Customer	: ESRIN	Document Ref	: IDEAS-VEG-OQC-REP-1356
Contract No	: 21525/08/I-OL	Issue Date	: 08 October 2013
WP No	: 10000	Issue	: 1.0

Title : **IDEAS – AATSR Third Reprocessing Detailed QC Report**

Abstract : This document is the full report into the detailed quality control checks on AATSR third reprocessing data in Envisat format

Author :

Pauline Cocevar
and Siân O'Hara

Approval :

Accepted :

Distribution :

Hard Copy File:
Filename:
IDEAS-VEG-OQC-REP-1356 AATSR Third Reprocessing Detailed QC Report v1-0.doc

TABLE OF CONTENTS

AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	DATE	DCI No	REASON
1.0	08-Oct-2013		First formal issue of report

This Page is Intentionally Blank

1. INTRODUCTION

1.1 Purpose and Scope

This document presents the results of the inspections performed for the detailed quality control analysis on the Envisat-format AATSR data from the third reprocessing.

1.2 Structure of the Document

After this introduction, the document is divided into a number of major sections that are briefly described below:

2 OVERVIEW

This section contains an overview of the detailed QC checks that were conducted on the AATSR reprocessed dataset.

3 COLOCATION

The method used to assess the view colocation and the results are presented in this section.

4 GEOLOCATION

The geolocation assessment sections contains two verification checks: one against colocated regridded MERIS data, and one against a set of reference test sites. The methods and results are outlined here.

5 CLOUD IDENTIFICATION

This section contains details on previous cloud-clearing failures and assesses whether they have changed in the reprocessed data.

6 VISUAL INSPECTIONS

Detailed inspections were performed on a set of randomly selected data products throughout the mission. The products and outcome are given in this section.

7 SUMMARY

This section summarises the outcome from the detailed QC performed on the AATSR reprocessed data.

ANNEX A   FULL RESULTS FROM DETAILED QC

The annex contains full tabulated results from the colocation and geolocation verification checks.

1.3 Referenced Documents

The following is a list of documents with a direct bearing on the content of this report. Where referenced in the text, these are identified as RD.n, where 'n' is the number in the list below:

RD.1   AATSR Reprocessing Systematic QC Investigation, IDEAS-VEG-OQC-REP-1261, version 1.0, 24 May 2013.

RD.2   AATSR Third Reprocessing IDEAS QC Plan, IDEAS-VEG-OQC-PLN-1014, version 1.0, 9 May 2013.

RD.3   AATSR IPF Change Log, IDEAS-VEG-OQC-REP-0225, version 3, 18 March 2013: http://earth.eo.esa.int/pcs/envisat/aatsr/events/IDEAS-VEG-OQC-REP-0225_3_AATSR_IPF_Change_Log.pdf

RD.4   AATSR Geolocation Investigation Report, IDEAS-VEG-OQC-REP-0674, version A, 17 September 2010.

1.4   Definitions of Terms

The following terms have been used in this report with the meanings shown.

Term	Definition
IDEAS	Instrument Data quality Evaluation and Analysis Service, reporting to the ESA Data Quality and Algorithms Management Office (EOP-GMQ), responsible for quality of data provided to users including the data calibration and validation, the data processing algorithms, and the routine instrument and processing chain performances.

This Page is Intentionally Blank

2. OVERVIEW

In addition to the systematic Quality Control (**QC**) activities performed on the entire dataset of reprocessed AATSR data in Envisat format [RD.1], various detailed inspections were performed on subsets of the data to check for specific characteristics. The objective of this spot-check QC was to verify that particular improvements expected in the data were present and also to ensure that the overall data quality was maintained for those aspects not expected to change. Details of the methodology for each activity are given in the AATSR Third Reprocessing IDEAS QC Plan [RD.2].

The improvements in the dataset for which detailed inspections were performed were the view colocation, the absolute geolocation and cloud identification. Generally the inspections were repeats of previous analyses that had led to the original qualification of the issues.

Note that other improvements such as consistent and accurate visible channel calibration, and improved sea surface temperature (**SST**) retrievals, were not included in the detailed inspections. Partly because these were resulting from usage of previously verified auxiliary files (usage checked in the systematic QC) and partly because these improvements will be confirmed by other parties of the AATSR Quality Working Group (**QWG**).

Additionally, the spot-check QC required visual inspections to be conducted on individual products at all processing levels. This was to ensure that the general quality of the dataset was maintained, at a level not possible with just the systematic QC.

Improvements were enabled via the use of a new version of the AATSR Instrument Processing Facility (**IPF**) and updated auxiliary files. Full details of these are given in the AATSR IPF Change Log [RD.3].

3. COLOCATION

The colocation error between the forward and nadir views of AATSR was expected to be improved by an update to the L1B characterisation data auxiliary file.

3.1 Method

The method for evaluating the colocation was used previously in operations: taking sample products and calculating the difference between the nadir view and forward view data of the 0.87 µm band. A difference image was produced (forward–nadir) using BEAM, and statistics were calculated on the difference image to give the mean and standard deviation of the forward–nadir data.

3.2 Products inspected

Two L1 products per year of mission were randomly chosen for evaluation, and 0.87 µm difference images and statistics were produced for both the previous data and the reprocessed data. Table 1 lists the products that were inspected and compared.

Table 1. Products that were used for the colocation comparison

Colocation: Previous data	Colocation: Reprocessed data
ATS_TOA_1PRUPA20020729_081210_ 000065272008_00092_02150_7251.N1	ATS_TOA_1PUUPA20020729_081210_ 000065272008_00092_02150_5872.N1
ATS_TOA_1PRUPA20021111_095246_ 000065272011_00093_03654_6639.N1	ATS_TOA_1PUUPA20021111_095246_ 000065272011_00093_03654_7261.N1
ATS_TOA_1PRUPA20030228_211100_ 000065272014_00157_05221_0074.N1	ATS_TOA_1PUUPA20030228_211100_ 000065272014_00157_05221_8712.N1
ATS_TOA_1PRUPA20031224_024729_ 000065272022_00418_09490_9644.N1	ATS_TOA_1PUUPA20031224_024729_ 000065272022_00418_09490_2909.N1
ATS_TOA_1PRUPA20040401_160044_ 000065272025_00340_10915_2571.N1	ATS_TOA_1PUUPA20040401_160045_ 000065272025_00340_10915_4300.N1
ATS_TOA_1PRUPA20040817_134248_ 000065272029_00310_12889_7196.N1	ATS_TOA_1PUUPA20040817_134248_ 000065272029_00310_12889_6427.N1
ATS_TOA_1PRUPA20050107_221127_ 000065272033_00358_14941_8953.N1	ATS_TOA_1PUUPA20050107_221127_ 000065272033_00358_14941_8471.N1
ATS_TOA_1PRUPA20050727_233457_ 000065272039_00230_17819_5686.N1	ATS_TOA_1PUUPA20050727_233457_ 000065272039_00230_17819_1436.N1
ATS_TOA_1PRUPA20060322_153149_ 000065272046_00125_21221_1633.N1	ATS_TOA_1PUUPA20060322_153149_ 000065272046_00125_21221_4788.N1
ATS_TOA_1PRUPA20060821_055124_ 000065272050_00291_23391_0742.N1	ATS_TOA_1PUUPA20060821_055124_ 000065272050_00291_23391_6836.N1
ATS_TOA_1PRUPA20070527_012111_ 000065272058_00274_27382_1067.N1	ATS_TOA_1PUUPA20070527_012111_ 000065272058_00274_27382_0744.N1
ATS_TOA_1PRUPA20071031_040748_ 000065272063_00018_29631_5519.N1	ATS_TOA_1PUUPA20071031_040748_ 000065272063_00018_29631_2930.N1
ATS_TOA_1PRUPA20080404_122755_ 000065272067_00252_31869_3663.N1	ATS_TOA_1PUUPA20080404_122755_ 000065272067_00252_31869_5098.N1
ATS_TOA_1PRUPA20080731_121918_ 000065272070_00438_33558_4828.N1	ATS_TOA_1PUUPA20080731_121918_ 000065272070_00438_33558_6801.N1
ATS_TOA_1PRUPA20090318_100954_ 000065272077_00222_36849_8588.N1	ATS_TOA_1PUUPA20090318_100954_ 000065272077_00222_36849_0254.N1
ATS_TOA_1PRUPA20091006_074022_	ATS_TOA_1PUUPA20091006_074022_

Colocation: Previous data	Colocation: Reprocessed data
000065272083_00106_39739_0120.N1	000065272083_00106_39739_3306.N1
ATS_TOA_1PRUPA20100521_070549_ 000065272089_00349_42988_4187.N1	ATS_TOA_1PUUPA20100521_070549_ 000065272089_00349_42988_6866.N1
ATS_TOA_1PRUPA20100924_174938_ 000065272093_00155_44798_7887.N1	ATS_TOA_1PUUPA20100924_174938_ 000065272093_00155_44798_8719.N1
ATS_TOA_1PRUPA20110611_031356_ 000065273103_00233_48523_8599.N1	ATS_TOA_1PUUPA20110611_031356_ 000065273103_00233_48523_2484.N1
ATS_TOA_1PRUPA20111230_231205_ 000065273110_00130_51437_2647.N1	ATS_TOA_1PUUPA20111230_231205_ 000065273110_00130_51437_5422.N1
ATS_TOA_1PRUPA20120113_211832_ 000065273110_00330_51637_3019.N1	ATS_TOA_1PUUPA20120113_211832_ 000065273110_00330_51637_5623.N1
ATS_TOA_1PRUPA20120406_145752_ 000065273113_00240_52840_4377.N1	ATS_TOA_1PUUPA20120406_145752_ 000065273113_00240_52840_6782.N1

3.3   Results

The full results of the mean and standard deviation of the difference image for each of the products listed in Table 1 are given in Table 11 in Annex A.

Table 2 shows the average difference for all 22 comparisons; the mean and standard deviation of these differences are improved for the reprocessed data compared to the previous version products.

Table 2. Average view difference mean and standard deviation for previous and reprocessed AATSR data

	Previous	Reprocessed
Average Mean	2.76	2.60
Average Standard Deviation	7.83	6.50

Figure 1 and Figure 2 display the results for all the products and the average for the mean and standard deviation for previous and reprocessed data.
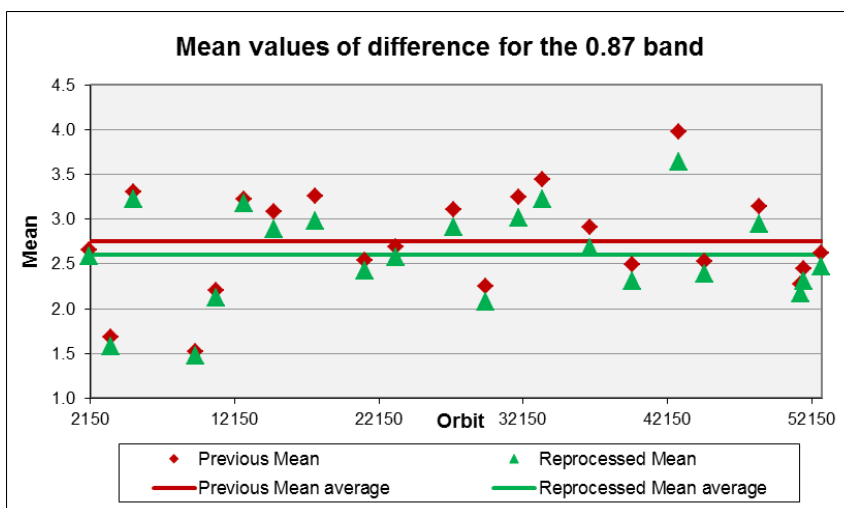
Figure 1. Mean of forward–nadir view difference for all inspected products.
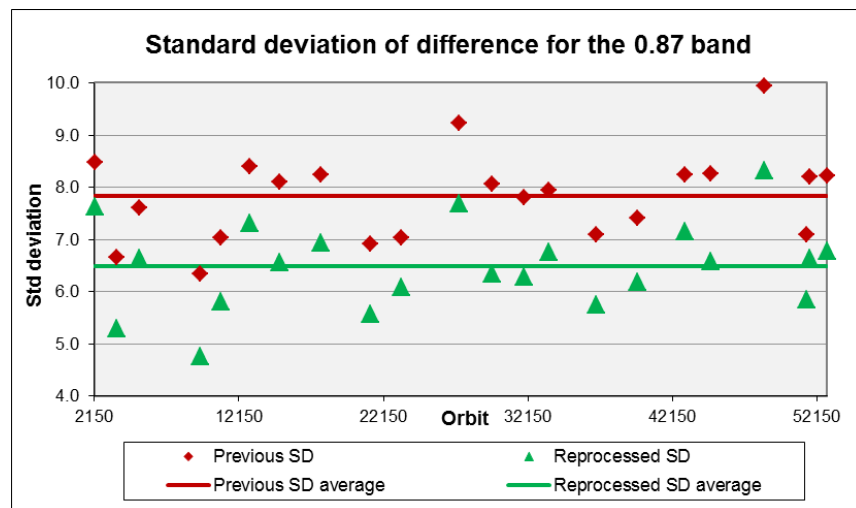
Figure 2. Standard deviation of forward–nadir view difference for all inspected products.

This improvement can also be noted visually in images of the difference band, as shown for the example from orbit 48524 (filename orbit number 48523) in Figure 3. The image for the previous data has much more variation, indicating more difference, whereas the image for the reprocessed data is much "flatter" meaning there is less difference and so the views are better colocated.
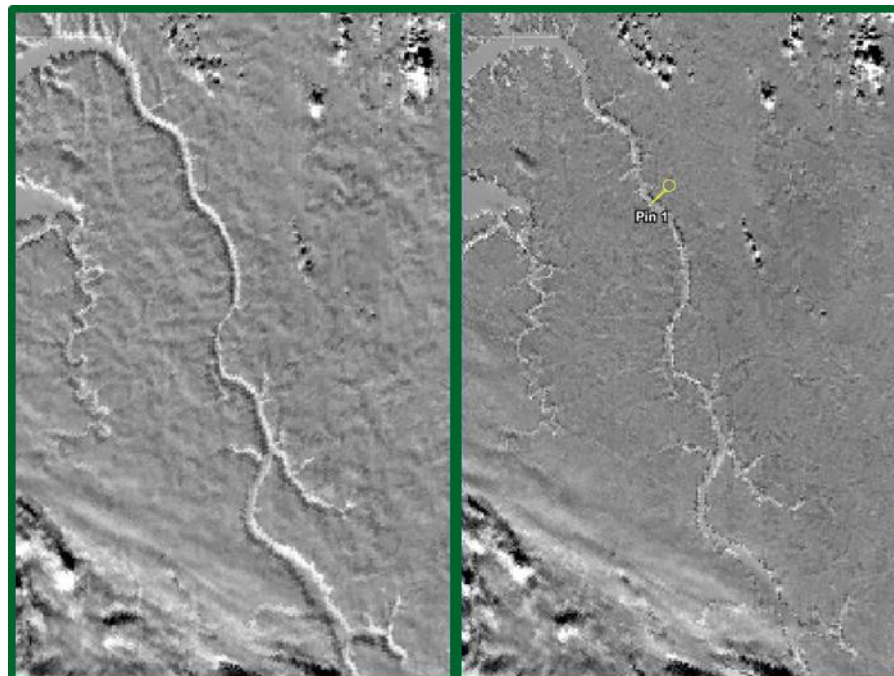
Figure 3. View difference image for previous data (left) and reprocessed data (right) from orbit 48524.

3.4   Conclusion

With regard to view colocation, the difference between nadir and forward views was found to be reduced, both via statistical analysis and visual comparisons.

4. GEOLOCATION

An update to the L1B characterisation data auxiliary file was made to improve the absolute nadir geolocation. Two separate comparisons were made for this verification: one against regridded MERIS data, and one against a set of reference site coordinates.

4.1 Geolocation comparison to MERIS data

Previous comparisons of AATSR data to MERIS [RD.4] had shown a systematic offset of 1 pixel along track and 1 pixel across track on average.

4.1.1 Method

Following the method used in [RD.4], colocated AATSR and MERIS scenes were created, and the MERIS data then regridded onto the AATSR grid. Coordinates for features (at pixel level) in images from both instruments were extracted, and the distance calculated between the feature in MERIS and in AATSR data. For this inspection, previous and reprocessed data were each compared to their own MERIS regridded data.

4.1.2 Products inspected

The list of products that were inspected and compared is given in Table 3. Each MERIS scene in the left column was compared with data from the AATSR products in the two columns on the right. Note that one AATSR product may be compared with more than one MERIS scene. In total, 27 MERIS scenes were compared with AATSR data, and 105 separate features were identified and geolocated.

Table 3. Products that were used for the MERIS geolocation comparison

| Geolocation: MERIS scene	Geolocation: Previous / Reprocessed data
MER_FR__1PNUPA20020919_114559_ 000000982009_00338_02897_1337.N1	ATS_TOA_1PRUPA20020919_105850_000065272009_00337_02896_7329.N1 ATS_TOA_1PUUPA20020919_105850_000065272009_00337_02896_6544.N1
MER_FRS_1PNUPA20050210_095752_ 000001972034_00337_15421_1990.N1	ATS_TOA_1PRUPA20050210_091820_000065272034_00336_15420_0821.N1 ATS_TOA_1PUUPA20050210_091820_000065272034_00336_15420_8925.N1
MER_FRS_1PNEPA20060612_095213_ 000001972048_00294_22392_0353.N1	ATS_TOA_1PRUPA20060612_091234_000065272048_00293_22391_5534.N1 ATS_TOA_1PUUPA20060612_091234_000065272048_00293_22391_5906.N1
MER_FRS_1PNUPA20060618_100623_ 000001972048_00380_22478_1986.N1	ATS_TOA_1PRUPA20060618_092405_000065272048_00379_22477_6054.N1 ATS_TOA_1PUUPA20060618_092405_000065272048_00379_22477_5992.N1
MER_FRS_1PNUPA20060831_214455_ 000002282050_00444_23544_2029.N1	ATS_TOA_1PRUPA20060831_204224_000065272050_00443_23543_1406.N1 ATS_TOA_1PUUPA20060831_204223_000065272050_00443_23543_6988.N1
MER_FRS_1PNUPA20070610_093942_ 000001972058_00480_27588_1982.N1	ATS_TOA_1PRUPA20070610_090356_000065272058_00479_27587_2097.N1 ATS_TOA_1PUUPA20070610_090356_000065272058_00479_27587_0949.N1
MER_FRS_1PNUPA20070814_190058_ 000001972060_00414_28524_1983.N1	ATS_TOA_1PRUPA20070814_182425_000065272060_00413_28523_6408.N1 ATS_TOA_1PUUPA20070814_182425_000065272060_00413_28523_1881.N1
MER_FRS_1PNUPA20080520_054259_ 000001972068_00406_32524_1975.N1	ATS_TOA_1PRUPA20080520_045932_000065272068_00405_32523_7815.N1 ATS_TOA_1PUUPA20080520_045932_000065272068_00405_32523_5758.N1
MER_FRS_1PNUPA20080523_104934_ 000001972068_00452_32570_1976.N1	ATS_TOA_1PRUPA20080523_100704_000065272068_00451_32569_8142.N1 ATS_TOA_1PUUPA20080523_100704_000065272068_00451_32569_5804.N1
MER_FRS_1PNUPA20080607_044115_ 000001972069_00162_32781_2036.N1	ATS_TOA_1PRUPA20080607_035326_000065272069_00161_32780_9463.N1 ATS_TOA_1PUUPA20080607_035326_000065272069_00161_32780_6017.N1
MER_FRS_1PNEPA20080704_034331_ 000001972070_00047_33167_2274.N1	ATS_TOA_1PRUPA20080704_030434_000065272070_00046_33166_1910.N1 ATS_TOA_1PUUPA20080704_030434_000065272070_00046_33166_6409.N1

Geolocation: MERIS scene	Geolocation: Previous / Reprocessed data
MER_FRS_1PNEPA20080707_103304_ 000001972070_00094_33214_2276.N1	ATS_TOA_1PRUPA20080707_095243_000065272070_00093_33213_2128.N1
MER_FRS_1PNEPA20080707_103622_ 000001972070_00094_33214_2275.N1	ATS_TOA_1PUUPA20080707_095243_000065272070_00093_33213_6456.N1
MER_FRS_1PNUPA20080714_165127_ 000001972070_00198_33318_2026.N1	ATS_TOA_1PRUPA20080714_161500_000065272070_00197_33317_2778.N1 ATS_TOA_1PUUPA20080714_161500_000065272070_00197_33317_6560.N1
MER_FRS_1PNEPA20080724_095359_ 000001972070_00337_33457_2271.N1	
MER_FRS_1PNEPA20080724_095715_ 000001972070_00337_33457_2273.N1	ATS_TOA_1PRUPA20080724_091814_000065272070_00336_33456_4199.N1 ATS_TOA_1PUUPA20080724_091814_000065272070_00336_33456_6699.N1
MER_FRS_1PNEPA20080724_100031_ 000001972070_00337_33457_2272.N1	
MER_FRS_1PNEPA20080802_065736_ 000001972070_00464_33584_0351.N1	ATS_TOA_1PRUPA20080802_061416_000065272070_00463_33583_4941.N1 ATS_TOA_1PUUPA20080802_061416_000065272070_00463_33583_6826.N1
MER_FRS_1PNUPA20080803_162402_ 000001972070_00484_33604_1994.N1	ATS_TOA_1PRUPA20080803_154615_000065272070_00483_33603_5025.N1 ATS_TOA_1PUUPA20080803_154615_000065272070_00483_33603_6846.N1
MER_FRS_1PNEPA20090722_063215_ 000001972081_00020_38651_0350.N1	
MER_FRS_1PNEPA20090722_063530_ 000001972081_00020_38651_0354.N1	ATS_TOA_1PRUPA20090722_054822_000065272081_00019_38650_5509.N1 ATS_TOA_1PUUPA20090722_054822_000065272081_00019_38650_2183.N1
MER_FRS_1PNEPA20090722_064412_ 000001972081_00020_38651_0356.N1	
MER_FRS_1PNEPA20090723_091737_ 000001972081_00036_38667_0348.N1	ATS_TOA_1PRUPA20090723_083757_000065272081_00035_38666_5890.N1
MER_FRS_1PNEPA20090723_092028_ 000001972081_00036_38667_0355.N1	ATS_TOA_1PUUPA20090723_083757_000065272081_00035_38666_2199.N1
MER_FRS_1PNUPA20090723_110401_ 000001972081_00037_38668_1997.N1	ATS_TOA_1PRUPA20090723_101833_000065272081_00036_38667_5905.N1 ATS_TOA_1PUUPA20090723_101833_000065272081_00036_38667_2200.N1
MER_FRS_1PNUPA20090911_014009_ 000001972082_00246_39378_1996.N1	ATS_TOA_1PRUPA20090911_004339_000065272082_00245_39377_9497.N1 ATS_TOA_1PUUPA20090911_004339_000065272082_00245_39377_2926.N1
MER_FRS_1PNUPA20090912_091903_ 000001972082_00265_39397_1993.N1	ATS_TOA_1PRUPA20090912_083501_000065272082_00264_39396_9827.N1 ATS_TOA_1PUUPA20090912_083501_000065272082_00264_39396_2945.N1

4.1.3 Results

The full results of the distance between the features identified for each of the products listed in Table 3 are given in Table 12 in Annex A.

Table 4 gives the average distance of the 105 identified features between regridded MERIS scenes and previous and reprocessed AATSR data.

Table 4. Average distance of identified features between MERIS and previous and reprocessed AATSR data

	Previous	Reprocessed
Distance from MERIS (km)	1.35	0.13

It can be seen from Table 4 that the average distance from MERIS of the identified features is much closer for the reprocessed AATSR data than for the previous data.

This improvement can also be seen if one considers the type of displacement by pixels. If an AATSR pixel feature is exactly colocated with the regridded MERIS pixel feature, the displacement is 0 km. If the feature is offset to an adjacent pixel, then the displacement is approximately 1 km (considering the pixel resolution of AATSR). If the offset is diagonal (i.e. showing the average offset of 1 pixel along track and 1 pixel across track), then the displacement is of the order of 1.41 km.

Table 5 shows the number of instances for each AATSR dataset that corresponded to these pixel offsets. It can be noted that the previous data had no instances of exact correspondence with regridded MERIS data, and the features were most often located diagonally, while the reprocessed data had the majority of identified features corresponding exactly with the regridded MERIS data.

Table 5. Number of instances of pixel feature displacement

	Feature displacement (km)		
	~1.41	~1	0
Previous data	89	16	0
Reprocessed data	0	14	91

A visual example of this improvement is shown in Figure 4, taken from orbit 22392 (AATSR filename orbit number 22391), where the coordinates of a particular feature in the regridded MERIS data were extracted and used as a reference for the AATSR data. In the previous version data, the AATSR pixels for the same feature are offset diagonally from the MERIS coordinates but the reprocessed data shows good agreement.

Previous AATSR	MERIS reference	Reprocessed AATSR
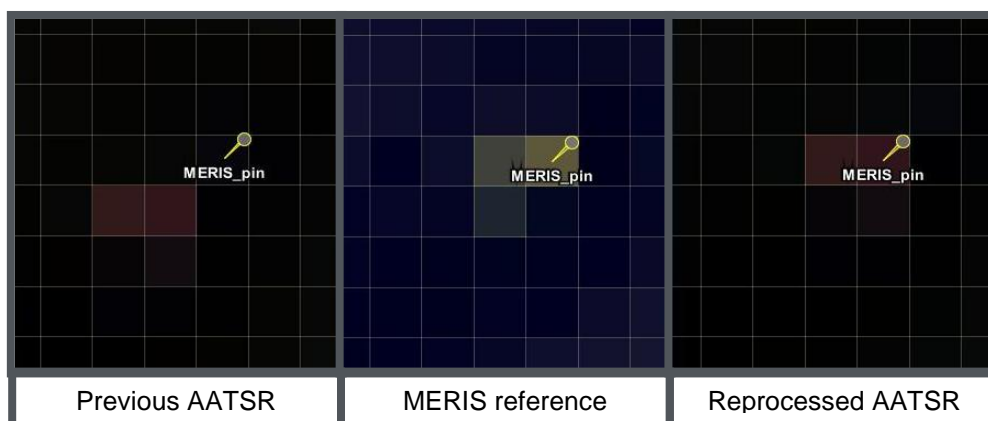
Figure 4. Geolocation between previous version and reprocessed AATSR data compared to regridded MERIS as a reference.

4.1.4 Conclusion

The geolocation of the reprocessed dataset is improved when compared to MERIS data; it is now to within 1 pixel.

4.2   Geolocation comparison to reference site coordinates

In a similar fashion to the MERIS comparison, coordinates for a set of reference sites with features distinguishable in AATSR data at pixel level were extracted and then compared to those taken from previous and reprocessed products. These particular sites had been used as part of ongoing QC while Envisat was operational.

4.2.1 Method

The locations of the seven sites used as reference are shown in Figure 5. The reference latitude and longitude of the sites were taken from Google maps.

Figure 5. Locations of reference test sites for geolocation comparison.

AATSR products that had a clear-sky view over the locations in Figure 5 were chosen and the pixel-level features were geolocated. These were then compared with the reference coordinates and a distance between the two locations was calculated. A total of 22 products for each AATSR dataset were inspected over the seven test sites.

4.2.2 Products inspected

Table 6 lists the previous and reprocessed products that were inspected for comparison at each of the geolocation test sites.

Table 6. Products that were inspected for geolocation comparison

Geolocation: Previous data	Geolocation: Reprocessed data
Australia	
ATS_TOA_1PRUPA20020824_011229_ 000065272008_00460_02518_5766.N1	ATS_TOA_1PUUPA20020824_011229_ 000065272008_00460_02518_6227.N1
ATS_TOA_1PRUPA20061210_010106_ 000065272053_00374_24977_0372.N1	ATS_TOA_1PUUPA20061210_010106_ 000065272053_00374_24977_8305.N1
ATS_TOA_1PRUPA20090506_010640_ 000065272078_00417_37545_9323.N1	ATS_TOA_1PUUPA20090506_010640_ 000065272078_00417_37545_1052.N1
ATS_TOA_1PRUPA20120302_011911_ 000065273112_00160_52329_3723.N1	ATS_TOA_1PUUPA20120302_011911_ 000065273112_00160_52329_6271.N1

Geolocation: Previous data	Geolocation: Reprocessed data
Korea	
ATS_TOA_1PRUPA20031018_011507_ 000062202020_00461_08531_0213.N1	ATS_TOA_1PUUPA20031018_011236_ 000065272020_00460_08530_1978.N1
ATS_TOA_1PRUPA20051107_010947_ 000065272042_00188_19280_2746.N1	ATS_TOA_1PUUPA20051107_010946_ 000065272042_00188_19280_2911.N1
ATS_TOA_1PRUPA20101016_011211_ 000065272093_00460_45103_1263.N1	ATS_TOA_1PUUPA20101016_011211_ 000065272093_00460_45103_9035.N1
ATS_TOA_1PRUPA20101028_011525_ 000065273096_00002_45275_1447.N1	ATS_TOA_1PUUPA20101028_011525_ 000065273096_00002_45275_9140.N1
India	
ATS_TOA_1PRUPA20021202_035035_ 000065272011_00390_03951_7815.N1	ATS_TOA_1PUUPA20021202_035034_ 000065272011_00390_03951_7522.N1
ATS_TOA_1PRUPA20040211_041603_ 000048382024_00119_10193_0271.N1	ATS_TOA_1PUUPA20040211_034747_ 000065272024_00118_10192_3595.N1
ATS_TOA_1PRUPA20110522_034703_ 000065273102_00377_48236_7966.N1	ATS_TOA_1PUUPA20110522_034703_ 000065273102_00377_48236_2196.N1
Morocco	
ATS_TOA_1PRUPA20050410_100422_ 000065272036_00179_16265_8974.N1	ATS_TOA_1PUUPA20050410_100422_ 000065272036_00179_16265_9761.N1
ATS_TOA_1PRUPA20070324_095536_ 000065272056_00365_26471_7342.N1	ATS_TOA_1PUUPA20070324_095536_ 000065272056_00365_26471_9741.N1
ATS_TOA_1PRUPA20120131_101702_ 000065273111_00151_51889_3243.N1	ATS_TOA_1PUUPA20120131_101702_ 000065273111_00151_51889_5837.N1
South Africa	
ATS_TOA_1PRUPA20031130_070317_ 000065272022_00077_09149_6385.N1	ATS_TOA_1PUUPA20031130_070317_ 000065272022_00077_09149_2599.N1
ATS_TOA_1PRUPA20060607_064850_ 000065272048_00220_22318_5174.N1	ATS_TOA_1PUUPA20060607_064850_ 000065272048_00220_22318_5833.N1
ATS_TOA_1PRUPA20080722_070016_ 000065272070_00306_33426_3380.N1	ATS_TOA_1PUUPA20080722_070016_ 000065272070_00306_33426_6669.N1
Florida	
ATS_TOA_1PRUPA20071226_145136_ 000065272064_00325_30439_7143.N1	ATS_TOA_1PUUPA20071226_145136_ 000065272064_00325_30439_3686.N1
ATS_TOA_1PRUPA20111116_150402_ 000065273108_00355_50800_1983.N1	ATS_TOA_1PUUPA20111116_150402_ 000065273108_00355_50800_4767.N1
Mexico	
ATS_TOA_1PRUPA20041101_171532_ 000065272031_00398_13979_7239.N1	ATS_TOA_1PUUPA20041101_171532_ 000065272031_00398_13979_7529.N1
ATS_TOA_1PRUPA20080930_170348_ 000065272072_00312_34434_4412.N1	ATS_TOA_1PUUPA20080930_170348_ 000065272072_00312_34434_7699.N1
ATS_TOA_1PRUPA20091124_170342_ 000065272084_00312_40446_0185.N1	ATS_TOA_1PUUPA20091124_170342_ 000065272084_00312_40446_4044.N1

4.2.3 Results

Full details of the comparison with the reference sites are given in Table 13 in Annex A. Table 7 shows the average distances for each test site location for the identified pixel. It can be seen that there is an improvement for each test site location in the reprocessed data. Over all sites there was an average offset for previous data of 1.21 km but the reprocessed data were much closer with an average offset of 0.65 km.

Table 7. Average distances from each test site location for previous and reprocessed data

Test site	Average distance from test site (km)	
	Previous	Reprocessed
Australia	1.24	0.91
Korea	1.11	0.60
India	1.36	0.63
Morocco	1.46	0.41
South Africa	0.99	0.81
Florida	1.14	0.55
Mexico	1.16	0.63
Average	1.21	0.65

Figure 6 displays the results for all 22 geolocation comparisons and the mean values for the previous and reprocessed data. As well as the improved mean, there is also less variability within the reprocessed data. Over the 22 sites, the standard deviation of the distances from the locations to the test sites is 0.42 km for previous data, and 0.31 km for the reprocessed data.
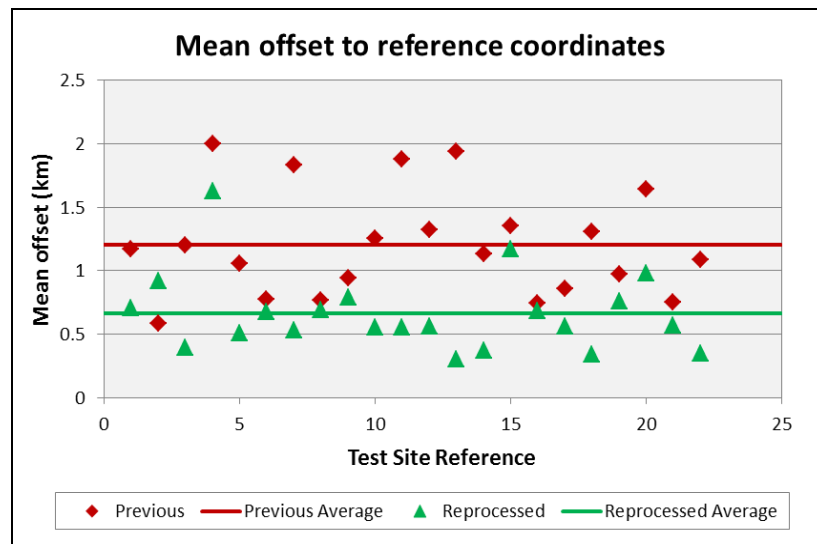
Figure 6. Geolocation offset to reference coordinates.

4.2.4 Conclusion

The geolocation of the reprocessed dataset is better when compared with the reference test sites; it is now to within 1 pixel.

5. CLOUD IDENTIFICATION

A slight improvement in the cloud identification was anticipated, due to some updates made to the test parameters in the cloud look-up table auxiliary file. Although these updates were to correct for known errors in the auxiliary file, rather than to specifically improve the cloud identification, nevertheless verification of the auxiliary file indicated there should be an improvement.

5.1 Method

AATSR was known to have occasional cloud identification failures resulting in SST retrievals being performed for cloudy pixels, and this was being monitored operationally. Reprocessed products were compared to previous instances of known cloud identification failures to check for signs of improvement.

Reprocessed L1 and L2 NR products were opened using BEAM, and the location of the previous failure was examined. The L1 products were inspected for cloud flagging accuracy; L2 products were used to confirm whether SST retrievals had been performed.

5.2 Products inspected

Table 8 lists the products that were inspected for the cloud identification comparisons.

Table 8. Products that were used for the cloud identification comparison

Cloud identification: previous data	Cloud identification: reprocessed data
ATS_TOA_1PRUPA20020815_192151_ 000065272008_00342_02400_7784.N1	ATS_TOA_1PUUPA20020815_192151_ 000065272008_00342_02400_6110.N1
ATS_NR__2PRUPA20020815_192151_ 000065272008_00342_02400_7786.N1	ATS_NR__2PUUPA20020815_192151_ 000065272008_00342_02400_6110.N1
ATS_TOA_1PRUPA20031005_112451_ 000065272020_00280_08350_2780.N1	ATS_TOA_1PUUPA20031005_112450_ 000065272020_00280_08350_1801.N1
ATS_NR__2PRUPA20031005_112451_ 000065272020_00280_08350_2782.N1	ATS_NR__2PUUPA20031005_112450_ 000065272020_00280_08350_1801.N1
ATS_TOA_1PRUPA20041208_175250_ 000065272032_00427_14509_6219.N1	ATS_TOA_1PUUPA20041208_175250_ 000065272032_00427_14509_8064.N1
ATS_NR__2PRUPA20041208_175250_ 000065272032_00427_14509_6221.N1	ATS_NR__2PUUPA20041208_175250_ 000065272032_00427_14509_8064.N1
ATS_TOA_1PRUPA20050222_025855_ 000065272035_00003_15588_7523.N1	ATS_TOA_1PUUPA20050222_025855_ 000065272035_00003_15588_9093.N1
ATS_NR__2PRUPA20050222_025855_ 000065272035_00003_15588_7525.N1	ATS_NR__2PUUPA20050222_025855_ 000065272035_00003_15588_9093.N1
ATS_TOA_1PRUPA20060421_213111_ 000065272047_00057_21654_5447.N1	ATS_TOA_1PUUPA20060421_213111_ 000065272047_00057_21654_5176.N1
ATS_NR__2PRUPA20060421_213111_ 000065272047_00057_21654_5449.N1	ATS_NR__2PUUPA20060421_213111_ 000065272047_00057_21654_5176.N1
ATS_TOA_1PRUPA20070614_115916_ 000065272059_00037_27646_2427.N1	ATS_TOA_1PUUPA20070614_115916_ 000065272059_00037_27646_1008.N1
ATS_NR__2PRUPA20070614_115916_ 000065272059_00037_27646_2429.N1	ATS_NR__2PUUPA20070614_115916_ 000065272059_00037_27646_1008.N1
ATS_TOA_1PRUPA20080727_192734_ 000065272070_00385_33505_4416.N1	ATS_TOA_1PUUPA20080727_192734_ 000065272070_00385_33505_6748.N1
ATS_NR__2PRUPA20080727_192734_ 000065272070_00385_33505_4418.N1	ATS_NR__2PUUPA20080727_192734_ 000065272070_00385_33505_6748.N1

Cloud identification: previous data	Cloud identification: reprocessed data
ATS_TOA_1PRUPA20090907_225719_ 000065272082_00201_39333_8415.N1	ATS_TOA_1PUUPA20090907_225719_ 000065272082_00201_39333_2882.N1
ATS_NR__2PRUPA20090907_225719_ 000065272082_00201_39333_8417.N1	ATS_NR__2PUUPA20090907_225719_ 000065272082_00201_39333_2882.N1
ATS_TOA_1PRUPA20100310_131053_ 000065272087_00324_41961_2269.N1	ATS_TOA_1PUUPA20100310_131053_ 000065272087_00324_41961_5790.N1
ATS_NR__2PRUPA20100310_131053_ 000065272087_00324_41961_2269.N1	ATS_NR__2PUUPA20100310_131053_ 000065272087_00324_41961_5790.N1
ATS_TOA_1PRUPA20110517_215250_ 000065273102_00316_48175_7847.N1	ATS_TOA_1PUUPA20110517_215250_ 000065273102_00316_48175_2135.N1
ATS_NR__2PRUPA20110517_215250_ 000065273102_00316_48175_7847.N1	ATS_NR__2PUUPA20110517_215250_ 000065273102_00316_48175_2135.N1
ATS_TOA_1PRUPA20110726_204703_ 000065273105_00028_49180_0458.N1	ATS_TOA_1PUUPA20110726_204703_ 000065273105_00028_49180_4397.N1
ATS_NR__2PRUPA20110726_204703_ 000065273105_00028_49180_0458.N1	ATS_NR__2PUUPA20110726_204703_ 000065273105_00028_49180_4397.N1
ATS_TOA_1PRUPA20111225_161425_ 000065273110_00054_51361_2570.N1	ATS_TOA_1PUUPA20111225_161425_ 000065273110_00054_51361_5346.N1
ATS_NR__2PRUPA20111225_161425_ 000065273110_00054_51361_2570.N1	ATS_NR__2PUUPA20111225_161425_ 000065273110_00054_51361_5346.N1
ATS_TOA_1PRUPA20120101_101658_ 000065273110_00151_51458_2668.N1	ATS_TOA_1PUUPA20120101_101658_ 000065273110_00151_51458_5443.N1
ATS_NR__2PRUPA20120101_101658_ 000065273110_00151_51458_2668.N1	ATS_NR__2PUUPA20120101_101658_ 000065273110_00151_51458_5443.N1
ATS_TOA_1PRUPA20120402_022247_ 000065273113_00175_52775_4314.N1	ATS_TOA_1PUUPA20120402_022247_ 000065273113_00175_52775_6717.N1
ATS_NR__2PRUPA20120402_022247_ 000065273113_00175_52775_4314.N1	ATS_NR__2PUUPA20120402_022247_ 000065273113_00175_52775_6717.N1

5.3   Results

Table 8 displays the product orbit number and location of the anomaly for each product. The assessment is given in terms of whether the cloud flag has now been set correctly.

Table 9. Results from the cloud identification comparison

Filename orbit number	Location of anomaly		Assessment
	Latitude	**Longitude**	
02400	47.89	-139.68	Unchanged
08350	46.26	-19.43	Cloud clearing successful
14509	22.31	-124.47	Cloud clearing successful
15588	-47.86	-89.18	Cloud clearing successful
21654	-38.15	-8.98	Cloud clearing successful
27646	59.40	-21.38	Cloud clearing successful
33505	52.25	-137.09	Cloud clearing successful
39333	46.72	165.72	Cloud clearing successful
41961	-48.02	121.63	Cloud clearing successful
48175	38.16	-178.11	Cloud clearing successful

Filename orbit number	Location of anomaly		Assessment
	Latitude	Longitude	
49180	64.50	1.32	Unchanged
51361	25.51	-97.29	Cloud clearing successful
51458	-42.22	164.64	Cloud clearing successful
52775	-53.89	-77.63	Unchanged

Out of the 14 case studies examined, 11 were improved and 3 were unchanged. Figure 7 shows an example of the improved cloud identification from orbit 33506 (filename orbit number 33505).
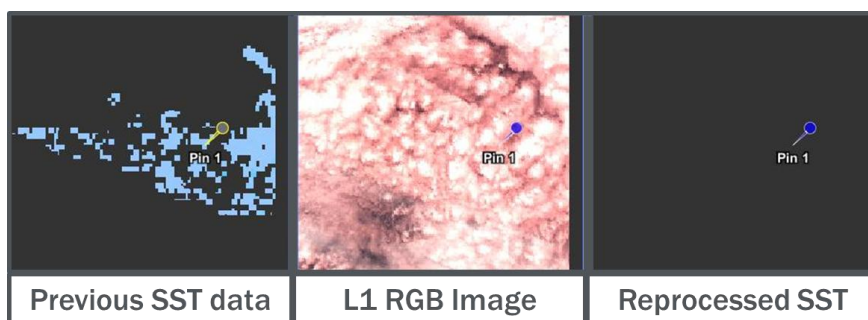
Figure 7. Cloud identification improvement example for orbit 33506; no false SST retrieval in the reprocessed data.

The cloud identification over land has also changed, as a result of the improved visible channel calibration. In general, the changes are an improvement with fewer clear sky land pixels being flagged as cloudy. Figure 8 shows an example of this improvement, from orbit 52334 (filename orbit number 52333), where the light blue pixels show where the cloud flag has been set.
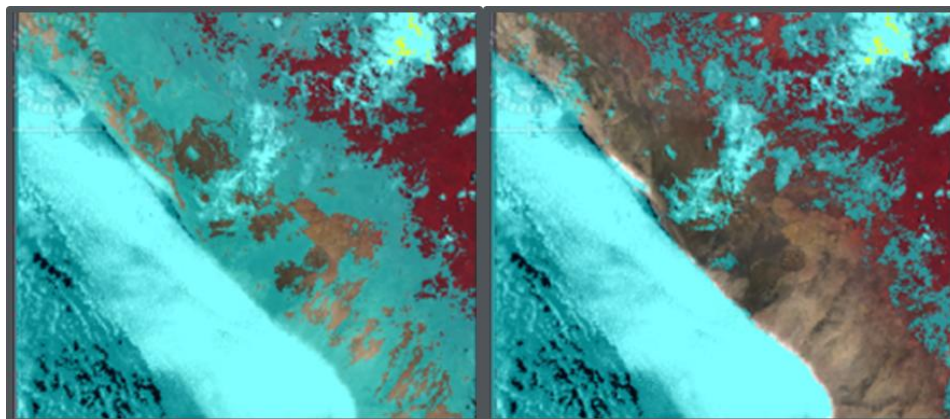
Figure 8. Cloud flag for previous (left) and reprocessed (right) AATSR data for orbit 52334; fewer reprocessed land pixels are incorrectly flagged as cloudy.

5.4   Conclusion

The results presented above confirm there has been an improvement in cloud identification in the reprocessed data.

6. VISUAL INSPECTIONS

6.1 Method

Visual inspections were performed on randomly selected reprocessed TOA, NR and AR products, taking one of each product type per year of mission (33 in total). Each product was opened using appropriate tools (BEAM for L1 and NR; QUASAR and EnviView for AR), and selected bands within the product were then scanned for anomalies.

6.2 Products inspected

Table 10 displays the list of the reprocessed products that were randomly selected for visual inspection.

Table 10. Products randomly selected for visual inspection

Visual inspection – reprocessed data
ATS_TOA_1PUUPA20021002_004639_000065272010_00016_03076_6709.N1
ATS_TOA_1PUUPA20031018_011236_000065272020_00460_08530_1978.N1
ATS_TOA_1PUUPA20041209_035626_000065272032_00433_14515_8070.N1
ATS_TOA_1PUUPA20050131_111318_000065272034_00194_15278_8800.N1
ATS_TOA_1PUUPA20060227_073152_000065272045_00292_20887_4454.N1
ATS_TOA_1PUUPA20070610_090356_000065272058_00479_27587_0949.N1
ATS_TOA_1PUUPA20080417_135952_000065272067_00439_32056_5284.N1
ATS_TOA_1PUUPA20090512_162334_000065272079_00011_37640_1147.N1
ATS_TOA_1PUUPA20100609_203329_000065272090_00128_43268_7151.N1
ATS_TOA_1PUUPA20110701_210324_000065273104_00100_48821_2788.N1
ATS_TOA_1PUUPA20120228_231213_000065273112_00130_52299_6245.N1
ATS_NR__2PUUPA20020824_061416_000065272008_00463_02521_6230.N1
ATS_NR__2PUUPA20031005_112450_000065272020_00280_08350_1801.N1
ATS_NR__2PUUPA20041208_175250_000065272032_00427_14509_8064.N1
ATS_NR__2PUUPA20050222_025855_000065272035_00003_15588_9093.N1
ATS_NR__2PUUPA20060421_213111_000065272047_00057_21654_5176.N1
ATS_NR__2PUUPA20070614_115916_000065272059_00037_27646_1008.N1
ATS_NR__2PUUPA20080727_192734_000065272070_00385_33505_6748.N1
ATS_NR__2PUUPA20090907_225719_000065272082_00201_39333_2882.N1
ATS_NR__2PUUPA20100310_131053_000065272087_00324_41961_5790.N1
ATS_NR__2PUUPA20110517_215250_000065273102_00316_48175_2135.N1
ATS_NR__2PUUPA20120402_022247_000065273113_00175_52775_6717.N1
ATS_AR__2PUUPA20020801_150017_000065272008_00139_02197_5917.N1
ATS_AR__2PUUPA20030204_015827_000065272013_00303_04866_8404.N1
ATS_AR__2PUUPA20040312_062554_000065272025_00048_10623_4024.N1
ATS_AR__2PUUPA20050418_091240_000065272036_00293_16379_9876.N1
ATS_AR__2PUUPA20060522_133406_000065272047_00496_22093_5612.N1
ATS_AR__2PUUPA20070628_180126_000065272059_00241_27850_1212.N1

Visual inspection – reprocessed data
ATS_AR__2PUUPA20080702_223424_000065272070_00029_33149_6392.N1
ATS_AR__2PUUPA20090914_022959_000065272082_00289_39421_2970.N1
ATS_AR__2PUUPA20101006_030712_000065272093_00318_44961_8878.N1
ATS_AR__2PUUPA20111119_113334_000065273108_00396_50841_4817.N1
ATS_AR__2PUUPA20120213_172123_000065273111_00342_52080_6026.N1

6.3   Results

The visual inspections did not result in any new anomalies being seen within the products.

During the inspections, it was noted that the top of atmosphere cloudy sea brightness temperature datasets within the AR products are not as expected: they also contain data over cloudy land and clear sea. This was checked with multiple tools to rule out the possibility of incorrect display by one tool. Previous version AATSR data products are similarly structured; therefore this feature has not been introduced in this reprocessing. Investigation into this issue will continue offline.

6.4   Conclusion

Visual inspections did not reveal any anomalies or discrepancies in the reprocessed data that were different from the previous data.

7.   SUMMARY

Following the AATSR Third Reprocessing IDEAS QC Plan [RD.2], the reprocessed AATSR dataset was subject to detailed QC checks in specific areas: view colocation, absolute nadir geolocation and cloud identification. This was in addition to the visual inspection of a set of randomly selected data for more detailed checks than can be carried out within the systematic QC.

The outcome of these detailed QC checks was as follows:

- Colocation: the difference between nadir and forward views was found to be reduced, both via statistical analysis and visual comparisons.

- Geolocation: the geolocation was better when compared to both MERIS data and a set of reference coordinates; it is now to within 1 pixel.

- Cloud identification: of the 14 case studies examined, 11 showed improvement, 3 were unchanged.

The results from the spot-check QC detailed inspections confirm that the expected improvements are seen in the reprocessed AATSR data. Visual inspections did not reveal any anomalies or discrepancies in the reprocessed data.

Therefore, it is confirmed that the third reprocessed AATSR dataset is an improved dataset when compared with the previous version.

ANNEX A   FULL RESULTS FROM DETAILED QC

This annex lists the full results from the detailed QC investigations.

A.1   Colocation

Table 11 gives the full details of the mean and standard deviation for the previous and the reprocessed data when analysing the forward–nadir difference of the 0.87 μm band by product orbit number. Full product names are given in Table 1.

Table 11. Mean and SD of the forward–nadir difference of the 0.87 μm band for previous and reprocessed data products

Filename orbit number	Previous data		Reprocessed data	
	Mean	SD	Mean	SD
02150	2.66	8.47	2.59	7.62
03654	1.69	6.66	1.58	5.29
05221	3.30	7.60	3.23	6.64
09490	1.52	6.35	1.48	4.77
10915	2.20	7.03	2.12	5.80
12889	3.23	8.40	3.18	7.31
14941	3.08	8.11	2.89	6.56
17819	3.26	8.25	2.98	6.94
21221	2.54	6.92	2.43	5.58
23391	2.69	7.03	2.58	6.08
27382	3.11	9.23	2.91	7.69
29631	2.25	8.06	2.08	6.35
31869	3.25	7.80	3.02	6.29
33558	3.44	7.94	3.23	6.76
36849	2.91	7.09	2.68	5.75
39739	2.49	7.42	2.31	6.18
42988	3.98	8.24	3.64	7.15
44798	2.53	8.27	2.39	6.58
48523	3.14	9.95	2.95	8.32
51437	2.28	7.09	2.17	5.84
51637	2.45	8.21	2.31	6.64
52840	2.62	8.23	2.47	6.77

A.2   Geolocation comparison to MERIS

Table 12 gives the full details of the identified features in the geolocation MERIS comparison. The MERIS scene is named in the table; the names of the AATSR products that were compared with each MERIS scene is given in Table 3.

Table 12. Details of comparison to identified feature in MERIS scenes

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	Lon	Lat	Lon		Lat	Lon	Lat	Lon	
MER_FR__1PNUPA20020919_114559_000000982009_00338_02897_1337.N1										
	16.596350	-22.907526	16.589508	-22.918789	1.42	16.596386	-22.907516	16.596386	-22.907516	0.00
	16.892319	-25.039883	16.885372	-25.051083	1.42	16.892355	-25.039879	16.892355	-25.039879	0.00
	16.141418	-22.882143	16.134573	-22.893385	1.42	16.141453	-22.882141	16.141453	-22.882141	0.00
	16.677610	-22.936111	16.668728	-22.938244	1.01	16.688562	-22.943106	16.688562	-22.943106	0.00
	16.548471	-24.005014	16.541570	-24.016235	1.42	16.548508	-24.005003	16.548508	-24.005003	0.00
MER_FRS_1PNUPA20050210_095752_000001972034_00337_15421_1990.N1										
	44.122147	5.803766	44.115310	5.788814	1.42	44.122050	5.803709	44.122050	5.803709	0.00
	43.562447	7.129455	43.564570	7.117427	1.00	43.562350	7.129397	43.571148	7.132341	1.01
	40.090880	8.589778	40.084435	8.575415	1.42	40.090790	8.589716	40.090790	8.589716	0.00
	35.717087	3.284539	35.710140	3.271399	1.42	35.716995	3.284490	35.716995	3.284490	0.00
MER_FRS_1PNEPA20060612_095213_000001972048_00294_22392_0353.N1										
	43.007343	9.428539	43.000780	9.413586	1.42	43.007175	9.428475	43.007175	9.428475	0.00
	36.611736	7.527086	36.613870	7.516227	1.00	36.611565	7.527010	36.620388	7.529675	1.01
	36.915565	10.308837	36.909164	10.295016	1.42	36.915400	10.308753	36.915400	10.308753	0.00
	45.728718	8.596865	45.722023	8.581377	1.41	45.728554	8.596758	45.728554	8.596758	0.00
	39.992783	8.309889	39.986134	8.295691	1.42	39.992610	8.309815	39.992610	8.309815	0.00

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	**Lon**	**Lat**	**Lon**		**Lat**	**Lon**	**Lat**	**Lon**	
	38.869030	8.653846	38.862423	8.639829	1.42	38.868862	8.653758	38.868862	8.653758	0.00
MER_FRS_1PNUPA20060618_100623_000001972048_00380_22478_1986.N1										
	36.765327	3.338217	36.758503	3.324775	1.42	36.765305	3.338183	36.765305	3.338183	0.00
	35.688038	3.079154	35.681194	3.065902	1.42	35.688010	3.079117	35.688010	3.079117	0.00
	26.153336	0.190229	26.146389	0.178314	1.42	26.153309	0.190197	26.153309	0.190197	0.00
	32.132626	5.304812	32.134857	5.294543	1.00	32.132600	5.304785	32.141420	5.307441	1.01
MER_FRS_1PNUPA20060831_214455_000002282050_00444_23544_2029.N1										
	-37.518578	177.178510	-37.525220	177.164810	1.42	-37.518707	177.178470	-37.518707	177.178470	0.00
	-42.883198	173.316060	-42.889446	173.300920	1.42	-42.883340	173.316010	-42.883340	173.316010	0.00
	-40.672710	173.994540	-40.679035	173.979950	1.42	-40.672844	173.994500	-40.672844	173.994500	0.00
	-38.070446	175.242770	-38.076893	175.228800	1.42	-38.070580	175.242720	-38.070580	175.242720	0.00
MER_FRS_1PNUPA20070610_093942_000001972058_00480_27588_1982.N1										
	54.681880	13.435314	54.675385	13.416460	1.41	54.681940	13.435321	54.681940	13.435321	0.00
	54.471750	20.118046	54.466236	20.098316	1.41	54.471810	20.118061	54.471810	20.118061	0.00
	52.274850	18.899511	52.269165	18.880892	1.42	52.274906	18.899527	52.274906	18.899527	0.00
	55.080154	15.151845	55.073895	15.132562	1.41	55.080208	15.151855	55.080208	15.151855	0.00
MER_FRS_1PNUPA20070814_190058_000001972060_00414_28524_1983.N1										
	50.699677	-126.841860	50.701960	-126.855550	1.00	50.699720	-126.841870	50.708454	-126.838250	1.00
	49.945377	-124.764150	49.939190	-124.781480	1.42	49.945423	-124.764160	49.945423	-124.764160	0.00
	54.801476	-123.748820	54.795383	-123.768196	1.41	54.801520	-123.748825	54.801520	-123.748825	0.00
	52.357258	-120.884410	52.351640	-120.903120	1.42	52.357304	-120.884410	52.357304	-120.884410	0.00

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	Lon	Lat	Lon		Lat	Lon	Lat	Lon	
MER_FRS_1PNUPA20080520_054259_000001972068_00406_32524_1975.N1										
	22.353020	69.442160	22.346308	69.430400	1.42	22.353043	69.442190	22.353043	69.442190	0.00
	26.367517	67.819565	26.358652	67.817300	1.01	26.367544	67.819595	26.365515	67.829360	1.00
	32.665012	70.090900	32.658306	70.078000	1.42	32.665043	70.090930	32.665043	70.090930	0.00
	28.136524	70.317600	28.129858	70.305230	1.42	28.136553	70.317630	28.136553	70.317630	0.00
MER_FRS_1PNUPA20080523_104934_000001972068_00452_32570_1976.N1										
	30.050198	-9.399882	30.043297	-9.412262	1.42	30.050283	-9.399862	30.050283	-9.399862	0.00
	33.361786	-8.237786	33.354940	-8.250658	1.42	33.361870	-8.237768	33.361870	-8.237768	0.00
	33.955086	-5.516849	33.948483	-5.530023	1.42	33.955173	-5.516828	33.963990	-5.514141	1.01
	25.551508	-11.260545	25.544523	-11.272368	1.42	25.551594	-11.260523	25.551594	-11.260523	0.00
MER_FRS_1PNUPA20080607_044115_000001972069_00162_32781_2036.N1										
	8.368337	78.059510	8.361353	78.048706	1.42	8.368366	78.059520	8.368366	78.059520	0.00
	9.836136	80.188710	9.829186	80.177830	1.42	9.836168	80.188720	9.836168	80.188720	0.00
	11.258665	78.650604	11.260569	78.641655	1.00	11.258698	78.650620	11.258698	78.650620	0.00
	16.978250	79.856260	16.971231	79.845116	1.42	16.978285	79.856270	16.978285	79.856270	0.00
MER_FRS_1PNEPA20080704_034331_000001972070_00047_33167_2274.N1										
	41.967587	101.603770	41.961056	101.589040	1.42	41.967660	101.603800	41.967660	101.603800	0.00
	40.985695	103.593490	40.979420	103.578766	1.42	40.985764	103.593520	40.985764	103.593520	0.00
	38.410427	97.467390	38.403503	97.453750	1.42	38.410492	97.467415	38.410492	97.467415	0.00
	39.610943	98.400830	39.604095	98.386880	1.42	39.611008	98.400856	39.611008	98.400856	0.00
MER_FRS_1PNEPA20080707_103304_000001972070_00094_33214_2276.N1										
	36.115590	-5.350839	36.117493	-5.361694	1.00	36.115612	-5.350829	36.115612	-5.350829	0.00

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	**Lon**	**Lat**	**Lon**		**Lat**	**Lon**	**Lat**	**Lon**	
	37.426860	-1.483042	37.420284	-1.496799	1.42	37.426884	-1.483030	37.426884	-1.483030	0.00
	37.573690	-0.781502	37.564896	-0.784401	1.01	37.573710	-0.781489	37.571430	-0.770537	1.00
	39.386450	-2.877185	39.388515	-2.888484	1.00	39.386475	-2.877174	39.386475	-2.877174	0.00
MER_FRS_1PNEPA20080707_103622_000001972070_00094_33214_2275.N1										
	25.014784	-3.841870	25.008060	-3.853870	1.42	25.014797	-3.841859	25.014797	-3.841859	0.00
	26.770933	-5.670248	26.764061	-5.682304	1.42	26.770948	-5.670237	26.770948	-5.670237	0.00
	28.764767	-3.020436	28.758110	-3.032861	1.42	28.764786	-3.020424	28.764786	-3.020424	0.00
	31.951706	-3.514514	31.944963	-3.527294	1.42	31.951723	-3.514502	31.951723	-3.514502	0.00
MER_FRS_1PNUPA20080714_165127_000001972070_00198_33318_2026.N1										
	45.848910	-92.437210	45.842800	-92.453270	1.42	45.848972	-92.437195	45.848972	-92.437195	0.00
	53.485622	-87.432670	53.480152	-87.451990	1.42	53.485680	-87.432650	53.485680	-87.432650	0.00
	46.830265	-97.827690	46.823437	-97.843390	1.42	46.830326	-97.827680	46.830326	-97.827680	0.00
MER_FRS_1PNEPA20080724_095359_000001972070_00337_33457_2271.N1										
	58.321938	11.322015	58.324245	11.305515	1.00	58.321995	11.322027	58.330685	11.326447	1.00
	56.329230	16.439575	56.323680	16.418941	1.41	56.329290	16.439596	56.337833	16.445005	1.01
	55.957990	10.414424	55.951540	10.394880	1.41	55.958042	10.414434	55.958042	10.414434	0.00
	54.601833	13.129107	54.595787	13.109791	1.41	54.601894	13.129120	54.601894	13.129120	0.00
MER_FRS_1PNEPA20080724_095715_000001972070_00337_33457_2273.N1										
	46.219130	6.153395	46.212290	6.137878	1.42	46.219193	6.153403	46.219193	6.153403	0.00
	43.031280	6.101541	43.024494	6.086791	1.42	43.031340	6.101551	43.031340	6.101551	0.00
	42.238070	8.548501	42.231586	8.533664	1.42	42.238132	8.548512	42.238132	8.548512	0.00
	36.917515	7.556634	36.910980	7.542936	1.42	36.917576	7.556646	36.917576	7.556646	0.00

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	Lon	Lat	Lon		Lat	Lon	Lat	Lon	
MER_FRS_1PNEPA20080724_100031_000001972070_00337_33457_2272.N1										
	35.411304	4.687155	35.404488	4.673935	1.42	35.411366	4.687166	35.411366	4.687166	0.00
	32.031208	5.260557	32.024490	5.247766	1.42	32.031270	5.260569	32.031270	5.260569	0.00
	25.234030	5.053682	25.227331	5.041647	1.42	25.234090	5.053695	25.234090	5.053695	0.00
	26.126910	5.842813	26.120266	5.830651	1.42	26.126970	5.842825	26.126970	5.842825	0.00
MER_FRS_1PNEPA20080802_065736_000001972070_00464_33584_0351.N1										
	31.852943	49.873913	31.846104	49.861240	1.42	31.852999	49.873930	31.852999	49.873930	0.00
	29.339283	50.353670	29.332502	50.341250	1.42	29.339342	50.353683	29.339342	50.353683	0.00
	26.033432	50.148964	26.026610	50.136883	1.43	26.033432	50.148964	26.033432	50.148964	0.00
	24.876963	46.975136	24.869934	46.963352	1.42	24.876963	46.975136	24.876963	46.975136	0.00
MER_FRS_1PNUPA20080803_162402_000001972070_00484_33604_1994.N1										
	46.566600	-89.631584	46.559930	-89.647310	1.41	46.566612	-89.631590	46.566612	-89.631590	0.00
	45.794940	-84.415085	45.788920	-84.431230	1.42	45.794952	-84.415100	45.794952	-84.415100	0.00
	49.768948	-88.990500	49.762270	-89.007256	1.41	49.768960	-88.990524	49.768960	-88.990524	0.00
	50.829746	-85.533485	50.832250	-85.547110	1.00	50.829760	-85.533500	50.838463	-85.529560	1.01
MER_FRS_1PNEPA20090722_063215_000001972081_00020_38651_0350.N1										
	26.253613	54.509327	26.246685	54.497368	1.42	26.253641	54.509330	26.253641	54.509330	0.00
	26.624346	55.846428	26.617512	55.834362	1.42	26.624374	55.846436	26.624374	55.846436	0.00
	27.844406	56.403030	27.837606	56.390812	1.42	27.844435	56.403034	27.844435	56.403034	0.00
	26.375408	56.451286	26.368630	56.439205	1.42	26.375439	56.451290	26.375439	56.451290	0.00

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	Lon	Lat	Lon		Lat	Lon	Lat	Lon	
MER_FRS_1PNEPA20090722_063530_000001972081_00020_38651_0354.N1										
	12.674868	54.197414	12.665979	54.195335	1.01	12.674895	54.197420	12.674895	54.197420	0.00
	9.766952	50.871704	9.759989	50.860832	1.42	9.766978	50.871710	9.766978	50.871710	0.00
MER_FRS_1PNEPA20090722_064412_000001972081_00020_38651_0356.N1										
	-12.978514	48.757626	-12.985496	48.746655	1.42	-12.978493	48.757637	-12.978493	48.757637	0.00
	-17.341766	44.124767	-17.348566	44.113438	1.42	-17.341750	44.124780	-17.341750	44.124780	0.00
	-21.093690	43.674187	-21.100470	43.662590	1.42	-21.093674	43.674200	-21.093674	43.674200	0.00
	-19.738787	45.734715	-19.745682	45.723305	1.42	-19.738768	45.734726	-19.738768	45.734726	0.00
MER_FRS_1PNEPA20090723_091737_000001972081_00036_38667_0348.N1										
	43.056328	16.060392	43.049538	16.045654	1.42	43.056385	16.060392	43.056385	16.060392	0.00
	41.576504	19.460403	41.570145	19.445646	1.42	41.576565	19.460411	41.576565	19.460411	0.00
	38.483593	14.972803	38.476770	14.959069	1.42	38.483658	14.972805	38.483658	14.972805	0.00
	44.830433	18.571495	44.823914	18.556070	1.42	44.830494	18.571497	44.830494	18.571497	0.00
MER_FRS_1PNEPA20090723_092028_000001972081_00036_38667_0355.N1										
	31.017145	15.685777	31.010460	15.673080	1.42	31.017208	15.685781	31.017208	15.685781	0.00
	31.551344	14.917973	31.553438	14.907728	1.00	31.551409	14.917976	31.560253	14.920436	1.01
	28.509012	13.807593	28.502200	13.795313	1.42	28.509073	13.807597	28.509073	13.807597	0.00
MER_FRS_1PNUPA20090723_110401_000001972081_00037_38668_1997.N1										
	15.840763	-15.868284	15.833788	-15.879399	1.42	15.840817	-15.868280	15.840817	-15.868280	0.00
	17.310766	-12.481295	17.303932	-12.492611	1.42	17.310822	-12.481293	17.310822	-12.481293	0.00
	19.473120	-14.041997	19.466198	-14.053378	1.42	19.473175	-14.041995	19.473175	-14.041995	0.00
	25.269579	-11.605109	25.271635	-11.614777	1.00	25.269636	-11.605107	25.278502	-11.602823	1.01

MERIS scene	Identified feature in MERIS data regridded to previous data		Identified feature in previous data		Distance MERIS to previous data (km)	Identified feature in MERIS data regridded to reprocessed data		Identified feature in reprocessed data		Distance MERIS to reprocessed data (km)
	Lat	Lon	Lat	Lon		Lat	Lon	Lat	Lon	
MER_FRS_1PNUPA20090911_014009_000001972082_00246_39378_1996.N1										
	-14.973347	124.826640	-14.980341	124.815600	1.42	-14.973273	124.826660	-14.973273	124.826660	0.00
	-24.553268	121.891754	-24.560207	121.880005	1.42	-24.553192	121.891790	-24.553192	121.891790	0.00
	-18.613508	121.788895	-18.611525	121.779650	1.00	-18.613434	121.788925	-18.604560	121.791020	1.01
MER_FRS_1PNUPA20090912_091903_000001972082_00265_39397_1993.N1										
	30.391350	13.592277	30.384428	13.579854	1.42	30.391401	13.592293	30.389460	13.602455	1.00
	22.585966	15.589105	22.579260	15.577316	1.42	22.586025	15.589123	22.586025	15.589123	0.00
	25.535600	14.275398	25.528791	14.263434	1.42	25.535658	14.275415	25.535658	14.275415	0.00

A.3 Geolocation comparison to reference sites

Table 13 displays the details of the geolocation comparison the reference sites. Names of the products inspected are given in Table 6. The filename orbit number is given for ease of reference, which in most cases is the same for the previous and reprocessed products.

Table 13. Details of geolocation comparison to reference sites

Filename orbit number (previous/repro)	Previous data			Reprocessed data		
	Lat	Lon	Distance to site (km)	Lat	Lon	Distance to site (km)
Australia (-25.9737, 114.2174)						
02518	-25.98305	114.21205	1.17	-25.976091	114.22397	0.71
24977	-25.977816	114.21382	0.58	-25.979874	114.22356	0.92
37545	-25.981548	114.20918	1.20	-25.97467	114.22122	0.40
52329	-25.991623	114.21945	2.00	-25.975735	114.23355	1.63
Korea (34.6026, 127.0979)						
08531/08530	34.599613	127.08696	1.05	34.60676	127.10028	0.51
19280	34.600082	127.090034	0.77	34.6069	127.10315	0.68
45103	34.597046	127.07907	1.83	34.603783	127.092255	0.53
45275	34.59813	127.09148	0.77	34.6052	127.10479	0.69
India (19.9588, 85.0237)						
03951	19.958714	85.01471	0.94	19.965494	85.02619	0.79
10193/10192	19.949501	85.01696	1.25	19.958582	85.02897	0.55
48236	19.952442	85.00702	1.88	19.959421	85.01843	0.56
Morocco (35.708, -5.5054)						
16265	35.706410	-5.519918	1.32	35.712960	-5.506611	0.56
26471	35.703274	-5.526086	1.94	35.708280	-5.502092	0.30
51889	35.701256	-5.514762	1.13	35.707860	-5.501274	0.37
South Africa (-33.8659, 25.5327)						
09149	-33.878	25.530960	1.36	-33.870907	25.543829	1.17
22318	-33.869694	25.526056	0.74	-33.863014	25.539228	0.68
33426	-33.870255	25.525034	0.86	-33.863304	25.537964	0.57
Florida (24.5337, -82.0038)						
30439	24.525177	-82.01267	1.31	24.532188	-82.00091	0.34
50800	24.53328	-82.01343	0.98	24.540197	-82.00161	0.76
Mexico (29.0656, -113.0884)						
13979	29.051924	-113.09477	1.64	29.058607	-113.082275	0.98
34434	29.063105	-113.095566	0.75	29.061152	-113.08554	0.57
40446	29.06461	-113.09951	1.09	29.062603	-113.0895	0.35

End of Document