Minutes of Meeting

Date(s) Meeting held : 04/06/2020

Location : Webex

Minuted by : Bertrand Theodore

Participants : see table below

Distribution : participants

Attachments : *< if applicable >*

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
Flavio Iturbide	NOAA
Christina Koepken-Watts	DWD
Miguel A. Martinez	AEMET
Tony McNally	ECMWF
EUMETSAT + ESA representatives	
Daniel Lamarre	ESA
Tobias Guggenmoser	ESA
Thomas August	EUMETSAT
Pierre Dussarrat	EUMETSAT
Gary Fowler	EUMETSAT
Stefano Gigli	EUMETSAT
Jochen Grandell	EUMETSAT
Tim Hultberg	EUMETSAT
Domenico Schiavulli	EUMETSAT
Bertrand Theodore	EUMETSAT

Introduction – H. Roquet

Due to the circumstances, the meeting is held as a tele-conference and reduced in length with respect to what was originally planned. Herve Roquet thanks the participants for their flexibility. The agenda is adopted without modifications.

On-going actions

List of Actions

Action #	Action item description	Status
M8.A1	Circulate the status of the actions a week before the MAG meeting	**Closed by completion**
M8.A2	ESA and EUM to solve the issue of the OPDmax/Nb of samples in the interferograms	**Closed by answer**
M8.A2bis	Distribute the values, once fixed, to the group	**Closed by completion**
M8.A3	As a follow-up of action M7.A4 that could not be completed, EUM to make the performances of the INR (not the algorithm itself) available to the group or what is needed to make it possible	**Open** and postponed to next the meeting in fall 2020 when new information (due in July) will be available
M8.A4	ESA to finalize the list the instrument non-conformities that could have an impact on the products	**Closed by completion**. An updated status will be given during the meeting.
M8.A4bis	MAG members to provide an assessment of the impact of the instrument non-conformities in their applications	**Open** as this is related to the completion of M8.A4. Postponed to the next the meeting in fall 2020
M8.A5	EUM to circulate a mathematical description of the uniformization (as e.g. an extract of the L1 PS) to the MAG members	**Closed by completion.** Nigel Atkinson states that this is a very nice short report. Claude Camy-Peyret seconds this statement and proposes its inclusion in the science plan > **Action M9.A2**
M8.A6	Nadia Fourrie, Christina Koepken-Watts and Tony McNally to clarify the details (dwell(s) ID, spatial resolution of the input data, number of time slices) of the IRS L1 test dataset to be generated	**TBD**: to be discussed during the meeting. Depending on the outcome of the discussion, a new action will be proposed
M8.A7	ECMWF to generate a L1 dataset according to the characteristics defined by the answer to action M8.A6 and the spectral sampling defined by answer to action M8.A2	**TBD**: the completion of this action is linked to the closing of M8.A6**,** that could not be completed. The subject of test data will however be discussed during the meeting and a new/updated action could replace this one.
M8.A8	Dave Tobin to circulate a paper (issued in May 2019) about blending ground and satellite measurements	**Closed by completion**

M8.A9	EUM to make the IRS L1 format specification available to the MAG members along with the test dwell awaiting distribution (answer to action M7.A7)	**Open:** the IRSL1FS was made available to the group, however the test dataset was corrupted and has not yet been updated.
M8.A10	MAG members to assess, using the test dwell that will be distributed as answer to action M7.A7 and the L1 format specification (action M8.A9), whether the metadata (flags, quality indices, etc…) in the L1 product files suit their needs	**TBD**: this action is linked to the completion of M8.A9 that could not be closed. The subject of test data will however be discussed during the meeting and a new/updated action could replace this one.
Previous actions still open		
M7.A3ter	Provide information on the model used to generate the chromatism values already supplied to EUMETSAT	**Closed by completion**
M7.A7	Distribute the existing dwell of simulated IRS L1B PCs which was mentioned at the SWG-46 to the MAG members	renamed M8.A9
M7.A13	Circulate a first version of each section of the science plan	**Open**. However an update of Ch. 4 has been received. So far, only Ch.1 and Ch. 4 have been circulated. Christina Koepken-Watts comments that there is a good level of details in these chapters. She had planned to work on her part in spring but due to the circumstances, this slipped. Herve Roquet observes that this is perfectly understandable and thanks those who contributed.

Summary of instrument non-compliances – D. Lamarre

Presentation of the requests for deviation that will be presented by OHB at the MTG-S CDR that will take place at the end of summer. There are four of them:

- IRS integrated energy: in LWIR, only 66.6% (typical case) or 60.2% (worst case) of the energy falls within a single pixel instead of the required 67%.
- Inter-band co-registration is 983m in the worst case, while it should be 800m or better
- The requirement on the radiometric noise is not fulfilled for most spectral channels although only in the worst case.
- The requirement on the in-field stray light is addressed in the following presentation.

Tony McNally: still confused about this new 12km compliance figure. More generally (and a point raised before) this issue of "pixel size" is very important for users to plan how they will use the IRS data. e.g. will it make sense for us to use adjacent pixels. Do they provide independent information or not ? Would it make more sense for us to plan to average pixels together...or sample pixels to ignore adjacent pixels. Such questions have science and technical implications that we need to plan for.

Christina Köpken-Watts: same concern.

Daniel Lamarre: We had a requirement on IE over 4x4km but we realized that we could not achieve it as it was almost considering that the instrument is diffraction limited. So instead of considering a single pixel alone, we considered the first row around a given pixel i.e. a group of 3x3 pixels of 12x12km. Of course the requirement is then much higher: it is no longer 67% but 92 or 94% IE. So it is just a choice for making sure that the energy is contained within the central pixel and the row of pixels around it. This was the way not to wave this requirement.

Claude Camy-Peyret: commented on the shape of the PSF: part of the energy could be only slightly spread around one given pixel and we have to quantify that. Daniel was explaining that by choosing this 12km requirement, we can be sure that more than 92 or 94% of the energy is within that, however the main contribution could be close to 4x4km.

Pierre Dussarrat: This will be presented later that can help the discussion that shows that, indeed, the resolution is not 12km.

Tony McNally: what we need is some guidance on is the implication of this PSF for the strategy of how the data is transmitted in term of independence. Clearly from what we are seeing it does not make any sense to considering adjacent 4km pixels as independent at all. We can widen our radius to a larger figure and then the situation changes but I think we need to have a very clear idea of that in advance as it has a huge implication on the data volume, the transmission and usage but also the science strategy.

Stefano Gigli: the point is not black and white. First of all the integrated energy is a function of the wavenumber so the requirement of 67% within 4x4km is not met but just at the lower edge of LWIR. Furthermore if 66% of the energy is concentrated within the central pixel, 34% is coming from the 8 pixels around it i.e. 4% for each adjacent pixel. I thus would not say that the pixels are strongly dependent of each others and only for the lowest wavenumbers.

Tony McNally: This is a new situation for us in the sense that we are not usually assimilating pixels where there is a spill of energy on one pixel to the next. We are usually using pixels that are spatially separated and therefore independent even though the PSF for these particular pixels is a rather vague concept and we take no account of it in the assimilation system.

Stefano Gigli: but this behaviour is typical of every optical instrument

Jochen Grandell: I understand that a scatterometer has such a spilling from one pixel to the other but you do of course a data thinning, is that the case?

Tony McNally: yes a scatterometer is an obvious case where there is oversampling and it was deliberate, I believe. But most of the users of the IRS products will be familiar with using data from instruments like IASI where there is no oversampling.

Thomas August: do you assimilate SEVIRI data? In that case don't adjacent pixels slightly overlap?

Tony McNally: yes, we do assimilate SEVIRI data but because of this exact issue, we use a spatially averaged product, we make no attempt to assimilate individual pixels and this is exactly the origin of my question. At the moment we are designing incredibly large data-handling system for MTG-IRS and if that makes no sense because of the optics we should change strategy now and be given guidance from the instrument producer.

Tobias Guggenmoser: taking into account the spill of energy could be done using the correlation matrix in the assimilation system; I don't see how it can be done on the instrument side.

Stefano Gigli: or stated differently you may have a requirement on the maximum amount of energy you can accept from to the adjacent pixels.

Tony McNally: then let me redirect the question to EUMETSAT: knowing what has just been presented by Daniel, does it make sense to disseminate IRS data at every pixels?

Stefano Gigli: maybe not, but I do not understand why this should not make sense since there is a difference between pixels.

Thomas August: Tony, what you are implying is that because NWP is not going to make use of each every pixel then they should not be necessary disseminated to preserve bandwidth but then you cannot decide in advance which pixels you are going to assimilate because I assume you are going to target the clearer pixels first. Plus, there are other applications that will need the full spatial sampling so it cannot be discarded as such immediately.

Claude Camy-Peyret: I fully understand Tony but one question is what could be the acceptable correlation between pixels? You could then choose your spatial sampling distance to thin the quantity of data.

Tony McNally: we can experiment with that and we have some a-priori ideas about what the requirement would be. I like the concept of 12km as it is quite honest and easy to understand. But the question is that we have put a lot of work trying to manage bandwidth, science and technical work to alleviate the problem of bandwidth. But if the 4km concept is a rather artificial concept in the sense of information content then there may be some saving in the dissemination that could be made. Are there any user out there who would make use of the 4km pixel in that way or not. If there are clear users, then that answers my question.

Pierre Coheur: I understand your concern and I agree that this may be the first time that we use an imaging FTS so there are issues that we have never tackled before. I think that the 4km is still something that will be critical and a breakthrough that the mission can bring even though it is not really 4km. If we degrade to 12km we will lose a lot of what IRS can provide so I think what we will need is an accurate knowledge of the PSF and we will do our best with that.

Miguel Martinez: it is really important to have the 4km pixel for nowcasting applications.

Tony McNally: so the answers are clear so we will not consider any actions to reduce the data volume at source. I am happy with that and we will take our own steps to handle the data volume.

Gary Fowler: I would like to give a bit of background. What Pierre Coheur was saying about the imaging spectrometer is a very good point and one we considered earlier on the mission. So when we were coming up with these requirements we were considering the user needs to image small holes in clouds and there were a lot of debates on how big these holes should be. If we cluster the pixels together and take an average over 12km, it reduces the capability of finding holes because these will not be nice and square. And I think also that with imaging spectrometer, there is a great potential for handling the data in a different way looking at the PSF rather than just saying "all my pixels are independent". So for the future of this instrument I think there is a lot to investigate here and it will bring a lot of science and new analysis techniques that everybody will benefit on.

Herve Roquet: so my conclusion is that we do not take any further action apart from what is already planned.

Claude Camy-Peyret: we had a very interesting and important discussion. It would be good to have it reflected in the minutes.

Dorothee Coppens: as soon as we have the final information on the PSF, we will anyway circulate it to the MAG members.

IRS in-field straylight – D. Lamarre

Gary Fowler: we have discussed this issue quite a lot with D. Lamarre. The first step is to get the PSFs so that we can do an assessment at L1 and L2 of this effect so that is really the information we need to get before making any statement.

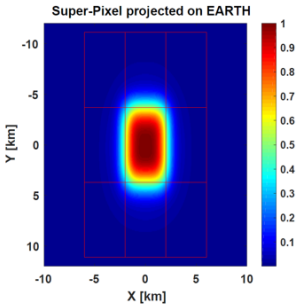
Daniel Lamarre: that is agreed, we have delivered the PSF but there is still uncertainties on what the file represents. I am in relation with OHB so that EUM should get the information by this week.

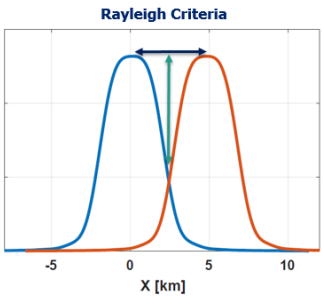
Gary Fowler: about the correction, we probably have to do it at L1 and this would probably be quite a processing-intensive thing to do.

Impact of the instrument optical performances on the L1 products – P. Dussarrat

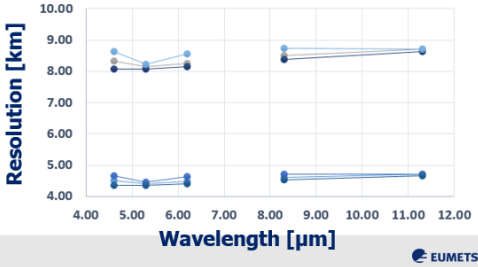
Super-pixel PSF Description without Straylight

- **From: MTG-KT-IR-MA-0001/ MTG-KT-IR-RP-0036 (CDR data-pack)**
- **Focus on Europe (~Paris) @11.3µm:**
  - Pixel = 90 µm (4x4km)
  - Longitude = 0° (X)
  - Latitude = 50° (Y)
- **Low dependency on wavelength and FOV :**
  - Pixel size limited





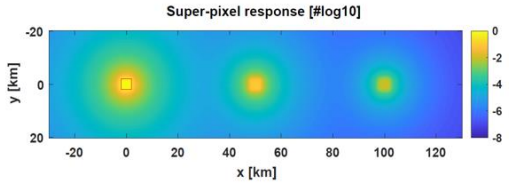
Wavelength [µm]	4.60	5.30	6.20	8.30	11.30
Rayleigh X [km]	4.67	4.45	4.63	4.72	4.72
(Min - Mean - Max)	4.51	4.41	4.47	4.60	4.71
	4.36	4.36	4.41	4.54	4.67
Rayleigh Y [km]	8.64	8.23	8.56	8.73	8.72
(Min - Mean - Max)	8.34	8.16	8.26	8.50	8.71
	8.07	8.07	8.15	8.39	8.64

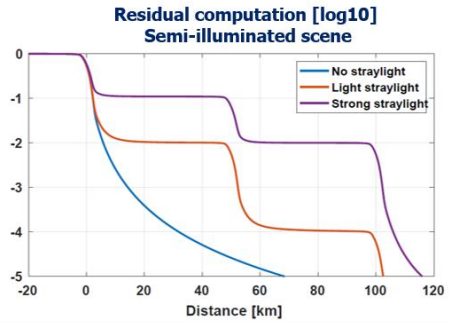


4 EUM/RSP/PLN/20/1178416, v1 Draft, 26 May 2020 EUMETSAT

Super-pixel PSF with Bouncing (ghosts)

- **04/06/2020: No PSF available**
- **Requirements:**
  - Residual: 1% at 50km and 0.5% at 100km (IRS-URD_1017)
- **Information:**
  - 50km bouncing
  - 100km straylight requirement close to be fulfilled
- **Two scenarios have been considered:**
  - Light straylight: 1% bouncing signal, requirements ok
  - Strong straylight: 10% bouncing signal, requirement 50km, 100km ~x2 spec





5 EUM/RSP/PLN/20/1178416, v1 Draft, 26 May 2020 EUMETSAT

Conclusion

Bouncing impacts

- One direction ghosts with an amplitude ~ a single wave-number radiometric noise,
- Strong dependency with the wavenumber,
- Barycentre shifts function of wavenumber, threaten the intra-band co-registration,
- Spectral calibration jitter (up to a few ppm).

➔ Other requirements could be impacted by the in-field straylight, not only the one specifically on the straylight itself.

10 EUM/RSP/PLN/20/1178416, v1 Draft, 26 May 2020 EUMETSAT

Claude Camy-Peyret: you did a good exercise, very interesting simulation. You said that the ghosts are going into a single direction. Is it your own choice or is it the actual pattern ?

Daniel Lamarre: I can answer that. In the MWIR, most of the ghost are more or less symmetric. But the one related to the dichroic reflections goes into a single direction. So this asymmetry corresponds to the reality. About the co-registration, it is not because one is moving from one place to the other that his average position is in between the two places.

Pierre Dussarrat: I agree with you that it is the problem of the barycentre, in fact with all averages: you lose information. I was rather thinking to the problem of the location of a point source.

Claude Camy-Peyret: I can reassure Pierre. For those wanting to use IRS spectra to really make an emission characterization, a first step would be to have a general idea of where it is, then one can make use of better high-resolution images to confirm the position of the source. Then the exact position of the source will not matter much because one will know that from external sources. What would matter is the mapping of the IRS pixels to this absolute reference. Generally and except for power plants, sources will not be localized, so it is not that much of a problem.

Herve Roquet: how much are these impacts time-dependent?

Daniel Lamarre: in principle this will not change because these effects originate from the cold optics and from the detector. These are the most stable part of the instrument as they are maintained at constant temperature, they do not see the external environment so the PSF will not change.

Tony McNally: Agree that we need a clear quantification of the stray light impact on level-1 data (max/average) before / after any corrections EUMETSAT may be able to make in the L1 processing. From this we can make an educated judgement as to if it is / is not acceptable. It is impossible (in my opinion) to assess this in any general way in the level-2 space.

Pierre Dussarrat: yes, we will definitely characterize the effect at L1 as a first step and circulate the information to everyone.

Herve Roquet: typically should this take place during summer time?

Dorothee Coppens: if we get the information by next week, we will start immediately the investigation. Note that OHB should come with their assessment on the spectral calibration by the end of June.

Daniel Lamarre: yes, in fact I already have the information but I am double-checking with OHB in order to avoid the ping-pong between EUMETSAT-ESA-OHB and the other way around

Herve Roquet: after this assessment, what will be the way forward?

Gary Fowler: the first step is to see if we have a problem at L1 and L2. If there is indeed a problem, we have to raise it to the MAG and also run some further detailed analysis on whether or not we can correct for this and whether it would make sense to mix information. It is a step by step process.

Dorothee Coppens: at the Level-1 there are 2 aspects that we need to assess, the first one is to assess the impact of what Pierre has shown and the second one that could take longer is to see what we can correct so I do not know by when we can then provide an answer.

Daniel Lamarre: we have a spec and we can imagine ways to become more compliant. But contrary to the FCI where we do an interpolation to resample the data on a regular spatial grid, you do not want us do it for IRS because you might have problems with the retrieval. So if we try to correct the effect by subtracting the contributions from the other pixels to meet the stray light requirement, we will be combining information of different pixels and it will be detrimental to the applications. So if we have to do something to improve the stray light performance, we have to do it in cooperation with the L2 processing, whatever L2 processing means. It does not make sense to spend money and effort now to improve the performance only looking at the effect on the engineering model itself.

Tobias Guggenmoser: in order to correct, we would need to use information from adjacent dwells that have been taken at other times

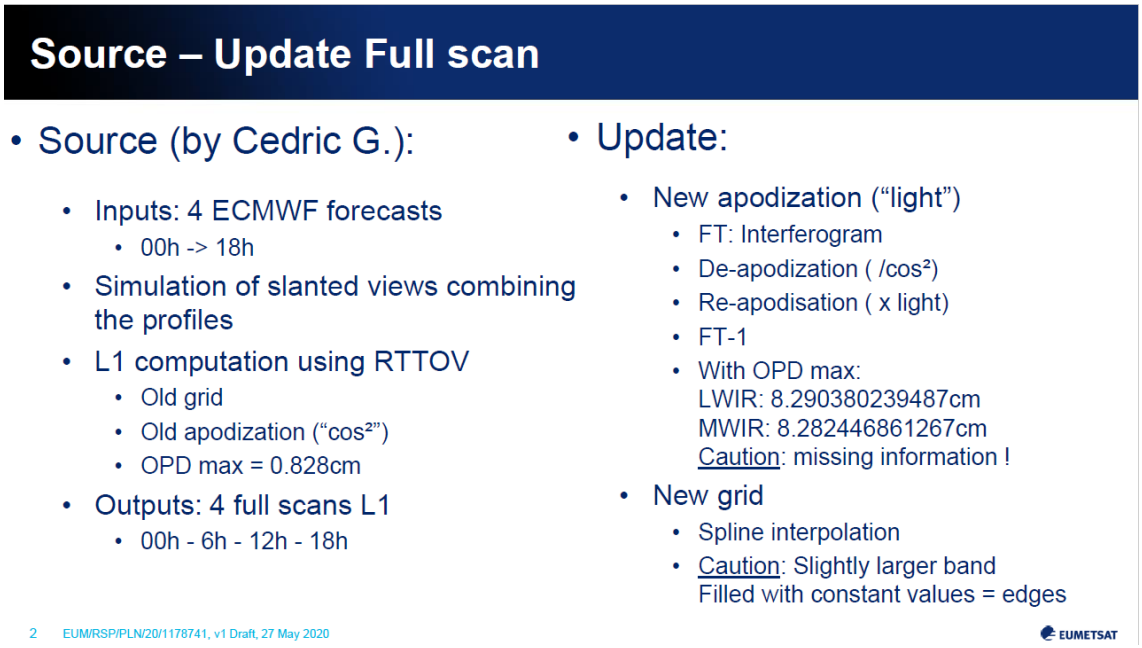
Herve Roquet: I fully support that the decision is not taken only on engineering considerations but takes into account the scientific impact on the L1 and L2 products. But we have to keep in mind that L2 is not a single application, some applications are using directly L1 products.

Claude Camy-Peyret: I am speaking for Tony and I am sure he would agree, yes it would be a very bad idea for NWP in general to combine information from different pixels as it would disturb the assimilation system

Thomas August: L2 should be understood as any application using the L1. Also, I understand what you are talking about with respect to the requirement at the instrument level and before talking about the impact on the applications we should look at the impact at the L1 and how much that can be recovered or not and from then onwards on the next steps.

Herve Roquet: we will try to reflect this discussion in the minutes as well as on the action list.

IRS test dataset available at EUMETSAT – P. Dussarrat



Herve Roquet: what kind of use do you see for this dataset ?

Dorothee Coppens: originally we have done this change to give it to L2 team to prepare for the new spectral grid but we thought this could be useful to everybody as a starting point for the discussion on the generation of test data.

Olivier Samain: I can give some context. Our need was to provide the contractor a full LAC or even better a full disk with the correct format so that they can start the implementation of their prototype. We are still using the old spectral grid but we intend to generate the same dataset on the new grid when we have all the data. We ask ourselves if other users could be interested to have also a full disk with the official format and not just a couple of dwells. Of course there are a lot of missing data but it will be formatted with the correct latitude, longitude, radiances.

Claude Camy-Peyret: what is the channel for which the map is plotted?

Pierre Dussarrat: it is in the window channels in order to display the surface temperature

Claude Camy-Peyret: which species do you have other than the usual ones ? CO for instances ?

Thomas August: this dataset was presented to you a few years ago. It is made of hourly disks. The variable parameters are T, q, O3, the rest is fixed. The surface parameter are variable (T and emissivity). The idea was to have something that is geophysically representative that we can use as a training basis for the L2 prototype and also evaluate the effect of the slant views. So it includes clouds as well; the cloud modelling is simple: black clouds have been specified at low, mid and high altitude from the ECMWF model and have been included in RTTOV. And the surface elevation is realistic as well. So the geolocation of the pixel and the dwell geometry is representative of what we will get.

Tim Hultberg: from the film it looks like the clouds are not moving, is that right?

Pierre Dussarrat: it could be a bug in the video because I can see the clouds moving maybe not in a realistic way because it is based on a linear interpolation but they are moving.

Pierre Coheur: you said surface parameters are included but what about the solar reflectivity? And more than that, do we have a way to quantify the solar reflectivity which we know is important already from 2200 cm-1? This is something where we may lack information with IRS and I was wondering if someone had an idea on how to deal with that?

Thomas August: in that particular case the simulation was stopped at 2175 cm-1.

Pierre Coheur: but even in that range there can be an effect of solar reflectivity so when we retrieve CO we usually take that into account by defining an effective reflectivity at much longer wavenumbers, at the very far end of the IASI spectral band. We have not think of that before so I do not know how we will proceed but I think this is something that we need to take into account. We need to find a way to solve the problem.

Claude Camy-Peyret: I think it is important for the impact of clouds because the reflection of solar light on thick clouds will be important. In the pure thermal case, I think that the effect would be large at higher wavenumbers…. But I agree if we want to have a detailed retrieval we will need to account for that for future simulation.

Miguel Martinez: one problem in RTTOV is that it is possible to simulate that part of the spectrum but only for a couple of channels while we have several hundreds so this would mean to make several calls to RTTOV.

Pierre Coheur: my point was not to include that in the test data; I just want to mention that this is maybe an information that we will not get with IRS and that we may need for CO retrieval

Herve Roquet: I suggest that because we have a full discussion planned on test data we could have first Miguel's presentation and have a discussion thereafter

IRS proxy data generation – M. Martinez

Link to animations of MTG simulations:
http://www.nwcsaf.org/AemetWebContents/ReferenceSystem/GEO/HTMLContributions/iSHAI/MTG/index.html

Olivier Samain: you mentioned you are going to need a large number of files to test the workflow in terms of ingestion with the correct format and filenames, is that correct?

Miguel Martinez: yes, that's right not now but

Olivier Samain: do you need the support from EUM to do that?

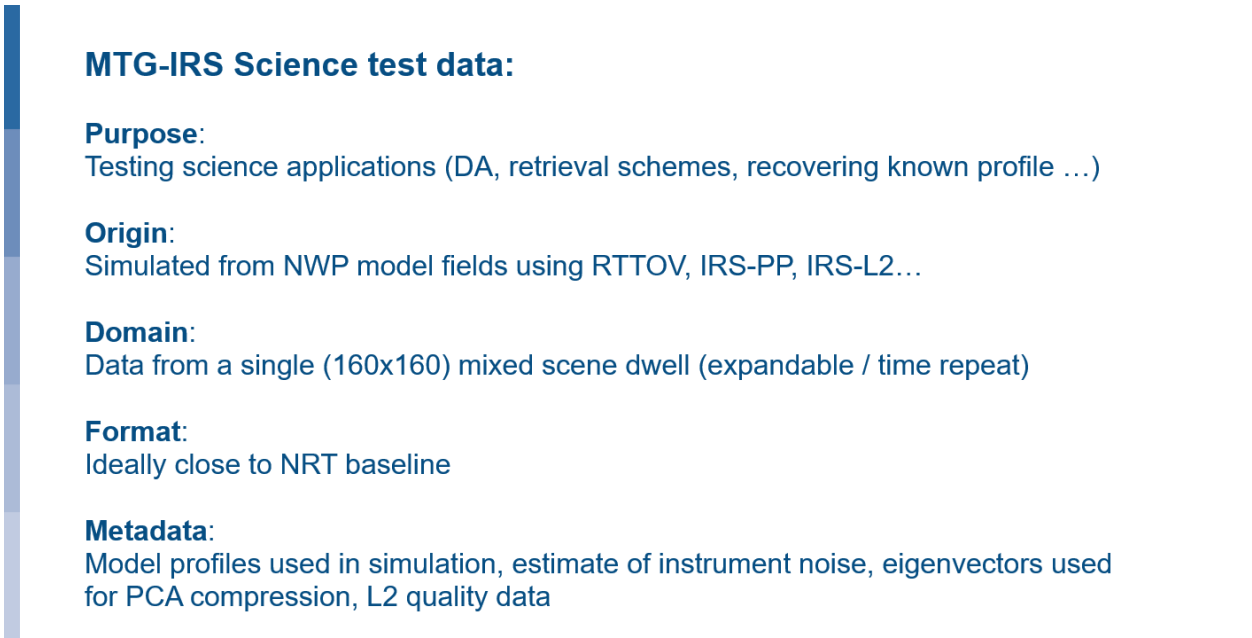
Miguel Martinez: yes definitely

Olivier Samain: we have tools to do this kind of production, especially if they do not to be scientifically correct, so if you make you requirements clear we can see what we can do

Herve Roquet: I think that the way these requirements for test data should be formulated should be through the SAF. We have seen that these kind of dataset are necessary for the engineering activity for the review process in a way similar than what is done for FCI.

Test data generation discussion

Herve Roquet: there was an action on Christina, Nadia and Tony to define a test dataset and the main idea was to define a fully consistent dataset going from L1 to PCs to be able to test in particular the reconstruction step so that this dataset could be used also for L2 retrievals.



Tony McNally: this is a slide we showed last time: it is the idea of producing a small limited science dataset, perhaps a single dwell where we use model fields of T, q, clouds but possibly also atmospheric composition to generate a dwell of L1 spectra. This could then be used to generate a dwell of reconstructed radiances as well as to generate a dwell of L2 soundings. We had discussions with Christina and Nadia but we haven't really finalized the exact details of this. I think the only consensus we have reached is to start with something very modest to begin with and then we would like to have one iteration with the group about how adequate the initial dataset is and what needs to be added. We would then respond to that feedback and then have a second iteration rather than spend a lot of time discussing our own preferences and what we think should or should not be in this initial dataset. We did agree that it needs to include land

and sea, cloudy pixels and non-cloudy pixels but we have not made a huge amount of progress in really defining the detailed content.

Just two comments I would like to make: I get the impression from listening to Pierre´s and Miguel's presentations that we have a slight proliferation of test data lying around at the moment and it´s not exactly clear to me that these efforts are coherent and coordinated. I think the MAG needs to be clear about what test data we do want to be generated and avoid duplication in this area because their generation is a very heavy amount of work. The other question is that when we are simulating this single dwell, should we take into account this effect of 60% of IE comes from a single pixel? Then if we have a model field that indicates that we have a pixel which is located completely in clouds and adjacent to that is a clear pixel should we try to simulate the fact that the clear pixel will contain mixed information or should we not bother with this effect to begin with. But anyway we haven't reached a clear definition yet.

Christina Koepken-Watts: thanks Tony for this. We should really avoid duplication and one thing that was not entirely clear to me is that the test data that Pierre presented has some similarities with what we wanted to generate. So this dataset looks to me already interesting for quite a few of the technical tests we could do.

Herve Roquet: I fully support the idea that we should not avoid duplication and not waste manpower and energy on this. Just to clarify what you have in mind Tony, you suggest that we go with a first trial and then iterate on it. So you mean not on a document but with a first dwell and we iterate on how it could be improved.

Tony McNally: yes that would be my suggestion: rather than to try to anticipate everything in advance, try to circulate one dataset and build on that based on the feedback from people who have actually looked at the dataset and used it rather than trying to take into account all various people´s own preferences.

Thomas August: just to give a little more information on the dataset that pre-exists: when it was designed, it was with 2016 data so with a model that is not what it is now so if there is a new one we should really consider a model with a better spatial resolution. And the idea at the time was also to have enough radiance variance such that PCs would be interesting from the content point of view not just from the format point of view so that we would have the thermodynamic variability as well as the viewing variability from the nadir to the limb.

Herve Roquet: in the slide you are showing, Tony, there are clearly contributions from various partners. So part of the work could be done at ECMWF, the L2 part at EUMETSAT, the PP part at the MetOffice, did you try to coordinate this?

Tony McNally: the answer is no. The coordination aspect of course is important but the priority to me is: can we as a MAG identify all the work that is going at the moment. Maybe the existing dataset is sufficient and we don't need to generate something new. I would really appreciate a clear message on that right now because it is a huge amount of work. So could we answer that question now before we decide if we need another test dataset at all.

Christina Koepken-Watts: this is a little bit along the line of the question I had about the exact details of the test data from EUMETSAT. To me it looks like if we had a look to what is exactly in there and maybe look at the data themselves and take this as a first iteration and if we see particular demands on this then we could go into the second iteration straight away. If ECMWF do a forward simulation, how do we get it formatted at EUMETSAT into the standard netCDF format?

Thomas August: on the first part for you to understand what this dataset consists of, it is easy as we have a description of it so that you could have a clear understanding of what is in it.

Christina Koepken-Watts: my suggestion would be to circulate that first and then we move on from there

Herve Roquet: yes I support your proposal

Olivier Samain: concerning the format, this is something we can do with a bit of work but this is feasible.

Pierre Coheur: I agree with Tony that the dataset should stay simple. I also agree that if we already have one we should not duplicate it. My feeling is that we don't need the chemistry to be added yet.

Nigel Atkinson: just a comment, I have done some work on the single dwell that was once posted on the EUM website. I was able to generate reconstructed radiances from it and it worked quite nicely so what Tony is suggesting should work.

Herve Roquet: so if this dataset were not corrupted it could fit our needs? Or is it another dataset? From what I understood this dataset is still not compliant in terms of spectral sampling?

Nigel Atkinson: yes that's quite likely.

Pierre Coheur: yes, and my feeling is that what Pierre has shown is probably good to start with. I am not sure that we need more than that.

Christina Koepken-Watts: that is also my feeling.

Herve Roquet: Pierre's dataset is not yet formatted in the correct official format ?

Pierre Dussarrat: yes that's right, it is not.

Dorothee Coppens: we could see with OS what we could do with the formatting and generate the PCs.

Tim Hultberg: yes we can do the PC compression at EUMETSAT.

Dorothee Coppens: maybe we would need to cut the spectral range making it starting at 700 cm-1 to remove the flat part that was added to match the official spectral range.

Nigel Atkinson: is anybody interested in BUFR? We could generate BUFR as well. We had some discussion with ECMWF about this for GIIRS. We came up with proposal for a BUFR sequence that could be used for IRS.

Herve Roquet: if there is an agreement on that within the group we can formulate in a straightforward way an action in the minutes and we can progress from that rather quickly.

Thomas August: quick question: when it was first generated we used RTTOV and at that time the spectral range started at 700 cm-1. But now it seems that the spectral range is starting at 680 cm-1. So should we wait for that to regenerate the radiances on this basis ? Because Pierre´s dataset is obviously missing spectral information in that region (as well as above 2175 cm-1). What is the status of the generation of the new coefficients for RTTOV ?

Dorothee Coppens: the new coefficients for RTTOV will start at 680 cm-1 because this corresponds to what we will disseminate even if we don´t have the same requirement in this spectral region.

Thomas August: because all the preparatory steps of this dataset, so the underlying geophysical vectors have been stored when generating the dataset so it is just a matter of piping that through the new version of RTTOV when we will get it to have correct radiances over the full spectral range.

Dorothee Coppens: I am waiting for an answer from MeteoFrance-Lannion, Jerome [Vidot] is working on that. As soon as we have the new RTTOV, we can re-generate the spectra.

Thomas August: exactly, that´s what I wanted to make sure to the MAG: when they will see the documentation, they will see that the spectral range starts at 700 cm-1 but everything is in place to regenerate it in a second step.

Gary Fowler: a point on the BUFR formatting. We did have an action going back for five years from the OPS working group to indicate what the BUFR format would be for the IRS and Daniel Lee from EUMETSAT has liaised with WMO about that so before defining something new you should check with him.

Nigel Atkinson: we'll do.

Dorothee Coppens: about the dataset, do you need all dwells, or some dwells ?

Herve Roquet: since we want to keep the dataset simple and iterative, we could start with a single dwell.

Christina Koepken-Watts: we had a little look on which one fits the regional models domains for France and Germany. Maybe we could consolide that and provide something like 2 or 3 dwells.

Nadia Fourrie: yes these dwells 49 and 50 but if Miguel is interested maybe he would like to have a dwell located more to the south.

Christina Koepken-Watts: for us number 50 or even 60 would be good. Maybe 4 to 5 dwells should satisfy nearly everybody.

Daniel Lamarre: it would be more politically correct that the chosen dwells cover a bit of every country

Olivier Samain: the point in having an iterative approach is to be able to quickly spot any issue and not have to do a large scale processing but once it is streamlined the number of dwell does not really matter.

Action M8.A6 is thus replaced by M9.A4: "Define a small set of dwells (from 1 to 4) possessing adequate characteristics (land/sea, covering one or several regional model domains) to be used as a test dataset (mentioned during the meeting were dwells 49, 50, 60 of LAC4, see Figure 1)"

Action M8.A7 is obsolete and thus closed.

Action M8.A10 thus becomes obsolete and is replaced by M9.A6.

Update on the study at ECMWF – T. McNally

New EUMETSAT L2 product being tested at ECMWF:

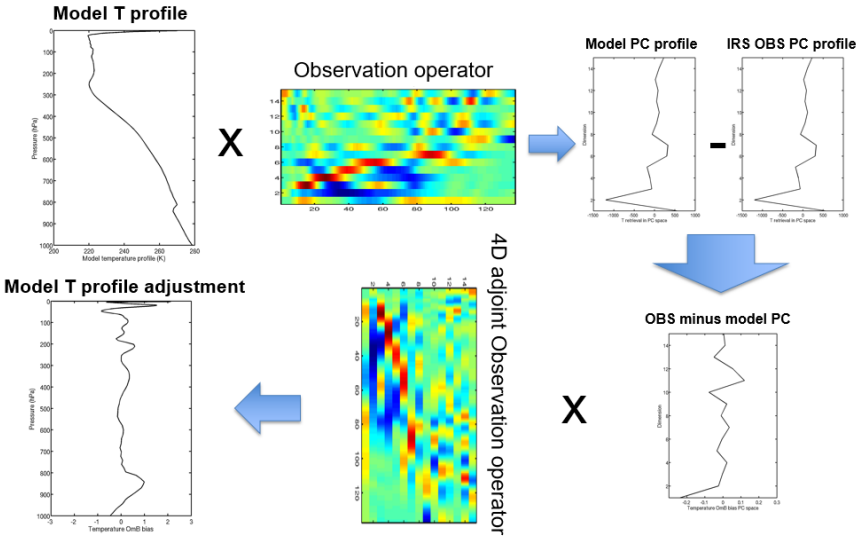
Decreasing optimality of product use…

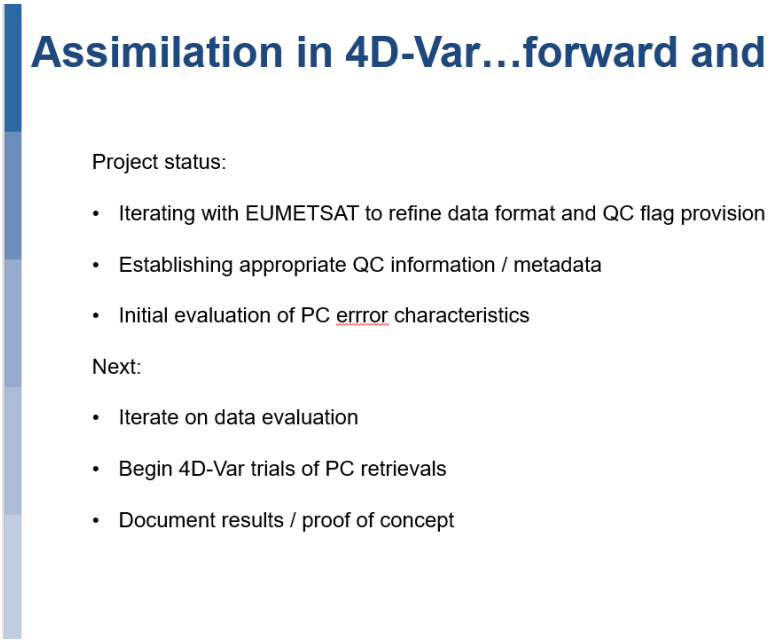
Option 1:	Option 2:	Option 3:	Option 4:	Option 5:
Disseminate retrieval on **native grid** with **scene dependent** error covariance / averaging kernels	Eigenvector representation of profiles	Disseminate retrieval on native grid with **climatological** error covariance / averaging kernels	Disseminate retrieval on **native grid** and allow user to **diagnose** covariance locally (i.e. no metadata disseminated)	Disseminate retrieval on a **reduced grid / layering** with full covariance data

Increasing dissemination data volumes…

What is the best approach / compromise for potential users of IRS L2 data (forecasters / assimilation) ?

Assimilation in 4D-Var…forward and adjoint operation





Olivier Samain: I think Tony you have the wrong assumption for the format of the L2 product. We are not disseminating eigenvectors but full profiles and only the covariance matrix is provided in the PC space.

Thomas August: this study that we are doing with Kirsty and Tony at ECMWF is part of an exploratory line and follows discussions we had in the MAG regarding the assimilation of L2 products in NWP. The latter is not operational at the moment and this is not planned in the coming years but out of scientific interest, and for some centres who have not the capability to assimilate radiances or where it would be advantageous not to, we are exploring that. So the format we are iterating on with Tony has nothing to do with the official format for the dissemination of L2 products which are intended in the geophysical space as a profile of T, q with uncertainties for different applications. What we are touching on here is to address both conveying the maximum information and reducing the data volume. And that is achieved by compressing the profiles into PCs and by conveying the observation operator with support of eigenvectors statically defined.

Tony McNally: absolutely this is a proof of science concept study that we are doing collaboratively with RSP.

Tim Hultberg: this is also why we decided to provide the observation operator in the files even though, I agree, this increases the data volume. But because this is a proof of concept this is the way we do it. But, as we discussed, if this proves to be something promising, it is possible to actually add a few indices together with some look-up tables which would allow computing the observation operator on the user side.

Herve Roquet: very nice. Tony, do you have an idea of when you would have first results in terms of assimilation impact?

Tony McNally: we are not doing a beauty contest between the assimilation of L2 profiles from EUMETSAT and the assimilation of these eigenvectors profiles. I think we have presented in the past the status of the profile assimilation study and that has been documented. This is a new study where we will document the impact of this eigenvector retrieval. We will not not do a side beauty contest between the two because the underlying retrieval which support this eigenvector product has changed as well. And we will have results by the next MAG meeting.

Thomas August: one thing we have learned from the previous study is that the assimilation of temperature profiles degraded the forecasts. And we have a strong suspicion that the reason is that the observation operator did not take into account the actual vertical sensitivity of the measurements and this is something the retrieval can not cope with. So we believe that this approach is a more correct way of dealing with the measurement and hopefully we will get at least a neutral if not an improvement of the forecast with the assimilation of temperature as well.

Claude Camy-Peyret: I have a naive question: you wrote "a unit covariance matrix". Is it not just the diagonal that is unity ?

Tim Hultberg: no, because we do normalize with the full error estimate so it is supposed to be really a unit error.

Preliminary results on NH3 from GIIRS – P. Coheur

First look to GIIRS data for atmospheric composition. This is a study that was conducted by Lieven Clarisse who prepared the slides as well.

GIIRS products: T, q, O3 (total and profiles), 1 scan every 2 hours, one for China and 1 for a larger domain. Spatial sampling is 16km at nadir. Spectra look pretty good.

Cloud detection scheme uses a training database made of IASI data. Based on 4 GIIRS channels. Working nicely when compared to MODIS.

Calibration: not too bad when compared to simulated spectrum but a spectral shift of 0.26 cm-1 is needed to achieve the best correlation. Residual is not too bad in the window region but there are some residuals remaining especially from 1100 cm-1 on. This could be due to the lack of knowledge of the ILS: the best results were obtained using the IASI ILS with an adapted MOPD but it is of course only an estimate.

NH3: what is shown is not really NH3 column but rather the strength of the NH3 signal in the spectrum. But NH3 shows up nicely in absorption between 900 and 1000 cm-1 when the thermal contrast is positive. Since there is information every 2 hours, we could observe temperature inversion during the night i.e. negative thermal contrast so that HN3 appears in emission.

Two examples of distribution: first at 5 UTC: we see NH3 where we expect to see it especially around Beijing and the north China plain as well as in Pakistan. Second during the night when thermal contrast is much less favourable but we still do see NH3 in Pakistan and around Beijing.

Very first view of the diurnal cycle of an atmospheric pollutant from space. Very stimulating prospect but need to be very careful because the detected diurnal contrast depends on the thermal constrast so the sensitivity of the instrument. Next step will consist in retrieving the column content.

Claude Camy-Peyret: very good work for sure, showing the potential of IRS. This means that you would like to have the temperature profile itself so that you could introduce it into your retrieval. Would you rely on the temperature retrieval that would improve this question of the thermal contrast?

Pierre Coheur: we are using model temperature profile and this is fine for what we are doing now: we do not need more temperature information.

Science plan

Herve Roquet: it would be nice to discuss rapidly the science plan. When do the authors expect to deliver their contributions ? I think the basic question is: can we reasonably expect to have all contributions before the next MAG meeting ? Having at least the first draft of all of them would allow seeing if there are missing points or on the contrary overlaps between the various sections.

Christina Koepken-Watts: I fully agree. I have a plan to do it after the summer holidays, end august-beginning of September.

Claude Camy-Peyret: I was a little bit frustrated the last time as the way forward I proposed was not fully agreed. So I am now insisting on the specificities of IRS for climate. It is essentially a NWC and meteorology as well as chemistry as illustrated today by Pierre. Climate is a bit more difficult, it is a broad subject where we could be interested in molecules that would contribute to the climate, CO2 for instance. I plan to have something small ready for the next MAG.

Herve Roquet: thank you Claude and I am sorry to be the cause of your frustration but I really think that the science plan should focus on what makes IRS original.

Conclusion

Herve Roquet: I would like to thank all of you for your participation to this remote meeting. I will see with Dorothee to define a date in October-November.

Claude Camy-Peyret: Dorothee could you make sure to gather all slides and put them on a website ?

Dorothee Coppens: yes I will do it

Actions list

List of Actions			
Action #	**Action item description**	**Due date**	**Actionee**
M9.A1	Circulate the status of the actions a week before the MAG meeting	Next MAG	MAG secretariat
M9.A2	EUM to include the mathematical description of the uniformization that was circulated to the MAG as answer to M8.A5 in the science plan	Next MAG	EUM
M9.A3	Report on the assessment of the impact of in-field stray light issue on the L1 product and the way forward	ASAP	EUM
M9.A3	Distribute to the MAG a description of the EUM test dataset originally generated by the L2 processing team and resampled by Pierre on the new spectral grid.	ASAP	EUM
M9.A4	Define a small set of dwells (from 1 to 4) possessing adequate characteristics (land/sea, covering one or several regional model domains) to be used as a test	ASAP	MAG members

	dataset (mentioned during the meeting were dwells 49, 50, 60 of LAC4, see Figure 1).		
M9.A5	Distribute the dwell(s) defined in action M9.A4 to the MAG. This dataset will be based on the EUMETSAT dataset described in the note distributed as action M9.A3 properly reformatted according to the official L1 format specification.	Next MAG	EUM
M9.A6	Provide feedback on the distributed test dataset (content, format etc…)	End 2020	All
Previous actions still open			
M8.A3	As a follow-up of action M7.A4 that could not be completed, EUM to make the performances of the INR (not the algorithm itself) available to the group or what is needed to make it possible	Next MAG	EUM
M8.A4bis	MAG members to provide an assessment of the impact of the instrument non-conformities in their applications	Next MAG	All
M8.A9	EUM to make the IRS L1 format specification available to the MAG members along with the test dwell awaiting distribution (answer to action M7.A7)	ASAP	EUM
M7.A13	Circulate a first version of each section of the science plan	Next MAG	All

“by next MAG” should be circulated 2 to 3 weeks before the meeting latest.

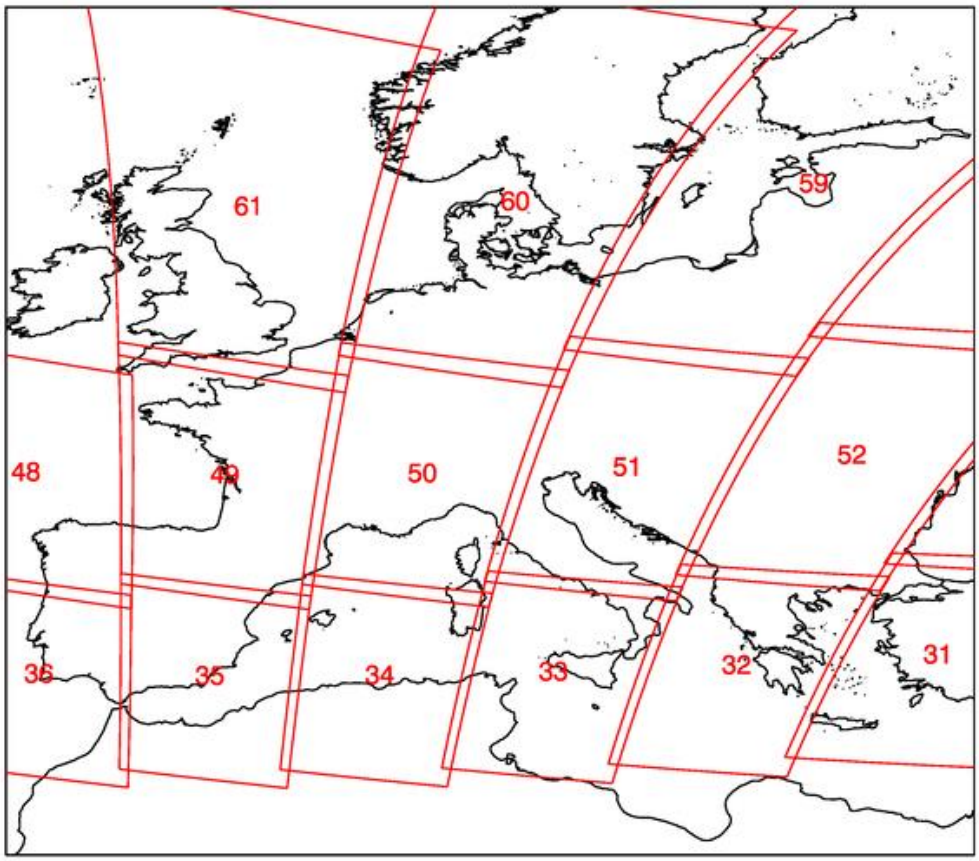


Figure 1: coverage of the IRS dwells over Europe

Link to the material from the previous meetings:

https://www.eumetsat.int/website/home/Data/ScienceActivities/ScienceMeetingsandWorkshops/index.html