

AATSR Level 2 (ATS_AR__2P) Product Quality Readme Information

This file presents the Product Quality Readme (PQR) information for the AATSR Level 2 ATS_AR__2P products.

All PQRs are retained for reference in this file, even those pertaining to historically available datasets only, hence there is an explicit statement in each PQR noting whether it is still applicable to the most recent AATSR dataset.

The Third AATSR Reprocessing Dataset (IPF 6.05)

Users are strongly recommended to use the most recent AATSR dataset: Third Reprocessing data products were generated in 2013, and information on the updates and improvements expected was published in the [User Note for the Third AATSR Reprocessing](#). Users can identify third reprocessing products using the following information:

- The IPF software version contained within the main product header of third reprocessing products is "AATS/6.05".
- The Processing Stage Flag contained within the product name and main product header has been incremented to U, for example:
ATS_AR__2PUPA20120308_005911_000065273112_00246_52415_6357.N1.

Index of PQRs for IPF 6.05

An index of the PQRs applicable to the third reprocessing dataset (IPF 6.05) is given in Table 1. Full details of these PQRs are available in the [PQRs for IPF 6.05](#) section below.

Table 1 AATSR PQRs applicable to IPF 6.05

PQR Reference	PQR Title
ENVI-GSOP-EOGD-QD-04-0049	L1b PQRs with an impact on the ATS_AR__2P product

Index of historical PQRs

An index of the historical PQRs is given in Table 2. The relationship between historical data and these PQRs can be deduced by inspecting the [AATSR IPF Change Log](#). Full details of these PQRs are available in the [Historical PQRs](#) section below.

Table 2 Historical AATSR PQRs

PQR Reference	PQR Title
ENVI-GSOP-EOGD-QD-04-0049	L1b PQRs with an impact on the ATS_AR__2P product
ENVI-GSOP-EOGD-QD-04-0050	Co-ordinates of 10 arc minute cells
ENVI-GSOP-EOGD-QD-04-0051	Transposed confidence words
ENVI-GSOP-EOGD-QD-04-0052	17 km Dual View SST
ENVI-GSOP-EOGD-QD-04-0053	Incorrect NDVI exception value used in 50 km cells
ENVI-GSOP-EOGD-QD-04-0054	Missing or invalid ACLOUD fields in the 50 km AST cell records
ENVI-GSOP-EOGD-QD04-0055	Implementation of the LST algorithm and use of placeholder for LST in the ATS_AR__2P product
ENVI-GSOP-EOGD-QD-14-0127	Incorrect values in AST confidence word, 17 & 50 km cells

PQR Reference	PQR Title
ENVI-GSOP-EOGD-QD-14-0128	50/17 km cell size anomaly in AST product

References

Table 3 lists a set of AATSR references that users may find useful when using AATSR data.

Table 3 AATSR References

Item	Available from
Envisat and AATSR Product Specifications	https://earth.esa.int/support-docs/productspecs/index.htm
AATSR Product Handbook and related Technical Notes	http://envisat.esa.int/handbooks/
Additional information on AATSR	https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/envisat/instruments/aatsr
AATSR IPF Change Log	https://earth.esa.int/web/guest/-/aatsr-ipf-change-log
Other referenced documents	ESA library

PQRs for IPF 6.05

Field:	Contents:
PQR Title	L1b PQRs with an impact on the ATS_AR__2P product
PQR Reference	ENVI-GSOP-EOGD-QD-04-0049
Affected Data Sets	Various; items in bold are applicable to IPF 6.05
Description	<p>L2 spatially averaged data are affected by the following PQRs against the ATS_TOA_1P product, from which the gridded and averaged L2 products are derived:</p> <ul style="list-style-type: none"> • PQR ENVI-GSOP-EOGD-QD-04-0063: Sub-optimal geolocation and view collocation. <i>Note that the impact on the spatially averaged product is different to that on the full resolution product since the magnitude of the errors is lower than the spatial resolution of the spatially averaged product.</i> • PQR ENVI-GSOP-EOGD-QD-04-0064: Availability of VC1 files and calibration of visible channel data. <i>Note that this only affects the NDVI.</i> • PQR ENVI-GSOP-EOGD-QD-04-0066: Calibration of visible channels during outgassings. Note that this only affects the NDVI. • PQR ENVI-GSOP-EOGD-QD-14-0119: Visible channel calibration drift correction. <i>Note that this only affects the NDVI.</i> • PQR ENVI-GSOP-EOGD-QD-14-0121: Banding problem in consolidated data (errors loading 12 μm gross cloud tests LUT) • PQR ENVI-GSOP-EOGD-QD-14-0122: 12 μm brightness temperature discrepancy • PQR ENVI-GSOP-EOGD-QD-14-0124: Child product first MDS/ADS record displacement
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Historical PQRs

Field:	Contents:
PQR Title	L1b PQRs with an impact on the ATS_AR__2P product
PQR Reference	ENVI-GSOP-EOGD-QD-04-0049
Affected Data Sets	Various; items in bold are historical
Description	<p>L2 spatially averaged data are affected by the following PQRs against the ATS_TOA_1P product, from which the gridded and averaged L2 products are derived:</p> <ul style="list-style-type: none"> • PQR ENVI-GSOP-EOGD-QD-04-0063: Sub-optimal geolocation and view colocation. <i>Note that the impact on the spatially averaged product is different to that on the full resolution product since the magnitude of the errors is lower than the spatial resolution of the spatially averaged product.</i> • PQR ENVI-GSOP-EOGD-QD-04-0064: Availability of VC1 files and calibration of visible channel data. <i>Note that this only affects the NDVI.</i> • PQR ENVI-GSOP-EOGD-QD-04-0066: Calibration of visible channels during outgassings. <i>Note that this only affects the NDVI.</i> • PQR ENVI-GSOP-EOGD-QD-14-0119: Visible channel calibration drift correction. <i>Note that this only affects the NDVI.</i> • PQR ENVI-GSOP-EOGD-QD-14-0121: Banding problem in consolidated data (errors loading 12 μm gross cloud tests LUT) • PQR ENVI-GSOP-EOGD-QD-14-0122: 12 μm brightness temperature discrepancy • PQR ENVI-GSOP-EOGD-QD-14-0124: Child product first MDS/ADS record displacement
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	Co-ordinates of 10 arc minute cells
PQR Reference	ENVI-GSOP-EOGD-QD-04-0050
Affected Data Sets	All data processed before IPF v5.55
Description	<p>In all data <u>processed</u> (not acquired) before the introduction of IPF v5.55 in mid-January 2003 (at most stations before 14 January 03 and at the UK-PAC before 28 January 03), the calculation of the latitude and/or longitude of the 10 arc minute sub-cells is incorrect when either is negative. As a result, the latitude and longitude are not consistent with those of the corresponding 30 arc minute cell and two different sub-cells may be assigned the same co-ordinates when their common boundary is either the equator or the meridian.</p> <p>Refer to the additional notes below for a more detailed description of the problem and how to overcome it.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF version was used.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Reference	Additional notes for PQR ENVI-GSOP-EOGD-QD-04-0050
<p>1. Description of the problem</p> <p>The text of Software Problem Report on which this PQR is based reads as follows: “The calculation of the latitude and/or longitude of the 10 arc minute sub-cells is incorrect when either is negative. As a result, the latitude and longitude are not consistent with those of the corresponding 30 arc minute cell, and two distinct sub-cells may be assigned the same co-ordinates when their common boundary is either the equator or the meridian.</p> <p>“In the AST MDS at 10/30 arc minute resolution, there are nine 10 arc minute sub-cells corresponding to each 30 arc minute cell. Of these, the one in the south-west corner should be assigned the same latitude and longitude as the 30 arc minute cell in which it falls. The latitude and longitude should refer to the south-west corner point that is common to the cell and sub-cell. In the OP output this is only true when both co-ordinates are positive. In other cases the sub-cell is identified by a different corner point; if both latitude and longitude are negative, this is the north-east corner. In particular there are no sub-cells with longitude -180, although there are 30 arc minute cells with longitude -180.”</p> <p>This problem was the result of an incorrect rounding in the AATSR operational processor (OP). Suppose that the latitude and longitude of a pixel falling within a given 10 arc minute sub-cell, expressed in degrees, are φ, λ respectively. The position of the sub-cell is defined by the latitude and longitude of its south-west corner: that is to say, by</p> $\varphi_0 = \text{floor}(6 \times \varphi) / 6.0 \quad (1)$ $\lambda_0 = \text{floor}(6 \times \lambda) / 6.0 \quad (2)$ <p>where the <i>floor</i> function represents the algebraic integer part of its argument; that is to say, the nearest integer that is algebraically less than its argument. (Note that some software systems use a different definition of the <i>floor</i> function.)</p>	

The error arose because, when the argument was cast to integer, the OP rounded towards zero, rather than towards the more negative value.

Clearly if φ and λ are positive, this is correct. However, if either is negative, the rounding is in the wrong direction, and the resultant sub-cell co-ordinate will be too high by 1/6 degree (10 arc minutes), equal to the linear dimension of the sub-cell.

No equivalent problem affects the 50/17 km Measurement Data Sets, because here the cell and sub-cell latitude and longitude are derived directly from the latitude and longitude of the corner pixel.

2. Determination of the correct sub-cell co-ordinates

On the face of it, it might seem that the error could be corrected by subtracting 10 arc minutes from each co-ordinate if it is negative; thus

$$\varphi_0(\text{corrected}) = \varphi_0 - (1/6) \text{ if } \varphi_0 < 0,$$

and similarly for λ_0 . However, this approach is not correct if either φ_0 or λ_0 is zero.

For example, with the incorrect rounding, the distinct sub-cells containing pixels at positions (ε, λ) , $(-\varepsilon, \lambda)$, where ε is a small latitude ($\varepsilon < 10$ arc min), will both be assigned the co-ordinates $(0, \lambda_0)$, although they fall in different 30 arc minute cells on opposite sides of the equator. This leads to an ambiguity in the sub-cell location.

The only unambiguous way to correct the error is to make use of the order of the 10 arc minute sub-cells in the measurement data set (MDS) to deduce in which 30 arc minute cell they fall. Co-ordinates can then be assigned to them on this basis.

In the measurement data set at 30 arc minute resolution the cells are ordered by increasing latitude at each longitude, and by increasing longitude. The corresponding 10 arc minute sub-cells, in the 10 arc minute MDS, are ordered in groups of 9, each group corresponding to a 30 arc minute cell. Suppose that record j in the 30 arc minute MDS (where j is the record number used by EnviView, and is 1 for the first record in the MDS) corresponds to a particular cell. Then the 9 sub-cells that fall within the cell have record numbers from

$$9 \times (j - 1) + 1$$

to

$$9 \times (j - 1) + 9$$

inclusive in the 10 arc minute MDS.

Suppose that k ($1 \leq k \leq 9$) is the index of the sub-cell within the group of 9. The cells are ordered so that, if $\varphi_0(k)$ and $\lambda_0(k)$ represent the latitude and longitude of the sub-cell k ,

$$\varphi_0(k) = \varphi_0(1) + \Delta\varphi \tag{3}$$

$$\lambda_0(k) = \lambda_0(1) + \Delta\lambda, \tag{4}$$

where $\Delta\varphi$ and $\Delta\lambda$ are given in Table 1 below.

Table 4 Latitude and longitude offsets of sub-cell k

k	$\Delta\varphi$ (arcmin)	$\Delta\lambda$ (arcmin)
1	0	0
2	0	10
3	0	20
4	10	0
5	10	10

6	10	20
7	20	0
8	20	10
9	20	20

The co-ordinates of the sub-cell with $k = 1$, $\varphi_0(1)$ and $\lambda_0(1)$, are identical to the co-ordinates of the 30 arc minute cell within which it falls, so that the co-ordinates of sub-cell k can be calculated from the co-ordinates of the 30 arc minute cell simply by adding the values of $\Delta\varphi$ and $\Delta\lambda$ from the row of Table 1 corresponding to the value of k .

Explicit formulae for $\Delta\varphi$ and $\Delta\lambda$ can be given in terms of k as follows:

$$k' = \text{int}((k - 1)/3); \Delta\varphi(k) = 10k' \text{ arc minutes.} \quad (5)$$

$$k'' = (k - 1) - 3k'; \Delta\lambda(k) = 10k'' \text{ arc minutes.} \quad (6)$$

3. The case of the Meteo product (ATS_MET_2P)

This problem will also affect the Meteo product, where it is more difficult to treat because the Meteo product does not include the 30 arc minute cells. This case might be approached with reference to the Averaged Surface Temperature (ATS_AR__2P) product from which it is derived. However, if the latter is not available, the records in the Meteo product can be taken in groups of 9. Applying equations 7 and 8 below with φ , λ set equal to the latitude and longitude of the central sub-cell ($k = 5$) will give the co-ordinates $\varphi_0(1)$ and $\lambda_0(1)$ of the corresponding 30 arc minute cell directly, to which the corresponding offsets from Table 1 can be added.

$$\varphi_0 = \text{floor}(2 \times \varphi) / 2.0 \quad (7)$$

$$\lambda_0 = \text{floor}(2 \times \lambda) / 2.0 \quad (8)$$

where as before the *floor* function rounds towards the more negative value (not towards zero).

Field:	Contents:
PQR Title	Transposed confidence words
PQR Reference	ENVI-GSOP-EOGD-QD-04-0051
Affected Data Sets	All data processed with IPF v5.55 or higher
Description	<p>The confidence information in the MDSs of the above products consists of 32 bits, provided in the form of two 16-bit words. These two 16-bit words are transposed in the current products relative to the original product specification (note that the product specification itself was altered to match the implementation for issue 4/B onwards).</p> <p>The bit/byte numbering convention used is: bit 0 is the least significant bit, with byte 0 being the most significant byte. Currently only the first 4 of the potential 32 bits are used. Therefore the first word should always be set to zero, and the bits should only be set in the second word, e.g.</p> <pre>ast_conf_flags[0] 0x0000 ast_conf_flags[1] 0x0003</pre> <p>However, in the current products these words are transposed. e.g.</p> <pre>ast_conf_flags[0] 0x0003 ast_conf_flags[1] 0x0000</pre> <p>This problem was introduced with version v5.55 of the Operational Processor which began operating at most stations on 14 January 2003 and at the UK-PAC on 28 January 2003. Information on the processing centre, processing date and processor version number relating to each product can be found in the MPH.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, since the product specification (from 4/B onwards) has been updated to match the implementation described above.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	17 km Dual View SST
PQR Reference	ENVI-GSOP-EOGD-QD-04-0052
Affected Data Sets	Products generated before IPF v5.55
Description	<p>In November 2002 algorithm verification revealed that the 17 km dual view SST retrievals in the ascending arcs of the L2 spatially averaged product differed from the corresponding nadir-only retrievals by an unrealistically large amount and were clearly invalid. A health warning was issued to the validation team. The problem was also reported at the Validation Workshop in December 2002.</p> <p>This problem was corrected in a new version of the AATSR operational software (version 5.55) which was introduced for NRT data on 14 January 2003, and for consolidated data on 28 January 2003. However, users interested in the 17 km spatially averaged data set and in possession of data received in late 2002/early 2003 should bear in mind that the problem will still be present in AST products generated before these dates. The processing date for each product is given in the MPH.</p> <p>Note that the 10 arc minute cells in the AST product are not affected by this problem. Therefore, as the 17 km and 10 arc minute cell data sets are very similar, people with early data may be able to satisfy their needs using the 10 arc minute data instead of the 17 km data.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF was used.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	Incorrect NDVI exception value used in 50 km cells
PQR Reference	ENVI-GSOP-EOGD-QD-04-0053
Affected Data Sets	All data processed before IPF v5.58
Description	<p>When the mean NDVI in the 50 km AST records should be set to an exception value, it is being set to -1 and not to the correct exception value of -19999 in data processed before the date identified above.</p> <p>Note that -1 (in units of 0.01 %) represents a valid NDVI, and so an exception value of -1 cannot be used in this case.</p> <p>The exception value -1 is also being used instead of the exception value of -19999 for the standard deviation of NDVI.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF was used.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	Missing or invalid ACLOUD fields in the 50 km AST cell records
PQR Reference	ENVI-GSOP-EOGD-QD-04-0054
Affected Data Sets	All data processed before IPF v5.58
Description	<p>The 50 km and 30 arc minute MDS in the AATSR AST product include a number of parameters that are the counterparts of parameters in the ATSR-2 Averaged Cloud (ACLOUD) product.</p> <p>Due to a bug in the processing software, the ACLOUD parameters do not appear in the 50 km MDS of the Level 2 AST products processed with affected IPF versions as identified above.</p> <p>The fields affected are as follows.</p> <p>In the SST Measurement Data Sets:</p> <ul style="list-style-type: none"> • Cloud-top temperature, nadir view (cl_top_temp_nad) • Percentage cloud-cover, nadir view (perc_cl_cov_nad) • Cloud-top temperature, forward view (cl_top_temp_for) • Percentage cloud-cover, forward view (perc_cl_cov_for) <p>In the BT/TOA Measurement Data Sets:</p> <ul style="list-style-type: none"> • Lowest 11 micron BT of all cloudy pixels, nadir view (low_11bt_cl_nad) and the six subsequent fields. • Lowest 11 micron BT of all cloudy pixels, forward view (low_11bt_cl_for) and the six subsequent fields. <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF was used.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	Implementation of the LST algorithm and use of placeholder for LST in the ATS_AR__2P product
PQR Reference	ENVI-GSOP-EOGD-QD04-0055
Affected Data Sets	All data processed before IPF v6.0
Description	<p>Although a valid LST retrieval was implemented in the ATS_NR__2P product from 10 March 2004 (IPF v5.58), this implementation was NOT extended to the ATS_AR__2P product, as this part of the algorithm had not yet been prototyped. Therefore, the following placeholder used for Averaged LST was still in place:</p> <ul style="list-style-type: none"> • Averaged LST – currently set to averaged 11 µm BT <p>From 28 March 2007 (IPF v6.0), the averaged LST retrieval was implemented. For further information, refer to the Technical Note: Improvements to the AATSR IPF relating to Land Surface Temperature Retrieval and Cloud Clearing over Land by A.R. Birks (September 2007).</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF was used.</p>
Prepared by	IDEAS AATSR QC Team
Originator	P. Goryl
Approver	P. Lecomte

Field:	Contents:
PQR Title	Incorrect values in AST confidence word, 17 & 50 km cells
PQR Reference	ENVI-GSOP-EOGD-QD-14-0127 (issue date: 12 May 2014)
Affected Data Sets	Data processed before IPF v6.03 (worst affected before v5.60)
Description	<p>The AST confidence word may incorrectly show that the 3.7 micron channel was used in the nadir or dual view SST retrieval on daytime arcs, although this channel is not in fact used for daytime data.</p> <p>The problem was partially corrected with IPF v5.60, so flags are correctly set for daytime (descending) arcs where the SST retrievals are valid for both views. Nevertheless, the AST confidence word may be incorrectly set for records where the nadir or dual view SST retrieval was invalid, indicating that the 3.7 micron channel was used (although this has no meaning in this instance).</p> <p>Although the wrongly set flags may be ignored as far as the 17 km cell is concerned, they present a problem since they may propagate into the confidence word for the 50 km cell.</p> <p>The persistent issue still present after IPF v5.60 was traced to an issue with the initialisation of the AST confidence word. This was correct with IPF v6.03.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as a later IPF was used.</p>
Prepared by	IDEAS+ AATSR QC Team
Approver	P. Goryl

Field:	Contents:
PQR Title	50/17 km cell size anomaly in AST product
PQR Reference	ENVI-GSOP-EOGD-QD-14-0128 (issue date: 12 May 2014)
Affected Data Sets	All AST products processed before 15 June 2006
Description	<p>A parameter within a configuration file in the operating environment was automatically setting the cell size to 48, regardless of the contents of the ATS_PC2_AX file.</p> <p>Thus in these products the cell sizes are 48 and 16 km rather than the 50 and 17 km indicated by the ATS_PC2_AX auxiliary file. Subject to this modification, the averaged brightness temperature, reflectance and SST values will be correct.</p> <p>Data from 3rd reprocessing: This PQR is not applicable, as the correct configuration was used.</p>
Prepared by	IDEAS+ AATSR QC Team
Approver	P. Goryl

UPDATED: 21st September 2015