MEMORANDUM

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To	:	Philippe Goryl, ESA	**Date**	:	01 May 2014
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cc	:	Nigel Houghton, ESA D. Ghent, UOL aatsr@eo-sppa.org	**File ID**	:	IDEAS-VEG-OQC-REP-1484 AATSR UOL LST Reprocessing QC Report v1-0.doc

SUBJECT : AATSR UOL LST Reprocessing QC Report

This document gives a summary of the QC performed on the University of Leicester (UOL) Land Surface Temperature (LST) products that were generated from the third reprocessing AATSR Level 1 dataset.

Scope

AATSR UOL LST products in netCDF format were generated from the Level 1 dataset (covering 20 May 2002 to 08 April 2012) by the LST team at the University of Leicester. Systematic header checks were performed on all products and involved thorough inspection of the product headers for consistency and correct contents. The completeness of the dataset when compared with the Level 1 master list was also analysed. Visual inspections were performed on a set of randomly selected LST products.

In contrast to previous QC on the reprocessed dataset, the QC header scripts were supplied to the LST team, who kindly ran the scripts on the data *in situ* at NEODC. The outputs were then sent to IDEAS for analysis.

Results

This section outlines the results from the systematic checks, completeness checks and visual inspections of the data, and contains information on the jpeg conversion QC activity.

Systematic checks

An initial set of 50018 AATSR LST products were analysed systematically, followed by a further 9 products (see Completeness Checks below); there were two related issues raised:

1) 24 products 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 LST product, were 2 seconds earlier than the start time listed in the filename and the data from the originating L1 product. Table 1 lists the products with a 2-second start time mismatch between the product name and the header.

2) 27347 products were flagged in a similar way as above, but for a 1-second discrepancy. When such 1-second mismatches arose for ARC L2P data (22 cases out of 50027), the matter was considered acceptable due to the very small number of products involved and the small mismatch. For LST products, more than half exhibit a 1-second discrepancy, which makes the underlying issue causing this discrepancy of more concern.

No other issues arose from the header inspections.

Table 1. Products with a 2-second start time mismatch between the product name and the header

Product name
ATS_LST_2PUUOL20020829_115911_000065272009_00037_02596_6303.nc
ATS_LST_2PUUOL20040226_160043_000065272024_00340_10414_3815.nc
ATS_LST_2PUUOL20040821_195921_000065272029_00371_12950_6497.nc
ATS_LST_2PUUOL20050109_160626_000065272033_00383_14966_8495.nc
ATS_LST_2PUUOL20050411_161510_000065272036_00197_16283_9779.nc
ATS_LST_2PUUOL20060204_161751_000065272044_00469_20563_4130.nc
ATS_LST_2PUUOL20060712_064856_000065272049_00220_22819_6329.nc
ATS_LST_2PUUOL20070321_113028_000065272056_00323_26429_9699.nc
ATS_LST_2PUUOL20070402_033026_000065272056_00490_26596_9866.nc
ATS_LST_2PUUOL20070526_083512_000065272058_00264_27372_0734.nc
ATS_LST_2PUUOL20080203_024133_000065272065_00375_30990_4223.nc
ATS_LST_2PUUOL20080304_120203_000065272066_00309_31425_4654.nc
ATS_LST_2PUUOL20080316_222839_000065272066_00487_31603_4832.nc
ATS_LST_2PUUOL20080317_215702_000065272066_00501_31617_4846.nc
ATS_LST_2PUUOL20081024_110724_000065272073_00151_34774_8054.nc
ATS_LST_2PUUOL20081104_220535_000065272073_00315_34938_8218.nc
ATS_LST_2PUUOL20090104_114445_000065272075_00180_35805_9093.nc
ATS_LST_2PUUOL20090219_023547_000065272076_00332_36458_9756.nc
ATS_LST_2PUUOL20090824_000912_000065272081_00488_39119_2668.nc
ATS_LST_2PUUOL20091112_150008_000065272084_00139_40273_3856.nc
ATS_LST_2PUUOL20101010_092343_000065272093_00379_45022_8951.nc
ATS_LST_2PUUOL20101019_180355_000065272094_00012_45156_9088.nc
ATS_LST_2PUUOL20110223_223449_000065273099_00417_46983_1005.nc
ATS_LST_2PUUOL20120324_111400_000065273113_00051_52651_6593.nc

Completeness checks

The completeness checks conducted by IDEAS were based on the listing of L1 products generated by IDEAS as part of the completeness checks on the AATSR Envisat-format reprocessed data. Referencing the initial LST dataset against the L1 list revealed that nine L1 products did not have a corresponding LST product available; Table 2 lists the L1 products.

Table 2. L1 products with no corresponding LST product

Product name
ATS_TOA_1PUUPA20050127_113910_000065272034_00137_15221_8753.N1
ATS_TOA_1PUUPA20050127_131946_000065272034_00138_15222_8754.N1
ATS_TOA_1PUUPA20050127_150022_000065272034_00139_15223_8755.N1
ATS_TOA_1PUUPA20050127_164058_000065272034_00140_15224_8756.N1
ATS_TOA_1PUUPA20050127_182134_000065272034_00141_15225_8757.N1
ATS_TOA_1PUUPA20050127_200210_000055292034_00142_15226_8758.N1
ATS_TOA_1PUUPA20050128_070832_000027642034_00149_15233_8759.N1
ATS_TOA_1PUUPA20050128_074621_000065272034_00149_15233_8760.N1
ATS_TOA_1PUUPA20050128_092657_000065272034_00150_15234_8761.N1

Examination of the NEODC archives revealed that all products were of non-nominal size (393 kB) and could not be opened by BEAM. Inspection of the DISSHARM archive showed products of nominal size, except for two shorter products (15226 and 15233_8759). The shorter products were downloaded and inspected using BEAM,

revealing no apparent anomalies. Notification was given to NEODC and UOL that these nine products should be retransferred to NEODC, and further LST products generated in order to obtain a complete AATSR LST dataset.

Actions were taken by NEODC and UOL and the missing LST products were generated and placed in the NEODC archive. There are therefore no open issues with the completeness of the AATSR UOL LST reprocessed dataset.

Visual inspections

For detailed inspections, one LST product per year was originally selected to be opened in BEAM and viewed band by band. A final total of 13 products were inspected (see Table 3).

Table 3. List of LST products that were visually inspected

Product name
ATS_LST_2PUUOL20021010_013532_000065272010_00131_03191_6817.nc
ATS_LST_2PUUOL20031115_031317_000065272021_00361_08932_2377.nc
ATS_LST_2PUUOL20040120_073200_000046072023_00307_09880_3284.nc
ATS_LST_2PUUOL20050325_100711_000065272035_00451_16036_9533.nc
ATS_LST_2PUUOL20060531_121044_000065272048_00123_22221_5736.nc
ATS_LST_2PUUOL20070705_142007_000065272059_00339_27948_1310.nc
ATS_LST_2PUUOL20080912_162917_000065272072_00054_34176_7414.nc
ATS_LST_2PUUOL20091118_183249_000065272084_00227_40361_3952.nc
ATS_LST_2PUUOL20101223_202627_000065273097_00387_46091_0079.nc
ATS_LST_2PUUOL20110428_214911_000065273102_00043_47902_1862.nc
(1) ATS_LST_2PUUOL20120202_222524_000065273111_00187_51925_5873.nc
(2) ATS_LST_2PUUOL20040617_222305_000065272027_00444_12021_5468.nc
(3) ATS_LST_2PUUOL20061024_222554_000065272052_00215_24317_7681.nc

Inspection of the 2012 product revealed an anomalous strip of LST data over the Bering peninsula. Two further products were inspected covering the same region to ascertain if this was an inherent feature in the products, and it was found to be so. The three products inspected are shown in italics in Table 3.

Figure 1 displays the anomalous LST strip for the three products (1) – (3), as labelled in Table 3. The fields displayed are (left to right) LST, fractional vegetation cover (fv) and total column water vapour (tcwv). Figure 2 gives the LST colour legend for Figure 1, and Figure 3 displays a map of the pin location given in Figure 1. The anomalous LST values are all set to 273.15 K. All other data bands were inspected closely: the fv band displayed some similar features, but the tcwv band exhibited a distinctive strip in the same location. The tcwv values were 0 kg m^{-2}, which is a valid minimum value for the data, but the strip is non-realistic; this is especially visible in products (2) and (3).

A further look at the anomalous data against the longitude band (Figure 4 for product (3), orbit number 24317) showed that the bottom edge of the strip was coincident with the 180/-180 longitude line (180th meridian). The origin of the anomaly cannot be ascertained by IDEAS, and so the matter was referred to the LST team for further investigation.

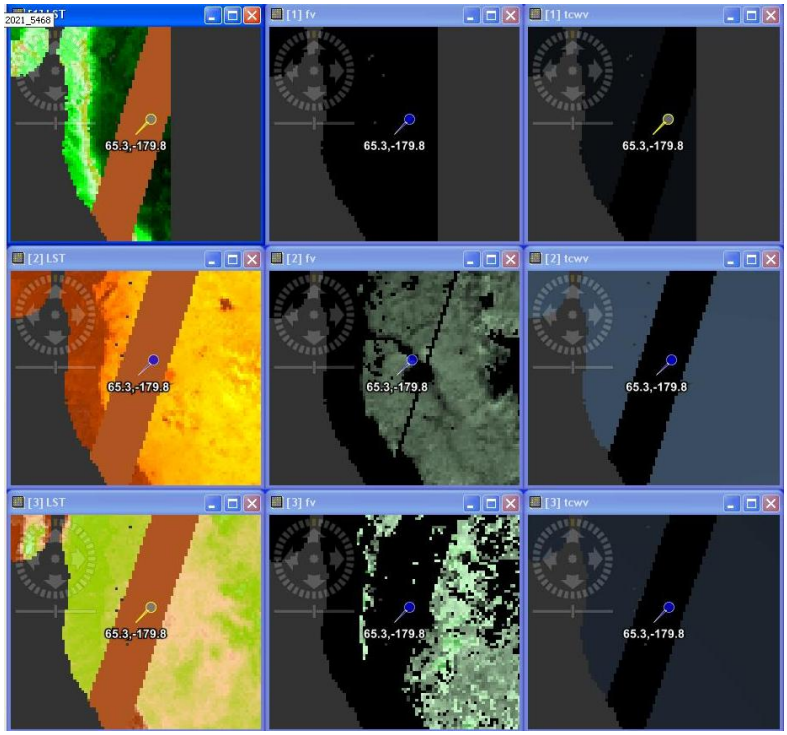

Figure 1. Three LST products (see Table 1) displaying an anomalous LST strip in the Bering peninsula. Left to right: LST, fractional vegetation cover (fv) and total column water vapour (tcwv).

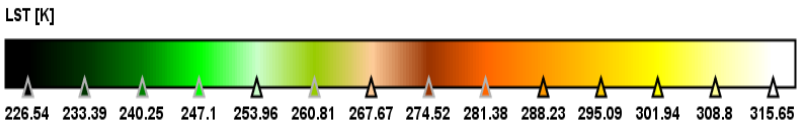

Figure 2. LST colour legend for Figure 1.

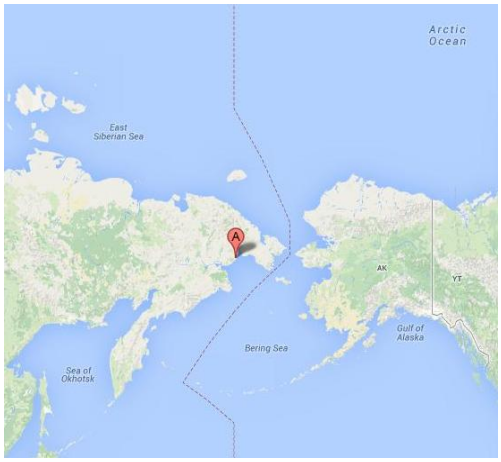

Figure 3. Map location of the pin shown in Figure 1.
(Map data ©2014 ZENRIN, Google)

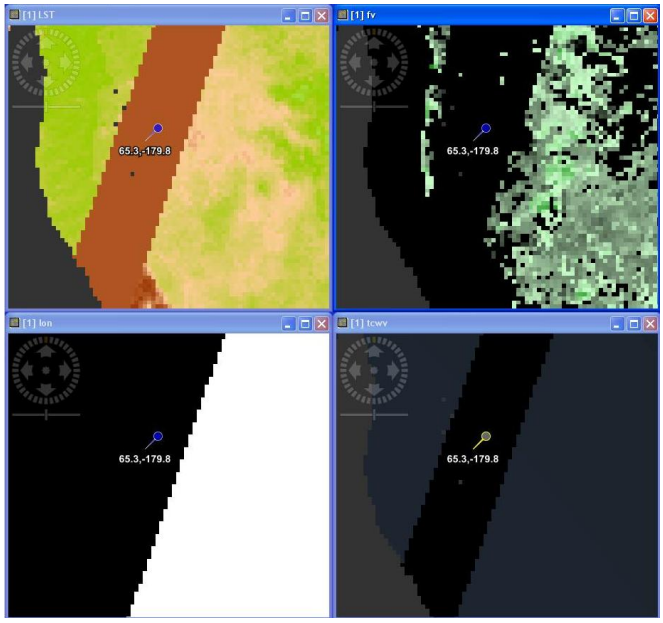

Figure 4. The anomalous bands of product (3) shown with longitude (bottom left). The transition from black to white in the longitude band signals the 180th meridian.

Conversion to jpegs

A very useful method to check the contents of all LST products is to attempt to convert the netCDF products into jpegs using BEAM. This technique uses three selected bands (latitude, longitude and LST) to produce an RGB image. Failure to convert the product to a jpeg usually highlights a problem with the originating product. However, since IDEAS does not have ready access to the full dataset, this QC activity cannot yet be undertaken. Jpeg conversion was successful on the nine missing products that underwent QC after the main set.

For the moment, IDEAS are prepared to recommend the release of the dataset without this activity having been completed. Attempts are under way to carry out this activity within the short term.

Conclusions

The LST products that have a disagreement of two seconds between the start time in the product name and the header start time will remain in the archive. The difference is small and the products affected are few.

The LST products that have a disagreement of one second between the start time in the product name and the header start time will also remain in the archive, since the difference is minimal.

Both issues above have been notified to the LST team at UOL, and will also be placed on the (A)ATSR Open Issues list for continued awareness and possible future investigation.

The anomaly that occurs within the LST products at the 180th meridian has been referred to the LST team for investigation. Due to the small amount of land coverage at the 180th meridian, it is not required that LST products be regenerated for the 3rd reprocessing dataset.

At this point, IDEAS recommends the release of the LST dataset to users, subject to the same segregation policy as the Envisat-format products from the 3rd reprocessing.

Actions

On the basis of the investigations from the AATSR UOL LST QC, the following actions are requested:

1. From the 1-second and 2-second start time mismatches between filename and header:
    a. IDEAS to place this issue (also seen in ARC L2P products) in the (A)ATSR Open Issues list.
2. From the discovery of anomalous data at the 180th meridian:
    a. D. Ghent requested to conduct an investigation.
3. IDEAS to take steps to conduct the jpeg conversion QC activity on the full LST dataset and report on any issues arising (e.g. any further segregation or product removal).
4. The LST dataset at NEODC is complete and can be hosted on DISSHARM, following the same segregation policy as the Envisat-format products from the 3rd reprocessing.
5. IDEAS to conduct a completeness check on the LST dataset at DISSHARM, once notification has been received that the transfer of the dataset is complete.

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

- Information on the start time mismatches in the final reprocessing information for users.
- Information on the anomalous bands at the 180th meridian in the final reprocessing information for users.
- Any information required in light of the results from any further investigations.