Minutes of Meeting

Meeting Name	:	IRSMAG Nov 2018 minutes
Meeting Reference	:	EUM/RSP/MIN/18/1034417, v1D
Meeting Date	:	7-8 November 2018
Meeting Location	:	Belspo, Brussels (hosted by ULB)
Minuted by	:	Bertrand Theodore/Dorothee Coppens
Participants	:	See table below
Distribution	:	Participants + Bojan Bojkov + Erik Gregow + Dave Tobin
Attachments	:	*None*

List of participants:

Name	Institute
MAG co-chairs	
Herve Roquet	Météo-France
MAG secretary	
Dorothee Coppens	EUMETSAT
MAG members	
Nigel Atkinson	MetOffice - UK
Claude Camy-Peyret	IPSL
Pierre-François Coheur	ULB
Nadia Fourrie	Météo-France
Antonia Gambacorta (remotely)	NOAA/NESDIS/STAR
Christina Koepken-Watts	DWD
Miguel A. Martinez	AEMET
Tony McNally	ECMWF
Johannes Orphal	KIT
EUMETSAT + ESA representers	
Daniel Lamarre	ESA
Thomas August	EUMETSAT
Jochen Grandell	EUMETSAT
Tim Hultberg	EUMETSAT
Bertrand Theodore	EUMETSAT
Domenico Schiavulli	EUMETSAT
Invited Talk	
Didier Fussen	IASB

IRS MAG Meeting Agenda

Wednesday 7 November			
14:00 – 14:15		Welcome and agenda	Co-chairs
14:15 – 14:30		Revue of on-going actions	Co-chairs
Instrument, breadboard and level-1			
14:30 – 15:00		MTG IRS – Development Status	Daniel Lamarre
15:00 – 15:30		Presentation on a list of what parameters from the MTG-IRS breadboard are needed.	Claude Camy-Peyret, Johanne Orphal and Dave Tobin
15:30 – 16:00		Status on the level 1 prototype developments and plans	Bertrand Theodore
16:00 – 16:30	**Coffee break**		
16:30 – 17:00		Presentation on ALTIUS instrument	Didier Fussen (invited talk)
17:00 – 17:30		Discussion around the concrete ideas on what could be done in term of limb sounding, in particular in synergy with limb-sounding instruments such as ALTIUS (action.M5.A3)	All
17:30 - 18:00		Update on the last version of the EURD	Jochen Grandell
19:30	**Dinner at the restaurant "Les petits oignons"**		

Thursday 8 November			
9:00 - 9:15		Welcome	Co-chairs
Level-2 activities			
9:15 – 9:45		Status of the internal development of the IRS level-2 prototype	Tim Hultberg
9:45 – 10:15		IRS L2 products, interactions with End Users: studies, feed-back and requirements consolidation	Thomas August
10:15 – 10:30		Potential benefits of assimilating MetOp combined retrieval L2 products in AROME-France	Nadia Fourrie
10:30 – 10:45		Action M5.A22 – Results from the comparisons between the L2VDP and radio-soundings	Dorothee Coppens (slide prepared by S. Tjemkes)
10:45 – 11:00	**Coffee break**		
11:00 – 11:30		NOAA level 2 algorithm developments finalized to improve regional weather forecast applications: boundary layer issues, quality control, first guess choices	Antonia Gambacorta
11:30 – 12:00		• Action.M5.A21 - Available information at ECMWF on the quality of radio-soundings • Winds	Tony McNally
12:00 – 13:30	**Lunch**		
13:30 – 14:00		Action.M5.A14 - NWC-SAF services and products for MTG-IRS	Miguel A. Martinez
14:00 – 14:30		Discussion on specific test cases to assess the potentiality of the L2 processing. External data (i.e. ground-based/in situ observations or sounding from other instruments) would be needed to complete the evaluation (action.M5.A5)	Pierre Coheur Nigel Atkinson + Any other presentation?
14:30 – 15:00		IRS science plan: concept and table of content and to propose book-captains for each section (action.M5.A15)	Tony McNally/Jochen Grandell
15:00 – 15:30		Discussion and comment on the draft processing specification of the IRS-PP	All

15:30 – 16:00		Review of actions/recommendations	All
16:00	**Adjourn**		

Introduction - co-chairs

Introduction of the meeting.

On-going actions – co-chairs

Action #	Action item description	Comments
Action.M5.A1	To include hybrid PC approach in the ATBD L1 and the processing specification and to update EURD (by end of June) accordingly. Linked to **Recom.M5.R1.**	**Closed,** the documents have been updated. **Follow-up action (Action.M6A1): distribute the L1PS (PDR version) to the MAG**
Action.M5.A2	Nigel Atkinson and Dorothee Coppens to compare the performances of each uniformisation method	**Open, there was** no time to perform the comparison, not to mention the problem of the distribution of the SRF from industry to external parties. Daniel Lamarre however mentions that it should be possible to distribute them, TBC.
Action.M5.A3	To come back at next MAG with concrete ideas on what could be done in term of limb sounding, in particular in synergy with limb-sounding instruments such as ALTIUS. A session will be organised at the next MAG.	**Closed,** discussed during the present meeting
Action.M5.A4	MAG members are invited to read the HSIR roadmap and to give some comments. Important is to assess if the direction where EUM is heading in the next 5 years is the correct one and fits the scope of IASI, IASI-NG and IRS	**Closed,** the roadmap is fully approved. Pierre Coheur asks if it would be possible to have the final version made available to the MAG and possibly to a wider audience on the EUM website for instance (**Action. M6A3)**
Action.M5.A5	To provide specific test cases to assess the potentiality of the L2 processing. External data (i.e. ground-based/in situ observations or sounding from other instruments) would be needed to complete the evaluation.	To be discussed during the meeting ➔ **Action considered as closed. Further interactions with end users on IRS level 2 products will continue, as part of EUMETSAT plans**
Action.M5.A7	To come up with a concept and table of content of the IRS science plan and to propose book-captains for each section	**Closed**. Discussed during the meeting
Action.M5.A9	To provide answer to the RIDs raised on the IRS L1 ATBD	**Open**, the ATBD is being updated and the RIDs will be answered accordingly. Postponed to spring 2019
Action.M5.A9 *As presented at 36th STG-SWG March 2014*	To prepare a proposal for the technical and communications procedure to be followed if an update of the global PC basis is necessary in IRS operations. The proposal	**Open,** postponed to spring 2019

	should be circulated to IRS-MAG members for feedback.	
Action.M5.A10 *As presented at 36th STG-SWG March 2014*	To establish which NWP centres envisage to assimilate retrievals for regional/convection resolving NWP	**Open.** Note by Herve Roquet: the SWG could be an appropriate forum to ask this question
Action.M5.A11 *As presented at 36th STG-SWG March 2014*	NWP centres with interest in L2 retrieval assimilation should work together with EUMETSAT to specify which ancillary information is needed in the L2 products, decide on any additional necessary studies to address unresolved L2 assimilation issues and confirm whether NWC needs should drive L2 retrieval configuration, esp. w.r.t the choice of used a-priori profiles	**Open.** Dorothee Coppens comments that there are on-going studies that could help provide answers. Results of the studies will be presented in Spring or Autumn 2019.
Action.M5.A12 *As presented at 36th STG-SWG March 2014*	To establish, with users, e.g. the CAMS community, the potential to retrieve atmospheric composition products (like CO, O3, NH3 and Aerosol Optical Depth) from MTG-IRS and consider whether this can be added as a Day-1 product.	The action was deemed as somewhat vague. Pierre Coheur expressed the importance of the interaction with CAMS to define what could be distributed. Herve Roquet wondered if a first step to interact with this community could be to invite somebody (Vincent-Henri Peuch?) to a MAG. This was agreed by the MAG even if Claude Camy-Peyret added that this should not prevent studies to be performed and further asked if the atmospheric composition products are already defined. The action was thus reformulated as: **Action.M6A4**: to invite a member of the CAMS community (V.-H. Peuch?) to the next MAG to discuss the needs for atmospheric composition products derived from IRS.
Action.M5.A13 *As presented at 36th STG-SWG March 2014*	To establish with key users: a) Is the NWP background still the preferred choice for L2 retrievals? b) Should some parameters be retrieved independently of a NWP background a-priori (e.g. surface parameters, stability indices, TPW)? c) Which additional retrieved parameters are needed (stability indices, integrated quantities)? d) Which additional information is needed (quality indicators, used background profile, metadata)?	Herve Roquet recalled that the L2 processing baseline has been approved with an open choice for the a-priori. The list of parameters is already baselined. Concerning points c) and d), this will be discussed during the meeting following Thomas' presentation ➔ **Action considered as closed, for the same reason as Action.M5.A5**

Action.M5.A14 *As presented at 36th STG-SWG March 2014*	NWC-SAF and NWP-SAF to circulate their list of planned tools for IRS to IRS-MAG and NMSs to solicit feedback on their plans and input for any additionally needed tools	**Closed**. NWP done with IRS-PP and NWC will be presented in this MAG.
Action.M5.A15 *Follow-up of Action.M3.A4*	Johannes Orphal, Dave Tobin, and Claude Camy-Peyret to prepare a list of what parameters from the MTG-IRS breadboard are needed.	**Closed** by the presentation by Claude Camy-Peyret
Action.M5.A16 *Follow-up of Action.M4.A2*	Circulate the IRS level 1 PFS to MAG members (new version coming by summer 2018) along with a test dataset in order to assess the metadata	**Closed**. The PFS was circulated. However Herve Roquet asked about the status of the test dataset. Domenico Schiavulli answered that this goes along with the test data plan that should be presented at the next meeting. **New action Action.M6A5:** Test data plan should be presented at the next meeting
Action.M5.A17 *Follow-up of Action.M4.A5*	To give information on the duration expected of the data outage during the yaw flip manoeuvre on top of the 64 minutes of the flip itself.	Done, **closed**
Action.M5.A18 *Follow-up of Action.M4.A6*	Provide more information on geolocation accuracy	Domenico Schiavulli reported that two methods for providing geolocation are foreseen but the final choice has not been made yet. Tests will be performed this winter and the outcome will be presented at the next MAG. **Open (Action.M6A6)**
Action.M5.A19 *Follow-up of Action.M4.A8*	Consider the dissemination of the imager mode data or, at least, a measure of the scene heterogeneity	**Closed**, images are now part of the L1 product.
Action.M5.A20 *Follow-up of Action.M4.A10*	Circulate the draft processing specification of the IRS-PP	Done. **Closed**.
Action.M5.A21 *Follow-up of Action.M4.A11*	Provide EUMETSAT with available information at ECMWF on the quality of radio-soundings	**Closed** by Tony McNally's presentation
Action.M5.A22 *Follow-up of Action.M4.A12*	Present the results from the comparisons between the L2VDP and radio-soundings	**Closed**. The comparison has been performed and the slides have been distributed (they have not been presented during the meeting for lack of time)
Action.M5.A23 *Follow-up of*	Action on EUMETSAT to circulate the presentation by C. Koepken-Watts and T.	Tony McNally and Christina Koepken-Watts explained that the presentation could be

Action.M4.A15	McNally about the needs in terms of IRS test data and on MAG members to comment and provide feedbacks.	circulated but is not relevant anymore. It would be better to reformulate the action as: **Action.M6A7: to report on the latest views on test data – to be presented at the next meeting**

Presentations	Actions/Recom.
7 November 2018	

MTGIRS – Development Status – Daniel Lamarre (ESA)
 <u>Summary</u>
 2019 will be the year of IRS: several important tests (electrical, thermal, etc…) will be performed on the various models that will be built by the manufacturer:
 • IRS Structural and Thermal Model (STM) – will be tested next year to assess:
      o The impact of micro-vibration.
      o The design of the instrument vs. the thermal environment.
 • IRS core spectrometer (CS)
      o Spectrometer.
      o Interferometer assembly (IA), back telescope assembly (BTA) and detector & electronic assembly (DEA).
 • IRS flat engineering Model
      o Communication.
      o Electronic boxes, incl. instrument control unit, no optical part.
 • IRS PFM – starting in 2019
 • IRS FM2
 	
 The IA/DEA EM (only one) will be developed in Q1/Q2 2019
 	
 Problems appeared on the back-telescope (BTA) – mechanical tests were not successful
 	
 Laser problem: Failure of the laser diode during lot validation tests.
 Thermo-elastic behaviour investigations because of the 3-axis stabilized satellite.
 	
 <u>Discussion:</u>
 Tony McNally: any development on the effective pixel size that was discussed at the previous MAG?
 Daniel Lamarre: there was maybe a misunderstanding on the integrated energy concept. The FWHM of the PSF is close to 4km, as required. However, of representing 67% of the energy in the pixel, which is the theoretical limit, we will have 62 or 63%.
 Claude Camy-Peyret: then we will have cross-talk between the pixels?
 Daniel Lamarre: yes.
 Calude Camy-Peyret: will the PSF be provided?
 Daniel Lamarre: yes.
 Johannes Orphal: what is the logic behind the tests performed with the various instrument models?
 Daniel Lamarre: a verification matrix has been devised to explicit which test will be performed with which model
 Johannes Orphal: Will the flight model be put under stress?
 Daniel Lamarre: yes, because we don't have a qualification model	

Presentation on a list of what parameters from the MTG-IRS breadboard are needed (follow-up of action M5A15)– Claude Camy-Peyret, Dave Tobin and Johannes Orphal Summary Claude Camy-Peyret presented his views: interferograms (160x160) illuminated by a stable and homogeneous source to get an independent estimate of the radiometric noise and spectral responsivity. If the full matrix cannot be obtained, at least a set of interferograms from various parts of the detector with some redundancy to check the consistency. Information on the test configuration is important as well. Discussion: Daniel Lamarre pointed out that what Claude calls the breadboard is what ESA refers to as the CS. Tests will be performed in 2019. Claude Camy-Peyret: Will tests be performed in the vacuum testing? Daniel Lamarre: yes, and the data should be available Johannes Orphal presents as well his thoughts on the subject: we need to have an independent verification of the instrument performances, however the idea is of course not to control what industry is doing. Could the testing be interactive? Daniel Lamarre: yes and it even would be good to have a kind of interaction. Claude Camy-Peyret: we now have, thanks to Daniel Lamarre's presentation, an overview of what kind of data from which kind of instrument will be available. Ideally, we would need the Pierre Coheur data however data from the CS is a good start Daniel Lamarre: the detector (DEA) on the CS is from the first generation so it would not perform like the one on the PFM (but close to) Herve Roquet: could the data be provided in a format close to the L0/L1 format? Daniel Lamarre: probably not EUM: the conversion from raw data to L0/L1 could possibly be done at EUMETSAT It is noted that it is important to keep the list of needed data in line with industry data availability	**Action.M6A8:** Merge Claude and Johannes presentations so as to have a full view on the instrument data needed from the engineering models **Action.M6.2**
Status on the level 1 prototype developments and plans – Bertrand Theodore Summary L1 prototype processor developed by KIT was delivered to EUMETSAT, lacking validation and missing some components. Completion and alignment with the L1PS driven by the critical milestone of June 2019: freeze of the L1PS. IDPF-S in development by Thales, next milestones: Preliminary design review (PDR) in January 2019 Critical design review in January 2020 Acceptance review v1 (core of the processing): September 2020 Acceptance review v2 (core+optimization, monitoring): June 2021 Test data generation for testing L1PP, IDPF-S and probably the IQT. Generation is constrained by the volume of input data (high-resolution NWP fields) and the	

computations to be performed.
Preliminary list of test datasets addressing the main possible issues that could affect the instrument.

Discussion
Tony McNally emphasized that, concerning test data, we should not restrict ourselves to a minimal set of test data because of a lack of computational power. He proposed to provide high-resolution atmospheric fields at 1.5 km resolution from the experiments with high-resolution models performed at ECMWF. It could even be possible to compute the corresponding spectra (TBC). This proposition is very welcomed by EUMETSAT.

Presentation on ALTIUS instrument – Didier Fussen

Summary:
D. Fussen, head of Department at BIRA-IASB, emphasized that there is a crucial need for high vertical resolution atmospheric sounding missions - limb-sounding instruments such as ALTIUS have this capability.
ALTIUS original idea dates back from 2005. It is a UV-VIS-NIR (250-1800 nm) limb spectral imager on a heliosynchronous orbit. Target vertical resolution: 0.5 – 1km.
Main target: stratospheric O_3 (operational product). But other measurements are possible: aerosols, PMC, PSC, H_2O, possibly CH_4, N_2O
Measurements combine limb-scattering (global coverage) and occultations (self-calibration), can be done sidewards or backwards, very light and flexible instrument.
Still some issues to be solved, financing not completely covered, ground segment…
Selected as an ESA Earthwatch mission – NRT is planned but depends on the infrastructure of the GS.
Launch target: Dec 2021.

Discussion:
Claude Camy-Peyret: will direct broadcast be available?
Didier Fussen: because of RTM, it's not so trivial to process the data. Level 2 processing in one hour.
Tony McNally insisted on the importance of having NRT data for the data to be used in NWP.
Didier Fussen: yes, but it is a problem of budget and downlink debit.
Johannes Orphal: one argument for operation is not only O_3 monitoring but CH_4. This is a political issue.
Pierre Coheur: how low in the atmosphere can the instrument scan?
Didier Fussen: 10-15 km in visible for ozone

Discussion around the concrete ideas on what could be done in term of limb sounding, in particular in synergy with limb-sounding instruments such as ALTIUS

Pierre Coheur: a specific area of synergy with IRS could be the quasi limb observation that the latter will perform at high latitudes: IRS will have very good stratospheric ozone and will see a bit of the polar processes Claude Camy-Peyret: what is assimilated at high latitude in NWP? Tony McNally: ECMWF is assimilating MSG up to 70 degrees. This is possible for sure up to 75 degrees. The limitation is the cloud detection and the thermal contrast, but up to 70 degrees there is no degradation wrt nadir observations. Johannes Orphal: should we run some studies to investigate this? All: first step would be to clarify the context: **Action**: Tony McNally/Claude Camy-Peyret/Johannes Orphal to write a small text to emphasize the requirement for NRT access to ALTIUS products for assimilation purposes, and their potential contribution to validation campaigns H_2O is also interesting. ALTIUS can have H_2O in the lower atmosphere, in UTLS. Tony McNally: revisit time is not an issue for NWP, this has no impact.	**Action.M6A9**
Update on the last version of the EURD – Jochen Grandell Summary: Jochen Grandell presented the main IRS requirements that have been clarified, added or improved (including spectral sampling, radiometric performances or integrated energy in the pixel) A new scanning sequence is now suggested (following a MAG recommendation) and the timeliness has been revised. The updated EURD has been presented at STG and SWG and should be approved by council in December 18. Version 5 will be generated after CDRs, with available expected instrument performances. Discussion: Daniel Lamarre: is the new scan law agreed? Jochen Grandell: the document has been agreed by the delegate bodies so, yes, it is agreed. Comments can still be taken onboard. Daniel Lamarre: what is the current version of the document? Jochen Grandell: v4 Tony McNally: we have seen earlier that the requirement of 67% integrated energy in a 4x4km pixel is unreachable so why put it in the EURD. It will be a non-compliance, why don't put something realistic there? Jochen Grandell: could be for historical reasons but also it could be too late to change it. Daniel Lamarre: ESA would be happy to provide a realistic value to put in the EURD Tony McNally: then we should update the EURD, we are aware that there is a problem there, it would be dishonest to let the users believe that they will get a pixel of 4x4km while we know this won't be met. Herve Roquet: what is the way forward then? This requirement should disappear	

in v5. Should we put an action on EUMETSAT? Jochen Grandell: we will have anyway a discussion in house. Dorothee Coppens: so we put a recommendation to clarify the pixel size (in terms of integrated energy)	
Action to send the EURD v4 to MAG. Recommendation: to clarify what the actual pixel size (EUMETSAT)	**Action.M6A10** **Recom.M6.1**
8 November 2018	

Status of the internal development of the IRS level-2 prototype – Tim Hultberg

Five topics.
- PC test data for user familiarization
    - Based on a simulation from ECMWF fields
    - Both clear and cloudy radiances
    - One full day, hourly disks
- L2 prototyping activities
    - Development on-going
    - Some modules already completed, missing are still the cloud detection, optimal estimation and the conversion from slant to vertical profiles. Estimation: spring 2019
- Cloud information for L1
    - Based on PWLR, to be added to L1PS
    - Presentation of the results of the demonstrator that gives promising results
- Forecasts as prior in the statistical retrieval
    - FCT performs better than PWLR if ERA5 is taken as truth but the simulated radiances fit the measurements better
    - But PC analysis shows that for the leading PCs (broad structures), the performance of PWLR is similar to the one of FCT. Small scale structures are not seen by the measurements but can be included using FCT as prior information
    - Tests on-going but preliminary results are promising
- Error estimates in the PWLR

But not enough time to show everything.

Tony McNally: The PWLR with FCT a-priori is a kind of Frankenstein monster: it's difficult to interpret because of the two different sources of a-priori
Cristina Koepken-Watts: this question is anyway related to the kind of product we want: do we want the product to be independent from the FCT?
Dorothee Coppens: finding the answer will require interaction with the users (see next presentation by Thomas)

Discussion on the error estimation with the mixed a-priori info. Tim Hultberg stated that the estimation is very accurate and better than having the error estimated on the a-priori, and the measurement (+ RTM error…)

IRS L2 products, interactions with end users: studies, feed-back and requirements consolidation – Thomas August

Four topics:

- L2 ATBD/PD status: update after the MAG review, ready for the price conversion, some convective parameters added (consistent with FCI products)
- Instability: instability can be detected with IASI so why not with IRS? Some instability parameters are based on averaged quantities where the vertical structures may be less important. A series of test cases are presented which illustrate this possibility qualitatively.
- Experiments swapping the *a priori* in IASI L2 OEM (FG/FCT):
  - Updated results from last year *vs* sondes – OEM (with FCT) slightly closer to sondes than OEM (with PWLR) but OEM (with inaccurate FCT) not performing well, unlike OEM (with PWLR).
  - Demo experiment OEM (model error + FCT): posterior retains fine structures of the prior as expected, however posterior extremely close to prior → No real information taken from the measurement. OEM (PWLR) smoother, broadly in good agreement with (FCT) but can be significantly different in places.
- User feedback: interaction with the users has been pursued:
  - FCT or not FCT? Many requests for independent information – to be studied further how products can be used and should be represented (including e.g. lapse-/layer- quantities)
  - Quantities used by the forecasters. Example of an external study with the Hungarian met service and ARSO on the validation and use of IASI L2, the assimilation of IASI L2 in regional NWP at M-F and some cases studied at the DWD. EUM participated to the training of forecasters at FMI with discussion on the current IASI L2 products to raise awareness and dialog on current products, and the expectation from IRS.
- Next steps:
  - Pursue studies with Met Services and organise hands-on sessions with forecasters to collect feed-back (e.g. ESSL)
  - Identify and procure test cases where added-value of different product configurations can be evaluated
  - Experiments with different a-priori
  - Regional users workshops to compile feed-back and consolidate requirements

Potential benefits of assimilating Metop combined retrieval L2 products in AROME-France – Nadia Fourrie

Model: Arome, 1.3 km horizontal resolution, 90 levels from the surface to 10hPa, assimilation of various observations: radar, surface, aircrafts, radiosondes and satellites

IASI L2 assimilation: temperature and WV profiles, only L2 received in Lannion, 1 profile assimilated over a 160km box, only data above 1000hPa over sea, 900 or 700hPa over land depending on the orography
Assimilation experiment:
    • baseline: no IASI, AMSU or MHS data
    • control: baseline + IASI, AMSU and MHS L1 radiances
    • L2: baseline + L2 products
Results: very small impact on temperature and humidity in general. L2 experiment has scores comparable with the control, L2 helped to decrease the bias in the T/q forecasts as compared to *in situ* measurements
 	
Comment by Johannes Orphal: this is interesting but we have to follow accurately where the information comes from	

Action M5.A22 – Results from the comparisons between the L2VDP and radio-soundings – (slides from Stephen Tjemkes) Due to a lack of time and because the L2VDP is not the baseline of the MTG L2 processing, the slides have not been presented but have been circulated.	

NUCAPS algorithm developments targeted towards regional forecasting applications: boundary layer issues, quality control, first guess choices
 	
Antonia Gambacorta presented the rationale and strategy for the development of unified retrieval algorithms for hyperspectral missions at NOAA, including from EUMETSAT IASI mission.
 	
She discusses the advantages of forecast-free retrievals, which is a strong requirement at NOAA, in particular in view of using the atmospheric sounding products in support to weather forecasting.
 	
Antonia presented NOAA's activities in interacting with forecasters during dedicated campaigns and illustrates how their potential is explored with sample case studies.
 	
NUCAPS → NOAA L2 operational algorithm:
    • statistical regression (Goldberg, 2003)
    • cloud clearing (sometimes introducing a cold bias)
    • sequential OE
 	
First the temperature spectral channels are used, then the water vapour using WV spectral channels is solved, then the temperature is solved again using both temperature and WV channels ➔ this has improved the retrievals.	

Action.M5.A21 - Available information at ECMWF on the quality of radio-soundings – Tony McNally (on behalf of Bruce Ingleby) Presentation of the profile of the temperature accuracy for the various types: about 1K, and for RH: between 10 and 18. Many different types of sondes exist.	

This answers the question, action closed

Impact of hyperspectral IR radiances on NWP wind analyses / forecasts - Tony McNally

Radiance assimilation of LEO hyperspectral sounders (IASI/CrIS) provides more information on wind than the AMVs thanks to the 4DVAR tracing implicitly the humidity structures.

This will be even more true with a good time sampling so the impact on wind of MTG-IRS products (radiances in 4DVAR + 3D winds) will be enormous!

However, error in L2 humidity fields are complex, correlated and situation dependent. It will then be important to better characterise the vertical structure in the humidity profiles in terms of inter-level correlations and the meaning of the vertical sensitivity.

Action.M5.A14 - NWC-SAF services and products for MTG-IRS – Miguel Martinez

The NWCSAF is developing several software prototypes for local generation of nowcasting products from MTG-IRS:

- qIRS: reconstruction of BTs spectra from the Principal Components (PCs); combination and re-projection (on the FCI grid) of the spectra over user-defined regions of interest; generation of IRS L1 imagery products. In the presentation several examples of IRS L1 imagery for use in nowcasting have been shown
- sSHAI_ES: interpolation to user-defined pressure levels and reprojection of IRS L2 products+computation of NWC parameters (TPW, LPW, instability). This was illustrated by the interpolation and reprojection of EUMETSAT IASI L2 (PWLR[3] and OEM) products (T, q etc…) over a selected NWCSAF region
- sSHAI: locally generated IRS L2 product using as inputs IRS BTs (qIRS) and local NWP models + computation of NWC parameters

The users could thus get a synergistic exploitation of IRS L1 and L2 products together with the NWCSAF/GEO products from FCI and LI products.

Discussion:
Tony McNally: several people have been simulating synthetic spectra; there is a common interest. Is there room for a collaboration?
Miguel Martinez: yes this should be possible.

Discussion on specific test cases to assess the potentiality of the L2 processing. External data (i.e. ground-based/in situ observations or sounding from other instruments) would be needed to complete the evaluation (action.M5.A5)

Pierre Coheur:
Presentation on test dataset for IRS atmospheric chemistry application (air quality, fires, volcanoes). The question is: is it useful and if so, what are we aiming for? There are existing database from past ESA studies: OnTraq/Camelot, Isotrop2017,

NITROSAT2018. There are also airborne field experiments from NASA, NOAA, NSF.

Nigel Atkinson:
Proposed to run a study using GRUAN datasets + RTM + noise. ➔ then IRS L2 retrievals (different a-priori) for testing.
This would be useful to understand what IRS can or can't see, but not to address the user needs.

Tony McNally: Problem with RTM simulation, radiosondes are missing Tskin and upper stratosphere info.
Christina Koepken-Watts: the GRUAN dataset is very interesting for validation. However, this should not be the only parameter to decide which prior is the best
All: is it then worth spending time on generating these while we have other problems to solve?
Tony McNally: We won't learn anything we already know with this activity. Interacting with users on their needs (taking uncertainties, layer sensitivities…) is more important.
Dorothee Coppens: EUMETSAT is actively interacting with the user community by initiating studies, participating to workshops and direct communications.

IRS science plan: concept and table of content and to propose book-captains for each section (action.M5.A15)

Presentation by Tony McNally:
Emphasis on the unique combination of hyperspectral measurements at high time and spatial sampling. Decision on the book captains during the presentation:

Chapter 1: Rationale for IRS and system description ➔ Dorothee Coppens
Chapter 2: Cross-cutting challenges ➔ Johannes Orphal
Chapter 3: Support for operation meteorology ➔ Christina Koepken-Watts
Chapter 4: Support for AC monitoring and forecasting ➔ Pierre Coheur
Chapter 5: Support for future climate science ➔ Claude Camy-Peyret
Chapter 6: Scientific process studies ➔ Tony McNally

Tony then presents some ideas for the various chapters and in particular a template for each topic:

- What is it: generally improving our understanding of it?
- Why does it matter: current shortcoming of knowledge?
- How IRS will be used?
- Who will actually do the work and should we guide this?
- What are the expected outcomes and who/what will benefit?

Tony McNally suggest another possible chapter "supporting community science" as with MTG, the 0 degree GEO region will be the most comprehensively observed region from space ever.

Discussion Christina Koepken-Watts: maybe we should add something on the synergy GEO-LEO Pierre Coheur: if the plan is short enough this could even take the form of a paper and give a wide audience (and is motivating for the authors) Jochen Grandell: we have to decide to make it short or not Herve Roquet: Short is better - the idea is to have a draft at the next meeting, final version by the end of 2019. Action: all chapter coordinators to come to the next meeting with a draft of their contribution	**Action.M6A11**
Discussion and comment on the draft processing specification of the IRS-PP – All The document has been distributed a few months before the meeting. The proposition is acceptable. Nothing has been discussed.	
AOB **Ideas for the next meeting:** • To have presentation(s) covering atmospheric composition and air quality aspects: o Invite someone from CAMS. o AC-SAF C-DOP4 plans? • To organise better the time allocation in the agenda, to reserve clearly time for discussion. • Include a presentation (WHO?) on Error covariance matrix. Next MAG will be in May 2019, in Darmstadt.	

Recommendations:

List of Recommendations	
Recom.M6.1	EUM to clarify what the actual pixel size in term of integrated energy

Actions:

List of Actions			
Action #	**Action item description**	**Due date**	**Actionee**
Action.M6.1	To distribute the final version of the L1PS (PDR version) to the MAG when available.	Sept. 2019	EUM
Action.M6.2	To keep a list of test data needed in line with industry data availability.	Next MAG	EUM
Action.M6.3	To distribute the final version of the roadmap for the development of hyperspectral infrared products to the MAG, and investigate the possibility to make it available to a wider audience (e.g. via EUMETSAT website).	Dec. 2018	EUM
Action.M6.4	To invite somebody from the CAMS community (V.-H. Peuch?) at the next meeting to discuss the needs for atmospheric composition products derived from IRS.	Next MAG	EUM
Action.M6.5	To circulate results of the study on geolocation accuracy.	Next MAG	EUM (GEO)
Action.M6.6	Test data plan should be presented at the next meeting.	Next MAG	EUM (GEO)
Action.M6.7	To revisit Tony McNally and Christina Koepken-Watts's old presentations on the needs for L1 and L2 test data and report at the next meeting as a follow-up of M5.A23.	Next MAG	Tony McNally and Christina Koepken-Watts
Action.M6.8	To merge the views of Claude Camy-Peyret and Johannes Orphal into a single list of desirable test data/parameters from the IRS Engineering Model (EM) as follow-up of M5.A15.	Next MAG	Claude Camy-Peyret, Johannes Orphal
Action.M6.9	To write a small text to emphasize the requirement for NRT access to ALTIUS products for assimilation purposes, and their potential contribution to validation campaigns.	Next MAG	Claude Camy-Peyret, Johannes Orphal and Tony McNally
Action.M6.10	To make available to the MAG the latest version of the MTG EURD (v4).	Next MAG	EUM

Action.M6.11	To come up with a draft of each chapter (Dorothee Coppens, Johannes Orphal, Christina Koepken-Watts, Pierre Coheur, Claude Camy-Peyret, Tony McNally)	Next MAG	Science plan coordinators
Previous actions still open			
Action.M5A2	To compare the performances of the different uniformisation methods	Nov. 2019	Nigel Atkinson and Dorothee Coppens
Action.M5A9	To provide answer to the RIDs raised on the IRS L1 ATBD	Next MAG	EUM
Action.M5A10	To establish which NWP centres envisage to assimilate retrievals for regional/convection resolving NWP	Next MAG	EUM
Action.M5A9bis	To prepare a proposal for the technical and communications procedure to be followed if an update of the global PC basis is necessary in IRS operations. The proposal should be circulated to IRS-MAG members for feedback.	Next MAG	EUM

"by next MAG" should be circulated 2 to 3 weeks before the meeting at latest.