Topical Discussion Meeting report

Name of the meeting: Data utilisation preparation of ESA's upcoming Aurora Mission
Convener/s: Stefan Kraft, Mehdi Scoubeau, Jorge Amaya
Secretary: Mehdi Scoubeau
Data – Time: 30/10/2025 – 17-18h CET
Room: Grim
Nr of participants: 30+ in person, unknown online (but at least 3)
Form of TDM: Service/Project Feedback

Objective of the TDM

The topical discussion focused on the following questions:
• Which potential new services and products can be established by using the observational data of the ESA Aurora mission?
• Which possible enhancements of existing services can be envisaged?
• Which developments would have to be carried out to enable future service and product provisions.
• What improvements in terms of the expected data quality or mission requirements are desirable for the identified services or product.
• Which observational capabilities are desirable in terms of monitoring specific features or events in different space weather conditions (e.g. substorm monitoring, global mapping capabilities, pointing strategy).

Discussion highlights

The discussions, comments and questions can be grouped in two main categories: 1) questions/comments on the existing capabilities and requirements; and 2) suggestion on developments and potential future product and service

1. questions/comments on the existing capabilities and requirements

Refresh rate

- The 15-20 min refresh rate is deemed sufficient to capture global scales phenomena. The public manifested interest of faster refresh rates to capture fast moving phenomena.

Optical and UV lines

- The participants are excited by the prospect of having lines in UV and in optical, this provides lots of degrees of freedom
- Which of the UV band would be better to get was discussed
- Overall, the participants encourage ESA to try and fund the 2 AUI UV modules
- Experts in auroral emissions suggested additional lines to be considered in the visible range.

Latency

- While it is clarified that the latency is currently defined for Level 1, it seems like the 20min requirement is appropriate.

Miscellaneous questions were answered:

- Questions on sunlight filtering for the UV but also for the optical instrument
- Questions on the bottleneck for the cadence and ways to reduce it
- Question on the radiation impact on the image quality
- Question on whether there will be any image processing at image level (Level 1) or only at combined image level (Level 2+)

2. Suggestion on developments and potential future product and service

Combination of lines to derive precipitating electrons

- The operational aspect of the mission is questioned if the optical lines are used.
- Experts manifest the importance of having more than 1 far UV band for the calculation of all precipitating electron properties, but argue that is an interesting solution to use one far UV band and one (or more) optical line(s).

Early identification of aurora (type)

- Can be done on the level 1 products, no need to wait for the image of the full auroral oval
- Other experiences show that this can be done within 1 min
- Could potentially be done with AI development but it takes time - prototype
- Suggestion to prepare prototypes, maybe using the E2ES as vehicle

Conductance/conductivity maps

- The participants asked how it is possible to obtain these maps with images only?
  Answer: This will be part of an inverse modelling activity that uses electron precipitation to calculate atmospheric ionisation and hence deduce electron profiles, which can be in turn used to calculate Pedersen and Hall conductivity.

Monitoring of proton belt

- Important for the EP transfers to GEO (OTV for instance)
- SWESNET will use data from 1 mission (TBD) which will stop in 2027

Combination of RM and FGM

- Important to derive the pitch angle, especially given the unidirectional nature of the RM in RadMag
- Especially needed given the attitude profile of the aurora spacecraft
- Experts in radiation belts and RadMag are very positive about the data that can be obtained from the slot region

FAC

- The participants estimate that at the altitude of the spacecraft, with a cadence of 10 – 20 Hz, and the accuracy stated in the presentation, it will be possible to capture large- and meso-scale FAC and perform statistical long-term analysis of region 1 and region 2 Birkeland currents.

EMIC wave

- The FGM frequency is discussed (>20Hz requested by some of participants). Low-frequency EMIC waves are mentioned. It is observed that one could combine the Radiation Monitor and Magnetometer data to identify that something of that order occurred.
- A Cadence of ~20 Hz for the magnetometer is considered by the public to be sufficient to capture the low range of the EMIC waves.

High latitude over the horizon radar

- Over the polar regions, capturing plasma bubbles would be very helpful to perform over-the-horizon radar observations.
- These plasma bubbles appear as very faint auroras which can be captured with the stated sensitivity of AUI of 200 R.
- Would be very useful/important given that SSUSI is discontinued.

Aurora Boundaries

- Paper is shared by participant on deriving boundaries from UV images, using IMAGE data

Main conclusion of the meeting

Overall, the TDM participants have given positive feedback to the Aurora team on the requirements and capabilities of the Aurora-D mission. There was a lot of interest, and a fruitful discussion took place regarding the foreseen products as well as potential new or enhanced services that the ESA Space Weather could consider once Aurora-C would be in place.

Annexes

N/A