



MEMORANDUM

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| To | : Philippe Goryl, ESA | Date | : 02 December 2013 |
| CC | : Nigel Houghton, ESA aatsr@eo-sppa.org | Issue | : 1.1 |
| | | File ID | : IDEAS-VEG-OQC-REP-1374 ATSR-1 and ATSR-2 ARC L2P Reprocessing QC Report v1-1.doc |

SUBJECT : ATSR-1 and ATSR-2 ARC L2P Reprocessing QC Report

This document is a report on the systematic and detailed QC investigations on ATSR-1 and ATSR-2 ARC L2P and L3U reprocessed data in netCDF format. IDEAS QC procedures for this reprocessing are outlined in the AATSR Third Reprocessing IDEAS QC Plan (IDEAS-VEG-OQC-PLN-1014).

Scope

ATSR-1 ARC L2P and L3U reprocessed data (generated by the ARC L2P processor) from 01 August 1991 to 17 December 1997, and ATSR-2 ARC L2P and L3U reprocessed data from 1 June 1995 to 22 June 2003, were analysed by IDEAS QC checks. The systematic checks were performed on all products in netCDF format, and included thorough inspection of the product headers for consistency and correct contents, converting the netCDF files to jpegs using BEAM as a means of verifying the product contents, and also verifying the completeness of the L2P/L3U dataset when compared with the original set of Envisat-format L1 that were previously checked. Visual inspections were also performed on randomly selected L2P and associated L3U products.

Results

This section outlines the results from the systematic checks, completeness checks and visual inspections of the data.

Systematic checks

The total number of netCDF products analysed in bulk was 46096 for ATSR-1 and 74756 for ATSR-2.

There were three separate issues raised for investigation from the systematic checks:

- 1) Nine ATSR-2 L2P products were found to have incorrect header contents (all variables affected except time);
- 2) For ATSR-1, 84 L2P and 727 L3U products failed to convert to jpegs, raising queries about the contents and quality of the original products;
- 3) For ATSR-2, 9 L2P and 630 L3U products failed to convert to jpegs, raising queries about the contents and quality of the original products.

The investigations into the issues outlined above are detailed in the following sections.

Also, as reported for the AATSR L2P ARC products (IDEAS-VEG-OQC-REP-1348 AATSR ARC L2P Reprocessing QC Report), a handful of products most months for both instruments were flagged for timing mismatches between the start time in the product filename and the start time listed in the header. The header start time, and the first row of pixels within the L2P product, were 1 second earlier than the start time listed in the

filename and the data from the originating L1 product. This matter has been referred to O. Embury at the University of Reading but it was decided that the affected products will remain in the archive, since the difference is minimal and the products affected are few.

ATSR-2 incorrect information in headers

The nine ATSR-2 L2P products that contained incorrect information in the header are listed in Table 1, along with their associated L3U; note that the L3U did not give rise to any header errors.

Table 1. ATSR-2 L2P products with no header information

| Product name – L2P | Product name – L3U |
|---|---|
| 19951228221853-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19951228221853-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 19980606134430-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19980606134430-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20001011111846-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20001011111846-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010207171255-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010207171255-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010525210719-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010525210719-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010526034434-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010526034434-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010527062945-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010527062945-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010528042017-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010528042017-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20010529035009-UPA-L2P_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20010529035009-UPA-L3U_GHRSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |

The L2P products listed in Table 1 were found to have a number of irregularities:

1. Their filesizes were very small (12 or 129 kB vs ~30 MB for a normal L2P product);
2. BEAM was unable to open them;
3. The headers contained no variable attribute information other than time.

Opening the parent L1 in BEAM showed that there were no data in the bands. Although the associated L3U products were not flagged for header irregularities, they contain no useable data.

Reference to the removal list for ATSR-2 data showed that the associated L1 and L2 products were scheduled for removal. Therefore, the L2P and L3U products listed in Table 1 should also be removed from the archive.

Failure to convert to jpegs: both L2P and L3U

Table 2 shows the number of orbits for ATSR-1 and ATSR-2 for which both L2P and L3U did not produce a jpeg.

Table 2. Number of orbits for which both L2P and L3U netCDF files did not produce a jpeg

| ATSR-1 | ATSR-2 | Reason |
|--------|--------|--|
| 84 | 9 | Parent L1 was too short to produce a combined view |

Visual inspections of some of the netCDF files and their parent L1, and calculation of the lengths of all parent L1 products revealed that:

- The ARC L2P contained no SSTs;
- Only metadata existed in the ARC L3U;
- The parent L1 was found to be too short to produce a combined view. None of the 93 L1 products was longer than 77 seconds.

It is recommended that the affected L2P and L3U netCDF products be removed from the archive since they contain no useable data; this will be documented in the user information.

Failure to convert to jpegs: L3U only

Table 3 shows the number of orbits for which only the ARC L3U netCDF products for both instruments failed to produce a jpeg, along with how many of the originating L2P files did not contain any valid SST and how many contained valid SST data, and of those cases with valid SST pixels how many contained quality level=5 data (the requirement for L3U products).

Table 3. Number of orbits for which the L3U netCDF files did not produce a jpeg, number that did not or did contain valid SST data in the L2P and number of the latter that contained quality level (QL) 5 data

| Instrument | L3U jpeg failures | No SST in L2P | SST in L2P | QL=5 data in L2P SST |
|------------|-------------------|---------------|------------|----------------------|
| ATSR-1 | 643 | 434 | 209 | 0 |
| ATSR-2 | 621 | 594 | 27 | 0 |

These failures to make L3U jpegs were because BEAM was not able to open the ARC L3U product. It was also found that the netCDF facility `ncdump` did not function normally: the L3U variable `sea_surface_temperature` could not be output successfully. However, by using `ncdump` on the associated L2P products it was possible to discover if they contained any valid SST data, and if so, whether any were quality level 5 data.

In a large proportion of cases (see Table 3) there were no SSTs in the L2P products and therefore no possibility of SSTs in the L3U products; it is recommended that the affected L2P and L3U netCDF products be removed from the archive since they contain no useable data (and the L3U products are corrupt).

In some cases (see Table 3) there were SSTs in the L2P products, but none of these were of the quality level necessary to be input to the L3U product; it is recommended that the affected L3U netCDF products be removed from the archive since they contain no useable data and are corrupt.



All the above issues will be documented in the user information and the lists of products to be removed will be made available to the archive operators (not listed in this document for space reasons).

It must be noted that a number of the products subject to the issues above have already been identified for segregation or removal from the ATSR-1 and ATSR-2 database, due to commissioning period timings, outgassings and other instrument events. Therefore, lists of extra products to be removed will be made available to the archive operators.

Completeness checks

The ARC data completeness checks were based on the listing of L1 products generated by IDEAS as part of the completeness checks carried out on the ATSR-1 and ATSR-2 Envisat-format reprocessed data. Referencing the L2P/L3U reprocessed data against the L1 list showed that every L1 product had generated both L2P and L3U products, except for one ATSR-1 L1 product (orbit 18017), which was subsequently reprocessed and generated a nominal L2P and L3U product. There are therefore no open issues with the completeness of the ATSR-1 and ATSR-2 L2P/L3U reprocessed dataset.

Visual inspections

For detailed inspections, one L2P product from each instrument was randomly chosen per year of mission to be inspected, along with its associated L3U. A total of 32 products were inspected using BEAM. The list of products is given in Table 4.

Table 4. List of products that were visually inspected

| Product name – L2P | Product name – L3U |
|--|--|
| 19911130030044-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19911130030044-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19920819062645-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19920819062645-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19930711090149-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19930711090149-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19940508111420-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19940508111420-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19950301154512-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19950301154512-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19960229182227-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19960229182227-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19970801044601-UPA-L2P_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc | 19970801044601-UPA-L3U_GHR SSTskin-ARC-ATSR1-v02.0-fv01.0.nc |
| 19950917033420-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19950917033420-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 19961125072410-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19961125072410-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 19970306111113-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19970306111113-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 19980512145522-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19980512145522-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 19990720173618-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 19990720173618-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20001029212039-UPA-L2P_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20001029212039-UPA-L3U_GHR SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |

| Product name – L2P | Product name – L3U |
|--|--|
| 20011203232755-UPA-L2P_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20011203232755-UPA-L3U_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20020214014606-UPA-L2P_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20020214014606-UPA-L3U_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |
| 20030613182050-UPA-L2P_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc | 20030613182050-UPA-L3U_GHRSSST-SSTskin-ARC-ATSR2-v02.0-fv01.0.nc |

All bands were examined as part of the check. These visual inspections showed that some bands within the L2P products had not been filled correctly for pixels where there was missing data in the parent L1 or no calculated SST; this was seen in the AATSR L2P dataset and reported fully in the AATSR ARC L2P Reprocessing QC Report (IDEAS-VEG-OQC-REP-1348). This behaviour was deemed to be acceptable in the reprocessed dataset, due to the fact that the pixels in question are not associated with SST data; L3U products are unaffected.

Conclusions

L2P files that contain incorrect header contents (because the parent L1 products contain no band data) also contain no useable data, therefore it is recommended that they and the associated L3U files be removed from the archives.

L2P/L3U files for which the parent L1 product is too short to generate a combined view contain no useable data, therefore it is recommended that they be removed from the archives.

For L2P files that contain no SST data, it is recommended that the L2P and L3U files be removed from the archives.

For L2P files that do not contain any quality level 5 SST data, it is recommended that the associated L3U files be removed from the archives.

Bands within the L2P products that are partially incorrectly filled have been deemed acceptable in the reprocessed dataset, due to the fact that affected pixels are not associated with SST data. L3U products are unaffected.

Actions

On the basis of the investigations from the ATSR-1 and ATSR-2 ARC L2P/L3U QC, the following actions are requested:

- 1) From the ATSR-2 products that contained incorrect header information, IDEAS have confirmed that these products are on the RAL removal lists:
 - a. OCF and NEODC to ensure the removal of all required L2P and L3U products from the archives based on the RAL removal lists, if they have not already done so.
- 2) From the failure to convert to jpeg investigations for ATSR-1 and ATSR-2:
 - a. IDEAS to prepare a listing of L2P/L3U products that should be removed from the archives and make the lists available to the archive operators. These lists will be delta lists and will not contain any of the products previously identified by RAL as necessary for removal.
 - b. OCF and NEODC to remove the requested products from the archives.



In addition to the actions above, IDEAS will provide the following to users:

- A warning that no useable data exist within certain L2P/L3U files and for short products.
- Information on incorrectly filled L2P bands in the final reprocessing information for users.
- Any information required in light of the results from the investigation into the 1 second start time mismatch.