Minutes of Meeting

Meeting #6 of MIPAS Quality Working Group
13-14 January 2005
ESA ESRIN- Frascati

1) LEVEL 1B
1.1) (ESA)
Level 1B Configuration RM
Presentation of L1B configuration (ADF, IPF, Prototype and MICAL)
Presentation of new features and bug fixes
No real time processing foreseen for now

Anomaly Investigation Status RM
Presentation of open L1B anomalies

AI L1-6.01, Bomem to investigate S6 data where a large number of spectra are flag as corrupted.
Status: Closed (see e-mail from Gaetan dated 11/02/2005)

AI L1-6.02, Bomem to produce a TN analyzing the NESR threshold vs spectral resolution

Level 1B Monitoring RM
Presentation of example of QUADAS report
Tele-participation Joost
- compression of spectra
- feedback on daily report

AI L1-6.03, Gaetan Perron to act as interface for level 1B to Joost

AI L1-6.04, Anu Dudhia to act interface for level 2 to Joost

1.2) (BOMEM)
Level 1B Investigation Status (includes 2RR, 1RR) GP
Presentation of data quality comparison vs different MIPAS modes:
2RR, 1RR(1), 1RR(2)
Mode performances are comparable

LOS campaign data analysis
Bias LOS to trackers: 20 mdeg, except for one point 24 mdeg, outliers to be checked in details.

Forward/Reverse problems
Presentation of self-phase correction results

AI L1-6.05, Bomem to perform F/R analysis in altitudes where spectral information is more dominant with respect to noise.

Investigations IPF 4.62 errors:
Systematic oscillations in forward Band D
NESR setting (3 instead of 5) technote coming (see AI L1-6.02 above)

1.3) Level 1B performance assessment
1.3a) (IMK) AK
Forward/Reverse analysis
ESRIN vs Kiruna oscillations, wrong aux files
Investigation is ongoing in raw mode data

1.3b) (DLR) MB
Presentation of influence of on-board filtering: FCE results in small radiance differences (results in offset error at high altitude). ORM may be affected, as its offset is altitude independent and only applied at high alt. At low altitude a continuum correction is applied which again will not be adequate. H_2O retrieval could thus be related to Fringe Count errors.

AI L1-6.06, Bomem to provide on-board filters to IMK/DLR and simulation algo of on-board truncation to 18 bits.

AI L1-6.07, IMK/DLR to take into account on-board truncation

1.3c) (IMK) HF
Pointing retrieval from MIPAS spectra (IMK Michael Kiefer-> Anne).
Aug 2004, 2FR software degraded to 2RR for validation
400 m difference between poles reduction of resolution affects retrieval, and thereby underestimates the slope to be only 200m

Real 2RR orbits, slope is now 1000m!
Offset has also changed significantly in only a few days, from -1.7 to -0.5 km.

AI L1-6.08, ESA to search for corresponding mispointing data.

1.4) (BOMEM/All) Review Level 1B workplan
Planning of IF measurements
Non-Linearity calibration still to be planned with IF4+IF16
3 extreme temperatures are sufficient.
Recommendation not to measure during increase.

Microvibration, Pointing jitter, Noise model
"long-term Radiometric analysis of signal fluctuations"
1 gain per month.

AI L1-6.09, Bomem re-iterate workplan with Manfred and Anne, and distribute to QWG for comments by end of January.
Status: Closed (see e-mail from Gaetan dated 11/02/2005)

2) LEVEL 2

- R. Mantovani (ESA) describes the Level 2 IPF configuration. She says that the anomalies relative to cloud detection, to negative variance values and to profile counting bug have been fixed in IPF 4.62. She says that the ADFs for processing data at reduced spectral resolution are to be finalised in February 2005 and, since the processing will be performed only off-line, an increase in processing resources by a factor of 2 or 3 is acceptable.

A. Dudhia (OU) asks if the ADFs for processing data at reduced spectral resolution to be provided in February 2005 have to be for the old scenario (measurements of August 2004) or for the new scenario (future measurements).

R. Koopman (ESA) answers that the ADFs have to be for the old scenario.

B. Carli (IFAC) asks if the measurements with the new scenario have to be analysed only off-line or also in near real time.

R. Koopman (ESA) answers that for the future measurements only the off-line analysis will be performed.

- R. Mantovani (ESA) describes the status of the Level 2 anomalies. In particular the differences in forward/reverse oscillations between the measurements processed at ESRIN and at KIRUNA before the November update has been explained by the fact that two different MIP_CA1_AX were used.
- R. Mantovani (ESA) shows an example of MIPAS daily report for level 2 products.

B. Carli (IFAC) suggests that an orbital coordinate would be better than the time as independent variable in the plots reported in the daily report.

R. Koopman (ESA) says that this modification can be asked to S&T.

R. Mantovani (ESA) says that she will distribute some daily reports in order to have some feedback by QWG.

AI_L2_6.01 ESA to distribute some MIPAS daily reports to QWG.
Status : Closed (see e-mail dated 31 January 2005)

AI_L2_6.02 All to send comments to ESA on the distributed MIPAS daily reports.

- S. Bartha (ASTRIUM) describes the activities on ML2PP since last QWG meeting. In particular he says that the batch mode ML2PP extension has been delivered as patch-SCR37. Furthermore he shows some properties of the pT error propagation matrix.

- S. Ceccherini (IFAC) makes a presentation on the status of level 2 investigation. He says that new OMs for reduced spectral resolution operation have been satisfactorily found for all the species with the exception of ozone, so the recent activity at IFAC was focused on the understanding the ozone issue. For the different O3 OMs delivered by OU he shows the results of the chi-square test and the comparison of the profiles obtained using reduced resolution spectra with the profiles obtained using full resolution spectra. He concludes that the presence of less information in the reduced resolution spectra with respect to the full resolution spectra made the process of MW selection more difficult than expected. Finally he raises the problem of whether in the choice of OM priority has to be given to MWs that produce small residuals or to those that give results consistent with full resolution spectra.

A general consensus is manifested on the importance of historical consistency.

A. Dudhia (OU) asks if for the O3 retrieval at reduced resolution S. Ceccherini (IFAC) has used the the profiles of pressure and temperature obtained by the retrieval at full or reduced resolution.

S. Ceccherini (IFAC) answers that he has used the pT profiles obtained by the retrieval at reduced resolution.

J.M. Flaud(LPPM) suggests that a test should be done retrieving the ozone by the spectra at reduced resolution using the pT profiles retrieved by the high resolution spectra. This test would clarify if the problem in the retrieval of ozone derives from errors in the pT profiles.

AI_L2_6.03 IFAC to perform the retrieval of ozone by the spectra at reduced resolution using the pT profiles retrieved by the high resolution spectra.

- A. Dudhia (OU) shows the results of the retrievals performed with the MORSE code of the reduced resolution spectra measured on August 2004. He has compared the zonal averages with the monthly mean resulting by the near real time measurements of August 2003. He notes that the results for pressure, temperature, CH4, HNO3, and N2O are similar to those of August 2003, while some problems seem to be present in the retrieval of H2O and O3. Also the results for NO2 are significant different from those of August 2003, but because of the natural variability of this species, no conclusion can be reached. Then he shows the results of the REC analysis and the comparison with the REC analysis performed on the near real time data of August 2003. The results for 0th and 2nd derivative signatures are similar to those of August 2003, while the 1st derivative in residuals shows a spectral shift that is similar to that present in the MIPAS data prior to correction.

A. Kleinert (IMK) says that the large difference in H2O profiles with respect to those of August 2003 must be visible in the spectra (Level 1b files) as well.

A. Dudhia (OU) says that the first test to do is to perform the retrieval of H2O using the spectra measured at full resolution and artificially degraded at low resolution.

AI_L2_6.04 OU to compare the profiles retrieved with the spectra artificially degraded at low resolution with the profiles retrieved by the spectra at high resolution.

AI_L2_6.05 ESA, BOMEM, IMK and DLR to investigate on problematic scans identified by OU.

- A. Waterfall (UL) makes a presentation on reference atmospheres and cloud indices. She says that CO2 profiles are in process of being updated in the IG2 database and they will vary with season (3 months) and time throughout the mission. Pressure and temperature data will also be updated using the CIRA climatology. This should better represent the seasonal/latitudinal variation, particularly at the poles. Then she shows the results of further investigations on cloud index, in particular she finds that there can be problems in level 1b data on 6/12/03 (orbits 9241 and 9238). She finds that for the cloud index band B exhibits similar behaviour and variability to band A, while Band D is generally more variable than band A with a large shift to low (cloudy) values during winter days. She identifies the following items as possible causes of differences between bands A and D: solar scattering, terrestrial scattering and trace gases. However further investigations are needed in order to clarify the problem.

AI_L2_6.06 UL to deliver the new IG2 database at the next QWG.

AI_L2_6.07 UL to reach a conclusion on the problems identified in the cloud detection before the next QWG.

B. Carli (IFAC) recalls that the variation of CO_2 with latitude and season was in the past criticized because it may introduce some discontinuities in the retrieval.

R. Koopman (ESA) asks if it would be useful to perform some simulations in order to evaluate the impact of these discontinuities.

B. Carli (IFAC) says that it is not useful to perform simulations because we already know that the discontinuities are very small. We must verify if discontinuities in real measurements are detectable.

- H. Fischer (IMK) makes a presentation on the investigations performed in order to check if the discontinuity in arctic temperature observed in MIPAS data during winter 2003/2004 could be explained by stratospheric warming (AI_L2_5.03). He shows the evolution of the polar vortex in winter 2003/2004 as obtained by ECMWF data and compares it with what happened in winter 2002/2003. He concludes that winter 2003/2004 showed very unusual features in temperature distribution and circulation, and so the discontinuities observed in MIPAS data are not surprising. He says that more detailed investigations and in particular a direct comparison between MIPAS data and ECMWF data would be necessary.

M. L. Puertas (IAA) notes that also other species have shown an unusual variability during the winter 2003/2004, and he wonders if there could be a connection with the earlier solar storm.

AI_L2_6.08 ESA to identify the orbits that show the unusual behaviour.
Status : Closed (orbit already selected by Anne).

AI_L2_6.09 IMK to compare MIPAS data with ECMWF data for the polar winter 2003/2004.

- M. Ridolfi (UB) makes a presentation on the possible ways to regularise the profiles retrieved from oversampled scans. In the new MIPAS measurement scenario the altitude measurement grid is finer than the instrument spatial response function, therefore the precision of the fields retrieved at the measurement grid is expected to deteriorate. In order to limit the degradation of the retrieval precision he proposes to control the spatial resolution of the retrieved parameters using one of the following 2 techniques:
  1) to adopt an iteratively regularized Gauss-Newton method
  2) to apply an a-posteriori apodization to the profiles retrieved in the unconstrained approach.
  He shows in detail the two methods and the advantages/disadvantages. In particular a problem in method 1) is the choice of the regularization parameter; a problem in method 2 is that it does not help the stability of the retrieval.

B. Carli (IFAC) poses the problem, in case of method 2), if the smoothing tool is given to the user or the smoothing is applied directly by the operational code and ESA distribute both the unconstrained and smoothed profiles.

H. Fischer (IMK) says that the choice of the regularisation parameter is not so critical, at IMK some tests have been performed and the same regularisation parameter can be correct for many atmospheric states.

B. Carli (IFAC) says that on a large set of atmospheric states, as those measured by MIPAS, it is possible that the regularisation parameter cannot be kept constant.

R. Koopman (ESA) asks how it is possible to obtain a vertical resolution better than that of the instrument.

H. Fischer (IMK) says that in case of species with large vertical gradient the oversampling can improve the vertical resolution.

J. Langen (ESA) says that method 2) can be very useful to perform tests in order to decide which is the best measurement scenario, because it makes very easy to calculate the vertical resolution.

S. Bartha (ASTRIUM) says that the use of method 1) may not imply a big change in the code.

B. Carli (IFAC) says that the use of the modified expression for the solution may not be a big change in the code, but the major problem of method 1) is in the choice of the regularisation parameter that may depend on the altitude, on the species, on the iteration and on the state of the atmosphere and significant coding may be required to make automated choices.

R. Koopman (ESA) identify a workplan in the following steps:
    a) to quantify the activities below
    b) to confirm the step sizes in the nominal mode by looking at the first real data
    c) to regenerate OMs for the new scenario with the chosen MWs
    d) to modify the processor to include regularisation or a posteriori apodisation (long term).

B. Carli (IFAC) asks to A. Dudhia (OU) if performing the retrieval using a measurement grid of 1.5 km step and a retrieval grid of 3 km step implies to change the MWs.

A. Dudhia (OU) says that in general the MWs should be changed, but for the preliminary tests it is reasonable to use the MWs that have already been selected.

- J.-M. Flaud (LPPM) makes a presentation on new spectroscopic results obtained for HNO3. He identifies some problems in HNO3 spectral modelling that require a new Hamiltonian and intensity model. On the basis of this new model he shows the values of the new spectroscopic parameters and the residual improvements due to the change in the HNO3 spectroscopic data. Finally he determines the line intensity scaling factors in band B and C that provide the same HNO3 REC analysis coefficient obtained in band A. He says that it would be desirable to check these values with a further test that consists in (1) to retrieve HNO3 from band A and (2) from band B and C, then the scaling factor for line intensities in band B and C can be obtained from the ratio of the profiles obtained at (1) and (2). He asks to A. Dudhia (OU) if it is possible to select MWs in band C for the retrieval of HNO3.

A. Dudhia (OU) answers that it is possible, but he doesn't know how accurate the retrieval can be.

J.-M. Flaud (LPPM) asks if he has to include the new results in the MIPAS spectroscopic database or if he has to wait.

B. Carli (IFAC) says that now we don't want to modify too much the ADFs of the reduced resolution operation but in future when a reanalysis of the reduced resolution measurements will be done (probably at the end of 2005) a new release of the spectroscopic database should be done. He also warns that a change in the database is the first item of the chain of activities required for the ADF update. In view of an ADF update at the end of 2005 a new database must be available by June 2005.

A. Dudhia (OU) asks if the format of the spectroscopic database will be changed in order to be equal to that of HITRAN.

J.-M. Flaud (LPPM) says that the change of the format implies a lot of work so it has to be done only if it is really necessary.

B. Carli (IFAC) says that he doesn't see the need for a change in the format.

AI_L2_6.10 LPPM to produce an updated version of the spectroscopic database that takes into account the new MWs and the new spectroscopic results by June 2005.

R. Koopman (ESA) introduces the next point of agenda that is publications and conferences.

H. Fischer (IMK) asks if ESA can support a workshop dedicated to the validation of the full-resolution mission. The workshop could be held in spring 2005 so that some publications can be done in autumn 2005.

M. Ridolfi (UB) asks which data version should be validated.

H. Fischer (IMK) says that the last version of reprocessed data should be validated.

B. Carli (IFAC) says that ESA should provide precise instructions on the validation activities. The validation activities performed so far have used different retrieval codes and different versions of the data. These non consistent data makes it difficult to obtain final conclusions.

H. Fischer (IMK) says that also a validation of IMK data can be performed by IMK people.

B. Carli (IFAC) answers that the validation of IMK data is useful but independent from the validation of ESA data.

R. Koopman (ESA) says that the workshop of validation can be done together with the next ACVT.

H. Fischer (IMK) says that we have to consider this workshop as something different from ACVT, in fact after ACVT no publication was made, and then the budget for this workshop should be less than that of ACVT.

M. Ridolfi (UB) suggests to hold this workshop together with the next QWG.

R. Koopman (ESA) makes a list of the next conferences where the activities of QWG should be presented.

R. Koopman (ESA) says to take into consideration the update of the MIPAS handbook and of the ATBD.

B. Carli (IFAC) says that in particular the update should include a description of the off-line processing and of the cloud-detection.

The QWG meeting #7 will be held on 18-19 April 2005 at IFAC (Florence) as planned.

The QWG meeting #8 will be held on 22-23 September 2005 at IFAC (Florence).