AATSR Cycle Report
Cycle # 18

07 July 2003, 21:59:29 orbit 7069
11 August 2003, 21:59:29 orbit 7569

Scene acquired over Aral Sea.
This dramatic image of the Plateau Ustyurt and Aral Sea was processed from data acquired by AATSR on August 06, during orbit #7489. Covering parts of Kazakhstan in the north, Uzbekistan and Turkmenistan in the South, it is a colour composite created from AATSR's 0.86um (red), 0.67um (green) and 0.56um (blue) reflectance channels. The dessicated Aral Sea is seen near the top right. Its various shades of blue reflect the depth of water – the darker the blue the deeper the water. In this image vegeation appears red. The only really fertile area appears on the right, south of the Aral Sea. The blue water in the bottom left is the Kara-Bogaz-Gol, just east of the Caspian Sea. Between the Kara-Bogaz-Gol and the Aral is the Plateau Ustyurt. Crossing the plateau to the south-west of the Aral is a very distinct linear feature only 2 or so pixels in width. This feature is a conglomeration of roads, railroads and pipelines and is one of the few man-made features distinguishable by space-based instruments with kilometre-scale resolution.

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1 THE CYCLIC REPORT #18

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
IECF	Instrument Engineering and Calibration Facilities
IPF	Instrument Processing Facilities
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: 18
Cycle Start Time: 07-JUL-2003, 21:59:29 orbit stop: 7068
Cycle Stop Time: 11-AUG-2003, 21:59:29 orbit stop: 7569

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 and in the IPF version for the Level1 and Level2
- **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.

- **Instrument calibration data**: The instrument calibration file (ATS_INS_AX) has changed the validity end date. The data-set content of this file is identical to its predecessor, only the validity end has changed, both in the file name and in the corresponding MPH fields.
- **Data Acquisition**: The data acquisition for the Level0 has been of 98,54% of the whole period, for the Level1 of the 87,74% of the whole period.
- **Calibration activities**: AATSR agrees well with MERIS over desert sites (R_{AATSR}/R_{MERIS} = 1.041 (0.56 μm), 1.001 (0.66 μm), 1.037 (0 .87μm)
  Significant differences between AATSR/MERIS and ATSR-2 are observed over desert sites in the order of 8% - 13% depending on the channel.
  Results from the inter-comparison with other sensors conducted by Kerridge et al show lower discrepancies between ATSR-2, GOME and AATSR. However, only a limited number of comparisons have been performed owing to a delay in issuing SCIAMACHY data for this study.
- **Validation activities**: There are no issues of serious concern at this stage about the global accuracy of AATSR data based on the validation data collated so far.
  Validation of the AATSR METEO product from August 2002 - July 2003 against buoy data and SST analysis fields, demonstrates that AATSR retrievals of SST are accurate to within 0.3 K globally.
  Validation results from precision radiometer match-ups show a r.m.s. difference between AATSR SST data and *in situ* skin SST data of <0.2 K.

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/05.55

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

1.3.2 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)***

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)**
The instrument calibration file (ATS_INS_AX) has changed the validity end date. The data-set content of this file is identical to its predecessor, only the validity end has changed, both in the file name and in the corresponding MPH fields. **(2)**

Product name	**Start validity**	**Reason of changing**
ATS_VC1_AXVIEC2003	July, 9, 11, 14, 15, 16, 17, 21, 23, 28, 31 August, 1, 6, 7, 8, 11	(1)
ATS_INS_AXVIEC20030731_092706_20020301_000000_20070801_235959	July, 31	(2)

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_AXVIEC20030811_153729_20030810_071017_20030817_071017
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

No instrument unavailability during this period.

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).

Figure not available.
Figure 1.4.2.1: Missing measurements during cycle 18.

The total number of missing data is equivalent to 7 orbits on 501 (1.4%).
The Level0 data was available the 98.54% of the time during the cycle.
The Level1b data was available the 87.74% 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
11-JUL-03 07:00:40	11-JUL-03 08:37:55	5835	7117	7118
14-JUL-03 21:59:17	14-JUL-03 23:08:59	4182	7169	7169
15-JUL-03 08:14:00	15-JUL-03 09:52:30	5910	7175	7176
30-JUL-03 05:19:11	30-JUL-03 06:59:13	6002	7388	7389
31-JUL-03 19:41:31	31-JUL-03 21:23:21	6110	7411	7412
31-JUL-03 22:44:11	31-JUL-03 23:08:10	1439	7412	7413
01-AUG-03 00:07:25	01-AUG-03 00:49:44	2539	7413	7414
05-AUG-03 02:06:34	05-AUG-03 03:48:13	6099	7472	7473
06-AUG-03 11:41:06	06-AUG-03 13:19:37	5911	7492	7493

Tab 1.4.2.1: ATS_NL__0P missing data during cycle 18

UTC Start	UTC Stop	Duration (sec)	Orbit Start	Orbit Stop
07-JUL-03 22:25:20	08-JUL-03 03:21:54	17794	7069	7072
08-JUL-03 21:51:28	08-JUL-03 23:25:17	5629	7083	7084
10-JUL-03 00:46:02	10-JUL-03 02:23:07	5825	7099	7100
11-JUL-03 00:14:05	11-JUL-03 01:45:37	5492	7113	7114
14-JUL-03 00:19:18	14-JUL-03 01:51:33	5535	7156	7157
14-JUL-03 05:24:14	14-JUL-03 06:59:43	7159	7159	7160
15-JUL-03 01:29:45	15-JUL-03 04:48:51	11946	7171	7173
16-JUL-03 00:57:23	16-JUL-03 02:35:08	5865	7185	7186
17-JUL-03 23:53:33	18-JUL-03 01:26:11	5558	7213	7214
22-JUL-03 06:15:30	22-JUL-03 07:47:34	5524	7274	7275
23-JUL-03 00:37:12	23-JUL-03 02:09:01	5509	7285	7286
25-JUL-03 11:22:37	25-JUL-03 12:51:29	5332	7320	7321
26-JUL-03 00:43:08	26-JUL-03 02:20:04	5816	7328	7329
28-JUL-03 23:06:46	29-JUL-03 00:38:46	5520	7370	7371
29-JUL-03 17:30:59	29-JUL-03 20:40:42	11383	7381	7383
31-JUL-03 21:23:21	31-JUL-03 22:44:10	4849	7412	7412
31-JUL-03 23:11:02	01-AUG-03 00:07:25	3383	7413	7413
01-AUG-03 00:49:44	01-AUG-03 05:51:36	18112	7414	7417
01-AUG-03 22:39:16	02-AUG-03 02:00:19	12063	7427	7429
02-AUG-03 13:50:40	02-AUG-03 15:19:02	5302	7436	7437
02-AUG-03 22:07:28	03-AUG-03 06:28:24	30056	7441	7446
03-AUG-03 21:34:15	04-AUG-03 05:57:22	30187	7455	7460
04-AUG-03 22:45:19	05-AUG-03 02:06:34	12075	7470	7472
05-AUG-03 03:48:13	05-AUG-03 05:24:40	5787	7473	7474
05-AUG-03 22:12:14	06-AUG-03 06:34:07	30113	7484	7489
06-AUG-03 21:39:39	07-AUG-03 06:03:01	30202	7498	7503
07-AUG-03 22:50:50	08-AUG-03 03:54:33	18223	7513	7516
08-AUG-03 22:18:15	09-AUG-03 05:01:07	24172	7527	7531
09-AUG-03 21:45:44	10-AUG-03 06:08:42	30178	7541	7546
11-AUG-03 00:39:32	11-AUG-03 02:18:45	5953	7557	7558

Tab 1.4.2.2: ATS_TOA_1P missing data during cycle 18

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 table are pointed out three kinds of missing products modified:

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

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
10-JUN-03 18:05:39	10-JUN-03 19:42:08	5789	6680	6681
11-JUN-03 14:19:04	11-JUN-03 14:51:01	1917	6692	6692
12-JUN-03 20:22:16	12-JUN-03 20:26:21	245	6710	6710
13-JUN-03 06:36:12	13-JUN-03 08:18:38	6146	6716	6717
23-JUN-03 08:05:01	23-JUN-03 09:42:48	5867	6860	6861
23-JUN-03 21:16:40	23-JUN-03 23:01:35	6295	6868	6869
03-JUL-03 07:53:25	03-JUL-03 09:29:44	5779	7003	7004
04-JUL-03 22:13:08	04-JUL-03 23:57:54	6286	7026	7027
06-JUL-03 04:31:48	06-JUL-03 06:13:19	6091	7044	7045
06-JUL-03 21:09:10	06-JUL-03 21:37:56	1726	7054	7054
06-JUL-03 21:40:56	06-JUL-03 22:51:44	4248	7054	7055
07-JUL-03 02:18:18	07-JUL-03 03:59:23	6065	7057	7058

Tab 1.4.3.1: ATS_NL__0P missing data during cycle 17.
Red: data gaps cancelled (no detection during the current cycle with respect to previous one).
Green: duration change of data gap (during the current cycle, with respect to the previous one).

UTC Start	UTC Stop	Duration (sec)	Orbit Start	Orbit Stop
09-JUN-03 22:03:06	09-JUN-03 23:36:58	5632	6668	6669
12-JUN-03 03:48:52	12-JUN-03 05:23:17	5665	6700	6701
13-JUN-03 04:57:35	13-JUN-03 06:36:11	5916	6715	6716
18-JUN-03 02:18:20	18-JUN-03 03:57:50	5970	6785	6786
22-JUN-03 00:11:11	22-JUN-03 01:42:29	5487	6841	6842
24-JUN-03 02:31:13	24-JUN-03 04:08:15	5822	6871	6872
27-JUN-03 15:58:57	27-JUN-03 17:25:34	5197	6922	6923
28-JUN-03 18:44:01	28-JUN-03 20:13:33	5372	6938	6939
30-JUN-03 02:42:58	30-JUN-03 04:14:11	5473	6957	6958
30-JUN-03 22:45:15	01-JUL-03 00:18:10	5575	6969	6970
03-JUL-03 02:48:51	03-JUL-03 04:20:00	5469	7000	7001
03-JUL-03 22:50:52	04-JUL-03 02:06:10	11718	7012	7014
04-JUL-03 22:19:30	05-JUL-03 01:34:58	11728	7026	7028
05-JUL-03 21:45:40	05-JUL-03 23:19:31	5631	7040	7041
06-JUL-03 22:56:51	07-JUL-03 00:29:53	5582	7055	7056
07-JUL-03 02:22:31	07-JUL-03 03:53:52	5481	7057	7058

Tab 1.4.3.2: ATS_TOA_1P missing data during cycle 17
Green: duration change of data gap (during the current cycle, with respect to the previous one).
Blue: new data gaps (detection during the current cycle).

1.5 Quality Control

1.5.1 Monitoring of parameters

JITTER:

The average scan-mirror jitter rate during this cycle was 0.01 jitters/sec or better, except for a surge in jitter that occurred on August 05 when the mean jitter rate reached 0.73 jitters/sec. On August 06 it returned to a mean rate of very close to 0.0 jitters/sec where it remained until the end of the cycle.

SENSOR TEMPERATURE:

All sensors maintained their nominal orbital and seasonal values except during the outgassing period (August 01 to 05) when the thermal infrared and 1.6um channels were warm and unavailable.

VISCAL:

Reflectance channel calibration files (ATS_VC1_AX) are available for everday of the cycle except during the outgassing period. Nominal viscal characteristics were observed throughout the cycle.

TOTAL NOISE:

Total noise in the thermal infrared channels, as represented by the standard deviation of the black-body signal in each channel, was nominal throughout the cycle except on August 05. On this day the total noise was up temporarily by approximately 30 to 50%. August 05 was the first day back for the thermal channels following the outgassing.
Total noise in the 1.6 um reflectance channel was nominal throughout the cycle.

NEΔT: Info unavailable.

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

- *RAL SPR 15*
    - The Operational Processor sets the Record Quality Indicator incorrectly.
    - It is unclear whether or not the processors should omit MDS records in granules for which the attachment flag is set.

- *RAL SPR 16*

  Missing VISCAL GADS in L1b IPF products.

- An observation about the change to the null value for dsr_time used in the AST and Meteo products.

- *Empty child product.*

  Some child products extracted from Level1b (TOA) product has unexpected exceptional values in the data set.

1.5.3.1.2 New SPRs since the last Cyclic Report

- *RAL SPR17*

  Empty SST % Cloud Coverage 50KM.
  In Level2 AR product (averaged product) Sea Surface Temperature (SST) the cloud coverage percentage is set to 0 for the 50KM cells. The cloud top temperature fields in the 50 km AST cell records are also in error.
  It does not happen for the 30arc minute cells.

- *RAL SPR 18*

  The NDVI in the 50 km AST cell records is not consistent with the 30 arc minute cell values from the same region. This turns out to be because an incorrect exception value is being used for the mean NDVI and for the standard deviation of NDVI in the 50 km AST cell records. The value -1 is being used in place of the correct exception value of -19999. Thus although the NDVI data is correct where it is valid, the incorrect exception value means that invalid NDVI values in the 50 km cells could be mistaken for valid data.

1.5.3.2 SPR closed

The SPRs 17 and 18 will be fixed in the next version of the processor, planned in October/November.

All other SPRs are currently still under investigation.

1.6 Calibration/Validation activities and results

1.6.1 Calibration

The seven channels of the AATSR instrument are calibrated in two different ways. The thermal channels (3.7 μm, 11 μm, 12 μm) are calibrated using two onboard black bodies; the visible and near-infrared channels (0.56 μm, 0.66 μm, 0.87 μm and 1.67 μm) are calibrated using an onboard solar diffuser system referred to as the VISCAL. Further details of the calibration of AATSR can be found in the AATSR Product Handbook [1]. Prior to launch, the instrument underwent a rigorous pre-launch calibration campaign [2]. In order to maintain the calibration of the instrument, continuous monitoring of the black bodies and the VISCAL system is also performed in-flight. Currently, the operation of the black bodies and the VISCAL system is nominal and no calibration-related anomalies have been reported (see Section 1.5) apart from the anticipated need for routine out gassing to remove contamination from the visible FPA relay lens. The application of the visible calibration algorithm in the processor has been thoroughly checked and is reported as correct.

So far, several groups have been working on the calibration of the visible channels. A meeting was held in London on 11 July 2003 to discuss their progress to date. Three analysis methods are currently being pursued:

1. Vicarious validation and long-term monitoring of visible channel reflectance's over desert sites and Greenland (Smith – RAL, Hagolle – CNES)
2. Inter-comparison of uncorrected visible reflectance measurements with similar measurements from other sensors including, ATSR-2, GOME and SCIAMACHY (Stammes – KNMI, Kerridge – RAL)
3. Calibration of visible measurements using cloud targets (Poulsen – RAL).

The main conclusions on visible channel calibration from the meeting were:

- AATSR agrees well with MERIS over desert sites (R_{AATSR}/R_{MERIS} = 1.041 (0.56 μm), 1.001 (0.66 μm), 1.037 (0 .87μm)
- Significant differences between AATSR/MERIS and ATSR-2 are observed over desert sites in the order of 8% - 13% depending on the channel.
- Results from the inter-comparison with other sensors conducted by Kerridge et al show lower discrepancies between ATSR-2, GOME and AATSR. However, only a limited number of comparisons have been performed owing to a delay in issuing SCIAMACHY data for this study.

Two different methodologies were presented on comparing ATSR-2 and AATSR, with some results showing good agreement and other results showing poor agreement. Reasons for this apparent difference in opinion have not yet been established and ongoing analysis is currently being carried out by the groups concerned.

1.6.2 Validation

The primary goal of the AATSR instrument is the determination of SST at an accuracy required for climate change studies (± 0.3 K). To show that AATSR is achieving this target, a comprehensive validation campaign is being carried out. The campaign is made up of two parts: 1) An initial validation campaign to show that AATSR is meeting its target requirements following launch, and 2) ongoing validation to show that AATSR is achieving its target accuracy throughout the lifetime of the mission. Currently, the initial validation phase is approaching conclusion, with a discussion workshop in October 2003 (see section 1.7).

The validation of the SST product involves a comparison of retrieved SST values on two levels. Two research groups (the UK Met Office and the University of Leicester) have been comparing monthly global SST values, at a resolution of 0.5°. An example monthly mean global SST plot is shown in Figure 1.6.2.1.

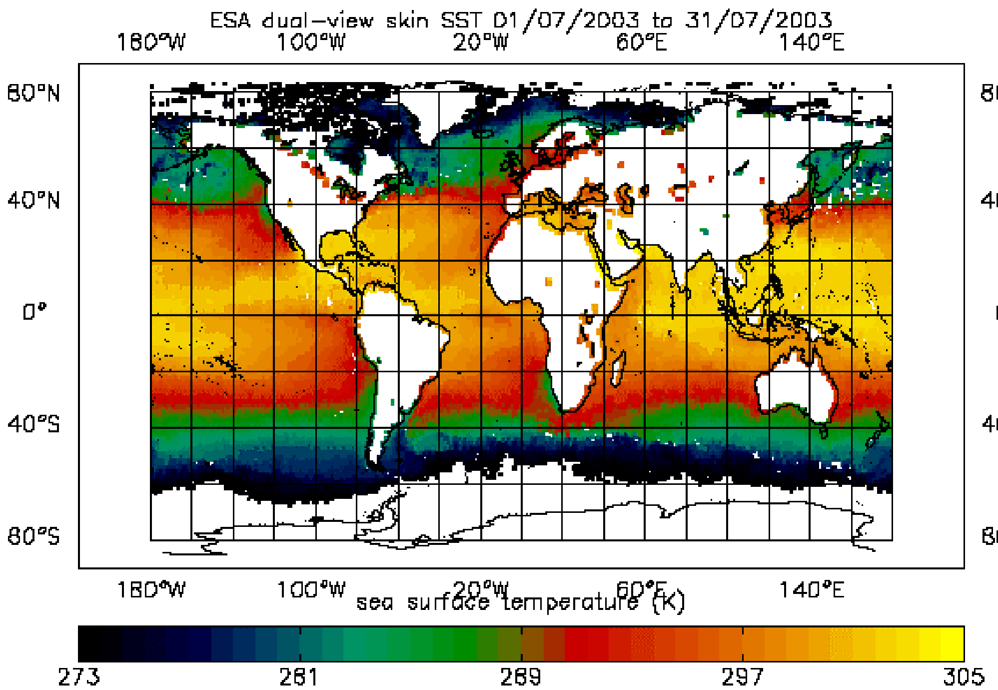

Figure 1.6.2.1: Monthly mean global SST for July 2003. Image provided by the UK Met Office.

Using the above data, the UK Met Office has done a comparison with data collected from a network of buoy SST values, the results for July 2003 being shown in Figure 1.6.2.2. [The number of match-ups contributing to the statistics is shown in Figure 1.6.2.3]. In July 2003, there were 669 match-ups in total, with a mean (ESA operational dual-view skin SST minus buoy SST) of 0.015 K, standard deviation 0.536 K, and a mean (dual-view bulk SST minus buoy SST) of 0.162 K, standard deviation 0.506 K.

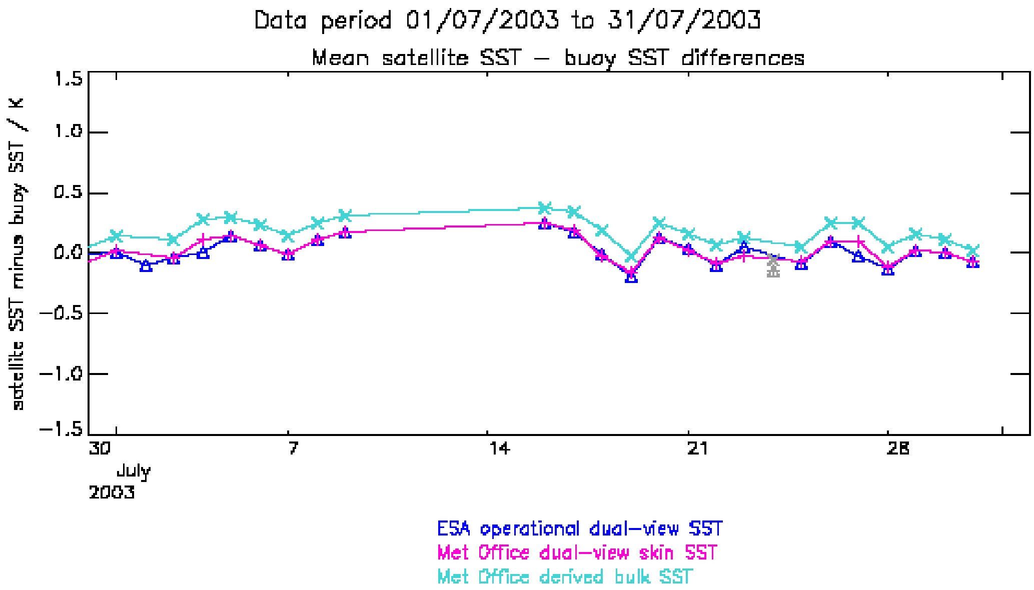

Figure 1.6.2.2: Comparison of daily mean difference between AATSR SST and buoy SST for July 2003. Image provided by the UK Met Office.

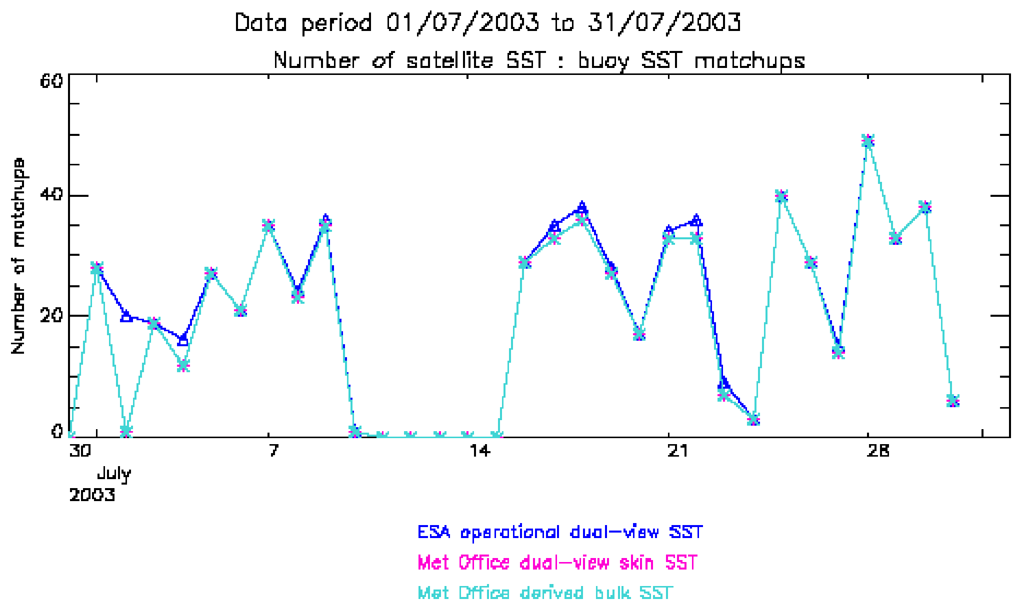

Figure 1.6.2.3: Plot of number of match-ups contributing to Fig. 1.6.2.3. Image provided by the UK Met Office.

The UK Met Office has performed the above analysis for all months from August 2002. The results show that the monthly mean AATSR SST product is within the required accuracy of ± 0.3 K, globally.

Separate to the global analysis, and essential for confirming the absolute accuracy of the retrieved AATSR SST values, several validation scientists have been collecting high-precision in-situ SST values using high-precision radiometers. So far data have been collected by:

- Barton – CSIRO, using the DAR011 radiometer in waters around Australia
- Minnett – RSMAS, using the MAERI radiometer on several vessels, notably on a Caribbean cruise liner
- Robinson & Donlon – SOC, using an ISAR radiometer on the M/V Pride of Bilbao operating across the Bay of Biscay
- Nightingale – RAL, using the SISTeR radiometer in the Indian Ocean (one cruise)

A large number of clear sky match-ups have been obtained so far (~ 35), but only a few have been fully quantified so far. A summary of the difference between AATSR and the precision radiometers for all match-ups quantified to date is shown in Figure 1.6.2.4.

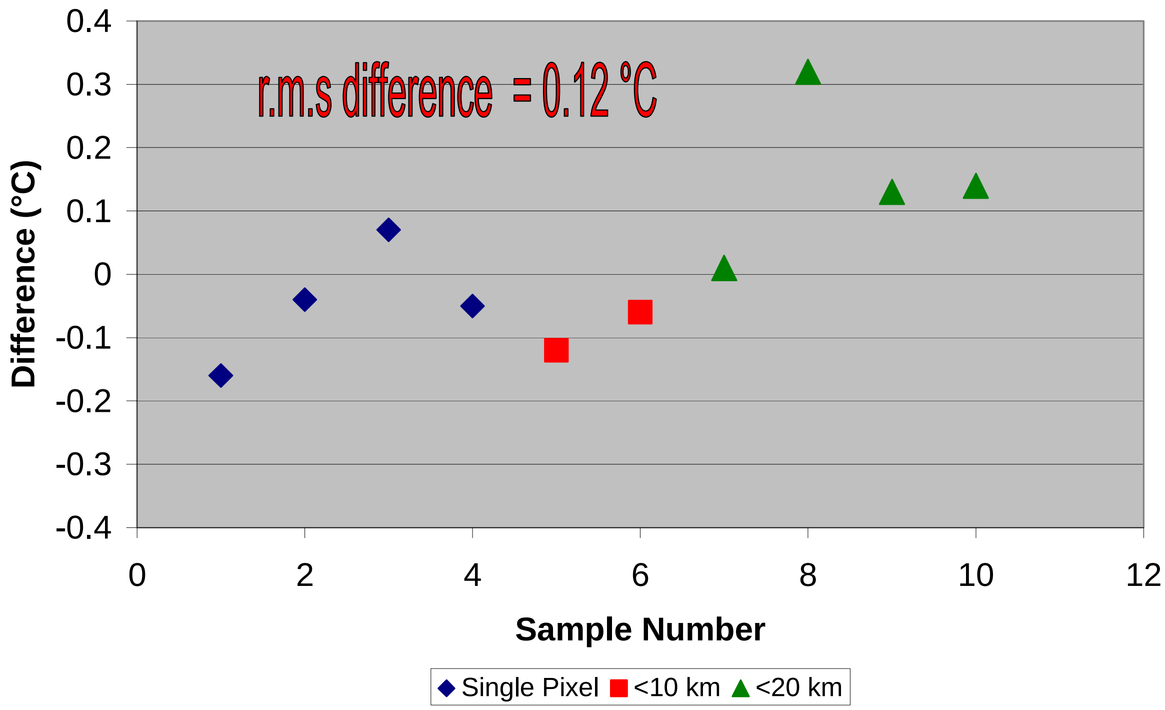

Figure 1.6.2.4: Plot showing difference between AATSR and precision radiometers.

The data presented in Figure 1.6.2.4, on the whole, represents a small absolute SST range covering 24 °C to 28 °C. Only one match-up has been quantified so far outside this range, around 12 °C, and is represented by point number four in Figure 1.6.2.4.

1.6.2.1 Validation Summary

There are no issues of serious concern at this stage about the global accuracy of AATSR data based on the validation data collated so far.

Validation of the AATSR METEO product from August 2002 - July 2003 against buoy data and SST analysis fields, demonstrates that AATSR retrievals of SST are accurate to within 0.3 K globally.

Validation results from precision radiometer match-ups show a r.m.s. difference between AATSR SST data and *in situ* skin SST data of <0.2 K.

1.7 General information

A MERIS/AATSR Validation Team meeting will be held at ESRIN on October 20-24. The results from the validation team will be presented.