MEMORANDUM

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To	:	Philippe Goryl, ESA	**Date**	:	25 September 2013
CC	:	RAL aatsr@eo-sppa.org	**Issue**	:	1.0
			File ID	:	IDEAS-VEG-OQC-REP-1349 ATSR-1 and ATSR-2 Reprocessing Detailed QC Report v1-0.doc

SUBJECT : ATSR-1 and ATSR-2 Reprocessing Detailed QC Report

This document gives the results of the detailed QC checks carried out on the ATSR-1 and ATSR-2 Envisat-format data from the third reprocessing. IDEAS QC procedures for this reprocessing are outlined in the AATSR Third Reprocessing IDEAS QC Plan (IDEAS-VEG-OQC-PLN-1014). The results of the systematic QC checks on ATSR-1 and ATSR-2 reprocessed data were given in IDEAS-VEG-OQC-REP-1331.

Scope

The ATSR-1 reprocessed dataset ran from 01 August 1991 to 17 December 1997 and the ATSR-2 reprocessed dataset from 1 June 1995 to 22 June 2003. A detailed inspection of ATSR-1 and ATSR-2 colocation was carried out in order to confirm expected improvements. (Note that no geolocation correction was introduced for these instruments and so no specific analysis was performed.) Visual inspections were also performed on randomly selected TOA, NR and AR products for both instruments.

Results

The outcome of each of the detailed QC checks is given in the following subsections.

ATSR-1 colocation

The colocation was checked by the same method used during AATSR operations to monitor this characteristic: taking sample products and calculating the difference for a particular band between the nadir view and forward view data using BEAM. Table 1 lists the products that were inspected: one randomly chosen product per year.

Table 1. Products inspected for ATSR-1 colocation

Product
Reprocessed data
AT1_TOA_1PURAL19911129_033413_000000001043_00032_01935_0000.E1
AT1_TOA_1PURAL19920922_001559_000000004006_00044_06201_0000.E1
AT1_TOA_1PURAL19930718_073728_000000004014_00320_10485_0000.E1
AT1_TOA_1PURAL19940511_124918_000000006999_99999_14743_0000.E1
AT1_TOA_1PURAL19950308_145913_000000007002_02263_19064_0000.E1
AT1_TOA_1PURAL19960104_142100_000000008009_00353_23387_0000.E1
AT1_TOA_1PURAL19970801_030525_000000008026_00060_31611_0000.E1
Previous data
AT1_TOA_1PTRAL19911129_033413_000000001043_00032_01935_0000.E1
AT1_TOA_1PTRAL19920922_001559_000000004006_00044_06201_0000.E1

Product
AT1_TOA_1PTRAL19930718_073728_000000004014_00320_10485_0000.E1
AT1_TOA_1PTRAL19940511_124918_000000006999_99998_14743_0000.E1
AT1_TOA_1PTRAL19950308_145913_000000007002_02263_19064_0000.E1
AT1_TOA_1PTRAL19960104_142100_000000008009_00353_23387_0000.E1
AT1_TOA_1PTRAL19970801_030525_000000008026_00060_31611_0000.E1

For AATSR, statistics for the 0.87 micron channel difference were calculated, since visible channels give the clearest indications of colocation differences and improvements. This option is not available for ATSR-1 and so the 11 micron channel was chosen. Products from the previous dataset were truncated at the ANX to match the reprocessed data product length. The average mean and standard deviation of the forward–nadir difference image for the 11 micron channel are given in Table 2.

Table 2. Average view difference mean and standard deviation for previous and reprocessed ATSR-1 data

	Previous	Reprocessed
Average mean	-2.84	-2.85
Average standard deviation	6.24	6.13

Although the average SD has improved from the previous data to the reprocessed, this is not the case for the average mean although the change is very small. However, whilst the statistics do not seem to present a promising result, visual inspections of the difference views clearly display the improvements and a selection of these are shown below.

Figure 1, Figure 2 and Figure 3 display 11 micron difference images for orbits 01935, 10485 and 19064, respectively. They display the previous data (left) and reprocessed data (right). It can be seen that the difference images for the previous data have much more variation, indicating more difference, whereas the images for the reprocessed data are much “flatter” meaning there is less difference and so the views are better colocated.

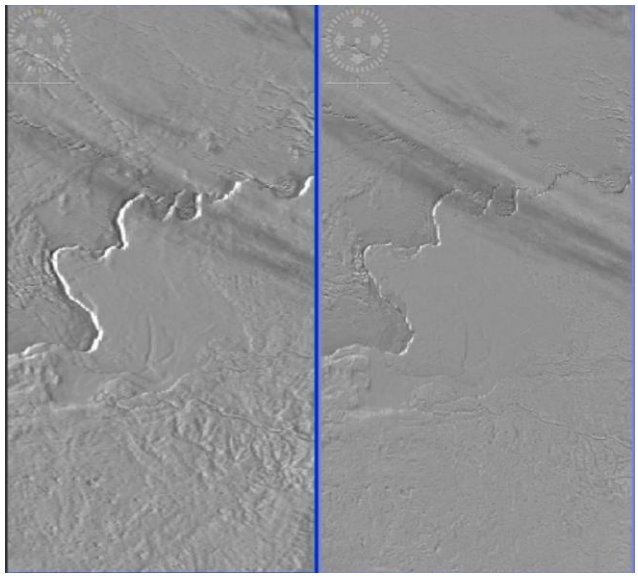

Figure 1. Forward–nadir difference view of the 11 micron channel for ATSR-1 orbit 01935: previous data (left) and reprocessed data (right).

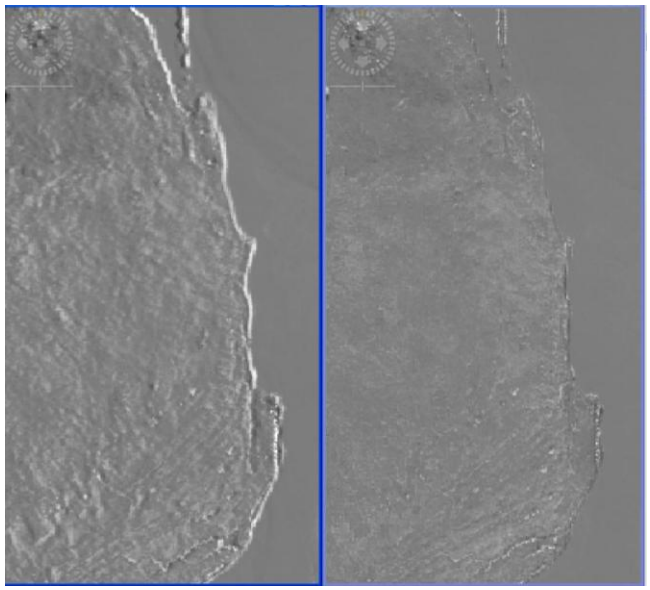

Figure 2. Forward–nadir difference view of the 11 micron channel for ATSR-1 orbit 10485: previous data (left) and reprocessed data (right).

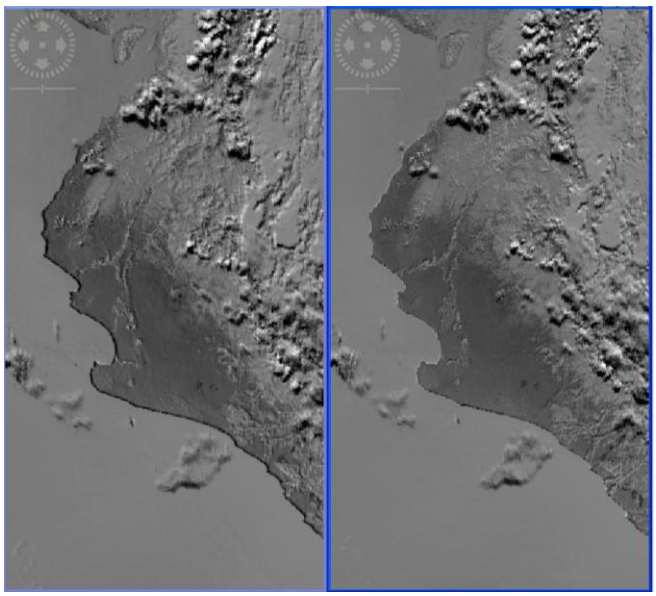

Figure 3. Forward–nadir difference view of the 11 micron channel for ATSR-1 orbit 19064: previous data (left) and reprocessed data (right).

It is therefore confirmed that the ATSR-1 colocation has been improved within the reprocessed dataset.

ATSR-2 colocation

The same method was used as outlined in the previous section for ATSR-1 colocation. Table 3 lists the ATSR-2 products that were evaluated for colocation: one randomly chosen product per year.

Table 3. Products inspected for ATSR-2 colocation

Product
Reprocessed data
AT2_TOA_1PURAL19950602_025657_000000001001_00246_00601_0000.E2
AT2_TOA_1PURAL19960707_075552_000000001012_00478_06344_0000.E2
AT2_TOA_1PURAL19970815_043730_000000001024_00247_12125_0000.E2
AT2_TOA_1PURAL19980222_111653_000000001029_00480_14863_0000.E2
AT2_TOA_1PURAL19991020_192530_000000001047_00127_23528_0000.E2
AT2_TOA_1PURAL20001207_155251_000000001059_00039_29452_0000.E2
AT2_TOA_1PURAL20011227_223328_000000001070_00043_34967_0000.E2
AT2_TOA_1PURAL20020918_234538_000000001077_00330_38761_0000.E2
AT2_TOA_1PURAL20030504_205849_000000001084_00085_42023_0000.E2
Previous data
AT2_TOA_1PTRAL19950602_025657_000000001001_00246_00601_0000.E2
AT2_TOA_1PTRAL19960707_075552_000000001012_00478_06344_0000.E2
AT2_TOA_1PTRAL19970815_043730_000000001024_00247_12125_0000.E2
AT2_TOA_1PTRAL19980222_111653_000000001029_00480_14863_0000.E2
AT2_TOA_1PTRAL19991020_192530_000000001047_00127_23528_0000.E2
AT2_TOA_1PTRAL20001207_155251_000000001059_00039_29452_0000.E2
AT2_TOA_1PTRAL20011227_223328_000000001070_00043_34967_0000.E2
AT2_TOA_1PTRAL20020918_234538_000000001077_00330_38761_0000.E2
AT2_TOA_1PURAL20030504_205849_000000001084_00085_42023_0000.E2

The average mean and standard deviation of the forward–nadir difference images for previous and reprocessed data for the 11 micron channel are given in Table 4.

Table 4. Average view difference mean and standard deviation for previous and reprocessed ATSR-2 data

	Previous	Reprocessed
Average mean	-2.80	-2.80
Average standard deviation	6.74	6.48

As for ATSR-1, the statistical difference between previous data and reprocessed difference bands is small but the SD has improved. Figure 4, Figure 5 and Figure 6 display details from the 11 micron difference images for orbits 12125, 23528 and 42023, respectively. These figures are shown in closer detail than the ATSR-1 images and so appear noisier. An improvement can clearly be seen: the previous data images again have much more variation, indicating more difference, whereas the images for the reprocessed data are much “flatter” meaning there is less difference and so the views are better colocated.

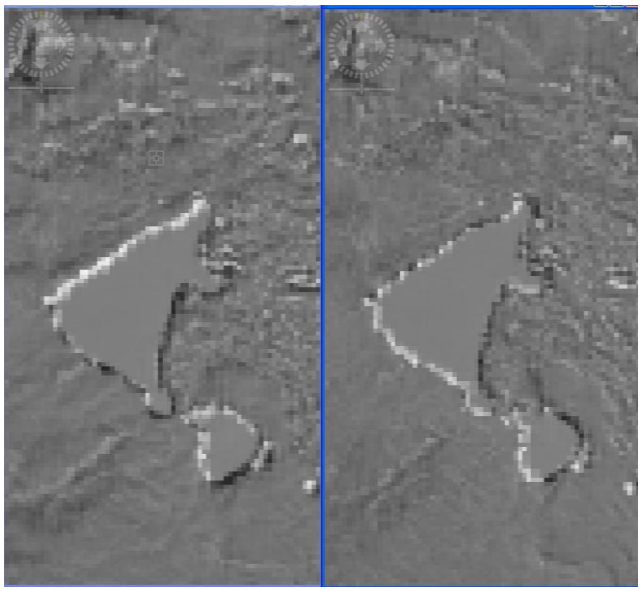

Figure 4. Forward–nadir difference view of the 11 micron channel for ATSR-2 orbit 12125: previous data (left) and reprocessed data (right).

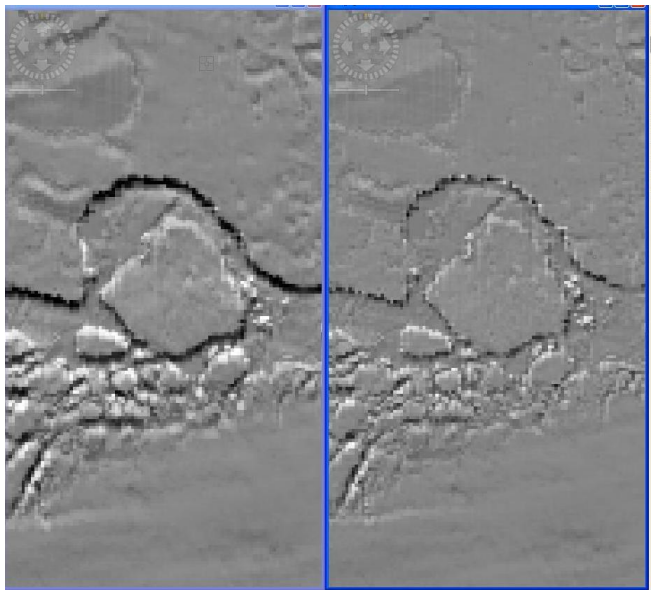

Figure 5. Forward–nadir difference view of the 11 micron channel for ATSR-2 orbit 23528: previous data (left) and reprocessed data (right).

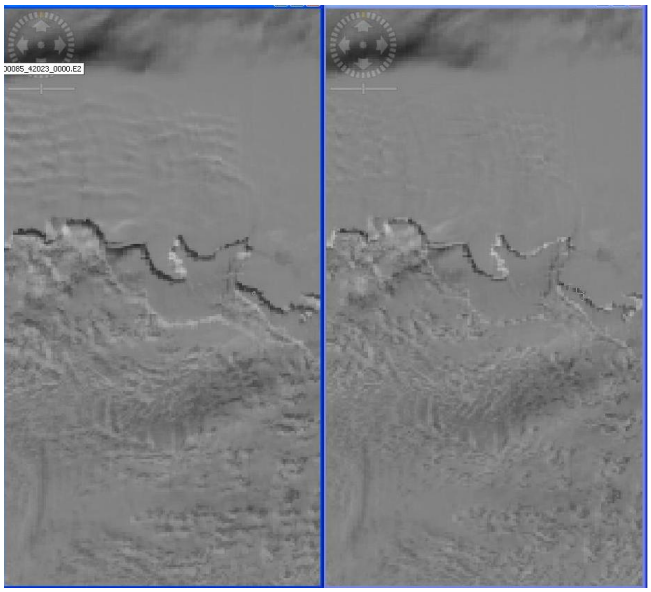

Figure 6. Forward–nadir difference view of the 11 micron channel for ATSR-2 orbit 42023: previous data (left) and reprocessed data (right).

It is therefore confirmed that the ATSR-2 colocation has been improved within the reprocessed dataset.

Visual inspections

Visual inspections were performed on randomly selected TOA, NR and AR products, taking one of each product type per year of mission for each instrument (48 in total). Each product was opened using appropriate tools, and selected bands within the product were then scanned for anomalies. Table 5 lists the products that underwent visual inspections; two products that were found to have anomalies are shown in bold.

Table 5. List of products that were visually inspected

Product
AT1_TOA_1PURAL19911103_012017_000000001035_00002_01561_0000.E1
AT1_TOA_1PURAL19920908_023650_000000004005_00346_06002_0000.E1
AT1_TOA_1PURAL19930715_033411_000000004014_00275_10440_0000.E1
AT1_TOA_1PURAL19940520_073209_000000006999_99999_14869_0000.E1
AT1_TOA_1PURAL19950325_133741_000000008001_00281_19307_0000.E1
AT1_TOA_1PURAL19960129_193711_000000008010_00213_23748_0000.E1
AT1_TOA_1PURAL19971007_212615_000000008028_00028_32581_0000.E1
AT1_NR__2PURAL19911006_133711_000000001025_00038_01167_0000.E1
AT1_NR__2PURAL19921215_162127_000000004008_00254_07413_0000.E1
AT1_NR__2PURAL19930321_210607_000000004011_00128_08790_0000.E1
AT1_NR__2PURAL19940629_190955_000000006999_99999_15450_0000.E1
AT1_NR__2PURAL19950804_010453_000000008005_00159_21189_0000.E1
AT1_NR__2PURAL19960108_035131_000000008009_00404_23438_0000.E1
AT1_NR__2PURAL19970312_022802_000000008022_00031_29578_0000.E1
AT1_AR__2PURAL19911208_051434_000000001046_00033_02065_0000.E1

Product
AT1_AR__2PURAL19920514_125157_000000004002_00180_04333_0000.E1
AT1_AR__2PURAL19930920_101055_000000004016_00236_11403_0000.E1
AT1_AR__2PURAL19941123_194743_000000007002_00759_17560_0000.E1
AT1_AR__2PURAL19950130_232021_000000007002_01737_18538_0000.E1
AT1_AR__2PURAL19960602_222938_000000008013_00501_25539_0000.E1
AT1_AR__2PURAL19971009_083849_000000008028_00049_32602_0000.E1
AT2_TOA_1PURAL19950615_010745_000000001001_00431_00786_0000.E2
AT2_TOA_1PURAL19960822_034836_000000001014_00132_07000_0000.E2
AT2_TOA_1PURAL19971030_113118_000000001026_00337_13217_0000.E2
AT2_TOA_1PURAL19981201_151526_000000001038_00010_18902_0000.E2
AT2_TOA_1PURAL19990310_200545_000000001040_00428_20322_0000.E2
AT2_TOA_1PURAL20000512_234413_000000001053_00058_26465_0000.E2
AT2_TOA_1PURAL20010719_201344_000000001065_00242_32661_0000.E2
AT2_TOA_1PURAL20020923_024058_000000001077_00389_38820_0000.E2
AT2_TOA_1PURAL20030403_052723_000000001083_00133_41570_0000.E2
AT2_NR__2PURAL19951231_001747_000000001007_00273_03634_0000.E2
AT2_NR__2PURAL19961027_023356_000000001016_00074_07944_0000.E2
AT2_NR__2PURAL19970813_040008_000000001024_00218_12096_0000.E2
AT2_NR__2PURAL19980509_130902_000000001032_00066_15952_0000.E2
AT2_NR__2PURAL19991009_165017_000000001046_00469_23369_0000.E2
AT2_NR__2PURAL20000116_181923_000000001049_00384_24787_0000.E2
AT2_NR__2PURAL20011220_193224_000000001069_00442_34865_0000.E2
AT2_NR__2PURAL20020306_061908_000000001072_00019_35945_0000.E2
AT2_NR__2PURAL20030131_075704_000000001081_00249_40684_0000.E2
AT2_AR__2PURAL19950919_091332_000000001004_00307_02165_0000.E2
AT2_AR__2PURAL19960902_080426_000000001014_00292_07160_0000.E2
AT2_AR__2PURAL19970901_104522_000000001024_00494_12372_0000.E2
AT2_AR__2PURAL19981011_234122_000000001036_00287_18177_0000.E2
AT2_AR__2PURAL19991111_211443_000000001047_00443_23844_0000.E2
AT2_AR__2PURAL20000928_123151_000000001057_00037_28448_0000.E2
AT2_AR__2PURAL20010218_173921_000000001061_00083_30498_0000.E2
AT2_AR__2PURAL20020713_235121_000000001075_00373_37802_0000.E2
AT2_AR__2PURAL20030502_083716_000000001084_00049_41987_0000.E2

Product AT1_AR__2PURAL19960602_222938_000000008013_00501_25539_0000.E1 was found to contain very little data. Investigations into both the parent L1 and version 2.0 products showed that this orbit was very disrupted. This orbit was not listed on either the removal or segregation lists, and so was referred to RAL for clarification. RAL reported that this date was at the beginning of a phased, long-term shutdown of ATSR-1, and recommend that all products from orbits 25532 (2nd June 1996) to 25544 (3rd June 1996) are removed from the archive, and that products from orbit 25531 are segregated.

Product AT2_NR__2PURAL19951231_001747_000000001007_00273_03634_0000.E2 did not contain any information within the main dataset. Some products from December 1995 had also been flagged within the systematic checks and the matter was referred to RAL, who have since advised that products from December 1995 should be removed from the archive and are taking steps to ensure this.

Inspection of the AR products revealed that the brightness temperature banded datasets (cloudy and clear, over sea and land) do not seem to contain the datasets that are expected, in common with AATSR AR reprocessed products. This behaviour is the same for the previous dataset and so we conclude that the reprocessing did not introduce any changes (and investigation into this will be done separately).

Conclusions

The results from the spot-check QC detailed inspections on ATSR-1 and ATSR-2 Envisat-format data confirm that the expected improvements for colocation are seen in the reprocessed data. Visual inspections revealed disrupted data for ATSR-1 in June 1996, and for ATSR-2 in December 1995 (already picked up in the systematic QC checks and an action is pending for their removal from the archive).

Action

There is one action arising from the detailed QC checks on the ATSR-1 and ATSR-2 third reprocessing data in Envisat format:

- RAL to ensure the segregation of ATSR-1 products from orbit 25531, and the removal of ATSR-1 products from orbits 25532 to 25544 from the archive.