods of instability when the FW goes out of synchronization for about 2.5 hours and then returns to normal. OSO has been tasked to examine these events and determine if there is something going on within the spacecraft during that period which is
causing the problem.

-The soundings people have noticed a general decrease in the number of cloudy soundings generated from NOAA 15. The percentage of cloudy soundings have dropped from 90% last Thursday (during FW high power mode) to less than 70% as of this morning. They are still using the AMSU-only soundings mode of operation until they decide to go to normal HIRS-AMSU
soundings. They will make a decision this afternoon whether or not to return to normal operations.

The Longwave Outgoing Radiation group does not notice any change in the quality of their data.

-ITT and NASA will draft a fault path analysis for all to follow to narrow down the cause of the anomaly. At the moment, ITT and NASA have not eliminated the "debris in the bearings" theory. Two other hypotheses are:

1. The 1Hz clock signal coming from the spacecraft is not precise enough to maintain FW synchronization (OSO to check s/c data), and

2. FW electronics may have become sensitive to external stimuli (EMI, mechanical, solar event, etc). ITT and OSO to review the data from various sources (including SEM data with the folks from Boulder).
--Dr. Cao, HIRS Instrument Scientist at ORA, has seen some streaks in channel 1 and 2 data since we went back to nominal torque mode on the FW.

13 Jun 2000
On Tuesday June 13, 2000, an updated version of the CPIDS database will be placed into operations to implement the updates to the NOAA-K AMSU-B RFI (Bias Correction tables). The installation of the updated CPIDS will occur between 11:00 am and 12:00 noon (local time). The first orbits to be processed will be:
NSS.GHRR.NK.D00165.S1441.E1613.B1083537.GC and
NSS.HRPT.NK.D00165.S1615.E1626.B1083737.GC .
The scheduled ingest time for the HRPT orbit is 12:15 pm (local time) and the GHRR orbit is 12:40 pm (local time).

19 Jun 2000
Problems with the HIRS parallel test data were corrected over the weekend. Test data is updated on the CEMSCS and the ftp site. The implementation date is set for July 11, 2000.

28 Jun 2000
The clock corrections and constant attitude corrections were turned on beginning with the following orbits. Data has been placed on the anonymous ftp site.
NSS.HRPT.NK.D00180.S1858.E1912.B1105252.GC
NSS.GHRR.NK.D00180.S1711.E1857.B1105152.GC
NSS.LHRR.NK.D00180.S1758.E1806.B1105151.GC

29 June 2000
The clock correction starts with the following orbits. There were apparent parameter adjustments

that had to be made. Therefore start with these orbits: B1106767 GC., B1106667 GC.

Level 1B data users:
NOAA-15 - Header Record
Byte 339 - 340 Earth Location Bit Field
bits 15 - 2: <zero fill>
bit 1: reasonableness test: active (0 = inactive)
bit 0: attitude error: correction (0 = not corrected)

NOAA-15 - Data Record
GAC, HRPT/LAC, AMSU-A/B, HIRS/3
Word 13 and 14: bit 14: 1 = scan time corrected for clock drift
SEM/2
Word 17 and 18: bit 14: 1 = scan time corrected for clock drift

10 Jul 2000
At 12:15 pm local, SOCC switched the MIRP to utilize the internal sync instead of AVHRR sync delta. Problems with data for all instruments other than AVHRR should have cleared up after this change.

The HRPT transmission from NOAA-15 has been experiencing severe problems with signal synchronization since early on 10 July. NOAA is aware of the problems and is investigating the cause and any possible solution to restoring the HRPT service.

Update 1 at 1400 UTC:
First indications are that of a possible failure of the AVHRR instrument scan motor. Scanner problems will affect all AVHRR output, both HRPT and APT data transmissions. NOAA personnel are awaiting more information from telemetry when the satellite is again within view of the NOAA Command and Data Acquisition stations.

11 Jul 2000
The new Preprocessor Release 2.6 was implemented into operations on Tuesday July 11, 2000 . This release implements new executable programs for the following instruments in the AIP preprocessor (AMSU-A, AMSU-B, HIRS, SEM, DCS) and AVHRR (GAC, HRPT, LAC). The Level 1b* to 1bB converter will implement new executable programs for HIRS and AMSU-B.

The last orbits to be processed by NOAA-15 LAC B1123333 and NOAA-15 LAC B11234345.

10 Jul 2000
The ATOVS processing on NOAA-15 has been experiencing problems throughout today, 10 July. Data from 0400 UTC to the present has been affected. Some data was processed from 0400 UTC to 0730 UTC, but the data was unusable from 0730 UTC to 1618 UTC. The data were processed again but the data did not return to its nominal state.

The reduced ATOVS processing is associated with the problems with the AVHRR instrument. The scan motor for the AVHRR is severely degraded and the AVHRR instrument on NOAA-15

is not useful. Unfortunately for the other instruments, the AVHRR is the base instrument to which the others are synchronized; hence no data for the bulk of today. NESDIS is in the process of switching the synchronization from the AVHRR to internal sync so that we can process data from the other instruments.

12 Jul 2000
There was a JCL problem with the HIRS processing of the Level 1b data after our update on yesterday. The problem has been fixed. The following orbits where processed after the fix was made. Data from yesterday (day 193) will be reprocessed for archive purposes only and will not be transmitted (unless requested).
NSS.HIRX.NK.D00194.S1015.E1206.B1124647.WI
NSS.HIRX.NK.D00194.S0825.E1020.B1124546.WI
NSS.HIRX.NK.D00194.S0636.E0831.B1124445.WI

Reprocessed
NSS.HIRX.NK.D00193.S1540.E1724.B1123536.GC
NSS.HIRX.NK.D00194.S0313.E0459.B1124243.GC
NSS.HIRX.NK.D00194.S0454.E0641.B1124344.GC

12 Jul 2000
At 1700Z The AVHRR instrument was placed in the "AVHRR synchronization" mode. Initial passes (HRPT at this time) indicate data is of good quality and can be processed. Operations will continue to monitor passes to determine the quality of products in this mode.

21 Jul 2000
On July 24, a test will be conducted with the NOAA-15 HIRS. At 12:38Z, the HIRS filter wheel housing heater will be turned on for a duration of 48 hours. It is hoped that the filter wheel elevated temperature will draw additional lubricant into the bearing assembly. Product impacts should be expected for the first 12 hours or so after the heater turn-on as the filter wheel reaches a new steady-state operating temperature.

In addition, an on-board command macro is being validated for upload to NOAA-15 early in the week. This command macro, which is loaded directly to flight software, is designed to automatically trigger off elevated HIRS filter wheel current values (280 mA threshold) to command the filter wheel into High Power mode, thereby supplying 35% more current to the filter wheel motor. This action duplicates the current operational procedure during a pass, but extends the capability to 100% of the orbit.

On Thursday, July 27, the recorders will be configured for one day to record continuous AIP data along with GAC. The AIP data, which contains all spacecraft and instrument data aside from the AVHRR, is recorded independent of the MIRP. This operational test will be used to compare data quality between the two data streams to help evaluate MIRP/AVHRR impacts to other instrument data. The prime impact to the users due to this test is the loss of one day of LAC recordings from NOAA-15.

21 July 2000

An emergency release version 2.6.1 will be put into operations today Friday July 21, 2000. This emergency release implements a new executable program for the AIP preprocessor which will correct the AMSU-B anomaly documented as CCR 1583 . This is the anomaly associated with the AMSU-B bias earlier this year.

The first orbits to be processed by Release 2.6.1 will be NOAA-15 HRPT B1137878 scheduled to be ingested at 1:01 pm (local time) and NOAA-15 GHRR B1137677 scheduled to be ingested at 1:32 pm (local time).

25 Jul 2000
Since the Filter Wheel housing heater was turned on around noon local time on Monday the 24th, users have reported problems with the HIRS data. The heater was turned off and the dwell returned to the 28V bus during the 1712z pass this afternoon. We will monitor the data for improvements.

27 Jul 2000
The clock drift correction capability has not been turned on at this time. For NOAA-15, since we do not have the AVHRR to determine the accuracy of our updates and since our corrections for NOAA-15 do not agree with the values reported by SOCC, we are waiting on the recovery of the
AVHRR before implementing this option or some other method of assuring the accuracy.

We look forward to beginning the parallel tests for NOAA-12 and -14 next week and turning on the corrections within two weeks of that date. The actual implementation data will be announced next week.

31 July 2000
The NOAA-15 AVHRR synchronization problem continues. In order to be able to perform troubleshooting and engineering observations without disrupting AMSU and other products, SOCC is proposing that we switch to using the stored AIP data (SAIP). This will give them the leeway to use the AVHRR sync delta, so that the AVHRR can be monitored.

We expect that users will not have a problem with the SAIP data. However, a test has been scheduled for Thursday, August 3, 2000, beginning around 00:00Z. We will produce SAIP data in parallel to the operational data. Also, whenever an SAIP orbit is not available, an AIP orbit will be substituted.

14 Aug 2000
Per SOCC, on August 17 at 01:15 Z until 23:17 Z SOCC will go operational with NOAA-15 SAIP. There will be no GAC or HRPT during this time. The STX2 (normally used for HRPT) will be off except for two dual transmissions over the CDA's. One at Wallops Rev 11759 AOS 11:57 Z and one at Fairbanks Rev 11762 AOS 16:53 Z. The AMSU may be adversely affected during these times.

The two week SAIP test previously scheduled to start on August 21 has been delayed for a week (possibly longer).

28 Aug 2000
Another test has been scheduled using the SAIP data. This is a result of the anomalies experienced with the NOAA-15 AVHRR instrument.

The list below contains the scheduled passes where SAIP and GAC datasets will be played to the ground. The list identifies the spacecraft, rev number, downlink site, maximum elevation, YYMMDD, and AOS (in GMT) for the playback pass.

15 12030 W 58.18 000905 130920
15 12033 F 73.04 000905 180550
15 12051 W 70.53 000907 000620
15 12065 W 71.89 000907 234350
15 12079 W 43.79 000908 232130
15 12087 W 46.83 000909 131920
15 12095 F 37.97 000910 023000
15 12104 F 63.12 000910 175250
15 12108 W 56.29 000911 001610
15 12118 F 48.14 000911 173020

05 Sep 2000
Due to transmission problems at the CDA station the scheduled pass of SAIP data NOAA-15 12030 for 13092 has been delayed. The pass scheduled for 180550 GMT will not occur. The next scheduled pass is: NOAA-15 12035 F 19.49 000905 212520.

13 Sep 2000
Starting September 12th and continuing on through September 17th, the MIRP on NOAA-15 will be configured back into synchronization with the AVHRR for up to two orbits each day. This will occur concurrently with an extra data recorder recording SAIP. The MIRP will then be re-configured back to internal synchronization just before the end of the SAIP record. The SAIP will be processed first and then the GAC. This mode will continue until the next scheduled "test rev" (at which time the MIRP/SAIP sequence will be repeated).

This test is being continued to allow engineering insight into the workings of the AVHRR during the back-orbit without comprising operational data from the other instruments on NOAA-15. If the GAC dataset has numerous "breaks in data" coming down from the spacecraft and the SAIP data set does not, do not be alarmed, as this is most likely caused by the AVHRR rephrasing.

Table G.1-2. List of Datasets that Were Resynched with the AVHRR on NOAA-15.

Acquisition Orbit	CDA Station	YYMMDD	GAC End (HHMMSS)	HRPT Start (HHMMSS)	HRPT End (HHMMSS)
12136	W	000912	233120	233150	234550
12139	F	000913	044200	044350	045610
12152	F	000914	023950	024200	025340
12161	F	000914	180250	180430	181640

12165	W	000915	002620	002650	004050
12179	W	000916	000340	000410	001820
12193	W	000916	234110	234140	235550
12207	W	000917	231900	231930	233310

18 Oct 2000
The most recent NOAA-L CPIDS update version date D00292 will be placed into operations on Wednesday October 18, 2000 1:30 pm (local time) . The last orbits processed before the promotion will be
NSS.GHRR.NL.D00292.S1535.E1706.B0038485.WI ,
NSS.HRPT.NL.D00292.S1707.E1720.B0038585.WI .
The first orbits to be processed after promotion will be
NSS.GHRR.NL.D00292.S1701.E1846.B0038586.WI
and NSS.HRPT.NL.D00292.S1846.E1902.B0038686.WI .

Description of change:
Dr. Cao's message: "After working with Mike Chalfant on a few orbits of HIRS/NOAA-16 data, we found that the calibration coefficients for the visible channel that I sent to you previously has an error in it. This is because the previous coefficients were based on the assumption that delta counts instead of raw counts are used in converting to radiance. To correct this problem, the calibration Intercept for channel 20 (visible channel) in the CPIDS file should be changed to 51.4852 from the previous 0.53521. The slope remains the same. There are some other issues with the calibration coefficients for channel 20 as well, but for now, let's just correct this number first. Without this correction, the Level 1b data produces erroneous results including negative albedos."

27 Oct 2000
As has happened in the past, the NOAA-15 HIRS instrument is experiencing motor filter wheel problems. The process by which this is corrected (to bring the motor current down to normal) is to switch to high power mode. This has caused a problem with HIRS Ch7, the increased temperature (High Power mode) has caused the space view counts to go to saturation in the A/D 4095. Therefore, the data cannot be calibrated for this channel.

30 Oct 2000
On 30 Oct 2000, at 12:25 Eastern Daylight time the AVHRR instrument on NOAA-15 will go into the external synchronization mode for 6 minutes. The purpose is to capture a GAC database. If problems are encountered during this period then SOCC will switch back to the internal mode.

07 Nov 2000
The NOAA-15 HIRS instrument in still operating in the High Power Mode. This causes noisy operational data. At this time we are processing the HIRS data, but not using it to generate a product. The instrument also has the Filter Wheel Motor housing heater turned on (this is also a non operational mode). These modes are attempts to correct problems with the instrument. It has not been determined at this time how long these modes of operation will last. However, we are still providing the Level1b datasets. This is because within the Level1b data are appended earth

location and calibration information that is still needed by some users.

08 Nov 2000
On the morning of November 9, 2000, SOCC will perform a test that will involve cutting off the filter wheel motor on the NOAA-15 HIRS instrument for one second in an effort to demagnetize it.

09 Nov 2000
The toggle test of the NOAA-15 HIRS motor filter wheel has been planned for November 13, 2000. The exact time has not been determined.

22 Nov 2000
On November 28, 2000, the Information Processing Division (IPD) will discontinue the distribution of the NOAA-15 AVHRR Level 1b data. The current AVHRR data produced is not useable and will no longer be distributed to the general public. The Satellite Operations Control Center (SOCC) and other offices within the National Oceanic and Atmospheric Administration (NOAA) will continue efforts to identify and correct the problem. The user community will be notified when the AVHRR data is reliable and distribution will resume.

Problems with the AVHRR instrument began in July when the instrument demonstrated synchronization errors. Since the onboard processor normally uses the AVHRR to process all other instrument data, this problem rendered all data unusable. To restore good data for instruments other than AVHRR, the SOCC switched to using internal synchronization. The spacecraft will be operated in this mode until a correction to the AVHRR problem is found.

30 Nov 2000
The Information Processing Division has announced that no changes will be made to operational systems from December 15, 2000 through January 2, 2001. On December 12, the Pre-Product Processing group is planning to make several changes to the Level 1b process before the freeze begins. These changes should have no impact to the user community. The changes will make it possible for us to correct clock drift errors in the NOAA-16 AVHRR data and will correct effects of moon glint in the NOAA-15 AMSU-B data. A summary of the changes is provided below. Parallel testing will be conducted throughout the week of December 4th.

The KLM Level 1b preprocessing software will be updated to include AMSU-B moon glint anomaly corrections. Changes to the Level 1b format are not required. The user will find that previously unusable data will now be processed as normal. User impact - Increased data quality.

The NOAA-16 Calibration file will be updated to allow moon glint corrections for High Resolution Infrared Radiation Sounder (HIRS) data on that spacecraft. User impact - Increased data quality.

Both the KLM and A-J Level 1b preprocessing systems will be updated to allow scan geometry parameters to be changed to user supplied parameters. This will give us the ability to adjust the scan geometry differently for different satellites. User impact - improved earth location data due to use of double precision variables. New MSU scan angle $\pm$ 47.3685 degrees

(difference in latitude of 0.01 degrees, longitude 0.03 degrees); AVHRR new stepping angle 0.05407226563 degrees for all satellites except NOAA-16 which will be 0.053955078 degrees; AMSU-A - maximum difference in latitude of 0.005 and longitude of 0.0001; AMSU-B - maximum difference in latitude of 0.0001 and longitude of 0.0001.

The clock drift corrections for the NOAA-16 spacecraft will be turned on to correct the along track error. User impact - improved earth location data removing clock error of about 650 milliseconds (about 4 kilometers).

08 Dec 2000
Pre-Product Processing staff and users have detected several inconsistencies in the parallel test data for the NOAA-16 HIRS, AMSU-B, and HRPT data. Those problems have been identified and corrected where needed. The parallel test data is now the same as the operational data except for the changes that we noted in our initial change notice. Because these problems have made it difficult for you to verify that the test data meets your needs, we are changing the scheduled implementation date to December 14 rather than December 12. We are making every effort to implement the changes before our mandatory freeze period is reached (from December 15 through January 6, no changes are allowed to operational software or hardware).

Below is an explanation of the corrections that had to be made to the parallel tests and information on why you see some differences or errors not seen in the NOAA-15 data.

In the parallel test, the NOAA-15 HIRS calibration was different from the operations because the 24-hour file was not updated for the data provided before day 341. That has been corrected now.

The HIRS Level 1b for NOAA-16 is reflecting calibration problems that will be corrected as soon as we change the algorithm that updates our 24-hour file. Since NOAA-16 is not operational this can be done over the freeze period without impacting other satellites. The permanent fix will be implemented as soon as possible after the freeze is lifted.

Clock corrections for NOAA-16 are turned on in the test data, but we are seeing adjustments of $\pm$ 500 ms in the clock error that last for several days. We are adjusting for the change once it is detected. Depending on which set of data you examine you will see descending passes with a very small along track error or an error of about 500 ms. Both of these errors are significantly smaller than the error without clock corrections turned on as seen in the operations data.

We believe that the small differences you see in the NOAA-16 AMSU-B are due to a change to correct for moon glint. The instrument scientist felt that the correction should be incorporated in with other similar anomalous corrections and should be flagged under the existing indicators as shown below. The quality of the data will determine if differences other than moon glint will show up (this will effect calibration).

Existing Level 1b indicators:
QUALITY INDICATORS
Calibration Quality Flags (all bits off implies a good calibration)
Bits set per channel

bit 4: All bad space view counts for scan line
bit 1: Marginal space view counts for this line

Existing Level 1b* indicators:
CALIB_CHAN_PROBLEM_INDICATOR
array item 2: no good space view counts for scan line
array item 5: Some bad space view counts for scan line

13 Dec 2000
The preprocessor release 2.7 will be implemented into operations on December 14, 2000 between the hours 11:05 am and 12:15 pm local time. The following items will be put into operations:
(1) New earth location software changes for all instruments which will support all spacecraft (NOAA-15, NOAA-16, NOAA-14, NOAA-12).
(2) NOAA-16 CPIDS - insert RFI values, and moonglint offset for HIRS channel 19.
The first orbits to be processed for NOAA-16 will be
NSS.HRPT.NL.D00349.S1726.E1741.B0118989.WI ingest time 12:26 pm local and
NSS.GHRR.NL.D00349.S1415.E1610.B0118788.WI ingest time 12:46 pm local .

The first orbits to be processed for NOAA-15 will be
NSS.HRPT.NK.D00349.S1849.E1903.B1345656.GC ingest time 1:49 pm local and
NSS.GHRR.NK.D00349.S1346.E1542.B1345354.GC ingest time 2:16 pm local.

The first pass after the update
NSS.GHRR.ND.D00249.S1420.E1544.B4979091.GC
NSS.HRPT.NJ.D00349.S1633.E1647.B3070808.GC

02 Jan 2001
The Computer Operations Branch will coordinate the reprocessing of the day 001 data that was bad. The data will be processed as time allows between current data processing. This will be done overnight as much as possible.

05 Jan 2001
Normal post launch operations schedules indicate that the NOAA-16 Level 1b data should be declared operational three months after launch (January 8, 2001). The Information Processing Division has an outstanding High-resolution Infrared Sounder (HIRS) calibration issue that will not be resolved by this date. Current plans indicate that an operations date of February 20, 2001 should provide adequate time to implement the necessary changes to correct the identified calibration problem. Official notification will be sent out as soon as a decision has been made.

19 Jan 2001
On January 24, 2001, NOAA-16 Level 1b data will be declared operational for the following instruments:

AMSU-A
AMSU-B

SEM
DCS

30 Jan 2001
MEMORANDUM FOR: All NOAA-16 Level 1b Data Users

FROM: Barbara Banks
Chief, Information Processing Division

SUBJECT: Operational Status of NOAA-16 Level 1b Data

On January 24, the Information Processing Division declared the following Level 1b and 1b* data operational. These data are available to the user community:

AMSU-A Advanced Microwave Sounding Unit-A
AMSU-B Advanced Microwave Sounding Unit-B
SEM Space Environment Monitor
DCS Data Collection System
SAR Search and Rescue
SBUV Solar Backscatter Ultraviolet Spectrometer

Anomalies seen in the Advanced Very High Resolution Radiometer (AVHRR) Level 1b data, the High Resolution Infrared Radiometer (HIRS) Level 1b, and SBUV data are significant enough to delay the operational status of these instruments. National Environmental Satellite, Data, and Information Service(Satellite Operations Control Center (SOCC), Office of Research Applications scientists, Information Processing Division), National Aeronautics and Space Administration, and Lockheed, are working together to resolve the remaining issues as quickly as possible. The user community will be notified when the AVHRR and HIRS Level 1b and 1b* data are deemed reliable and declared operational.

13 Feb 2001
On February 15, the following changes will be implemented:
NOAA-16 HIRS earth locations will be corrected by applying a constant attitude correction to adjust for the across track error. A correction of -1.8 degrees (error of +1.8 degrees) will be used as a constant roll offset.

A NOAA-16 HIRS CPIDS file will be updated to change the minimum number of space FOVs needed to calculate space coefficients from 45 to 40 to correct the problem where channels 17, 18, and 19 are periodically not calibrated.

The software to update the 24-hour calibration coefficients file header will be modified to use a different algorithm to compute the variance of the calibration slopes. The current algorithm uses a shortcut version of the variance formula which is producing negative variances for NOAA-16 and therefore preventing the automatic update of the slopes used for the Level 1b HIRS earth view data. This algorithm change will effect both NOAA-15 and 16 HIRS calibration. On February 15, the algorithm change will be made for NOAA-16 so that the 24-hour file will begin

updating automatically. The change will be made for NOAA-15 on February 21. Parallel testing is on going.

Changes on February 15 will be made between 10:30 am and 11:45 am local time. The updates will be made after the following passes have been processed.
NSS.HRPT.NL.D01046.S1516.E1530.B0207676.GC
NSS.GHRR.NL.D01046.S1330.E1515.B0207576.GC
The first orbits processed after the update will be:
NSS.HRPT.NL.D01046.S1644.E1653.B0207777.WI
NSS.GHRR.NL.D01046.S1510.E1642.B0207677.WI
The following passes will be received out of sequence and will be affected by the change
NSS.GHRR.NL.D01046.S1148.E1336.B0207475.GC
NSS.LHRR.NL.D01046.S1300.E1311.B0207475.GC

On February 21, the following changes will be implemented:
- The algorithm used to update the NOAA-15 HIRS 24-hour calibration file will be changed so that updates will happen more readily.

- The preprocessing software will be updated to correct an error in the attitude algorithm that affects pitch angle adjustments to the earth location data. This will be a no impact change.

- The along track and across track errors seen in the NOAA-16 instrument data will be corrected by adjusting the earth location data with a pitch attitude correction of -0.44 degrees (along track), by using the SOCC reported clock error (along track), and by using a max scan angle of ± 55.25 degrees instead of ± 55.37 degrees (across track).

- The preprocessing software will be updated to properly extract the AVHRR dig-B and analog telemetry data for NOAA-16.

20 Feb 2001
Previously announced updates to the NOAA-KLM preprocessor (Level 1b process) will be made on February 21, between 12:30pm and 1:30 pm local time. The first orbits processed after the change are listed below. This update includes a switch to the NOAA-15 HIRS 24-hour calibration file processing that will improve the frequency of the updates. The NOAA-16 AVHRR processing will be updated to account for a pitch error rather than treating the along track error as a clock error. This includes a software change. All changes should have no adverse impact on the data nor should they require changes by the user community.

NOAA-15
NSS.GHRR.NK.D01052.S1559.E1754.B1443637.GC
NSS.HRPT.NK.D01052.S1926.E1940.B1443838.GC

NOAA-16
NSS.GHRR.NL.D01052.S1713.E1859.B0216163.WI
NSS.HRPT.NL.D01052.S1900.E1914.B0216363.WI

27 Feb 2001
We discovered that when the updates were made to the NOAA-16 operation on February 21, the attitude corrections along track were not turned on for the AIP instruments. This was corrected beginning with the following pass:
NSS.AIPX.NL.D01057.S2316.E0104.B0223637.GC
An official memo declaring all Level 1b data for NOAA-16 operational is forthcoming.

15 March 2001
Plans are to implement changes to NOAA-15 on March 22, 2001. These will include yaw error correction (+0.3 degrees) and clock correction (+584 milliseconds). This will also include an RFI bias update to the AMSU-B instrument that impacts as follows:

Channels 16, 17 and 18: No changes made
Channel 19: Substantial changes in the pixel 50-90 side of the swath. Up to 3.5K. Brightness temperatures had become too high on this side of the swath.
Channel 20: Changes of up to ∀0.8K.

Channel 19 has seen larger than normal drifts during December 2000 and January 2001. However, these appeared to stabilize during February. As in the past, it is the SARR interference that has shown the largest changes; STX-2 has been quite stable, though a minor update to the STX-2 RFI
tables have been made.

16 Apr 2001
On April 17, 2001, the following update will go into operation for NOAA-16 Level 1b:

We will switch the Level 1b process to correct the along track error using a +1 second in addition to the normal clock error. The user will see changes in the earth location data that will improve the quality with the clock correction offset reflecting a different range from current. Also, the attitude correction information will become zero with the constant attitude correction flag set to zero in the header record.

The change will be made between the hours of 11:00am and 12:30 pm local. The last passes processed before the change will be:
NSS.LHRR.NL.D01107.S0919.E0926.B0293333.GC
NSS.HRPT.NL.D01107.S1447.E1502.B0293636.GC
NSS.GHRR.NL.D01107.S1300.E1447.B0293536.GC
All data with time periods after the above passes will be processed using the changes.

16 Apr 2001
At 16:00 Z SOCC turned off the Aydin Frame Synchronizers and put the GDP Space Systems' Frame Synchronizers in their place. The GDP Frame Synchs were turned on at 16:35Z and the first data received:

from Wallops CDA was a delayed STIP:
NSS.TIPS.NH.D01106.S0809.E1200.B6476567.WI |

and from Fairbanks CDA:
NSS.HRPT.NL.D01106.S1639.E1651.B0292323.GC |

The following data were also delayed and will be ingested using the GDP Frame Synchs:

NSS.GHRR.NK.D01106.S1359.E1540.B1520304.GC |
NSS.LHRR.NJ.D01106.S1256.E1306.B3244242.GC |

(The N-14 LAC appears to be noisy from the CDA.)

30 Apr 2001
Users reported problems processing the NOAA-15 and -16 HRPT and LAC data. The problem was traced to fill data that was not zero filled. Sensor data word 3414 and spare word 3415 (bytes 14919 - 14924) contain spare bits that are not zero filled as specified in the Level 1b format. The problem was corrected in the preprocessor software. No other Level 1b data is affected by the change. This is considered a no impact change and we plan to put the change into operations on tomorrow, May 1, 2001 between the hours of 10am and 11:45am local time.

The first orbits to be processed after the change are:
NSS.HRPT.NL.D01121.S1543.E1555.B0313434.GC
NSS.GHRR.NL.D01121.S1215.E1410.B0313233.GC
NSS.LHRR.NL.D01121.S1346.E1351.B0313333.GC

NSS.HRPT.NK.D01121.S1639.E1651.D1541818.GC
NSS.GHRR.NK.D01121.S1317.E1512.B1541617.GC

17 May 2001
Below is updated information on the status of the current Level 1b data with anomalies and plans for updates.

NOAA-16
We are no longer using the pitch correction for NOAA-16 instrument data. Instead, we are using a timing correction of 1 second for all instruments to fix the along track error along with the normal SOCC clock drift correction. For Example: On May 16 at 0000Z the clock error determined was +862 milliseconds (ms) (+1 sec for along track error and -138 ms SOCC clock drift error).

The across track error seen in the AVHRR data is corrected by using a scan angle of ± 55.25 degrees (stepping angle of 0.05398143624 degrees instead of the normal ± 55.37 (stepping angle 0.05409868099 degrees).

The across track error seen in the HIRS data is believed to be a mirror misalignment. To properly earth locate the data we are correcting for a roll error +1.8 degrees. Any user wishing to collocate the corrected HIRS data with other instruments must realign the spots to match the other instruments unless they are using lat/lons to collocate.

NOAA-15
The AVHRR is still having problems and is not providing reliable data. When the data is good, we are correcting earth locations for clock drift errors as well as correcting for a yaw error of +0.2 degrees.

PLANS FOR UPDATES WITHIN THE NEXT 4 MONTHS
1.) Correct the NOAA-16 AVHRR PRT values. (User impact to be determined) We are currently using NOAA-15 PRT values for NOAA-16 and will change them to the appropriate values as identified by the instrument scientist.

2.) Correct calibration for first scan line of HIRS pass. (No impact to users) Sometime since the NOAA-16 AIP processing became operational, it was noticed that the intercept in the first scan in the HIRS NOAA-15/16 1b*/1b was incorrect. The problem caused the temperatures in the first scan line to be wrong and appear as a distinct anomaly in the images generated from the HIRS data. Complicating the problem was the erroneous setting of a time sequence error flag. Analysis revealed that the time sequence flag started being set when clock corrections were turned on to correct an along track error. It was discovered that the flag was being inadvertently set because the initial expected time used for comparing successive scans was not a corrected time. This error was corrected and rather than concentrate on a time sequence problem, personnel began examining the HIRS calibration. After much examination of the entire calibration process, an anomaly was discovered in the part of the secondary mirror interpolation scheme which uses a polynomial algorithm to convert counts to secondary mirror temperatures. The interpolation algorithm assumes that three temperatures exist; a previous, a current and a subsequent mirror temperature. At the beginning of an orbit there are usually missing scans and very rarely a complete superswath. Consequently one or two of the counts were missing and were assigned a value of zero. The algorithm that converts from counts to temperature was bypassing code based on the count being a missing value (not zero). The algorithm was executed in some cases where some of the counts were 0 causing erroneous secondary mirror temperatures.

3.) NOAA-M updates
a.)Change HIRS calibration method for first 24 hours after launch so that raw coefficients are produced instead of using a previous satellite's data - no impact to user.
b.) Update the HIRS encoder position table to correct the slew values for NOAA-16 and make it easy to change the values per satellite. - no impact to user
c.) Put the HIRS 63rd element header in the right position and assign the HIRS scan quality flags after the 63rd element is properly aligned. - possible user impact

4.) Change NOAA-15/16 preprocessor to correctly select the primary CPU - no impact to user

OTHER ANOMALIES NOTED:
Recent problem seen in AMSU-B data related to moon glint correction: Under the current algorithm for detecting moon in the space view, we noticed that during the peak of the moon occurrence that three out of the four space view samples per scan are showing moon glint contamination. When this occurs for more than four continuous scans, no calibration

coefficients are computed for that channel. Channel 16 is affected the most, 17 to a lesser extent, and we haven't noticed a loss of data in 18, 19, or 20. We've noted that space view (spot) 1 of the 4 appears unaffected as compared to scans of surrounding good data during this anomaly. We are open to suggestions for possible fixes. One possibility could be to use scan spot 1 when the other 3 are out of tolerance. The anomaly must be investigated further. One example of the anomaly was seen in the NOAA-16 orbit 0313839, scans 1325 (23:13:09Z) through 1334 (23:13:33Z), JDAY 121.

21 May 2001
There is a problem with the spare bytes that should be zero filled (bytes 14921 - 14924) in the LAC and HRPT Level 1b data for NOAA-15 and -16. Also, the fill bits for word 3414 of the AVHRR sensor data in each record are not set to 00 as they should. This is under investigation and as soon as a correction is made to the software, an update will be announced to properly zero fill the data.

25 May 2001
NOAA-16/15 HIRS:
The following software update to the AIP preprocessor will be implemented on May 31, 2001 to correct the calibration for the first scan line of the HIRS passes. This update has been tested internally and no differences in the data were detected when compared to the operational Level 1bs. This should be a no impact change to the user community. Below is a more detailed explanation of why the update is needed. If you need to look at test data, please use only the AIP (HIRS, AMSU-A, and AMSU-B) Level 1b and 1b* data found on the CEMSCS (P1b and P1S) and the same data from the anonymous ftp site (psbsgi1.nesdis.noaa.gov under subdirectory pub/test1b/NOAA15 and NOAA16). The AVHRR data contains preliminary corrections for the PRT conversion coefficients and visible calibration coefficients.

NOAA-16 AVHRR PRTs and VISIBLE Calibration Coefficients: Problems with the PRT conversion coefficients was mentioned in the notice outlining our plans over the next four months. Since then, we have discovered that the visible coefficients for NOAA-16 must be updated. We are conducting preliminary tests of the AVHRR Level 1b and 1b* data containing these updates. The test data are on the above sites, however, this data has not been verified by the instrument scientist and should not be considered final. Once internal testing is complete and the instrument scientist has completed the data verification, a notice will be sent out to the user community. We believe the changes will have a minimal impact and a week of testing will be sufficient for all users.

Details on the correct calibration for first scan line of HIRS pass: Sometime since the NOAA-16 AIP processing became operational, it was noticed that the intercept in the first scan in the HIRS NOAA-15/16 1b*/1b was incorrect. The problem caused the temperatures in the first scan line to be wrong and appear as a distinct anomaly in the images generated from the HIRS data. Complicating the problem was the erroneous setting of a time sequence error flag. Analysis revealed that the time sequence flag started being set when clock corrections were turned on to correct an along track error. It was discovered that the flag was being inadvertently set because the initial expected time used for comparing successive scans was not a corrected time. This error was corrected and rather than concentrate on a time sequence problem, personnel began

examining the HIRS calibration. After much examination of the entire calibration process, an anomaly was discovered in the part of the secondary mirror interpolation scheme which uses a polynomial algorithm to convert counts to secondary mirror temperatures. The interpolation algorithm assumes that three temperatures exist; a previous, a current and a subsequent mirror temperature. At the beginning of an orbit there are usually missing scans and very rarely a complete superswath. Consequently one or two of the counts were missing and were assigned a value of zero. The algorithm that converts from counts to temperature was bypassing code based on the count being a missing value (not zero). The algorithm was executed in some cases where some of the counts were 0 causing erroneous secondary mirror temperatures.

30 May 2001
On May 31, 2001, we will implement a correction to the HIRS Level 1b data. When clock error corrections are turned on the first scan line is inadvertently flagged as having a time sequence error. Also, this scan line has an incorrect calibration parameter causing erroneous brightness temperatures. These problems will be corrected with the changes on May 31. The change will not affect the user community other than improving the Level 1b data. The updates will be effective beginning with the following orbits.

NOAA-16 -- NSS.HIRX.NL.D011151.S1344.E1531.B0355657.GC
NOAA-15 -- NSS.HIRX.NK.D011151.S1712.E1836.B1584546.GC

07 Jun 2001
On June 5, 2001, at 235900Z, the Satellite Operations Control Center (SOCC) updated the NOAA-15 elapsed time clock to correct for the clock drift. The SOCC correction was performed with no problems. However, the preprocessing clock drift file was not updated properly. The NOAA-15 clock error or along track error seen in images from the Advanced Very High Resolution Radiometer (AVHRR) normally does not agree with the clock drift error reported by SOCC. As a result, the preprocessor file must be updated according to corrections that agree with the AVHRR observed error rather than the SOCC reported error. For this particular update, the SOCC correction was used introducing an error in the Level 1b data of approximately a second for all passes processed for day 157 from 0000Z through the passes below. This error affected all NOAA-15 instrument Level 1b earth location data and time codes.

NSS.GHRR.NK.D01157.S1754.E1939.B1593132.GC
NSS.HRPT.NK.D01157.S1940.E1953.B1593232.GC

28 Jun 2001
Below is an update received from the Satellite Operations Control Center relating the current status of the NOAA-15 HIRS instrument:

SATOPS MORNING REPORT June 28, 2001
NOAA-15 rev 16229 / F at 1645Z: Multiple HIRS Flags. The NOAA-15 HIRS filter wheel motor appears to be acting up again. There was a current spike up to ~300 mA at ~1310z and associated period monitor activity and loss of synchronization. Things settled down (although not to pre-1300z Levels) until ~1435z when another, wider, current spike (again ~300 mA) occurred, again with loss of sync and period monitor response. As a result of the erratic

behavior, the HIRS filter motor heater was turned on yesterday at ~1825z (rev 16230). The temperature and current rose for ~45 minutes, when the temperature Leveled out, and the current dropped somewhat, but was still noisy and erratic. The current rose slightly again at ~2315z, but both the current and temperature began to fall (~linearly) at ~0100z. At ~0330z, the current began jumping between 2 Levels (~260 mA - ~280 mA), a signature seen last summer. Also at 0330z, the period monitor and sync began to settle out. The latest data shows the current reasonably steady at ~260mA, but noisier than prior to this latest anomaly. The period monitor is varying ~∀3 counts, and the filter wheel seems to be in sync. The plan is to monitor the telemetry for the rest of the day and to turn the filter motor heater off tomorrow morning if things continue to improve (or remain in their present state). The telemetry will be monitored tomorrow and through the weekend, with the heater 'on' kept as a contingency procedure.

19 Jul 2001
On July 31, 2001, the Information Processing Division plans to update the NOAA-16 PRT Conversion Coefficients (IR Target Temperature Coefficients - as identified in the NOAA-KLM Users Guide). Jerry Sullivan, Office of Research and Analysis, provided a brief explanation of the problem and the impact on the user that is inserted below for your information. Also, below is a table showing all changes.

Test data is provided for CEMSCS users in datasets named P1S and P1b.*.NL, where "*" is the instrument (LHRR, HRPT, GHRR, AMAX, AMBX, HIRX, ...). For other users, subsets of the data will be provided daily on psbsgi1.nesdis.noaa.gov anonymous ftp site (pub/test1b/NOAA16). You will need to change to a new file as indicated below.

THE PROBLEM:
To calibrate the thermal channels on any AVHRR, the temperature of the internal blackbody must be known. There are four Platinum Resistance Thermometers (PRTs) imbedded in the blackbody that measure its temperature. NESDIS calculates the blackbody temperature as the average of these four PRT temperatures. The PRTs actually send a count value back to the ground station, so coefficients to convert each PRT count value to temperature are supplied by ITT, the instrument manufacturer. For AVHRRs in the KLM series, the coefficients are different for each PRT. These coefficients must be put into the NESDIS operational computer code that calculates internal blackbody temperature as the first step in computing calibration coefficients. For the NOAA-16 AVHRR, the wrong coefficients were put into the computer code; the NOAA-15 coefficients were put in by mistake.

THE IMPACT of the CHANGE on DATA USERS:
Brightness temperatures were calculated for the same 1,000,000 earth scene pixels in the test dataset in two ways: Using the correct NOAA-16 PRT coefficients and using the wrong ones (current operational values). The conclusions were:
Using GAC test data:
1. The difference between brightness temperatures (equivalent blackbody temperatures) generated by using the correct NOAA-16 PRT coefficients and the incorrect NOAA-15 coefficients was nearly constant for all three channels, 3B, 4, and 5,
2. the difference depends on the Earth scene temperature,
3. the difference was a bias, not a random difference; the temperatures produced from the

correct coefficients are always lower.

The root-mean-square (RMS) differences between temperatures produced from the correct coefficients and temperatures produced from the incorrect coefficients, tabulated as a function of scene temperature are:

Table G.1-3 RMS Differences between temperature coefficients and temperatures produced from the incorrect coefficients

Scene temperature	RMS temperature differences
215 K	0.04 K
240 K	0.05 K
275 K	0.06 K
295 K	0.07 K
320 K	0.09 K

CHANGES:
The changes to the NOAA-16 PRT Conversion Coefficients 4, 5 and 6 scaling factors resulted in the creation of version 02 of the GAC and HRPT Level 1b structure files (no change to the 1b* structure file). The new structure files are located in:
DEV.PDP.CM.CONVERT.STRUCTUR(GA1bSF02)
DEV.PDP.CM.CONVERT.STRUCTUR(HRPT1b02)

The PRT conversion coefficients are listed in the Level 1b Header beginning with byte 201 through byte 248.

30 Jul 2001
Users have reported anomalies when using the test GAC data, especially for the visible channels. We are delaying the update scheduled for July 31 until further notice to resolve these anomalies. This served as a reminder to us that we did not include information on the visible calibration update that is also included in the current test data. Below are the new values as provided by the instrument scientist.
NOAA-16 AVHRR A301 visible channel calibration

Table G.1-4 New NOAA-16 AVHRR A301 Visible Channel Calibration Coefficients

Channel #	Contents	Slope	Intercept	Breakpoint
1	0- 25% albedo	0.0523	-2.016	497.5
	25-100% albedo	0.1528	-51.91	497.5
2	0 -25% albedo	0.0513	-1.943	500.3
	25-100% albedo	0.1510	. -51.77	500.3
3A	0 -12.5% albedo	0.0287	-2.043	498.7
	12.5-100% albedo	0.1806	-78.03	498.7

02 Aug 2001

The Satellite Operations Control Center discovered a problem that apparently resulted in the introduction of a 900 millisecond timing error for both NOAA-15 and 16. This will account for the constant along track error that is currently corrected at the user Level. Excerpts from Peter Phillips message are provided below to fill you in on some of the details. On August 7, SOCC plans to correct the error and perform a clock update to remove the 900 milliseconds. At that time we will update our clock drift file to remove the 1 second corrections that we have been applying to the NOAA-15 and 16 data. Direct readout users that are correcting their data should do the same. As soon as the expected error parameters are received from SOCC, a new clock drift file will be placed on our web site to reflect the change.

Message dated July 26, 2001 from Peter Phillips:
"In preparation for ordering new frame synchs for the CDAs, yesterday we started reviewing the present frame synch settings for all data types. We came across a very interesting discrepancy when we compared the blocking factor settings for real-time TIP data. For ATN satellites, PACS sets up the frame synch to collect 5 frames of data before passing the data over the HDLC interface to the Comm Controller. For KLM satellites, PACS sets up the frame synch to collect 11 frames.

This difference in these settings is significant because Ground Receive Time (GRT) is not stamped on the TIP frames until they arrive at the CDA Comm Controller. GRT is used in the calculation of the spacecraft clock error, which is the difference between TIP Time and GRT. ... When calculating the clock error, PACS adds a correction factor to the TIP Time (same as subtracting from GRT) to account for the delay. This correction factor is a constant value of 400 milliseconds that does not vary whether the data is KLM or ATN.

Based on the relatively good correlation between SOCC and CEMSCS estimates of the spacecraft clock error for ATN satellites, this correction factor appears reasonable for the ATN blocking factor setting of 5 frames. However, this correction factor is not adequate for the KLM setting of 11 frames. Based on frame synch tests performed at SOCC in 1999, a delay of 150 milliseconds is introduced for every additional frame of data that is collected in the frame synch. Therefore, collecting an additional 6 frames will lead to an additional delay in stamping GRT of approximately 900 milliseconds. This will cause the SOCC reported spacecraft clock error to be 900 milliseconds less than the true value for KLM spacecraft. Because the spacecraft clock error is used as the basis for setting the spacecraft clock, the net effect of this discrepancy will be that the spacecraft clock will be set 900 milliseconds AHEAD of the true value.

This, in turn, would cause the AVHRR imagery to appear to be lagging the calculated spacecraft position by nearly 1 second, which is the problem users have seen on KLM spacecraft.

SOCC engineers and operators confirmed this phenomenon today on a NOAA-15 pass at Fairbanks. As expected, PACS set up the frame synch to buffer 11 frames of data. The reported TIP clock error was -200 milliseconds. Midway through the pass, the operators changed the buffer setting to 5. The reported TIP clock error changed to +700 milliseconds. The operators then returned the buffer setting to 11, and the reported TIP clock error returned to -200 milliseconds. These results indicate that the "true" clock error on NOAA-15 is approximately

+700 milliseconds, not -200 milliseconds as we have been reporting up to this point. SOCC engineers will perform a similar test on NOAA-16 Friday morning to ensure the results are consistent for all operational KLM spacecraft. If they are consistent, PACS software can be corrected through a PIR to change the frame synch blocking factor setting to 5 frames for KLM TIP data, and the spacecraft clocks can be corrected by -900 milliseconds--or whatever amount is necessary to bring the "true" error to zero--in a coordinated manner between the SOCC engineers and user community."

07 Aug 2001
Following is the bulletin issued by SOCC announcing their intentions to correct the NOAA-15 and 16 elapsed time clocks. The Information Processing Division will update the Level 1b preprocessor replacing our current adjustments at the same time. The Level 1b user should not be impacted by the update. Direct readout data users should update their systems accordingly.

"Due to a configuration error in ground equipment, the TIP clock errors that are being reported for NOAA-15 and NOAA-16 have been determined to be inaccurate by >900 milliseconds, i.e. actual clock errors are 900 milliseconds greater than the values being reported. The NOAA-15 TIP clock is now reading 100 milliseconds and the NOAA-16 TIP clock is reading +100 milliseconds. The actual errors are: NOAA-15 = +800 milliseconds, NOAA-16 = +1000 milliseconds. It is necessary to subtract 1.0 second from both spacecraft clocks to correct this error. These corrections will take place on August 7th, 2001 via SCT at 23:59:00Z for the control OBPs. The standby OBPs will be updated via real time command (in the schedules).

30 Aug 2001
NOAA-10 was deactivated today, August 30, 2001, at 0951Z after continued problems indicated that the useful life of the spacecraft was over. It was launched on September 17, 1986. It began operations on November 17, 1986 and remained operational for 1763 days. At the time of its deactivation it had completed 77741 orbits around the earth. It was the last of the E-F-G series of Advanced TIROS-N spacecraft.

12 Sep 2001
The PRT Conversion Coefficients and scaling factor change will be done today as scheduled. The first orbits to be processed after the update are:
NSS.GHRR.NL.D01255.S1221.E1416.B0502223.WI
NSS.HRPT.NL.D01255.S1715.E1727.B0502525.WI

14 Sep 2001
Following is information received this week relating to activities or anomalies that may affect NOAA-14 and -15 products.

NOAA-15 AVHRR continues to function erratically. As of September 12, examination of the last 24 hours of trending data indicated that approximately half of the orbits processed were nominal. Also, over the pass 2 to 3 weeks channel 4 and 5 have demonstrated erratic behavior where most of the data is affected. This problem is apparently not attributed to the "normal" sync delta or scan motor problems. Investigations continue.

Information reported by SOCC
NOAA-14 AVHRR Testing: A 24-hour test to reduce the amount of overlap in the NOAA-14 orbital data will be conducted on all GAC data recorded starting at 0000Z on Wednesday, September 19. The objective of the test is to try to reduce the age of the oldest data on the recorders without affecting any products. On September 10 at 0513Z , the NOAA-14 spacecraft attitude control mode was switched from nominal mode to Yaw Gyro Compassing (YGC) attitude control mode. An analysis of the data leading up to the switch indicates the sun sensor's field of view was obstructed (probably by the solar array) as it was attempting to take a reading. NOAA-14 has entered a period of time where, over the next several months, it's experiencing spacecraft sun angles lower than any previously encountered by NOAA-14 on-orbit. This is not unusual for older spacecraft whose orbits have precessed.

Since the environmental conditions believed to have caused this problem are expected to continue for several months, SOCC engineers decided to leave NOAA-14's attitude control mode in the YGC mode. The YGC attitude control mode typically has no impact on data products.

Then, at 0125Z on J253, redundancy software on NOAA-14 switched buses from the B-bus to the A-bus and then inhibited further bus switching. The cause of this bus switch is still under investigation. Aside from the loss of bus redundancy (because further bus switching is inhibited), there was no impact to the mission capability of the spacecraft. No NOAA-14 data was lost as a result of these events.

Reported on September 11: NOAA-14 YGC and bus switch investigations continue. The most likely reason for the switching of the control mode and buses is due to apparent shading of the sun sensor by the solar array. Among other actions, engineers are considering an array movement that would give the sun sensor a clear view of the sun.

On September 13, NOAA-14 rev 34563 / F at 1731z : Commanding performed to increase the telemetry time resolution of the sun sensor read output from 8 seconds to 1 second. Executed commands to change the telemetry table 1, word 13, in the control OBP. The result of the commanding was to increase the telemetry time resolution of the sun sensor read output from 8 seconds to 1 second. Other spacecraft systems remain unchanged. Now that the telemetry sampling rate of the Sun Sensor Assembly (SSA) has occurred, engineers plan to change the solar array bias from -55 degrees to -20 degrees while continuing to monitor the SSA's output during the update window. If test results are positive, engineers will (after a suitable time period) return the spacecraft to the B-bus and re-enable bus switching in redundancy management software. For the time being, the spacecraft will remain in the YGC attitude control mode. Aside from the loss of bus redundancy (because further bus switching is inhibited), there is no impact to the mission capability of the spacecraft.

Important note to all involved in N14 product generation: As described above, the N14 array will be moved on Monday, September 17 at approximately 1400z. Short term temperature variations should be expected as the spacecraft achieves a new thermal balance due to the resultant change in bus and instrument shading.

18 Sep 2001

NOAA-14 Solar Array Move Update: The array move for N-14 has been delayed one day. It is now scheduled for Orbit 34618 at 1502 Z (11:02 am local) on J261 (18 September 01).

19 Sep 2001
NOAA-14 Update: The NOAA-14 array move occurred successfully on September 18, 2001, rev 34632 / F at 1451z. The sun sensor is now unshaded. Short term temperature variations have been observed as the spacecraft achieved a new thermal balance due to the resultant change in bus and instrument shading. As of this morning, the spacecraft thermal environment has stabilized and all temperatures look nominal for the new configuration. The plan for September 19 is to restore the spacecraft bus from bus A to bus B at 1800z. After additional on-orbit performance is analyzed, the final step of this recovery process will be to restore the attitude control mode from Yaw Gyro Compassing (YGC) mode to Nominal mode.

24 Sep 2001
On September 21, NOAA-14 was successfully commanded back to Nominal ADACS control mode on rev 34676 / Fairbanks at 1740z . The NOAA-14 ADACS subsystem was placed in YGC control mode since September 8, 2001 due to blockage of the sun sensor field of view by the solar array. The skew gyro was also selected to replace the X (yaw) gyro at the same time due to the bad yaw updates from the blocked sun sensor. The sun sensor blockage has been eliminated by the reduction of solar array offset that was performed on September 18, 2001. Hence, it was possible to return the ADACS subsystem to the NOMINAL control mode and to reselect the orthogonal set of gyros.

01 Oct 2001
Beginning on the evening of September 29 through the afternoon of October 1, the earth locations created for the NOAA-16 Level 1b/1b* contained an error of approximately 15 kilometers along track. This was caused by erroneous drag parameters used to predict the orbit vectors on the evening of the 29th and 30th when creating the User Ephemeris File (UEF). This error in the UEF affected the Level 1b earth location as indicated below; the TBUS bulletins sent out on September 30 and October 1; the Equator Crossing data showed a +2 second error, and the Search and Rescue Ephemeris. The problem was corrected around 1850L on October 1. Level 1b data will be reprocessed for archive purposes as indicated. Other passes are no longer available on the CEMSCS for reprocessing.

First orbits processed with bad Earth location:
NSS.GHRR.NL.D01273.S0025.E0219.B0526970.WI (and AIP)
NSS.HRPT.NL.D01273.S0600.E0613.B0527272.WI
NSS.LHRR.NL.D01273.S0056.E0102.B0526969.WI

Last orbits processed with bad Earth location:
NSS.GHRR.NL.D01274.S1850.E2043.B0529395.GC (and AIP)
NSS.HRPT.NL.D01274.S2228.E2242.B0529696.GC
NSS.LHRR.NL.D01274.S2037.E2041.B0529595.GC

These passes will be reprocessed to replace the archive data: (and AIPs for corresponding GHRR)

NSS.GHRR.NL.D01274.S1041.E1227.B0528990.GC.A
NSS.GHRR.NL.D01274.S1222.E1408.B0529091.GC.A
NSS.GHRR.NL.D01274.S1403.E1557.B0529192.WI.A
NSS.GHRR.NL.D01274.S1554.E1714.B0529293.WI.A
NSS.GHRR.NL.D01274.S1709.E1854.B0529294.WI.A
NSS.GHRR.NL.D01274.S1850.E2043.B0529395.GC.A

NSS.HRPT.NL.D01274.S1856.E1910.B0529494.WI.A
NSS.HRPT.NL.D01274.S2041.E2049.B0529595.MO.A
NSS.HRPT.NL.D01274.S2048.E2101.B0529595.GC.A
NSS.HRPT.NL.D01274.S2221.E2229.B0529696.MO.A
NSS.HRPT.NL.D01274.S2228.E2242.B0529696.GC.A

NSS.LHRR.NL.D01274.S1658.E1709.B0529292.WI.A
NSS.LHRR.NL.D01274.S1710.E1716.B0529393.WI.A
NSS.LHRR.NL.D01274.S1758.E1806.B0529393.WI.A
NSS.LHRR.NL.D01274.S1840.E1852.B0529393.WI.A
NSS.LHRR.NL.D01274.S2037.E2041.B0529595.GC.A
NSS.LHRR.NL.D01274.S2254.E2300.B0529696.GC.A

03 Oct 2001
Earth Location:
In reference to the NOAA-16 earth location problems reported for September 30 and October 1, the following
GAC and AIP (HIRS, AMSU) data were reprocessed to replace the earth location in the Level 1b archive. All
HRPT and LAC passes could not be reprocessed before the data was purged from the mainframe. All other data affected by the problem will not be reprocessed.

NSS.GHRR.NL.D01274.S1041.E1227.B0528990.GC.A
NSS.GHRR.NL.D01274.S1222.E1408.B0529091.GC.A
NSS.GHRR.NL.D01274.S1403.E1557.B0529192.WI.A
NSS.GHRR.NL.D01274.S1554.E1714.B0529293.WI.A
NSS.GHRR.NL.D01274.S1709.E1854.B0529294.WI.A
NSS.GHRR.NL.D01274.S1850.E2043.B0529395.GC.A

20 Oct 2001
The stored command table (SCT) returned the NOAA-14 MIRP to re-phasing 'enabled'. This command goes out at every day/night transition in order to change the APT channel. To remedy this situation, the schedulers are re-creating the SCTs for the next week with the MIRP commands removed. The new set of SCTs will become active at 0000z tonight (JDAY 293 / 0000z). As soon as possible after 0000z, re-phasing will be disabled and should remain so until further notice. The scan motor current continues to run at ~190 mA.

SATOPS Morning Report October 19, 2001
NOAA-14 AVHRR Anomaly: The NOAA-14 AVHRR began behaving erratically yesterday at

approximately 1955z. At that time, the scan motor current spiked up from ~120mA to ~163 mA and decreased slowly to ~135mA by 2230z. Since that time, the current has been steadily rising, reaching values as high as 205 mA. The sync deltas indicated that the MIRP was re-synching constantly in order to compensate for the AVHRR, resulting in corrupted TIP data and AVHRR imagery.
Re-phasing was disabled on the MIRP at 1207z this morning, recovering the rest of the TIP data stream. This is same configuration being used on NOAA-15, and it will remain the NOAA-14 configuration until further notice.

22 Oct 2001
The NOAA-14 AVHRR has been experiencing problems over the past few days. Below is information that we received from SOCC relating to the problem.

SATOPS Morning Report October 22, 2001
As a result of the N14 AVHRR end-of-life condition, the N14 MIRP was recommanded to AVHRR Sync Rephase Disabled multiple times on Friday until the new stored command schedule resolved this issue at 0000z on Saturday morning. Multiple data sets prior to the GAC received at 0258z on Saturday, October 20, were corrupted due to AVHRR timing issues; this has now been resolved via SCT and the other data from N14 should continue without corruption due to the AVHRR.

07 Nov 2001
On November 6, on NOAA-14 rev 35326 / F at 1823z, the Satellite Operations Control Center (SOCC) performed an enable and then disable rephase to allow a re-sync of the AVHRR to occur. The HRPT data became very noisy during the brief period that it was enabled (indicating synch problems between the AVHRR and the MIRP). Users should see improvement in the data following this orbit.

13 Nov 2001
The NOAA-15 AMSU-B Channel 4 Warm Black Body counts, drifted into the Lower Limit and Gross filtering occurred over the last 36 hours (3 day weekend holiday). To correct the problem, the Channel 4 WBB gross filtering limit was opened from 23000 to 20000 so that addition data will be accepted. This change was effective after Level 1b orbit number 1820506.

20 Nov 2001
The PreProduct Processing group has plans to implement the following changes within the Level 1b/1b* data before the freeze scheduled for around the December 17th time frame. We are requesting feedback from the instrument scientists on the differences that the users will see due to the Planck constant update, as soon as possible. This information will be passed on to the user community. Initial Level 1b test data has been provided on the anonymous ftp site along with ops data (psbsgi1.nesdis.noaa.gov under subdirectory pub/test1b/R2.9A) as indicated at the end of this message. CEMSCS data users will find Level 1b* data under the P1S data set names and Level 1b data under P1b data set names.

1. Correction of the Planck constants in response to the request from the Satellite Products and Services Review Board to adopt the 1998 CODATA constants for all operational systems in

NESDIS.
Current Planck constants: c1 = 0.119104398E-04 c2 = 1.43876934
1998 CODATA constants: c1 = 0.119104270E-04 c2 = 1.43877506

2. Orbit Parameters in the Header - Under certain circumstances we may be required by the Air Force to discontinue distribution of the orbit parameters in header for a period of time. To meet any such future requests, we are introducing a capability to zero out the orbit parameters (epoch date, time, and 12 orbit parameters) by toggling them on and off. (This change will also impact NOAA-12 and NOAA-14. Test data will be provided.)

Normal parallel test runs will begin on Monday, November 26th, with the orbit parameters provided as normal. After one week the orbit parameters will be turned off for a week (beginning Monday, December 3rd) and then back on the following week (Monday, December 10th).

NOAA-16
P1S.GHRR.NL.D01323.S1206.E1352.B0598182.GC
P1S.HRPT.NL.D01323.S1353.E1407.B0598282.GC
P1S.AMAX.NL.D01323.S1206.E1352.B0598182.GC
P1S.AMBX.NL.D01323.S1206.E1352.B0598182.GC
P1S.HIRX.NL.D01323.S1206.E1352.B0598182.GC

P1b.GHRR.NL.D01323.S1206.E1352.B0598182.GC
P1b.HRPT.NL.D01323.S1353.E1407.B0598282.GC
P1b.AMAX.NL.D01323.S1206.E1352.B0598182.GC
P1b.AMBX.NL.D01323.S1206.E1352.B0598182.GC
P1b.DCSX.NL.D01323.S1206.E1352.B0598182.GC
P1b.HIRX.NL.D01323.S1206.E1352.B0598182.GC
P1b.SBUX.NL.D01323.S1206.E1352.B0598182.GC
P1b.SEMX.NL.D01323.S1206.E1352.B0598182.GC
P1b.TIPX.NL.D01323.S1206.E1352.B0598182.GC

NOAA-15
P1S.GHRR.NK.D01323.S1126.E1310.B1828990.WI
P1S.HRPT.NK.D01323.S1312.E1326.B1829090.WI
P1S.AMAX.NK.D01323.S1126.E1310.B1828990.WI
P1S.AMBX.NK.D01323.S1126.E1310.B1828990.WI
P1S.HIRX.NK.D01323.S1126.E1310.B1828990.WI

P1b.GHRR.NK.D01323.S1126.E1310.B1828990.WI
P1b.HRPT.NK.D01323.S1312.E1326.B1829090.WI
P1b.AMAX.NK.D01323.S1126.E1310.B1828990.WI
P1b.AMBX.NK.D01323.S1126.E1310.B1828990.WI
P1b.DCSX.NK.D01323.S1126.E1310.B1828990.WI
P1b.HIRX.NK.D01323.S1126.E1310.B1828990.WI
P1b.SEMX.NK.D01323.S1126.E1310.B1828990.WI

P1b.TIPX.NK.D01323.S1126.E1310.B1828990.WI

05 Dec 2001
Updated NOAA-16 test data have been placed on the anonymous ftp server for those users that cannot access the CEMSCS. This data will be updated daily (Monday through Friday) until the implementation. We do not believe that the Planck constant change will impact your operations, however instrument scientists have not finalized their evaluations.

The HIRS data were checked and the 24 hour file was reset to ensure that we are in sync with operations and using only data based on the updated CPIDS. The data that I provided today is based on an updated file. The actual constants received in the notice were put in the CPIDS as received. However, the preprocessor treats all real numbers as REAL*4. As a result, after the fifth significant digit you will see differences in the data. You will not see the exact values that were put in from the notice. To fix this in the preprocessor is a MAJOR change (in essence, rewriting the preprocessor). If these new values are giving us bad or worse results, we should never implement them in the current preprocessor but wait for the METOP era. The Soundings Development Team reports that the images look fine.

12 Dec 2001
The two minute overlap test of the recorded data was conducted today on NOAA-16. It was scheduled to begin on orbit 6299/F at 0102z and end on the December 13th on orbit 6313/F at 0051z.

13 Dec 2001
The NOAA-15 HIRS 24-hour calibration test input file was reset to make it coincide with the operational file (except for the Planck constants change). We believe this will eliminate any problems seen in the NOAA-15 HIRS test data. Updated Level 1b test data for all NOAA-15 and 16 instruments has been provided on the anonymous ftp server (psbsgi1.nesdis.noaa.gov; Subdirectory - pub/test1b/R2.9A). Both NOAA-15 and 16 are running in parallel to the operation on the CEMSCS with the except that the NOAA-15 GHRR is run by request (current orbit on the CEMSCS for GHRR is for D01347.S1355). Orbit parameters in the header are zeroed out in the test data. Next week these parameters will be turned back on. An implementation date will be set for mid January.

31 Dec 2001
Based on the response received, we believe that we can go forward with our plans to update the Planck constants and to add the ability to switch the orbit parameters in the header on and off. We plan to put the changes into operation on January 23, 2002. We will continue to provide the orbit parameters in the header and hence this should be a "no impact" change. We have provided test results below for you to compare to what you are seeing. Test data will continually be available until the actual implementation date.

Reports from instrument scientists and users on the observed impact of the change in test data provided.
HIRS
Dr. Changyong Cao of Office of Research and Applications reports that for NOAA-15 and -16,

the max difference observed in HIRS is on the order of 0.003 mW/m2-sr-cm-1.

AVHRR
Dr. Jerry Sullivan, Office of Research and Applications reports the following for AVHRR:
For NOAA-16, comparisons were done using the data sets
NSS.GHRR.NL.D01340.S1047.E1231.B0622021.GC.OPS
P1b.GHRR.NL.D01340.S1047.E1231.B0622021.GC
and for NOAA-15, the data sets
GHRR.NK.D01323.S1126.E1310.B1828990.WI.OPS
GHRR.NK.D01323.S1126.E1310.B1828990.WI
These GAC orbits contain 5,000,000 Earthscene pixels.

For AVHRR channels 4 and 5, for both NOAA-15 and -16, the RMS difference between equivalent brightness temperatures generated from the old-Planck and new-Planck datasets was 0.001K.

For AVHRR channel 3B radiances/temperatures computed by using two different values for the Planck constants. Radiance was converted into equivalent blackbody temperature to make the comparison easier. Comparisons were broken down into three temperature ranges: >275K (SST range), 240-275 range, and the cold range from 200-240K. The accuracy of channel 3B temperatures below 240K is always somewhat suspect because on average there is a jump of 2.5K for the minimum count change of one count.

There were 5,000,000 pixels in the NOAA-15 datasets but only 2,500,000 in the NOAA-16 because channel 3A was on part of the time. The table below shows the channel 3B RMS temperature difference between datasets using the old and new Planck constant values.

Table G.1-5 Channel 3B RMS temperature differences (in K) between datasets using the old and new Planck constant values

	> 275K	**240-275**	**200-240 K**
NOAA-15	0.019	0.095	0.400
NOAA-16	0.022	0.106	0.434

AMSU-A and AMSU-B
Dr. Clement Chouinard of Data Assimilation and Satellite Meteorology Division; Dorval P.Q. CANADA (results of test done on one orbit) reports:
Number of AMSU-A data 347,400 (23,160 pixels * 15 channels)

3585 (1.32%) larger than .01 degrees
318328 (91.63%) identical
12149 (3.50%) smaller than 0.01 degrees
7084 (2.04%) smaller than 0.02 degrees
5525 (1.59%) smaller than 0.03 degrees
241 (0.07%) smaller than 0.04 degrees
226 (0.07%) smaller than 0.05 degrees

160 (0.05%) smaller than 0.06 degrees
100 (0.03%) smaller than 0.07 degrees
2 (0.00%) smaller than 0.08 degrees

Number of AMSU-B 1,042,200 (208,530 pixels * 5 channels)

3161 (0.30%) larger than.02 degrees
82700 (7.93%) larger than .01 degrees
765948 (73.46%) identical
167251 (16.04%) smaller than 0.01 degrees
16911 (1.62%) smaller than 0.02 degrees
4778 (0.46%) smaller than 0.03 degrees
1450 (0.14%) smaller than 0.04 degrees
303 (0.03%) smaller than 0.05 degrees
148 (0.01%) smaller than 0.06 degrees

23 Jan 2002
The Level 1b updates to include new Planck constants and the ability to switch orbit parameters in the header on and off will be made operational today as indicated below.

The times of the first orbits to be processed will be the following:

NSS.GHRR.NJ.D02023.S1233.E1428.B3642425.GC
NSS.HRPT.NJ.D02023.S1556.E1610.B3642626.GC

NSS.GHRR.NK.D02023.S1310.E1505.B1921516.GC
NSS.HRPT.NK.D02023.S1632.E1644.B1921717.GC

NSS.GHRR.NL.D02023.S1544.E1707.B0690001.WI
NSS.HRPT.NL.D02023.S1708.E1720.B0690101.WI

24 Jan 2002
NOAA-14: Beginning on the morning of January 18, 2002, the AVHRR GAC data changed so that most parameters reverted back to their normal values after months of problems caused by high scan motor currents. As of today all looks very good for the GAC. The HRPT data does seem to demonstrate a slight problem causing earth locations to look off by about a half pixel but not uniformly. Also, there appear to be numerous pixel dropouts or bad data points throughout the data.

Level 1b update clarification:
We are not planning to zero out the orbit parameters in the header. You should find that the parameters are still present. We have only installed the capability so that if the need arises, we will do so immediately and notify the user community.

When this change was implemented, we also implemented a change to correct the computation of the satellite azimuth angle at nadir. Problems had been reported for the AVHRR data where

the angle was set correctly to zero in the northern hemisphere and 180 in the southern hemisphere, but occasionally the southern hemisphere would have zero set instead of 180. This has been corrected.

05 Feb 2002
On February 6, 2002; the installation of the new frame synchronizers and software updates is scheduled for 11:20 pm to 3:01 am local (038/0420z - 038/0801z). The change should be transparent to the user, however several passes will be delayed and the user will NOT receive HRPT data for NOAA-15 rev 19424/F AOS at 0524z and NOAA-16 rev 7106 AOS at 0621z.

On February 13, 2002; to support the frame sync installation and testing at the Wallops Command and Data Acquisition Station, the NOAA-11 STIP data for REV# 69058 will not be recorded between these times:

JDAY	TIME	-	JDAY	TIME
044	20:09:25	-	044	23:47:45

The lost record time total is: 3 hours 36 minutes 20 seconds.

13 Feb 2002
On February 12 (day 43), the NOAA-15 HIRS instrument began showing affects from increased Filter Motor Current. The Filter Motor Current began to rise on orbit 19498 but didn't seriously affect Sync until orbit 19503 when the sync went below 0.999. Sync is currently 70% (0.7) throughout orbits. Channel 7 space view went into saturation at the time of sync loss causing complete data loss for ch7 processing. Monitoring will continue.

14 Feb 2002
It looks like the NOAA-15 HIRS instrument is back to normal. Channel 7 returned to normal after the Level 1b pass B1952324. However, the HIRS 24-hour calibration file must be re-initialized to get rid of bad data. This will be done over the next 24-hours. Assuming the HIRS instrument continues to function properly, we expect to have a good update sometime tomorrow morning.

15 Feb 2002
Within the next 24 hours, we expect the HIRS instrument to stabilize. Useable coefficients should be provided in the Level 1b. Monitoring will continue.

11 Apr 2002
At 19:32z, JD 100, 4 April 2002, the AMSU-A channel 11 detector output changed rendering the data unusable. All readings of Space, Warm Target and Earth counts are approximately 7195 counts. No other parameters seem to be affected at this time. SOCC and instrument scientists have been notified of our observations.

12 Apr 2002
Update from the SOCC SATOPS Morning Report April 12, 2002:
"On Wednesday, April 10 at ~19:30z, the NOAA-15 AMSU-A1 channel 11 signal dropped dramatically. In the hours preceding the anomaly, channel 11 behaved normally, its value varying periodically with orbital position between ~18600 and 18000 counts. At ~17:50z the

pattern changed and by 18:45z it began to drop steadily. Finally at ~19:30z channel 11 dropped instantly from 16500 to 7195 counts. Since then it has been steady between 7196 and 7194 counts. So far the engineering investigation has not revealed any other abnormalities in AMSU data or spacecraft data that coincide with this anomaly, but they are continuing to look into the matter."

30 Apr 2002
The Satellite Operations Control Center (SOCC) reports that due to thermal considerations they began moving the NOAA-14 solar array on April 29. The solar array (SA) offset will change from -20 degrees to -55 degrees over the next few days.

01 May 2002
The SOCC morning report states the following:
NOAA-14 rev 37798/ F at 1928z on April 30: The solar array (SA) offset was modified to -40 degrees. It will remain at this offset for the next several weeks as engineers assess power and thermal balance.

This notice announces changes to the AIP (AMSU-A, AMSU-B, HIRS, DCS, SEM, SBUV) and AVHRR (GAC, LAC, and HRPT) Level 1b pre-processors planned for May 15, 2002. The user should see no changes in the AVHRR data. The following changes may be seen in the AIP Level 1b data to correct telemetry data. We believe these are also "no impact" changes.

Instrument Status: bytes 117 - 120 of the Data Set Quality Indicators in the HIRS Header Record may be different than in the current operation. The pre-processor was corrected to report the proper values for Digital-B telemetry status. The same is true for bytes 125 - 128 of the Second Instrument Status. The affected bits are indicated below.

bit 15: Instrument power
bit 14: Electronics power
bit 13: Filter motor power
bit 12: Scan motor power
bit 11: Cooler heater
bit 10: Filter housing heater
bit 9: Cooler door release
bit 8: Cooler window heater
bit 7: Go to NADIR position
bit 6: Calibration sequence
bit 5: Cooler door closed
bit 4: Cooler door fully open
bit 3: Filter motor power Level
bit 2: Patch temperature controller

Also under the Data Set Quality Indicators, bytes 123 - 124, the Record Number of Status Change can be different if the above telemetry instrument status bits are changed.

CPU values in the HIRS Level 1b data record - TIP Euler Angles (roll , pitch, and yaw), attitude

mode, attitude and time associated with TIP Euler angles retrieved from CPU telemetry differ from the operational data. They have been corrected so that values are pulled from the proper scan lines in all cases.

Digital-B Telemetry: Within the HIRS data record in the bytes 4541 - 4542 of the Invalid Word Bit Flags and bytes 4543 - 4544 of the Digital B Data may be different than in the current operation. The preprocessor was corrected to report the proper values as listed below.

bit 15: instrument power
bit 14: electronics power
bit 13: filter motor power
bit 12: scan motor power
bit 11: cooler heater
bit 10: filter housing heater
bit 9: cooler door release
bit 8: cooler window heater
bit 7: go to nadir position
bit 6: calibration sequence
bit 5: cooler door closed
bit 4: cooler door fully open
bit 3: filter motor power Level
bit 2: patch temperature controller

04 May 2002
NOAA/ NESDIS will implement a software change which uses revised AMSU-B Planck constants, on 8 May 2002. Computational values of two constants in AMSU-B needed correction. The constants in Planck's Law (c1 and c2) currently used in AMSU-B are slightly outdated and are being replaced based on an internal NOAA review.

Planck's Law states:
$B(nu,T)=3D\ c1 * (nu^3) / [e^{(c2*nu/T)}-1]$
where:
B is radiation (energy/time/area/solid/angle/wavenumber),
nu=3D wavenumber (number of wavelengths in one centimeter (cm^{-1})),
T=3D temperature K
The new values of c1 and c2 are

c1 =3D 1.1910427E-05 mW/m^2/steradian/cm^{-4}

c2 =3D 1.4387752 cm- K

Changes (if any) will be minimal.

07 May 2002
SOCC announced that today a high speed dwell test will be conducted on NOAA-16 during a Fairbanks pass. The test is scheduled for pass 8367/F at 1518z (11:18 EST). The dwell tests are controlled by onboard macros activated via ground commanding. Any missing data is the result

of this test, and the test will be completed prior to LOS at 1532z (11:32 EST).

The dwell will replace the part of the TIP frames with data from the motor current on Gyro 1. The instruments that are affected by this are the HIRS, the SBUV, and SEM. Also, DCS, CPU-A/B, and DAU data will be lost. The gaps in data will correspond with dwell times, which should occur in 30 second periods. Hopefully no more than one run of the macro will be needed.15 May 2002
The KLM pre-processor Release 3.0 update will go into operations today, May 15, around 2:00 p.m. local time. The user should not see any change in the Level 1b data. This change is being made to correct software problems. The first orbits to be processed for NOAA-15 and NOAA-16 are listed below.

NOAA-15
NSS.GHRR.NK.D02135.S1632.E1828.B2081112.GC
NSS.HRPT.NK.D02135.S2000.E2013.B2081313.GC

NOAA-16
NSS.GHRR.NL.D02135.S1651.E1836.B0848182.WI
NSS.HRPT.NL.D02135.S1836.E1852.B0848282.WI
NSS.LHRR.NL.D02135.S1739.E1747.B0848181.WI

G.2 CHANGES MADE TO NESDIS' SST OBSERVATION PRODUCT

Not available

G.3 CHANGES MADE TO NAVY'S SST OBSERVATION PRODUCT

June 7, 1999
Began using NOAA-15 for operational processing of MCSST's. Equations based on April 1999 global drifting buoy match ups. Modified nighttime cloud screening, replacing AVHRR Ch5 - Ch3 test with AVHRR Ch4 - Ch3 test. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL(4/5) = .9367T4 + .0864Tf (T4-T5) + .5979 (T4-T5)(SEC(A) -1) - 253.8050

NLSST NIGHT TRIPLE
NL(3/4/5) = .9799 T4 + .0364Tf (T3-T5) + 1.195 (SEC (A) -1) - 266.0100
T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

June 24, 1999
NOAA-15: Modified AVHRR Ch4 - Ch5 cloud screening test. Test originally was Ch4 - Ch5 <

3.5, has been modified to 0 <(Ch4 - Ch5) < 3.5.

August 23,1999
NOAA-15: Implemented new visible cloud threshold table, generated with data collected during the July - Aug 1999 time frame.

February 28, 2000
NOAA-15: Operationally implemented new coefficients for the HIRS two part test.

March 7, 2001
NOAA-16: Initiated operational distribution of NOAA-16 MCSST orbital files.

Implemented Orbital MCSST equations derived for NOAA-16 SEATEMP processing. Equations based on December 2000 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9139T4 + .0770Tf (T4-T5) + .7659 (T4-T5)(SEC(A) -1) - 247.9117

NLSST NIGHT TRIPLE
NL (3/4/5) = .9407T4 + .0330Tf (T3-T5) + 1.6042 (SEC(A) -1) - 255.0355

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

April 16, 2001
NOAA-16: Updated NOAA-16 equations based on March 2001 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9233T4 + .0755Tf (T4-T5) + .8015 (T4-T5)(SEC(A) -1) - 250.6939

NLSST NIGHT TRIPLE
NL (3/4/5) = .9627T4 + .0327Tf (T3-T5) + 1.5653 (SEC(A) -1) - 261.4709

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

June 28, 2001

NOAA-16: Implemented a field test for type 159 processing in areas of high specular reflectance. This test will help eliminate the generation of aerosol contaminated observations.

October 9, 2001
NOAA-16: Implemented a two-part nighttime aerosol test. The test has to fail both a SST intercomparison (MC(3/4) equation minus NL (4/5) equation) and a field test to be rejected as aerosol contaminated. Implemented reliability values that are assigned to each MCSST observation.

October 17, 2001
NOAA-16: Updated NOAA-16 equations based on September 2001 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9171T4 + .0795Tf (T4-T5) + .7975 (T4-T5)(SEC(A) -1) - 248.8961

NLSST NIGHT TRIPLE
NL (3/4/5) = .9622T4 + .0336Tf (T3-T5) + 1.6073 (SEC(A) -1) - 261.3291
T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 27, 2001
NOAA-16: Increased day/night attempts per target from 10/3 to 15/15 attempts, respectively.

March 25, 2002
NOAA-16: Updated NOAA-16 daytime equations based on February 2002 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9246T4 + .0775Tf (T4-T5) + .7664 (T4-T5)(SEC(A) -1) - 251.1504

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

April 30, 2002
NOAA-16: Implemented 1 km Land/Sea tag file to allow better coastal MCSST generation.

October 22, 2002
NOAA-17: Initiated operational distribution of NOAA-17 MCSST orbital files.

Implemented Orbital MCSST equations derived for NOAA-17 SEATEMP processing. Equations based on August/September 2002 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9404T4 + .0838Tf (T4-T5) + 1.1098 (T4-T5)(SEC(A) -1) - 255.1277

NLSST NIGHT TRIPLE
NL (3/4/5) = .9684T4 + .0334Tf (T3-T5) + 1.9245 (SEC(A) -1) - 262.5276

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 5, 2002
NOAA-16: Updated NOAA-16 daytime equations based on September 2002 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9128T4 + .0803Tf (T4-T5) + .7709 (T4-T5) (SEC(A) - 1) - 247.7182

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 7, 2002
NOAA-17: Initiated operational production and distribution of MCSST's generated with NOAA-17 LAC data.

April 22, 2003
NOAA-16: Implemented new Visible Cloud Threshold table generated with data collected during the March/April 2003 time frame.

May 28, 2003
NOAA-16 and NOAA-17: Replaced the linear interpolation of Level 1b earth location data with three-point Lagrangian interpolation. This will improve the accuracy of the earth location towards the edge of the scan.

June 11, 2003
NOAA-16 and NOAA-17: Modified processing code to enable MCSST production when solar zenith angles are between 75-90 and channel 3a data is present. Currently a type 159 (relaxed daytime) observation is attempted.

July 2, 2003
NOAA-17: Updated NOAA-17 daytime equations based on May/June 2003 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9304T4 + .0870Tf (T4-T5) + 1.0076 (T4-T5)(SEC(A) -1) - 252.4396

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 24, 2003
NOAA-16: Updated NOAA-16 daytime equations based on November 2003 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9296T4 + .0813Tf (T4-T5) + .7214 (T4-T5)(SEC(A) - 1) - 252.4412

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

February 12, 2004
NOAA-16: Updated NOAA-16 daytime equations based on global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT

NL (4/5) = .9128T4 + .0803Tf (T4-T5) + .7709 (T4-T5)(SEC(A) -1) - 247.7182

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

May 19, 2004
NOAA-16: Updated NOAA-16 daytime equations based on global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT

NL (4/5) = .9296T4 + .0813Tf (T4-T5) + .7214 (T4-T5) (SEC (A) -1) - 252.4412

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

August 24, 2004
NOAA-16 and NOAA-17: Modified nighttime low stratus cloud screening test, replacing AVHRR ch5-ch3>0 test with AVHRR ch4-ch3>0 test.

June 7, 2005
NOAA-16: Implemented Orbital MCSST equations derived for NOAA-16 Sea Temp processing. Regression necessary due to improved ch4 + ch5 calibration precision in new NOAA-N formatted 1B data. Equations based on May 2005 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9018T4 + .0824Tf (T4-T5) + .6923 (T4-T5)(SEC(A) -1) - 244.5447

NLSST NIGHT TRIPLE
NL (3/4/5) = .9802T4 + .0331Tf (T3-T5) + 1.7227 (SEC (A) -1) - 266.5712

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

NOAA-17: Implemented Orbital MCSST equations derived for NOAA-17 SeaTemp processing. Regression necessary due to improved ch4 + ch5 calibration precision in new NOAA-N formatted 1B data. Equations based on May 2005 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9367T4 + .0848Tf (T4-T5) + 1.0270 (T4-T5) (SEC(A) -1) - 254.2330

NLSST NIGHT TRIPLE
NL (3/4/5) = .9984T4 + .0329Tf (T3-T5) + 1.9592 (SEC (A) -1) - 271.3281

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

G.4 CHANGES MADE TO MAPPED GAC PRODUCTS

November 27, 2001
NOAA-16: Increased day/night attempts per target from 10/3 to 15/15 attempts, respectively.

March 25, 2002
NOAA-16: Updated NOAA-16 daytime equations based on February 2002 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9246T4 + .0775Tf (T4-T5) + .7664 (T4-T5) (SEC (A) - 1) - 251.1504

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

April 30, 2002
NOAA-16: Implemented 1 km Land/Sea tag file to allow better coastal MCSST generation.

October 22, 2002
NOAA-17: Initiated operational distribution of NOAA-17 MCSST orbital files. Implemented Orbital MCSST equations derived for NOAA-17 SEATEMP processing. Equations based on August/September 2002 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9404T4 + .0838Tf (T4-T5) + 1.1098 (T4-T5)(SEC(A) - 1) - 255.1277

NLSST NIGHT TRIPLE
NL (3/4/5) = .9684T4 + .0334Tf (T3-T5) + 1.9245 (SEC(A) - 1) - 262.5276

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 5, 2002
NOAA-16: Updated NOAA-16 daytime equations based on September 2002 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9128T4 + .0803Tf (T4-T5) + .7709 (T4-T5) (SEC (A) - 1) - 247.7182

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)

A = Satellite Zenith Angle

November 7, 2002
NOAA-17: Initiated operational production and distribution of MCSSTs generated with NOAA-17 LAC data.

April 22, 2003
NOAA-16: Implemented new Visible Cloud Threshold table generated with data collected during the March/April 2003 time frame.

May 28, 2003
NOAA-16 and NOAA-17: Replaced the linear interpolation of Level 1b earth location data with three-point Lagrangian interpolation. This will improve the accuracy of the earth location towards the edge of the scan.

June 11, 2003
NOAA-16 and NOAA-17: Modified processing code to enable MCSST production when solar zenith angles are between 75-90 and channel 3a data is present. Currently a type 159 (relaxed daytime) observation is attempted.

July 2, 2003
NOAA-17: Updated NOAA-17 daytime equations based on May/June 2003 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9304T4 + .0870Tf (T4-T5) + 1.0076 (T4-T5) (SEC (A) - 1) - 252.4396

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

November 24, 2003
NOAA-16: Updated NOAA-16 daytime equations based on November 2003 global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9296T4 + .0813Tf (T4-T5) + .7214 (T4-T5) (SEC (A) - 1) - 252.4412

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

February 12, 2004

NOAA-16: Updated NOAA-16 daytime equations based on global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9128T4 + .0803Tf (T4-T5) + .7709 (T4-T5) (SEC (A) - 1) - 247.7182

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

May 19, 2004
NOAA-16: Updated NOAA-16 daytime equations based on global drifting buoy matches. The operational MCSST daytime equation is the NLSST DAY SPLIT.

NLSST DAY SPLIT
NL (4/5) = .9296T4 + .0813Tf (T4-T5) + .7214 (T4-T5) (SEC (A) - 1) - 252.4412

T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

August 24, 2004
NOAA-16 and NOAA-17: Modified nighttime low stratus cloud screening test, replacing AVHRR ch5-ch3>0 test with AVHRR ch4-ch3>0 test.

June 7, 2005
NOAA-16: Implemented Orbital MCSST equations derived for NOAA-16 SeaTemp processing. Regression necessary due to improved ch4 + ch5 calibration precision in new NOAA-N formatted 1B data. Equations based on May 2005 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9018T4 + .0824Tf (T4-T5) + .6923 (T4-T5) (SEC (A) - 1) - 244.5447

NLSST NIGHT TRIPLE
NL (3/4/5) = .9802T4 + .0331Tf (T3-T5) + 1.7227 (SEC (A)-1) - 266.5712

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

NOAA-17: Implemented Orbital MCSST equations derived for NOAA-17 SeaTemp processing.

Regression necessary due to improved ch4 + ch5 calibration precision in new NOAA-N formatted 1B data. Equations based on May 2005 global drifting buoy matches. The operational MCSST equations are the NLSST DAY SPLIT and the NLSST NIGHT TRIPLE.

NLSST DAY SPLIT
NL (4/5) = .9367T4 + .0848Tf (T4-T5) + 1.0270 (T4-T5) (SEC (A) - 1) - 254.2330

NLSST NIGHT TRIPLE
NL (3/4/5) = .9984T4 + .0329Tf (T3-T5) + 1.9592 (SEC (A) - 1) - 271.3281

T3 = Channel 3 Brightness Temperature (K)
T4 = Channel 4 Brightness Temperature (K)
T5 = Channel 5 Brightness Temperature (K)
Tf = Analyzed Field Temperature (C)
A = Satellite Zenith Angle

G.5 CHANGES MADE TO RADIATION BUDGET PRODUCTS

Not Available

G.6 CHANGES MADE TO SOUNDING PRODUCTS (ATOVS AND AMSU-B)

April 27, 1999
ATOVS operational.

May 4, 1999
Update coefficients.

May 11, 1999
Update coefficients.

May 12, 1999
1. Added AMSU-A channel 6 to the CDB high terrain retrieval channel combination. This will only affect high terrain areas like Antarctica and the Himalayas.
2. RETDVR was modified to retrieve coast and ice as land.
3. SPGDVR software was modified to do limb correction only once.

May 17, 1999
Update coefficients.

May 24, 1999
Update coefficients.

June 2, 1999
Update coefficients.

June 8, 1999
Update coefficients.

June 9, 1999
The ATOVS GTS (SATEM) formatter was modified to check for zero thickness values and filter retrievals containing those values from distribution.

June 24, 1999
Implemented new OPCUPD to:
1. Correct problem with summing of total ozone values when values are missing (substitute the values for the US Standard Ozone for missing and then include in sum).
2. Replace global S matrix with "S" bin 5 (everything south of 60S) where the S matrix is only based on that bin's samples. Rest of globe still use the global S matrix.

New Coefficients generated from this implementation were not used in the operations until after the implementation described for June 29, 1999.

June 24, 1999
The GTS formatter (SATEM) was modified to perform quality control and then sub sample. The tasks were being done in reverse, which at times led to a reduced sample size. This will ensure that all retrievals selected for distribution are of acceptable quality.

June 29, 1999
Implemented new SPGDVR to remove AMSU-A channel 6 from the CDB for high terrain retrieval channel combination. This will only affect high terrain areas like Antarctica and the Himalayas.

July 6, 1999
Update Coefficients.

July 13, 1999
Update Coefficients.

July 15, 1999
Implemented new SPGDVR to call new RETOD2 which uses correct measurement for precipitable water.

July 19, 1999
Update Coefficients.

July 22, 1999
A new Unified Radiosonde system was implemented.

July 26, 1999 .
Update Coefficients.

July 30, 1999
Corrected scaling factors on the Retrieval Operational Data File (RODF) which is the primary output file from SPGDVR and primary input file to all product formatters and the retrieval archive. A total of 20 scaling factors were incorrect.

Parameter	Old Scaling	New (Correct) Scaling
Retrieved Surface Pressure	1	64
1st Guess Water Vapor Mixing Ratio (1st word)	64	1024
1st Guess radiance Temperature (1st word)	1024	64
Forecast Relative Humidity	64	256
Forecast surface pressure	256	10
Forecast Pressure	64	10
Potential Temperature time minus	10	100
Forecast time Stability Departure	10	512
Lower Departure	100	512
Time difference (satellite minus forecast)	512	1
Stability forecast increment	512	1
Total Precipitable water (300-500mb)	100	128
Total Precipitable water (500-700mb)	1	128
Sulfur Dioxide	128	1
Polar Redundancy Flag	128	1
Outgoing long wave radiation	1	10
Layer Cooling rate (240-10mb)	1	1000
Layer cooling rate(500-240mb)	10	1000
Cloud comparison flag	1000	1
Library search closeness	1000	1

August 4, 1999
Corrected $I_1I_2I_3I_4$ term for the SATEM to have I_3 (Instrument Combination Flag) set to 1 when clear and 3 when cloudy and I_4 (Data Processing Technique) set to 3 when cloudy and 4 when clear.

August 9, 1999
Update Coefficients.

August 10, 1999
On August 9, 1999, two NOAA-15 orbits 064344 and 64445 were lost due to antenna problems at Gilmore Creek.

August 17, 1999
Update Coefficients.

August 23, 1999

Update Coefficients.

August 30, 1999
Update Coefficients.

September 1, 1999
Orbit 676364 failed processing.

September 2, 1999
The precipitable water content had been incorrectly distributed in the SATEM as distinct layers when it should have been summation. This was corrected. Additionally, cases were found where the terrain was sea but the sea surface temperature was zero, these situations were eliminated in the SATEM. The problem is the terrain flag comes from the SSM/I processing and the Sea Surface Temperature is from another system with (obviously) a different terrain field.

September 7, 1999
Update coefficients.

September 13, 1999
Update coefficients.

September 20, 1999
Update coefficients.

September 22, 1999
Corrected the “No HIRS” designation to not be flagged when the HIRS really is present. Also changed the initialization of some variables to be properly done.

October 4, 1999
Update coefficients.

October 4 to 6, 1999
Problems with orbital processing resulted in the replacement of the first guess library, CDB and OPCDB at 1545L on October 6.

October 7, 1999
Archive changed to report ‘0' SST as missing instead of ‘0’ see September 2, 1999 entry for explanation of ‘0' SST.

October 12, 1999
Update coefficients.

October 13, 1999
Copied clear and cloud Matchup data bases from parallel to operations, changed CDB after orbit 736768 (data time 1650 to 1835Z).
October 19, 1999

Update coefficients.

October 25, 1999
Update coefficients.

November 2, 1999
Change CDB radiosonde match time windows for the latitude bins to reduce the number of matchups in selected bins. (New time windows by bin (3,6,6,6,4,6,6,4,3,2,3,3,3,3,3,2,2,3,3,3, 3,3,2).

November 4, 1999
Update coefficients.

November 10, 1999
Update coefficients.

November 15, 1999 10:35L
Modified thresholds in CDB.

November 17, 1999
Update coefficients.

November 17, 1999
Allocate archive with logical record length of 1000 and block size of 9000.

November 18, 1999
Modified thresholds in CDB.

November 23, 1999
Update coefficients.

November 24, 1999 11:54L
Modified thresholds in CDB.

December 1, 1999
Update coefficients.

December 2, 1999
Update thresholds in CDB.

December 6, 1999
Update coefficients.

December 14, 1999
Update coefficients.

December 21, 1999
Update coefficients.

December 21, 1999
Spike in HIRS filter wheel motor current in orbit 832122 (1841 -2027Z). Did not appear to impact data.

December 28, 1999
Update coefficients.

January 5, 2000
Update coefficients.

January 12, 2000
Update coefficients.

January 12, 2000 10:47L
Change window channel test threshold.

January 19, 2000
Update coefficients.

January 27, 2000
Update coefficients.

February 1, 2000
Implemented significant upgrade:

1. Replaced the radiosonde oriented first guess computation for stratospheric levels with an AMSU-A regression scheme. The two schemes are merged between 50 and 10mb inclusive.

2. The grouping (binning) of the matchups were changed to use ascending/descending node instead of day/night for grouping in addition to latitude zone and terrain. Additionally, the problem of some bins being reported a full (complete set of matchups) when they were actually incomplete and could hold more matches (and hence improve the selection for the first guess) were corrected.

3. Consistent screening of the matchups between the eigenvector update, the operator component update and the first guess library build is now being performed.

4. The eigenvector update was also modified to use ice data for land eigenvectors only (not sea). This program also extends the interpolated temperature profile from the RAOB by merging the interpolated profile generated from AMSU-A channel brightness temperatures.

5. The orbital processing was modified with these changes:

A. Correct the exclusion of HIRS channel 20 on the product file which had been mistakenly removed by the limb correction process and in its place the node was included. (Those who read channel 20 from the BUFR data- you are getting the node!)

B. Used the AMSU-A surface products cloud liquid water and land precipitation index to create a new precipitation contamination flag. This flag is combined with the median filter flag in the overall precipitation editing scheme. Note, we do not send precipitation data to users.

C. The cloud products (currently experimental) were improved by adding a separate calculation of the cloud amount based on the surface temperature estimated HIRS channel 8. Finally, filters were added to remove extraneous clouds over Antarctica. Please note this is NOT the clear/cloudy indicator but the Cloud amount, cloud top temperature, etc. terms.

D. Two layers were added to the computation of the total precipitable water (200-250mb and 250-300mb), these are currently not distributed.

E. Cloud detection tests were modified for high terrain in response to concerns raised about the total ozone computation. This IS the clear/ cloudy indicator.

F. AMSU-A channel 5 is excluded in the computation of the retrieval operator component G for land south of -60 South.

G. Added AMSU-A data mislocation algorithm.

February 8, 2000
Update coefficients.

February 24, 2000
Update coefficients.

February 25, 2000
Copied clear and cloudy matchup data bases from the production parallel system to the operational system.

March 7, 2000
Update coefficients.

March 14, 2000
Update coefficients.

March 16, 2000
Changed CDB thresholds at 11:20 am.

March 20, 2000
Update coefficients.

March 28, 2000
Update coefficients.

April 5, 2000
Update coefficients.

April 11, 2000
Update coefficients.

April 18, 2000
Update coefficients.

April 25, 2000
Update coefficients.

G.7 CHANGES MADE TO COASTWATCH PRODUCTS

Not available.

G.8 CHANGES MADE TO SNOW AND ICE PRODUCTS

Not available.

G.9 CHANGES MADE TO OZONE (SBUV/2) PRODUCTS

Not available.

G.10 CHANGES MADE TO AEROSOL/OPTICAL THICKNESS PRODUCTS

Not available.