REPORT ON
THE FIRST INTERNATIONAL
IASI CONFERENCE

ANGLET, FRANCE

13 TO 16 NOVEMBER 2007

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CENTRE NATIONAL D'ÉTUDES SPATIALES

EUMETSAT

SUMMARY REPORT ON

THE FIRST IASI INTERNATIONAL CONFERENCE

ANGLET, FRANCE

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CONFERENCE ORGANIZED BY: **CENTRE NATIONAL D'ETUDES SPATIALES (CNES)**

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With the participation of Meteo-France and CNRS/INSU

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REPORT PREPARED BY : **THIERRY PHULPIN AND DIETER KLAES**

WITH THE HELP OF **DOROTHEE DIEBEL, PETER SCHLUESSEL,**

CLAUDE CAMY-PEYRET, JONATHAN TAYLOR

and the contribution for the status reports of all the Chairs of the sessions

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EXECUTIVE SUMMARY

The First International IASI Conference took place only one year after the successful launch of the IASI instrument on the Metop platform on 19th October 2006.

It is a credit to the manufacturers of IASI and to CNES and EUMETSAT that so soon after launch users are already making significant use of IASI data and were able to present exciting first results.

A key role of IASI is in support of Numerical Weather Prediction. ECMWF started to assimilate IASI data in June 2007 and the UK Met Office in November 2007. A number of other centres are in the pre-operational testing phase. IASI is already being seen to have a significant impact on NWP – the largest single impact of any instrument despite coming on top of existing systems. No centres reported any problems in the real-time availability of IASI data which is a significant endorsement of the EUMETSAT EUMETcast distribution service. The speed at which NWP centres have established viable assimilation systems is, to a large extent, due to the valuable experience gained with the AIRS instrument. The role of the AIRS and indeed the AIRS Science Team in getting AIRS data to the NWP community is gratefully acknowledged.

The performance of IASI has been assessed by the IASI TEC and validated against NWP model output and airborne and balloon coincidence flights. Results during the conference showed that the radiometric performance of IASI specification of 0.5K has clearly been met. The Joint Airborne IASI Validation Experiment (JAIVEX) demonstrated that the achieved calibration is within 0.2K accuracy. Comparisons between AIRS and IASI showed comparable radiometric biases of 0.1-0.2K.

The high spectral resolution of IASI is already showing benefits with several users describing techniques to use this information to retrieve surface and cloud properties – paving the way for even greater use of IASI data in NWP. The use of Principal Components (PC) and in particular PC radiative transfer showing innovative ways of dealing and utilising the high volumes of data from satellite borne interferometers – giving promise for the enhanced use of IASI and other follow on missions including potential geostationary missions.

Other sessions during the conference concentrated on retrieval of cloud and aerosol properties and on the growing number of trace gases that can be detected in IASI data. This highlights another critical role of IASI in the monitoring of the Earth's climate over a pro-longed time period.

All of the above use of IASI data is dependent on quality spectroscopic databases and this conference revealed that whilst there is a consensus in performance of radiative transfer codes there still remain differences between major spectroscopic data bases and that these fundamental issues still need to be resolved.

In summary – after a very short period the IASI instrument has proven itself to be well calibrated and stable and is set to contribute significantly to future NWP and Climate Studies.

1. INTRODUCTION

The first IASI International Conference was held at the hotel “Atlanthal”, in Anglet, France, from 13 to 16 November 2007. This event took place only one year after the launch of Metop-A (and with it IASI) on the 19 October 2006 and only six months after the first data have been distributed in near real time to the Numerical Weather Prediction centres. The conference was jointly organized by the CNES and EUMETSAT with the participation of Météo-France and CNRS/INSU.

The objectives of this first conference were:

- To present the results on the instrument performance,
- To show initial results of assimilation of IASI in numerical weather prediction models,
- To present the results of the validation campaigns,
- To review the validity and consistency of the IASI products and get feedback from the users,
- To provide an error estimation of the Level 1 and Level 2 products,
- To recommend further level 2 algorithm developments where needed.
- To promote IASI
- And to broaden the user community and applications with IASI.

Around one hundred and thirty participants attended the conference and provided either technical or scientific contributions. A list of participants is given in Annex 1. Ten countries were represented plus one international agency, EUMETSAT, two space agencies, CNES and JAXA, and one industrial company, ThalesAleniaSpace, who produced the instrument.

The presentations were gathered on a range of various issues which included :

- Mission and Instrument
- Pre-processing
- NWP Assimilation and monitoring
- Validation campaigns –Radiances
- Radiative Transfer and Spectroscopy
- Clouds and aerosols
- Temperature/water vapour retrieval
- Trace gas retrieval and Atmospheric Chemistry
- Validation campaigns on products and properties
- Future instruments.

There were a total of 46 oral and 35 poster presentations. The programme was established by a scientific committee, the composition of which is given in Annex II. The conference programme can be found in Annex III.

At the end of the conference the concluding session provided status reports summarising the activities by topic, as listed above. These reports, given in section 2, include for each topic a state of the art showing the highlights, the open issues and some proposition of work to address these issues.

The discussion brought some recommendations from the plenary to CNES and EUMETSAT concerning the instrument, the data processing, and the services to help the users in sharing their results and some questions. These recommendations are reported in section 3.

During the conclusions, the CNES and EUMETSAT informed the attendees of their future plans on for coordinating and communicating the science from IASI. These are presented in section 4.

The conference also recognised the merits of the pioneer developer of IASI, François Regis Cayla, who attended the meeting.

2. STATUS REPORTS

2.1. PRE-PROCESSING

by Dieter Klaes (EUMETSAT)

2.1.1. HIGHLIGHTS

There were four main topics addressed, in four oral presentations and two poster presentations. The posters were introduced at the end of the session. The main topics of this session were:

- Processing by Satellite Operator: NOAA/NESDIS/STAR
- Principal Component Analysis
- Compression
- Global/Local

The results are summarised below.

2.1.1.1. PRINCIPAL COMPONENTS

Two talks elaborated several aspects of the processing using Principal Components.

The first talk by Chris Barnet from NOAA/NESDIS/STAR (for Mitch Goldberg, who could not attend) addressed the preparation of the data using principal components and the subsequent retrieval. In their approach they found that it is convenient to treat all IASI bands together, and that there is no advantage to use granule eigenvectors. The processing of a global number of granules was also computationally efficient. It was found that about 150 Eigenvectors are sufficient to represent the full IASI spectrum. Furthermore it was found that one could use static eigenvectors, i.e. no re-computation for each retrieval is required.

This allowed very fast retrievals of temperature and humidity profiles and trace gas columnar amounts. Partly cloudy and clear cases could be easily distinguished.

The second oral presentation related to Principal Component use was given by Dave Tobin from the University of Wisconsin, Madison. He discussed the Principal Component Analysis of IASI spectra. This analysis allowed the identification of non uniform scene instrument line shape (ILS) effects and small inter FOV spectral calibration differences through single principal components. In the inter FOV spectral calibration, there were only small differences seen, which shows how well the instrument is working. Reconstructing the spectrum not using the relevant PC, which describes the effect, removes it from the (reconstructed) spectrum.

2.1.1.2. COMPRESSION

Allen Huang from Space Science and Engineering Center (SSEC), University of Wisconsin-Madison (for Bormin Huang, who could not attend) reviewed current lossless compression schemes and showed current research in hardware implementations. Many different methods of lossless compression were tested; this included the application of PCA. Currently a factor 4.7 lossless compression seems to be reachable (with the Predictive Partitional Vector Quantisation PPVQ) compared to JPEG2000, which is currently considered as a standard lossless compression method. Hardware solutions are intended and currently being investigated for

performing compression on-board or on-ground for data redistribution and archive. Work towards implementation has been started.

CIMSS indicated that they are looking for national and international partnerships for these activities. To test the methods with IASI data IASI raw counts were needed.

2.1.1.3. PROCESSING BY SATELLITE OPERATOR

Walter Wolf from NOAA/NESDIS/STAR presented the development of the NOAA IASI Near Real Time Product Processing and Distribution System. A full processing system was developed using an existing/working processing system as a model (the AIRS processing system in this case.) For the future CrIS processing system the same model as for IASI will be used.

It was important to produce test data early for users in the dissemination format (BUFR with EUMETSAT format for IASI 1c data), for CrIS this is planned as well. A large number of products were adapted to many customers, in standard formats (BUFR, netCDF). There were global gridded data sets.

Validation and monitoring is considered as very important. Daily comparisons with match-ups are provided and an on-line system for monitoring at granule level. All data and products are provided to the archive.

2.1.1.4. GLOBAL/LOCAL

Two posters addressed the use of IASI data in the frame of the AAPP (ATOVS and AVHRR Pre-Processing package), which is maintained by EUMETSAT NWP SAF.

Nigel Atkinson from the Met Office, UK, discussed the aspects of pre-processing a common set of ATOVS/AVHRR/IASI data. Some aspects were the selection of subsets, the collocation with companion instruments. One aspect addressed was the use of reconstruction scores (from PCA) to monitor instrument noise.

Pascal Brunel from Météo-France demonstrated that local s/w cannot necessarily deliver the same results as global software even if the same source code is used as a baseline. This occurs because of different context files used in the global granule processing at the central facility and the context files used locally, where one has necessarily to start from scratch. This leads to deviation in the products, however most data are expected to be good enough for NWP.

2.1.2. ISSUES AND FUTURE ACTIVITIES

With principal components future work requires the testing of the results in data assimilation tests.

Further questions to investigate: How to quantify PCA corrections? Otherwise also the robustness and accuracy of the method is currently under investigation and needs to be demonstrated and quantified. Interest in collaboration with other scientists was expressed. Furthermore it would be interesting to investigate the application of corrected data to retrievals to see the impact of the correction.

With respect to compression: hardware solutions are intended and currently being investigated for performing compression on-board or on-ground for data redistribution and archive. Work towards implementation has been started.

CIMSS indicated that they are looking for national and international partnerships for these activities. To test the methods with IASI data IASI raw counts were needed.

Regarding operations and its preparation, it was important to produce test data early for users in the planned dissemination format. This should be done for all future instruments.

Validation and monitoring is considered as very important. Daily comparisons with match-ups and an on-line system for monitoring at granule level are required. It is also required that all data and products are provided to the archive.

With regards to local software it has to be recognised that depending on the approach for processing (e.g. pipeline processing in granules in the case of IASI) that local s/w cannot necessarily deliver the same results as global software even if the same source code is used as a baseline. The resulting deviation in the products needs to be checked and investigated whether they are good enough for NWP or other applications.

2.2. NUMERICAL WEATHER PREDICTION

By T. Mc Nally (ECMWF)

2.2.1. HIGHLIGHTS

The early distribution of IASI radiance data following the launch of METOP has been very useful and allowed NWP centres to establish the necessary technical and scientific infrastructure to process, monitor and ultimately assimilate the observations. No centres reported any problems in the real-time availability of IASI data which is a significant endorsement of the EUMETSAT EUMetCast distribution service and the NWP reception / ingest systems that were put in place prior to launch. These technical achievements should be appropriately acknowledged - given the huge data volumes involved.

Monitoring of observed IASI radiances against RT simulated values inside NWP systems suggest that the data are of excellent quality and very stable in time. The close agreement between observations and simulations also suggest the spectral characterisation and RT models are accurate. Many NWP centres now monitor IASI data operationally and some have results posted on the WWW. These monitoring systems are very sensitive and clearly showed (in real time) the impact of changes made by CNES and EUMETSAT to the instrument calibration during the CAL/VAL phase. It is hoped that this demonstrates the value of early data dissemination to NWP centres and becomes an established model for the future.

The NWP centres have quickly constructed “day-1” systems to assimilate IASI radiances. ECMWF has used the data operationally since June 2007 on the basis experiments that showed a clear positive impact upon forecast quality. The UK Met Office has showed similar positive impact and schedule the operational use of IASI for November 2007. A number of other centres are in pre-operational / research testing. The speed at which NWP centres have established viable assimilation systems is, to a large extent, due to the valuable experience gained with AIRS radiances in data handling, cloud detection and bias correction of high volume IR radiance observations. The role of AIRS and indeed the AIRS Science Team in getting AIRS data to the NWP community should be acknowledged.

2.2.2. ISSUES

While the early positive impacts gained by the NWP centres are significant, it is generally accepted that IASI is currently under-exploited in a number of areas listed below:

Number of channels: In the long-wave CO_2 band (where most NWP centres currently focus) only a very sparse selection of channels sounding the upper stratosphere and surface are assimilated - reflecting the relative importance of these for NWP. However, in the crucial region between the lower stratosphere and mid-troposphere a majority of non-adjacent channels are currently used (adjacent channels are not used to avoid apodization inter-correlations). Thus this band is already used rather well and large increases in the number of channels are not a priority.

Use of other bands: Excluding the high noise short-wave band, it is channels in the ozone and water vapour regions which are conspicuously underused at present. The ozone band is not a high priority for NWP and information from other sensors is currently well used (e.g. UV data). The main aim to use ozone channels would be to improve our knowledge in the polar night and investigations are underway at a number of centres. Probably the largest under use of IASI is in the water vapour region - accounting for nearly 50% of all the IASI channels. A number of NWP centres have reported problems using water vapour channels from AIRS and IASI unless the observation errors are inflated beyond reasonable levels. While there are a number of theories as to the source of the problem, the only thing that is known at the moment is that NWP systems (which are already highly constrained by model physics and other water vapour observations) react rather badly to our attempts to assimilate these data. It should be stressed that there is no suggestion that the AIRS / IASI data (or RT models) are particularly poor. Understanding of the problems and subsequent exploitation of these data is a priority for the NWP centres.

Land / ice surfaces: The under-use of satellite data over land and ice surfaces (where surface properties may be poorly known) is a generic problem and not specific to IASI. However, presentations made at the conference suggested that ambiguities between surface variables and the atmosphere may be more readily resolved with IASI and there is thus cause of optimism.

Cloud affected radiances: Again, the lack of use of satellite data in cloudy situations is a generic rather that an IASI specific problem. While there were no presentations made on the subject at the conference there is progress being made.

2.3. CLOUDS AND AEROSOLS

by Lydie Lavanant (Meteo France)

2.3.1. HIGHLIGHTS

Four oral presentations (Calbet, Chaboureau, Huang, Strow) were given during the ‘Clouds and Aerosols’ session to which we can add two presentations (Prunet, Lavanant) given in different sessions but also largely related to cloud detection and processing.

2.3.1.1. DUST/ AEROSOL:

Mineral dust aerosols and cirrus play an important role in climate by altering the radiation budget. Their radiative direct effect can modify the general circulation on

climate timescale, but also at shorter time scales. IASI has a large sensitivity to dust spectral signatures and it is needed to incorporate dust into profile retrievals for accurate results.

Chaboureau has presented the validation of a MESO-NH model through the comparison of synthetic IASI spectra for specific phenomena (dust, precipitation, cirrus, etc.) against IASI data. It has shown that the use of prognostic dust aerosol instead of climatology better captures the observed convective activity and has concluded to the high value of satellite observation for the objective tuning of empirical ice parameter and for the verification of hydrometeor contents and concentration.

Strow *et al* have started the implementation at UMBC of a IASI dust retrieval algorithm similar to their AIRS one. Preliminary comparisons of retrieved dust amount from IASI, AIRS and MODIS during a Saharan dust storm and of profile and dust retrievals versus ECMWF analyses look promising.

2.3.1.2. RETRIEVALS IN CLOUDY CONDITIONS:

Cloud detection is a key pre-processing point before any further processing. Dealing with cloud-affected channels is also a critical process for accurate atmospheric profiles and trace gases retrievals. Several presentations have taken this problem into account during and outside the 'Clouds' session.

Lavanant has presented the validation of the MAIA cloud mask applied on IASI L1c AVHRR clusters versus the full-resolution AVHRR operational cloud mask and has shown that the direct processing in a 1dVar system of cloudy radiances affected by opaque clouds for partly and overcast situations, gives very promising results when retrieving atmospheric profiles.

Huang *et al* has presented the extraction of the IASI clear signature using the MAIA cloud mask applied on IASI L1c AVHRR clusters. The estimation of the cloud-cleared error for partly-cloudy situations when compared to a nearby clear fov gives good results. He also has shown the useful use of PC noise filtering in the cloud-clearing and retrieval performance. Preliminary results of the IASI/AVHRR cloud clearing impact on atmospheric sounding retrieval have demonstrated the utility of this approach.

Prunet *et al* has presented the processing of IASI heterogeneous scenes. He uses the MAIA cloud mask associated to the IGBP atlas on IASI L1c AVHRR clusters to characterise the surfaces and extract the cloud-cleared IASI radiances before retrievals. The availability of IASI clear-sky data with the required accuracy is increased by a factor 3 to 5 on ten successive global orbits, coherent with the factor 3.3 obtained by Huang on a single granule. He indicates that the characterisation of the surfaces inside the fov provides the necessary inputs for an explicit correction of the spectral error associated to fov non uniformities.

Others outside the 'Clouds' session have presented their methods to retrieve cloud parameters without external NWP information using PC processing (Liu,..), to select cloud-unaffected channels using the ECMWF method (Collard), to select clear situations using a cost function (Hilton), …

2.3.1.3. VALIDATION OF CLOUD PARAMETERS:

Calbet has presented the validation of the CO_2-slicing cloud top pressure and fraction with campaign data from Lindenberg and Sodankylä. The cloud top pressure error is about 100hPa. The accuracy is better for high level clouds as predicted by simulations or for single layer situations. The Cloud fraction is not directly related to in-situ ground based cloud fraction as supposed.

2.3.2. ISSUES AND FUTURE ACTIVITIES

The importance of the IASI L1c AVHRR clusters has been recognised for a fast and accurate cloud and surface type characterisation. Also a IASI stand-alone CO_2-slicing cloud determination has proved its accuracy for high-level clouds during validation campaign.

Users that are not necessarily experts in cloud/dust detection have expressed a crucial need for a cloud/dust detection as a pre-processing step before further processing (profile retrievals, trace gases retrievals, etc.). Also, not easily taken into account by users, is the spectral shift correction for heterogeneous scenes which could largely affect the retrieval accuracy for partly-cloudy situations and in case of land surfaces heterogeneities in the fov.

Future activities should concentrate on a cloud/dust pre-processing strategy. This could be the availability of a simple cloud/dust mask maintained package including the spectral shift correction and using or not external NWP information. This could be the introduction of an additional cloud information (cloud flag on IASI channels, cloud parameters...) inside Day 2 IASI L1c files (IASI L1d ?) together with corrected IASI spectra for heterogeneous conditions.

Also to be discussed, as IASI cloud-cleared radiances seem valuable from preliminary results, this information could be included in Day 2 IASI files (for example through PC information).

Validation of retrieved cloud/dust products through field campaigns or through their impact on retrieved level 2 parameters is important for their use in NWC/ MESO-NH applications.

2.4. RADIATIVE TRANSFER AND SPECTROSCOPY

By P.-F. Coheur, ULB

2.4.1. HIGHLIGHTS

The session on radiative transfer and spectroscopy included four oral and one poster presentation:

On the spectroscopy side, the current status of the GEISA-IASI spectroscopic database, which was developed as an activity of the ISSWG and which is available through the Ether data center (http://ether.ipsl.jussieu.fr), has been presented (N. Jaquinet-Husson). It presently compiles the line parameters of 14 species absorbing in the thermal infrared (TIR) spectral region useful for IASI –accounting also for the principal isotopologues–, along with the pressure- and temperature- dependent

absorption cross section of some heavier molecules and the optical properties of several types of aerosols. Comparison of GEISA-IASI with other databases was presented and discussed. Although an overall agreement was reported, quite a few differences have been identified, stressing the need for improved spectroscopic parameters. This was also the subject of a poster (A. Perrin), which reported on new laboratory measurements and theoretical analyses for nitric acid, formic acid and formaldehyde. Formic acid, whose intensities were underestimated by a factor of two up to now, resulting in too high concentrations in the atmosphere, can be seen as an example of the necessity of accurate laboratory measurements to feed the spectroscopic databases and to improve on their reliability.

The differences in the spectroscopy directly reverberate on the atmospheric radiative transfer models. They were suggested to be the main sources of discrepancies when comparing model simulations to reference measurements, obtained during a series of well-documented campaigns (M. Matricardi). The respective merits of the different spectroscopic databases to reproduce nadir observations in the TIR were shown, however, to be dependent on the spectral range investigated. Furthermore, specific formulations, such as those accounting for the line mixing in the CO_2 *Q*-branches or those associated with the water vapour continuum, have been put forward as important factors that impact on the model simulations. More generally, it was found that line-by-line models agree very well with each other, with differences being smaller than the model to observation differences.

Radiances measured by AIRS and IASI have been compared and were shown to be in good agreement, with differences being of the order of 0.1 K or less (L. Strow). Biases with respect to ECMWF for the two instruments were also shown to be very similar, with some possible issues, however, in the most opaque regions associated to the strong absorptions of CO_2 in the longwave and of water vapour. As a side study, the possibility to identify variations in CO_2 using very clean field-of-views from AIRS measurements over the ocean was demonstrated, setting a baseline on the stability of this instrument, and put in perspective analysis of longer-term trends with IASI.

2.4.2. ISSUES

As pointed out above, several issues related to either the reference spectroscopy or the atmospheric radiative transfer models have been raised during the session but also throughout the conference. Among the major difficulties for the proper modeling of IASI spectra, line shape (CO_2, possibly CH_4) and water vapour continuum formulations were underlined on the fundamental spectroscopy side, whereas the inaccurate knowledge of emissivities, aerosols and clouds spectral signatures in the TIR were pointed out on the radiative transfer one.

2.4.3. FUTURE ACTIVITIES

The high-quality of the IASI spectra in terms of radiometric performance provides a unique opportunity to push further the research in atmospheric spectroscopy and radiative transfer, which would ultimately increase the scientific output of the mission. For example, more species than those currently included in GEISA-IASI database are expected to be observed by IASI under specific conditions. New findings on these species but also on persisting spectroscopic issues should be shared and communicated within the community, in order to stimulate spectroscopists for new laboratory measurements and to improve on the quality and reliability of the spectroscopic databases. As a first activity, a new version of GEISA-IASI, including several new species, is under development and will be made available in the course

of 2008. Similarly, several known issues related to the modelling of the IASI radiance measurements for different surface types (e.g. spectral emissivity), atmospheric conditions (clouds, aerosols) and observation geometry (large viewing angles) will be tackled in different groups for specific studies. Coordinated efforts on these different aspects of the radiative transfer modelling would help to improve on the level 2 data products for different IASI applications.

2.5. VALIDATION CAMPAIGNS – RADIANCES

By D. Diebel (EUMETSAT)

2.5.1. HIGHLIGHTS

OVERVIEW

The title of this session refers specifically to validation campaigns for IASI radiances, i.e. the characterisation of IASI radiances via independent measurements; however some of the oral presentations and presented posters also described a validation via use of modelling, and the term “campaign” will be therefore used here in a wider sense.

The scope of the validation of the IASI radiances as presented has focussed mainly on two aspects:

- First the radiometric, spectral and geometric accuracy of IASI level 1 products, i.e. the radiances, is assessed, in order to confirm that the IASI system is compliant with applicable specifications and to characterise the actual performance.

- Secondly, many applications benefit from the combined use of data from several instruments on different platforms (e.g., IASI and AIRS). In this case it is less important to know the absolute accuracy of the IASI radiances but the relative biases between the two instruments have to be established.

The validation and characterisation of IASI radiances as addressed in the presentations and posters of this session has been based on the following approaches:

- Comparison of IASI radiances with radiances measured during the JAIVEx campaign over Texas and the Gulf of Mexico with aircraft based instruments, operated by the University of Wisconsin (S-HIS, NAST-I) and by the Met Office (ARIES).

Comparison against spectra acquired by a balloon borne interferometer IASI-Balloon, operated by CNRS, during a field campaign at Esrange, close to Kiruna in Sweden.

- Comparison with simulated spectra, using data from radiosondes and other in-situ measurements and/or NWP model fields as input for Radiative Transfer Models (RTM).

Note that the validation of IASI radiances has also been addressed in other sessions, in particular Topic 0 “Mission and Instrument”, Topic 2 “NWP Assimilation and Monitoring” and Topic 4 “Radiative Transfer and Spectroscopy”.

2.5.2. RESULTS

The specification for IASI in terms of spectral calibration is $2 \cdot 10^{-6}$. An assessment against spectra which have been modelled with Line-by-Line RTMs shows that IASI is overall compliant with this specification. This is also supported by results from the comparison of IASI spectra against spectra acquired with aircraft based instruments and with the IASI-Balloon. It is pointed out that the spectral accuracy of the instruments used for comparison have their own limits in terms of spectral accuracy; for example the balloon based interferometer is accurate to $3 \cdot 10^{-6}$, which prevents a more precise characterisation of the actual spectral accuracy of IASI radiances.

The accuracy of the IASI spectral calibration was also addressed in the separate session for Topic 0 “Mission and Instrument”. Also here it was noted that the spectral accuracy was compliant with the specifications. In addition the variability between the four sub-pixels was characterised and found to be dependent on the applied method (direct correlation of the spectra, or correlation of the derivatives), especially in the long-wave part of the spectrum.

Regarding the radiometric properties, the specification of 0.5 K for the absolute calibration has been met. The performed validations against the airborne interferometers during the JAIVEx campaign (which are themselves calibrated to an accuracy of 0.1–0.2 K) have demonstrated that the achieved calibration is with < 0.2 K actually much better than the specification. Note that the balloon based data could unfortunately not be used for the validation as the balloon spectra were degraded due to technical problems within the instrument during the campaign.

In terms of consistency of data from IASI and AIRS it was observed that both instruments have comparable radiometric biases of 0.1–0.2 K. This was assessed by using sonde measurements and NWP model fields as inputs for an RTM and by comparing the synthetic radiances against the measured IASI radiances. The relative bias was characterised to be in the order of 0.1 K.

One presentation described also an assessment of the co-registration of the IASI sounder with the built-in IASI imager, and the co-registration was found to be consistent with the mission specification of one imager pixel (1 km at nadir).

Note that the IASI mission specifications cover, in addition to the parameters as discussed above, specifications for spectral resolution and sampling interval, spectral line shape, radiometric noise and co-registration between IASI and AVHRR. These were not specifically addressed under Topic 5, but the compliance of the IASI system with all applicable specifications has been discussed in detail under Topic 1.

2.5.3. ISSUES AND FUTURE ACTIVITIES

The results presented for this Topic 5 are consistent with the results discussed for the related Topic 1 and have demonstrated that the IASI spectra are compliant with the specifications. The validation of spectra should continue with focus on two aspects:

- The long term behaviour of the IASI system: The specification for the long term radiometric stability is 0.3 K; up to now the stability has been better than the specification but a continued assessment during the mission lifetime should be done.
- The accurate intercalibration of IASI and other instruments: This is required to allow the generation of global, long-term datasets, which are internally

consistent and can be used for applications in the fields of climate monitoring and atmospheric chemistry.

In addition efforts should be made to improve the “standards” for radiometric and spectral calibration. At this time the accuracy which is achieved by independent measurements is in the same order of magnitude as the accuracy of IASI itself. To allow a better characterisation of the “true” performance of IASI, AIRS, etc. it would be desirable to have reference instruments with a performance which is a factor 5 to 10 better. For example a standard with a radiometric bias of typically <0.02 K would be desirable. It has been understood that activities have already been initiated for some of the airborne instruments used during the IASI validation campaigns in order to improve the radiometric accuracy further.

2.6. TEMPERATURE / WATER VAPOUR RETRIEVAL

By C.D. Barnet (NOAA/NESDIS/STAR)

2.6.1. HIGHLIGHTS

The session on temperature and water vapour retrieval had ten oral presentations and three poster presentations. The presentations focused on three sub-topics: emissivity retrievals; validation experiments; and results of various retrieval methodologies.

A number of presenters discussed a methodology of solving for emissivity using eigen-functions derived from an emissivity database. Emissivity is an important topic within temperature and moisture soundings because an accurate surface radiance retrieval is important for retrieval of profiles in the lower troposphere. This discussion was initiated by the first speaker, Bob Knuteson, who discussed the emissivity methodology in detail and showed some example results from retrievals applied to SHIS, NAST-I, and IASI during the JAIVEX campaign. Four other talks also utilized this approach for solving for emissivity as summarized in Table 6.1.

A number of presentations focused on validation experiments in support of IASI product retrievals. Andreas Macke (IFM-GEOMAR) discussed Atlantic cruises (Cape Town to Bremerhaven) made in April 12 to May 4, 2007 with measurements of temperature, water vapor, and liquid water via a microwave radiometer (HATPRO) and radio-sondes and future validation possibilities with OCEANET 2008-2010. Mathias Schneider (Univ. Karlsrule) discussed the performance of using high spectral resolution ground-bases FTIR measurements for the validations of water vapor. A number of speakers discussed the JAIVEX intensive campaign in April 2007 that included flights of ARIES, NAST-I, SHIS and the deployment of a large number of drop-sondes and radio-sondes.

A number of presentations discussed retrieval of temperature and moisture along with other parameters such as trace gases, cloud parameters, and surface parameters. These presentations are summarized in the Table below. This table is a starting point for an inter-comparison of methodologies and results. The methodologies are quite varied, especially in the sense of how they handle clouds and surface properties. A number of presenters used a scattering radiative transfer and solved for cloud microphysical parameters (cloud optical depth (COD), cloud particle size (CPS), and cloud top pressure (CTP)). All the methodologies are

attempting to exploit the high information content within IASI in the retrieval of temperature and water vapor.

In general, all the presentations showed preliminary results and in all cases the results were extremely impressive given the relatively short period of time that IASI radiances have been available. All the presenters were excited about working with IASI and all are grateful to EUMETSAT and the IASI instrument team for a wonderful satellite and instrument.

2.6.2. ISSUES AND ACTIVITIES.

During the discussion period of some of the talks there was a concern about validation of temperature and moisture retrievals. This is a difficult subject, given that each of these algorithms have specific strengths and weaknesses and, as such, are somewhat application dependent. One approach to rectify this issue would be for the algorithm developers to provide a comparison on a common dataset. For example, statistics using the JAIVEX sondes might suffice or some predetermined focus period in the near future (see below). If JAIVEX is used, it would be desirable for the EUMETSAT IASI team to reprocess the L1c, if possible, with the more recent calibration applied. Currently, each algorithm developer uses a dataset of convenience to compare to.

It might also be desirable for the IASI-team to provide (or coordinate) a central location or server for validation datasets. In this way, ancillary data (e.g., ECMWF analysis, spacecraft health, etc.) could be maintained and the datasets could be made more uniform. The AIRS science team has found that “focus days” are quite useful. A day of IASI observations along with ECMWF-analysis, radiosondes, etc. could be acquired and all algorithm developers could run their algorithms on these focus-days and be able to inter-compare results at future meetings. It would be desirable to have intensive campaigns on these focus days (e.g., April 19, 2007 JAIVEX), but not mandatory. Four focus days a year has been found useful by the AIRS team to explore season and long-term trends in the AIRS products.

Another topic, along these same lines, is that algorithm developers should provide averaging kernel and error estimates for their products. While this is somewhat algorithm dependent, it is clear that an infrared sounder will have variable skill depending on the geophysical state. Regions of intense moisture variability overcast or uniform cloudiness, or isothermal profiles can be more difficult than homogenous, relatively clear, large lapse rate scenes. Error estimates and/or averaging kernels would convey critical information to the user community and also be highly useful in validation of products.

A single metric for algorithm performance is a difficult task because this “metric” would be application dependent. One application is for NWP to ingest retrievals instead of radiances; however, selection of a-priori, need for averaging kernels, and subtle biases are all complex topics for the NWP application. As we saw in this session the developers show combinations of statistics with respect to ECMWF or sondes and/or maps or 3-D graphics that illustrate the reasonableness of their product. A more robust definition of users of retrievals is needed and then a metric for inter-comparison of methodologies and validation approaches could be specified.

One potential user of IASI temperature and water vapor products is the climate community. For this community to accept these products we need to look at long-

term biases of temperature and moisture and to be sure that the selection of "acceptable" retrievals due to clouds or other issues does not induce signals into the climate record of IASI. IASI radiances themselves are also a useful climate product and one final issue was raised during this conference. The IASI instrument rejects certain scenes for various reasons (e.g., southern Atlantic anomaly, problems with phase calibration, etc). Rejection of a couple percent of IASI radiances is not a problem unless there is a systematic nature to this rejection. An analysis of randomly selected IASI radiances in the April to July 2007 time-frame shows that IASI has a tendency to reject cold scenes in the tropics - presumably scenes with high convective clouds (George Aumann, JPL, private communication). Given that validation in cloudy scenes is more difficult (for any instrument), the knowledge of instrument performance via internal calibration in critical to the climate community. A recommendation was made for EUMETSAT and CNES to explore this issue further. One immediate idea was that the IASI L1c file should contain more information about why a scene is rejected and that the file should contain as much calibration information as possible such that the climate community could assess, correct, or mitigate the loss of IASI radiances in certain scenes.

Presentation	Bob Knuteson	Lydie Lavanant	Jun Li	Xu Liu	Carmine Serio (by Guisseppe Greico)	Jonathan Taylor	William Smith	Daniel Zhou	Antonia Gambacorta
Affliation	CIMSS	Meteo-France	CIMSS	LaRC	Univ. Basilicata	UK Met. Office	Hampton Univ.	LaRC	NOAA
Datasets	IASI, SHIS NAST-I	IASI w/ AMSU, AVHRR	AIRS IASI	IASI NAST-I	IASI	ARIES	NAST-I IASI	NAST-I IASI	AIRS, IASI with AMSU & MHS
Emissivity Ret.	EOF	Not at this time	EOF (in physical)	PC	?	PC	EOF	EOF	Spectral (in physical)
Parameters	T,q,ε,Ts	T, q (Ts, Tcld f/ AVHRR)	T,q,ε,Ts COD,CTP CPS	T,q,ε,Ts O_3,CO, COD,CTP CPS	T,q,Ts, O_3	T,q,ε,Ts In future: clouds	T,q,ε,Ts O_3,CO, COD,CTP CPS	T,q,ε,Ts O_3,CO, COD,CTP CPS	T,q,ε,ρ,Ts, O_3,CO,CH_4 CO_2,HNO_3 CTP, cloud fraction
Clouds	Clear Scenes	AVHRR	Single FOV	Single FOV		In future	Two layers		Cloud Clearing
Radiative-Transfer		RTTOV8.5	SARTA (UBMC)	PCRTM	σ-IASI	HT-FRTC	LBLRTM		SARTA (UMBC)
a-priori	Climatology	ECMWF	Simulated Regression	?	ε-IASI ν^2-IASI		Simulated Regression	Simulated Regression	IASI Regression
Physical Methodology	1DVAR	1DVAR	Disc. Principle	1DVAR	δ-IASI	1DVAR	Disc. Principle	1DVAR	AIRS Science Team
Number Chl's		≤ 263	all	all		250 PC's	all	all	≈ 500
Validation	JAIVEX	ECMWF	JAIVEX	JAIVEX ECMWF	ECMWF	JAIVEX	JAIVEX	JAIVEX	Op.Sondes, ECMWF

2.7. TRACE GAS RETRIEVAL & CHEMISTRY

by D. Edwards, NCAR

2.7.1. HIGHLIGHTS

The high quality of the IASI data has been demonstrated by the work on trace gas retrieval and preliminary analysis that has already been performed. There is great potential for IASI to make a very important contribution to atmospheric composition

studies and applications. The older satellite missions, for example ENVISAT and EOS Terra/Aqua/Aura, are maturing and the timing and capabilities of future satellite missions remains uncertain with respect to trace gas retrievals. Specifically, the NPOESS/CrIS instrument, which should be complementary to IASI, may not even have a retrieval capability for carbon monoxide. IASI will be well placed to continue the long-term chemical records of inter-annual variability, and possibly trends, started with other nadir infrared sensors such as Terra/MOPITT and Aqua/AIRS.

During the conference, papers were presented discussing retrievals for members of several chemical families: CO2, CH4, CO, O3, HNO3, SO2 and H2O isotopologues. The initial retrieval schemes are working well and show promise for future enhancement. Current methods include demonstrated algorithms from AIRS, operational total column neural net retrievals and research approaches based on optimal estimation. Indications are that the excellent signal characterization of IASI will permit retrieval of trace gas vertical profile structure comparable to that previously obtained from higher resolution instruments.

2.7.2. ISSUES AND FUTURE ACTIVITIES

In addition to the work detailing trace gas retrieval capability, several other research directions are receiving attention and were reported on during the IASI conference. There is considerable interest in retrieving CO2 for climate and carbon budget studies. The challenge here is to achieve precision better than 1%. This may provide a thermal infrared free troposphere measurement capability to complement other satellite column measurements, such as that from the upcoming OCO mission. Multi-spectral techniques are being investigated to decouple temperature and CO2 IASI signal dependencies using AMSU-A or the shortwave region of the IASI spectrum. This may be an area where the principal component techniques for noise reduction that are being investigated within the IASI community could prove very useful.

Validation of the new IASI trace gas retrievals is another critical area of work. In general, the results of the initial validation studies look good. A comprehensive validation approach is essential. This will need to be cross-scale and involve comparison with other satellite instruments, data taken during aircraft field campaigns (e.g. the upcoming IPY POLARCAT campaign), and monitoring programs (e.g. MOZAIC), and surface remote sensing and monitoring. The excellent IASI geographical coverage of chemical fields will also aid field campaign flight planning and data analysis.

With respect to trace gas retrievals, early experience is already indicating where future improvements would be beneficial. These will address, for example, optimal estimation forward model speed, surface characterization and view angle dependency. The availability of high quality IASI spectra also allows for possible retrieval of other species not on the current list.

Modelling work has already started for chemistry and transport studies. Future studies could look at correlations between IASI species (e.g. CO2/CO/CH4 for carbon budget studies; O3/CO for tropospheric ozone budget studies) or IASI in combination with other instrument retrievals (e.g. GOME2 NO2/IASI HNO3 for active and reservoir nitrogen studies; IASI CO/MLS CO for lower and upper troposphere transport studies; IASI CO/AIRS CO for characterization of diurnal transport). There are also operational applications of IASI trace gas data. There is potential for a major

impact on air quality forecast skill with the assimilation of IASI retrievals (e.g. O3, CO, SO2) into global and regional chemistry transport models and a possible tie to air quality prediction programs such as GMES/GEMS.

3. RECOMMENDATIONS

- The IASI performance looks so good that it is recognised that more than the listed mission objectives are expected. Some of them like the Climate monitoring require performance beyond the specifications of the instrument which would deserve a dedicated investigation. For instance:

  i) even if the characterization of the instrument performance is very thorough and precise, some work has shown controversial results on the spectral calibration in the various pixels. A clarification on the results has been recommended.

  ii) Some studies make use of the cloud top temperature of the high cumulo-nimbus anvils in the Tropics. Unfortunately, the corresponding spectra are sometimes flagged due to the ZPD determination algorithm. It is suggested that this should be considered and a corrective action to be studied (the spectra could be saved and delivered when a more precise processing will be possible).

- Clouds
  - A flag indicating clouds or outliers has to established and added in level 1 or level 2 products.
  - Spectra in partly cloudy pixels have to be corrected of the pseudo apodization effect. Possibility of delivering the cloud-decontaminated spectra has to considered
-

- Validation

- It might be desirable for the IASI-team to provide (or coordinate) a central location or server for validation datasets. In this way, ancillary data (e.g., ECMWF analysis, spacecraft health, etc.) could be maintained and the datasets could be made more uniform.

- Some “focus day” of IASI observations along with ECMWF-analysis, radiosondes, etc. could be acquired and all algorithm developers could run their algorithms on these focus-days and be able to inter-compare results at future meetings.

4. CONCLUSIONS AND FUTURE PLANS

IASI was recognised to be very good with high performance and a remarkable stability. Major scientific results are expected from IASI. Since the distribution of Level 2 data has only just started, the conference showed that some strong improvement can still be made for the day-2 and that new products are accessible. In the same way, some additional Level 1 products could be considered and the same for Level 3 or 4. IASI also opens the way to many other sounders of the same type (on LEO and on GEO) requiring a good preparation that IASI will facilitate.

All this work will be performed by the group which was assembled for this conference and others. But to be efficient and go quickly to an implementation of the results, good coordination is required. It was thus proposed to continue the work previously

performed by the ISSWG, set up by the CNES and EUMETSAT in 1995. A new group called the IASI Science Advisory Group (ISAG) will be managed by the two agencies EUMETSAT and CNES to monitor the activities carried out on the various issues, inform on the progress, distribute information, give advice and pass on recommendations to CNES and EUMETSAT. The ISAG will meet about once a year, dates to be defined.

A second conference is planned to be organised in the time frame of 18 months to two years, phased with other Conferences (in particular the ITSC).

ANNEX 1

List of Attendees

Last Name	First Name	Company	E-mail
Present:			
ARMANTE	Raymond	Laboratoire de Meteorolgie Dynamique	armante@lmdx99.lmd.polytechnique.fr
ATKINSON	Nigel	Met Office	nigel.atkinson@metoffice.gov.uk
AUGUST	Thomas	TASC/EUMETSAT	thomas.august@eumetsat.int
BAQUE	Claire	SILOGIC	claire.baque@silogic.fr
BARNET	Christopher	NOAA/NESDIS/ STAR	chris.barnet@noaa.gov
BARRET	Brice	Laboratoire d'Aérologie,CNRS, Université de Toulouse 3	barp@aero.obs-mip.fr
BEAULNE	Alain	Environnement Canada	Alain.Beaulne@ec.gc.ca
BELON	Bruno	CNES	bruno.belon@cnes.fr
BEST	Fred	University of Wisconsin-Madison	fred.best@ssec.wisc.edu
BLUMSTEIN	Denis	CNES	denis.blumstein@cnes.fr
BONYARD	Anne	Service d'aéronomie Institut Pierre-Simon Laplace	anneb@aero.jussieu.fr
BOONE	Cathy	CNRS/IPSL	cathy.boonne@ipsl.jussieu.fr
BRU	Richard	Noveltis	richard.bru@noveltis.fr
BRUNEL	Pascal	Météo France	pascal.brunel@meteo.fr
BUFFET	Laurence	CNES	laurence.buffet@cnes.fr
CALBET	Xavier	EUMETSAT	Xavier.Calbet@eumetsat.int
CAMERON	James	Met Office	james.cameron@metoffice.gov.uk
CAMY-PEYRET	Claude	CNRS UPMC	camy@ccr.jussieu.fr
CARIOLLE	Daniel	Météo France	daniel.cariolle@cerfacs.fr
CARLIER	Thierry	CNES	thierry.carlier@cnes.fr
CAYLA	François	CNES	suzanne.chorier@cnes.fr
CHABOUREAU	Jean-Pierre	Laboratoire d'Aerologie Univresité Paul Sabatier	Jean-Pierre.Chaboureau@aero.obs-mip.fr
CHALON	Gilles	CNES	gilles.chalon@cnes.fr
CLERBAUX	Cathy	Service d'aéronomie Institut Pierre-Simon Laplace	ccl@aero.jussieu.fr
CLOUGH	Shepard	Atmospheric and Environmental Research	clough@aer.com
COHEN	Marc	EUMETSAT	marc.cohen@eumetsat.int
COHEUR	Pierre-François	Université Libre Bruxelles	pfcoheur@ulb.ac.be
COLLARD	Andrew	ECMWF	Andrew.Collard@ecmwf.int
CREVOISIER	Cyril	Laboratoire de Meteorolgie Dynamique	Cyril.Crevoisier@lmd.polytechnique.fr
DE STAERKE	Danielle	CNES	danielle.deStaerke@cnes.fr
DENIEL	Carole	CNES	carole.deniel@cnes.fr
DIEBEL	Dorothée	EUMETSAT	dorothee.diebel@eumetsat.int
EDWARDS	David	National Center for Atmospheric Research (NCAR)	edwards@ucar.edu
EREMENKO	Maxim	LISA CNRS	eremenko@lisa.univ-paris12.fr
FIEDLER	Lars	EUMETSAT	lars.fiedler@eumetsat.int
FJORTOFT	Roger	CNES	roger.fjortoft@cnes.fr
GAMBACORTA	Antonia	Perot systems-Noaa Nesdis	antonia.gambacorta@noaa.gov
GAUDEL	Inés	CNES	ines.gaudel@cnes.fr
GEORGE	Maya	Service d'aéronomie Institut Pierre-Simon Laplace	maya.george@aero.jussieu.fr
GIROD	Françoise	CNES	francoise.girod@cnes.fr
GOUDY	Philippe	CNES	philippe.goudy@cnes.fr
GRIECO	Giuseppe	DIFA Università della Basilicata	gg936ing@unibas.it
GUIDARD	Vincent	Météo France	vincent.guidard@meteo.fr
HADJI-LAZARO	Juliette	Service d'aéronomie Institut Pierre-Simon Laplace	juliette.hadji-lazaro@aero.jussieu.fr
HAN	Hyojin	School of Earth & Environmental Sciences	hanhj@eosat.snu.ac.kr
HANSON	Christopher	EUMETSAT	christopher.hanson@eumetsat.int
HARNQUIST	Sara	SMHI	Sara.Hornquist@smhi.se
HEBERT	Jean-Philippe	CNES	philippe-jean.hebert@cnes.fr
HEILLIETTE	Sylvain	Environment Canada	sylvain.heilliette@ec-gc.ca
HERBIN	Hervé	Université Libre Bruxelles	hherbin@ulb.ac.be
HESS	Reinhold	Deutscher Wetterdienst (DWD)	reinhold.hess@dwd.de
HILTON	Fiona	Met Office	fiona.hilton@metoffice.gov.uk
HOURCASTAGNOU	Jean-Noël	CNES	jean-noel.hourcastagnou@cnes.fr
HUANG	Allen	University of Wisconsin-Madison	allenh@ssec.wisc.edu
HULTBERG	Tim	EUMETSAT	TIM.HULTBERG@EUMETSAT.INT
HURTMANS	Daniel	Université Libre Bruxelles	dhurtma@ulb.ac.be
JACQUINET	Nicole	Laboratoire de Météorologie Dynamique	nicole.jacquinet@lmd.polytechnique.fr
KAIFEL	Anton	Center for Solar Energy and Hydrogen Research	anton.kaifel@zsw-bw.de

KANAWADE	Vijay	University of Leicester	vpk1@le.ac.uk
KIM	Yoonjae	Koreo Meteo	alaborer@dreamwiz.com
KLAES	Dieter	EUMETSAT	dieter.klaes@eumetsat.int
KNUTESON	Robert	University of Wisconsin-Madison	robert.knuteson@ssec.wisc.edu
KRUGLANSKI	Michel	BIRA-IASB	michel.kruglanski@bira-iasb.oma.be
KUMPS	Nicolas	BIRA-IASB	nicolas.kumps@bira-iasb.oma.be
KWON	Won-Tae	School of Earth & Environmental Sciences	wtkwon@kma.go.kr
LABROT	Tiphaine	Météo France	tiphanie.labrot@meteo.fr
LARAR	Allen	NASA	allen.m.larar@nasa.gov
LARIGAUDERIE	Carole	CNES	carole.larigauderie@cnes.fr
LAVANANT	Lydie	Météo France	lydie.lavanant@meteo.fr
LE FLOCHMOEN	Eric	CNRS, Laboratoire d'Aérologie	lefe@aero.obs-mip.fr
LI	Jun	University of Wisconsin-Madison	Jun.Li@ssec.wisc.edu
LIU	Xu	NASA	xu.liu@nasa.gov
MAC NALLY	Tony	ECMWF	Anthony.McNally@ecmwf.int
MACKE	Andreas	IFM-GEOMAR	amacke@ifm-geomar.de
MARGUINAUD	Philippe	Météo France	philippe.marguinaud@meteo.fr
MATRICARDI	Marco	ECMWF	Marco.Matricardi@ecmwf.int
MIRAS	Didier	Thales Alenia Space	didier.miras@thalesalaniaspace.com
MONTAGNER	François	EUMETSAT	francois.montagner@eumetsat.int
MUNRO	Rosemary	EUMETSAT	rosemary.munro@eumetsat.int
NEWMAN	Stuart	Met Office	stu.newman@metoffice.gov.uk
ODULEYE	Olusoji	EUMETSAT	olusoji.oduleye@eumetsat.int
ORPHAL	Johannes	LISA CNRS	orphal@lisa.univ-paris12.fr
PANCHAL	Manasvi	University of Leicester	mp204@le.ac.uk
PAPINEAU	Nicole	CNRS	nicole.papineau@cnrs-dir.fr
PARKER	Robert	University of Leicester	rjp23@le.ac.uk
PARMENTIER	Noël	Belgian Institute Space Aeronomy	noel.parmentier@aeronomie.be
PAYAN	Sébastien	CNRS UPMC	payan@ccr.jussieu.fr
PEQUINOT	Eric	CNES	celine.arnal@cnes.fr
PERRIN	Agnès	LISA CNRS	perrin@lisa.univ-paris12.fr
PHULPIN	Thierry	CNES	thierry.phulpin@cnes.fr
POMMIER	Matthieu	Service d'aéronomie Institut Pierre-Simon Laplace	pommier@aero.jussieu.fr
POUGATCHEV	Nikita	Space Dynamics Laboratoty	nikita.pougatchev@sdl.usu.edu
PRATA	Fred	NILU	fred.prata@nilu.no; fred_prata@hotmail.com
PRIETO	José	EUMETSAT	prieto@eumetsat.int
PRUNET	Pascal	Noveltis	pascal.prunet@noveltis.fr
QUENTIN	Céline	LSITT-CNRS	quentin@lsiit.u-strasbg.fr
RANDRIAMAMPIANINA	Roger	Norwegian Meteorological Institute	rogerr@met.no
RAZAVI	Ariane	Service de chimie quantique et photographique	arazavi@ulb.ac.be
REMEDIOS	John	University of Leicester	j.j.remedios@le.ac.uk
RENAUT	Didier	CNES	didier.renaut@cnes.fr
REVERCOMB	Henry	University of Wisconsin-Madison	hank.revercomb@ssec.wisc.edu
RIDAL	Martin	SMHI	martin.ridal@smhi.se
ROQUET	Hervé	Météo France	herve.roquet@meteo.fr
RUSTON	Benjamin	Naval Research Laboratory - Monterey	bcruston@gmail.com
SCHLUESSEL	Peter	EUMETSAT	peter.schluessel@eumetsat.int
SCHNEIDER	Matthias	Karlsruhe Institute of Technologie, IMK-ASF	matthias.schneider@imk.fzk.de
SCHRÖDER	Marc	German weather service (GWD)	Marc.Schroeder@dwd.de
SCHWAERZ	Marc	Deutscher Wetter Dienst	marc.schwaerz@dwd.de; univ.schwaerz@dwd.de
SHIOMI	Kei	JAXA	shiomi.kei@jaxa.jp
SIMEONI	Denis	Thales Alenia Space	denis.simeoni@thalesaleniaspace.com
SMITH	William	HAMPTON University	bill.l.smith@cox.net
STROW	Larrabee		lstrow@gmail.com
TAYLOR	Jonathan	Met Office	jonathan.p.taylor@metoffice.gov.uk
TAYLOR	Joe	University of Wisconsin-Madison	joe.taylor@ssec.wisc.edu
TJEMKES	Stephen	EUMETSAT	stephen.tjemkes@eumetsat.int
TOBIN	David	University of Wisconsin-Madison	dave.tobin@ssec.wisc.edu
TOURNIER	Bernard	Noveltis	bernard.tournier@noveltis.fr
TURQUETY	Solène	Service d'aéronomie Institut Pierre-Simon Laplace	solene.turquety@aero.jussieu.fr
USPENSKI	Alexander	SRC Planeta	uspensky@planet.iitp.ru
VOCINO	Antonio	CNMCA - Italian Air Force National Meteorological	vocino@meteoam.it
WATERFALL	Alison	Rutherford Appleton Laboratory	A.M.Waterfall@rl.ac.uk
WESPES	Catherine	Service de chimie quantique et photographique	cwespes@ulb.ac.be
WOLF	Walter	NOAA/NESDIS/ STAR	walter.wolf@noaa.gov
ZHANG	Hong	University of Wisconsin-Madison	hongz@ssec.wisc.edu
ZHOU	Daniel	NASA	daniel.k.zhou@NASA.GOV

ANNEX 2

Committees

Organizing Committee

Anne Marie Laborde, CNES
Lidwine Fagès, CTA-Events
Thierry Phulpin, CNES
Peter Schlüssel, EUMETSAT
Dieter Klaes, EUMETSAT
Dorothee Diebel, EUMETSAT
Gökhan Kayal, EUMETSAT
Xavier CALBET, EUMETSAT

Scientific committee

Thierry Phulpin, CNES
Peter Schlüssel, EUMETSAT
Claude. Camy-Peyret, LPMAA
Jonathan Taylor, Met Office
Christopher. Barnet, NOAA
Cathy Clerbaux, SA
Pierre-François. Coheur, ULB
David Edwards, NCAR
Lydie. Lavanant, Meteo France
Hank Revercomb, CIMSS
Fiona Hilton, Met Office
Carmine Serio, Universita de Basilicata
Larrabee Strow, University of Maryland
Antony Mac Nally, ECMWF
Dorothee Diebel, EUMETSAT
Lars Fiedler, EUMETSAT
D. Klaes, EUMETSAT

Topics / Chaiman:

0. Mission and instrument – Claude Camy-Peyret, Jonathan TAYLOR
1. Preprocessing – Dieter KLAES
2. NWP assimilation and monitoring – Tony McNALLY
3. Clouds and Aerosols – Lydie LAVANANT
4. Radiative Transfer & Spectroscopy – Pierre-François COHEUR
5. Validation campaigns – Radiances – Dorothee DIEBEL
6. Temp. / water vapour retrieval – Chris BARNET
7. Trace gas retrieval and chemistry – David EDWARDS
8. Validation campaigns – Products / Properties – Larrabee STROW
9. Agencies / Future Programs – Hank REVERCOMB

Summary reports : T. Phulpin and D. Klaes
Round Table : T. Phulpin and D. Klaes
Conclusions

ANNEX 3

FINAL AGENDA

Topics

0 Mission and Instrument
1 Preprocessing
2 NWP Assimilation and Monitoring
3 Clouds and Aerosols
4 Radiative Transfers and Spectroscopy
5 Validation Campaigns - Radiances
6 Temp. / Water Vapour Retrieval
7 Trace Gas Retrieval and Chemistry
8 Validation Campaigns - Products / Properties
9 Agencies / Future Programs

Date	Time	Presentation Title	Slides	Topic #	Type of Presentation	Main Author	Affiliation
Tuesday, November 13, 2007							
Nov. 13	**9:15**	**Welcome**				*Philippe GOUDY*	CNES/DCT
						Marc COHEN	Eumetsat
						Hervé ROQUET	Meteo France
						Nicole PAPINEAU	INSU
			Y			*Thierry PHULPIN*	CNES
Nov. 13	**09:45**	**Mission and Instrument**					
Nov. 13	09:45	IASI: a Review of Instrument Performance and Characterizations	Y	0	Oral	*Denis SIMEONI*	Alcatel Space
Nov. 13	10:05	IASI on MetOp-A – Level 1 Cal/Val Description	Y	0	Oral	*Denis BLUMSTEIN*	CNES
Nov. 13	10:25	IASI on MetOp-A – Radiometric and Spectral Performances	Y	0	Oral	*Bernard TOURNIER*	Noveltis
Nov. 13	10:45	Break					
Nov. 13	11:15	IASI Level 2 product processing at EUMETSAT	Y	0	Oral	*Peter SCHLUESSEL*	Eumetsat
Nov. 13	11:35	Activities on IASI at CNES and projects	Y	0	Oral	*Thierry PHULPIN*	CNES
Nov. 13	11:55	Synergetic Operational Earth observations with the EPS/Metop System	Y	0	Oral	*Dieter KLAES*	Eumetsat
Nov. 13	12:15	Geometric performances of IASI	y/n	0	Poster	*Roger FJORTOFT*	CNES
		System Performance Monitoring at IASI Technological Expertise Center (TEC)	y/n	0	Poster	*Inès GAUDEL*	CNES
		Expertise and data managed on IASI studies within Ether system	N	0	Poster	*Françoise GIROD*	CNES
Nov. 13	12:30	Lunch					
Nov. 13	**14:00**	**Preprocessing**					
Nov. 13	14:00	Using Principal Component Analysis (PCA) of IASI radiances to filter noise and generate retrievals.	Y	1	Oral	*Mitch GOLDBERG presented by Chris BARNET*	NOAA/NESDIS/STAR
Nov. 13	14:20	Current Status of Lossless Compression of Ultraspectral Sounder and Hyperspectral Imager Data	Y	1	Oral	*Borming HUANG presented by Allen HUANG*	Space Science and Engineering Center, University of Wisconsin-Madison
Nov. 13	14:40	Principle Component Analysis of IASI spectra	Y	1	Oral	*David TOBIN*	University of Wisconsin Madison
Nov. 13	15:00	The NOAA/NESDIS/STAR IASI Near Real-Time Product Processing and Distribution System	Y	1	Oral	*Walter WOLF*	NOAA
Nov. 13	15:20	Pre-processing of IASI data for NWP using the AAPP software package	Y/y	1	Poster	*Nigel ATKINSON*	Met Office
		Pre-processing of IASI data. About the use of the AAPP/OPS-LRS software for local processing and comparison with global IASI data	Y	1	Poster	*Pascal BRUNEL*	Météo France
Nov. 13	15:25	Break					
Nov. 13	**16:00**	**NWP Assimilation and Monitoring**					
Nov. 13	16:00	Monitoring and Assimilation of IASI Radiances at ECMWF	Y	2	Oral	*Andrew COLLARD*	ECMWF
Nov. 13	16:20	IASI NRT monitoring at EUMETSAT and results from radiance monitoring	Y	2	Oral	*Lars FIEDLER*	Eumetsat
Nov. 13	16:40	Monitoring and assimilation of IASI data in Météo-France NWP system	Y	2	Oral	*Vincent GUIDARD*	Météo France
Nov. 13	17:00	First results of IASI assimilation experiments at the Met Office	Y	2	Oral	*Fiona HILTON*	Met Office
Nov. 13	17:20	Monitoring of IASI radiances at Environment Canada	n/n	2	Poster	*Louis GARAND presented by Sylvain HEILLIETTE*	CMC
		Comparison of IASI radiances with NWP models from four operational centres	n/y	2	Poster	*Fiona HILTON*	Met Office
		First experience of the assimilation of the IASI data in the ALADIN LAM model	y/y	2	Poster	*Roger RANDRIAMAMPIANINA*	Nowegian meteorological institute
		Using a data assimilation adjoint to improve channel selection of assimilating hyperspectral dataset	y/n	2	Poster	*Benjamin RUSTON*	Naval Research Laboratory
		Special Issue of ACP on results from IASI	Y			*Cathy CLERBAUX*	
Nov. 13	**17:25**	**Validation Campaigns - Radiances**					
Nov. 13	17:25	NIST TXR Validation of Scanning HIS radiances and a UW-SSEC Blackbody	y/n	5	Poster	*Fred BEST*	Space and engineer center Univ. Wisconsin
		Spectral Radiances provide a new standard in absolute accuracy: Direct IASI radiance validation results from aircraft	y/n	5	Poster	*Henry E. REVERCOMB*	Space Science and Engineering Center, Univ.of Wisconsin-Madison
		Validation of IASI L1c Radiances using ECMWF Model Fields and Coincident Radiosondes	y/n	5	Poster	*Larrabee STROW*	
		Performance of an FTIR sounder on several airborne platforms: the Scanning High Resolution Interferometer Sounder (S-HIS)	Y/y	5	Poster	*Joe TAYLOR*	Space Science and Engineering Center, Univ.of Wisconsin-Madison
Nov. 13	**17:30**	**Radiative Transfers and Spectroscopy**					
Nov. 13	17:30	Quantitative spectroscopy of formic acid and formaldehyde leading to high quality databases in the infrared spectral regions	y/n	4	Poster	*Agnès PERRIN*	Laboratoire Interuniversitaire des Systèmes Atmosphériques, CNRS
		Infrared spectroscopic studies of the Earth's outgoing spectrum and the detection of climate change	cancelled	4	Poster	~~*John HARRIES*~~	All Imperial College, London
Nov. 13	**18h00**	**Poster Session 1 & Ice Breaker**					
Nov. 13	20:30	Dinner					

Wednesday, November 14, 2007							
Nov. 14	**09:00**	**Radiative Transfers and Spectroscopy**					
Nov. 14	09:00	The GEISA/IASI Spectroscopic database: evaluation for IASI FLIGHT DATA	Y	4	Oral	*Nicole JACQUINET*	CNRS/LMD
Nov. 14	09:20	An intercomparison of line-by-line models using different molecular databases	Y	4	Oral	*Marco MATRICARDI*	DIFA, University of Basilicata, Potenza, Italy
Nov. 14	09:40	Radiative Transfer Models for IASI and/or Spectroscopy	Y	4	Oral	*Larrabee STROW*	
Nov. 14	**10:00**	**Validation Campaigns - Radiances**					
Nov. 14	10:00	Validation of IASI level 1 and level 2 products using IASI-balloon	Y	5	Oral	*Claude CAMY-PEYRET*	*CNRS/LPMAA*
Nov. 14	10:20	IASI Radiance Validation Analysis for JAIVEX	Y	5	Oral	*Allen LARAR*	NASA Langley Research center
Nov. 14	10:40	Break					
Nov. 14	11:10	Validation of IASI radiances from Joint Airborne IASI Validation Experiment (JAIVEx)	Y	5	Oral	*Stuart NEWMAN*	Met Office
Nov. 14	11:30	Leicester studies of the quality of IASI spectra through infra-red radiative transfer simulations	Y	5	Oral	*John REMEDIOS*	Univ. Leicester
Nov. 14	**11:50**	**Temp. / Water Vapour Retrieval**					
Nov. 14	11:50	Validation and documentation of IASI and companion Metop observations for climate research.	Y/y	6	Poster	*Raymond ARMANTE*	CNRS/LMD
		Temperature, Water Vapour and Ozone retrievals using statistical techniques based on dimension reduction.		6	Poster	*Italia DEFEIS presented Giuseppe GRIECO*	Instituto per le Applicazioni del Calcolo "Mauro Picone
		An updated status on temperature, water vapor and ozone retrievals from IASI radiance measurements, using the NOAA Unique retrieval algorithm	n	6	Poster	*Antonia GAMBACORTA*	Perot Systems
Nov. 14	**11:55**	**Trace Gas Retrieval and Chemistry**					
Nov. 14	11:55	Measurements and modeling of IASI tropospheric ozone	y/n	7	Poster	*Anne BOYNARD*	Service d'Aéronomie/IPSL, CNRS
		Inferring surface fluxes of greenhouse gases from IASI		7	Poster	~~*Frédéric CHEVALLIER*~~	Laboratoire des Sciences du Climat et de l'Environnement
		Tropospheric OZONE from IASI measurements IN THE INFRARED USING ALTITUDE-DEPENDENT TIKHONOV REGULARIZATION.	y/n	7	Poster	*Maxim EREMENKO*	LISA-UMR
		Processing system for analyzing IASI Level 1C data to retrieve trace gases concentrations	y/n	7	Poster	*Juliette HADJI-LAZARO*	Service d'Aéronomie/IPSL, CNRS
		Tropospheric water vapour isotopologues (H216O, H218O and HDO) retrieved from IASI/METOP data.	Y	7	Poster	*Hervé HERBIN*	Université Libre de Bruxelles
		CO retrievals from IASI: comparison with MOPITT/TERRA	y/n	7	Poster	*Mathieu POMMIER*	Service d'Aéronomie/IPSL, CNRS
		Infrared Retrieval of SO2 using high spetral resolution satellite data	y/n	7	Poster	*Fred PRATA*	Norwegian Institute for Air Research
		Assessment of methane using the IASI instrument	y/n	7	Poster	*Ariane RAZAVI*	Université Libre de Bruxelles
		IASI measurements of the HNO3 distributions	y/n	7	Poster	*Catherine WESPES*	Université Libre de Bruxelles
		Study of the transport pathways of pollution in the tropical upper troposphere through the assimilation of spaceborne CO and O3 observations in the MOCAGE model		7	Poster	*Brice BARRET*	NOAA/NESDIS/ STAR
		Dynamic Ozone Profile Climatology : Software bundle for intergration in retrieval sche	y/n	7	Poster	*Anton ZAIFEL*	ZSW
		Potential of CO2 retrieval from IASI	y/n	7	Poster	*Pascal PRUNET*	NOVELTIS
Nov. 14	12:10	Lunch					
Nov. 14	**15:00**	**Clouds and Aerosols**					
Nov. 14	15:00	Cloud detection methods in the IASI L2 PPF	Y	3	Oral	*Xavier CALBET*	Eumetsat
Nov. 14	15:20	Evaluation of summertime convection forecasts against IASI observations	Y	3	Oral	*Jean-Pierre CHABOUREAU*	Laboratoire d'Aerologie Univresité Paul Sabatier
Nov. 14	15:40	Cloud Detection, Clearing and Property Retrieval using IASI and MAIA / AVHRR Cloud Mask and Classification	Y	3	Oral	*Allen HUANG*	CIMSS, University of Wisconsin-Madison
Nov. 14	16:00	Observations of Dust with IASI	Y	3	Oral	*Larrabee STROW*	
Nov. 14	**16:20**	**Validation Campaigns - Products / Properties**					
Nov. 14	16:20	Contribution to tropospheric studies using IASI data	y/n	8	Poster	*Michel KRUGLANSKI*	Belgian Institute for Space Aeronomy
		Atmospheric Sounding campains for IASI validation	y/n	8	Poster	*François MONTAGNER*	Eumetsat
		The Concordiasi Project over Antarctica during IPY	y/n	8	Poster	*Florence RABIER*	Météo France
Nov. 14	**16:25**	**Agencies / Future Programs**					
Nov. 14	16:25	Use of IASI data to prepare new missions in the Thermal infrared		9	Poster	~~*Thierry PHULPIN*~~	CNES
		IASI observations as testbed for development fo Meteosat Third Generation Infrared Sounder end-to-end processing chain	y/n	9	Poster	*Stephen TJEMKES*	Eumetsat
Nov. 14	16:30	Break					
Nov. 14	**17:00**	**Poster session 2**					
Nov. 14	20:30	Dinner					
Thursday, November 15, 2007							
Nov. 15	**09:00**	**Temp. / Water Vapour Retrieval**					
Nov. 15	09:00	Comparison of Land Surface Infrared Spectral Emissivity Derived from MetOP IASI and Aqua AIRS	Y	6	Oral	*Robert KNUTESON*	Space Science and Engineering Center, Univ. Wisconsin-Madison
Nov. 15	09:20	Processing of IASI data at CMS for NWC applications	Y	6	Oral	*Lydie LAVANANT*	Météo France
Nov. 15	09:40	Single footprint sounding and cloud property retrievals from IASI radiances under all sky conditions	Y	6	Oral	*Jun LI*	Cooperative Institute for Meteorological Satellite Studies Univ. Wisconsin-Madison
Nov. 15	10:00	Atmospheric and Surface Property Retrievals from IASI and NAST-I	Y	6	Oral	*Xu LIU*	NASA Langley Research center
Nov. 15	10:20	Break					
Nov. 15	10:40	Preliminary Results of phi-IASI radiative transfer and retrieval products evaluation	Y	6	Oral	*Carmine SERIO presented by G. GRIECO*	Univ. Basilica
Nov. 15	11:00	1d-Var Retrieval of Temperature, Water Vapour and Spectrally Resolved Surface Emissivity Using Data from Joint Airborne IASI Validation Experiment	Y	6	Oral	*Jonathan TAYLOR*	Met Office
Nov. 15	**11:20**	**Trace Gas Retrieval and Chemistry**					
Nov. 15	11:20	Observing trace gases from IASI radiances	Y	7	Oral	*Christopher BARNET*	NOAA/IOSSPDT
Nov. 15	11:40	Monitoring of atmospheric composition using the thermal infrared IASI/METOP sounder	Y	7	Oral	*Cathy CLERBAUX*	Service d'Aéronomie/IPSL, CNRS
Nov. 15	12:00	Midtropospheric CO2 Concentration Retrieval in the Tropical Zone from the MetOp IASI/AMSU Observations	Y	7	Oral	*Cyril CREVOISIER & N.A. SCOTT*	Laboratoire de Meteorolgie Dynamique