AATSR Cycle Report
Cycle # 28

21 June 2004, 21:59:29 orbit 12079
26 July 2004, 21:59:29 orbit 12579

Scene acquired over Northern of Canada on 03 July 2004, absolute orbit 12248 (relative orbit 170).
This image, from northeast to southwest, shows a cloud free overpasses over the Amundsen Gulf/Victoria-Island (to the top/center of image) and over the Great-Bear Lake (to the bottom of the image), just as their ice is beginning to melt. The ice appears in different shades of blue, the water, free by ice, appears black.

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1 THE CYCLIC REPORT #28

1.1 Acronyms and abbreviations

AATSR	Advanced Along Track Scanning Radiometer
CR	Cyclic Report
DMOP	Detailed Mission Operation Plan
DMS	Data Management System
EN-UNA-YYYY/#	Envisat Unavailability (plus year and number)
ESOC	European Space Operation Center
HSM	High Speed Multiplexer
IECF	Instrument Engineering and Calibration Facilities
IPF	Instrument Processing Facilities
MPS	Mission Planning Schedule
NRT	Near Real Time
OCM	Orbit Control Manoeuvre
PDS	Payload Data Segment
PMC	Payload Management Computer
SPR	Software Problem Reporting
SW	Software
VISCAL	Visible Calibration

The AATSR list of acronyms and abbreviation is in the following site:
http://envisat.esa.int/dataproducts/aatsr/CNTR5-1.htm#eph.aatsr.glossary.acronabbr:nrt

1.2 Summary

Cyclic number: 28
Cycle Start Time: 21-JUNE-2004, 21:59:29 orbit stop: 12079
Cycle Stop Time: 26-JULY-2004, 21:59:29 orbit stop: 12579

The main activities during the cycle have been the following:

- **Processor L0 and IPF Version**: No changing in the version of AATSR processor for Level0 (5.22).
  New IPF version for Level1 and Level2 (5.59) delivered on 19 July 2004.
- **Visible calibration data**: The visible calibration coefficients data (ATS_VC1_AX) are changed regularly during the cycle. These VC1 files are being used within the time criteria set for NRT processing. Off-line data processing is expected to take place within 2 weeks of acquisition. When this is the case the VC1 file used should be +/- 1 day from the date of acquisition (i.e. within specification). If off-line data are generated before 2 weeks from acquisition, this may not be achieved.

- **Data Acquisition**: The data acquisition for the Level0 has been of 99.3% of the whole period, for the Level1 of the 99.2% of the whole period. Three unavailability for the instrument:
  - ***HSM*** input module anomaly (twice) on July 17th.
  - ***Out-gassing***: planned (from July, 23rd to July, 26th). The NRT products during an outgassing contain only 0.86, 0.67 and 0.56um channel data and even these data will be [relatively] poorly calibrated. NRT L1B and Browse products immediately after an outgassing may be poorly calibrated as a post-outgassing ATS_VC1_AX file may not have been incorporated into the NRT processing.

- **Calibration activities**: No further information is reported with respect to the previous cycle.

- **Validation activities**: Geophysical validation of AATSR SST estimates using in situ radiometer and buoy data, up to the ENVISAT Symposium in September 2004, have shown that AATSR is generally meeting the Defra specifications of < 0.3ºC (one sigma) globally for night time data with slightly higher errors observed for day time data.

1.3 Software version and Auxiliary files version

1.3.1 Software version

AATSR processor for Level0; version: PFHS/5.22
AATSR IPF for Level1 and Level2; version: AATSR/05.59 – delivered on 19th July 2004. Two changes has been done:

- The first one is referred to MPH -> REF_DOC field: From this version on, the IPF takes care of filling this field, instead of the PFHS.
  As per the Software version, the information is hard-coded at compilation time to avoid misconfiguration.

- The second one is referred to incorrect handling of unexpected CFI warning message. In-fact the IPF didn't make a difference between a return code of type WARNING and a return code of type ERROR: the execution was aborted in both cases. Today, in the case where a WARNING is returned, it will be notified in the log files and the execution will continue.

DOCUMENTATION Applicable: PO-RS-MDA-GS-2009 Is. 3 Rev. H

1.3.1.1 Auxiliary file version

This is the list of AATSR auxiliary files.

- ***Browse Product Look-up Data (ATS_BRW_AX)***
- ***L1b Characterization Data (ATS_CH1_AX)***
- ***Cloud Look-up Table Data (ATS_CL1_AX)***
- ***General Calibration Data* (ATS_GC1_AX)**
- ***AATSR Instrument Data* (*ATS_INS_AX*)**
- ***Visible Calibration Coefficients Data (ATS_VC1_AX)***
- ***Level1B Processing Configuration Data (ATS_PC1_AX)***
- ***Level2 Processing Configuration Data (ATS_PC2_AX)***
- ***SST Retrieval Coefficients Data (ATS_SST_AX)***
- ***LST Land Surface Temperature Coefficients Data (ATS_LST_AX)***

In this section will be reported the list of the auxiliary files changed in the cycle and for each file will be specified the date and the reason of the changing.
Will be also reported the list of the latest filename for every auxiliary file currently in use by the PDS.

Only the ATS_VC1_AX file is expected to change regularly. These VC1 files are being used within the time criteria set for NRT processing. Off-line data processing is expected to take place within 2 weeks of acquisition. When this is the case the VC1 file used should be +/- 1 day from the date of acquisition (i.e. within specification). If off-line data are generated before 2 weeks from acquisition, this may not be achieved. **(1)**

Product name	**Start validity**	**Reason of changing**
ATS_VC1_AXVIEC2004	June, 21, 24, 25, 26, 27, 28, 29, 30 July, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26	(1)

Tab 1.3.2.1: Auxiliary files list changed during the period

Product name
ATS_BRW_AXVIEC20020123_072338_20020101_000000_20200101_000000
ATS_CH1_AXVIEC20021114_113144_20020301_000000_20070801_235959
ATS_CL1_AXVIEC20020123_073044_20020101_000000_20200101_000000
ATS_GC1_AXVIEC20020123_073430_20020101_000000_20200101_000000
ATS_INS_AXVIEC20030731_092706_20020301_000000_20070801_235959
ATS_VC1_AXVIEC20040726_075551_20040722_084355_20040729_084355
ATS_LST_AXVIEC20040311_095537_20020301_000001_20070801_235959
ATS_PC1_AXVIEC20030430_211727_20020301_000000_20070801_235959
ATS_PC2_AXVIEC20020123_074151_20020101_000000_20200101_000000
ATS_SST_AXVIEC20020123_074408_20020101_000000_20200101_000000

Tab 1.3.2.2: Latest auxiliary files currently in use by the PDS

1.4 PDS status

1.4.1 Instrument Unavailability

The AATSR has been switch-down:

- From 17 Jul 2004 16:55:57.000 (day of year 199, orbit 12448, anx offset=0924.647) to 17 Jul 2004 19:50:00.000 (day of year 199, orbit 12449, anx orbit =5551.719), due to a HSM input module anomaly (unplanned anomaly).
- From 17 Jul 2004 19:50:00.000 (day of year 199, orbit 12448, anx offset=0924.647) to 17 Jul 2004 19:52:30.000 (day of year 199, orbit 12449, anx orbit =5551.719), due to a HSM input module reset (planned unavailability).

An Out-gassing occurred on AATSR from 23 July 2004 09:00:00.000 (day of year 205, orbit 12529, anx offset=1857.479) to 26 July 2004 15:39:45.000 (day of year 208, orbit 12576, anx orbit =1353.863)

Start	Stop	Reason	Reference	Planned
17 Jul 2004 16:55:57.000	17 Jul 2004 19:50:00.000	HSM anomaly	EN_UNA-04/179	NO
17 Jul 2004 19:50:00.000	17 Jul 2004 19:52:30.000	HSM reset	EN_UNA-04/180	YES
23 Jul 2004 09:00:00.000	26 Jul 2004 15:39:45.000	Out-gassing	EN_UNA-04/186	YES

1.4.2 Level0 data acquisition and Level1b processing status

In this chapter will be reported the Level0 missing and the data unavailability not planned in the period.
Only the Level1b data not processed starting from the corresponding Level0 will be reported.
The figure below shows the Level0 data missing measurements (yellow line) and the Level1 data not processed starting from the corresponding Level0 (red line) and the unavailability not planned (green line).

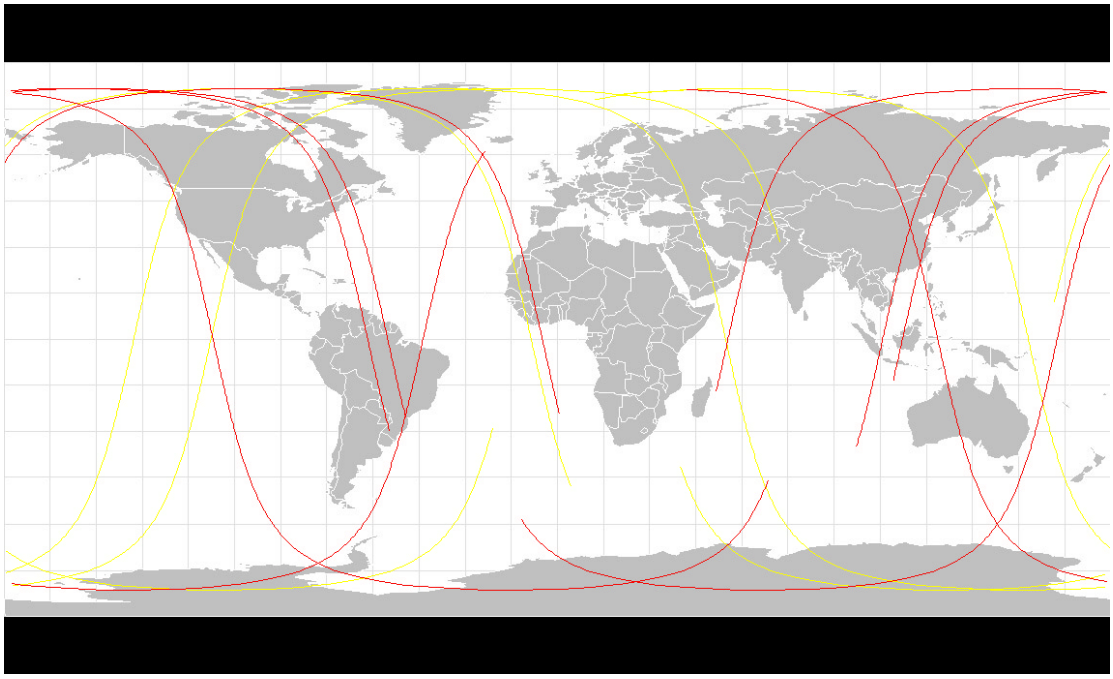


Figure 1.4.2.1: ***Missing measurements during cycle 28.***
Yellow line: Level0 missing (PDS failure)
Red lines: Level1 missing

The total number of missing data is equivalent to 3.5 orbits on 501 (0.7%).
The Level0 data was available the 99.3% of the time during the cycle.
The Level1b data was available the 99.2% of the time during the cycle.
The following tables show the list of Level0 and Level1 lack of data.

UTC Start: start time of the missing acquisition.
UTC Stop: stop time of the missing acquisition.
Duration: duration of the missing acquisition.
Orbit Start: absolute orbit start of the missing acquisition.
Orbit Stop: absolute orbit stop of the missing acquisition.

UTC Start	UTC Stop	Duration (sec)	Orbit Start	Orbit Stop
01-JUL-04 12:06:41	01-JUL-04 12:09:06	145	12216	12216
04-JUL-04 11:05:09	04-JUL-04 12:14:07	4138	12258	12259
09-JUL-04 22:20:31	09-JUL-04 23:20:54	3623	12336	12337
17-JUL-04 16:49:26	17-JUL-04 19:50:00	10834	12448	12449
20-JUL-04 11:32:53	20-JUL-04 12:11:58	2345	12487	12488

Tab 1.4.2.1: ATS_NL__0P missing data during cycle 28

UTC Start	UTC Stop	Duration (sec)	Orbit Start	Orbit Stop
13-JUL-04 12:37:27	13-JUL-04 14:09:40	5533	12388	12389
16-JUL-04 01:58:18	16-JUL-04 03:06:50	4112	12424	12425
16-JUL-04 04:50:34	16-JUL-04 06:22:56	5542	12426	12427
19-JUL-04 22:12:50	19-JUL-04 23:43:36	5446	12479	12480
20-JUL-04 01:33:40	20-JUL-04 02:34:56	3676	12481	12482

Tab 1.4.2.2: ATS_TOA_1P missing data during cycle 28

1.4.3 Level0 and Level1b backlog processing status

In this chapter a check with respect to the previous cycle is done to verify if the status of the missing data has changed after a backlog processing. In the following tables (showed only if a change whit respect the previous cycle has been detected) will be point out three kinds of missing products modified:

- Data gap cancelled: it refers to data gap that was identified in the previous report but hasn't now been detected as a result of backlog processing (red line).
- Duration change of data gap: it refers to data gap/s still exists but that it has got longer or shorter since the last report (green line).
- New data gap: it refers to data gap now filled as a result of a backlog processing (blue line).

The list of data missing during the previous cycle has not changed (see the list in the Cyclic Report #27).

1.5 Quality Control

1.5.1 Monitoring of parameters

JITTER:

The average scan-mirror jitter rate during this cycle was 0.02 jitters/sec or better. Note that occasional, short duration jitter periods do occur. During this cycle no periods of very high jitter were detected, but the period July 06 to July 12 showed occasional periods where the maximum jitter rate reached 0.15 jitters/sec. Users should check the jitter rate during the period covered by their products by checking the Scan Quality Annotation Data Sets (using EnviView, for example).

SENSOR TEMPERATURE:

All sensors maintained their nominal orbital and seasonal ranges except during the out-gassing period that started July 23 (orbit #12529)and continued to the end of the cycle.

VISCAL:

Reflectance channel calibration files are available for all days except:

June 22-23
July 12
July 24-26 (out-gassing)

Nominal viscal characteristics were observed throughout the cycle where data was available.

TOTAL NOISE:

Total noise in the thermal infrared channels, as represented by the standard deviation of the black-body signal in each channel, was close to nominal throughout the cycle. During the period July 06 to July 12 some orbits do show small increases in the total noise, but with no significant impact on image quality.

Total noise in the reflectance channels was close nominal throughout the cycle.

NEΔT:

Nominal throughout the cycle.

1.5.2 Users Rejection

No user complaints during this cycle.

1.5.3 Software Problem Reporting. Potential impact

In this section will be described the SPR open with the potential impact on the data quality, and the SPR closed.

1.5.3.1 SPR open

In this section will be reported the list of SPRs.

1.5.3.1.1 Existing SPRS that are still open

No SPRs still opened.

1.5.3.1.2 New SPRs since the last Cyclic Report

None

1.5.3.2 SPR closed

The old SPRs have been resolved after the new IPF version installation – IPF 5.58 – operational since 10th March 2004.

1.6 Calibration/Validation activities and results

1.6.1 Calibration

No further information on instrument calibration is reported. The current status of the instrument calibration can be found in Section 1.7.1 of Cyclic Report 20.

1.6.2 Validation

The results from the AATSR validation programme at the ENVISAT symposium are now summarised. The results are grouped into two categories, namely results from validating the AATSR 1-km product against radiometers and results from validating the AATSR 10´ product against global buoy data.

1.6.2.1 In Situ Analysis

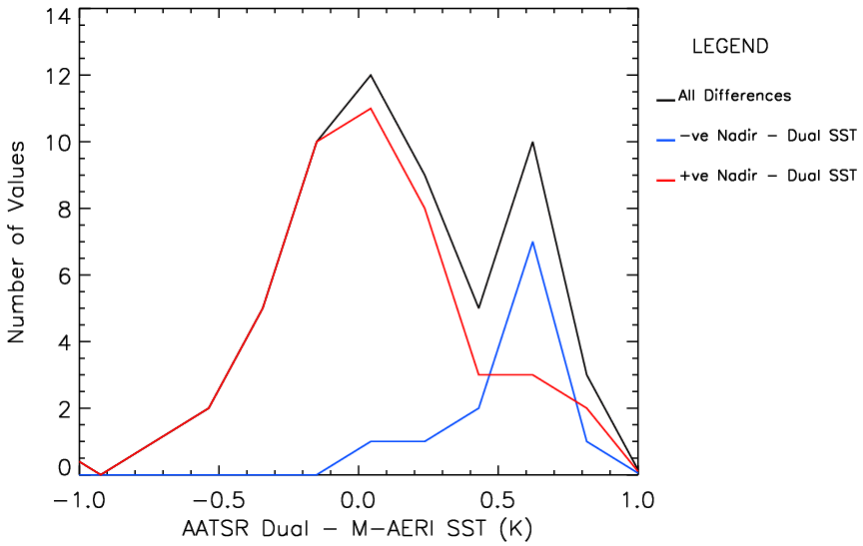
This section details progress so far in point-to-point validation of retrieved AATSR GSST values using the ISAR (operated by SOC), SISTeR (operated by RAL), DAR011 (operated by CSIRO) and M-AERI radiometers. A summary of all returned match-ups, up-to and including the symposium, is given in the table below.

	Day			Night		
	Bias	St. Dev.	Num.	Bias	St. Dev.	Num.
All Data	+0.16 K	0.33 K	36	+0.12 K	0.34 K	89
M-AERI	+0.23 K	0.33 K	30	+0.13 K	0.36 K	76
DAR011	-0.15 K	0.12 K	4	+0.05 K	0.21 K	8
ISAR	-0.05 K	N/A	1	0.00 K	N/A	1
SISTeR	-0.06 K	N/A	1	+0.11 K	0.22 K	3

For night time data, the results suggest that AATSR has a warm bias of 0.12 K, whereas for day time the bias is 0.16 K. The standard deviation given in the above table includes all data and is not limited to the 0.3 K (1σ) limits imposed by the scientific requirements.

Further inspection of the data, based on the value of the difference between the dual SST value and an equivalent nadir only SST value, revealed an important distinction when a histogram was analysed. A histogram of day time comparisons between AATSR and M-AERI is shown below. The black

line is for all differences, the blue line is for differences when dual minus nadir is positive and the red line is for differences when dual minus nadir is negative.



The reason for using day time data as the example is that it is easy to apply a simple "either negative or positive" discrimination test to the dual-nadir difference value as there is a small difference between N2 and D2 retrievals. For night time data, the dominance of the 3.7 micron channel in the SST retrieval removes this small bias and so a small positive value of +0.1 K is used to avoid incorrect assignment of data. Values between +0.1 K and + 0.3 K have been tested and the differences have not yet been fully assessed and so the +0.1 K limit is currently used.

Applying this test to the M-AERI data and to data from Ian Barton's DAR011 radiometer gives the following results:

	Day			**Night**		
	Bias	St. Dev.	Num.	Bias	St. Dev.	Num.
M-AERI C1	+0.56 K	0.22 K	23	+0.03 K	0.28 K	65
M-AERI C2	+0.12 K	0.28 K	7	+0.49 K	0.34 K	11
DAR011 C1	-0.00 K	0.06 K	3	+0.02 K	0.25 K	3
DAR011 C2	-0.31 K	N/A	1	+0.19 K	0.26 K	5

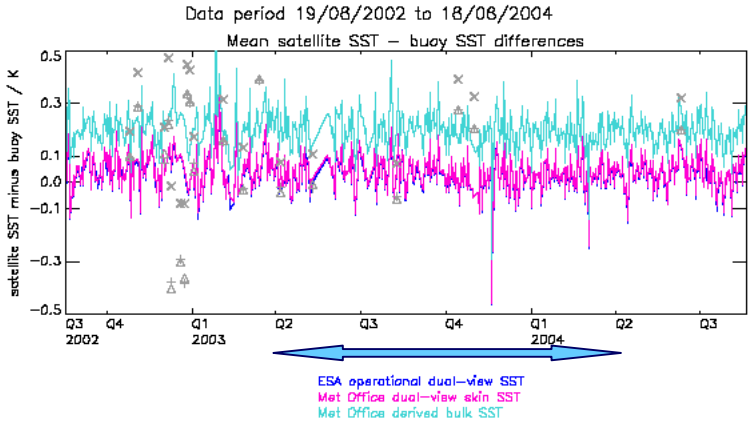
Here, C1 refers to match-ups with a negative dual/nadir difference (which for night time data actually refers to differences less than +0.1 K) and C2 refers to positive dual/nadir differences.

The first point to note is that the simple dual-nadir test appears to work independently on the DAR011 results as well as the M-AERI results, albeit on a much smaller number of match-ups. More importantly, it shows that the warm bias for the majority of the M-AERI measurements is actually much

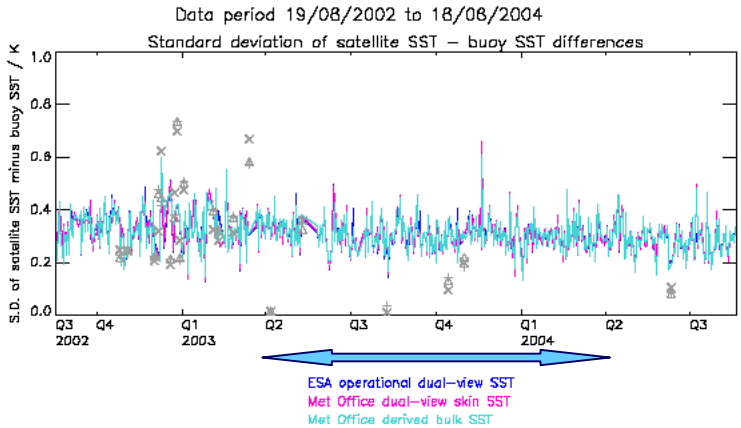
lower than that suggested by not using the dual-nadir test, around 30 mK for M-AERI night time data, with a standard deviation that is already less than 0.3 K with all data included. This is an extremely good result and shows that instrument is performing excellently.

1.6.2.2 Global Analysis against Buoys

The Met Office has performed NRT daily analysis of the METEO product and used the results to make comparisons made on a global scale to in situ buoy data and SST analysis fields. The comparison of AATSR with buoy data can be used to identify systematic errors or serious regional anomalies as it provides what are really gross error estimates. For comparison with global in situ buoy data, AATSR ASST data have been matched up to buoy observations collocated within a 10 arc minute cell and coincident within 3 hours. From ~ 30 match-ups per day through a 12-month period from 1st April 2003, statistics show that the AATSR skin SST - buoy bulk SST differences are mainly within ± 0.3 K. The mean difference between AATSR skin SSTs and buoy bulk SSTs for the 12-month period is +0.06 K with a standard deviation of 0.27 K (within specification) for night time match-ups, with a mean of -0.01 K and a standard deviation of 0.33 K for day time match-ups. A time series of global match-ups is shown in the figure below.



blue arrow = 1 complete year:
1 April 2003 – 31 March 2004



The figure shows that the estimates of the ocean's skin temperature show closer agreement with the buoy data (a measure of bulk SST) than do the Met Office estimates of bulk SST derived from AATSR ASST data (not shown here), even though at night a bias of between -0.1 K and -0.2 K is expected due to the skin effect. This suggests that the AATSR SST product exhibits a small warm bias of around 0.1-0.2º K and therefore requires further investigation and observations.

The dual-nadir difference test detailed in the radiometer comparison is currently being applied to buoys match-ups and will be reported once the analysis is completed.

1.6.2.3 SUMMARY

Geophysical validation of AATSR SST estimates using in situ radiometer and buoy data, up to the ENVISAT Symposium in September 2004, have shown that AATSR is generally meeting the Defra specifications of < 0.3ºC (one sigma) globally for night time data with slightly higher errors observed for day time data.

1.7 General information

None