MTG-EPSSG-User-Days2019_MeetingReport

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0 SUMMARY AND OBJECTIVES

The MTG and EPS-SG User Days 12-14 November 2019 at EUMETSAT HQ in Darmstadt, Germany, were organised as an important step in preparing users and industry for the exploitation of the MTG and EPS-SG next-generation meteorological satellites.

Set about two years before launch of the first MTG-I satellite, focus of the event was put on data access to MTG and EPS-SG for users in Europe and North Africa, with the latest information provided on:
- the MTG and EPS-SG programme development,
- data dissemination plans and their evolution,
- user experiences and use cases.

The event included a technical exhibition for manufacturers of data reception equipment and processing software.

The main User Day event on 13 November 2019 was aimed for the following audience:

- future users of MTG and EPS-SG from National Meteorological and Hydrological Services (NMHS) in Member States and North Africa,
- industry (i.e., manufacturers of software and hardware for data reception and processing).

Meetings for a restricted audience were organised on 12 and 14 November 2019:

- "MTG Day" for the MTG User Preparation (MTGUP) user group and future users of MTG in North Africa, on 12 November
- "EPS-SG Day" for future users of EPS-SG, on 14 November

The meeting agenda is provided in Appendix A.

Represented participants at the meeting were:

- Member State representatives on the MTGUP User Group
- MTGUP Advisory Group members
- One additional participant/nominee per Member State (for EPS-SG matters)
- Representatives of four countries in North Africa (Morocco, Algeria, Tunisia, Egypt)
- Representative of the WMO Regional Training Centres in Israel
- Invited application experts
- Manufacturers of HW/SW required for data access and processing
- Participants of the RAIDEG-10 meeting held on 11 November 2019
- Invited EUMETSAT Secretariat staff

A total of 97 external participants from 36 countries attended the User Days. All but two Member States were represented. Day one ("MTG Day") had 51 externals, on day 2 some 81 including 18 representatives from 11 SW/HW manufacturers, on day three ("EPS-SG Day") some 55. From EUMETSAT Secretariat, around 55 individuals from the GEO and LEO Programmes, RSP, SCIR, GSI, SEP, RSO and USC participated for at least part of the event.

To facilitate Q&A by participants, the online collaborative tool www.slido.com was used (see Appendix B for Q&A).

Presentations, list of participants and other material from the User Days are available : https://dmtool.eumetsat.int/cs/idcplg?IdcService=COLLECTION_DISPLAY&hasCollectionID=true&dCollectionID=272087561736454251

The meeting website has presentations in pdf:
https://www.eventsforce.net/eumetsat/frontend/reg/thome.csp?pageID=2615&eventID=8&traceRedir=2

1 MTG PREPARATION USE CASES

Alexander Schmid (MTG Programme Manager) introduced the MTG programme, which is expected to provide continuity and significant innovation for Europe in satellite meteorology. User involvement started in 2000, with first user consultations. The 2019 User Days are organised two years before launch of MTG-I1 and three years before data become available. Flight hardware is being build now all over Europe. He introduced the programme for the day and the speakers.

1.1 Use cases for FCI data in nowcasting severe weather

Martin Setvak (CHMI) showed the effect of spatial resolution on identifying image features when observing convective storm tops. Higher resolution leads to better detection of fine-scale features, such as gravity waves, storm tops, anvil cirrus clouds; for comparison, he demonstrated the benefit of higher spatial resolution with ground-based camera photography of a convective line using 50m image resolution. He showed correction of viewing angle effects by remapping to Transverse Mercator projection, and the typical size of FCI pixels at 1 km nominal resolution at nadir. He compared the sandwich product at 0.5km, 1km and 3km spatial sampling distance. Storm top features are related to intensity and persistence of storm updrafts (OTs, above-anvil cirrus plumes, radial cirrus, cloud-top gravity waves or ship waves). Better resolution (in space and time) improves the chance of detecting storm that have the potential to become severe.

Regarding fire detection, he showed examples for bonfire detection in Czech Republic and Eastern Germany, using VIIRS 375m imagery in bands I4 (3.7µm) and I5 (11.45µm) as proxy for FCI imagery. 1km SSD imagery can still detect most of the fires, 2km SSD imagery cannot. FCI will be a significant step ahead in detecting fires, especially at smaller scale.

1.2 Synergetic use of FCI and LI for thunderstorm nowcasting

Ulrich Hamann (MeteoSwiss) showed an overview of thunderstorm detection and tracking algorithms used by various groups. He described the synergetic use of MSG and other data sources (radar, ground-based lightning detection) in COALITION, allowing for nowcasts up to 45 minutes and with 5 minute update cycle. SEVIRI data at 9.7µm is the most important satellite component (no use of the HRV).

He showed a case study for nowcasting thunderstorm intensity over Southern Germany. The higher resolution of 1.3 and 2.2µm imagery in RSS mode will help improve feature tracking and atmospheric motion vectors. LI data will be used to track thunderstorm cell history.

A EUMETSAT fellowship has recently been awarded to MeteoSwiss for the period 2020-2023, to combine MTG “4D weather cube” data, machine learning and the existing thunderstorm nowcasting algorithm.

LI is not expected to replace ground-based lightning detection networks, but to complement them.

The InfraRed Sounder vertical resolution is in the order of 1-2km, complementing radiosonde and model-based profile information over a wide area, and every 30 minutes over Europe.

No data denial experiments have yet been made to test the thunderstorm nowcasting algorithms sensitivity towards ground-based radar data.

1.3 Himawari-8 Use Cases and NWCSAF software in Australia

Leon Majewski (Australian Bureau of Meteorology) described the experiences with new-generation Himawari-8 Advanced Himawari Imager (AHI) data into the operational context. He stressed the need for preparing for the novelty and volume of data – moving from 5-channel JMA MTSAT imagery to 16 AHI channels, and 50 times more data.

He showed examples for the use of VIS/IR imagery in support of storm tracking and active fire monitoring. MTG will have much more information on fires. In addition, JMA provided targeted 2.5-min rapid scan observations on the occasion of severe fires in the Victoria federal state, giving much more contextual information.

For the uptake of AHI imagery, a significant training campaign among forecasters was undertaken. They rated highest the impact on detecting fog and low clouds (using the Night Microphysics RGB), severe storms (Day Microphysics and Convection RGBs) and volcanic ash detection.

He showed examples for using the NWCSAF software for nowcasting storms, hail, severe rainfall, especially useful over areas without radar coverage.

Main lessons identified were:

- Co-design new products and visualisation systems with forecasters
- Use proxy data (MODIS, VIIRS)
- Use the NWCSAF software and its adaptation
- Test beds
- Start preparing 2 years before: make training attractive for forecasters; satellite champion forecasters to encourage others
- Regional focus group VLab and similar peer-to-peer fora should be used
- Mainstreaming the use of data in operations takes years

Furthermore:

- Prepare, train, evaluate, improve
    - Gather and challenge requirements
    - Difficult to elicit new capability requirements
- Anecdotes are good, standardised survey results are better
    - Repeatable survey, results demonstrate clear benefit to users
- Feedback identified areas for improvement
    - Fixing, or acknowledging, pain points builds trust
- Areas to target for improvements
    - Volume: streamline products by scenario
    - Complexity: better visualisations & training
    - Latency: find new/better computational methods

AHI does not remove the need for investment in ground-based radar, lightning detection networks.

Next steps:

- Deploy latest NWCSAF software
- Validate performance against existing observations/products
    - Radar/TITAN & insurance claims data
    - Tune algorithm coefficients for local conditions where necessary
- Understand error characteristics & product limitations
    - Routine verification, training documents

    - Blend multi-source observations to provide unified view
- Improve internal and external data services/platforms
- Co-design of nowcasting product visualisation and training documents
- Provide Feedback & Improvements back to NWCSAF

1.4 Use cases from the operational GOES-16 and lessons learned for user preparedness

Dan Lindsey (NOAA NESDIS) showed examples for use of ABI imagery in operations, GLM, and lessons learned in user preparation.

The Kansas 15 June 2017 example showed convergence of moisture along a low-level moisture boundary about 2.5h before clouds form; the split-window difference technique only works in clear skies (24-h Microphysics RGB "Dust" contains this difference). He recognised that clear skies were less frequent in Europe.

The March 2017 Fire case example showed that the 1.6μm, 2.2μm bands can be useful to detect hot fires (not just 3.9μm), and to monitor quick shifts in wind direction that can be dangerous for firefighters; the Fire Temperature RGB encapsulates these abilities.

On lightning detection, he showed the ability of GLM to detect the full extent of very long in-cloud flashes, and compared to ground-based Earth networks total lightning data.

Main lessons learned from user preparation for GOES-R:

1. Forecasters prefer real imagery in training as opposed to simulated imagery

2. Preferably from their local area of interest (although admittedly that will be difficult for MTG)
    - During commissioning, try to collect as many cases as possible and put together training around these

3. Full resolution (500 m) visible imagery used qualitatively provides lots of value

4. Forecasters like to tweak ranges/recipes for RGBs – if done with care it can help enhance certain features

5. If providing a derived product, provide with it the raw data/imagery – they are complementary (e.g., fire product and 3.9μm channel)

6. True Color imagery has operational value: qualitative aerosol detection, situational awareness, public and media outreach, etc.

7. Optical lightning sensors in space are not measuring the same thing as ground-based detectors, so do not expect both to always detect the same lightning
    - GLM has 70% detection efficiency, ground-based NDLN see more flashes ; needs more research, training

8. Challenges to visualisation SW/HW: testing data volumes early

GOES-R Prep Activities included:
- High-impact Weather Testbeds
- Experimental products and proxy data were sent to NWS in real time for evaluation and feedback

- SOO, Champions
- After launch and during commissioning are very good times to organise training- actual cases familiar to forecasters can be studied

Timeliness is important for fire detection, depending on stationarity of fire (1min vs 5min).

1.5 Use of IRS simulated and proxy data in global NWP

Kirsti Salonen (ECMWF) presented on

- Potential to improve wind forecasts by assimilating water vapour sensitive hyper-spectral IR radiances with high temporal resolution.
- Main findings from the MTG-IRS L2 (IASI proxy) retrieval assimilation
- First experiences from investigations with GIIRS data

Hyperspectral infrared sounder data from polar-orbiters has demonstrated impact on forecasts of wind fields, with improvements by adding more data spatially and temporally. Majority of the impact comes from the water vapour channels. In June 2019 the number of active IASI WV channels was increased from 10 to 39. Upcoming hyperspectral IR instruments on geostationary satellites (IRS) will provide observations up to 30 min time resolution and have enormous potential for NWP.

She reported on IASI L2 (IRS proxy) data assimilation experiments: retrievals are relatively smooth as expected, in many cases not resolving inversion as well as model fields; observation errors are highly correlated. She observed degradation in assimilating temperature retrievals, and improvements for humidity retrievals both for clear and cloudy skies.

Investigations of FY-4A GIIRS data have yielded first results:
- Spatial coverage: NH scan every 2h vs twice-daily from polar orbiters
- Investigating issues with temperature sounding channels: OBS-BG; noisiness, striping, spectral shift
- User-provider interaction is really important to address issues
- Not all channels affected by noisiness, striping; all affected by spectral shift, corrections possible
- No cloud screening; observation errors; thinning

CMA introducing a spectral shift correction. A subset of LW channels has been assimilated for 3 weeks. Work needs to continue.

ECMWF pursue work on assessing the impact of FCI and LI. No investigation of viewing angle effects on IRS data yet.

1.6 Future use of IRS in regional NWP

Nadia Fourrié (Météo-France) presented on investigations of the impact of IRS on the mesoscale non-hydrostatic limited area model AROME, with domain centered over France. The model is dedicated to forecasting high-impact weather (storms, precipitation) and fog. In there, MF use assimilated data as in the global model + radial winds and reflectivities from radars (24 radars). 18.5% of assimilated observations are from satellites (8% from SEVIRI – 6 channels, 4 temperature and 2 water vapour, present at each analysis time; and 5.9% from IASI – 44 channels, 24 temperature and 20 water vapour, available only for 6 analysis times out of 24, and depending on cloudiness).

Preparatory studies for IRS assimilation are run through fellowships and OSSEs. At MF, an OSSE framework has been built. The Nature Run : 7km over Europe, 105 levels, for two June dates in 2013 and 2015. The full observing system (+IRS, but without radar data) is simulated, from the Nature Run, and then randomly perturbed to simulate instrument errors. Furthermore:

- First guess departure controled (observations too far from the model are discarded)
- Observations are horizontally thinned to avoid correlation in observation errors which are not yet modelled in the observation error covariances in the data assimilation system.
- Cloudy observations are rejected or not, considering the data assimilation system capability

Results show a positive impact within the OSSE up to 21h lead time. Cloud screening approaches depend on channels and their sensitivity to high and low clouds. The impact of cloud screening is noticeable up to 18h.

Next steps include improvements to the Nature Run, addition of radar data, more elaborated IRS assimilation methodology, and looking at additional parameters.

2 MTGUP USER GROUP: INFORMATION EXCHANGE AND DISCUSSION

2.1 Guidance by MTGUP Advisory Group

Two members of the MTGUP Advisory Group, Hans-Joachim (Hajo) Koppert (DWD) and Simon Keogh (MetOffice) provided short keynotes, before the group split into the three theme panels.

Hajo Koppert called the advent of MTG a revolution to weather forecasting, coming with its challenges. He evoked a more vulnerable society due to climate change impacts, urbanisation, leading to evolving and more demanding user requirements: forecasts are expected to be better in time and space, e.g., for renewable energy system operations, aircraft routing. More economical use of resources in NMHS is necessary, and automation of many meteorological systems contributes to this end.

Simon Keogh highlighted key “strategic anchors” of the MetOffice that need reinforcing to embrace MTG and EPS-SG data. Key science activities addressing the new missions have launch + 12 months as target date, and include assimilation of radiances and AMVs, and verification of lightning risk forecasts. Key technology activities are an improved data reception and processing infrastructure, new data delivery methods, and leveraging of investments into the NWPSAF and NWCSAF software, products, and tools.

He stressed that nowcasting of meteorological phenomena where NWP forecasts have difficulty (e.g., fog detection, convection and convective initiation; nowcasting phenomena as well as beginning of recovery phase) are receiving renewed attention at the MetOffice.

2.2 Theme Panels

2.2.1 Test Data and Format Support

Secretariat:

- EUMETSAT Secretariat explained internal priorities that may affect provision of test data as resources get assigned to cover higher priority issues: Instrument > Operational Processor > System > Users
- Presented strategy of ensuring useful datasets developed for other purposes would be made available to the users (e.g. the 24 hour FCI test data developed for the L2 Processing Facility (L2PF) was made available to users with additional EUMETCast simulator script).
- Currently and soon to be available test data packages were described with target delivery dates.

General remarks:

- Only few users have looked at the provided FCI L1C test data
- No one seems to have used the EUMETCast simulator yet
- Provision of the bulk test dataset was seen as useful

Test data:

- FCI data do not contain geo-location information but use reference grids. Information on how to reconstruct geo-location could be made clearer in a Product User Guide (PUG) and include example code.

- From recent ITSC meeting: the international community wants visibility + timeline of test data (MTG + EPS-SG). User Days participants want early communication of any foreseen delays in test data provision so that mitigation actions can be taken on their side (e.g. interdependencies with the SAFs).

- For load testing purposes, simulation of the new FCI channels would be useful.

- Provided FCI test data is for the full disc; it would be useful to also have RSS test data.

- There were comments about the importance of informing users on what to expect from any released test data (e.g. limitations, etc.). Such information was part of the Test data package description provided with the FCI L1C test data release, which is good.

- It would be useful to add single channel, amalgamated datasets to the test data set, so that users can use these to validate they have put chunks together correctly. (Adding the image on the front of the jigsaw puzzle box).

- Contact point for any feedback on test data from users: EUM User Helpdesk (ops@eumetsat.int)

Data formats:

- FCI: Discussion on segment dissemination and constraints/implications this has on user side (this point was raised by the H-SAF in particular): some of the smaller institutes would prefer to have the option of receiving single channel files to optimise bandwidth usage and processing power usage (they sometimes only need 1 or 2 channels for their applications).

NOTE: the segmentation is to optimise the processing and timeliness. Products are internally divided into channels, so for processing not all channels need to be read. This does not reduce bandwith usage though.

- In the context of the above, the usage of the EPCT was discussed. (Although channel subsetting is likely to be a function, this does not reduce bandwidth as EPCT would be installed at the user site).

- When releasing new test data sets (and in general on the EUMETSAT website), it would be useful to give an indication of the stability of the formats (how mature they are) for the different instruments.

- It was suggested that EUM HQ should prescribe standardisation of SAF product formats in line with the EUMETSAT MTG products.

- There was very positive feedback on the index map/vector arrays in the FCI 1C format to allow assignment of sun angles, time stamps, swath number, etc., at the pixel level. This was seen as problem with GOES/HIMAWARI data products.

2.2.2 Training

Participants were encouraged to discuss:
- User needs and priorities
- Training opportunities
- MTG-related training plans, Short-term skills dev

Summary of points raised and discussion:

- Train the trainers must be the first step; multiply knowledge transfer at national/local level the second; cannot put all forecasters in a room, the service would stop (Poland)

- EUMETSAT should make sure that data flow is taken care of, a key step with regard to continuity of the service -> regional courses can assist these questions

- Innovation potential (higher temporal and spatial and spectral resolution; novel data) should be identified and exploited by working with Eumetrain/Testbeds on forecasting/nowcasting and marine forecasting material

- Grow in train the trainer (e.g. US SOO officers model) -> indicate community that, group of dedicated people, that can do this work of train the trainer (Portfolio course plus Facet-to-face training), EUM is keen to train these people

- NMHS-internal development teams –> should be supported with training on meteorology and remote sensing

- Need to recognise diversity in Europe – US had uniform approach in preparing NWS users

- Develop case studies from each region in which training is done

- Data needs to be understood before training design

- Challenges to understand data, to find proxy data, include:

- problem with 0.9μm channel and with IRS – how to get good training data? Sentinel-2 0.9μm data is noisy. 1.3μm data in dry environment can be proxy (in time!) for 0.9μm. IASI L2 and FY4A can be used as proxy for IRS.

- at the beginning of commissioning period, there needs to be MTG training material ready (e.g. translated materials, case studies) ready to follow regional/national training efforts

- technical resources need to be ready also to ingest and be used for training on MTG data (e.g. strong enough computers, EUMETView etc.)

- training on IRS principal components and LI can be offered from EUMETSAT

- can there be training on the LI products specific to MTG (not GOES GLM products) – can GLM data be transformed to LI-like products?

- the 'GLM toolbox' can be example of vehicles that can serve as testing environment on user side (sandbox environment for NMHSs)

- training will be more useful, convincing and accepted if not be done on simulated data but on proxy or pre-operational data is more suitable for that (scientifically meaningful and not costly)

- Value of MTG data at high latitudes is uncertain: challenges to motivate high-latitude users

- NMHSs need a clear training plan (training event schedule and training materials) to avoid duplication of the work

- Need a strategy for cross-instrument products and parallel utilisation of different instrument data and products

- Is there value of training on data from joint systems (JPSS + Sentinel + EPS-SG + …)?

- Point out and communicate to users clearly additional values of new instruments vs existing observations (e.g. LI vs ground network capabilities)

- Are there visiting schemes available for NMHSs – yes – Short-term Skills Development scheme used for operational needs (see EUMETSAT website)

- Self-paced, online, affordable training modules could be good flexible solution to training – dedicated time needs to be there, and the training "chunks" need to be short, otherwise not affordable – training needs to fit into 'business as usual'

- Generate separate short 1h online topical webinars (fog, rain, wind, …) showing advantages of MTG – downside is that operational staff cannot attend all at once

- Training should be organised at three levels: infrastructure, developers and operational forecasters

- Knowledge acquired through training (from e.g., Summer School) needs to be shared among NMHS staff

- Machine learning training – yes, good time already to do that, but to specific audience only (developers)

- Train on broad topics first (to draw attention from broader audience), e.g. summer convection and winter fog

- Training on 'MTG tools' (i.e., new data services) needed (e.g. processing toolbox)

2.2.3 User Information and Communication

General

Secretariat introduced this theme panel with the following questions that were meant to be answered during the course of the discussion.
- How is it going?
- What should we do differently?
- Are we missing something?

Upcoming communication events and resources for information
- EUMETSAT Conference Würzburg 2020 – more users to be invited?
- 2021 User event
- MOOCs in 2022 – after commissioning of MTG-I1
- Videos focusing on application areas
- User guides: Product user guides and Application guide – an online resource

Summary of points raised and discussion

- There were questions on communication of technical issues including
    - Hardware requirements - antenna
    - Licensing – new licences
    - Software
    - Transponder – transmission frequency

- The participants were directed to the data access talks on Wednesday and the EUMETSAT booths where experts will be able to give information on these issues.

- Participants appreciated the idea to have webinars to communicate on topics of interest to wider audience, not only from EUMETSAT but from other experts.

- There will be a revamp of the EUMETSAT webpage for easy access, and removal of outdated studies.

- Sharing of results from cal/val during commissioning: if not a full set of results, preliminary qualitative results could be made available. Very effective if these data could also be used for internal training of forecasters (close loop users)

- Concerns were expressed regarding purchasing hardware and software if there was a long launch delay – not foreseen, schedule has been stable for a while.

- User day event 2021 – before or after launch of MTG-I1? Possibly before is appropriate.

- For Würzburg 2020 conference, contact MTGUP user group for topics for User Prep Session. New data services also will be subject to discussion at the conference.

- Transition from MSG to MTG: how urgent is to switch from MSG to MTG? Next round of delegate bodies in 2020 will have a discussion on transition; the current schedule for transition to MTG is end 2024.

- Data Volume

  - There was a request for more interaction with developers and technical experts particularly on data access. Users stressed the need for more information on data format and data volumes. There were concerns for requirements of software and hardware (not receivers) as they need justifaction based on the data volume. A configuration of the requirements in this regard would be appreciated. Data volume by channels can be published on the website.

- Test Data

  - Regarding FCI Test data there was a comment that there is no georeferencing information per segment; Secretariat informed that to save data volume, georeferencing information is not explicitly provided per segment; it can be calculated using CF-convention grid mapping variables provided in the metadata. The FCI L1 Product User Guide provides further information.

- Software

  - The users asked for software recommendation for area selection, remapping, making RGBs etc. It was suggested to keep in touch with the manufacturers and share with other MSs. There was a query on Pytroll integration with MTG and references to the use of NWCSAF software used in Himawari. The MTG webpage can collect these activities done by the MSs.

- Testbeds

  - Following the successful US example on testbeds, there is a need to "up" our dialogue with ESSL. This is proven to be the best way to bring people together and have interactions and ideally best done during Commissioning. Poland mentioned where they have a training facility coming up by May/June 2020, in Krakow, near Polish forecast centre where up to about 20 participants can be accommodated.

  - Take into account fees since not all MS are members of ESSL

- Other information channels
  - Webinars – Webinars can be recorded and uploaded to youtube
  - Application User Guides - dynamic – testimonials
  - Laminated quick guides - hardcopies- are useful for forecasters
  - Monitoring website and
  - User notification Service.

- Application thrust for most NMHS is mainly on nowcasting with FCI

- Expectations on LI, including high latitudes: while Norwary said that the forecasters are fascinated by GLM images, they are not sure how much MTG-LI will be useful for Norway. Secretariat expects higher performance of LI at large viewing angles than GLM due to less chromatic aberration effects (using four cameras instead of just one with GLM).

- IRS is still not on the radar of most of the MSs. They find it difficult to convince management level based on IASI-L2. Some study to show the benefit of IRS at different latitudes would be nice to demonstrate the case. ESSL test bed results could be used for this.

- Guidance on user expectations from an Applications and Product Guide

- Resolve current EUMETSAT website issues, have better search function
- Quick guides to technical information
- Webinars: to reach forecasters, on LI
- Need Product User Guides, example scripts

2.3 Concluding panel

After reconvening in the main meeting room, participants shared views and experiences from the MTG Day, and raised further points with EUMETSAT Secretariat (H/USC – Joachim Saalmüller), Hajo Koppert (DWD) and Simon Keogh (MetOffice) on the panel.

Simon Keogh stressed that preparation for MTG in a NMHS was a change process, to be led by the scientists and developers who know most about MTG. Identification of internal stakeholders and their requirements regarding MTG was an essential first step, such as aviation forecasters. A clear test data timeline was critical for planning.

Hajo Koppert emphasized the importance of setting priorities: for DWD, these are convective initiation, low clouds, and fog.

Norway commented that this process was difficult to follow in a small service. Secretariat pointed to the value of partnerships – identify which tasks and responsibilities can be transferred elsewhere.

Germany pointed out the lack of preparation efforts by EUMETSAT in the transition to MSG, and commended the MTGUP project.

Hungary noted that the NWCSAF software was used to simulate MSG channels.

Hajo Koppert recommended that new application developers have to take all data sources into account and integrate / synthesise them, since forecasters do not just want more data.

Natasa Strelec-Mahovic (MTGUP Advisory Group member) suggested to use the forum where Heads of Forecasting of NMHS meet yearly, to identify data needs and priorities. Then smaller services can follow larger services.

3 TRANSITIONING TO MTG IN NORTH AFRICA

Minutes of this meeting, held as part of the 10th WMO RA-I Dissemination Expert Group (RAIDEG) meeting 11-12 November 2019, are available here:

https://community.wmo.int/meetings/10th-meeting-ra-i-dissemination-expert-group-raideg-10

4 MTG, EPS-SG AND DATA ACCESS

4.1 Introduction

Joachim Saalmüller (EUMETSAT, H/USC) opened the Main User Day and welcomed participants. All but two MS-NMHS were present, as well as 11 manufacturers to explore solutions. These User Days are organised about two years from the launch of MTG-I1, which is a good time to start preparation activities with "future focus".

Alain Ratier, Director-General of EUMETSAT, quoted the new MTG and EPS-SG tagline in that these missions will provide weather and climate like never before, in times that are seeing climate change and more frequent and intense weather as never before. Monitoring and forecasting these phenomena needs anticipation, and for that, better observations and improved medium-range weather forecasts are critical, which is the main purpose of EPS-SG; last chance forecasts can be enabled with MTG data, and the potential MTG-S IRS contribution to short-term weather forecasting holds promise.

He stressed that with MTG-I1 launch approaching, the challenges are not becoming smaller, and indeed there were challenges related to science preparation, ground segment, system. The User Days are organised for the NMHS, the reference users; since other users are beneficiaries downstream, bringing to society the value of the programmes; investments in infrastructure, and intellectual resources are necessary on the part of Member States. Future User Days will be open to other users.

4.2 Overview of MTG and EPS-SG Missions

Jochen Grandell (EUMETSAT, MTG Programme Scientist) introduced the MTG Mission, showed some of the expected benefits from the individual missions (FCI vs SEVIRI). On LI, space-based observations are a complementary measurement. Lightning occurs as precursor to severe weather, and also during severe weather. He showed an example for issuing a severe thunderstorm warning over Alabama, USA, when the GLM flash density product indicated a lightning jump and, considering all other sources of data, tipping the forecasters toward issuing a severe weather warning. IRS provides an innovation by sounding the atmosphere over the full disc at much higher frequency than polar-orbiting instruments. UVN provides a day-time view on atmospheric composition.

Programme status foresees MTG-I1 launch in Q4/2021, and MTG-S in Q2/2023, with 12 months commissioning. Hardware is currently being built by industry, and tested. Ground segment development is proceeding well. The [MTGDIS] document has details on the data and products to be disseminated. He showed the list of Level 1 and Level 2 products available from central facilities, and from the SAFs. He elaborated on various forms of test data, produced primarily for Programme purposes, and acknowledged the need for test data for user familiarization. A FCI L1c 24h test dataset was released in June 2019.

Peter Schlüssel (EUMETSAT, EPS-SG Programme Scientist) described the EPS-SG Mission. It is part of the Joint Polar System with NOAA, and fulfils the European contribution to the WMO Integrated Global Observing System as regards space-based observations from polar orbits. There are continuity and innovation elements to the various missions. Current launch dates are Q4/2022 for EPS-SG-A1 and Q4/2023 for EPS-SG-B1.

The missions on EPS-SG can be summarised into Sounding missions and Imaging missions:

The Sounding missions measure the vertical distribution of the atmospheric state:

- IASI-NG
- MWS
- RO

- UVNS (Sentinel-5)

The Imaging missions measure the horizontal distribution of clouds, aerosols, and surface variables:

- METimage
- 3MI
- MWI
- ICI
- SCA

He showed objectives, key performances, expected breakthroughs, and applications of the various missions.

Global and Regional Data Services will be available to receive EPS-SG data, with certain timeliness requirements. He also mentioned the Direct Data Broadcast Service, available to authorised users. He described the Payload Data Processing facility.

Test data are being generated, for industrial contractor testing, and then for testing by users.

4.3 User Preparation Activities

Stephan Bojinski (EUMETSAT, MTGUP Project Manager) introduced MTG user preparation key user groups, and the 2017-2027 MTG User Preparation Project (MTGUP) and its core themes: Science support, User information and communication, User familiarisation (test) data and format support, User training, and Data access support. He illustrated some MTGUP results, such as test data releases, website and other resources, user guidance material.

Sreerekha Thonipparambil (EUMETSAT, EPS-SG UP Project Manager) described the User Interactions planned within EPS-SG UP, along similar core themes as MTGUP and, in addition to MS-NMHS, an expanded target user group, e.g., involving centres running global and regional NWP models.

Lothar Schüller (EUMETSAT, SAF Network Manager) introduced the SAF network, advantage of SAFs being located with NMHS, hence close to the users. The SAFs have assigned responsibility for continuity products in the MTG and EPS-SG era. Interactions between Programmes and SAFs are ongoing in the 3rd phase of the SAFs; the next phase 2022-2027 should fully embrace MTG and EPS-SG, based on their proposals.

One question asked about opportunities to run some SAF processors at EUMETSAT Central Facilities (example to apply LSASAF software to HR FCI imagery for an enhanced fire product).

4.4 Data Access Evolution

4.4.1 New Data Services

Sally Wannop (EUMETSAT, User Relations Manager) briefed on the evolution of the EUMETSAT data access services, responding to user feedback and addressing future satellites mission data:

- Near-real time push service: EUMETCast Satellite and EUMETCast Terrestrial
- Download service: Centralised data downloading and tailoring
- Long-term archive: Data preservation and offline media requests
- View service: Enhanced web mapping, coverage and feature extraction
- Customisation toolbox: Data conversion tool

- Hosted processing: to be explored more in the future.

She explained the roll-out plans for the new data services in 2019-2021.

Access to all service is managed by existing registration login credentials at https://eoportal.eumetsat.int

One participant questioned whether the Product Customisation Toolbox was competing with commercial vendors. Secretariat clarified that this was not the case – the Toolbox was intended to facilitate data handling as part of EUMETSAT housekeeping. The Toolbox code can be customised.

4.4.2 Near-real Time Data Services

Klaus-Peter Renner (EUMETSAT, Dissemination System Manager) presented on NRT services: EUMETCast Satellite, EUMETCast Terrestrial, the backup concept, and tentative data flow evolution for EUMETCast Satellite Europe.

A1 Telekom Austria provides the uplink service for the EUMETCast Europe service, and Overon provides the terrestrial link.

The minimum requirements for new EUMETCast Satellite services are:

Dishes and LNBs:
- One dedicated LNB per satellite;
- LNB type currently single, in future depends on new transponders (known Dec 2020)
- One dual feed dish or two single feed dishes;
- More LNBs or dishes depending on High Availability and redundancy needs;

DVB receivers:
- One dedicated tuner/decoder per transponder;
- Number of receivers depend on multi-feed support;
- Additional receivers depending on High Availability and redundancy needs;

Tellicast client stations:
- One station can support all services;
- Additional stations depending on High Availability and redundancy needs

Other equipment:
- DVB switches and network elements as needed;

He showed several example configurations.

EUMETCast Terrestrial basic functionalities:
- Principle similar to EUMETCast Satellite (multi-cast), but using terrestrial links
- Receiver signal to network (GEANT) where packets have to go
- Efficient: multiplicity only at nodes where necessary
- IP_TV uses same technology
- Central server sends data to network (GEANT) only once

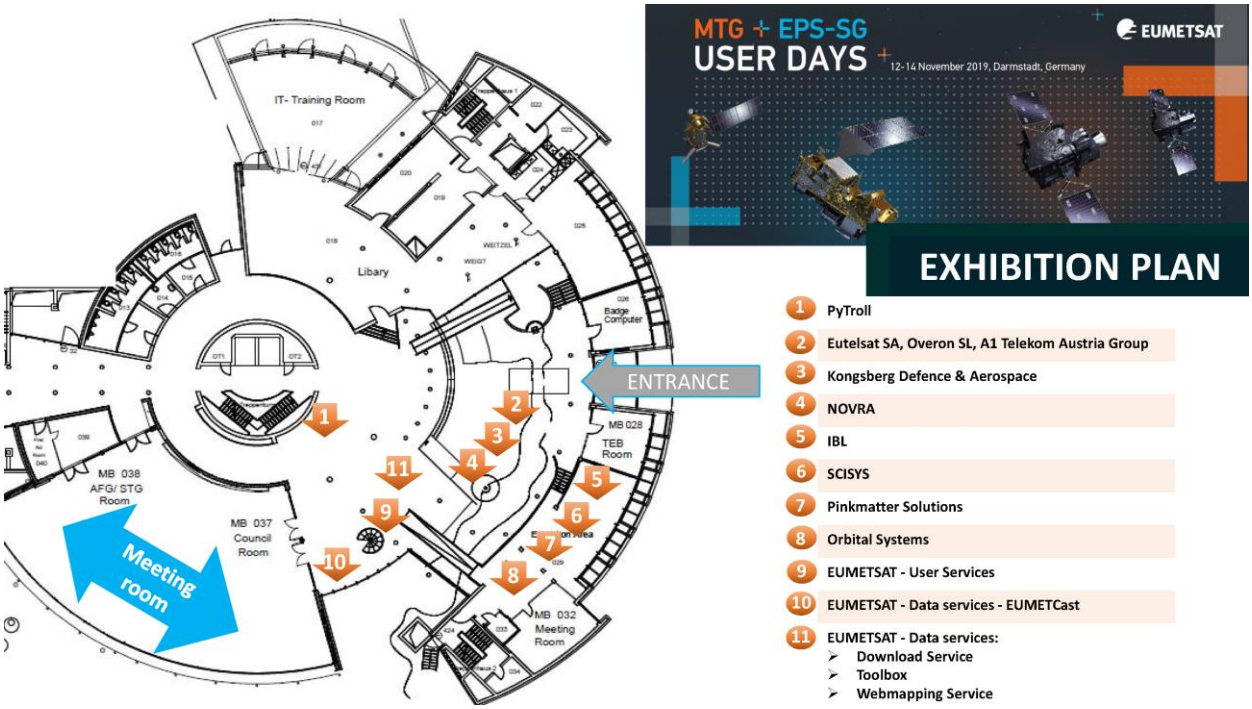
He showed estimates for net data rates (data size per day) and EUMETCast Europe transponder capacity evolution (the latter is slightly higher than net data rate due to overhead data).

All EUMETCast Satellite data will be on EUMETCast Terrestrial.

4.4.3 Near-real Time Data Services

Davide Castellazzi (EUMETSAT, EPS-SG System and Operations Preparation Manager) described the EPS-SG Direct Broadcast Service. This Service, consisting of continuous transmission worldwide of EPS-SG instrument data in X-band for instantaneous acquisition (within 10s of sensing time). This is data is to be used for the Local and Regional missions.

4.5 Technical Exhibition



4.6 Concluding Plenary

Czech Republic suggested to make MTG data, if not NRT or off-line, as soon as possible available during commissioning after 4-6 weeks.

Norway asked when the EUMETCast Satellite backup service is going to be activated (currently out for testing purposes).

Poland noted that NMHS and manufacturers share many of the same problems.

5 THE EPS-SG MISSION AND USER PREPARATION

5.1 Introduction

Gökhan Kayal (EUMETSAT, EPS-SG Programme Manager) opened the day, stressed the special moment since significant progress with EPS-SG has been made. The post-EPS user consultation started in May 2006, just before the launch of Metop-A. He showed the EPS-SG Programme Status. With the User Days, it is expected that the process of discussing how to exploit the data would start.

5.2 Innovation potential of the 3MI/EPS-SG

Jérôme Riedi (University of Lille) described 3MI, its heritage and expected improvements in observing aerosols and clouds in the atmosphere, using multiple viewing angles and polarisation detection. 3MI builds on POLDER/MERIS heritage.

The 3MI is the first dedicated aerosol mission flown by a satellite agency. It is a wide field of view (FOV) radiometric multi spectral imager with multi polarization I, Q, U, multi angle (14 viewing angles). The swath sizes are different for VIS and SWIR

It is essential that for innovative missions like 3MI, there is a need to provide test data and tools for users to understand the data.

A near real time aerosol properties retrieval algorithm for 3MI (GRASP) developed by Dubovik was presented. About 55 parameters including aerosol size distribution, spectral index of refraction, sphericity fraction and aerosol height can be retrieved. Main cloud properties retrieved from 3MI includes

- Cloud thermodynamic phase
- Cloud top pressure
- Cloud optical thickness
- Cloud particle size
-

The potential synergy among EPS-SG instruments 3MI, Sentinel-5, IASI-NG, METimage, as well as synergy of GEO and LEO instruments was also presented.

5.3 The Ice Cloud Imager (ICI) – a new perspective on ice clouds and precipitation

Susanne Crewell (University of Cologne) described the knowledge gaps to be addressed by ICI, namely gaps in detecting ice water in the atmosphere. The spectrum covered by ICI closes a gap between IR and radar MW ranges (sub-mm), and has sensitivity to Ice Water Path. More information on cloud processes is expected from ICI data, e.g., precipitation formation in ice phase or liquid phase, water vapour profiling.

She described the approach for exploiting ICI using observations, retrievals/adjoint, an atmospheric model, and a forward operator.

Spectroscopy not well understood in the sub-millimetre range (see workshop report, including astronomers: Mattioli et al., 2019, BAMS). Several microphysical schemes to describe hydrometeor scattering are investigated, including a neural network approach. Turner et al. developed a major review of such databases.

Airborne campaigns are organised to inform model parameterization, on ice particle shapes and comparison with models, measurements.

She mentioned the possibility of approaching the German Research Foundation (DFG) for funding ICI-related research and campaigns.

5.4 Enabling the exploitation of EPS-SG data with fast RT models and outlook for NWP

Roger Saunders (MetOffice) described the broad range of data types used in global and UK model, improvements due to satellite data, the role of fast radiative transfer models in NWP, enhancements of RTTOV capabilities for EPS-SG, and the planned exploitation of EPS-SG at the MetOffice.

MetOffice forecast skill has improved persistently, with a 2-day forecast in 2015 being as good as a 1-day forecast in 2000. He presented a recent FSOI result showing the relative contribution of satellite data to global 24-hour forecast to be of 64%. The NWPSAF software (AAPP, RTTOV, MWIPP) has been running operationally since 2000, and monitoring of operational instruments is also undertaken. He showed the overall development of RTTOV as well as the enhancements particularly to enable the use of Metop-SG. Simulated imagery using model data is used by the forecasters to easily see if the model has an error in the positioning of a front or depression.

Status of RTTOV support for EPS-SG

- IASI-NG coefficients based on a gaussian apodisation function given by max optical path diff of 4cm and full width at half maximum of Gaussian function 0.25cm^{-1}
- IASI-NG coeffs for PCs with PC-RTTOV and HT-FRTC
- MWS based on instrument spec (top hat & actual SRF)
- MWI based on instrument spec (top hat)
- ICI based on instrument spec (top hat)
- METImage based on nominal channels (top hat SRFs)
- 3MI not supported yet

He also presented the Met Office plans for using EPS-SG data. Because EPS-SG has a strong heritage from EPS, the use of heritage data is not perceived as a challenge while new missions like ICI and 3MI requires research in areas of radiative transfer modelling, data assimilation, and modelling.

5.5 Nowcasting for Nordic latitutdes using EPS-SG data

Adam Dybbroe (SMHI) showed an overview of using polar-orbiting satellite data for nowcasting applications in high latitude regions of Northern Europe. Sweden is somewhat in the gap between GEO and LEO optimal coverage. No Highly-Elliptical Orbit (HEO) mission is planned as yet.

He elaborated on:

- Nowcasting and regional forecasting
- High latitudes - considerations on resolution, coverage, revisit times etc
- NWCSAF/PPS and preparing for EPS-SG
- Example applications with PPS cloud parameters

Prominent nowcasting issues are cloud cover, fog (visibility), road weather, cloud icing for aviation, and heavy precipitation in urban areas. Both fine resolution regional NWP models as well as traditional

extrapolation-based nowcasting techniques can be used. Data timeliness matters greatly for the MetCoOp AROME model (with hourly updates and data cut off -30 and +15 minutes).

SMHI are looking at data from AVHRR, MODIS, VIIRS, MERSI-2, and plan to use METimage, MWI, and ICI. NWCSAF PPS output is being used, with the next major release in Q1/2022.

High viewing angles can be useful for cirrus cloud detection.

The Arctic Weather Satellite (AWS) is a proposed passive MW mission, with a demonstrator to be launched in 2023.
He advocated against using the rainbow palette for colour maps.

5.6 User Preparation for Atmospheric Composition Satellite Data

Federico Fierli briefed on the EUMETSAT Atmospheric Composition Satellite Data User Engagement Plan and planned activities. Such data encompasses current and planned geostationary and polar-orbiting EUMETSAT missions (such as GOME, IASI, IRS) as well as the Copernicus Sentinel-4 and Sentinel-5 missions.

He described the scope of this user engagement, within five domains (air quality, understand and modelling atmosphere and climate change, assimilation, emission inventory support excluding GHGs, sand/dust/ash monitoring).

Elements of user preparation are user consultation, communication, test data, training, data access.

What users may need:

- Data and products through value chains, CAMS etc
- Direct use of observations

5.7 Exchange of Information and Discussion on EPS-SG User Preparation

The discussion session on the EPS-SG day was carried out following the concept of "Open Space". Participants proposed topics that were relevant to EPS-SG through slido and an agenda was formulated where three parallel topics were discussed spanning 45 minutes. Three such sessions were held, thus covering nine topics altogether.

tinyurl.com/beready19

The topics covered are the following:

1. EPS-SG impact on operational forecasters

   Forecasters expected a major impact from scatterometer data. Metimage with its high spatial resolution provides key information (eg., fog) though the temporal resolution is too low. For Nordic countries the sounding data from MWS and IASI-NG to have a great impact, particularly in conjunction with NOAA satellites. For regional NWP, there is indirect impact from the use of ECMWF boundary conditions. Forecasters will heavily rely on products from SAF, for example, hydrology products related to snow depth, snow water equivalent

2. Synergestic use of EPS-SG sensors

The co-registration for EPS-SG instruments was discussed here. There is no coregistration between ICI and MWI though MWIPP software will make a between match ICI and MWI. The synergy between MetImage and 3MI-L1C has to be checked while synergy between microwave and scatterometer is not established.
The group discussed some combined products of interests like the temperature and humidity product from MWS and IASI-NG using Metimage cloud mask, the 3D winds from IASI which is a test product with cloud information from AVHRR, GHRSST which is a combined product SST from various sources including IASI-NG, MetImage, VIIRS and the multimission aerosol product.

A new IASI like instrument, FORUM, which has frequencies extending up to ICI frequencies was brought to the notice of the group. This instrument which will be launched around 2026 is foreseen to fly in tandem with Metop-SGA

3. Software Tools

The group discussed the need to bridge knowledge gap between the usrs and the manufactures who prepare software tools for EPS-SG. There was an interest to integrate Eumetsat Toolbox with Pytroll though currently Pytroll has not developed readers for EPS-SG data. Webmapping services, like Eumetview will be powerful as a Training tool.

4. SAF products

SAF Day-1 products will be to ensure continuity while Day-2 products will exploit the new and additional capabilities of EPS-SG, but these are not yet defined and will be subject to proposals for CDOP 4 and their preparation. SAF products have to be communicated to all users and stakeholders more actively. The new data services are well considered and discussed with the SAFs, however, as the final capacity of the new services are still not known, decisions will probably not made before the next SAF phase proposals.

SAFs plans should be driven by (user) requirements, and these requirements needs to be documented in order to serve as a good reference. Users, in particular from the Met Services are encouraged to express their requirements to the SAFs, giving the opportunity to shape the SAFs committments for the next phase. The Secretariat (lothar.schueller@eumetsat.int) is able to help you establishing the contact to the relevant SAF experts.

5. Regional NWP and Nowcasting

The group discussed a few of the priority nowcasting appliations in their Met services, which included thunderstorm, fogs, aviation, drought, precipitation, sea level rise, and fire.

Not all data assimilated in global NWP systems is assimilated in the regional NWP. About 50% of the impact in regional NWP comes from the boundary conditions (at least for 24-48 hours). But because the global model updates are twice a day and regional model has hourly updates, the impact from the BCs decrease in due course if satellite data are not assimilated in the regional model.

In addition to radiance assimilation, L2 products (like aerosol optical depth, scatterometer winds, soil moisture) are also assimiliated in NWP.

6. Heritages

The group was interested in the innovative missions on EPS-SG, particularly the applications of 3MI and ICI. For 3MI, POLDER, MODIS (can be downloaded from ICARE) and PARASOL would be

helpful for users to generate 3MI proxy test data. For ICI, there is no direct heritage, hence simulated data has to be used for user familiarisation.

7. Global user preparation for EPS-SG

   The group expressed more awareness regarding the products from EPS-SG and their use. Researchers and developers are aware of the development of instruments and their capabilities, but limited to their instruments of interest.

   While big centres assimilate data from EPS-SG, other centres are interested in products developed from EPS-SG. In fact there are a multitude of products available from EPS-SG, so visualisation tools are important.

   Test data is an essential part of user preparation for format familiarisation, system testing, and for scientific understanding. Training with proxy data is an essential aspect of user preparation. There is also a need for streamlined training approach, where the regional trainers are trained first, who then train the NMHS trainers who further trains the forecasters.

8. Transition from Metop to Metop-SG

   The Met Office enquired the possibility of having Metop close to Metop-C within 5 mins for validation purposes. This configuration has a scientific value if maintained for at least 6 months for NWP and for 1 year for Climate (GCOS). Similarly, when Metop SG B is launched, closeness to either Metop-C (or Metop B) was requested. The group also proposed an interesting configuration of satellite trains after the launch of the second set of satellites, within 5 minutes of each other. Limiting factor is mostly the data processing and also to a certain extent data transfer.

   SAFs might maintain parallel products for a time longer than six months for their downstream users. NWCSAF produce parallel products for Metop-SG and Metop-C.

   For direct readout, antennas need to be maintained for both Metop and Metop-SG. There is no processing at EARS stations. Data will be received and repatriated to Eumetsat for processing.

9. Reception diagram

   Local reception will offer 10mins advanced time and this offers resilience business continuity in the event of an issue at the central processor

   Davide C. (Eumetsat) explained that the local and regional processing will be identical. EPS-SG regional service will offer software for processing. Full Metop pass can be processed in three minutes to generate L1b data. IASI NG processing will be challenging, an estimate of 50 cores are needed to process the data. Regional data will process in parallel in chunks of ten minutes.

   L1 processor will be shared and users will be able to develop their own. Software companies can integrate the processor into their own reception software. There are also plans to include NWC SAF s/w into the processors to generate L2 products.

   There is a clear need for user training to exploit the new local and regional mission. All developers including NWPSAF are awaiting the outcome of the trade-off for local processing. EUM will publish the L1 format for the first satellite early next year. The downlink documentation will soon be available Space-to-ground ICD & Level 0 format specification (expected end 2019). The final L1 ATBD will only come end 2020. There was a concern that the information for the L1 may come too late for users and developers to prepare. For level 0 data processing the time schedule is acceptable; for the full turn-key system there is not much time. Level 1 processing software will only be available 1-yr before

launch. Users may have to consider a 2-step procurement. Basic hardware/software upgrade followed by the processing software package.

The group also touched upon EUMETCast reception in the MTG era. There is a need to offer training and support to users on the new configuration (prime, backup & Terrestrial)

6 OVERALL SUMMARY AND CONCLUSIONS

Some observations:

- Overall very good feedback by external and internal participants, regarding meeting objectives and organisation
- Explore next opportunities for MS-NMHS to connect with manufacturers, and for engaging manufacturers (e.g., industry day, collecting product portfolios, survey)
- Idea to create digital models of the spacecraft for a 3D printer
- Expose to MS-NMHS the software and hardware used among MS-NMHS, for guidance, based on the 2019 Enquiry

7 APPENDIX A – AGENDA

MTG + EPS-SG **USER DAYS 2019** EUMETSAT

12 November 2019 - Morning

MTG Preparation Use Cases *Council Room*

Registration as of 08:00

09:00-09:05	Welcome and introductory remarks *(Alexander Schmid, MTG Programme Manager)*
09:05-09:25	Use cases for FCI data in nowcasting severe weather *(Martin Setvak, CZ)*
09:25-09:45	Synergetic use of FCI and LI for thunderstorm nowcasting *(Ulrich Hamann, CH)*
09:45-09:55	Q&A and discussion
09:55-10:15	Himawari-8 use cases and NWCSAF software in Australia *(Leon Majewski, Australian Bureau of Meteorology)*
10:15-10:40	Use cases from the operational GOES-16 and lessons learned for user preparedness *(Dan Lindsey, NOAA, USA)*
10:40-10:50	Q&A and discussion
10:50-11:15	Coffee break
11:15-11:35	Use of IRS simulated and proxy data in global NWP *(Kirsti Salonen, ECMWF)*
11:35-11:55	Future use of IRS in regional NWP *(Nadia Fourrié, Météo-France)*
11:55-12:20	Q&A and discussion
12:20-12:30	Group photo
12:30-13:30	Lunch break

MTG + EPS-SG **USER DAYS 2019** EUMETSAT

12 November 2019 - Afternoon

MTGUP User Group: Information Exchange and Discussion

13:30-13:45 **Keynote by MTGUP Advisory Group** *(Council Room)*

13:45-15:15 **MTGUP Theme Panels**

Test Data *(Council Room)*	**Training** *(Council Room)*	**User Information and Communication** *(Room MB17 IT Training Room)*
• Current and planned test datasets • User feedback	• User needs and priorities • Training opportunities • MTG Training Plan, Short-term skills development	• Application and User Guidance development • Status of user preparation

Transitioning to MTG in North Africa *(Room PC001)*

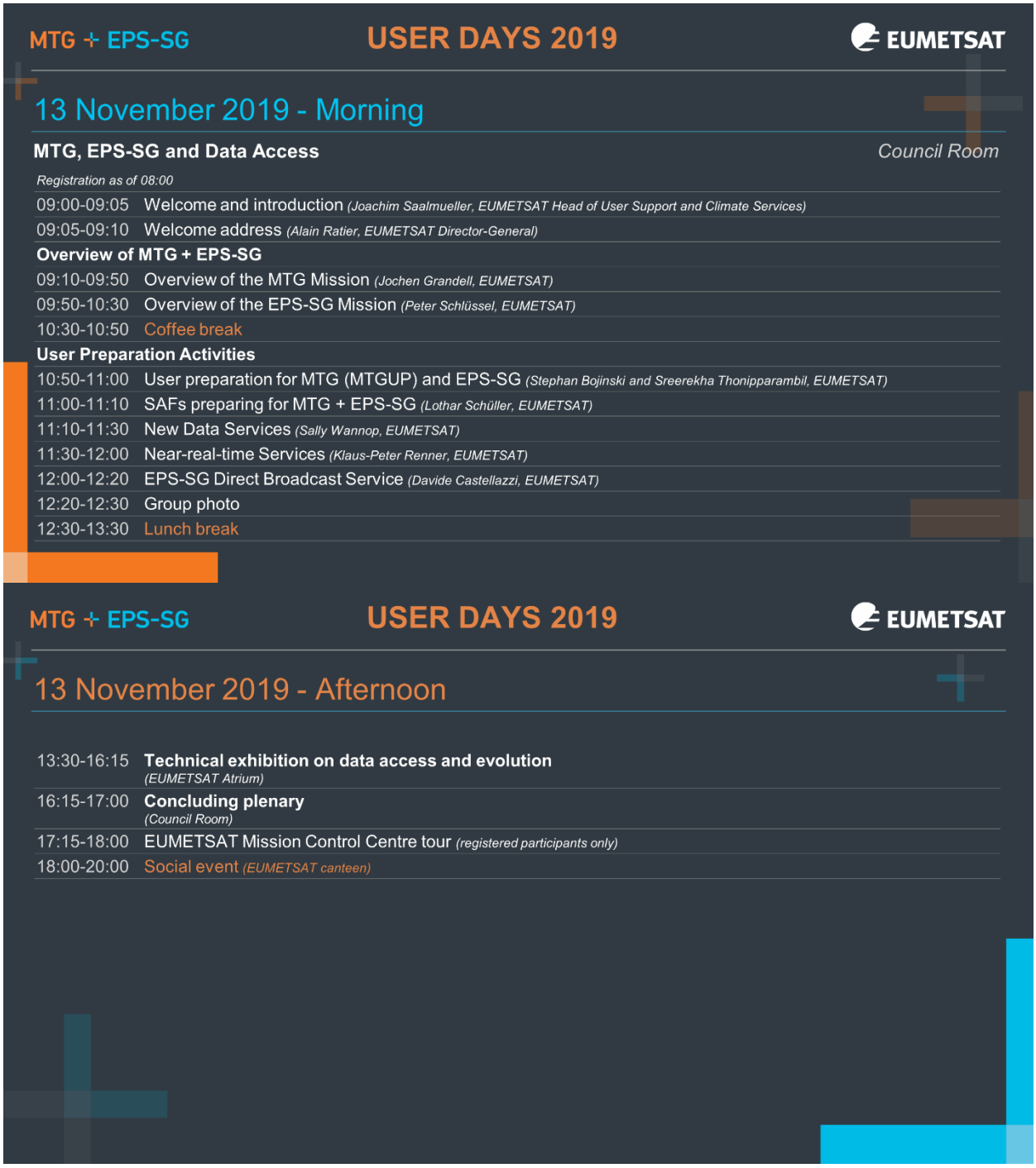
- MTG Africa Roadmap
- Status of User Preparation
- User Event in 2020

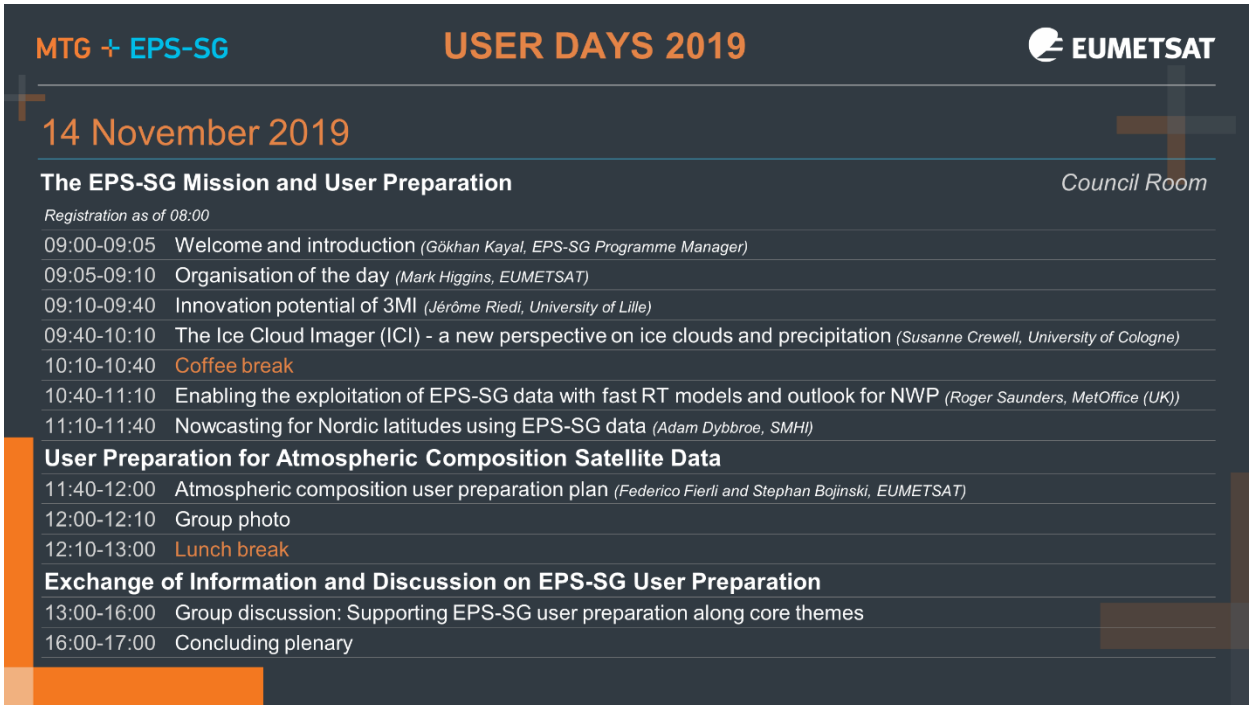
15:15-15:45 Coffee break

15:45-17:00 **Roundtable on status of user preparedness** *(Council Room)*

- Introduction and overview of user preparedness
- Discussion:
  - Status of user preparedness
  - Cross-fertilization among MS-NMHS
  - Best practices and lessons identified

17:30-18:30 **MTGUP Advisory Group Meeting (closed)** *(Room MB032)*


MTG + EPS-SG
USER DAYS 2019
EUMETSAT
13 November 2019 - Morning
MTG, EPS-SG and Data Access
Council Room
Registration as of 08:00
09:00-09:05 Welcome and introduction (Joachim Saalmueller, EUMETSAT Head of User Support and Climate Services)
09:05-09:10 Welcome address (Alain Ratier, EUMETSAT Director-General)
Overview of MTG + EPS-SG
09:10-09:50 Overview of the MTG Mission (Jochen Grandell, EUMETSAT)
09:50-10:30 Overview of the EPS-SG Mission (Peter Schlüssel, EUMETSAT)
10:30-10:50 Coffee break
User Preparation Activities
10:50-11:00 User preparation for MTG (MTGUP) and EPS-SG (Stephan Bojinski and Sreerekha Thonipparambil, EUMETSAT)
11:00-11:10 SAFs preparing for MTG + EPS-SG (Lothar Schüller, EUMETSAT)
11:10-11:30 New Data Services (Sally Wannop, EUMETSAT)
11:30-12:00 Near-real-time Services (Klaus-Peter Renner, EUMETSAT)
12:00-12:20 EPS-SG Direct Broadcast Service (Davide Castellazzi, EUMETSAT)
12:20-12:30 Group photo
12:30-13:30 Lunch break
MTG + EPS-SG
USER DAYS 2019
EUMETSAT
13 November 2019 - Afternoon
13:30-16:15 Technical exhibition on data access and evolution
(EUMETSAT Atrium)
16:15-17:00 Concluding plenary
(Council Room)
17:15-18:00 EUMETSAT Mission Control Centre tour (registered participants only)
18:00-20:00 Social event (EUMETSAT canteen)



MTG + EPS-SG

USER DAYS 2019

EUMETSAT

14 November 2019

The EPS-SG Mission and User Preparation — *Council Room*

Registration as of 08:00

09:00-09:05	Welcome and introduction *(Gökhan Kayal, EPS-SG Programme Manager)*
09:05-09:10	Organisation of the day *(Mark Higgins, EUMETSAT)*
09:10-09:40	Innovation potential of 3MI *(Jérôme Riedi, University of Lille)*
09:40-10:10	The Ice Cloud Imager (ICI) - a new perspective on ice clouds and precipitation *(Susanne Crewell, University of Cologne)*
10:10-10:40	Coffee break
10:40-11:10	Enabling the exploitation of EPS-SG data with fast RT models and outlook for NWP *(Roger Saunders, MetOffice (UK))*
11:10-11:40	Nowcasting for Nordic latitudes using EPS-SG data *(Adam Dybbroe, SMHI)*
User Preparation for Atmospheric Composition Satellite Data	
11:40-12:00	Atmospheric composition user preparation plan *(Federico Fierli and Stephan Bojinski, EUMETSAT)*
12:00-12:10	Group photo
12:10-13:00	Lunch break
Exchange of Information and Discussion on EPS-SG User Preparation	
13:00-16:00	Group discussion: Supporting EPS-SG user preparation along core themes
16:00-17:00	Concluding plenary

8 APPENDIX B – LIST OF PARTICIPANTS

List of internals participants:

	NAME	COMPANY/ORGANISATION
1	Alain Ratier	EUMETSAT
2	Alexander Schmid	EUMETSAT
3	Anne-Marie Andrieux	EUMETSAT
4	Bartholomeo Viticchie	EUMETSAT
5	Bertrand Fougnie	EUMETSAT
6	Bertrand Theodore	EUMETSAT
7	Bojan Bojkov	EUMETSAT
8	Carlos Mas	EUMETSAT
9	Chris Hartley	EUMETSAT
10	Christophe Accadia	EUMETSAT
11	Daniel Lee	EUMETSAT
12	Davide Castellazzi	EUMETSAT
13	Debbie Richards	EUMETSAT
14	Denis Fayard	EUMETSAT
15	Domenico Schiavulli	EUMETSAT
16	Domenico Schiavulli	EUMETSAT
17	Fabrizio Borgia	EUMETSAT
18	Federico Fierli	EUMETSAT
19	Gökhan Kayal	EUMETSAT
20	Guillaume Aubert	EUMETSAT
21	Harald Rothfuss	EUMETSAT
22	Ilaria Parodi	EUMETSAT
23	Ivan Smiljanic	EUMETSAT
24	Joachim Saalmueller	EUMETSAT
25	Joana Betencourt	EUMETSAT
26	Joaquín Rodríguez-Guerra	EUMETSAT
27	Jochen Grandell	EUMETSAT
28	Jose Prieto	EUMETSAT
29	Katja Hungershoefer	EUMETSAT
30	Kim-Hui Gaune	EUMETSAT
31	Klaus-Peter Renner	EUMETSAT
32	Lorna Putze	EUMETSAT
33	Lothar Schüller	EUMETSAT
34	Mark Higgins	EUMETSAT
35	Michael Schick	EUMETSAT
36	Milad Tawk	EUMETSAT
37	Miruna Stoicescu	EUMETSAT
38	Mounir Lekouara	EUMETSAT
39	Oriol Espanyol	EUMETSAT
40	Pamela Schoebel-Pattiselanno	EUMETSAT
41	Pepe Phillips	EUMETSAT

42	Peter Hardman	EUMETSAT
43	Peter Miu	EUMETSAT
44	Peter Schluessel	EUMETSAT
45	Regina Hoefenmayer	EUMETSAT
46	Ruth Evans	EUMETSAT
47	Sally Wannop	EUMETSAT
48	Simona Oancea	EUMETSAT
49	Sreerekha Thonipparambil	EUMETSAT
50	Stephan Bojinski	EUMETSAT
51	Sylwia Miechurska	EUMETSAT
52	Thierry Marbach	EUMETSAT
53	Thomas August	EUMETSAT
54	Tim Patterson	EUMETSAT
55	Vesa Nietosvaara	EUMETSAT
56	Vincent Gabaglio	EUMETSAT
57	Vinia Mattioli	EUMETSAT

List of external participants:

	NAME	**COMPANY/ORGANISATION**
1	Adam Dybbroe	SMHI
2	Ahmed Hmam	TUNISIA NATIONAL WEATHER SERVICE
3	Aleksei Vastsenko	Estonian Environment Agency
4	Alexander Harkenthal	Overon
5	Andreas Wirth	ZAMG
6	Andrei Diamandi	National Meteorological Administration Romania
7	Andrey Kulishev	National Institute of Meteorology and Hydrology
8	Anton Verhoef	KNMI Royal Netherlands Meteorological Institute
9	Ardo Abel	Information Technology Centre of the Ministry of the Environment Estonia
10	Bathobile Maseko	SAWS
11	Boris Burger	IBL Software Engineering
12	Bozena Lapeta	Institute of Meteorology and Water Management - National Research Institute Poland
13	Branislav Mikulas	IBL Software Engineering
14	Carla Sofia Fino Barroso	IPMA
15	Carsten Mannel	SCISYS Deutschland GmbH
16	Chris Sloan	UK Met Office
17	Christina Sverker	SMHI
18	Christo Georgiev	National Institute of Meteorology and Hydrology Bulgaria
19	Dan Lindsey	NOAA/NESDIS
20	Daniel Garcia	Prodetel SA

21	Davide Melfi	Italian Air Force Met Service - COMet
22	Diakaria Kone	Niger VLab
23	Dr. Peter Scheidgen	SCISYS Deutschland GmbH
24	Eman Shaker	Egyptian Meteorological Authority
25	Eysteinn Sigurðsson	Icelandic Meteorological Office
26	Frank Oynes	Kongsberg Spacetec AS
27	Fredrik Skärstrand	SMHI
28	Gerrit Holl	Deutscher Wetterdienst
29	Guido Gruber	A1 Telekom Austria Group
30	Hans-Joachim Koppert	Deutscher Wetterdienst
31	Harald Lauknes	Kongsberg Defence & Aerospace - Spacetec
33	Heikki Pohjola	WMO
34	Hulda Ros Helgadottir	Icelandic Meteorology Office
35	Ioannis Matsangouras	HNMS
36	Ján Kaňák	Slovak Hydrometeorological Institute
37	Janne Kotro	Finnish Meteorological Institute
38	Jekaterina Služenikina	Estonian Environment Agency
39	Jérôme Riedi	Université de Lille
40	Jindrich Stastka	Czech Hydrometeorological Institute
41	Jörg Asmus	Deutscher Wetterdienst
42	Josef Windisch	A1 Telekom Austria Group
43	Joseph Kageny	IMTR Kenya
44	Katrin Hannig	BGIC - Bundeswehr Geoinformation Centre
45	Kiril Slavov	National Institute of Meteorology and Hydrology Bulgaria
46	Kirsti Salonen	ECMWF
47	Konstantinos Kasapas	Hellenic National Meteorological Service
48	Kristiāns Pāps	Latvian Environment, Geology and Meteorology Centre
49	Kumar Dhurmea	EU Delegation to Mauritius
50	Lee Ann Simpson	SAWS
51	Leon Majewski	Australian Bureau of Meteorology
52	Leon-Guy Razafindrakoto	ACMAD
53	Lotte Kroer Myrvoll	Kongsberg Defence & Aerospace AS-Spacetec
54	Louis Wu	Novra Technologies Inc.
55	Luboslav Okon	Slovak Hydrometeorological Institute
56	Luca Nisi	MeteoSwiss
57	Maixent Kambi	DMN Congo-Brazzaville
58	Maksim Antonenko	KEMIT Estonia
59	Marcelino Manso	AEMET
60	Márta Diószeghy	Hungarian Meteorological Service
61	Martin Fránek	IBL Software Engineering
62	Martin Setvák	Czech Hydrometeorological Institute
63	Mateja Irsic Zibert	Slovenian Environment Agency - ARSO
64	Meral Leman Çukurçayır	TSMS
65	Metod Kozelj	Slovenian Environment Agency - ARSO
66	Michael Gordon	Onmedia AG

67	Mourad Benayache	Algerian Meteorological Office
68	Nadia Fourrie	CNRM Météo-France and CNRS
69	Nataša Strelec Mahović	Meteorological and Hydrological Service Croatia
70	Nicolas Clerbaux	Royal Meteorological Institute of Belgium
71	Noel Fitzpatrick	Met Éireann
72	Ole Jorgen Maeland	Orbital Systems LLC
73	Ondrej Nedelcev	Czech Hydrometeorological Institute
74	Onn Mintz	Israeli Meteorological Service
75	Paul deValk	Royal Netherlands Meteorological Institute (KNMI)
76	Paul Odams	UK Met Office
77	Pedro Ferreira	IPMA - LSA SAF
78	Philippe Labrot	Meteo-France
79	Piotr Struzik	Institute of Meteorology and Water Management – NRI, Poland
80	Rachida El Ouaranini	DMN Morocco
81	Robert Boreiko	Lithuanian Hidrometeorological service
82	Robert Mäkitie	Finnish Meteorological Institute
83	Roger Saunders	UK Met Office
84	Rubén Fernández-Salinero	AEMET
85	Simon Keogh	UK Met Office
86	Soubai Tareq	National Direction of Meteorology Morocco
87	Stella Aura	IMTR Kenya
88	Stephan Finkensieper	Deutscher Wetterdienst
89	Susanne Crewell	University of Cologne
90	Sylvain Le Moal	Meteo-France / Centre de Meteorologie Spatiale
91	Tahar Saouri	DMN Morocco
92	Thomas Blackmore	UK Met Office
93	Trygve Aspenes	Norwegian Meteorological Institute
94	Ulrich Hamann	MeteoSwiss
95	Xavier Calbet	AEMET
96	Xinxin Busch Li	SCISYS Deutschland GmbH
97	Zsofia Kocsis	Hungarian Meteorological Service

List of Exhibitors:

	Contact person	**COMPANY/ORGANISATION**
1	Adam Dybbroe Stephan Finkensieper	PyTroll
2	Michael Gordon Josef Windisch Guido Gruber Alexander Harkenthal	Eutelsat SA A1 Telekom Austria Group Overon SL
3	Lotte Kroer Myrvoll Harald Lauknes	Kongsberg Defence & Aerospace
4	Louis Wu	NOVRA

5	Martin Franek Boris Burger Branislav Mikulas	IBL
6	Carsten Mannel Xinxin Busch Li Peter Scheidgen	SCISYS
7	Philip Bouwer	Pinkmatter Solutions
8	Ole Jorgen Maeland	Orbital Systems
9	Stephan Bojinski Sreerekha Thonipparambil	EUMETSAT - User Services
10	 Klaus Peter Renner Oriol Espanyol Peter Hardman Milad Tawk	EUMETSAT - Data services EUMETCast
11	 Miruna Stoicescu Michael Schick Daniel Lee Peter Miu Ilaria Parodi Guillaume Aubert Fabrizio Borgia	EUMETSAT - Data services Data services – Download Service Data services – Toolbox Data services – Webmapping Service

9 APPENDX C – Q&A COLLECTED USING THE SLIDO TOOL

Questions	Subject	Responses
Will you build all the satellites in one batch, or will you build them as they are launched?	MTG Satellites	They are built in one batch, hence no possibility for major evolution over time in terms of instrument characteristics.
In the FCI test data set, is the 0.6 500m resolution provided or only 1000m resolution?	FCI test data	1000m horizontal resolution at nadir, as in the near-real-time Full-Disc Scanning Service (FDSS) mode
Question for MeteoSwiss: Have you also tried to run your algorithm/process without Radar data input, using satellite data for the motion/position estimate? *(this is related to MeteoSwiss presentation on 'Synergetic use of FCI and LI for thunderstorm nowcasting)*	FCI and LI	Response from MeteoSwiss: Not yet, but it is in our plan.
Can you explain to us as users what technology challenges played role in obtaining such good images resolution from geostationary orbit?	MTG Satellites	Challenges mainly related to meet user requirements for: pointing and geolocation accuracy, pixel-to-pixel consistency, straylight avoidance and correction, signal-to-noise
MTG sounding: 2 km vertical resolution for water vapour means 3-4 points in profile, 1 km vertical resolution for temperature - 10 points to tropopause, makes no chances to detect any inversion.	MTG Sounding	The strength of MTG IRS comes with its spatial and temporal coverage: the equivalent of 160x160 spectra in each instrument sample (dwell), every 30 minutes over Europe. As dictated by the physics of radiative transfer, it is not easy to detect inversions from any satellite-based sounding instrument. Also, IRS cannot see through clouds. IRS data are expected to complement model- and surface-based profiles (radiosondes etc) for nowcasting applications, e.g. in detecting convective initiation, and to have an impact on NWP.
How can improved satellite observations contribute not only to better monitoring, but also better prevention before severe events, especially fires induced by AGW CHANGES?	Data applications	Soil moisture and vegetation state maps can be derived from satellite data, using e.g., scatterometry, optical imagery, and these can indicate fire hazards due to dry, withered vegetation or dry soils.
What is the geostationary MTG satellite data (sounder) that can be used for the NWP?	MTG Sounding	IRS data (L1 and L2) are expected to have a positive impact on NWP at global and regional levels.

MetopSG daily data volume over European area?	EPS-SG	The EPS-SG system acquires data on global scale with a total of 10 instruments spread over two satellites. The size of level-1 and level-2 products centrally generated at EUMETSAT is 103 GB/orbit, with 14.207 orbits flown every day. The size of the fraction of the above data acquired over the European area is not included in the budget estimate. More up to date information will be available after the preparation of the data pack for System and OGS CDR Part 2, planned in May 2020, where these numbers will be re-evaluated and consolidated.
MetopSG: Any plans for a PM product from AOD data?	EPS-SG	The PM product is not currently in the plan although there are ideas to extract PM from AOD, which needs information on the aerosol type and its vertical distribution (only the lower part, close to the surface has to be included). We may be able to derive it from synergistic use of the sensors on EPS-SG, in the framework of the MAP product. But this will be a long-term development.

In MTG RSS mode, how will the LI work? Only over the FCI area?	LI	There is no RSS mode for the LI.
On which satellite will UVN fly?	UVN	UVN will fly on board the MTG-S satellites.
Where can LI test data be found?	LI	LI L2 test data are planned to be made available by end of this year. For more info on MTG test data, see: https://www.eumetsat.int/website/home/Satellites/FutureSatellites/MeteosatThirdGeneration/MTGData/MTGUserTestData/index.html. Check this page for any updates on test data.
For 3MI, what does push broom scan mean?	3MI	Push broom scanning is an along-track scanning concept where a multi angle acquisitions of the same on ground target is performed. The successive acquisitions of the the polarised and unpolarised spectral

		bands are achieved by using a rotating filter wheel.
On ASCAT there is a gap between the scans. Will this also apply to SCA?	SCA	SCA will also have two different swaths (left and right side) and no measurements in nadir direction.
Is EUMETSAT considering distributing MTG data through public clouds, analogously to how NOAA works with Amazon AWS cloud and publishes GOES-R L2 datasets?	Dissemination	No this is not foreseen.
For the solution based on DVB-S2, what is the internet speed requested?	Dissemination	DVB-S2 is not related to internet.
Will the signal strength be increased on the back-up satellite to reduce losses for users with the one dish dual lnb solution?	Dissemination	The max signal strength allowed by the satellite operator will always be used, therefore any degradation due to the dual feed solution at user side cannot be compensated. However the recommended antenna sizes, if used, contain sufficient margin for such a degradation.
Will each transponder provide different types of information? Why is it needed to use more than one transponder?	Dissemination	Yes each transponder will contain different types of data. The total data rate to be transmitted is larger than one single transponder and the max data rate for a single transponder on the current E10A satellite and High Volume Service is limited to approx. 69 megabits per sec.
Where can we find which data will be available on each of the transponders?	Dissemination	For future data, information about the transponder will be made available as we announce the release of the data. For MTG data, it is expected that this information will be provided in Q2 2021.

10 APPENDX D – PHOTOS

12 November 2019 (“MTG Day”)

13 November 2019 (“Main Day”)

14 November 2019 ("EPS-SG Day")