MEMORANDUM

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To	:	Philippe Goryl	**Date**	:	02 September 2013
Cc	:	Nigel Houghton	**Issue**	:	1.0
		aatsr@eo-sppa.org	**File ID**	:	IDEAS-VEG-OQC-MEM-1344 AATSR Third Reprocessing Detailed QC Summary v1-0.doc

SUBJECT : AATSR Third Reprocessing Detailed Quality Control Summary

This document presents a summary of the detailed inspections performed for the spot-check quality control analysis on the AATSR data from the third reprocessing.

Overview

In addition to the systematic Quality Control (QC) activities performed on the entire dataset of reprocessed AATSR data (ref: IDEAS-VEG-OQC-REP-1261), 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 (IDEAS-VEG-OQC-PLN-1014).

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 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.

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.

The next section gives a brief outline of the results from the QC, after which the details of each investigation are summarised.

Headline Results

The results were as follows:

- Colocation: the difference between nadir and forward views was found to be reduced, both via statistical analysis and also visual comparisons.
- Geolocation: the geolocation was better when compared to MERIS data and to reference coordinates, 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.

Spot-Check Quality Control Analysis Details

The following sections give further details on each area of analysis.

Colocation

The colocation improvement was checked by using the same method as was done 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.

The mean and standard deviation of these differences are improved for the reprocessed data compared to the previous version products (see Table 1).

Table 1 Average view difference mean and standard deviation for previous and reprocessed AATSR data

	Previous	Reprocessed
Average Mean	2.76	2.6
Average Standard Deviation	7.83	6.5

Figure 1 and Figure 2 show the results for all test products and the average for the mean and standard deviation for previous and reprocessed data.

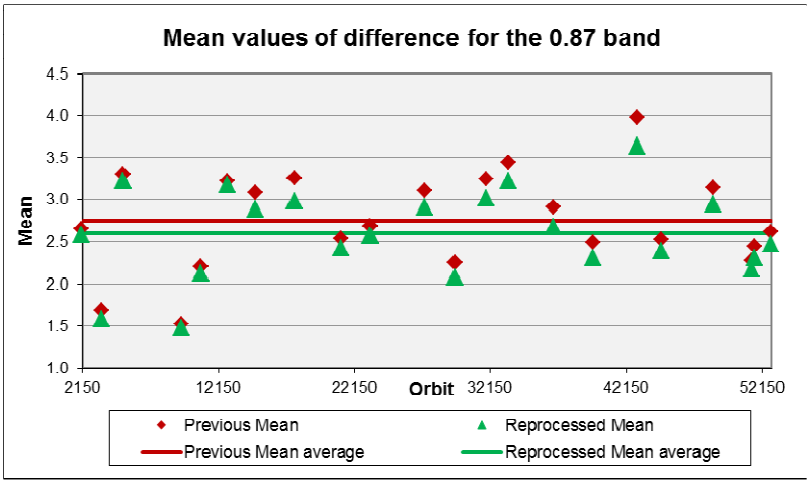

Figure 1 Mean of nadir-forward view difference for all test products

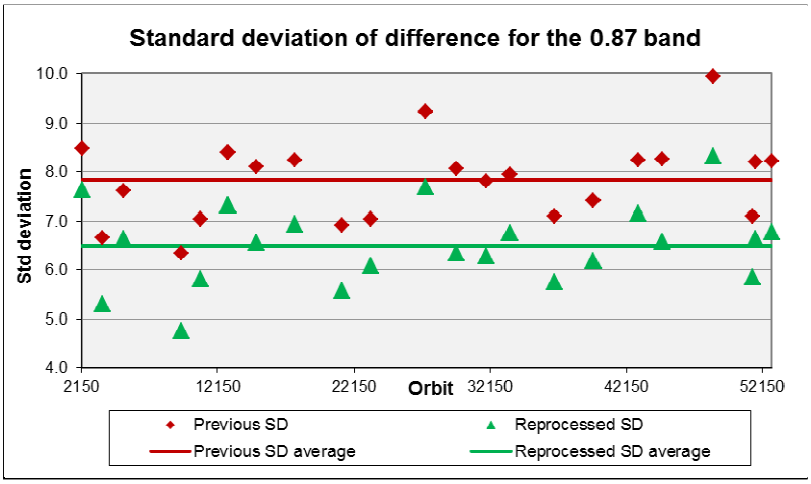

Figure 2 Standard deviation of nadir-forward view difference for all test products

This improvement can also be noted visually in images of the difference band, as shown for the example from orbit 48524 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.

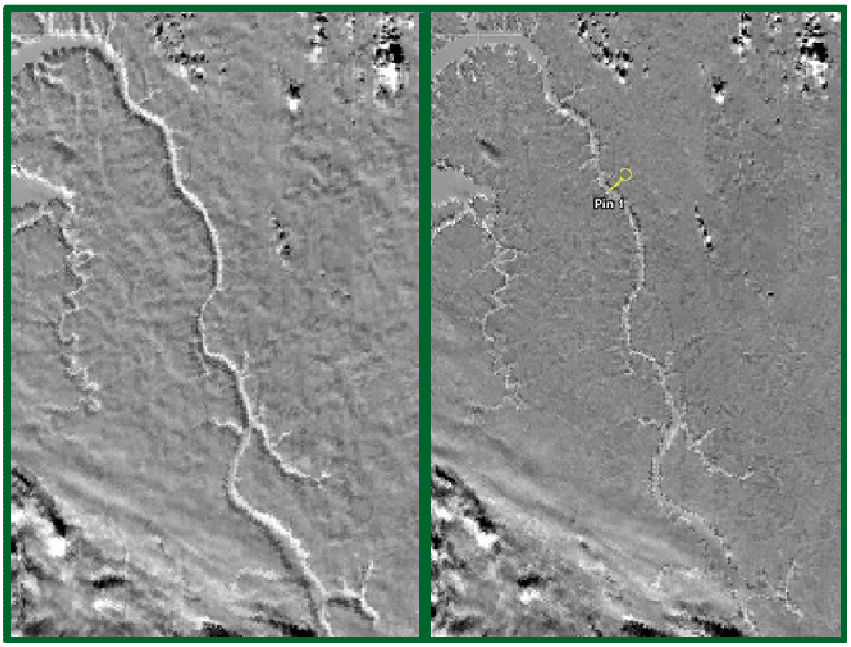

Figure 3 View difference image for previous data (left) and reprocessed data (right)

Geolocation

The geolocation was checked by repeating previous analysis methods whereby AATSR data were compared to regridded MERIS FR data (known to have better absolute geolocation). Additionally, AATSR data were compared to a set of reference site coordinates.

Geolocation Comparison to MERIS Data

Previous comparisons to MERIS (IDEAS-VEG-OQC-REP-0674) had shown a systematic offset of 1 pixel along track and 1 pixel across track on average. The reprocessed data did not have the same offset, indicating that the geolocation compared to MERIS was better.

An example of this improvement is shown in Figure 4, taken from orbit 22392, 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 from the MERIS coordinates but the reprocessed data shows good agreement.

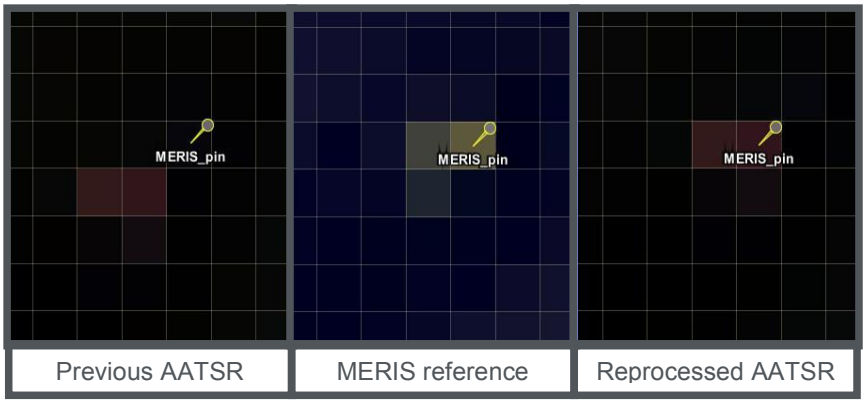

Figure 4 Geolocation between previous version and reprocessed AATSR data compared to regridded MERIS as a reference.

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 were extracted and then compared to those taken from previous and reprocessed products. This was done for a total of 22 products over 7 test sites.

The analysis using comparisons to reference coordinates revealed an average offset for previous data of approximately 1.21 km but the reprocessed data were much closer with an average offset of approximately 0.66 km.

Figure 5 shows the results for all test sites and the mean value for the previous and reprocessed data. As well as the improved mean, there is also less variability within the reprocessed data.

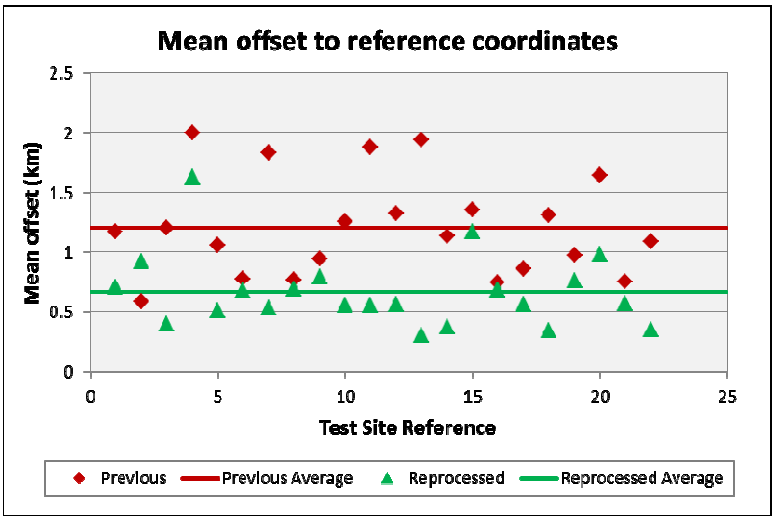

Figure 5 Geolocation offset to reference coordinates

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. These updates were to correct for known errors in the auxiliary file, rather than to specifically improve the cloud identification, nevertheless there was expected to be some difference due to the updates and verification of the auxiliary file indicated the differences should be an improvement.

AATSR was known to suffer from occasional cloud identification failures where SST retrievals were performed for cloudy pixels and this was being monitored operationally. Hence reprocessed products were compared to previous instances of known cloud identification failures to check for signs of improvement.

Out of the 14 case studies examined, 11 were improved and 3 were unchanged. Figure 6 shows an example of the improved cloud identification from orbit 33506.

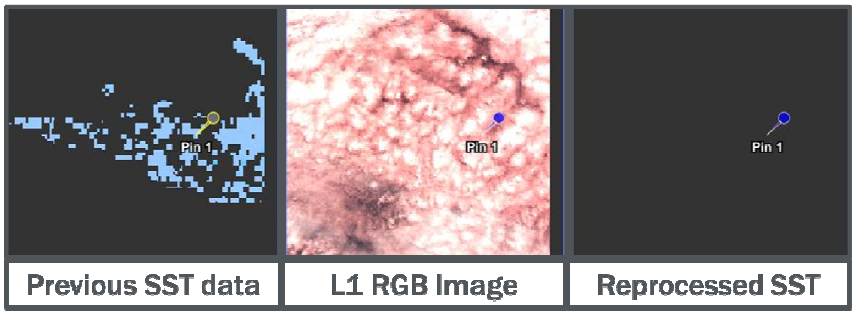

Figure 6 Cloud identification improvement example; no false SST retrieval in the reprocessed data

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 7 shows an example of this improvement, from orbit 52334.

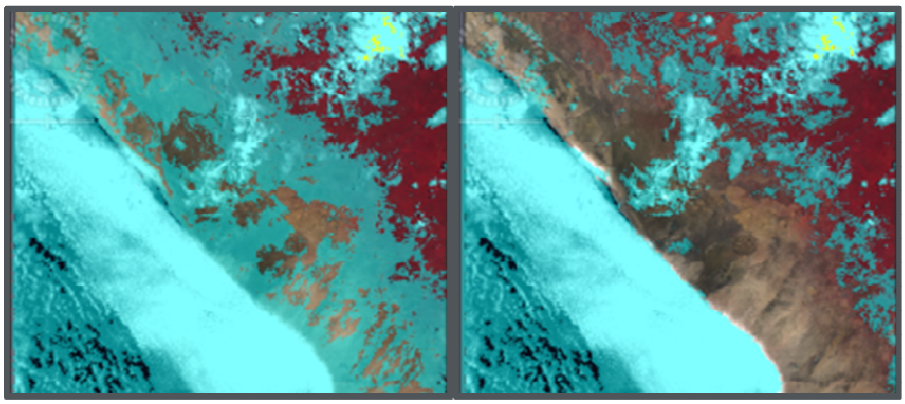

Figure 7 Cloud flag for previous (left) and reprocessed (right) AATSR data; fewer reprocessed land pixels are incorrectly flagged as cloudy.

Visual Inspections

Visual inspections were performed on randomly selected 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, and selected bands within the product were then scanned for anomalies. The inspections did not result in any new anomalies being seen within the products.

During the visual 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.

Conclusions

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