MEMORANDUM

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To	:	AATSR Users	**Date**	:	27 February 2009
			Issue	:	1
			File ID	:	IDEAS-VEG-OQC-REP-0253 Summary of (A)ATSR Archive QC Results.doc

SUBJECT : Summary of (A)ATSR Archive QC Activity Results

This memo presents a summary of the results from the quality control (QC) activities performed by the IDEAS AATSR QC Team on the archive of the reprocessed AATSR data and ATSR-1 and ATSR-2 data in Envisat format[1].

Background

ESA, in collaboration with Defra, have compiled all data from the (A)ATSR series of instruments flown on ERS-1, ERS-2 and Envisat. This archive amounts to a continuous dataset spanning 1991 to present day, with some overlap between the individual instruments. In order for this long time series dataset to be accepted by the user community, the quality of the data needed to be verified.

The archive consists of AATSR data processed with IPF v6.01 and ATSR-1/2 in AATSR format processed by the Archive Product Processor at the Rutherford Appleton Laboratory. Note: the APP is maintained to be in line with the Operational Processor, hence the processing is comparable to IPF v6.01. The characteristics and history of each instrument need to be appreciated to understand the data properly[2].

Approach

The quality of every data product contained within an ESA supported archive should be guaranteed. The MERCI tool, as developed by Brockmann Consult[3] under an ESA contract, has been installed at each of the archives, to catalogue the data. This tool performs some basic quality checks on the data; the results of these checks will be available to the users when they search the archives for products. The checks carried out by MERCI complement the work described in this document; MERCI was not used as part of the quality control activity. This activity implements QC not included in the functionality of the MERCI tool.

The correct use of auxiliary files, IPF version and the correct generation of headers for each Level 1 (L1) and Level 2 (L2) product will be verified using a bespoke tool, ATSR Header Analysis Tool (AHAT), created at VEGA[4]. For ATSR-1 and ATSR-2, only a

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[1] *Envisat-style products for ATSR-1 and ATSR-2, APP-TN-005, Issue 2.0, 20 March 2007:* http://www.neodc.rl.ac.uk/docs/atsr/Env-ATS-for-ATSR.pdf

[2] *ATSR-1/2 User Guide, Issue 1.0, 15 June 1999:* http://www.atsr.rl.ac.uk/documentation/docs/userguide/atsr_user_guide_rev_3.pdf

[3] *MERCI Tool Information:* http://www.brockmann-consult.de/english/flyers/pdf/lores/MERCI-Product-Information.pdf

[4] *VEGA is a trade name of SELEX Systems Integration Ltd.*

sample of the data needed to be inspected, as they have been generated during a single processing run. All AATSR data were inspected by AHAT as these products were generated in stages by the reprocessing activity.

L3 maps of monthly intervals were created for the whole archive, enabling the quality of all the product contents to be assessed efficiently and reliably; inspecting Level 3 maps permitted a high level examination of the data, immediately highlighting any problems or issues with the data. The creation of the L3 maps required the retrieval of the Meteo products for all 3 instruments; it was decided to analyse the headers of all of these Meteo products. In this way, every orbit represented in the archive will have undergone some level of QC for both format and contents.

The use of AHAT allows for product format and processing configuration to be verified, whilst the creation and examination of Level 3 maps allows for a high level inspection of the data itself to be conducted.

The application of the ATSR-2 ZGM correction was examined by visually inspecting the fit of the coastline to the data.

The results from these quality control tasks are presented in the next section.

Results

Header Inspections

The majority of products passed the QC inspections with no major anomalies being identified. However, there were a few data quality issues noted, which warranted further investigation:

- 4 AATSR orbits affected by a one hour time difference between product start/stop times reported in headers;
- 1 AATSR orbit with a one second discrepancy between product start/stop times reported in headers;
- 1 ATSR-2 orbit with differences in reported stop times;
- 2 ATSR-1 orbits with start times in 1950.

Some products were identified as not having come from the reprocessing activity. These products did not have the processing stage set as ‘R’ (the 11th character of the filename). These should all have been removed from the archive. Users are advised to ensure the products they receive do in fact come from the reprocessing, in order to be sure of receiving the most up-to-date data.

In addition to these issues, it was noted that old versions of the Digital Elevation Map (AUX_DEM_AX) and Land/Sea Mask (AUX_LSM_AX) auxiliary files were in use for certain data products. Further details are provided in the “Information for Users” section. This is not expected to have a significant impact upon the quality of AATSR data.

All ATSR-1 and ATSR-2 products were processed using a version of the auxiliary file with cloud flagging information (ATS_CL1_AX) whose validity range did not cover the entire period of the datasets. However, the information contained within the auxiliary file is applicable for the entirety of both missions, and so the error is only in the filename. There is no associated impact on data quality.

Level 3 Maps

Meteo products for all three missions were retrieved and processed up to Level 3 to form

monthly maps. This was achieved using the QUASAR tool, developed by RAL specifically for AATSR QC work. Figure 1 shows an example of the L3 maps produced.

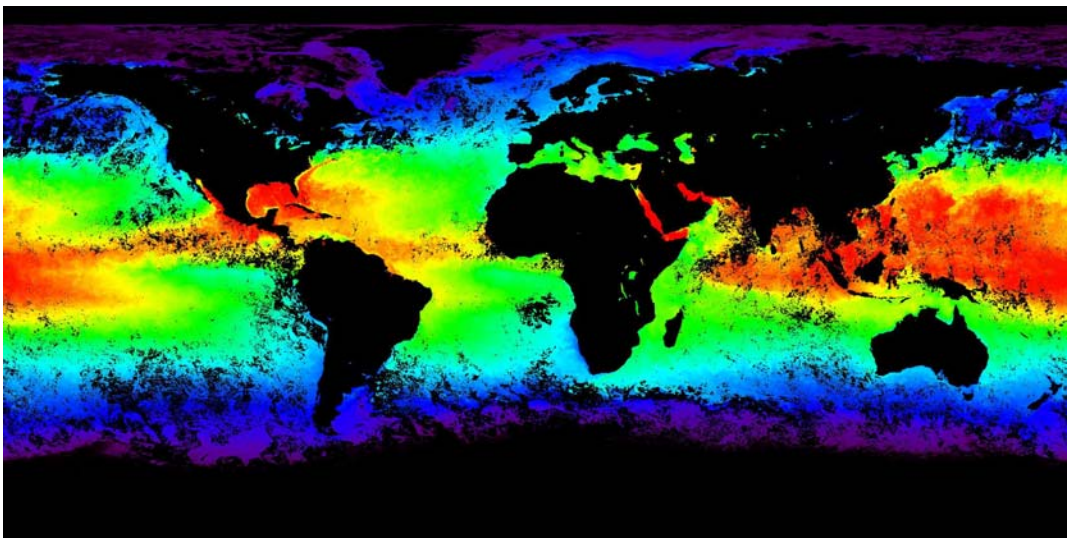

Figure 1 AATSR Level 3 map of dual-view SST from July 2004

The maps were inspected for any sign of problems with the data. In general, the quality of the data appeared nominal. However, there are noticeable areas, more prominent in the earlier missions, of blocks of cold water appearing surrounded by warmer seas. The cause of this was identified as failures of the cloud clearing. Other than these cloud clearing failures, no problems or issues were identified with the data. Examination of the complete series of the Level 3 maps indicates that the (A)ATSR archive is nominal.

It is planned to make the Level 3 maps available from the AATSR PCS website, see Sources of Further Information.

ATSR-2 ZGM Correction Inspection

The MERCI tool was used to identify suitable ATSR-2 scenes during January – June 2003 which had clearly visible coastline. These products were then downloaded and inspected. In each case a plot of the coastline was overlaid onto data from the visible channels, and the fit between data and coastline was evaluated.

In all cases, the comparison was favourable, showing significant improvement compared to examples seen without the ZGM correction applied. Examples of the observed fit are shown in Figure 2, Figure 3, Figure 4 and Figure 5.

Figure 2 Orbit 40285

Figure 3 Orbit 40268

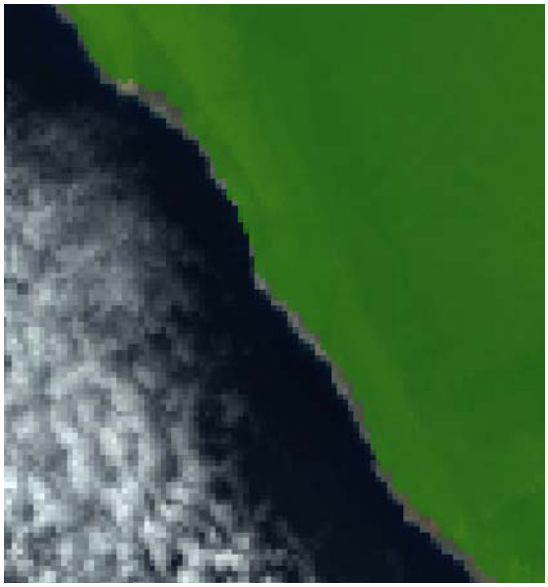

Figure 4 Orbit 41443

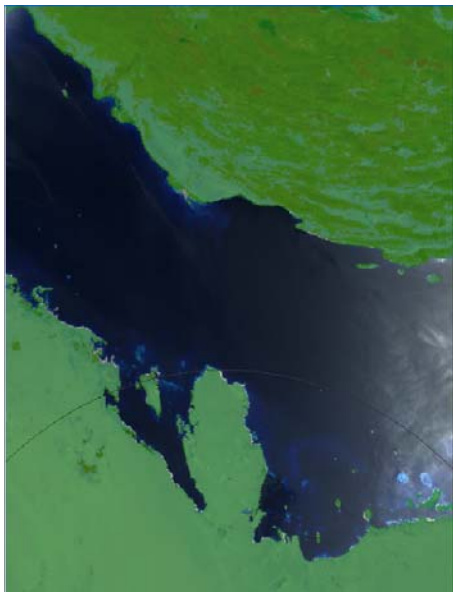

Figure 5 Orbit 41585

Conclusion

The investigation into the quality of the (A)ATSR archive revealed no significant problems or anomalies in the data.

A few products suffer from small issues, these are listed in Table 1. These products should have been removed from the archives. It is expected that the problems affecting these products will be corrected and the archive will be populated with the nominal products for these orbits at a later date.

Table 1 List of Problem Products

Instrument	Filenames of Affected Products
AATSR	ATS_TOA_1PRUPA20050327_004057_000101372035_00474_16059_2969.N1
	ATS_TOA_1PRUPA20050327_032133_000029182035_00475_16060_8351.N1
	ATS_NR__2PRUPA20050327_032133_000029182035_00475_16060_8353.N1
	ATS_AR__2PRUPA20050327_032133_000029182035_00475_16060_8354.N1
	ATS_TOA_1PRUPA20070325_010059_000101372056_00374_26480_7830.N1
	ATS_TOA_1PRUPA20070325_034135_000029182056_00375_26481_7378.N1
	ATS_NR__2PRUPA20070325_034135_000029182056_00375_26481_7380.N1
	ATS_AR__2PRUPA20070325_034135_000029182056_00375_26481_7381.N1
ATSR-2	AT2_TOA_1PTRAL19980929_231824_000000001036_00115_18005_0000.E2
	AT2_NR__2PTRAL19980929_231824_000000001036_00115_18005_0000.E2
	AT2_AR__2PTRAL19980929_231824_000000001036_00115_18005_0000.E2
ATSR-1	AT1_TOA_1PTRAL19930604_020156_000000004013_00188_09852_0000.E1
	AT1_NR__2PTRAL19930604_020156_000000004013_00188_09852_0000.E1
	AT1_AR__2PTRAL19930604_020156_000000004013_00188_09852_0000.E1
	AT1_TOA_1PTRAL19950725_180515_000000008005_00026_21056_0000.E1
	AT1_NR__2PTRAL19950725_180515_000000008005_00026_21056_0000.E1
	AT1_AR__2PTRAL19950725_180515_000000008005_00026_21056_0000.E1

Whilst the quality of the data in the (A)ATSR archive has been verified, there are a few issues and points of information of which users should be aware. These are given in the following section.

Information for Users

Orbit Numbering of AATSR Products

AATSR data products are given the number of the orbit within which the first line of data is located. However, the majority of the product will contain data for the next orbit. This is illustrated in Figure 6. The first line of Product #1 lies within Orbit #1 hence it is given this orbit number, even though it is Orbit #2 which is completely covered by the data.

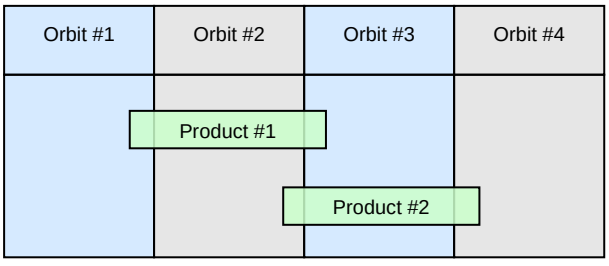

Figure 6 AATSR Orbit Numbering

This information needs to be taken into consideration when identifying full orbit products or searching for data which is close to the ANX.

Usage of AUX_LSM_AX file

Two versions of the Land/Sea Mask auxiliary file have been used in the processing of the archive. The updated file was introduced into the ground segment on 18 February 2008. This means that:

- NRT data acquired and processed since 18 February 2008 uses the new file.
- Systematic consolidated data processed after 18 February 2008 uses the new file. This is equivalent to data acquired after 04 February 2008.
- For reprocessed data, the use of the new or old file depends on processing date. In general, files acquired after 19 May 2006 use the new file. However, not all files were processed in chronological order of acquisition, so the only way to be sure is to inspect the relevant field in the SPH.

The new LSM file is:
`AUX_LSM_AXVIEC20080218_104630_20020101_000000_20200101_000000`

This updated file introduced a correction relating to the location of the Marquesas Islands. There should be no other impact on the data. Hence, if the region of interest is not that of the Marquesas Islands, then there should be no noticeable difference if the file was processed with either the old or new version of the Land/Sea Mask auxiliary file.

For reference, the previous land/sea mask auxiliary file used was:
`AUX_LSM_AXVIEC20020123_141228_20020101_000000_20200101_000000`

Usage of AUX_DEM_AX file

All products have been processed with an earlier version of the Digital Elevation Model file, AUX_DEM_AX. It is not foreseen that this will have any significant impact upon the quality of AATSR data.

The current file is:
`AUX_DEM_AXVIEC20031201_000000_20031201_000000_20200101_000000`

The file used in the reprocessing was:
`AUX_DEM_AXVIEC20020123_121901_20020101_000000_20200101_000000`

Visible Channel Calibration

There have been two updates made to allow for drift in the visible channels. These have been implemented using modifications to the visible calibration (VC1) files. The first applied an exponential drift correction and was incorporated in VC1 files from 29 Nov 05 13:20:26. Following observations of the drift, the correction was altered to a thin film model, and this was applied to VC1 files from 18 Dec 06 20:14:15.

A complete set of VC1 files containing the new drift correction could not be produced for this reprocessing, and so the drift correction applied will be dependent upon the generation date of the VC1 file used. These are summarised in Table 2.

Table 2 Visible Channel Drift Correction by VC1 Generation Date

Date VC1 Generated	Visible Channel Correction Applied
Before 29 Nov 05	No drift correction applied
29 Nov 05 – 18 Dec 06	Exponential drift correction applied
After 18 Dec 06	Thin film drift correction applied

Sources of Further Information

The **AATSR PCS site** contains further details on AATSR data:
http://earth.esa.int/pcs/envisat/aatsr/

The **AATSR Handbook** and **FAQ** contain further information on the AATSR instrument and its data products:
http://envisat.esa.int/handbooks/

The **AATSR Product Disclaimers** contain information on other factors to take into account when dealing with AATSR data:
http://earth.esa.int/dataproducts/availability/

A summary of the **instrument status history**, as provided by the Rutherford Appleton Laboratory, may be obtained from:
http://aatsr2.ag.rl.ac.uk/status.html

General **Envisat** website, including news and technical status reports:
http://envisat.esa.int/

Further information on **EOLI-SA** may be found at:
http://earth.esa.int/object/index.cfm?fobjectid=5035

For any further information or queries, please contact EOHelp@eo.esa.int.