AATSR Recalibration

Version 1.0

28 October 2009

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COLLABORATORS

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Chapter 1

SCOPE

This document is the Software User Manual (SUM) for AATSR Recalibration.

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Chapter 2

REFERENCES

Smith, D., Poulsen, C., and B. Latter: Calibration Status of AATSR and MERIS Reflectance Channels. AATSR and MERIS User Workshop, ESRIN (Frascati, Italy), 21-26 September 2008. (http://earth.esa.int/workshops/meris_aatsr2008/participants/485/pres_485_S

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Chapter 3

AATSR Recalibration

3.1 Recalibration of AATSR Reflectances

3.1.1 Nonlinearity Correction for the 1.6um channel

To find out if nonlinearity correction has already been applied, use name of GC1 file, which is given in DSD.32 metadata of the AATSR product:

If the GC1 file name is 'ATS_GC1_AXVIEC20020123_073430_20020101_000000_20200101_000000', nonlinearity correction has not yet been applied:

- Convert 1.6um reflectance back to raw signal (volts) using linear conversion

```
volts = -0.816 * (reflectance/100.0) / 0.192;
```

- Convert 1.6um raw signal to a corrected reflectance using non-linear conversion function with nonlinearity coefficients from pre-launch calibration:

```
correctedReflectance = 100.0 * Math.PI *
                       (A[0] +
                        A[1]*volts +
                        A[2]*volts*volts +
                        A[3]*volts*volts*volts) / 1.553;
```

  with the nonlinearity coefficients from pre-launch calibration:

```
final double[] A = new double[]{-0.000027, -0.1093,
                                0.009393, 0.001013};
```

If nonlinearity correction has already been applied (any other GC1 file name), the input reflectances are not changed within this module.

3.1.2 Removal of Existing Long-Term Drift

First, it need to be checked which drift correction had been applied. For this, the time information in the name of the VC1 file (which is given in DSD.31 metadata of the AATSR product) is used:

- If the time in the VC1 file name is before 29-NOV-2005 13:20:26, no drift correction had been applied.
- If the time in the VC1 file name is between 29-NOV-2005 13:20:26 and 18-DEC-2006 20:14:15, an exponential drift correction had been applied.

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- If the time in the VC1 file name is after 18-DEC-2006 20:14:15, a thin film drift correction had been applied.

An exponential drift to be removed is expressed as

```
drift = Math.exp(K[iChannel] * tDiff / 365.0);
```

where tdiff is the time difference between sensing start and Envisat launch time, and K are the yearly drift rates for exponential drift:

```
final double[] K = new double[]{0.034, 0.021, 0.013, 0.002};
```

A thin film drift to be removed is expressed as

```
drift = 1.0 + A[iChannel][0] * s * s;
```

where A are the thin film drift model coefficients

```
final double[][] A = new double[][]{{0.083, 1.5868E-3},
                                    {0.056, 1.2374E-3},
                                    {0.041, 9.6111E-4}};
```

Finally, multiplying the drift gives the original, uncorrected reflectances:

```
uncorrectedReflectance = reflectance * drift;
```

3.1.3 Application of new Long-Term Drift

The new drift correction is then performed using a look up table to obtain the drift measurement for a given channel and acquisition time. A linear interpolation is applied on the drift values in the table to exactly match the acquisiton time (the time interval in the table is usually 24 hours).

A snippet of a drift correction lookup table is given in the Appendix.

Finally, dividing by the drift gives the corrected reflectances:

```
correctedReflectance = reflectance / drift;
```

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Chapter 4

APPENDIX A

AATSR drift correction lookup table (snippet) :

```
AATSR Drift Corrections
Version   : 00-7
File Generated : 09-DEC-2008 13:32:35
Boxcar Width Used :120 Days
 #         Date            0.56um    0.66um    0.87um     1.6um
 0  01-MAR-2002 00:00:00   1.00000   1.00000   1.00000   1.00000
 1  02-MAR-2002 00:00:00   1.00004   1.00000   1.00001   1.00005
 2  03-MAR-2002 00:00:00   1.00007   0.99999   1.00003   1.00010
 3  04-MAR-2002 00:00:00   1.00011   0.99999   1.00004   1.00015
 4  05-MAR-2002 00:00:00   1.00015   0.99999   1.00006   1.00020
 5  06-MAR-2002 00:00:00   1.00018   0.99998   1.00007   1.00025
 6  07-MAR-2002 00:00:00   1.00022   0.99998   1.00008   1.00030
 7  08-MAR-2002 00:00:00   1.00025   0.99998   1.00010   1.00035
 8  09-MAR-2002 00:00:00   1.00029   0.99997   1.00011   1.00040
 9  10-MAR-2002 00:00:00   1.00033   0.99997   1.00013   1.00045
10  11-MAR-2002 00:00:00   1.00036   0.99997   1.00014   1.00050
11  12-MAR-2002 00:00:00   1.00040   0.99996   1.00015   1.00055
12  13-MAR-2002 00:00:00   1.00044   0.99996   1.00017   1.00060
13  14-MAR-2002 00:00:00   1.00047   0.99996   1.00018   1.00065
14  15-MAR-2002 00:00:00   1.00051   0.99995   1.00020   1.00070
15  16-MAR-2002 00:00:00   1.00208   1.00151   1.00175   1.00228
16  17-MAR-2002 00:00:00   1.00899   1.00838   1.00864   1.00921
17  18-MAR-2002 00:00:00   1.00887   1.00822   1.00849   1.00910
18  19-MAR-2002 00:00:00   1.00860   1.00791   1.00820   1.00884
19  20-MAR-2002 00:00:00   1.00755   1.00682   1.00713   1.00781
20  21-MAR-2002 00:00:00   1.00819   1.00742   1.00774   1.00846
21  22-MAR-2002 00:00:00   1.00713   1.00632   1.00666   1.00741
22  23-MAR-2002 00:00:00   1.00652   1.00567   1.00602   1.00681
23  24-MAR-2002 00:00:00   1.00590   1.00502   1.00539   1.00621
24  25-MAR-2002 00:00:00   1.00529   1.00437   1.00476   1.00561
25  26-MAR-2002 00:00:00   1.00590   1.00494   1.00534   1.00623
26  27-MAR-2002 00:00:00   1.00503   1.00404   1.00445   1.00538
27  28-MAR-2002 00:00:00   1.00436   1.00332   1.00376   1.00472
28  29-MAR-2002 00:00:00   1.00423   1.00315   1.00360   1.00460
29  30-MAR-2002 00:00:00   1.00431   1.00320   1.00366   1.00469
30  31-MAR-2002 00:00:00   1.00392   1.00277   1.00325   1.00431
```

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