Minutes of Meeting

Meeting #7 of MIPAS Quality Working Group
18-19 April 2005
ARF-CNR Sesto Fiorentino

LEVEL 2

- R. Mantovani (ESA) makes a list of the open action items from the previous QWG meetings.

A. Dudhia (OU) asks explanation about AI_L2_5.13.

S. Ceccherini (IFAC) suggests to look at the minutes of QWG meeting #5.

- R. Mantovani (ESA) describes the Level 2 IPF configuration and the status of ADFs. ESA has received from IFAC the ADFs (V5.0) for processing of measurements in 2RR mode with fixed altitude and old vertical grid. IPF 4.64 is already capable of processing oversampled data and provide output on a lower resolution grid. For data provision on original (oversampled) grid a new baseline is needed. No NRT time processing is foreseen for now. R. Mantovani (ESA) describes the re-processing status.

- R. Mantovani (ESA) describes the status of the Level 2 anomalies. In particular she makes an update of AI_L2_6.05 status, for which level 0 data have to be processed with IPF4.64 and sent to A. Dudhia (OU).

B. Carli (IFAC) asks which level is responsible of the anomaly detected by C. Belotti (IFAC) regarding the anomalous chi-square values in NO2 retrieval.

R. Mantovani (ESA) says that this anomaly has still to be investigated.

- R. Mantovani (ESA) makes a presentation on Level 2 performance assessment. Regarding the Level 2 daily monitoring she says that only OU has sent comments and she is waiting feedback from the other members of QWG. She shows an anomaly in the values of the retrieved tangent altitudes along one orbit measured on 25 March 2004.

B. Carli (IFAC) asks whether this anomaly occurs only on 25 March 2004 or if it is observed also other times.

R. Mantovani (ESA) says that only that orbit has been analysed.

AI_L2_7.01 ESA to check if the anomalous behaviour in the retrieved tangent altitudes occurred only on 25 March 2004 or also other times.

- R. Mantovani (ESA) describes the Level 2 monthly monitoring and asks if there are proposals from QWG for other quantities to monitor.

- S. Bartha (ASTRIUM) makes a presentation regarding the L2 processor prototype. He shows a mismatch between DPM and I/O DD with respect to the definition of the convergence ID. He makes a recapitulation of the implemented OM/MW/Masks selection and of the implemented Tikhonov regularization.

B. Carli (IFAC), with reference to the law of latitude dependence that is used in the pre-processor for MW selection, points out that if the law for the commanding of the floating altitude is changed in the mission planning a synchronous change is needed in the pre-processor.

- S. Ceccherini (IFAC) makes a presentation on the comparison between the profiles retrieved from full and reduced resolution spectra of orbit #10798. He shows that the agreement is better when the respective pressure and temperature profiles are used with respect to when the common pressure and temperature profiles retrieved at full resolution are used (AI_L2_6.03). He shows that the agreement improves reducing the radiance intensity of the reduced resolution spectra by 2%. Finally he compares the spectra degraded from full to reduced resolution by IFAC and by BOMEM and a bias of 2.5% in the difference is observed. He notices that the reduced resolution spectra provided by BOMEM are obtained by means of an undersampling instead of a resampling.

G. Perron (BOMEM) says that probably two different gain coefficients are used in full and reduced resolution spectra.

B. Carli (IFAC) notices that the bias in the difference of full and reduced resolution spectra coincides exactly with the percentage difference between the two sampling grids.

M. Birk (DLR) suggests to compare the area of the full and reduced resolution spectra.

A. Kleinert (IMK) asks to G. Perron (BOMEM) if the undersampling is applied to all the spectra measured at reduced resolution.

G. Perron (BOMEM) answers yes.

AI_L2_7.02 BOMEM to evaluate the possibility to perform a resampling instead of an undersampling in the production of reduced resolution spectra.

AI_L2_7.03 DLR to compare the area of the full and reduced resolution spectra.

AI_L2_7.04 BOMEM and IFAC to investigate on the origin of the differences between reduced resolution spectra obtained degrading a full resolution spectra.

- C. Belotti (IFAC) describes the status of the tests to perform the altitude grid correction using ECMWF data. He notices that the ECMWF data and the level 2 products provided by ESA to perform the tests are not consistent in longitude. Then he notices that in the ECMWF data there are 362 identical pressure and temperature profiles.

AI_L2_7.05 ESA to provide consistent level 2 products and ECMWF data to IFAC in order to perform the tests on the altitude grid correction.

- C. Belotti (IFAC) makes a presentation on the anomalous values of chi-square for NO2 retrievals reported in Level 2 products. He shows that these anomalous values are not obtained with ML2PP and with ORM. He notices that the only difference in the retrievals operated by the operational processor and by ORM and ML2PP is the use of ECMWF data to build the initial guess.

AI_L2_7.06 ESA to provide ECMWF data corresponding to orbit #7000 to IFAC.

AI_L2_7.07 IFAC to perform the retrieval on orbit #7000 using ECMWF data to build the initial guess and to compare the chi-square values with those reported in Level 2 products.

- P. Raspollini (IFAC) makes a presentation on the issue of the retrieval of H2O at high altitude. She reports the comparison between MIPAS re-processed data and climatological data showing an overestimation of H2O VMR in MIPAS data between 40 and 60 km. Then she shows the presence of a strong H2O saturated line in the MWs selected for reduced resolution measurements for which the Jacobian at 70 km changes sign for different values of H2O VMR. This problem already observed in the MWs used for full resolution is present also in the new MWs. However she observes that this problem cannot explain the overestimation of H2O VMR between 40 and 60 km. The existing uncertainties suggest not

to retrieve H2O at 70 km. She says that the causes of the overestimation of H2O VMR between 40 and 60 km could be errors in spectroscopic database or NLTE.

A. Dudhia (OU) suggests to continue to retrieve H2O VMR at 70 km because this reduces the extrapolation error.

B. Carli (IFAC) asks if the high value of H2O VMR retrieved by MIPAS is in contradiction with the hydrogen budget.

A. Dudhia (OU) answers yes.

- P. Raspollini (IFAC) makes a presentation on the ADFs V5.0 and says that as soon as possible the new version V5.1 (including pT error propagation matrices, spectroscopic database for MW database at reduced resolution and new MWs for cloud filtering) will be provided.

- P. Raspollini (IFAC) describes the tests on reduced resolution and oversampled measurements preformed with ORM. She shows the comparison between temperature profiles obtained with the old and the new microwindows. Then she shows the comparison between profiles retrieved for all the measurement altitudes and for a subset of the measurement altitudes (3 km step). She says that all retrievals converge also when 1.5 km resolution is used and so the new measurement scenario can be handled by ORM. She concludes that 3 km resolution is presently preferred but some further attempts may be desirable before disregarding the 1.5 km option.

M. Birk (DLR) asks if a regularization is applied.

P. Raspollini (IFAC) answers no.

M- Birk (DLR) asks how large are the correlations in the retrieved profiles.

P. Raspollini (IFAC) says that she has to check but she suspects that the correlations are large.

H. Oelhaf (IMK) suggests to perform two retrievals for each scan retrieving at complementary altitudes and then to perform an average between the two retrievals.

B. Carli (IFAC) says that this procedure cannot be handled by ORM and cannot be made operational.

B. Carli (IFAC) comments that the retrieval on the 1.5 km grid is more oscillating but contains more information than the retrieval on the 3km grid. Probably the best thing would be to leave the regularization up to the users, but generally they are not prepared for it.

T. Steck (IMK) notices that since the measurement grid has not a constant step it is not easy to choose a subset of altitudes for the retrieval grid.

After some further discussion a general agreement is found for implementing the "3 km" retrieval grid for short term off-line retrievals.

- B. M. Dinelli (ISAC) makes a presentation on "Analysis of fixed altitude nominal mode with GMTR and comparison with ORM performances". She says that ORM and GMTR produce very similar results also if GMTR results are somehow more stable than ORM results, probably because 2-D retrievals are less affected by vertical oversampling. She shows a comparison between retrievals performed with MWs optimised for new and old measurement scenario and she concludes that temperature retrievals with the MWs optimised for the new measurement scenario show better esd from 20 to 50 km but worse esd above 50 km. Finally she shows the comparison between profiles retrieved for all the measurement altitudes and for a subset of the measurement altitudes.

- S. Ceccherini (IFAC) describes an optimised procedure (called error consistency (EC) method) to determine the value of the regularization parameter in the retrieval of atmospheric vertical profiles. The regularization strength is obtained imposing that the differences between the regularized and the non-regularized profiles are on average equal to the errors of the regularized profile. The value of the regularization parameter is determined

by an analytical formula and it provides a better trade-off between retrieval errors and vertical resolution than that provided by the L-curve method.

J-M Flaud (LPPM) says that since applying the EC method we obtain a vertical resolution equal to the FOV of 3 km the same results would be obtained using a retrieval grid with a 3 km step.

B. Carli (IFAC) says that using a retrieval grid with 1.5 km step and regularizing with the EC method one obtains a better representation of the profile than using a retrieval grid of 3 km step. This is consistent with the sampling theorem that suggests an oversampling respect to the resolution.

- A. Dudhia (OU) makes a presentation on MW selection for new nominal mode. He shows the comparison between error analyses regarding the MWs selected for 3 km and for 1.5 km vertical spacing and reduced spectral resolution. He concludes that using slightly more MWs similar precision can be achieved for 1.5 km resolution as for 3 km. Therefore it may be possible to retrieve pT and many species at 1.5 km resolution.

- A. Dudhia (OU) makes a presentation on the analyses of Dec04/Jan05 spectra. He shows the results of the retrievals performed with the optimal estimation retrieval code MORSE and with the MWs selected for 3 km spacing. He says that the reprocessed (i.e. correctly calibrated) data of January 2005 show a definite improvement with respect to the first version distributed by ESA, and the data quality looks uniform for bands A-C. A few problems are present for CH_4 and N_2O, but they may be due to retrieval or MW problems.

B. Carli (IFAC) asks to A. Dudhia (OU) whether the reason for the chi-square values larger than those obtained with the full resolution spectra can be the undersampling and resampling issue described by S. Ceccherini (IFAC).

A. Dudhia (OU) answers that probably the larger chi-sqaure values are not due to the ILS but to the noise error or to systematic errors.

- J. Remedios (UL) makes a presentation on reference atmospheres and cloud indices. He has updated the CO_2 climatology in IG2 to be seasonal and time varying through the ENVISAT mission, but the structure can be adapted and he asks to QWG which is the best degree of detail.

T. Steck (IMK) suggests that retrieval tests would be useful in order to decide the best degree of detail.

J. Remedios (UL) says that he will produce 2 files with different detail for CO_2 concentration that will be used to perform retrieval tests. He says that also pressure and temperature data have been updated using the CIRA climatology, because this should better represent the seasonal/latitudinal variation particularly at the poles. He says that also N_2O profiles will be updated at least in the tropics.

J. Remedios (UL) says that an error in the specification of the MW boundary in band A for the cloud index (CI) calculation has been found that implies an error of about 10% in the CI value. He provides a recommendation to change the CI thresholds. Finally he reports some anomaly in cloud flagging occurred in offline products corresponding to January 2003.

- H. Oelhaf (IMK) makes a presentation on the comparison between MIPAS data and ECMWF data for the polar winter 2003/2004. He says that good consistency between MIPAS and ECMWF temperatures up to 0.5 hPa are found and so he considers close the AI_L2_5.03.

- B. Funke (IAA) makes a presentation on the extraordinary enhanced NOx in Antarctic winter 2003. He shows the high NOx concentration inside the vortex due to subsidence of thermospheric NOx from May to September 2003. He says that this phenomenon has not

relation with the anomalous chi-square values reported by C. Belotti (IFAC) because they do not correlate for time and latitudes.

- B. Funke (IAA) makes a presentation on upper atmosphere water vapour retrieval. He shows the comparison between the H2O retrieval performed with LTE and NLTE and a larger value of about 30% is obtained in case of LTE from 40 to 70 km of altitude. This result is in agreement with the results reported by P. Raspollini (IFAC).

It is noticed that the two retrievals of H2O performed with LTE and NLTE do not refer to the same measurements, but they correspond to different years. A comparison between retrievals performed on the same measurements would be desirable.

Finally B. Funke (IAA) shows the difference between retrievals of H2O performed using the original and the reprocessed level 1 data for upper atmosphere.

- J.-M. Flaud (LPPM) makes a presentation on "Reviews on lines recommended for spectral calibration". He says that the wavenumbers of the recommended lines taken form HITRAN2000 are in agreement within 10^{-4} cm^{-1} with the most recent data. Then he shows the results of the investigation on possible problems of the MWs used in Level 2. For each species he shows the chi-square values obtained for the retrieval of orbit #10798 and addresses the possible problems for every MW. J.–M. Flaud (LPPM) concludes that no particular problems seems to be present with the new MWs.

- M. Ridolfi (UB) makes a presentation on the validation of the new HNO3 line data. He assesses the improvement obtained in broadband residuals when using the new spectroscopic data for HNO3. He describes how he attempted to determine the scaling factors for HNO3 line intensities in bands B and C so that HNO3 line data in bands B and C are consistent with HNO3 data of band A. He concludes that the new HNO3 spectroscopic data improve significantly the residuals analysed so far and that the REC analysis is not an adequate tool to determine scaling factors for HNO3 lines.

  M. Ridolfi (UB) shows a discrepancy of about 3 % found between the HNO3 retrieved values when using the LUT or the line by line calculation. This discrepancy is not consistent with what is found by the investigations of C. Piccolo (OU).

AI_L2_7.08 UB and OU to trace back the origin of the discrepancy between LUT and line by line calculation in ORM.

AI_L2_7.09 UB to check the impact of the discrepancy between LUT and line by line calculation on Level 2 key products other than HNO3.

- M. Ridolfi (UB) makes a presentation on characterization of MIPAS Line Of Sight (LOS) pointing error. On the basis of dedicated in-flight LOS measurement campaigns organized by ESA he has estimated that the best estimation of the pointing error is 80 m and not 120 m as originally estimated. He has checked this value with tests on Level 2 pT retrievals and suggests to repeat these tests at least once per year. The new value of the pointing error (80 m) has been included in the last ADF delivery (V5.0).

- B. Carli (IFAC) makes a presentation on the Level 2 workplan. He describes the contract status, the activities for the maintenance of the ORM code, the activities for the future Level 2 operations and the planned changes to the code.

The QWG meeting #8 will be held on 21-22 September 2005 at UB (Bologna) instead that at IFAC (Firenze) as originally planned. On 23 September 2005 the meeting of the MIPAS Science Team will be held at UB.

The QWG meeting #9 will be held on 1 - 2 February 2006 in a place to be defined.