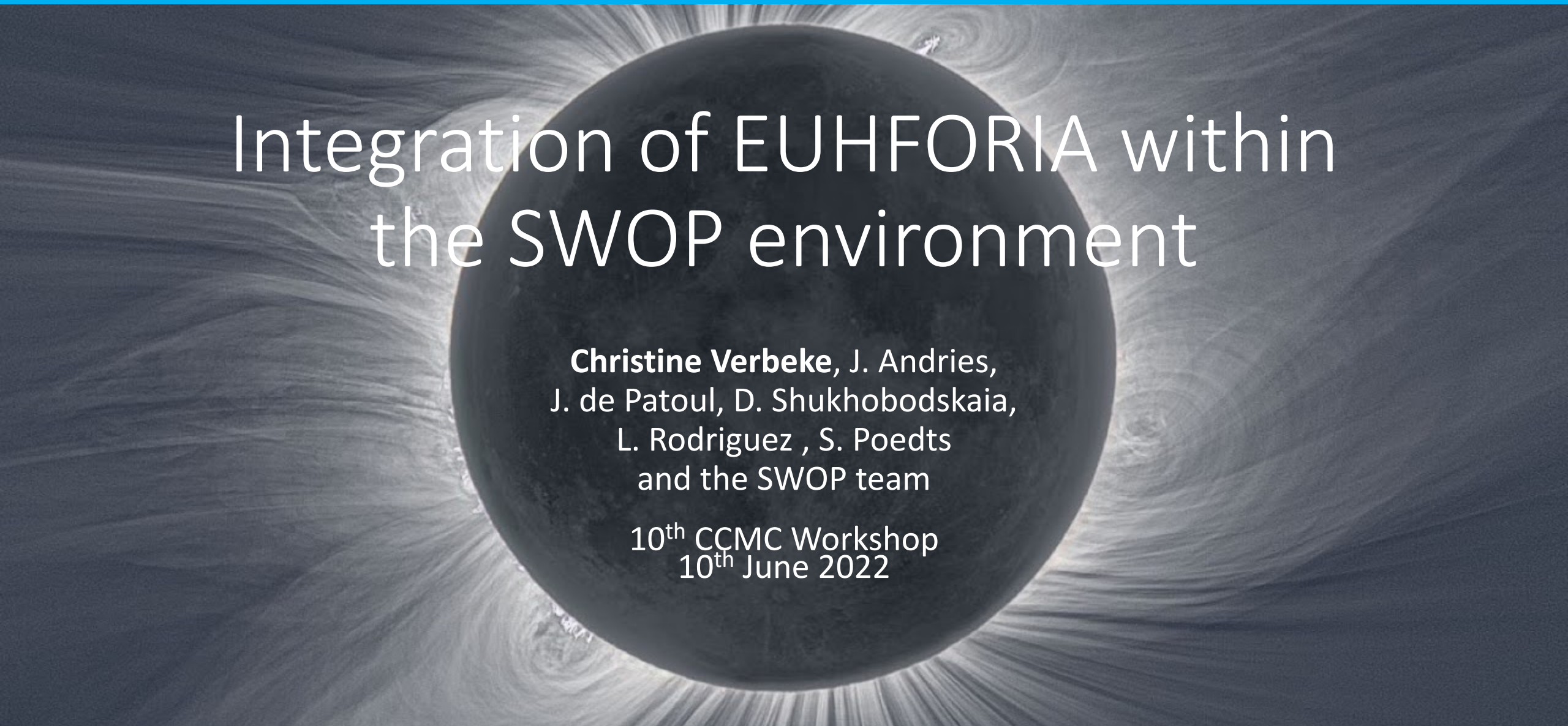

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Integration of EUHFORIA within the SWOP environment

Christine Verbeke, J. Andries,
J. de Patoul, D. Shukhobodskaia,
L. Rodriguez , S. Poedts
and the SWOP team

10th CCMC Workshop
10th June 2022

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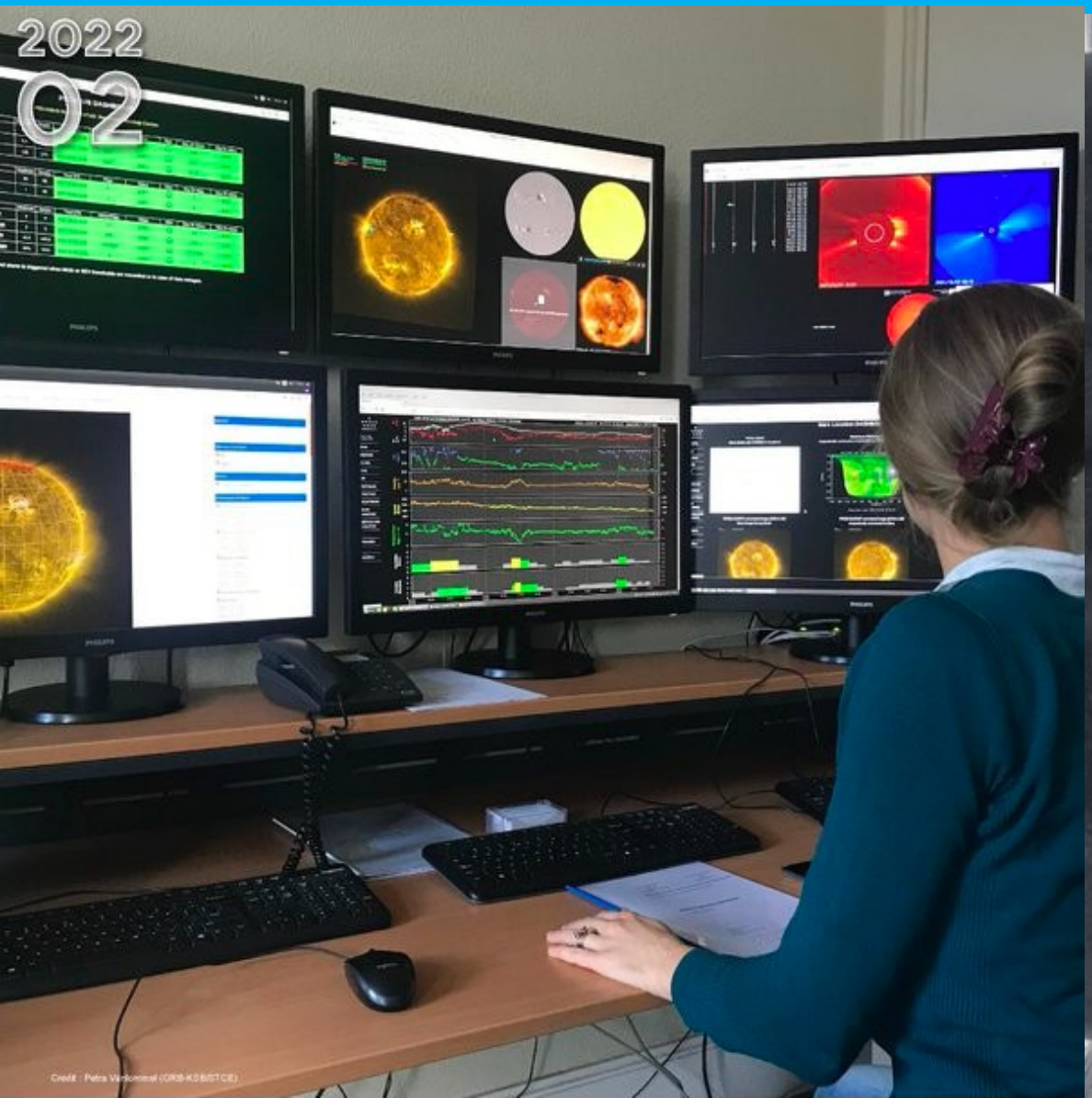
SWOP: Space Weather Operational Centre



- Team of 9 scientists covering 7/7, 12/24 + on call during night shifts
- Transitioning to full 24/7 monitoring by partnership with the Belgian Defence weather room
- We collect, manage and process data
- Disseminate SWx information into bulletins, plots, alerts and advisories through ESA, PECASUS, …

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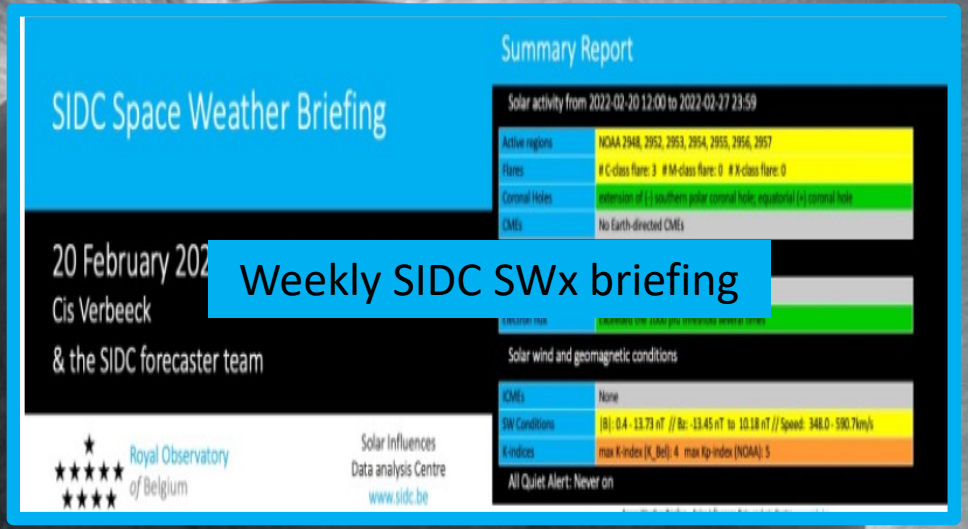
Space weather services, alerts and bulletin

```
:Issued: 2022 Mar 07 1248 UTC
:Product: documentation at http://www.sidc.be/products/m
#-----------------------------------------------------------
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from
# (RWC Belgium)
#-----------------------------------------------------------
SIDC URSIGRAM 20307
SIDC SOLAR BULLETIN 07 Mar 2022, 1246UT
SIDC FORECAST (valid from 1230UT, 07 Mar 2022 until 09 Mar 2022)
SOLAR FLARES  : C-class flares expected, (probability >=50%)
GEOMAGNETIC
SOLAR PROT
PREDICTION
PREDICTION
PREDICTIONS FOR 09 Mar 2022  10CM FLUX: 112 / AP: 004
COMMENT: Solar activity over the past 24 hours was at very low to low
levels with a single C-class flare. There are six numbered active regions
on the visible disc, the most prominent being NO
currently holds the largest number of sunspots a
C1.5-flare with peak time at 12:55 UTC on March
region on disc, NOAA 2960 (beta), has remained s
The X-ray flare activity is expected to be at ve
next 24 hours with 55% chance for C-class flaring.
```

Daily bulletin

ISES International Space Environment Service

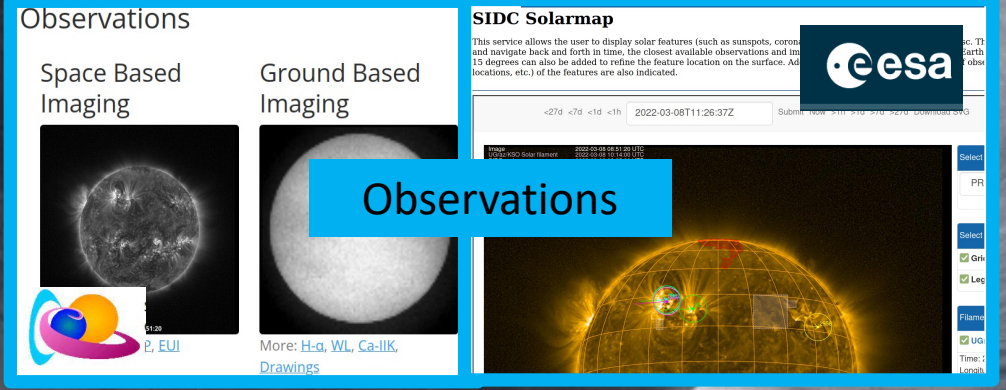


Weekly SIDC SWx briefing

```
SWX ADVISORY
DTG:              20250815/0555Z
SWXC:             PECASUS
ADVISORY NR:      2025/18
NR RPLC:          2025/17
SWX EFFECT:       HF COM SEV
OBS SWX:
FCST SWX
FCST SWX
FCST SWX +18 HR:  16/0000Z NOT AVBL
FCST SWX +24 HR:  16/0600Z NOT AVBL
RMK:              SPACE WEATHER EVENT (MAXI
FREQUENCY DEPRESSION) IS IN PROGRESS. IMPAC
COM FREQUENCY BANDS EXPECTED. LOWER FREQUEN
LESS IMPACTED.
NXT ADVISORY:     WILL BE ISSUED BY 20250815/1155Z=
```

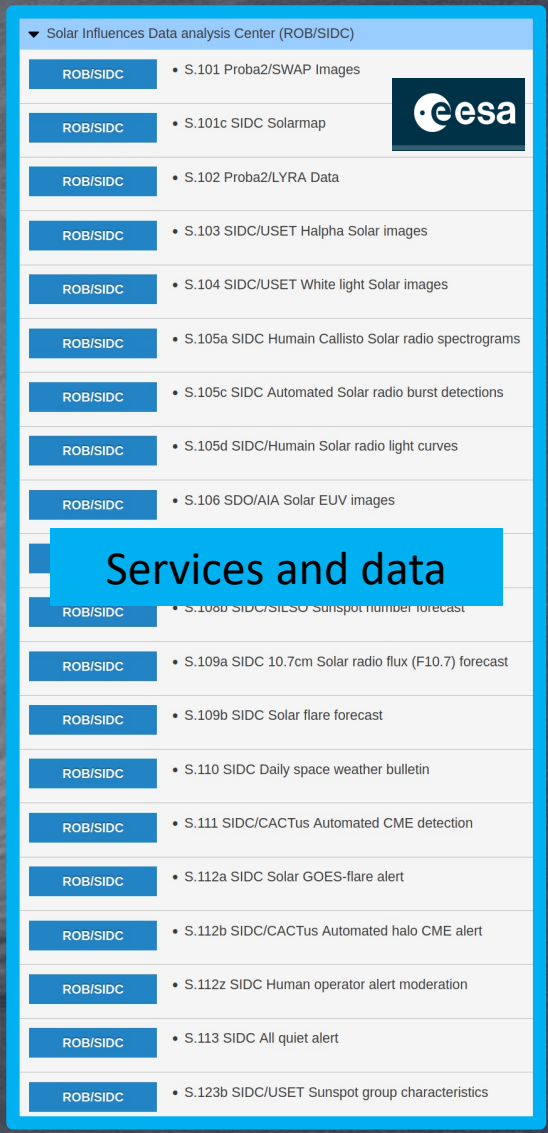
PECASUS PAN-EUROPEAN CONSORTIUM FOR AVIATION SPACE WEATHER USER SERVICES

SWx advisory



Observations

And many more



Services and data

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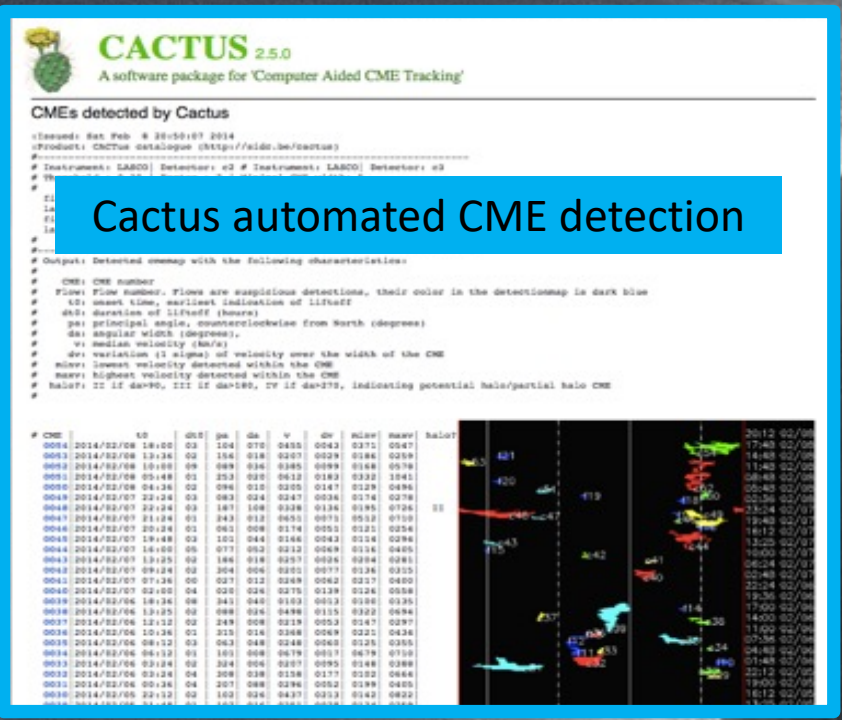
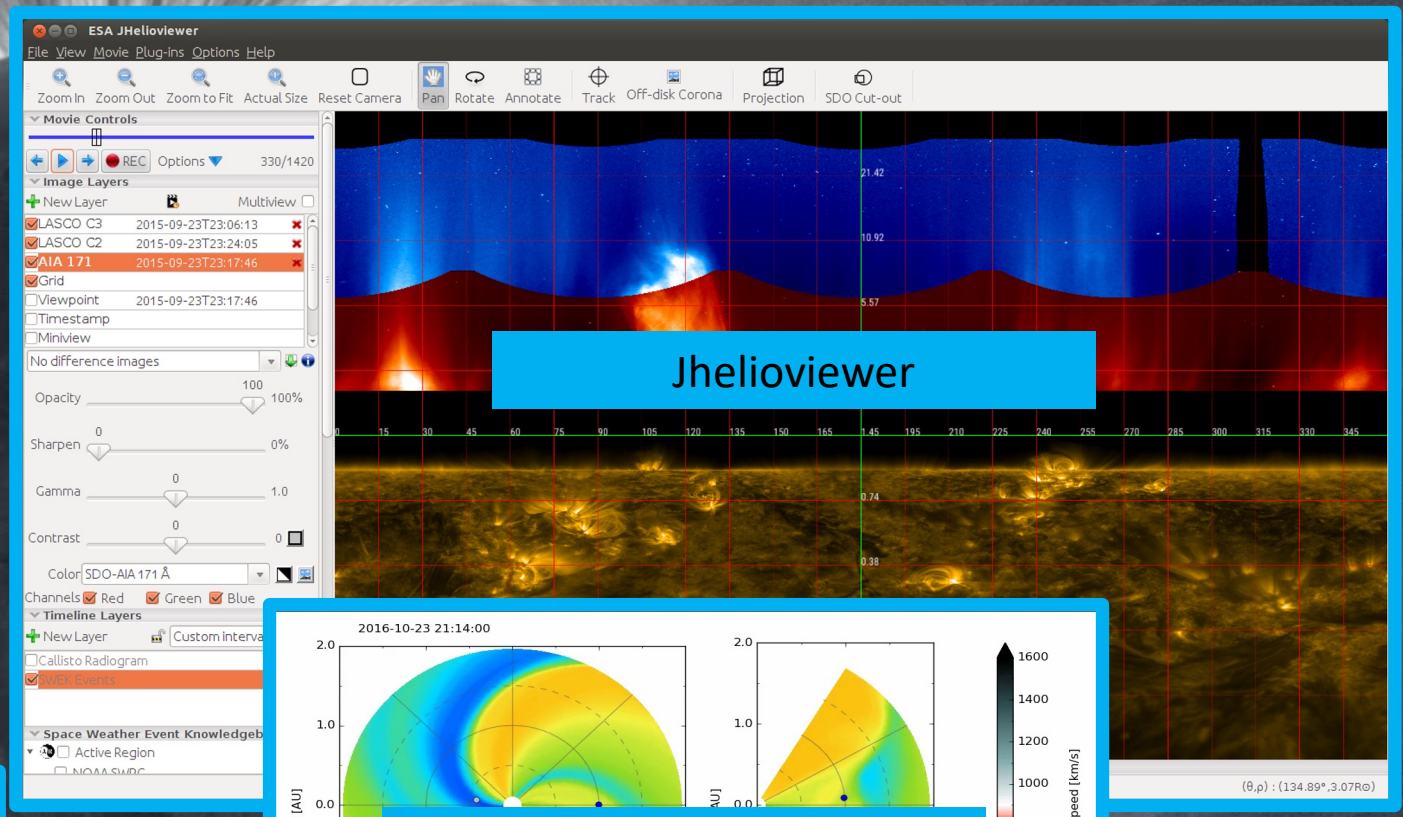
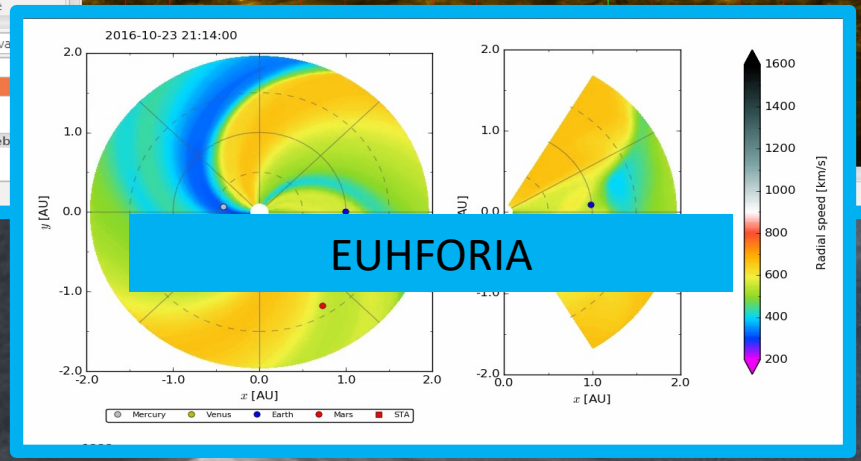
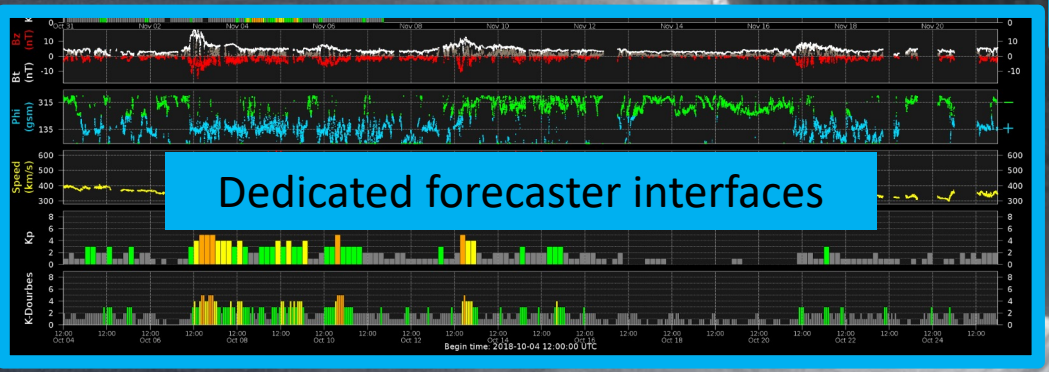
Data processing, models and tools









And many more

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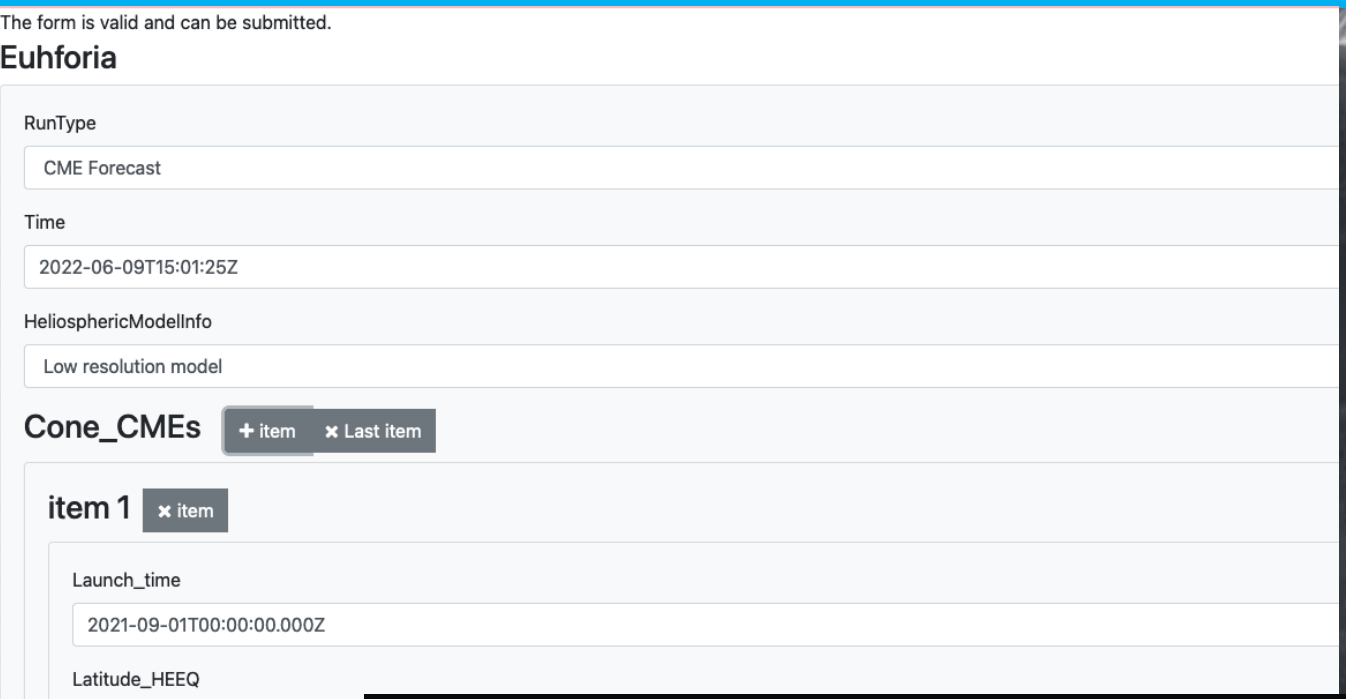
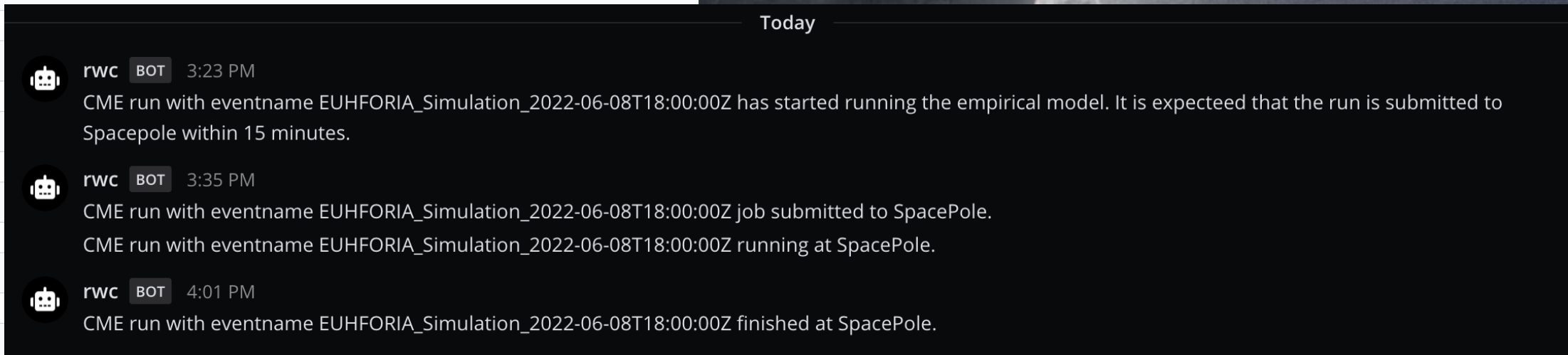
Integration of euhforia



- Automatic daily solar wind run
- Allows forecasters to submit a run (in a similar way to VSWMC)
- Simplified interface containing only key parameters
- Alerts forecasters on progress of run



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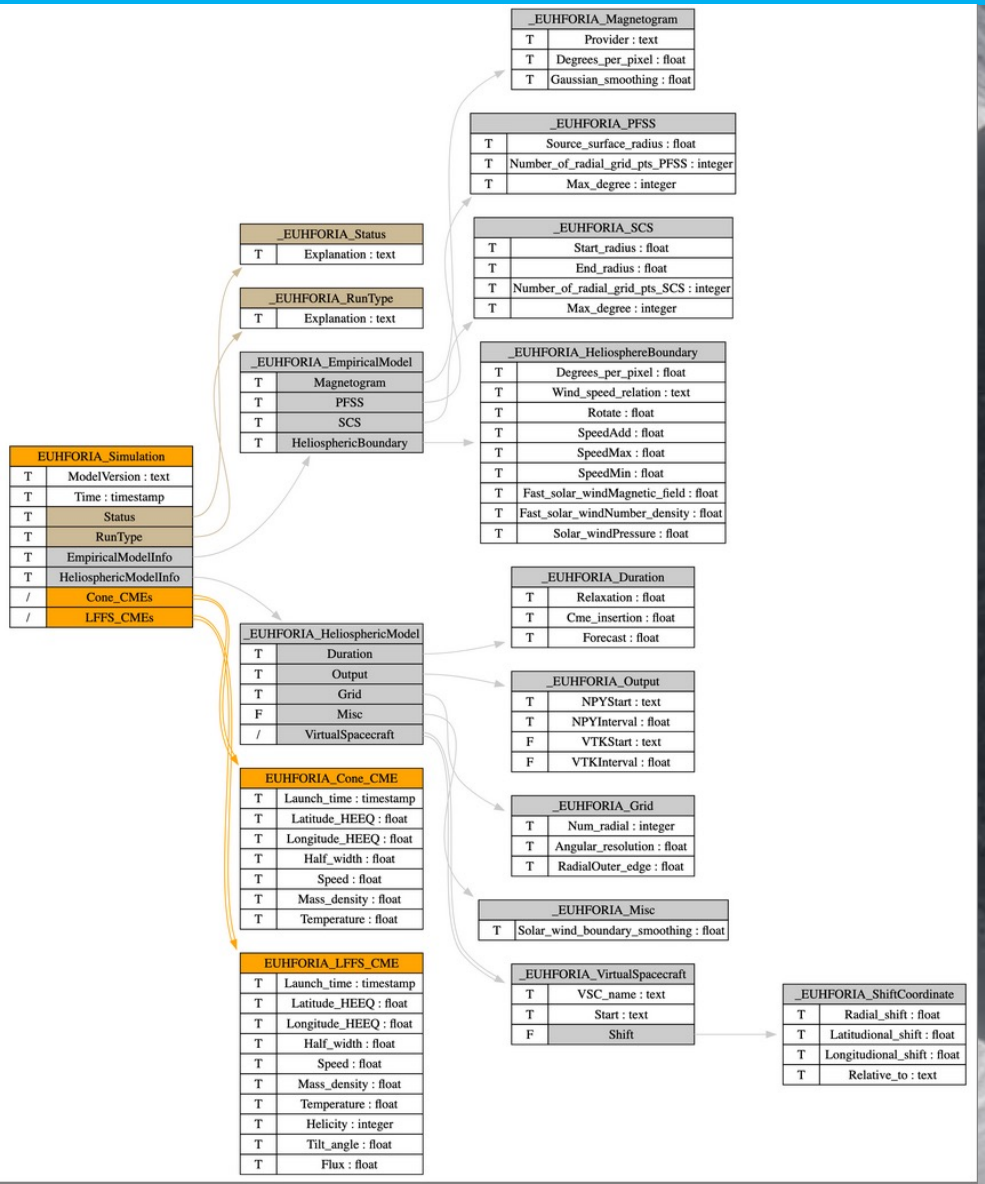
Integration of euhforia



- Event database collects all run information including all EUHFORIA input parameters, as well as status of the run.
- Two-way communication with SpacePole cluster where simulations run

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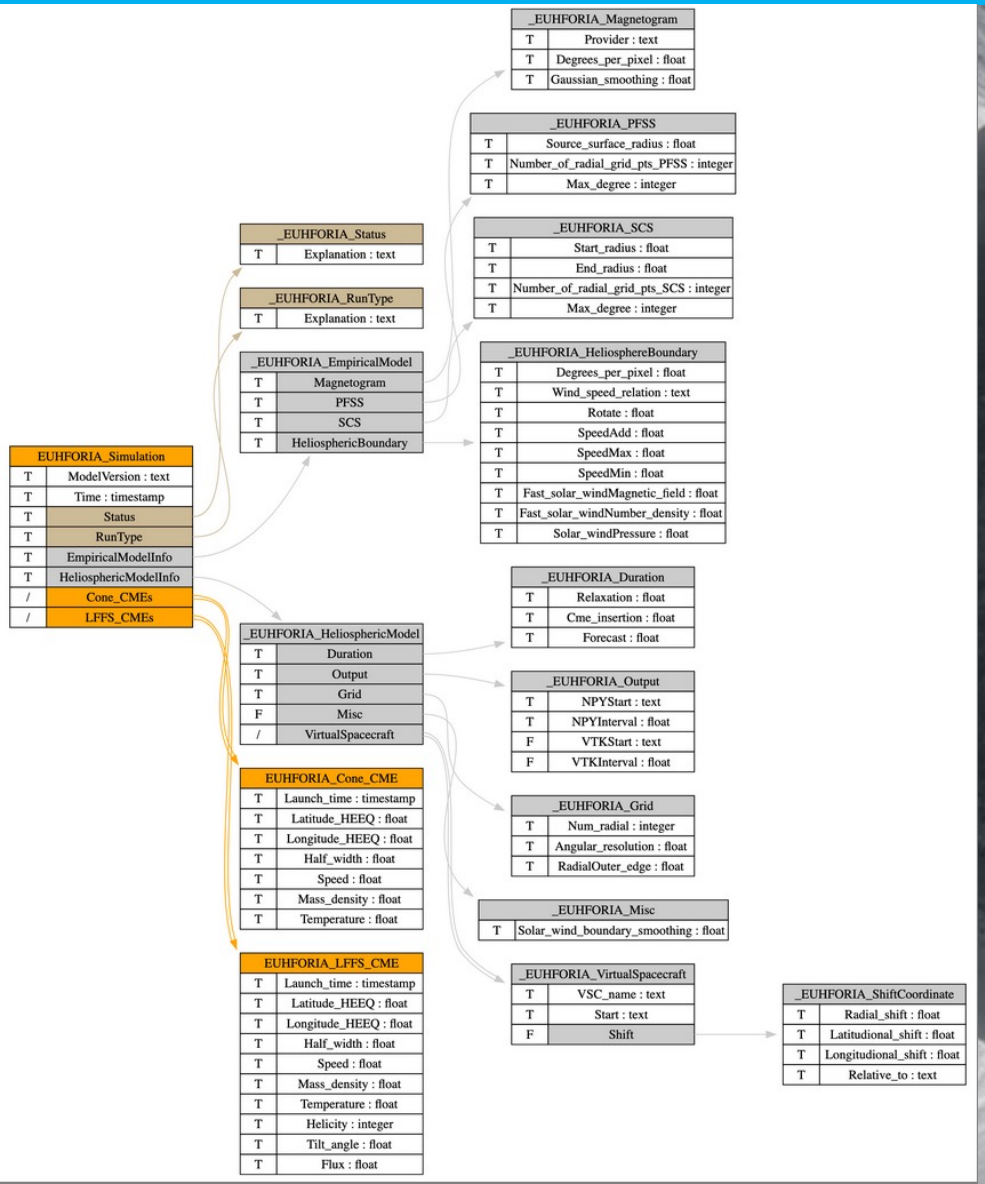
Integration of euhforia



- The event database consists of a larger set of data ranging from sunspots, coronal holes to flares and automated CME detection by Cactus

- Future work:
  - Addition of observed CME database including CME kinematics (similar to CCMC DONKI)
  - Coupling of the different events within the event database: flares, coronal holes, high speed streams, observed CMEs, simulated CME arrivals and observed CME arrivals

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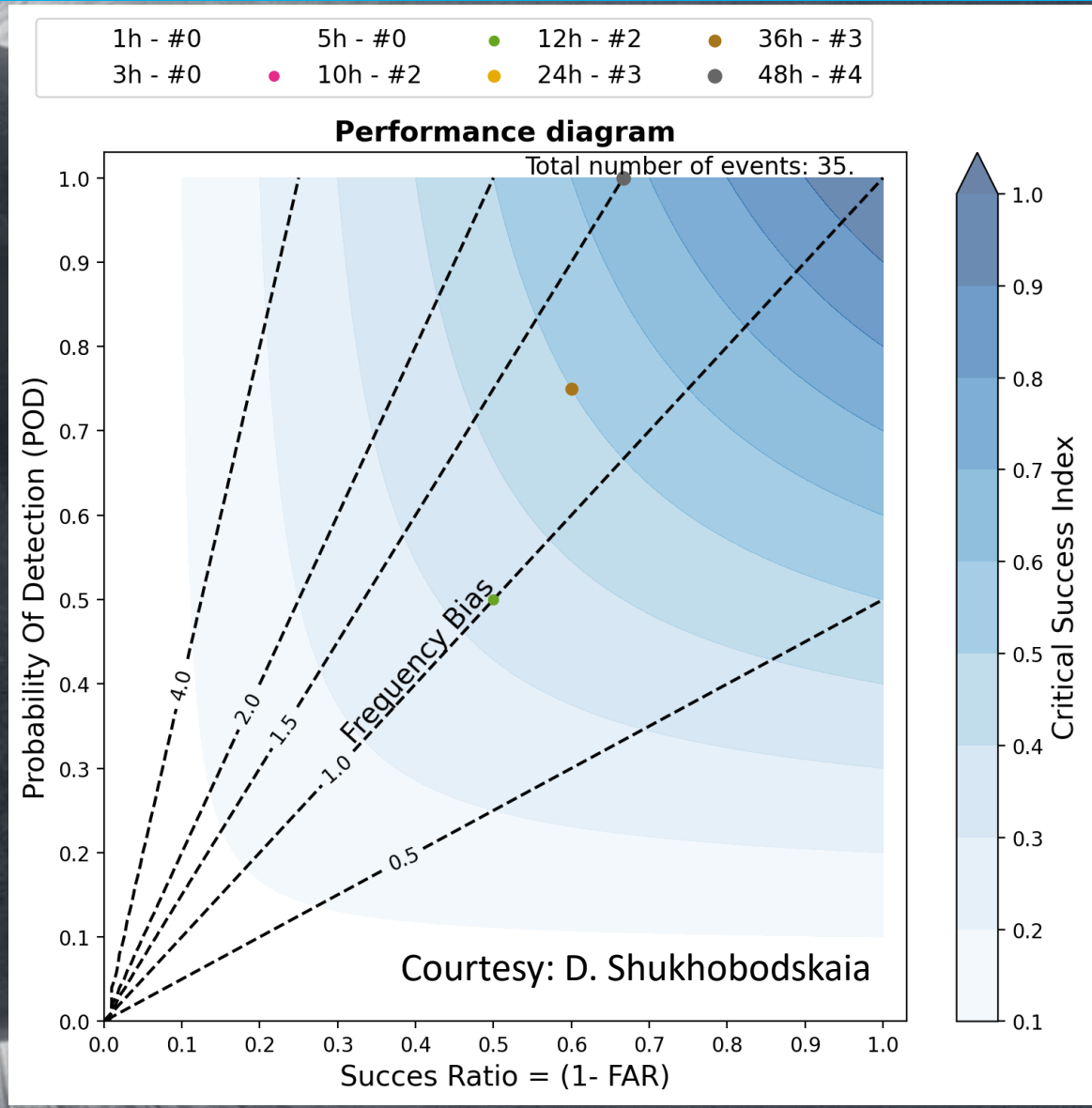
Performance of euhforia

- Preliminary results of EUHFORIA 2.0 project
- Consider observed CME events in August 2010 and July 2012 with speed above 350 km/s and angular width above 60 degrees (74 events)
- RMSE arrival time: 15h



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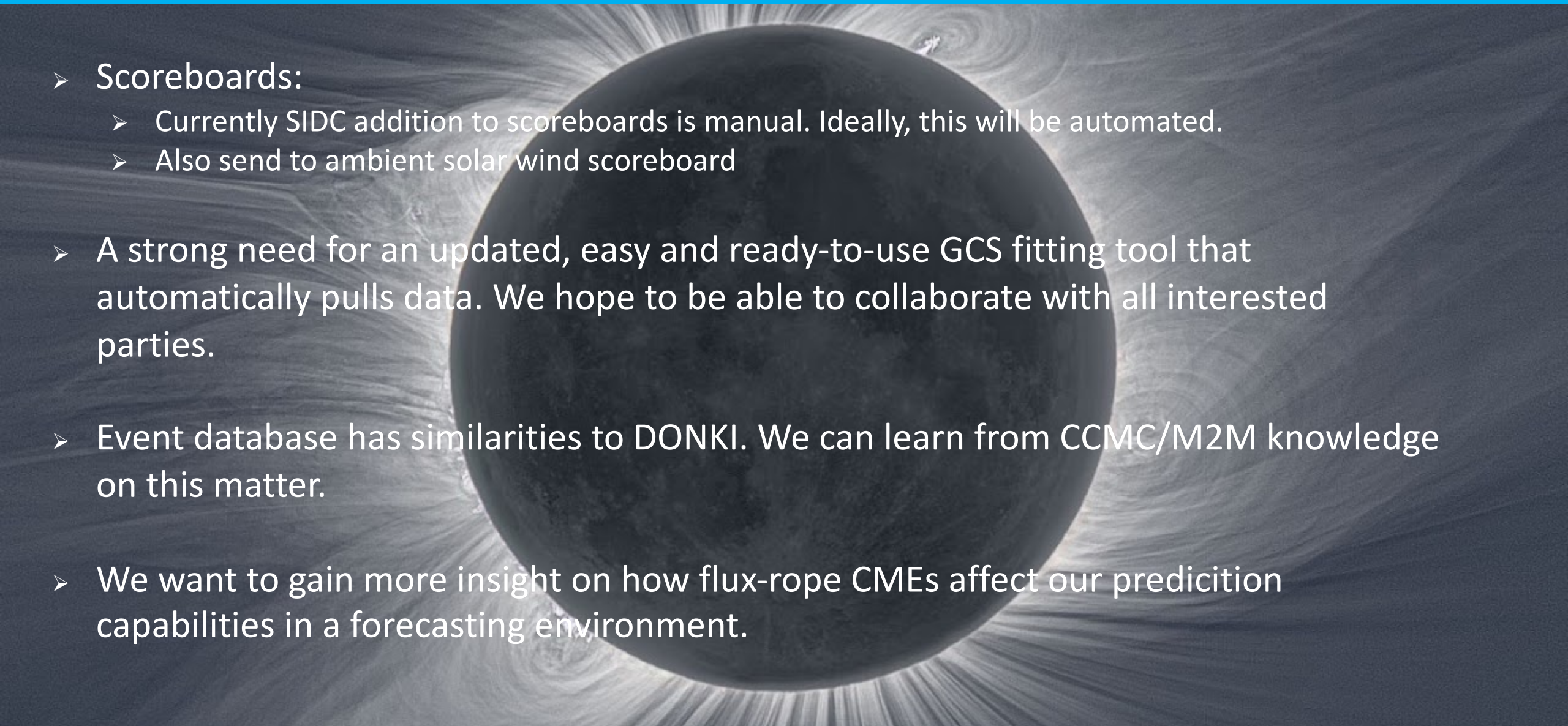
Collaboration ideas



- Scoreboards:
  - Currently SIDC addition to scoreboards is manual. Ideally, this will be automated.
  - Also send to ambient solar wind scoreboard
- A strong need for an updated, easy and ready-to-use GCS fitting tool that automatically pulls data. We hope to be able to collaborate with all interested parties.
- Event database has similarities to DONKI. We can learn from CCMC/M2M knowledge on this matter.
- We want to gain more insight on how flux-rope CMEs affect our predicition capabilities in a forecasting environment.

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Thank you. Questions?