

Reprocessing of selected scans in orbit 2081

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[RD1] TN1+2 “Enhanced Analysis of MIPAS Radiometric Performance Using In-Flight Calibration Data”,
Change #1 of contract 16150/02/NL/SF

[RD2] IRAC Final Report (in preparation)

Introduction

In reaction to a suggestion of Gottfried Schwarz, DLR, we reprocessed selected limb sequences of orbit 2081. The reprocessing included

1. new non-linearity characterisation done at DLR
2. correction wrt ice contamination

The following scans were reprocessed applying the DLR IDL tool:

Scan #	level 1a sweep numbers in scan	ZPD time of first sweep in scan
3	30-46	24.7.2002, 11:23:40
12	195-211	24.7.2002, 11:36:09
20	337-353	24.7.2002, 11:47:07
36	627-643	24.7.2002, 12:09:14
68	1199-1215	24.7.2002, 12:52:23

After the Amil2da meeting, June 23-24 on a request by Vivien Payne it was decided to reprocess the entire orbit 2081.

New non-linearity characterisation

Under ESA contract a new detector non-linearity characterisation method was developed [RD1]. The new non-linearity correction factors were assessed using the same modulation efficiency fit method used for assessing the in-flight non-linearity correction factors [RD2] and found to be improved wrt the on-ground non-linearity correction factors sofar used in level 1 processing.

Correction wrt ice contamination

The closest gain sequence is orbit 2150, 29.7.2002 (5 days after orbit 2081). Figure 1 shows an OFFs/DS ratio of channel A1 with the typical spectral ice signature. This ratio shows that a radiometric error of more than 2% is encountered when using the gain from orbit 2150. Figure 2 shows the ratio for all channels

We calculated also gains for orbit 1584 (19.6.2002) which was 34 days before orbit 2081. Figure 3 shows the gain ratios of orbit 2150/1584. Within 39 days the maximum gain change was 17% which corresponds to a transmittance change of about 0.4% per day. By intercomparison of DS spectra from orbit 1584 and orbit 2150 with offset spectra from orbit 2081 it was found that there is a linear change of the ice-transmittance with time. This implies approximately a linear change of the gain with time. A linear combination of 7 times gain of orbit 2150 + 1 times gain of orbit 1584 was used for calibration.

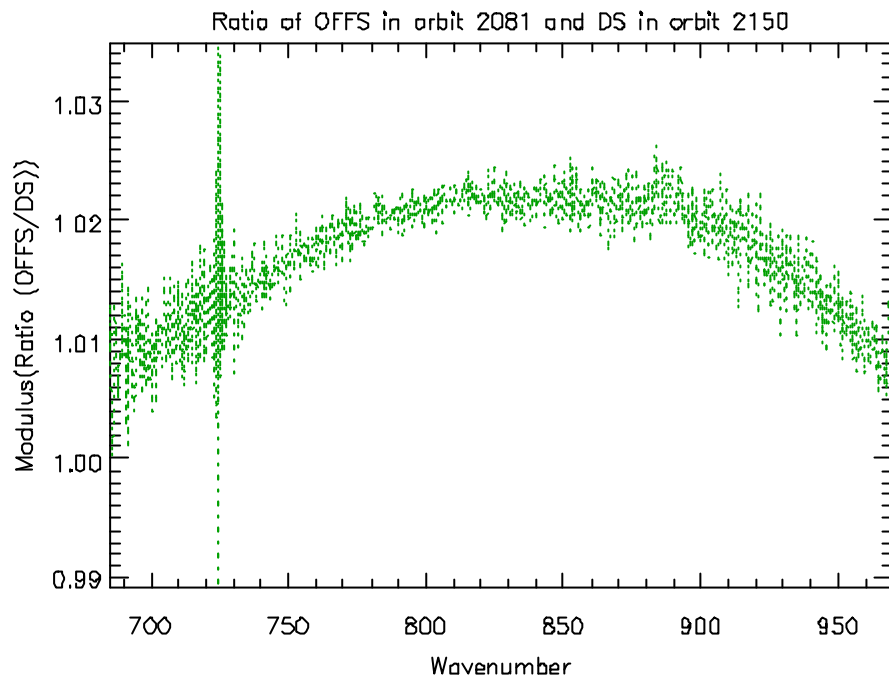


Figure 1: Modulus of ratio of summed OFFS spectra in orbit 2081 and summed DS spectra in orbit 2150, channel A1.

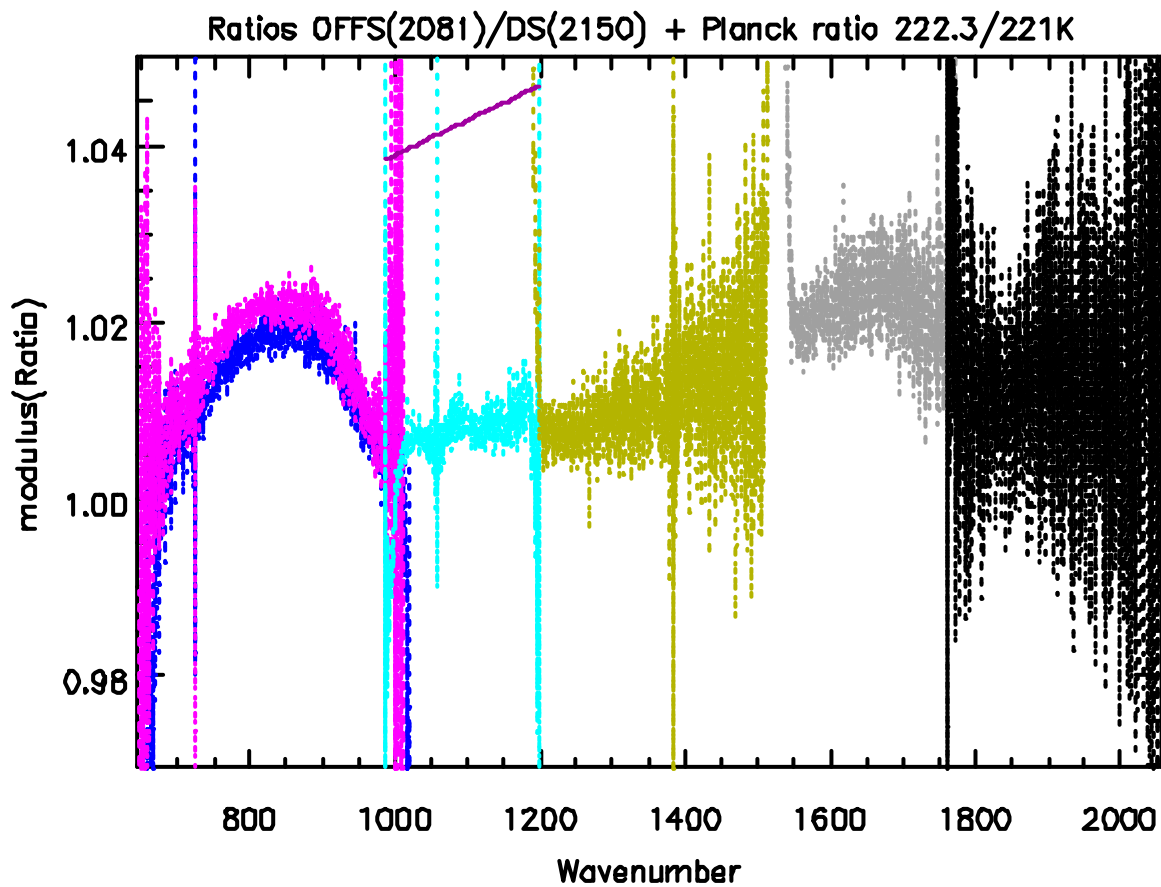


Figure 2: Modulus of ratio of summed OFFS spectra in orbit 2081 and summed DS spectra in orbit 2150 for all channels. Channel A1 is pink, A2 blue. The Planck ratio for the different FEO temperatures indicates that these housekeeping data are not very much related to the instrument radiation.

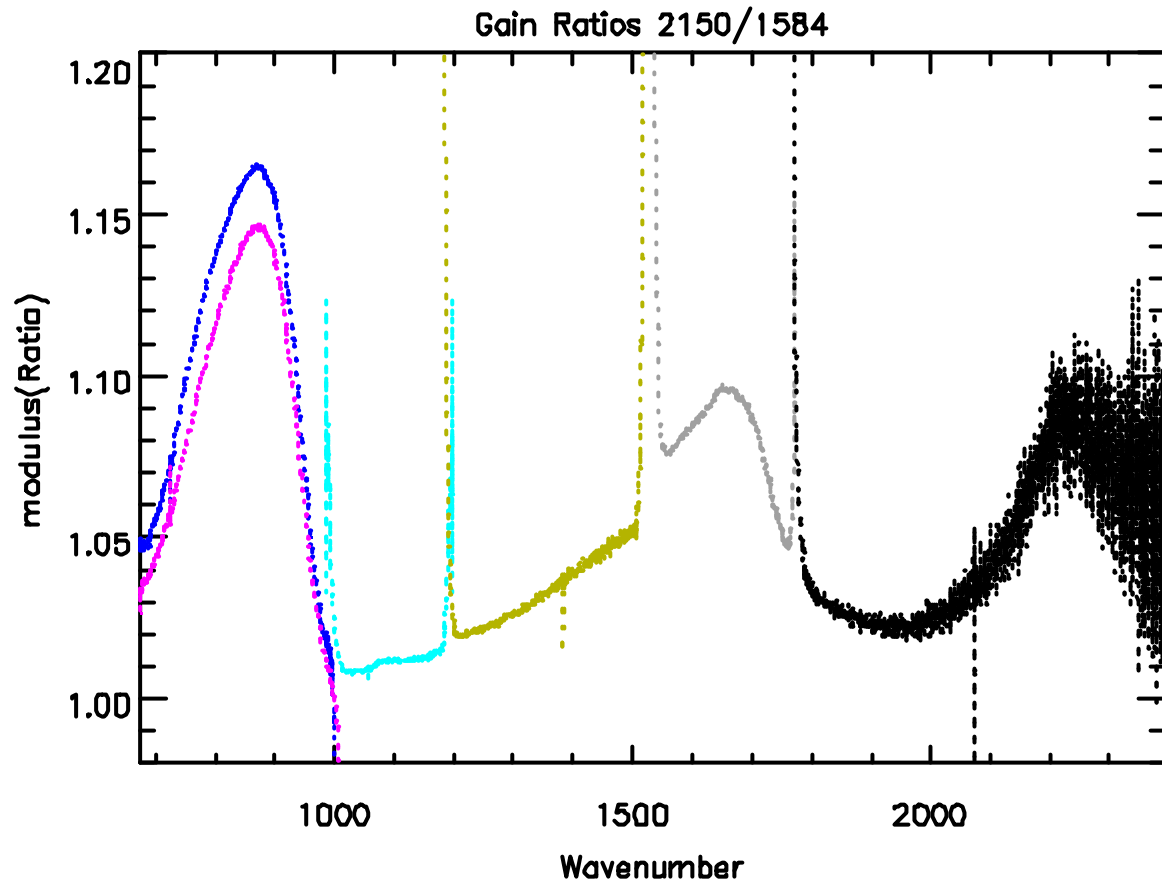


Figure 3: Gain ratio orbit 2150/1584. The pink curve is A1, blue A2. It can be seen that the ice affects all channels.

Assessment of new data

As already told the modulation efficiency fit is an excellent tool for assessing the quality of non-linearity correction factors. But there is another method for quality assessment for channels A1 and A2. Since these channels have overlapping spectral ranges, the direct intercomparison of the radiance spectra is a valid quality indicator. Since both detectors have different non-linearity an agreement would indicate good non-linearity correction.

We have formed weighted averages of A2/A1 radiance ratios, with the square of the radiance spectrum used for weighting. We used a spectrum with 42 and one with 6 km tangent height. For 42 km the agreement of A1 and A2 was better than 0.4% and for 6 km better than 0.2%. In contrast applying the old non-linearity correction factors the difference was 1% and 1.1% respectively. This clearly shows the improvement by the new detector non-linearity factors.

Data availability

Data will be available on FTP soon, all participating groups will be informed.