Investigation into ATSR-1 and ATSR-2 data availability

	Name	Organisation	Signature and date
Prepared	A Smith	RAL	Digitally signed by Andy Smith DN: cn=Andy Smith, o=RAL Space, ou, email=andy.smith@stfc.ac.uk, c=GB Date: 2017.01.17 16:36:36 Z
Checked	H Kelliher	Space ConneXions Limited	
Approved		RAL	

Science and Technology Facilities Council
Rutherford Appleton Laboratory
Harwell Science and Innovation Campus
Didcot
Oxfordshire OX11 0QX
United Kingdom

Distribution

Name	Organisation
ATSR team	RAL Space
Hugh Kelliher	Space ConneXions Limited
Ruth Wilson	Space ConneXions Limited
Miguel Martinez-Boti	BEIS
ATSR QWG	Various

Change Record

Issue	Date	Description
0.1	24-Aug-2016	First complete draft
0.2	26-Aug-2016	Updated following checks by Space Connexions Limited
1.0	26-Aug-2016	Issue 0.2 updates accepted. Prepared for distribution as Issue 1.0.
1.1	13-Jan-2017	New issue to record continued checks on each mission, beyond 1st 2 years of operation. Re-structured for clarity, e.g. sections on initial sample processing moved earlier, to follow investigation approach.
2.0	17-Jan-2017	Checked by Space Connexions and prepared for issue.

Table of Contents

1 Scope of Document

This Technical Note describes the work performed by RAL Space to investigate the availability of ATSR-1 and ATSR-2 data for periods where there are gaps in the current archive of UBT and higher-level products.

This work is performed as Work Package 4.4 of the proposal described in [AD 1].

2 Terms, Definitions and Abbreviations

2.1 Acronyms

ATSR	Along-Track Scanning Radiometer
CRC	Cyclic Redundancy Check
DSI	Data Services Initiative
ERS	European Remote Sensing satellite
IDL	Interactive Data Language (data manipulation and graphics software)
QC	Quality Control
SADIST(-2)	Synthesis of ATSR(-2) Data Into Sea surface Temperature (RAL software to process Level 0 ATSR data from tape into UBT products)
SET	SUPPLE pre-processor
SUM	SUPPLE main processor
SUPPLE	Sadist UBT Processor Linux Environment. Linux-ported version of the SADIST L0 to UBT processor software
TOA	Top of Atmosphere
UBT	Ungridded Brightness Temperature (Level 1 ATSR product, generated at single-scene spatial coverage, 512x512km)
YSM	Yaw-Steering Mode

3 Documents

3.1 Applicable Documents

Ref	Title	Document code	Version	Date
AD 1	ATSR Satellite Dataset Supporting Activities, 2014 - 2017	Proposal 2014-07-001 (response to DECC ITT : TRN 829/06/2014)	2	28-Jul-2014
AD 2	(A)ATSR Validation Activities, validation Issues Report	UL-AATSR-VIR	5B	29/11/2014
AD 3	ATSR-1 anomaly log	http://www.atsr.rl.ac.uk/satellite/logs/anomaly/archive/ers-1/index.shtml	n/a	n/a
AD 4	ATSR-2 anomaly log	http://www.atsr.rl.ac.uk/satellite/logs/anomaly/archive/atsr-2/index.shtml	n/a	n/a
AD 5	SADIST-2 v100 Products	ER-TN-RAL-AT-2164		06-Sep-1995
AD 6	ATSR-1/2 User Guide	http://www.atsr.rl.ac.uk/documentation/docs/userguide/index.shtml	1.0	15 June 1999
AD 7	ATSR Operations Log Book	n/a (hand-written ATSR-1 log)	n/a	July 1991 – March 2000
AD 8	ERS-1 anomaly log	http://www.atsr.rl.ac.uk/satellite/logs/anomaly/archive/atsr-1/index.shtml	n/a	n/a

3.2 Reference Documents

Ref	Title	Document code	Version	Date
RD 1	Filezilla home page	https://filezilla-project.org	n/a	n/a
RD 2	Investigation into ATSR-1 uncalibrated brightness temperatures	PO-TN-RAL-AT-0572	1.0	05-Aug-2016
RD 3	Investigations into ATSR-1 1.6 & 3.7μm channel switching	PO-TN-RAL-AT-0571	Draft	TBD
RD 4	33rd AATSR Quality Working Group Minutes	AATSRESL.MIN.009	1.0	31-Oct-2016

4 Overview

The proposal [AD 1] describes this work package as follows:

“Unlike earlier versions, the v3.0 archive offers the opportunity to identify missing input (UBT) data at both the orbit and sub-orbit levels. This can be done by scanning the improved pre-processor log files to provide the UBTs per orbit product. The results from this activity would then need to be compared with ESA’s L0 (disk-based) archive to see how much, if any, available L0 data is yet to be processed, and how much is really unavailable at L0.”

The validation report [AD 2] makes more specific references to data gaps:

“Noticeable gaps have been reported at the start of the ATSR-1 mission (during the eruption of Mount Pinatubo) and also at the start and end of the ATSR-2 mission.

Most of the data gaps appear in the commissioning phase of the parent spacecraft (ERS-1 for ATSR-1 and ERS-2 for ATSR-2) when both platform and instrument operations were highly variable. Consequently, the observed data gaps may be times when the instrument was off or in a non-standard mode.”

In practice, a direct, detailed comparison between UBT products and available Level 0 files is not straightforward. The ATSR-1 and ATSR-2 UBT products are “scene-based” rather than orbit-based. Each product contains 512 consecutive scan lines, with approximately 80 separate products per orbit. The Level 0 files are approximately orbit-based, presumably containing all data available from a single downlink transmission, with a filename containing the start and end acquisition times of the data. UBT products are identified by the orbit ascending node time and the along-track distance of the scene, rather than by acquisition time (although the start and end acquisition times are present in the product header). As a result, it is not straightforward to compare the time coverage of UBT and Level 0 products. The number of source packets or scans in a Level 0 product may be estimated from the file size, but there is no summary information regarding missing or duplicated source packets. It is therefore difficult to determine whether there are gaps in the data in a Level 0 file, or where the gaps occur, without processing the entire file and making checks at the individual packet level.

The work package was intended to identify available Level 0 data primarily at the orbit level, as stated above. For this reason, several different approaches have been attempted.

1) A listing of all UBT files used as input to the v3.0 processing was generated by recursively searching all the processing logs. This listing was passed to DSI in order to allow a detailed comparison with their Level 0 database, if a means could be found.

2) The NEODC holds a Postgres database of all UBT products, which was used as the starting point for APP processing. This entire database was dumped to an ASCII file and was passed to DSI, again for possible comparison with their L0 database.

3) A recursive search of the NEODC UBT archive was scripted. The script reports days for which fewer than 14 orbits are present. The resulting log can be compared with (a sample of) the DSI consolidated data set available by FTP, to try to identify at a fairly high level where gaps might be filled.

5 Investigations

5.1 Investigation approach

As noted in section 4, listings of the UBT files processed in v3.0 and of the Postgres database of UBT files held by the NEODC have been generated and passed to DSI, in order to allow investigation of possible means of comparison with the consolidated Level 0 archive from the recent re-transcription by ESA. This section therefore focuses on the 3rd approach taken, i.e. looking for days where UBT data for fewer than the expected number of orbits are archived.

A Linux shell script was written to descend the NEODC UBT archive directories recursively for a specified year and list the available UBT files. Based on the listing, the script derives and reports the number of UBT product files and the number of distinct orbits for which UBT products exist on each day. The script generates distinct log messages for any day directory where there are no UBT files or where the number of orbits is fewer than 14. There is no check on the "completeness" of each orbit (there are approximately 80 UBT products in a complete orbit, whereas the script only determines the orbits for which 1 or more UBTs are present), so the log messages give only a general indication of the archived data availability per day.

An example listing for part of August 1991 is shown below

91/08/07: 1192 UBTs and 15 orbits
91/08/08: 1110 UBTs and 14 orbits
91/08/09: 1027 UBTs and 14 orbits
91/08/10: no data
91/08/11: no data
91/08/12: no data
91/08/13: no data
91/08/14: 139 UBTs and 2 orbits
91/08/14 missing orbit(s)? nOrbits 2
91/08/15: 1110 UBTs and 14 orbits

In this example, the two listing entries for 91/08/14 show that (1) there are 139 UBT scene products in the archive, from 2 distinct orbits and (2) there are potentially missing orbits on this date because "nOrbits" found is 2. Logging the information on two separate lines aids filtering by standard Linux tools.

Based on the listing, any day for which missing data are reported can be checked against the ATSR-1 or ATSR-2 anomaly log ([AD 3] and [AD 4]) and, if the log indicates that the instrument was operating, the Level 0 data set can be checked for available files. N.B. the anomaly logs are not available for the entire missions for either ATSR-1 or ATSR-2. The early part of the ATSR-1 mission is covered by a single statement that from 16 July 1991 to 14 Sept 1991 is the commissioning period. The earliest entry in [AD 4] is from June 1998.

RAL has (at the time of the investigation) access to Level 0 data from the DSI re-transcription of Matera ERS data for ESA, via the CEMS (commercial) FTP server. It is therefore possible to search for any missing days' data in the DSI Level 0 archive. Since the access method is restricted to FTP, the archive search has been done manually and is quite time-consuming, although this task is made easier by the availability of visual FTP tools such as FileZilla [RD 1] e.g. FileZilla allows the user to set up filters which can be used to exclude duplicate Level 0 files or to select Level 0 filenames containing a specific version number. Given the manual nature of the task, it makes sense to prioritise the days with the largest amount of data missing.

It may be possible to automate the FTP search for Level 0 files by scripting, but the comparison must take account of the possible presence of multiple versions of Level 0 files for the same period, files with overlapping time ranges, or duplicate files.

The comparisons performed to date take no account of which orbits are present in either the UBT or Level 0 archives; only the number of Level 0 products and total number of orbits of UBT are compared. The presence of more Level 0 files than UBT orbits may imply that new UBT products can be generated, but there is no guarantee that a Level 0 product corresponds to a whole orbit. If UBT products exist for fewer than 14 orbits

and fewer than 14 Level 0 products are available on a given day, there is no guarantee that the same orbits are present.

The availability of Level 0 files does not always imply that new ATSR UBT products can be generated. For example, there are periods within the DSI re-transcription data set where Level 0 products exist when it is known that ATSR was not operating. It is also possible that if ATSR data are present, the pixel map used or the operating mode of the instrument may make it impossible for SUPPLE to process the data to UBT.

5.2 Level 0 versions and data quality

During the initial part of the investigation sample periods of data were transferred for processing in order to check the possibility of generating valid UBT products for the missing data periods, and to give an indication of the amount of data that might be recovered. Days were found in the Level 0 data set where products were available with more than one version. In many cases there appears to be a full set of products for one version and a small number of additional products of a different version. E.g. for ATSR-1 in 1991 the version which is most commonly available is 8700. There are days for which version 8700 L0 products are available for most or all of the day, while a small number of files are also present from a later version 9120. In such cases, the most obvious approach is to take the most complete data set. For other days, a complete day's data may be present in 2 different versions. Sample processing demonstrated that, while the version 9120 data are generated by more recent software, which might be expected to include improvements, the resulting Level 0 products are more prone to missing source packets, possibly due to reading from tape sources that have aged between transcriptions.

Based on the results of sample processing reported here and in [RD 2] the quality of the different available Level 0 versions was discussed at the (A)ATSR QWG meeting in September 2016 [RD 4].

In addition to Level 0 products being available with different versions, it is common to find overlapping Level 0 products. These overlapping products may have the same or similar start or end times. Often one Level 0 product exists with approximately a full orbit of data while additional products cover only part of an orbit. The resulting UBT products have overlapping time ranges but may have different starting along-track distances, so the overlap may be inexact. Scripts have been written to list the UBT products generated from Level 0 processing and to flag orbits where there is potential duplication of data or overlap of products. In the most extreme cases there may be over 150 products for an orbit as opposed to the expected number, approximately 80. It is assumed that it is advisable to minimise overlaps in the UBT archive in order to reduce both the total amount of data archived and the number of overlapping products the Level 1B processor must deal with.

The procedures to check UBT data have evolved over the course of the processing, but in general, checks for duplication have been performed based on the scripts above, combined with sample visual inspection of images. In most cases of overlap, no noticeable difference in quality between overlapping products is detected, although there are sporadic cases where two overlapping Level 0 products of the same version generate UBT products with considerably different rates of missing or corrupted scans.

5.3 ATSR-1 initial sample processing

FileZilla was used to search the FTP directories for Level 0 files for sample days listed as having no archived UBT data. Sample periods were then transferred from the FTP server and processed using SUPPLE.

Checks on the quality or validity of the processed UBT files can be done in several ways. Where possible, tools developed for other work packages such as that described in [RD 2] have been used in data checks in order to minimise development effort.

1. The number of UBT products generated per Level 0 file and the size of those products can give a first indication of the level of success.
2. Visual inspection of scenes using IDL provides a quick way to check general data quality, missing scan lines etc. Given the number of channels and the ATSR dual view, inspection is limited to a

sample of data from each product and to a sample of the available UBT products. Checking a whole day's data is possible but time-consuming.

3. Inspection of the SUPPLE log files gives an indication of the data quality or problems. The pre-processor (SET) log records the number of packets "padded", i.e. where null packets are inserted because of missing source packets, and the first and last relative scan numbers, from which the maximum possible number of source packets present can be calculated. The main processor (SUM) logs progress and errors. However, the amount of output per Level 0 file is large: e.g. for the data on 15-Oct-1991, the 16 SUM.log files generated by the main SUPPLE processor varied from about 13,000 to 33,000 lines each. Filtering to remove the "routine" status and low-level error messages is necessary. Standard Linux tools such as grep and awk have been used to filter the log file content and calculate totals.

The ATSR-1 archive for 1991 was checked as the first priority, as [AD 2] makes specific mention of the commissioning period and Mount Pinatubo eruption. The results of the initial sample processing are listed in Table 1. The column "L0 available" represents the number of Level 0 products in the DSI consolidated data set. Note that the consolidated Level 0 data set excludes products which are complete duplicates (these product files are denoted by an additional ".1", ".2" etc at the end of the filename). These duplicate files are therefore not returned by the search but there may be more than one product with the same times and different orbit numbers in the filename. Columns "L0 processed" and "UBTs generated" show the sample days processed and the number of UBT scene products generated for each day. For details of data quality checks on these days' data see 5.3. The results of full processing are reported in the appendices at the end of this document.

In general, days with no data or a small number of orbits archived were given priority, although in the case of 1991 the total number of days to check is small.

Date	Missing data status	L0 available	L0 processed	UBTs generated	UBT quality? / Comments
91/07/31	missing orbit(s)? nOrbits 2				[AD 7] notes instrument functional test starts 01-Aug. No Level 0 data before 31 July.
91/08/10	no data	16	Yes	1112	Blackbody temperatures not stabilised? [AD 7] records commanding of blackbody heaters and temperature monitoring up to 16-Aug. 3.7μm pixel data may also be missing up until 13-Sep-1991.
91/08/11	no data	14			
91/08/12	no data	14			
91/08/13	no data	15			
91/08/14	missing orbit(s)? nOrbits 2	13			
91/09/10	missing orbit(s)? nOrbits 13	12			13 orbits archived, 12 at L0 – same orbits?

Date	Missing data status	L0 available	L0 processed	UBTs generated	UBT quality? / Comments
91/09/13	missing orbit(s)? nOrbits 10	10			
91/09/14	missing orbit(s)? nOrbits 10	14			Within “missing” 1.6µm data period. To be reprocessed.
91/10/15	no data	15	Yes	1283	No problems detected (missing 1.6µm data as noted above)
91/10/16	no data	14			Within “missing” 1.6µm data period.
91/10/17	no data	14			As above
91/10/18	no data	15			As above
91/10/19	no data	14			As above
91/10/20	no data	14			As above
91/10/21	no data	15			As above
91/10/22	missing orbit(s)? nOrbits 2	14			As above
91/10/24	no data	15			As above
91/10/25	no data	14	Yes	1116	As above
91/10/26	missing orbit(s)? nOrbits 1	14			As above
91/10/28	missing orbit(s)? nOrbits 13	15			As above
91/10/29	no data	14			As above
91/10/30	no data	15			As above
91/10/31	no data	14			As above
91/11/01	missing orbit(s)? nOrbits 1	13			As above
91/11/12	missing orbit(s)? nOrbits 13	14			As above
91/11/13	missing orbit(s)? nOrbits 1	14			As above
91/12/11	missing orbit(s)? nOrbits 12	0			ERS-1 performing orbit manoeuvres to change from Commissioning Phase (3 day) to Ice Phase (3 day) orbit.

Date	Missing data status	L0 available	L0 processed	UBTs generated	UBT quality? / Comments
					Within “missing” 1.6µm data period.
91/12/12	missing orbit(s)? nOrbits 12	0			Within “missing” 1.6µm data period.
91/12/19	missing orbit(s)? nOrbits 13	0			As above
91/12/22	missing orbit(s)? nOrbits 13	0			As above
91/12/25	missing orbit(s)? nOrbits 13	0			As above

Table 1: Results of the check for missing ATSR-1 data in 1991, including sample days processed from Level 0 to UBT during the initial investigation.

For the 2 large missing data periods in August and October 1991 there are significant numbers of Level 0 products available to fill the gap, potentially allowing recovery of approximately 21 days’ data. However, August 1991 falls during the early part of commissioning, during which the instrument configuration is not stable and pixel data may not be present at all times.

It is also notable that there is a period in December 1991 where there are no Level 0 products at all, despite the fact that UBT data exist in the archive. Comparisons of the DSI Level 0 data set with the archive listings were continued into 1992, although in this case no sample days were processed during the initial investigation. The full listing of missing data days for 1992 is included in Appendix A.

5.3.1 10-Aug-1991

The archive checking script reported that no UBT files were present for 10-13-Aug-1991 and files from only 2 orbits (or parts of) were present on 14-Aug-1991.

Level 0 files, version 8700, were found for all days in the period 10-14-Aug-1991. In this case only one Level 0 version is present (see [RD 2] for discussion of available Level 0 versions and data quality), which simplifies the decision over which files to use as the input for processing to UBT.

A sample day’s Level 0 data for 10-Aug-1991 was downloaded and processed using the SUPPLE Level 0 to UBT processor. 1112 UBT products were generated, equivalent to almost 14 orbits.

The output UBT products from 2 Level 0 files were inspected visually using IDL (nadir views for the 12µm, 11µm and 1.6µm channels were inspected; it is assumed that if the nadir view data looks nominal the forward view is also free of anomalies as both views are extracted from the same source packet). Many scenes were present with no apparent data quality issues. There were scenes in parts of the orbit where data artefacts or corruption were present, but these features are found in many archived UBT products. Figure **1** shows two example scenes from this day’s data.

Nonetheless, these data may not be suitable for all science use because the instrument was undergoing commissioning activities. As shown in Figure 2, the warm and cold blackbody signals in the 12µm channel appear to be inverted: the warm blackbody counts are lower than those from the cold blackbody. The blackbody temperatures plotted in Figure **3** show that the “cold” blackbody is, in fact, warmer than the “warm” blackbody at this point in the mission. [AD 7] records that the blackbody temperatures were being monitored and the blackbody heaters commanded during the period up to 16-Aug-1991. [AD 7] also records that between 07-Aug-1991 and 15-Aug-1991 compression mode tests were being performed.

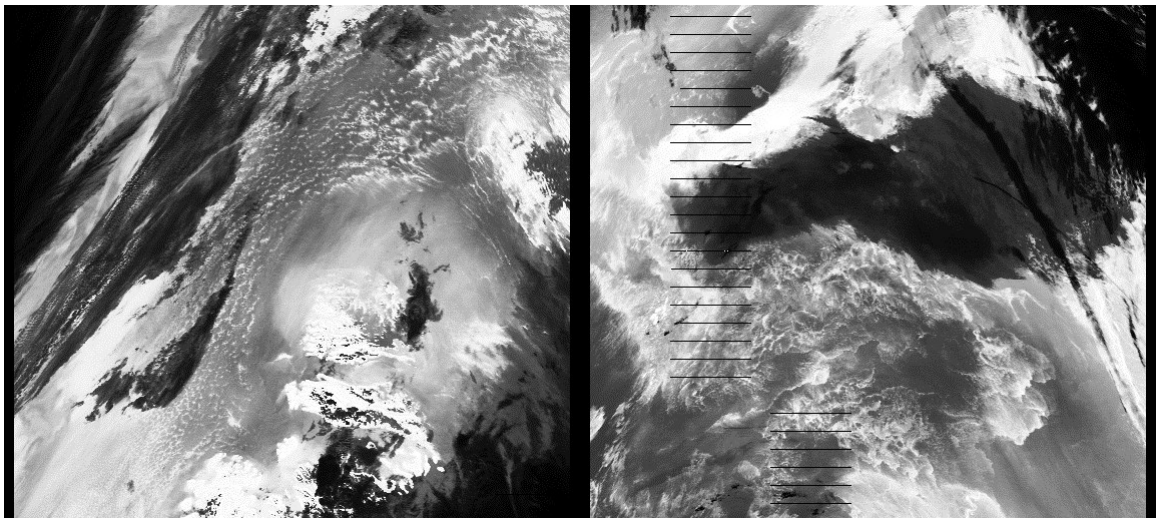

Figure 1: Two 11µm nadir-view scenes from UBT products generated from Level 0 data from 10-Aug-1991. Left: apparently valid brightness temperatures (ralubt-9108101517-11914) and right: examples of data artefacts (ralubt-9108101658-07411).

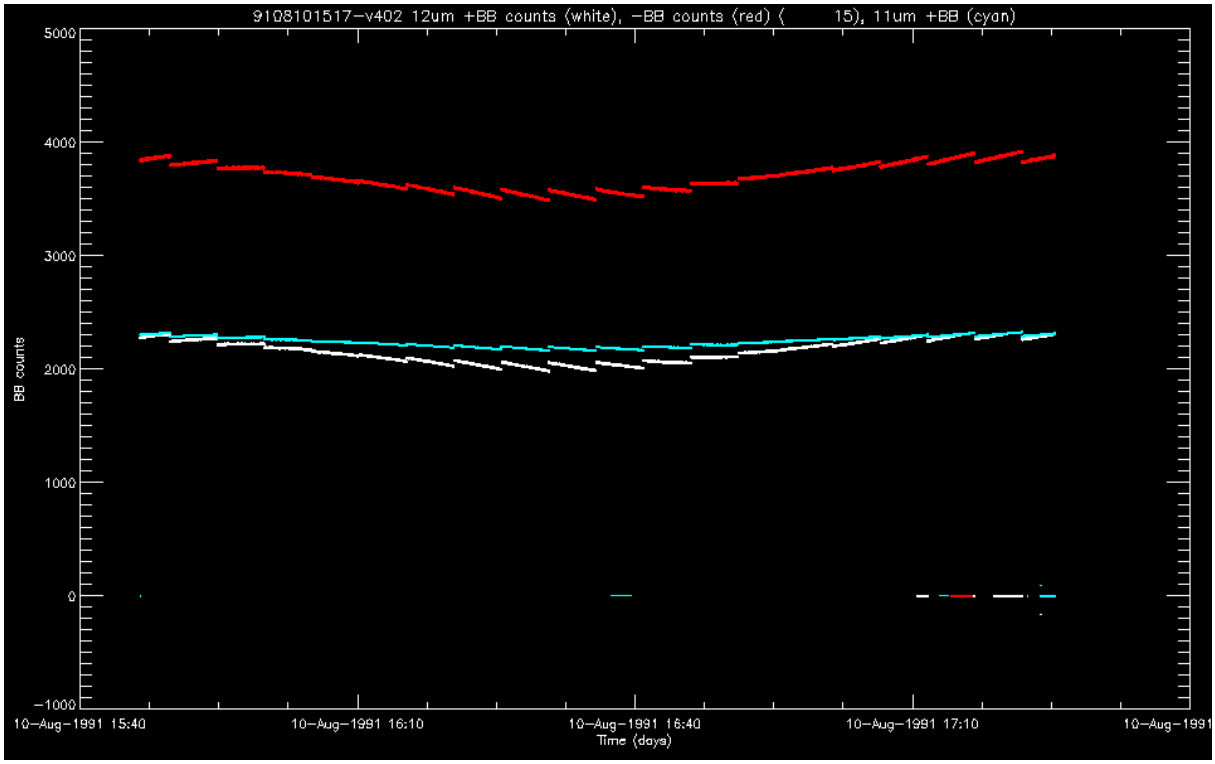

Figure 2: Blackbody counts from orbit with ascending node time 19910810 15:17. The plotted curves are the 12µm warm blackbody (white), the 12µm cold blackbody (red) and the 11µm warm blackbody (cyan).

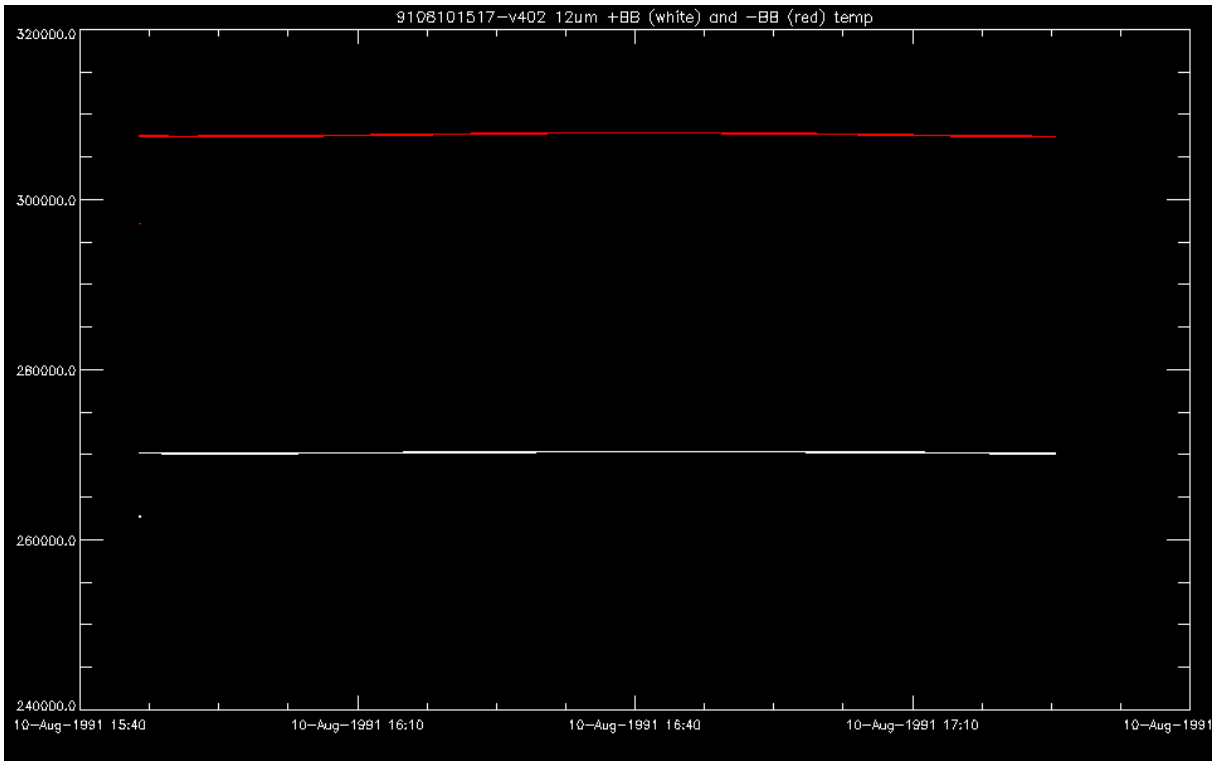

Figure 3: Blackbody temperatures from orbit with ascending node time 19910810 15:17. The plotted curves represent the "warm" blackbody (white) and "cold" blackbody" (red).

The SUPPLE pre-processor log reports the numbers of missing packets and possible total number of scans per Level 0 file (or orbit, approximately) listed in Table 2 for the 10-Aug-1991 data.

Start and end times from L0 filename	Missing packets padded	Total (possible) scans	Number of UBT products generated
19910809T224656_19910810T002531	4819	39737	78
19910810T011924_19910810T021414	331756	114681	0
19910810T021346_19910810T035333	605	40507	80
19910810T035310_19910810T053636	526	41896	82
19910810T053604_19910810T073144	11443	46363	91
19910810T073121_19910810T091359	322	41364	81
19910810T091332_19910810T105357	171	40335	79
19910810T105332_19910810T123222	269	39792	78
19910810T123158_19910810T140958	1721	39212	77
19910810T140934_19910810T154746	2934	39302	77
19910810T154722_19910810T172618	1131	40699	80
19910810T172554_19910810T190437	330	39804	78
19910810T190502_19910810T204455	288	40239	79

Start and end times from L0 filename	Missing packets padded	Total (possible) scans	Number of UBT products generated
19910810T204427_19910810T222422	255	40222	79
19910810T222355_19910810T235324	260	36054	71
19910810T235259_19910811T014047	8720	44009	86

Table 2: Counts of missing packets from Level 0 files for 10-Aug-1991

For many of the Level 0 files listed, the number of missing source packets detected is low, and in several cases is less than 1%. The file for 19910810T011924_19910810T021414 is clearly unusual: the duration is less than an hour and the number of apparently missing source packets is greater than the total number of scans present, as derived from the first and last relative scan numbers. The number of scans is itself about half of what would be expected from the duration. There are in fact 2 Level 0 files for this time period, with different orbit numbers (by 1). SUPPLE fails to generate any UBT files from either Level 0 file. The pre-processor logs a large number of "time delta anomaly" messages for these files, suggesting that a re-set may have been performed.

Despite the data quality issues reported above, as there are no existing UBT files for this period it is presumably desirable to process all the available Level 0 and archive the resulting UBT products.

5.3.2 15-Oct-1991

Between 15-Oct-1991 and 31-Oct-1991, there are 12 days with no UBT data archived. Of the remaining 3 days, 2 days have only 1 or 2 orbits and 28-Oct-1991 has 13.

14 or 15 level 0 files per day exist for this entire date range, with file version 8700. Files for 15-Oct-1991 were transferred and processed, generating 1283 UBT products.

The SUPPLE pre-processor logs show that in most cases the number of missed source packets padded is equivalent to approximately 1% of an orbit. The main processor logs do not appear to contain any severe errors after filtering of routine status and low-level error messages.

Visual inspection of sample scenes in IDL did not reveal any problems other than data corruption or artefacts in part of the orbit.

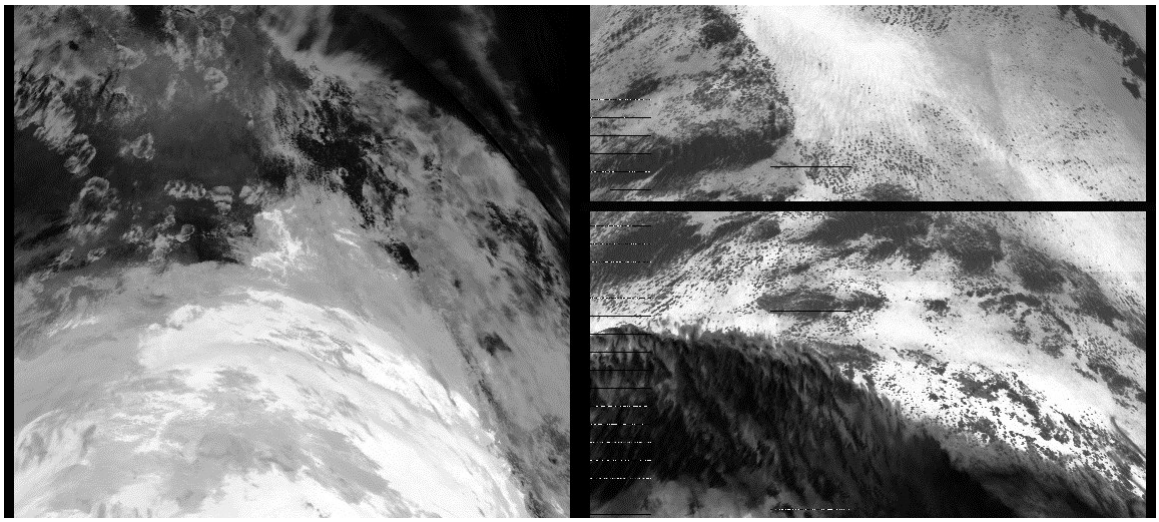

Figure 4: Two 11µm nadir-view scenes from UBT products generated from Level 0 data from 15-Oct-1991. Left: apparently valid brightness temperatures (9110150013-05256) and right: examples of data artefacts (ralubt-9110150153-03689).

Plots of the 12μm warm and cold blackbody counts and temperatures look nominal, as shown in Figure 5 and Figure 6.

Based on the limited set of quality checks performed the UBT products for this date appear to contain no major anomalies.

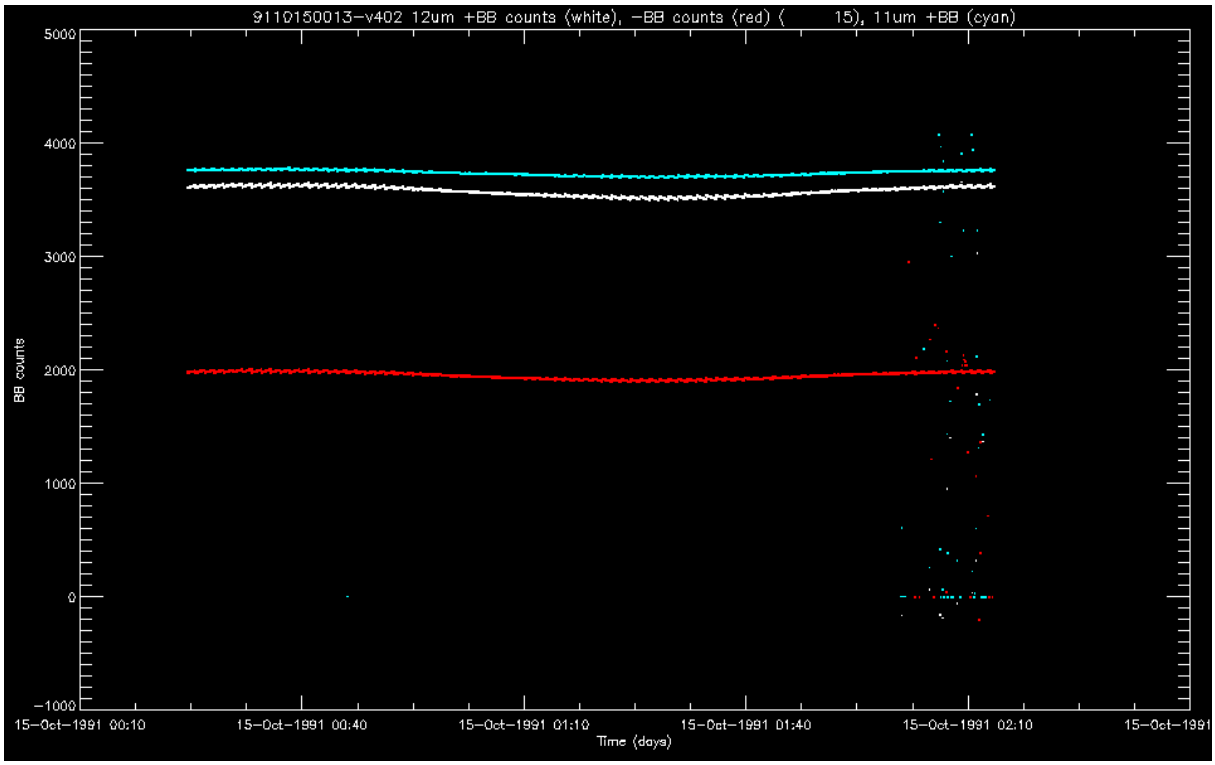

Figure 5: Blackbody counts from orbit with ascending node time 19911015 00:13. 12μm warm blackbody (white), 12μm cold blackbody (red) and 11μm warm blackbody (cyan).

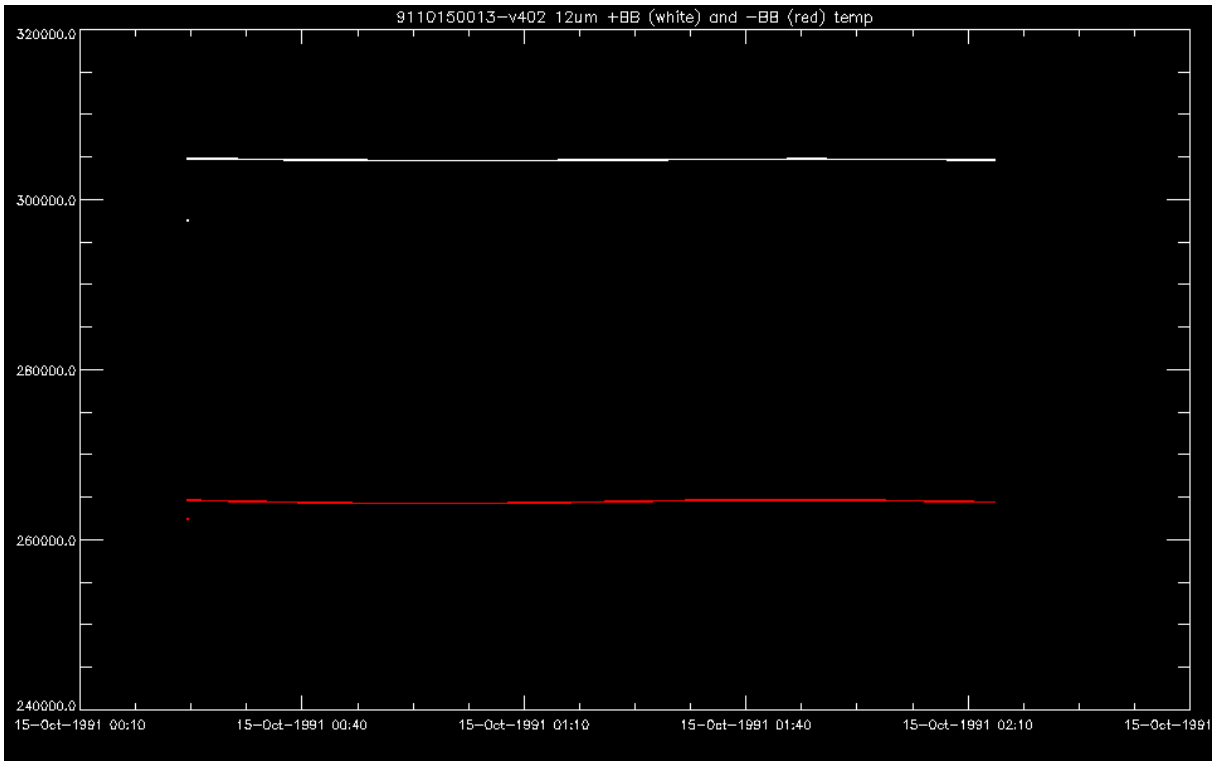

Figure 6: Blackbody temperatures from orbit with ascending node time 19911015 00:13. Warm blackbody (white) and cold blackbody (red).

5.3.3 25-Oct-1991

Due to the length of the period in October 1991 for which no UBT products are archived, additional Level 0 products from 25-Oct-1991 were transferred and processed. The data quality checks on logs files and visual checks in IDL produced similar results to the 10-Oct-1991 data.

5.4 ATSR-2 initial sample processing

Several days' Level 0 data from 1995 were transferred and processed using SUPPLE.

5.4.1 28-Apr-1995

No UBT products are present in the NEODC archive for this date.

9 Level 0 files are available, all with version 6210. From these files, 716 UBT products were generated.

The SET log reports close to 40,000 scans per Level 0 product and approximately 1000 scans padded with null packet data for each product.

The SUM logs report close to 40,000 scans per product with NIBBLE_SHIFT_DETECTED_ERR for these Level 0 products.

Visual inspection of a sample of scenes in IDL shows that no valid pixel data are present; all pixels are flagged -7: calibration unavailable. Plots of the blackbody counts in the 11µm and 12µm channels show that no blackbody data are available (see Figure 7).

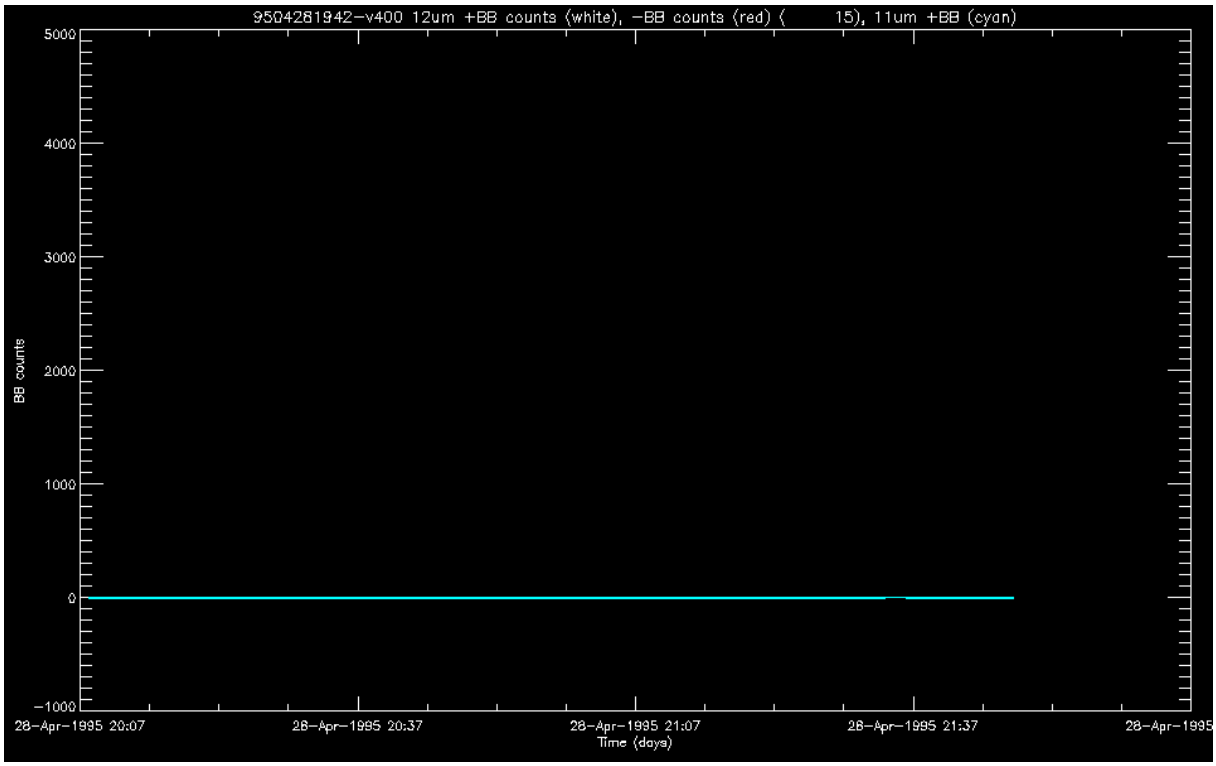

Figure 7: Blackbody counts from the 12µm and 11µm channels for ATSR-2 orbit 9504281942. As all counts are 0, the 12µm warm blackbody count (white) and cold blackbody count (red) are hidden by the trace for the 11µm warm blackbody count (cyan).

5.4.2 20-May-1995

No UBT products are present in the NEODC archive for this date.

17 Level 0 files are available, all with version 6210. From these files, 1134 UBT products were generated.

The SET logs report close to 40,000 scans per Level 0 product for the bulk of the products available and low numbers of scans padded with null packet data, with the exception of a small number of products which have only 1 scan present and 2 products which have 14,000 or 15,000 scans padded.

The SUM logs report up to 83 scans with RAWPKT_FAILS_BASIC_VALIDATION_ERR for most of these Level 0 products. The number of NIBBLE_SHIFT_DETECTED_ERR reported for these products is reduced to single figures per product.

No valid pixel data are present in the scenes inspected in IDL for this day. The blackbody counts in the 11µm and 12µm channels are 0.

5.4.3 21-May-1995

No UBT products are present in the NEODC archive for this date.

22 Level 0 files are available, all with version 6210 (several of these files have very small size and short duration). From these files, 787 UBT products were generated.

The SET logs report close to 40,000 scans per Level 0 product for the bulk of the products available and low numbers of scans padded with null packet data.

The SUM logs report a number of RAWPKT_FAILS_BASIC_VALIDATION_ERR for these Level 0 products, up to a maximum of 80 instances in one product.

No valid pixel data are present in the scenes inspected in IDL for this day. The blackbody counts in the 11µm and 12µm channels are 0 for the entire day.

5.4.4 24-May-1995

No UBT products are present in the NEODC archive for this date.

11 Level 0 products are available, all with version 6210. From these files, 800 UBT products were generated.

The SET logs report close to 40,000 scans per Level 0 product for the bulk of the products available and low numbers of scans padded with null packet data (mostly 100-200, maximum 4574).

The SUM logs report between 100 and 814 scans per product with HEX5_IRR_HRATE_MULTIPLE_ERR in 9 of the Level 0 products, a few hundred scans per product with NIBBLE_SHIFT_DETECTED_ERR and 30-90 instances of RAWPKT_FAILS_BASIC_VALIDATION_ERR per Level 0 product.

Visual inspection in IDL shows that apparently valid pixel data are present in the 11µm, 12µm and 1.6µm nadir views for all scenes checked from orbit 9505240922, for example.

5.4.5 28-May-1995

No UBT products are present in the NEODC archive for this date.

19 Level 0 files are available, all with version 6210. From these files, 1271 UBT products were generated.

The SET log reports close to 40,000 scans in each of the Level 0 products, except for a small number of products with between 1,000 and 4,000 scans, which may be duplicates.

The SUM logs report a number of scans from each Level 0 product where there are RAWPKT_FAILS_BASIC_VALIDATION_ERR, NIBBLE_SHIFT_DETECTED_ERR, HEX5_IRR_HRATE_SINGLE_ERR or HEX5_IRR_HRATE_MULTIPLE_ERR. The maximum number of HEX5_IRR_HRATE errors in any Level 0 file is 1399.

Visual inspection in IDL shows that apparently valid pixel data are present in the 11µm, 12µm and 1.6µm nadir views for all scenes checked from orbits 950528 00:33 and 950528 05:35 (other channels and forward view were not inspected).

The plotted blackbody counts also look nominal based on a cursory inspection, i.e. the 12µm warm blackbody counts are higher than the cold blackbody counts and the curves are regular.

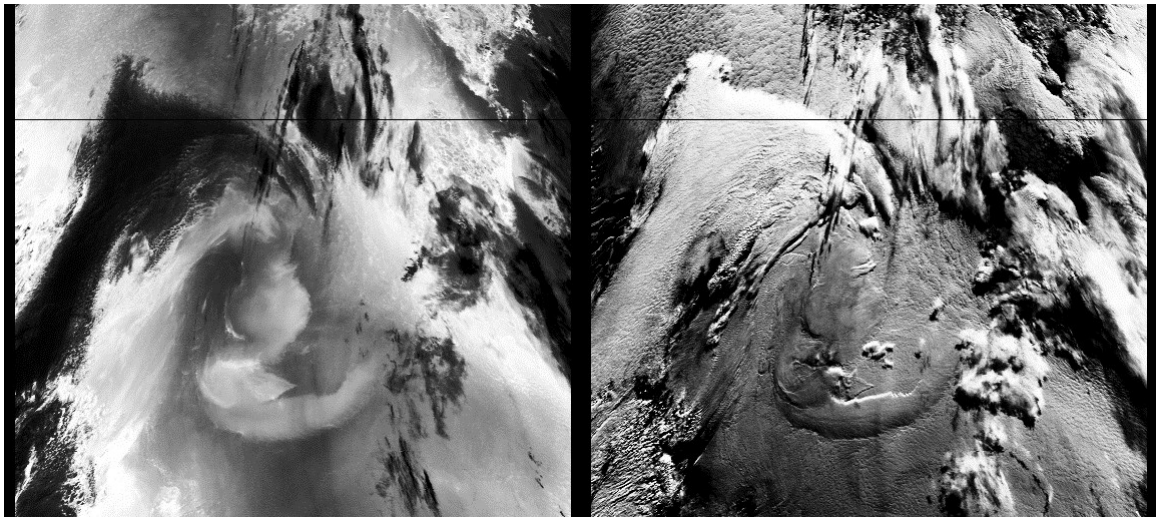

Figure 8: Nadir-view scenes from the ATSR-2 orbit at 950528 00:33, 11µm (left) and 12µm (right).

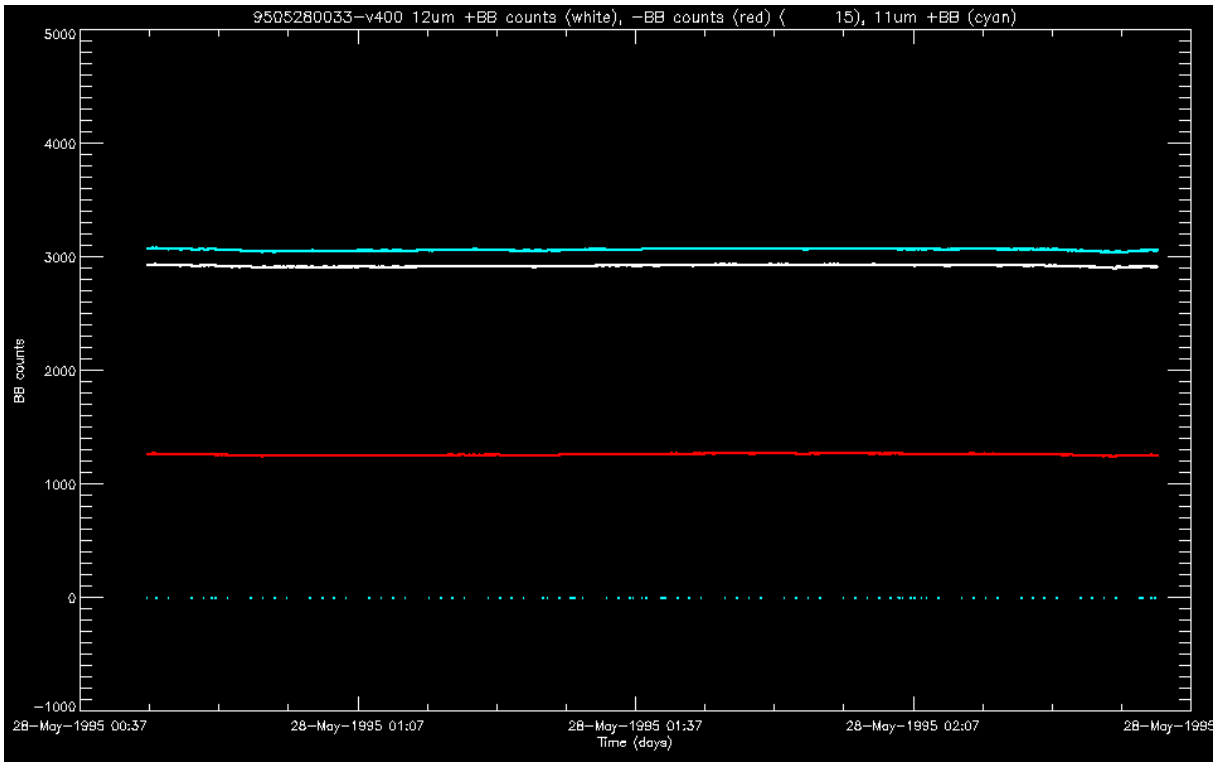

Figure 9: Blackbody values from the ATSR-2 orbit at 950528 00:33, processed by SUPPLE version 400. 12µm warm blackbody (white), 12µm cold blackbody (red) and 11µm warm blackbody (cyan).

5.5 ATSR-1 Level 0 data availability

The following sub-sections report in detail the processing performed for each year and the likely ability to fill gaps from the consolidated Level 0 archive for different periods of the ATSR-1 mission (at the time of writing all processing to UBT has been done but the resulting UBT products have yet to be merged with the archive). Detailed results of the sample processing of specific days are reported in section 5.3.

5.5.1 1991

For 1991, 29 days were listed as having UBT products archived for fewer than 14 orbits.

It should be noted that many of the days where data are missing in 1991 fall within the period of the 1.6/3.7µm channel switching investigation described in [RD 3]. The fix to the SUPPLE processor for this problem has now been validated and this entire period is to be reprocessed from Level 0, which will automatically lead to filling of data gaps wherever possible.

For the earlier part of 1991, prior to the channel switching problem, there were 8 days on which the UBT archive contained data from fewer than 10 orbits, and for which Level 0 products were transferred and processed. The Level 0 product version available is 8700.

5.5.2 1992

In January and February 1992, there are 13 days where the number of orbits in the UBT archive is less than 10 (in several cases only 1 or 2 orbits) and 13-15 Level 0 files are available. N.B. this period is within the range affected by the 1.6/3.7µm channel switching problem and due to be reprocessed in full [RD 3].

For later dates in 1992, days reported as having UBT products for fewer than 10 orbits have been checked against the Level 0 data set. All the days reported as having no archived UBT data correspond to events in the instrument anomaly log [AD 3], such as outgassing or ATSR in standby.

4 days of Level 0 data from the later part of 1992 have been processed to UBT.

From April 1992, there are 2 or more versions of Level 0 product available for the days checked.

During the earlier part of the year, versions 8311 and 8700 are available; from September 1992, there are Level 0 files with version 8311 and 9120. As reported in [RD 2], version 9120 files were transcribed from tape much more recently than the version 8700 (and presumably version 8311). Samples of version 9120 products processed for 1996 were found to contain a higher level of data dropouts or corruption than earlier transcriptions.

5.5.3 1993

Following the discussion of Level 0 data quality at the September 2016 QWG meeting, checks on the ATSR-1 archive were continued into 1993 and beyond.

For 1993, 44 days were reported on which there were UBT files for fewer than 14 orbits. Of these, many had data present for 13 orbits and were not checked further. For 22 days there were between 0 and 3 orbits of data and in all these cases the Level 0 archive contained more than 12 files, hence new UBT data have been generated for all or part of 22 days. In most of these cases, there was no indication of data quality issues in the anomaly log [AD 3].

For most of 1993, the Level 0 data file version is 8311. It was frequently found that up to 15 version 8311 files were available for a given day, with 1 or 2 version 9120 files also present (with the same time range as available version 8311 files). For these days the version 9120 data were ignored as the coverage was too sparse to be worth processing.

For the 2 affected days in December 1993, there were 14 version 8311 files and 14 version 9120 files. Both versions were processed and a comparison was made of sample orbits and scenes. In general the version 9120 data has several missing packets per scene, typically fewer than 10 (estimated by image inspection)

whereas the version 8311 data either has 0, or has fewer than the equivalent version 9120 data. For several orbits on each day, the version 8311 data contained 2 to 3 scenes in which there were no valid pixel data in the along-track distance range 0 to 5000. The same scenes in the version 9120 data contained mostly valid data. The version 8311 data was selected for processing on the basis that the inspected scenes looked generally cleaner than the version 9120 data set.

5.5.4 1994

For 1994, 66 days were found on which there were archived UBTs for fewer than 14 orbits. Of these days, 27 had 10 or more orbits present.

33 days were found where there were archived UBTs for only 0-4 orbits. Only 4 of these days corresponded to outages reported in the anomaly log [AD 3]. For the remaining 29 days, there were 14 or 15 Level 0 products available in general.

For most days in 1994, Level 0 products are available with some combination of versions 8311, 8700 and 9120. In general, version 8311 and version 9120 products are available for the complete day in each case. A sample processing and visual inspection of UBT outputs was done on the data from 06-Jan-1994, with similar results to the 1993 data, i.e. in general the version 9120-derived products were “noisier” than the version 8311 products. Version 8311 was chosen as the one to transfer and process. For some days, a combination of version 8700 and version 8311 was required to give complete coverage.

5.5.5 1995

For 1995, 56 days were reported as having archived UBTs for fewer than 14 orbits. For 20 of these days there were UBTs archived for 10 or more orbits. 15 days were found where the archive contained UBTs for only 0-4 orbits. In most of these cases there was no corresponding outage reported in [AD 3].

Level 0 products from 33 days where the archive contained UBTs for fewer than 10 orbits were transferred and processed to UBT.

Over the course of the year, Level 0 products were found with versions 8311, 8700, 9202 and 9120. Sample processing of the data from 20-Jan-1995 was performed on both available Level 0 versions, 8311 and 9120. As in the processing of earlier years, the version 9120 data was found to be significantly “noisier” than the earlier versions.

5.5.6 1996

In 1996, numerous days with no data are detected because the instrument was in hibernation for most of the year from 03-Jun-1996 onwards. Most “no data” reports can therefore be ignored. Furthermore, the entire period from 03-Apr-1996 to 02-Jun-1996 is due to be reprocessed to flag the “uncalibrated brightness temperature” problem [RD 2].

3 days were found in January, February and March 1996 on which there were fewer than 10 orbits archived and there was good coverage in the Level 0 products.

During July and August 1996, the instrument was de-hibernated for participation in the MUBEX campaign [AD 3]. Data downlink during this campaign consisted of a small number of orbits approximately every 3 days.

5.5.7 1997

1997 is also characterised by short periods of de-hibernation. Only 2 days were found on which the Level 0 data set may contain more data than the existing UBT archive. In both cases, only a partial day’s data are available at Level 0. Processing of the available Level 0 data for these days generated UBT products for 15 orbits.

The available Level 0 product versions for the 2 days processed in 1997 are version 6400 and 7100.

5.6 ATSR-2 data availability

The following sub-sections report the likely ability to fill gaps in the UBT archive from the consolidated Level 0 archive for different periods of the ATSR-2 mission. Detailed results of the sample processing of specific days are reported in section 5.4. See Appendix B for complete listings from the UBT listing tool.

5.6.1 Start of mission: May and June 1995

The earliest data held on the NEODC UBT archive are from 01-Jun-1995 (the higher-level products before 14-Aug-1995 are stored as “segregated” commissioning data). The ERS-2 launch took place in April 1995. The official ERS-2 mission time range begins at 15-May-1995 22:29:29.

Level 0 products are available from the DSI archive starting from 28-Apr-1995. The number of products in April and May 1995 varies considerably from day to day, up to a maximum of 25 different products of the same version on one day and including products where the start and end acquisition times are only a few seconds apart.

In the initial sample processing, products checked from 28-Apr-1995, 20-May-1995 and 21-May-1995 contained no valid pixel data; all were flagged as “calibration parameters unavailable for pixel”. The blackbody counts in the 11µm and 12µm channels are zero for the orbits checked on these days. Sample products from 24-May-1995 and 28-May-1995 contain apparently valid pixel data in the forward and nadir views.

Data for the period 20-May-1995 to 31-May-1995, a total of 12 days, have been transferred and processed. It was felt that there was little value in processing the earlier data given the sample processing results and the relatively large amount of data involved. The available products for this period primarily have version 6210, although a few files of version 7100 and 8200 were found.

5.6.2 June to December 1995

Between 01-Jun-1995 and 31-Dec-1995, there are 11 days where UBT products are archived for fewer than 14 orbits: only 4 days in this period have fewer than 10 orbits. For each of these 4 days, 12 to 15 Level 0 products are available, with version 6210 or 6300. These L0 products have been processed, resulting in UBT data for an additional 5 to 8 orbits per day.

5.6.3 1996

N.B. the anomaly log [AD 4] does not cover events in 1996-7. The first entry is for 03-Jun-1998.

There is a long gap in the data set at the beginning of 1996. ATSR-2 was in STANDBY mode from 22-Dec-1995 following a temperature trip caused by scan jitter [AD 6]. Continuous operation resumed on 1st July 1996.

In the period 26-Jun-1996 to 30-Jun-1996 there are between 13 and 16 Level 0 products available on each day, with version 6300. These products have been processed, resulting in UBT products for typically 14 orbits each day, but sample plots suggest that there are no pixel data present during this period.

Between July and December 1996, there is 1 day with no data present. 8 days are reported as having fewer than 14 orbits archived, but only 1 of these, 31-Dec-1996, has data for fewer than 10 orbits. All available Level 0 data for these periods have been processed, generating UBT products covering up to 20 orbits.

5.6.4 1997

For 1997, only 6 days were reported as having missing data. There were only 3 of these days where the archived UBTs covered fewer than 10 orbits. Level 0 products were available on 2 of the affected days, with version 6400 in February and 7100 in November. Processing of the available Level 0 products resulted in relatively low numbers of UBT products, 696 and 757 on 15-Feb-1997 and 26-Nov-1997, which may not improve coverage over the existing archive.

5.6.5 1998

For 1998, 12 days were identified as having missing data. There were 7 days on which UBT products for fewer than 10 orbits were archived. There were only 2 days on which sufficient Level 0 products were available to justify reprocessing. Products were available with versions 7200 and 8200.

For 03-Jun-1998, UBT products were generated for only 9 orbits, which may not improve the existing coverage.

For 16-Sep-1998, UBT products were generated for 11 orbits, which may give a small improvement over the existing archive.

5.6.6 1999

For 1999, 27 days were reported as having missing data. There were 18 days on which UBT products for fewer than 10 orbits were archived. Level 0 data were available on 16 of these days, with product versions 8400 and 8500.

All 16 days with Level 0 data available have been processed. Based on sample inspections the resulting UBT coverage appears close to complete.

For some days in 1999, the Level 0 data set contains several short, overlapping products with the same product version. E.g. on 29-Jan-1999 there are 24 Level 0 products, which generated UBT data covering 15 orbits, but which include several Level 0 products of duration between 1 second and 15 minutes. In some cases, the data quality from overlapping products was substantially different, requiring careful inspection to select the best UBT data for archiving.

5.6.7 2000

For 2000, 57 days were reported as having missing data. Of these days, only 21 had fewer than 10 orbits of UBT data archived and many cases corresponded to instrument or platform shutdowns. There were only 2 days where substantial amounts of Level 0 data appeared to be available to fill gaps.

Processing of both available days generated UBT products from a total of 32 orbits.

The available Level 0 products have version 8500.

5.6.8 2001

For 2001, 116 days were reported as having fewer than 14 orbits of UBT data in the archive. The majority of these cases had 12 or 13 orbits archived and were not followed up. There were 39 days with fewer than 10 orbits of UBT data, although many of these corresponded to payload shutdowns. There were 7 days on which Level 0 data were available to fill gaps.

Level 0 products for these days were transferred and processed to UBT, generating full or near-full coverage for each of the 7 days.

The Level 0 product versions available are 8500 during the early part of the year, 8700 and 8701 for later days.

5.6.9 2002

For 2002, 54 days were identified as having fewer than 14 orbits of UBT data in the archive. As with 2001, for a large proportion of these days there were 12 or 13 orbits archived. There were 31 days on which fewer than 10 orbits of UBT data were archived. There are 13 days on which Level 0 products were available, to give a potential improvement in coverage.

All Level 0 products for these 13 days were transferred and processed to UBT. The UBTs generated appear to provide complete coverage for all but 2 of these days, although only 3 days initially had no archived UBTs.

The Level 0 product versions available are 8700 and 8701.

5.6.10 2003 (up to June)

There were 27 days between 01-Jan-2003 and 30-Jun-2003 for which fewer than 14 orbits of UBT data were archived. There were 17 days on which data were archived for fewer than 10 orbits. There were 3 days on which Level 0 data were available, potentially allowing improved data coverage.

All 3 days of Level 0 products have been transferred and processed to UBT, generating a possible total of 2 days' new data.

The Level 0 product versions available are 8700 and 9002.

5.6.11 Data after July 2003

The data from July 2003 onwards are very fragmented. Following the failure of the on-board tape recorder, data were only downlinked for partial orbits and only for certain orbits within each day. Since this UBT data set was derived from a set of Level 0 data recently made available on tape it may be reasonable to consider this period as outside of the scope of the data availability investigation. It is also possible that the consolidated Level 0 data set now available was taken from different tape sources than the processed data for this period.

As a result of the partial data coverage, every day in this period is likely to be flagged as having missing data by the archive listing script. Checking each day against the Level 0 data set is not practical unless a way can be found to automate the Level 0 and UBT comparison. These data are stored as "segregated" on the NEODC archive. N.B. at present the listing script makes no checks on segregated archive directories.

6 Conclusions

The results of the initial investigation were reported in issue 1.0 of this technical note. Level 0 data quality was subsequently discussed by the QWG at the September 2016 meeting. A full check has now been performed on all archived data for the ATSR-1 mission, and for the ATSR-2 mission to June 2003.

6.1 ATSR-1

In 1991, there are many Level 0 products available for days where the NEODC archive contains UBT products from fewer than 14 orbits. The initial investigation concluded that, potentially, 21 days' data are recoverable. Sample processing to UBT and data checks on the UBT products suggested that there are no specific data quality issues affecting these data. For 1991, a single Level 0 product version exists, which removes any uncertainty regarding which Level 0 products to process.

To date, 8 whole or partial days' data from 1991 have been recovered. Many of the days that are missing from the archive fall within the period affected by the 1.6/3.7μm channel switching problem [RD 3]. Processing of Level 0 data from October and November 1991 may generate another 16 days' UBT data.

While additional UBT products have been recovered for 1991, the instrument was still undergoing commissioning and therefore care is required in using the resulting products for scientific study.

For 1992, the initial investigation found 19 days where UBT data might be recoverable from Level 0, particularly in the early part of the year. Data up to May 1992 are affected by the 1.6/3.7μm channel switching problem [RD 3]. All available Level 0 data for the affected period will be reprocessed. For later dates in 1992, the gaps in the data set correspond increasingly to logged instrument or platform outages. Level 0 products are available in more than 1 version after April 1992.

The greatest number of days' data recovered was for the years 1993-1995, where there were many cases of data missing from the UBT archive and no corresponding report in the operational anomaly log [AD 3].

As shown in Table 3 the Level 0 product version(s) available vary with date. There is no single version providing complete time coverage. For any given day, the best time coverage might be obtained by combining different versions for different times of day, or by selecting one of two or more product versions with overlapping coverage. A high-level check was performed on each day's processed UBT data, to reduce duplication and overlaps as far as possible, and, where overlapping UBT products were generated, to try to select the best quality data for archiving.

Note that during the initial processing one period was found where the UBT archive contains data but there are no products available in the consolidated Level 0 data set.

Year	Number of (part) days on which UBT recovered	L0 versions
1991	8	8700
1992	4	8311, 8700, 9120
1993	22	8311, 9120 (some days)
1994	29	8311, 8700, 9120
1995	33	8311, 8700, 9202, 9120
1996	3	6400, 8700, 9002
1997	2	6400, 7100

Table 3: Summary of the ATSR-1 UBT data recovered per year. N.B. The number of days listed per year represents the maximum amount that may have been recovered, since the existing archive may contain data for part of a day.

6.2 ATSR-2

At the start of the mission in 1995, there are Level 0 products for the period before the beginning of the UBT archive, from 28-Apr to 31-May-1995, although the results of sample processing indicate that only the products from the last 8-9 days of this period contain measurement data. The reason for the start date of 01-Jun-1995 in the UBT data set archived by NEODC does not appear to be documented. Data starting from 20-May-1995 have been transferred and processed to UBT, generating new data for 12 days. Data for this period must be treated with caution as it falls within the early part of commissioning.

Table 4 lists the number of whole or partial days' UBT data recovered per year, with the available Level 0 product versions (this list may not be exhaustive). A relatively small amount of data were recovered for 1996 as ATSR-2 was in STANDBY mode from 22-Dec-1995 to 01-Jul-1996 (the first day of continuous operation). For the remainder of 1996 and the subsequent years, the existing archive appears to have captured a higher proportion of the available UBT data than was the case for ATSR-1. Periods of missing data frequently correspond to payload shutdowns or other reported instrument or satellite anomalies. Nonetheless, new UBT products have been generated for up to 70 days in total over the entire ATSR-2 mission (although there are existing archived products providing partial coverage for some of these days).

The fragmented data starting from July 2003 (following the on-board tape recorder failure) are a recent addition to the UBT archive and have not been checked as part of this exercise. If the Level 0 tapes used to generate this data set were created from the same archive source as the Matera data consolidated by DSI it is likely that an availability check was performed when the data were originally transcribed to tape. The highly fragmented nature of the data implies considerably more effort in checking the archive for a smaller potential gain, due to the high frequency of data gaps.

Year	Number of (part) days on which UBT recovered	L0 versions
1995	16	6210, 6300, 7100, 8200
1996	7	6300, 6400, 7100
1997	2	7100
1998	2	7200, 8200
1999	16	8400, 8500
2000	2	8500
2001	7	8500, 8700, 8701
2002	13	8700, 8701
2003	3	8700, 9002

Table 4: Summary of the ATSR-2 UBT data recovered per year. N.B. The number of days listed per year represents the maximum amount that may have been recovered, since the existing archive may contain data for part of a day.

Appendix A ATSR-1 missing data listings

N.B. the "nUBT" figure is the value from the processing of all Level 0 products for the day, before duplicate UBTs have been removed.

1991
(includes number of UBT products resulting from "full" processing as well as initial sample processing)

Date	Missing data?	DSI L0 available	L0 processed	nUBTs	UBT quality / Comments
91/07/31	missing orbit(s)? nOrbits 2	4	Yes	246	
91/08/10:	no data	16	Yes		BB temps? Most of 1 extra orbit 9108092233 also generated
91/08/11:	no data	14	Yes	1121	
91/08/12:	no data	14	Yes	1113	
91/08/13:	no data	15	Yes	1206	
91/08/14	missing orbit(s)? nOrbits 2	13	Yes	1035	
91/09/10	missing orbit(s)? nOrbits 13	12	No		13 orbits archived, 12 at L0 - same?
91/09/13	missing orbit(s)? nOrbits 10	10	No		To be reproc for 1.6um
91/09/14	missing orbit(s)? nOrbits 10	14			
91/10/15:	no data	15	Yes	1283	Ok. Sample processed in initial investigation
91/10/16:	no data	14			
91/10/17:	no data	14			
91/10/18:	no data	15			
91/10/19:	no data	14			
91/10/20:	no data	14			
91/10/21:	no data	15			
91/10/22	missing orbit(s)? nOrbits 2	14			
91/10/24:	no data	15			
91/10/25:	no data	14	Yes	1116	
91/10/26	missing orbit(s)? nOrbits 1	14			
91/10/28	missing orbit(s)? nOrbits 13	15			
91/10/29:	no data	14			
91/10/30:	no data	15			
91/10/31:	no data	14			
91/11/01	missing orbit(s)? nOrbits 1	13			
91/11/12	missing orbit(s)? nOrbits 13	14			
91/11/13	missing orbit(s)? nOrbits 1	14			
91/12/11	missing orbit(s)? nOrbits 12	0			
	ERS-1 performing orbit manoeuvres to change from Commission Phase (3 day) to Ice Phase (3 day) orbit				
91/12/12	missing orbit(s)? nOrbits 12	0			
91/12/19	missing orbit(s)? nOrbits 13	0			
91/12/22	missing orbit(s)? nOrbits 13	0			
91/12/25	missing orbit(s)? nOrbits 13	0			

1992

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? / Comments
92/01/01 missing orbit(s)? nOrbits 2	14			01-Jan to 27-May all days will be proc for 1.6um
92/01/12 missing orbit(s)? nOrbits 13	14			
92/01/17 missing orbit(s)? nOrbits 1	14			
92/01/18 missing orbit(s)? nOrbits 1	13			
92/01/22 missing orbit(s)? nOrbits 2	15			
92/01/23 missing orbit(s)? nOrbits 2	14			
92/01/27 missing orbit(s)? nOrbits 2	14			
92/02/03 missing orbit(s)? nOrbits 12	11			

92/02/10 missing orbit(s)? nOrbits 2	14		
92/02/13 missing orbit(s)? nOrbits 5	14		
92/02/14 missing orbit(s)? nOrbits 9	9		
92/02/17 missing orbit(s)? nOrbits 10	14		
92/02/19 missing orbit(s)? nOrbits 13	15		
92/02/20 missing orbit(s)? nOrbits 1	13		
92/02/21 missing orbit(s)? nOrbits 7	15		
92/02/24 missing orbit(s)? nOrbits 12	15		
92/02/25 missing orbit(s)? nOrbits 10	15		
92/02/26 missing orbit(s)? nOrbits 13	14		
92/02/27: no data	15		
92/02/28 missing orbit(s)? nOrbits 2	14		
92/02/29 missing orbit(s)? nOrbits 6	14		
92/03/08 missing orbit(s)? nOrbits 13			
92/03/10 missing orbit(s)? nOrbits 12			
92/03/16 missing orbit(s)? nOrbits 13			
92/03/17 missing orbit(s)? nOrbits 12			
92/03/20 missing orbit(s)? nOrbits 13			
92/03/21 missing orbit(s)? nOrbits 12			
92/03/23 missing orbit(s)? nOrbits 11			
92/03/25 missing orbit(s)? nOrbits 13			
92/03/31 missing orbit(s)? nOrbits 12			
92/04/01 missing orbit(s)? nOrbits 12			
92/04/02 missing orbit(s)? nOrbits 12			
92/04/04 missing orbit(s)? nOrbits 13			
92/04/05 missing orbit(s)? nOrbits 6	6 v8700 10 v8311		
92/04/13 missing orbit(s)? nOrbits 11			
92/04/14 missing orbit(s)? nOrbits 10			
92/04/15 missing orbit(s)? nOrbits 1	14 v8311		
92/04/20 missing orbit(s)? nOrbits 11			
92/05/14 missing orbit(s)? nOrbits 11			
92/05/19 missing orbit(s)? nOrbits 13			
End of 1.6um missing BB period			
92/05/28 missing orbit(s)? nOrbits 13			
92/06/11 missing orbit(s)? nOrbits 7	6	no	Outgassing 10-16-Jun
92/06/12: no data	0		
92/06/13: no data	0		
92/06/14: no data	0		
92/06/15 missing orbit(s)? nOrbits 11	11	no	
92/06/25 missing orbit(s)? nOrbits 12	11	no	
92/06/26: no data	0	no	26-27th in standby
92/06/27 missing orbit(s)? nOrbits 6	6	no	
92/07/18 missing orbit(s)? nOrbits 13			
92/07/19: no data	0	no	19-23rd in standby
92/07/20: no data	0	no	
92/07/21: no data	0	no	
92/07/22: no data	0	no	
92/07/23 missing orbit(s)? nOrbits 1	1	no	
92/08/09 missing orbit(s)? nOrbits 6	6	no	9-10 in standby
92/08/10 missing orbit(s)? nOrbits 9	7	no	
92/08/20 missing orbit(s)? nOrbits 4	5	no	
92/08/25 missing orbit(s)? nOrbits 12	13	no	
92/09/02 missing orbit(s)? nOrbits 9	9	no	2-5th Sept standby
92/09/03 missing orbit(s)? nOrbits 2	3	no	
92/09/05 missing orbit(s)? nOrbits 12	12 v8311 2 v9120	no	
92/09/06 missing orbit(s)? nOrbits 10	8 v8311	no	
92/09/08 missing orbit(s)? nOrbits 13	14 v8311 4 v9120	no	8 Sep standby

92/09/20 missing orbit(s)? nOrbits 13	14 v8311 5 v9120				
92/09/21 missing orbit(s)? nOrbits 1	13 v8311 5 v9120	Yes	1083		
92/10/03 missing orbit(s)? nOrbits 5	14 v8311 4 v9120	Yes	1108		
92/10/13 missing orbit(s)? nOrbits 4	15 v8311 5 v9120	Yes	1176		
92/11/04 missing orbit(s)? nOrbits 13					
92/11/10 missing orbit(s)? nOrbits 11					
92/11/20 missing orbit(s)? nOrbits 13					
92/12/05 missing orbit(s)? nOrbits 13					
92/12/06 missing orbit(s)? nOrbits 1	13 v8311 2 v9120	Yes	943		

1993

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? / Comments
93/02/19 missing orbit(s)? nOrbits 2	14 v8311 1 v9120	yes	1108	
93/03/09 missing orbit(s)? nOrbits 13				
93/04/07: no data	14 v8311	yes	1112	
93/04/08 missing orbit(s)? nOrbits 2	15 v8311 2 v9120	yes	1203	
93/04/14 missing orbit(s)? nOrbits 13				
93/04/15 missing orbit(s)? nOrbits 8 was unavailable	9 v8311 1 v9120	no	9 L0 = 8 UBT? ESOC operations, IDHT	
93/05/01 missing orbit(s)? nOrbits 13				
93/05/02 missing orbit(s)? nOrbits 1	14 v8311	yes	1106	
93/06/01 missing orbit(s)? nOrbits 12				
93/06/02 missing orbit(s)? nOrbits 2	15 v8311 3 v9120	yes	1173	
93/07/08 missing orbit(s)? nOrbits 13				
93/07/09 missing orbit(s)? nOrbits 2	15 v8311 1 v9120	yes	1195	
93/07/21 missing orbit(s)? nOrbits 13				
93/07/22 missing orbit(s)? nOrbits 2	15 v8311 3 v9120	yes	1144	
93/07/26 missing orbit(s)? nOrbits 13				
93/08/18 missing orbit(s)? nOrbits 11				
93/09/14 missing orbit(s)? nOrbits 8 "operational reasons"	8 v8311 1 v9120	no	0	No LBR data due to
93/10/01 missing orbit(s)? nOrbits 13				
93/10/02 missing orbit(s)? nOrbits 3 then outgassing. Non-nominal	15 v8311 1 v9120	yes	957	Payload to STBY at 12:45 UTC
93/10/16 missing orbit(s)? nOrbits 13				
93/10/17 missing orbit(s)? nOrbits 2	14 v8311 1 v9120	yes	1102	
93/10/19 missing orbit(s)? nOrbits 13				
93/10/20 missing orbit(s)? nOrbits 2	14 v8311 2 v9120	yes	1102	
93/10/27 missing orbit(s)? nOrbits 13				
93/10/28 missing orbit(s)? nOrbits 2	15 v8311 1 v9120	yes	1195	
93/10/30 missing orbit(s)? nOrbits 13				
93/10/31: no data	14 v8311	yes	1109	
93/11/01 missing orbit(s)? nOrbits 2	15 v8311 3 v9120	yes	1190	
93/11/02 missing orbit(s)? nOrbits 13				
93/11/03: no data	12 v8311 1 v9120	yes	962	
93/11/04: no data	15 v8311 3 v9120	yes	1195	

93/11/05: no data	14 v8311 1 v9120	yes	1105	
93/11/06: no data	14 v8311 1 v9120	yes	1112	
93/11/07: no data	15 v8311 3 v9120	yes	1196	
93/11/08 missing orbit(s)? nOrbits 2	14 v8311 1 v9120	yes	1104	
93/11/11 missing orbit(s)? nOrbits 2	15 v8311 2 v9120	yes	1111	
93/12/06 missing orbit(s)? nOrbits 11				
93/12/10 missing orbit(s)? nOrbits 10				
93/12/13 missing orbit(s)? nOrbits 10				
93/12/14 missing orbit(s)? nOrbits 13				
93/12/19 missing orbit(s)? nOrbits 12				
93/12/25 missing orbit(s)? nOrbits 12				
93/12/26 missing orbit(s)? nOrbits 1	14 v8311 14 v9120	yes	1103	
93/12/28 missing orbit(s)? nOrbits 13				
93/12/29 missing orbit(s)? nOrbits 2	14 v8311 14 v9120	yes	1102	

1994

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? / Comments
94/01/06 missing orbit(s)? nOrbits 8 15	v8311 15 v9120	Yes (test)		
94/01/07 missing orbit(s)? nOrbits 10	" "			
94/01/08 missing orbit(s)? nOrbits 10	28 v8311 14 v9120	No		2 sets of v8311? Files with very close but slightly differing time ranges
94/01/10 missing orbit(s)? nOrbits 13		No		
94/01/11 missing orbit(s)? nOrbits 11		No		
94/01/12 missing orbit(s)? nOrbits 11		No		
94/01/22 missing orbit(s)? nOrbits 10		No		
94/01/23 missing orbit(s)? nOrbits 11		No		
94/01/29 missing orbit(s)? nOrbits 13		No		
94/01/30 missing orbit(s)? nOrbits 7	2 v8311 6 v8700 6 v9120	No		
94/03/07 missing orbit(s)? nOrbits 13		No		
94/03/08 missing orbit(s)? nOrbits 2	14 v8311 14 v9120	Yes	1100	
94/03/09 missing orbit(s)? nOrbits 11				
94/03/10 missing orbit(s)? nOrbits 2	2 v8311 13 v8700 15 v9120	Yes	1202	v8311 and v8700 don't overlap - need both
94/04/11 missing orbit(s)? nOrbits 9				
94/04/20: no data	15 v8311 15 v9120	Yes	1193	After here, filtered out v9120 checked v8??? only
94/04/21 missing orbit(s)? nOrbits 2	15 v8311+8700	Yes	1029	
94/05/02: no data	15 v8311	Yes	1107	
94/05/03: no data	14 v8311	Yes	1101	
94/05/04 missing orbit(s)? nOrbits 2	15 v8311+8700	Yes	1194	
94/05/05 missing orbit(s)? nOrbits 8	15 v8700+8311	Yes	1109	
94/05/06: no data	14 v8311	Yes	1108	
94/05/07: no data	15 v8311	Yes	1156	
94/05/08 missing orbit(s)? nOrbits 13				
94/05/17 missing orbit(s)? nOrbits 12				
94/06/17 missing orbit(s)? nOrbits 12				
94/06/20 missing orbit(s)? nOrbits 13				
94/06/23 missing orbit(s)? nOrbits 13				

94/06/26 missing orbit(s)? nOrbits 13				
94/06/29 missing orbit(s)? nOrbits 13				
94/07/01 missing orbit(s)? nOrbits 12				
94/07/04 missing orbit(s)? nOrbits 13				
94/07/25 missing orbit(s)? nOrbits 12				
94/07/26 missing orbit(s)? nOrbits 10				
94/08/13: no data	14 v8311	Yes	1060	
94/08/14: no data	14 v8311	Yes	1073	
94/08/15 missing orbit(s)? nOrbits 2	15 v8311	Yes	1154	
94/08/22 missing orbit(s)? nOrbits 13				
94/08/23 missing orbit(s)? nOrbits 2	15 v8311	Yes	1154	
94/09/08 missing orbit(s)? nOrbits 10	11 v8700	No		
94/09/18: no data	15 v8311	Yes	1158	
94/09/19: no data	15 v8311	Yes	1070	
94/09/20: no data	14 v8311	Yes	1079	
94/09/21: no data	15 v8311	Yes	1160	
94/09/22 missing orbit(s)? nOrbits 2	14 v8311	Yes	1022	
94/10/05 missing orbit(s)? nOrbits 2	2 v8311	No		Anomaly. DEU shutdown
94/10/06 missing orbit(s)? nOrbits 7	10 v8311	No		" "
94/10/15 missing orbit(s)? nOrbits 13				
94/10/16 missing orbit(s)? nOrbits 1	14 v8311	Yes	1021	
94/10/23 missing orbit(s)? nOrbits 2	14 v8311	Yes	1062	
94/11/14 missing orbit(s)? nOrbits 8	9 v8311	No		IDHT problem. No L-rate data 18:40-05:30
94/11/24 missing orbit(s)? nOrbits 4	14 v8311	Yes	1088	
94/11/25: no data	15 v8311	Yes	1178	
94/11/26: no data	14 v8311	Yes	1097	
94/11/27: no data	14 v8311	Yes	1094	
94/12/01 missing orbit(s)? nOrbits 12				
94/12/02 missing orbit(s)? nOrbits 1	14 v8311	Yes	1007	
94/12/03: no data	14 v8311	Yes	1088	
94/12/04 missing orbit(s)? nOrbits 12		No		
94/12/11 missing orbit(s)? nOrbits 13		No		
94/12/12: no data	15 v8311	Yes	1172	
94/12/13: no data	14 v8311	Yes	1100	
94/12/14: no data	14 v8311	Yes	1096	
94/12/15: no data	15 v8311	Yes	1111	
94/12/16: no data	9 v8311	Yes	601	DEU autonomous shutdown & outgassed. v8700 for same orbits
94/12/17 missing orbit(s)? nOrbits 1		No		

1995

Date	DSI L0 available	L0 Yes	nUBTs	UBT quality? Comments
95/01/20: no data	14 v8311 14 v9120	Yes	2086	Test processed all. v9120 lower quality
95/01/23 missing orbit(s)? nOrbits 7	14 v8311	Yes	1099	v9120 not checked
95/01/24 missing orbit(s)? nOrbits 11	-			ERS anomaly. IDHT error
95/01/26 missing orbit(s)? nOrbits 9				
95/01/27: no data	15 v8311	Yes	1183	
95/01/28 missing orbit(s)? nOrbits 8				

95/02/01 missing orbit(s)? nOrbits 12				SERVO COMPUTER PROBLEM AT KIRUNA
95/02/02: no data	14 v8311	Yes	1097	CMS PROBLEM AT GATINEAU
95/02/03: no data	15 v8311	Yes	967	CMS PROBLEM AT GATINEAU
95/02/04 missing orbit(s)? nOrbits 6	15 v8311	Yes	1042	
95/02/05 missing orbit(s)? nOrbits 8				
95/02/09 missing orbit(s)? nOrbits 1	15 v8311	Yes	1090	
95/02/10: no data	15 v8311	Yes	1182	
95/02/11 missing orbit(s)? nOrbits 8	15 v8311	Yes	1087	
95/02/13 missing orbit(s)? nOrbits 7	15 v8311	Yes	1179	
95/02/14 missing orbit(s)? nOrbits 8	14 v8311	Yes	1090	
95/02/15: no data	14 v8311	Yes	1102	
95/02/16: no data	15 v8311	Yes	1154	TRACKING PROBLEM AT KIRUNA
95/02/17: no data	14 v8311	Yes	1084	
95/02/18 missing orbit(s)? nOrbits 10				
95/02/22 missing orbit(s)? nOrbits 2	15 v8311	Yes	1147	
95/02/23: no data	14 v8311	Yes	1085	
95/02/24 missing orbit(s)? nOrbits 6	15 v8311	Yes	1175	
95/03/02 missing orbit(s)? nOrbits 6	15 v8311	Yes	1186	
95/03/08 missing orbit(s)? nOrbits 13				
95/04/14 missing orbit(s)? nOrbits 13				
95/04/15 missing orbit(s)? nOrbits 2	14 v8311	Yes	1078	
95/04/20 missing orbit(s)? nOrbits 11				
95/05/02 missing orbit(s)? nOrbits 7	14 v8311	Yes	1060	
95/07/05 missing orbit(s)? nOrbits 4	15 v8311	Yes	1142	
95/07/06 missing orbit(s)? nOrbits 8	14 v8311	Yes	1063	
95/07/19 missing orbit(s)? nOrbits 13				
95/07/20 missing orbit(s)? nOrbits 12				
95/07/21 missing orbit(s)? nOrbits 6	15 v8700	Yes	1137	
95/07/23 missing orbit(s)? nOrbits 13				
95/07/26 missing orbit(s)? nOrbits 9	13 v8700	Yes	1020	
95/07/29 missing orbit(s)? nOrbits 13				
95/07/31 missing orbit(s)? nOrbits 8	15 v8700+8311	Yes	1194	
95/08/01 missing orbit(s)? nOrbits 1	14 v8700+8311	Yes	1025	
95/08/02 missing orbit(s)? nOrbits 6	11 v8700	Yes	871	
95/08/27 missing orbit(s)? nOrbits 11				MPS error, IDHT LBR data unavailable from 01:02:00 - 08:17:00 UTC. No ATSR-1 data.
95/09/01 missing orbit(s)? nOrbits 11				
95/09/02 missing orbit(s)? nOrbits 7	14 v8700	Yes	1103	
95/10/22 missing orbit(s)? nOrbits 13				
95/10/23 missing orbit(s)? nOrbits 12				
95/10/25 missing orbit(s)? nOrbits 12				
95/10/26 missing orbit(s)? nOrbits 12				
95/10/27 missing orbit(s)? nOrbits 13				
95/11/11 missing orbit(s)? nOrbits 12				
95/11/13 missing orbit(s)? nOrbits 13				

95/11/14 missing orbit(s)? nOrbits 7	11 v8700	Yes	887
95/12/15 missing orbit(s)? nOrbits 3	13 v9002	Yes	1042
95/12/19 missing orbit(s)? nOrbits 6	9 v8700	Yes	722
95/12/21 missing orbit(s)? nOrbits 13			
95/12/24 missing orbit(s)? nOrbits 8	15 v9002+9120	Yes	1134
95/12/28 missing orbit(s)? nOrbits 5	14 v8700	Yes	1120

1996

N.B. in June 1996 ESA ceased data collection from ERS-1 [AD 6]. The platform was re-activated to acquire three days of data once every 70 days until December 1997.

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
96/01/02 missing orbit(s)? nOrbits 6	13 v8700	Yes	1049	
96/02/10 missing orbit(s)? nOrbits 7	15 v8700	Yes	1216	
96/02/17 missing orbit(s)? nOrbits 13				
96/03/29 missing orbit(s)? nOrbits 13				
96/03/31 missing orbit(s)? nOrbits 9	12 v8700	Yes	970	
96/05/09 missing orbit(s)? nOrbits 2	2 v8700 13 v9002	No		03-Apr to 02-Jun will all be reprocessed as part of the uncalibrated BTs investigation
96/05/10 missing orbit(s)? nOrbits 12				
96/05/20 missing orbit(s)? nOrbits 12				
96/06/03 missing orbit(s)? nOrbits 4				Payload into hibernation
96/07/11 missing orbit(s)? nOrbits 1	0			Downlink 17:18-17:30. MUBEX preparation
96/07/15 missing orbit(s)? nOrbits 1	0			Short realtime dump
96/07/26 missing orbit(s)? nOrbits 3	0			MUBEX campaign, dumps ~ every 3 days for ~2 orbits?
96/07/27: no data				
96/07/28: no data				
96/07/29 missing orbit(s)? nOrbits 3	0			
96/07/30: no data				
96/07/31: no data				
96/08/01 missing orbit(s)? nOrbits 1	0			
96/08/02: no data				
96/08/03: no data				
96/08/04 missing orbit(s)? nOrbits 1	0			
96/08/05: no data				
96/08/06: no data				
96/08/07 missing orbit(s)? nOrbits 1	0			
96/08/08 missing orbit(s)? nOrbits 2	0			
96/10/22 missing orbit(s)? nOrbits 9	9 v6400	No		
96/10/23 missing orbit(s)? nOrbits 9	8 v6400	No		
96/10/24 missing orbit(s)? nOrbits 11	10 v6400	No		
96/12/30 missing orbit(s)? nOrbits 1 0				

1997

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
97/01/03: missing orbit(s)? nOrbits 3	0			Instrument hibernated
97/03/10: missing orbit(s)? nOrbits 1	0			Instrument de-hibernated
97/03/12: missing orbit(s)? nOrbits 6	9 v6400	Yes	626	
97/03/13: missing orbit(s)? nOrbits 12	6 v6400			
97/03/14: missing orbit(s)? nOrbits 3	0			Hibernated
97/05/19: no data	0			Re-activation
97/05/20: missing orbit(s)? nOrbits 12	9 v7100	No		
97/05/23: missing orbit(s)? nOrbits 3	0	No		Hibernated
97/07/28: missing orbit(s)? nOrbits 1	0			Re-activation
97/08/01:missing orbit(s)? nOrbits 3	0			Hibernated
97/10/06:missing orbit(s)? nOrbits 1	0			Re-activation
97/10/10:missing orbit(s)? nOrbits 3	0			Hibernated
97/12/15:no data	0			Re-activation at 23:50
97/12/16:missing orbit(s)? nOrbits 10	9 v7100	No		
97/12/17:missing orbit(s)? nOrbits 10	0			
97/12/18:no data	4 v7100	Yes	328	Payload shutdown
97/12/30:no data	0			Emergency. 40% of solar array output lost.
97/12/31:no data				

The ATSR-1 anomaly log [AD 3] contains entries relating to “dehibernation” and data collection on 28 & 29-Apr-1999 and 24 & 25-Jan-2000. In March 2000 contact was lost with the spacecraft.

Appendix B ATSR-2 missing data listings

1995

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
95/04/28: no data	9	Yes	716	41,000 nibble shift errors per L0!
95/04/29: no data	9	no		
95/04/30: no data	10	no		
95/05/01: no data	13	no		Initial tests showed no pixel data
95/05/02: no data	14	no		
95/05/03: no data	17	no		
95/05/04: no data	16	no		
95/05/05: no data	25	no		
95/05/06: no data	17	no		
95/05/07: no data	9	no		
95/05/08: no data	19	no		
95/05/09: no data	15	no		
95/05/10: no data	10	no		
95/05/11: no data	15	no		
95/05/12: no data	16	no		
95/05/13: no data	15	no		
95/05/14: no data	14	no		
95/05/15: no data	13	no		
95/05/16: no data	15	no		
95/05/17: no data	15	no		
95/05/18: no data	17	no		
95/05/19: no data	16	no		
95/05/20: no data	17	Yes	1134 (init test)	No pixel data
95/05/21: no data	22 v6210	Yes	787	Period most likely to have sci data
95/05/22: no data	13	Yes	932	Lots of short overlapping L0 products this period
95/05/23: no data	15	Yes	1193	
95/05/24: no data	11	Yes	800	
95/05/25: no data	15	Yes	1080	
95/05/26: no data	14	Yes	767	
95/05/27: no data	16	Yes	1184	
95/05/28: no data	19 v6210 + 8200	Yes	1271	
95/05/29: no data	15	Yes	1181	
95/05/30: no data	14	Yes	1100	
95/05/31: no data	7 v6210 + 1 v7100	Yes	414	
95/06/06: missing orbit(s)? nOrbits 13	13	no		
95/08/09: missing orbit(s)? nOrbits 11	14	no		
95/08/26: missing orbit(s)? nOrbits 6	15 v6210 + 6300	Yes	1193	Data for 14 orbits in UBT output
95/09/24: missing orbit(s)? nOrbits 10	10	no		
95/10/10: missing orbit(s)? nOrbits 11	15	no		
95/10/21: missing orbit(s)? nOrbits 12	12	no		
95/10/24: missing orbit(s)? nOrbits 13	14	no		
95/10/28: missing orbit(s)? nOrbits 8	14	Yes	1107	UBT outputs cover 15 orbits
95/11/09: missing orbit(s)? nOrbits 7	14	Yes	1102	14 orbits
95/11/11: missing orbit(s)? nOrbits 13	13			
95/12/22: missing orbit(s)? nOrbits 7	12	Yes	598	9 orbits

1996

Date	DSI L0 available	L0 processed	nUBTs	UBT quality?	Comments
96/01/01: no data				In STANDBY until 26-Jun-1996	
96/06/26: no data	13 v6300	Yes	872		
96/06/27: no data	15	Yes	1193		
96/06/28: no data	14	Yes	945		
96/06/29: no data	16	Yes	1108		
96/06/30: no data	14	Yes	1110		
96/07/28: no data	6 v6300,6400,7100	Yes	470	No noticeable quality diff between versions	
96/11/02: missing orbit(s)? nOrbits 12					
96/11/09: missing orbit(s)? nOrbits 13					
96/11/22: missing orbit(s)? nOrbits 12					
96/11/23: missing orbit(s)? nOrbits 10					
96/11/25: missing orbit(s)? nOrbits 13					
96/11/29: missing orbit(s)? nOrbits 12					
96/12/04: missing orbit(s)? nOrbits 13					
96/12/31: missing orbit(s)? nOrbits 6 17	v6400	Yes	1267		

1997

Date	DSI L0 available	L0 processed	nUBTs	UBT quality?	Comments
97/02/14: no data	0				
97/02/15: missing orbit(s)? nOrbits 8	11	Yes	696		
97/04/03: missing orbit(s)? nOrbits 13					
97/07/05: missing orbit(s)? nOrbits 13					
97/11/25: missing orbit(s)? nOrbits 12					
97/11/26: missing orbit(s)? nOrbits 9	12 v7100	Yes	757		

1998

Date	DSI L0 available	L0 processed	nUBTs	UBT quality?	Comments
98/03/09: missing orbit(s)? nOrbits 11					
98/04/01: missing orbit(s)? nOrbits 13					
98/06/03: missing orbit(s)? nOrbits 8	10	Yes	701		ER2_OPER_AT2_ATS_0P_19980603T020600_19980603T033911_016304_0418_7200 many missing or bad scans
98/06/04: no data	0				
98/06/05 :no data	0				
98/06/06: missing orbit(s)? nOrbits 7	1				
98/08/01: missing orbit(s)? nOrbits 12					
98/09/15: missing orbit(s)? nOrbits 13					
98/09/16: missing orbit(s)? nOrbits 3	11	Yes	780		

98/11/17: missing orbit(s)? nOrbits 8	12	No		Available L0 only cover 7 orbits
98/11/18: missing orbit(s)? nOrbits 6	6	No		L0 cover 5 orbits
98/11/23: missing orbit(s)? nOrbits 13				

1999

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
99/01/25: no data	15 v8400	Yes	1192	
99/01/26: no data	14	Yes	1102	
99/01/27: no data	22 v8400	Yes	1204	Several short fragment L0s
99/01/28: no data	16	Yes	1061	
99/01/29: no data	24	Yes	1220	" plus corrupted / low quality data in some L0
99/01/30: no data	17	Yes	1140	
99/01/31: no data	22	Yes	1456	
99/02/16: missing orbit(s)? nOrbits 6	18	Yes	1325	
99/02/26: missing orbit(s)? nOrbits 3	14	Yes	1108	
99/02/27: no data	19	Yes	1118	Pixel data present
99/02/28: no data	19	Yes	1350	
99/08/28: missing orbit(s)? nOrbits 12				
99/08/29: no data	15 v8500	Yes	1165	
99/08/30: no data	14	Yes	1102	
99/08/31: no data	14	Yes	1109	
99/09/09: missing orbit(s)? nOrbits 13				
99/09/22: missing orbit(s)? nOrbits 13				
99/10/17: missing orbit(s)? nOrbits 13				
99/10/20: missing orbit(s)? nOrbits 11				
99/11/01: missing orbit(s)? nOrbits 12				
99/11/07: missing orbit(s)? nOrbits 13				
99/11/17: missing orbit(s)? nOrbits 10				
99/11/18: missing orbit(s)? nOrbits 6	6 v8500	No		
99/12/01: missing orbit(s)? nOrbits 5	12 v8500	Yes	944	
99/12/17: missing orbit(s)? nOrbits 13				
99/12/20: missing orbit(s)? nOrbits 5	14 v8500	Yes	1102	Low quality / corrupted data for part of 0904 orbit
99/12/31: missing orbit(s)? nOrbits 7	7	No		

2000

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
00/01/01: no data	0			Ground seg deactivated during year 2000 roll-over
00/01/02: missing orbit(s)? nOrbits 5	6 v8500			Data collection recommenced 15:57
00/02/07: missing orbit(s)? nOrbits 4	3			ERS-2 payload shut down

00/02/08: no data			
00/02/09: no data			
00/02/10: missing orbit(s)? nOrbits 7	8		Payload re-start 15:30, nominal temps 22:00
00/03/09: missing orbit(s)? nOrbits 6	14	Yes	1108
00/03/20: missing orbit(s)? nOrbits 12			
00/03/24: missing orbit(s)? nOrbits 11			
00/03/25: missing orbit(s)? nOrbits 8	8		Unplanned status (WAIT)
00/05/23: missing orbit(s)? nOrbits 6	5		
00/06/05: missing orbit(s)? nOrbits 13			
00/06/13: missing orbit(s)? nOrbits 6	15	Yes	1193
00/06/30: missing orbit(s)? nOrbits 3	2		All payload instruments switched off due to platform anomaly.
00/07/01: no data			
00/07/02: no data			"
00/07/03: no data			
00/07/04: no data			
00/07/05: missing orbit(s)? nOrbits 9	7		
00/07/07: missing orbit(s)? nOrbits 13			
00/07/10: missing orbit(s)? nOrbits 9	11		
00/07/11: missing orbit(s)? nOrbits 10			
00/08/08: missing orbit(s)? nOrbits 7	7		ATSR s/w anomaly, shut down
00/08/10: missing orbit(s)? nOrbits 13			
00/10/07: missing orbit(s)? nOrbits 10			ERS platform attitude anomaly, instruments off
00/10/08: no data			
00/10/09: no data			
00/10/10: no data			
00/10/11: missing orbit(s)? nOrbits 9			
00/11/18: missing orbit(s)? nOrbits 13			
00/11/26: missing orbit(s)? nOrbits 13			
00/11/29: missing orbit(s)? nOrbits 13			
00/11/30: missing orbit(s)? nOrbits 13			
00/12/01: missing orbit(s)? nOrbits 13			
00/12/02: missing orbit(s)? nOrbits 13			
00/12/04: missing orbit(s)? nOrbits 13			
00/12/06: missing orbit(s)? nOrbits 13			
00/12/09: missing orbit(s)? nOrbits 12			
00/12/13: missing orbit(s)? nOrbits 13			
00/12/15: missing orbit(s)? nOrbits 13			
00/12/17: missing orbit(s)? nOrbits 12			
00/12/20: missing orbit(s)? nOrbits 13			
00/12/22: missing orbit(s)? nOrbits 13			
00/12/23: missing orbit(s)? nOrbits 13			
00/12/27: missing orbit(s)? nOrbits 13			
00/12/28: missing orbit(s)? nOrbits 13			
00/12/31: missing orbit(s)? nOrbits 12			

2001

Date	DSI L0 available	L0 processed	nUBTs	UBT quality?	Comments
01/01/02: missing orbit(s)? nOrbits 13					
01/01/03: missing orbit(s)? nOrbits 12					
01/01/04: missing orbit(s)? nOrbits 13					
01/01/13: missing orbit(s)? nOrbits 13					
01/01/14: missing orbit(s)? nOrbits 13					
01/01/16: missing orbit(s)? nOrbits 13					
01/01/17: missing orbit(s)? nOrbits 12					
01/01/18: no data					Payload shutdown
01/01/19: no data					
01/01/20: no data					
01/01/21: no data					
01/01/22: no data					
01/01/23: no data					
01/01/24: no data					
01/01/25: no data					
01/01/26: no data					
01/01/27: no data					
01/01/28: no data					
01/01/29: no data					
01/01/30: no data					
01/01/31: no data					
01/02/01: no data					
01/02/02: no data					
01/02/03: no data					
01/02/04: no data					
01/02/05: no data					
01/02/06: no data					
01/02/07: missing orbit(s)? nOrbits 8					
01/02/08: missing orbit(s)? nOrbits 10					ATSR-2 restarted. ERS attitude in extra-backup mode, no gyros Will affect ATSR image quality.
01/02/09: missing orbit(s)? nOrbits 12					
01/02/10: missing orbit(s)? nOrbits 13					
01/02/11: missing orbit(s)? nOrbits 11					
01/02/12: missing orbit(s)? nOrbits 11					
01/02/13: missing orbit(s)? nOrbits 13					
01/02/14: missing orbit(s)? nOrbits 11					
01/02/15: missing orbit(s)? nOrbits 11					
01/02/17: missing orbit(s)? nOrbits 9		11 v8500			
01/02/18: missing orbit(s)? nOrbits 11					
01/02/19: missing orbit(s)? nOrbits 13					
01/02/20: missing orbit(s)? nOrbits 12					
01/02/21: missing orbit(s)? nOrbits 11					
01/02/22: missing orbit(s)? nOrbits 12					
01/02/23: missing orbit(s)? nOrbits 12					
01/02/24: missing orbit(s)? nOrbits 11					
01/02/25: missing orbit(s)? nOrbits 12					
01/02/27: missing orbit(s)? nOrbits 11					
01/02/28: missing orbit(s)? nOrbits 8		7			
01/03/01: missing orbit(s)? nOrbits 13					
01/03/02: missing orbit(s)? nOrbits 11					
01/03/03: missing orbit(s)? nOrbits 11					
01/03/04: missing orbit(s)? nOrbits 13					
01/03/05: missing orbit(s)? nOrbits 11					
01/03/06: missing orbit(s)? nOrbits 10					
01/03/07: missing orbit(s)? nOrbits 13					
01/03/08: missing orbit(s)? nOrbits 9		10			
01/03/09: missing orbit(s)? nOrbits 10					
01/03/10: missing orbit(s)? nOrbits 13					
01/03/12: missing orbit(s)? nOrbits 11					

01/03/13: missing orbit(s)? nOrbits 13				
01/03/14: missing orbit(s)? nOrbits 11				
01/03/15: missing orbit(s)? nOrbits 11				
01/03/16: missing orbit(s)? nOrbits 12				
01/03/17: missing orbit(s)? nOrbits 13				
01/03/18: missing orbit(s)? nOrbits 11				
01/03/19: missing orbit(s)? nOrbits 11				
01/03/20: missing orbit(s)? nOrbits 13				
01/03/21: missing orbit(s)? nOrbits 10				
01/03/22: missing orbit(s)? nOrbits 11				
01/03/23: missing orbit(s)? nOrbits 13				
01/03/24: missing orbit(s)? nOrbits 12				
01/03/25: missing orbit(s)? nOrbits 11				
01/03/26: missing orbit(s)? nOrbits 13				
01/03/27: missing orbit(s)? nOrbits 12				
01/03/28: missing orbit(s)? nOrbits 11				
01/03/29: missing orbit(s)? nOrbits 13				
01/03/31: missing orbit(s)? nOrbits 12				
01/04/01: missing orbit(s)? nOrbits 13				
01/04/03: missing orbit(s)? nOrbits 11				
01/04/04: missing orbit(s)? nOrbits 13				
01/04/09: missing orbit(s)? nOrbits 12				
01/04/10: missing orbit(s)? nOrbits 11				
01/04/11: missing orbit(s)? nOrbits 13				
01/04/14: missing orbit(s)? nOrbits 13				
01/04/16: missing orbit(s)? nOrbits 11				
01/04/29: missing orbit(s)? nOrbits 11				
01/04/30: missing orbit(s)? nOrbits 13				
01/05/06: missing orbit(s)? nOrbits 12				
01/05/08: missing orbit(s)? nOrbits 10				
01/05/15: missing orbit(s)? nOrbits 11				
01/05/16: missing orbit(s)? nOrbits 3	4			
01/05/17: missing orbit(s)? nOrbits 10				
01/05/20: missing orbit(s)? nOrbits 12				
01/05/21: missing orbit(s)? nOrbits 11				Platform anomaly. ATSR off.
01/05/22: no data	0			
01/05/23: no data	0			
01/05/24: missing orbit(s)? nOrbits 9				
01/05/25: missing orbit(s)? nOrbits 12				
01/05/28: missing orbit(s)? nOrbits 13				Nominal operation from 29-May 15:40
01/05/30: missing orbit(s)? nOrbits 10				
01/06/06: missing orbit(s)? nOrbits 13				
01/06/17: missing orbit(s)? nOrbits 6	15 v8500 + 8700	Yes	1193	
01/07/07: missing orbit(s)? nOrbits 12				
01/07/31: missing orbit(s)? nOrbits 1	15 v8700+8701	Yes	1109	
01/08/01: missing orbit(s)? nOrbits 3	16	Yes	1250	Lower quality duplicate UBT removed from 0108012005
01/08/09: missing orbit(s)? nOrbits 4	14	Yes	1102	
01/08/15: missing orbit(s)? nOrbits 4	14	Yes	1102	
01/08/27: missing orbit(s)? nOrbits 5	14	Yes	1108	
01/09/03: missing orbit(s)? nOrbits 10				
01/09/25: missing orbit(s)? nOrbits 11				

01/11/01: missing orbit(s)? nOrbits 6	16	Yes	1193	
01/11/17: missing orbit(s)? nOrbits 11				Payload shutdown during Leonids meteor storm
01/11/18: no data	0			
01/11/19: missing orbit(s)? nOrbits 7				Payload recovered
01/11/21: missing orbit(s)? nOrbits 10				
01/11/27: missing orbit(s)? nOrbits 5				Payload shutdown
01/11/28: missing orbit(s)? nOrbits 7				Payload recovered

2002

Date	DSI L0 available	L0 processed	nUBTs	UBT quality? Comments
02/01/28: missing orbit(s)? nOrbits 13				
02/01/30: missing orbit(s)? nOrbits 13				
02/01/31: missing orbit(s)? nOrbits 7	14 v8700 + 8701	Yes	1102	
02/02/01: missing orbit(s)? nOrbits 9	15	Yes	1193	
02/02/02: missing orbit(s)? nOrbits 9	15	Yes	1199	
02/02/03: missing orbit(s)? nOrbits 8	14	Yes	1031	
02/02/04: missing orbit(s)? nOrbits 8	14	Yes	1108	
02/02/05: no data	15	Yes	1194	
02/02/06: missing orbit(s)? nOrbits 2	14	Yes	1102	
02/02/08: missing orbit(s)? nOrbits 6	15	Yes	1194	
02/02/09: missing orbit(s)? nOrbits 7	14	Yes	1102	
02/02/11: missing orbit(s)? nOrbits 13				
02/02/12: no data	15 v8700	Yes	399	Mostly small L0s, not many orbits
02/02/13: no data	14 v8700 + 8701	Yes	1108	
02/02/14: missing orbit(s)? nOrbits 5	15	Yes	1195	
02/03/08: missing orbit(s)? nOrbits 2	0			Platform anomaly until 21-March
02/03/09: no data	0			
02/03/10: no data	0			
02/03/11: no data	0			
02/03/12: no data	0			
02/03/13: no data	0			
02/03/14: no data	0			
02/03/15: no data	0			
02/03/16: no data	0			
02/03/17: no data	0			
02/03/18: no data	0			
02/03/19: no data	0			
02/03/20: missing orbit(s)? nOrbits 1	1			
02/04/08: missing orbit(s)? nOrbits 5	4			
02/04/11: missing orbit(s)? nOrbits 9	11			No anomaly log information after 15-Apr-2002
02/04/19: missing orbit(s)? nOrbits 13				
02/04/20: missing orbit(s)? nOrbits 8	8			
02/08/17: missing orbit(s)? nOrbits 6	4			
02/11/18: missing orbit(s)? nOrbits 11				
02/11/19: missing orbit(s)? nOrbits 2	3			
02/12/09: missing orbit(s)? nOrbits 13				
02/12/10: missing orbit(s)? nOrbits 12				
02/12/13: missing orbit(s)? nOrbits 12				
02/12/14: missing orbit(s)? nOrbits 12				
02/12/16: missing orbit(s)? nOrbits 13				
02/12/17: missing orbit(s)? nOrbits 11				
02/12/18: missing orbit(s)? nOrbits 11				

02/12/19: missing orbit(s)? nOrbits 13					
02/12/20: missing orbit(s)? nOrbits 9	13	Yes	885		
02/12/21: missing orbit(s)? nOrbits 11					
02/12/22: missing orbit(s)? nOrbits 13					
02/12/23: missing orbit(s)? nOrbits 12					
02/12/24: missing orbit(s)? nOrbits 11					
02/12/25: missing orbit(s)? nOrbits 12					
02/12/26: missing orbit(s)? nOrbits 13					
02/12/27: missing orbit(s)? nOrbits 11					
02/12/28: missing orbit(s)? nOrbits 11					
02/12/29: missing orbit(s)? nOrbits 13					
02/12/30: missing orbit(s)? nOrbits 12					

2003

Date	DSI L0 available	L0 processed	nUBTs	UBT quality?	Comments
03/01/18: missing orbit(s)? nOrbits 12					
03/02/02: missing orbit(s)? nOrbits 13					
03/04/06: missing orbit(s)? nOrbits 13					
03/04/07: missing orbit(s)? nOrbits 12					
03/04/11: missing orbit(s)? nOrbits 6	5	No			
03/04/17: missing orbit(s)? nOrbits 12					
03/04/30: missing orbit(s)? nOrbits 12					
03/05/01: missing orbit(s)? nOrbits 13					
03/05/11: missing orbit(s)? nOrbits 6	14 v8700 + 9002	Yes	1108		
03/05/16: missing orbit(s)? nOrbits 6	6				
03/05/17: no data	0				
03/05/18: no data	0				
03/05/19: no data	0				
03/05/20: missing orbit(s)? nOrbits 10					
03/05/25: missing orbit(s)? nOrbits 13					
03/05/27: missing orbit(s)? nOrbits 3	17	Yes	1202		Overlapping L0s
03/05/29: missing orbit(s)? nOrbits 11					
03/06/05: missing orbit(s)? nOrbits 6	14	Yes	1102		
03/06/22: missing orbit(s)? nOrbits 9	9				
03/06/23: no data	0				
03/06/24: no data					
03/06/25: no data					
03/06/26: no data					
03/06/27: no data					
03/06/28: no data					
03/06/29: no data					
03/06/30: no data					