MIPAS QWG #13 – Minutes and Action Items

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Revision: F. Niro, 21/06/2007
T. Fehr, 04/07/2007

MIPAS QWG#13
12 – 14 June 2007
IFAC/CNR
Florence

List of attendants

Ginette	Aubertin	BOMEM	12-13 June 2007
Gabriele	Brizzi	UB	13 June 2007
Bruno	Carli	IFAC	12-14 June 2007
Massimo	Carlotti	UB	12-14 June 2007
Simone	Ceccherini	IFAC	12-14 June 2007
Marta	De Laurentis	ESA	12-14 June 2007
Anu	Dudhia	OU	12-14 June 2007
Thorsten	Fehr	ESA	12-14 June 2007
Jean Marie	Flaud	LISA	12-13 June 2007
Roland	Gessner	Astrium	12-13 June 2007
Michael	Hoepfner	IMK	12-14 June 2007
Anne	Kleinert	IMK	12-14 June 2007
Fabrizio	Niro	ESA	12-14 June 2007
Enzo	Papandrea	UB	13 June 2007
Gaetan	Perron	BOMEM	12-13 June 2007
Manuel	López-Puertas	IAA	12-14 June 2007
Piera	Raspollini	IFAC	12-14 June 2007
Marco	Ridolfi	UB	12-14 June 2006
Michael	Schmitt	Astrium	12-14 June 2007
Joanne	Walker	OU	12-14 June 2007
Gerald	Wetzel	IMK	12-14 June 2007

ACTION ITEMS

AI ID	AI description	Responsibility	Due date
	Level 0		
AI_L0_13.01	**IMK(AK) to provide a TN on the current results of AI_L1_11.11 to close the action**	IMK (AK)	Next QWG
AI_L0_13.02	**ESRIN/Astrium (F.Niro/R.Gessner) to investigate the correlation between FCE and instrument temperatures.**	ESA (FN), Astrium (RG)	Next QWG
AI_L0_13.03	M. de Laurentis and H. Oelhaf to unify the floating altitude laws of NOM and UTLS-1 in the planning tool and in the planning document	ESA (MdL), IMK (HO)	Next QWG
AI_L0_13.04	**H. Oelhaf update the Mission Planning Document, including the information for the Teresina campaign in November 2007.**	IMK	27/07/2007
AI_L0_13.05	Astrium to evaluate a statistic of the start-up failure normalised to the planned instrument duty cycle.	Astrium (RG)	Next QWG
AI_L0_13.06	Astrium to provide coarse balance results and cooler improvements of most recent passive decontamination	Astrium (RG)	Next QWG
	Level 1		
AI_L1_13.01	ESRIN (FN) to improve the cloud flagging monitoring by considering the relative number of sweeps at each altitude.	ESA (FN)	Next QWG
AI_L1_13.02	BOMEM and ESRIN (MdL) to clarify the difference for the state vector calculation between RGT and L1 processor.	BOMEM, ESA (MdL)	Next QWG
AI_L1_13.03	BOMEM to summarize in a TN the investigation on pointing and to include the presentation of A. Dudhia (OU) and IMK about fixed azimuth results.	BOMEM	Next QWG
AI_L1_13.04	ESRIN (MdL) to plan 4 orbits at fixed azimuth at different angles.	ESA (MdL)	Next QWG
AI_L1_13.05	ESRIN (FN) to check the differences in the baseline between IPF 4.61 and IPF 4.62 in order to explain the oscillation present in 4.61 and not in 4.62.	ESA (FN)	Next QWG
AI_L1_13.06	BOMEM to check the non-linearity and correction of elevation scan angles.	BOMEM	Next QWG
	Level 2		
AI_L2_13.01	LISA to provide the line list with the new spectroscopic parameters for C2H6 and NO+ to M. Ridolfi (UB) and to prepare a technical note describing the modifications to make to the MIPAS database.	LISA (JMF)	Next QWG
AI_L2_13.02	UB to update the MIPAS spectroscopic database according to AI_L2_13.01	UB (MR)	Next QWG
AI_L2_13.03	ESA (FN) to provide an orbit passing over Alaska for which the retrieval fails to ASTRIUM and	ESA (FN)	Next QWG

	IFAC.		
AI_L2_13.04	ASTRIUM and IFAC to investigate on the causes that determine the failure of retrievals over Alaska.	Astrium (MS), IFAC (PR)	Next QWG
AI_L2_13.05	All to provide feedback on how to simplify the L2 daily report.	All	Next QWG
AI_L2_13.06	UL to provide within one week comments on the proposed solution to avoid the crashes of ML2PP.	UL	Next QWG
AI_L2_13.07	ASTRIUM to evaluate the amount of work needed to change the strategy adopted when a band is corrupted.	Astrium (MS)	Next QWG
AI_L2_13.08	LISA to comment on residuals of the O3 MW 332.	LISA (JMF)	Next QWG
AI_L2_13.09	OU to provide a new ozone microwindow to substitute MW 332 to IFAC.	OU (AD)	Next QWG
AI_L2_13.10	IFAC to repeat the test in order to estimate biases between ozone profiles retrieved from reduced and full resolution spectra using the new ozone microwindow provided by OU.	IFAC	Next QWG
AI_L2_13.11	IFAC to provide the ILS parameters used to perform AI_L1_10.13 to BOMEM.	IFAC	Next QWG
AI_L2_13.12	BOMEM to check the ILS parameters used to perform AI_L1_10.13 by IFAC.	BOMEM	Next QWG
AI_L2_13.13	IAA to send the paper **(or the link to it)** about ozone retrieval difference when using either band A or band AB MW (Atmos. Chem. Phys., 6, 2767–2781, 2006) to J.-M. Flaud (LISA).	IAA	Next QWG
AI_L2_13.14	OU and IMK to perform the retrieval of CH4 and N2O profiles from some reduced resolution measurements and to compare the results with ESA processor in order to check if oscillations are also present.	OU, IMK	Next QWG
AI_L2_13.15	IFAC to investigate on the oscillations present in CH4 and N2O profiles retrieved from reduced resolution measurements.	IFAC	Next QWG
AI_L2_13.16	ESA to send the technical note describing the method to correct the MIPAS retrieved altitudes using ECMWF data to Y. Meijer (RIVM).	ESA (FN)	Next QWG
AI_L2_13.17	UL to investigate on the need to update the threshold of the cloud index.	UL	Next QWG

Presentations:

All meeting presentations are available on the Uranus server:

ftp://pcf:Ur0Fr0@uranus.esrin.esa.it/MIPAS/To_QWG/20070612-QWG13/Presentation

0) Level 0

Welcome and Introductions by T.Fehr (ESA)

0.1 Introduction (T.Fehr/ESA)

- Overview of ENVISAT Symposium: a large number of papers were presented for atmospheric chemistry, showing that the scientific interest on this subject is significant.
- ENVISAT operations has shown no platform anomalies since February 2007
- ENVISAT Mission Extension: At the moment, ESA has initiated a discussion on ENVISAT mission extension with different scenarios and has requested an assessment from all instruments as to whether specific instrument aspects need to be considered in this context. Evaluations are ongoing.
- MIPAS instrument ranking by ESTEC/PLSO status has been improved to "good", since the operations of the Interferometer could be stabilised. The MIPAS duty cycle could therefore be increased to 60% and a further increase to about 80% has been decided at the last In Orbit Performance (IOP) meeting end of May 2007.

0.2 Action Item Status (F.Niro/ESA)

Presentation of AI status (see handout); new due dates have been allocated to some AI's

- AI_L1_6.02 is still open
- AI_L2_9.01 is still open
- AI_L1_10.13: the action is closed, Astrium has provided a patch to IFAC, P. Raspollini presents her results on frequency calibration, the IFAC and BOMEM results are in agreement
- AI_L1_10.14 is still open. The Life Limited Items will be approximated using only the nominal mode. The UTLS mode will not be taken into account.
- AI_L1_11.11 is still on going. No new input to the investigation on F/R problem.

AI L1_13.01: IMK(AK) to provide a TN on the current results of AI_L1_11.11 to close the action.

- AI_L1_11.12: the action will be closed. A. Kleinhert said that it is not feasible.
- AI_L1_11.20: IFAC will provide the updated L2 ATDB by the end of June 2007
- AI_L2_11.10: the action is closed, JM Flaud provides the new ethane spectroscopy to the QWG, he suggests to update the MIPAS spectroscopy database accordingly
- AI_L1_12.03: the action is closed, AK shows that the effect of light backscatters in the MIPAS FOV by low altitude clouds is visible only on band D
- AI L1_12.06: Astrium (RG) stated that the action is meaningless since M. Endemann has now moved to other projects within ESA. It is proposed that the FCE statistics that is available up to now is correlated with existing temperature information. New action:

AI L1_13.02: ESRIN/Astrium (F.Niro/R.Gessner) to investigate the correlation between FCE and instrument temperatures

- AI_L1_12.09: this action is closed by the A. Dudhia presentation, he shows that the effect of microvibrations on L2 retrieval is smoothed out by continuum fit
- AI_L2_12.01: M. Schmitt stated that this modification will imply a big effort in terms of code implementation and testing and it can have some side effects on cloud flagging, he will provide an assessment about this impact and consequences
- AI_L2_12.04: the action is closed, the reduction of ILS error will be considered for next MW selection
- AI_L2_12.06: the action is closed, H. Oelhaf stated that the floating altitude law for NOM and UTLS can be unified, there is an action on M. De Laurentis and H. Oelhaf to modify the planning parameters and the related document

AI_L0_13.03: M. de Laurentis and H. Oelhaf to unify the floating altitude laws of NOM and UTLS-1 in the planning tool and in the planning document

- AI_L2_12.07: the action will be closed by end of June, the documentation will be delivered to Astrium
- AI_L2_12.08: the action is closed, no hint for forward/reverse differences in the level 1b data of Dec 2006 was found

0.3 Mission Planning Status (M.de Laurentis/ESA)

- Presentation of status (see handout)
- Action Items AI_L2_12.03 and AI_07 from Science Team (ST) meeting #5 (rearward observation with fixed azimuth) have been closed
- The actual measurement scenarios are the 2RR NOM mode with submodes UTLS-1, UTLS-2, MA, UA, NLC and AE. Re-initialisation of the interferometer is performed every third orbit (during campaigns every orbit). The duty cycle is about 60%.
- Calibration Scenarios:
  - Rearward LOS Calibration every 5 days with elevation angle offset of +0.1 deg, pitch bias = -0.03 deg, no harmonics. Note that prime sequence only is commanded
  - Sideways LOS Calibration newly introduced with 1 prime (+ 1 backup) orbit, no roll bias, no harmonics and elevation offset of +0.2 deg
  - RGC once per day
  - WCC after every transition to HEATER
  - DS offset every 800 sec
- Further in-flight calibrations:
  - IF16 every 2 months, IF9&IF11 every 3 months, IF10 every 6 months, IF6 once per year
  - Passive decontamination+IF16+IF4+IF16: to be performed on September/October 2007 with interaction between Mission Planner and Industry
- Future Planning: Discussion focused on how the increased duty cycle of 80% might be implemented. It was recognised that the overall operations needs to be simplified to reduce the workload for Mission Planning. For the baseline Scenario BS80, A. Dudhia proposed that the MA measurement is placed in between two NOM measurements. Further, the systematic re-initialisation should be reduced, but at the moment this is not done in order to be able to monitor the effects of the duty cycle increase.
- The following scenarios (*80% duty cycle*) have been proposed until next Science Team meeting in September:
  - [BS80] Baseline Scenario: 4 days NOM + 1 day MA + 3 days NOM + 2 days off
  - [ES80] Equinox & Solstice: 2 days NOM + 3 days UA + 3 days NOM + 2 days off
  - [ST80] Summer time (1-20 July): 3 days NOM + 2 days NLC + 3 days NOM + 2 days off
- Anomalies:

- Anomalous scan pattern during 3-11 April 2007; strange scanning profiles were recorded twice. A. Dudhia wondered why this was not detectable until L1 processing was performed. It was recognised that a monitoring of RDMOP versus House-Keeping (L0) data should be implemented to detect such wrong commanding.
- Command conflict: on 2nd May 2007, a command conflict between LOS backup sequence measurements and pointing tests lead to an instrument anomaly. Two heater commands were command subsequently.

- Pointing: It has been noted that several discrepancies exist between the RGT tool and the L1B processor. As a consequence tangent heights over the North or South Poles are not identical. Main differences were explained by the different user of the harmonics in the planning and Level 1 processing. An off-set of 700m (~25m°) remains to be investigated. In order to discuss the various problems on pointing, a dedicated pointing meeting has been proposed. (see Section 1.5)

0.4 Data Acquisition Status (F. Niro/ESA)

- Presentation of status - see handout
- Data processing status :
  - For the RR mission, all data were reprocessed to L1.
  - Validation dataset for RR mission has been processed with the new L1 and L2 prototype

0.5 Mission Plan Document Status (Science Team)

Not addressed.

AI_L0_13.04: H. Oelhaf update the Mission Planning Document, including the information for the Teresina campaign in November 2007.

0.6 Instrument Status (R. Gessner/Astrium)

- Presentation – see handout
- The instrument availability has further improved, so that the duty cycle was increased to 60%. A duty cycle of 80% is now envisaged for the next planning period.
- Interferometer performance: Since 2006, the long term error rate has decreased significantly; especially no INT turnaround errors were detected since end of September 2006, the most frequent error is now the interferometer start-up error. The probability of having this error rises when increasing the number of instrument restart. The plot shown seems to indicate a slight increase in the last quarter of 2007 of such type of error, but the increasing duty cycle was not taken into account.

AI L0_13.05: Astrium to evaluate a statistic of the start-up failure normalised to the planned instrument duty cycle.

- The Interferometer motor currents have significantly improved.
- Cooler performance. During last two months we observe a visible degradation in the cooler parameters: increase of compressor vibration levels, cooler radiator temperature, and cooler compressor head temperature and compressor stroke. As a result it was decided to perform a passive decontamination from 29th May to 6th June 2007. The coarse balance results were not yet available.

AI L0_13.06: Astrium to provide the coarse balance results and cooler improvement of the most recent passive decontamination

- Thermal performance. Instrument temperatures are slightly higher than the values of 2006 in the same period; especially the cooler temperature (see above). It is expected that all parameters get better after the passive decontamination

- General / Mission extension: Although the improved interferometer performance allows an increase of the duty cycle, a closer look at the mechanism parameters is required on the long term to determine performance degradation.

1) Level 1B

1.1 L1B configuration (F. Niro/ESA)

- Presentation of status (see handout)
- New L1B IPF 5.0 and new ADFs v7.0 planned for 4th quarter 2007.
- L1B IPF 4.67 operation OFL at DPAC. L1B products available via D-PAC ftp server.

1.2 L1B Anomaly Status (F. Niro/ESA)

- Problem in band A spectra in orbit #6192: The investigation has shown that wrong MIP_CO1_AX file was used. Orbit was reprocessed. The strategy of taking the offset from MIP_CO1_AX when the offset validity check failed should be revised for the next baseline, since this problem has occurred several times.
- Wrong calibrated L1B Products at D-PAC: The problem occurred for 11 orbits in band AB and B on 18-19 Apr 2007. The investigation has shown again that the wrong MIP_CO1_AX file was used by the L1B processor. Same problem as the investigation for orbit #6192.

1.3 L1B Monitoring (F. Niro/ESA)

- Presentation of L0/L1B monitoring (see handout)
- AI_L1_12.05: A new plot shows the variation of the Gain vs. the NESR. The spectral range was restricted to 800-970 cm^{-1} where the maximum gain increase is observed. A linear relation is found between the Gain and the NESR variation.
- The statistical analysis on the FCE shows a strong correlation with the number of IDU errors.
- The long term monitoring of detected spikes did not show any trend. It is suggested to add a threshold on the number of spikes detected in order to reject these measurements during the L2 processing if the number of spikes is too high.
- A new monitoring for clouds flagging was implemented. The monitoring needs some improvements by taking into account the relative number of sweeps at each altitude. M. Schmitt (Astrium) suggested plotting the cloud flag percentage as a function of the top height altitude instead of individual altitudes. It would be interesting to know how many sweeps are lost due to clouds.

AI_ L1_13.01: ESRIN (FN) to improve the cloud flagging monitoring by considering the relative number of sweeps at each altitude.

1.4 L1B Processor Status (G. Perron/BOMEM)

- Small update to MIGSP for the number of sweeps per scan in SPH.
- MIGSP v2.7 / MICAL v1.6 delivered/installed at ESRIN Oct 2006.

1.5 L1B Investigations (G. Perron/BOMEM)

- Pointing investigation (see presentation handout): Differences between planning tool, L1 processing and L2 retrieved tangent altitude should be investigated.
    - The planning algorithm (RGT) and the L1B processor differ for the orbit state vector initialisation and for the adopted CFI target modes. The L1B Processor does not take into account the elevation mirror non-linearity and the MIPAS frame alignment matrix.

AI L1_13.02: BOMEM and ESRIN (MdL) to clarify the difference for the state vector calculation between RGT and L1 processor.

- The most important difference between RGT and L1 processor is the fact that RGT introduce a pitch harmonic with amplitude of ~8mdeg, while this is not taken into account into the L1 processor. R.Gessner (Astrium) mentioned that this pitch harmonics was introduced during the commissioning phase and the reason for that was to take into account the budget for the harmonics of the platform. When introducing these harmonics in the L1 processor the difference (RGT-L1b) that is latitude dependent, is smoothed out. However even after the harmonics introduction in the L1 processor, there is still a 1km offset between the RGT altitude and the one calculated by L1B processor.
- Bug was found with RGT tool 5 when harmonics are used. This tool is only used by Marta to plot the expected tangent altitude, therefore this bug does not impact the operations, since the altitude are commanded in terms of scanning angle.

AI L1_13.03: BOMEM to summarize in a TN the investigation on pointing and to include the presentation of A. Dudhia (OU) and IMK about fixed azimuth results.

- BOMEM suggests to perform pointing test measurements consisting of 4 orbits at fixed azimuth angle at different angles, then to study the results with the support of retrieved tangent altitude (IMK). A. Dudhia (OU) suggests to wait at equinox time in order to have equivalent atmosphere between poles. T. Fehr (ESA) prefers to do it as soon as possible.

AI L1_13.04: ESRIN (MdL) to plan 4 orbits at fixed azimuth at different angles.

- AI_L1_12.04: The noise level calculated on IF16 raw measurements (orbit #25426) is ~7bits. Gain in band D could be lowered by a factor of 4 without reducing NESR.
- AI_L1_12.10/AI_L1_12.11: Comparison between IPF 4.59, IPF 4.61, IPF 4.67 and MIGSP 2.7. The oscillation at ~0.75 cm^{-1} is present only with IPF4.61 and this occurs only for band A, AB and C. A. Kleinhert (IMK) said that she did not observe this problem with IPF 4.62 which suggests that the problem was corrected in IPF 4.62.

AI L1_13.05: ESRIN (FN) to check the differences in the baseline between IPF 4.61 and IPF 4.62 in order to explain the oscillation present in 4.61 and not in 4.62.

- AI_L1_12.14: The larger instability of spectral calibration for scan 25-40 is due to an unusual low atmospheric temperature at 32km (investigation performed by A.Dudhia (OU) and a subsequent weakening of the CO2 laser lines used for the spectral calibration.

1.5 L1B Investigations (A. Kleinhert/IMK)

- AI_L1_12.03: Investigation to check if other bands than band D are affected by sunlight backscattered into the MIPAS FOV by low altitude clouds. Data from MIPAS balloon spectra (7 Dec 2002) and MIPAS Envisat spectra (orbit 22638) were used for the investigation. The effect of sunlight backscattered is visible only in band D and only in presence of clouds in the LOS. No effect when the clouds are below the LOS. No need to change band D gain settings.

1.6 L1B Performance assessment

Not addressed.

1.7 L1B Work Plan

- Presentation of improvements candidates (see handout):
  - T.Fehr (ESA) asked to put priority on these issues
  - C. Massimo (UB) said that the radiometric budget should be refreshed.
  - B.Carli (IFAC) mentioned that not only the absolute tangent height is important but also the accuracy of elevation scan steps. A. Dudhia said that they did evaluate this accuracy on few L2 products.

AI L1_13.06: BOMEM to check the non-linearity and correction of elevation scan angles.

2) Level 2

2.0) Ethane: C_2H_6 (J-M Flaud, LISA)

- JMF shows that the spectroscopic parameters for ethane in HITRAN and GEISA databases have large errors. He proposes new line positions and new line widths for this molecule. He shows that the new parameters allow improving the fit of the spectra of the Titan atmosphere with respect to HITRAN and GEISA databases and suggests to include the new parameters in the MIPAS database.
- Furthermore, analysing the MIPAS spectra he deduces that the NO^+ (1-0) and (2-1) ro-vibrational lines are not correct in HITRAN. On the basis of this analysis he proposes new spectroscopic parameters for NO^+ and suggests including them in the MIPAS database adding a flag describing the accuracy of the parameters. This proposal was supported by the QWB.

AI L2_13.01: LISA to provide the line list with the new spectroscopic parameters for C_2H_6 and NO^+ to M. Ridolfi (UB) and to prepare a technical note describing the modifications to make to the MIPAS database.
AI L2_13.02: UB to update the MIPAS spectroscopic database.

2.1) Level 2 IPF configuration (F. Niro, ESA)

- He says that the current version of IPF is 4.67 for processing reduced resolution data with 17 sweeps (Aug-Sep 2004). The future IPF 5.0 will be used for processing reduced resolution data with the new measurement scenario. Some RR data with the new measurement scenario were processed with the new L2 prototype (ML2PP 5.0) for the validation dataset. These new products have a new format and the new version of be at (4.2.0) is needed to read them.
    - M. Ridolfi (UB) asks whether also Enviview will be updated in order to read the new Level 2 products. T. Fehr (ESA) says that Enviview will be updated and released with the new IPF 5.0 is ready.

2.2) Level 2 anomaly investigation status (F. Niro, ESA)

- No Level 2anomaly was detected since last QWG.
- P. Raspollini (IFAC) found an anomaly when reading the microwindow labels from Level 2 products.
    - M. Schmitt (ASTRIUM) asks P. Raspollini (IFAC) to send him an e-mail with the description of the anomaly. The e-mail has to be sent in copy also to F. Niro (ESA) for keeping track of the anomalies.
    - Soon after the meeting it was found that the suspected anomaly was only a misinterpretation of the data
    - No further action is required.

2.3) Level 2 monitoring (F. Niro, ESA)

- From the monitoring of the validation dataset the following 2 issues have been detected:
    - The retrieval fails around the South Pole. This occurs mainly for nominal mode and is due to the fact that the algorithm which calculates the initial guess crashes for low altitude sweeps.

- The retrieval fails over Alaska during night for UTLS measurements. P. Raspollini (IFAC) suggests that the 2 problems could have the same cause identified in the crash of the initial guess algorithm for low altitude sweeps.

AI L2_13.03: ESA (FN) to provide an orbit passing over Alaska for which the retrieval fails to ASTRIUM and IFAC.
AI L2_13.04: ASTRIUM and IFAC to investigate on the causes that determine the failure of retrievals over Alaska.

- F. Niro (ESA) points out the issue that at the moment the L2 daily report is too detailed and asks to QWG feedback on how to simplify it.

AI L2_13.05: All to provide feedback on how to simplify the L2 daily report.

- Regarding the monthly monitoring F. Niro (ESA) asks support from QWG in order to agree the strategy to check the huge amount of data that will be available with the reprocessing.
  - T. Fehr (ESA) asks to QWG to suggest the order in which the data have to be reprocessed.
  - B. Carli (IFAC) suggests to start the reprocessing from the most recent measurements and to proceed back through the mission at steps of either months or years.

2.4) ML2PP status (M. Schmitt, ASTRIUM)

- The documentation status, the SPRs/Patches and the investigation on ML2PP crashes were summarized.
- ML2PP crashes in several retrievals because of the failure of the interpolation of base profile quantities. This happens when the lowest base profile altitude is smaller than the lowest initial guess profile altitude. He identified two causes for these crashes:
  - the lowest engineering altitude is above the earth surface for less than half of the vertical FOV width
  - the initial guess merged with the previous scan retrieved profile (hydrostatically corrected) does not cover the full FOV of the lowest sweep of the actual scan.
- A quick fix of the problem (already discussed in a teleconference) consisting in performing a sweep rejection below a certain altitude using a specially configured cloud filtering microwindow pair is proposed. This solution does not affect the code but only the auxiliary data files allowing its implementation in a very short time.
  - B. Carli (IFAC) proposes to fix the threshold for the rejection of the sweeps at 4.5 km.
  - After some discussion the QWG agrees with the value of 4.5 km.
  - T. Fehr (ESA) says that comments of J. Remedios (UL) on the proposed solution would be very useful.

AI L2_13.06: UL to provide within one week comments on the proposed solution to avoid the crashes of ML2PP.

- M. Schmitt (ASTRIUM) recalls the problem that when a band is corrupted the retrieval is not performed also if the corrupted band is not used for the retrieval (this frequently happens with band D). The modification of this strategy requires a modification of the code, so it cannot be performed in a short time.
  - B. Carli (IFAC) says that the retrieval should be stopped only when the corrupted band is used for the retrieval.
  - T. Fehr (ESA) says that it is necessary to evaluate the percentage of data that are lost with the current strategy and the amount of work needed to change strategy.

AI L2_13.07: ASTRIUM to evaluate the amount of work needed to change the strategy adopted when a band is corrupted.

2.5.1) Level 2 tests on selected microwindows (S. Ceccherini, IFAC)

- In order to identify possible biases between profiles retrieved from full and reduced resolution spectra he presents a test performed on an orbit (#10798) for which spectra at the two spectral resolutions are available. He shows a negative bias for pressure and a positive bias for temperature and ozone in the altitude range between 30 and 50 km of profiles retrieved at reduced resolution with respect to profiles retrieved at full resolution. The bias of ozone is confirmed by the first results of validation obtained by Y. J. Meijer (RIVM) comparing MIPAS reduced resolution profiles with collocated LIDAR measurements. S. Ceccherini (IFAC) shows that about 50% of the bias of ozone is due to the bias of pressure and temperature profiles, while the residual bias is determined by the ozone microwindow 332.
    - M. Carlotti (UB) asks whether the residuals of MW 332 have been analysed.
        - S. Ceccherini (IFAC) answers that the residuals have been plotted and sent to J.-M. Flaud (LISA) to be analysed. The comments of J.-M. Flaud are pending.
    - A Dudhia (OU) notes that the removal of MW 332 produces an increase of the retrieval errors at high altitudes.
    - M. L. Puertas (IAA) suggests to use MW 332 in the altitude range 50-70 km instead of the original range 31-70 km.
    - Dudhia (OU) suggests to substitute MW 332 with a new one that he has to select.
    - M. Ridolfi (UB) says that the validation data are still a small sample and we cannot trust them. He suggests to wait for a larger validation dataset.
    - Carli (IFAC) agrees that a larger validation dataset is needed but he suggests in the meantime to perform tests using an alternative microwindow.

AI L2_13.08: LISA to comment on residuals of the O3 MW 332.

AI L2_13.09: OU to provide a new ozone microwindow to substitute MW 332 to IFAC.

AI L2_13.10: IFAC to repeat the test in order to estimate biases between ozone profiles retrieved from reduced and full resolution spectra using the new ozone microwindow provided by OU.

2.5.2) Tests on preliminary reduced resolution L2 results (P. Raspollini, IFAC)

- About 10% of all pressure and temperature retrievals do not reach convergence for “too many Marquardt iterations”.In addition stops or crashes in the L2 processor occur in presence of very low measured tangent altitudes (problem already described by M. Schmitt, ASTRIUM). the histogram of chi-squares for ozone is different from what is expected. The analysis of ozone chi-squares shows that low values occur at high latitudes where low temperatures (and low O_3 concentrations) occur. There is not an explanation for this behaviour.
    - M. Carlotti (UB) suggests that the problem induced by MW 332 could be responsible of this unexpected behaviour of chi-square. P. Raspollini (IFAC) does not believe that this is the case because the problem of MW 332 does not affect the chi-square value.
    - Dudhia (OU) says that the chi-square is smaller when temperature is low because the random error is larger.
    - Carli (IFAC) says that this explanation would have to be valid also for the other species for which the unexpected behaviour of the chi-square is not observed.

2.5.3) Tests on frequency calibration AI_L1_10.13 (P. Raspollini, IFAC)

- The comparison between the residual frequency shift obtained using the linear and quadratic terms for the frequency correction retrieved by IFAC and by BOMEM is presented.
- IFAC and BOMEM coefficients provide similar results in terms of residual frequency shift apart an offset of about $5\ 10^{-7}$ and similar results in terms of chi-square reduction.
- The monitoring of frequency correction of the preliminary L2 dataset relative to the 2 years reduced resolution measurements indicates a large spread, but no trends. The tests show that

the chi-squares obtained for orbit #2081 are larger than those obtained during the commissioning phase. The fit of the ILS width does not reduce the chi-square values.

AI L2_13.11: IFAC to provide the ILS parameters used to perform AI_L1_10.13 to BOMEM.

AI L2_13.12: BOMEM to check the ILS parameters used to perform AI_L1_10.13 by IFAC.

2.5.4) Examining reduced resolution cloud index and Reference Atmospheres (D. Moore, UL)

- He shows the reduced resolution cloud index values as a function of altitude. Cloud index is not valid above 50 km due to noise. Many cloudy scenes in global view are observed as well as the polar stratospheric clouds in Antarctica. The cloud index threshold is high below 5 km, but the important thing is that the proper cloud index threshold is adopted above 5 km.
- He shows the comparison of reference atmospheres with the v4.61/v4.62 MIPAS level 2 geophysical dataset. MIPAS data agree very well in mean behaviour at most altitudes. Discrepancies due to clouds and noise have been noticed at the upper and lower limits of the MIPAS retrieval range. There are some disagreements, mainly in Polar Regions in the lower stratosphere and troposphere that need further investigation.
    - P. Raspollini (IFAC) asks if the V4.0 IG2 are the IG2 delivered to MIPAS team.
        - D. Moore (UL) confirms.

2.5.5) Analysis of UA FR measurements (M. Lopez Puertas, IAA)

- He shows that MIPAS confirmed previous NLTE modelling of spin and rotational temperatures. MIPAS is able to measure temperature and NO VMR with good precision (5-20 K; 5-20%) in the thermosphere (105-160 km)
- He describes the model for NO^+ NLTE and some preliminary results.
- Regarding the problem of the ozone bias arisen by S. Ceccherini (IFAC) M.L. Puertas (IAA) shows a figure from a paper of N. Glatthor and al. (Atmos. Chem. Phys., 6, 2767–2781, 2006) reporting the retrieved ozone using microwindows either in band A or in band AB. When microwindows in band AB are used the retrieved ozone VMR is larger of about 1 ppmv than when microwindows in band A are used.

AI L2_13.13: IAA to send the paper (or the link to it) about ozone retrieval difference when using either band A or band AB MW (Atmos. Chem. Phys., 6, 2767–2781, 2006) to J.-M. Flaud (LISA).

2.6.1) Validation of MIPAS-ENVISAT operational (RR mode) data with balloon borne measurements in the tropics (G. Wetzel, IMK)

- The results of comparison between reduced resolution MIPAS ENVISAT measurements and collocated MIPAS Balloon measurements in Teresina (Brazil) were presented.
- A positive bias for ozone above 31 km is observed. A Large bias is observed for water vapour below the hygropause (a similar behaviour is present in the IMK retrievals). Large oscillations in CH_4 and N_2O profiles at low altitudes are present in MIPAS-E and not in MIPAS-B measurements.
- Deviations of the reduced resolution mode are generally larger than those of the full resolution mode. M. Carlotti (UB) asks if the regularization is switched-on in these retrievals.
    - S. Ceccherini (IFAC) confirms, but in the case of CH_4 and N_2O the oscillations are larger than the retrieval errors and so the adopted regularization approach is not able to fully remove the oscillations.

2.6.2) Comparison between SPIRALE balloon-borne in-situ measurements and MIPAS-ENVISAT in the tropics (Teresina, 5° S, 43° W) (G. Wetzel, IMK on behalf of M. Pirre, LPCE/CNRS)

- Also the comparison with SPIRALE shows the problem of the oscillations in the CH_4 and N_2O profiles at low altitude.
- Large differences are observed in the comparison of HNO_3 profiles, but they are probably due to a problem of SPIRALE profiles.
- The comparison between the NO_2 profile measured by DOAS with the corresponding MIPAS profile has still to be done.
    - T. Fehr (ESA) says that the major problem showed by validation is the oscillations of the CH_4 and N_2O profiles at low altitudes.
    - M. Ridolfi (UB) says that it would be useful to compare the CH_4 and N_2O profiles with those obtained by the IMK processor.
        - M. Hoepfner (IMK) says that IMK has not yet processed these data.
    - B. Carli (IFAC) proposes the solution to remove from the retrieval grid one point every two.
    - Dudhia (OU) proposes to perform the retrieval of CH_4 and N_2O for some reduced resolution measurements using the Oxford and the IMK processors in order to see if also these profiles show anomalous oscillations.

AI L2_13.14: OU and IMK to perform the retrieval of CH_4 and N_2O profiles from some reduced resolution measurements and to compare the results with ESA processor in order to check if oscillations are also present.

AI L2_13.15: IFAC to investigate on the oscillations present in CH_4 and N_2O profiles retrieved from reduced resolution measurements.

2.6.3) EQUAL contribution to the quick validation of MIPAS-RR ozone profiles (T. Fehr (ESA) on behalf of Y. Meijer (RIVM))

- The results of the comparison between the ozone MIPAS profiles and the collocated LIDAR measurements, both globally and per latitude regions were presented. The positive bias of ozone above 30 km already showed by S. Ceccherini (IFAC) is clearly visible in all the comparisons.
- Further the altitudes retrieved by MIPAS are inaccurate and an improvement is obtained correcting the MIPAS altitudes using the ECMWF data were shown.
    - Dudhia (OU) suggests to correct the MIPAS altitudes with ECMWF for only one level and then to use the incremental altitudes retrieved by MIPAS.
        - M. Ridolfi (UB) says that this is the method already implemented in the L2 retrieval code (v5.0) and there is a technical note written by C. Belotti (IFAC) describing the method.

AI L2_13.16: ESA to send the technical note describing the method to correct the MIPAS retrieved altitudes using ECMWF data to Y. Meijer (RIVM).

2.6.4) Ground-based validation of MIPAS RR ozone profiles (T. Fehr (ESA) on behalf of C. De Clerq (IASB-BIRA)

- The results of the comparison between the ozone MIPAS profiles and the collocated ground-based measurements were presented. The provisional conclusions are that the MIPAS ozone profiles are consistent with the independent correlative data and their quality in the stratosphere is similar to that of previous MIPAS nominal mode v4.61 profiles. Mean difference is less than 10% level in the stratosphere. A positive bias of about 7% is observed at mid-latitude stations in the stratosphere. Mean differences larger than 30% are observed in the troposphere.
- M. Ridolfi (UB) says that the observed bias is a latitude dependent error because different locations give different results.

2.6.5) Comparison of MIPAS ESA RR UTLS-1 mode retrievals to IMK/IAA, ECMWF and MLS (M. Hoepfner, IMK)

- The comparison between ESA and IMK retrievals of tangent altitude corrections, temperature, H_2O and O_3 for 6 orbits measured at reduced resolution in UTLS-1 mode are presented.
- Significant differences for temperature are observed in the tropopause.
- ESA H_2O VMR has a higher value at high altitudes at the North Pole.
    - Dudhia (OU) says that this is probably due to an high concentration of H_2O in mesosphere and the retrieval increases the value at the highest tangent altitudes (about 50 km in the UTLS-1 mode) in order to fit the measurements.
    - M. Ridolfi (UB) says that the differences at the topmost altitudes are due to the approach of the extension of the profiles above the retrieval grid.
    - Carli (IFAC) notices that a positive bias for ozone above 35 km is observed for both ESA and IMK retrievals with respect to MLS.

2.6.6) HNO_3, N_2O and NO_2: Full and reduced resolution L2 compared (J. Walker, OU)

- That the comparison between full resolution and reduced resolution retrievals indicates a good agreement for HNO_3 and N_2O was shown. However, daytime and nighttime reduced resolution nominal NO_2 profiles agree less well with full resolution data, perhaps due to poor data availability. Finally she shows the correlations between N_2O and NO_2.
    - M. Hoepfner (IMK) asks to J. Walker (OU) whether she has noticed oscillations in N_2O profiles retrieved from reduced resolution measurements.
        - J. Walker (OU) answers that she analyzed only the mean profile and not single profiles. In the mean profile the oscillations are not present.

2.7.1) Summary of HR17 Temperature and Ozone validation (M. Ridolfi, UB)

- The results of the validation activity for full resolution measurements relative to temperature and ozone were presented. For temperature the detected bias is always within the systematic error prediction and depends on altitude, geographic area, season, ... This means that the bias is an error component that varies on time and spatial scales larger than those explored by the individual datasets used for the inter-comparison. The standard deviation of the differences between MIPAS and the correlative measurements is usually larger (a factor from 2 to 3) than the combined random error predicted on the basis of error propagation calculations.
- For ozone a bias (<±10%) within the combined systematic error in the range from 1 to 50 hPa (~ from 52 to 23 km) is observed. The precision is within the combined random error in the range from 1 to 40 hPa (~ from 52 to 25 km). Larger discrepancies are observed below 20-25 km with a positive bias of MIPAS (from 5 to 25 %) and the precision larger than the combined random error (by a factor of 1.5 to 3.0).
- Following open issues were identified:
    - error due to profile shape assumptions (relevant especially for temperature)
    - insufficient cloud flagging spatial smoothing (horizontal averaging kernels).

2.7.2) Validation of MIPAS-ENVISAT H_2O and NO_2 operational (FR mode) data (G. Wetzel, IMK)

- He shows the results of the validation activity for full resolution measurements related to H_2O and NO_2.
- For H_2O the differences in the altitude range 15-30 km are mostly within the combined errors. In the middle and upper atmosphere a bias of 10-20% is observed. Strong oscillations and often a low bias in lowermost stratosphere/near-tropopause are observed. Oscillations are present in some individual profiles.
- For NO_2, apart some retrieval instabilities, the profiles look reasonable. The differences are mostly within the combined errors. T. Fehr (ESA) asks for recommendations.
- G. Wetzel (IMK) identifies the oscillations of individual H_2O profiles as the main problem, while there are not significant problems for NO_2.

2.7.3) Validation of MIPAS HNO_3 operational data (M. Hoepfner, IMK)

- A problem related to cloud flagging was described. There are some cases where the ESA processor does not flag as cloudy a sweep, while the IMK processor does. In these cases the ESA HNO_3 profiles show strong oscillations that are not present in the IMK profiles.
- T. Fehr (ESA) says that UL has to investigate on these problems of the cloud flagging.

AI L2_13.17: UL to investigate on the need to update the threshold of the cloud index.

2.8) Level 2 Workplan (P. Raspollini and B. Carli, IFAC)

- P. Raspollini (IFAC) describes the past and the future activity of the Level 2 team.
- B. Carli (IFAC) shows a preliminary list of possible upgrades of retrieval products.
- A discussion on this list is performed by the QWG, further items are added and finally the following list is generated:
  - A - VCM of systematic errors (error spectra instead of masks)
  - A' - Correction of NLTE
  - A" - LUTs with CO2 line mixing correction
  - B - Optimal estimation instead of regularization (cloud filtering?)
  - B' - Extra points in retrieval grid
  - C - Multi-target vs. single target
  - D - Two dimensional retrieval
  - D' - Modeling of horizontal gradient in one dimensional retrieval
  - E - New target species
  - E' - Retrieval of weak targets
  - F - Middle Atmospheric mode retrieval
  - G - Cloud height in FM
  - H - Horizontal AK
- B. Carli (IFAC) proposes to write a short technical note where the advantages and the disadvantages of each upgrade are described. This technical note should be used by the Science Team to make recommendations about the most useful upgrades.

3) Place and date of the next meetings (all)

- **QWG#14** - two days in the week 8-13 October 2007 in Bologna. T. Fehr (ESA) will communicate the days as soon as possible.

- **QWG#15** - in the week 21-25 January 2008 in Frascati. The days have to be defined.