CCMC & ROB Partnership Outlook

CCMC Workshop 2018

M. J. West
on behalf of J. Andries & the Operational Space Weather Services Team

Solar Influences
Data Analysis Centre
www.sidc.be

Royal Observatory
of Belgium

ROB/SIDC Space Weather Services

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SWE MONITORING & FORECAST CENTRE

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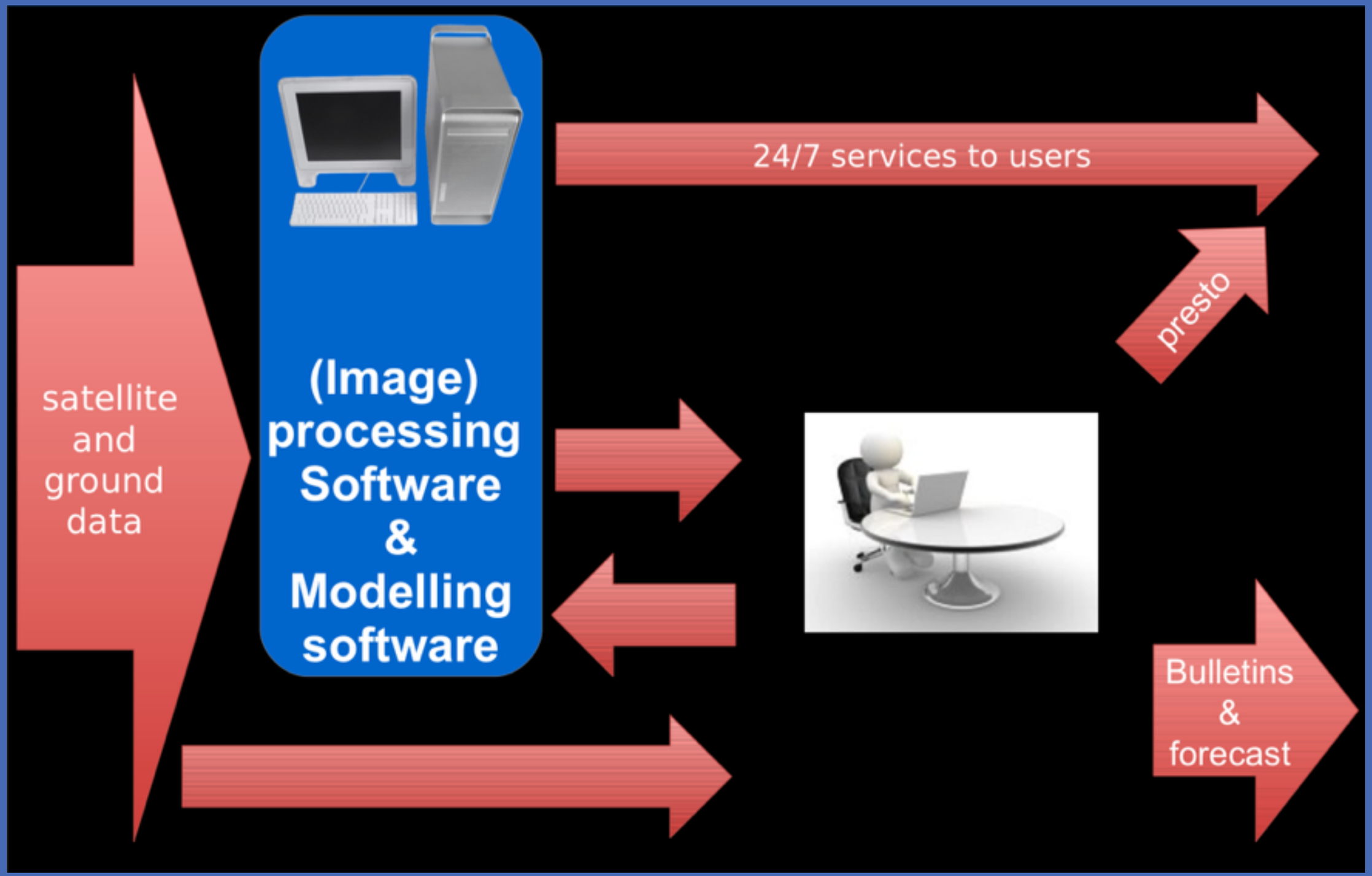

OBSERVATIONS AND DATA GATHERING

In house ground based instruments
(Solar Optical and Radio)

In house satellite instrument operation (Solar EUV)

Routine automated data import from various external sources

- SDO data mirror
- NOAA/SWPC data connection

24/7 SERVICES THROUGH AUTOMATION

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satellite and ground data

(Image) processing operational software

24/7 services to users

Automated event identification in (near) real time.

Broadcast through emails, SMS, webpages

26-APR-2018 - NEAR REAL TIME SERVICES

FLARE/DIMMING/WAVE DETECTION (SDO/AIA, <20MIN DELAY)

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solardemon.oma.be

Solar Demon Flare Detection (qlk)

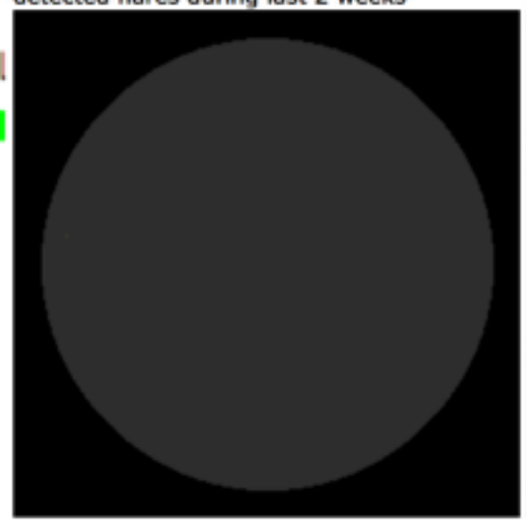
Quick-look! running in real time on SDO/AIA 94 QKL data
3 minute cadence, typical delay 15 minutes
(detection version 1.00)
(view all Solar Demon detection tools)

Detector 24h operating status:

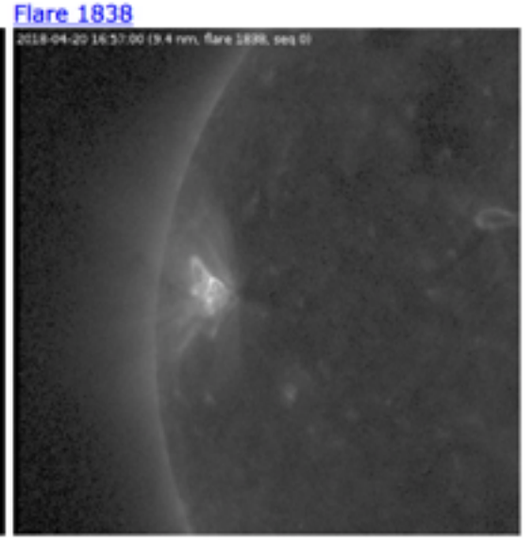
Last processed image:
0 hours and 15 minutes ago (2018-04-25 17:21 UTC)
Last detected flare:
120 hours and 30 minutes ago (2018-04-20 17:06 UTC)

Filters (category)
-- *All classes*
Only C class flares and above
Only M class flares and above
Only X class flares and above
Filters (time)
Last 7 days
-- *Last 14 days*

detected flares during last 2 weeks



Flare 1838



Overview of flares

	est. class	start	peak	end	#	lat	lon	dist. R⊙	AR	est. flux	GOES flux	GOES peak time		COMESEP	# det.	dimming	EUV Wave
April, 2018																	
20	B4	17:03	17:03	17:06	1838	5	-63	0.90	AR 2706	3.7	**5.3**	17:02	-1	0	2		wave

The research leading to these results has received funding from the European Commission's Seventh Framework Programme (FP7/2007-2013) under the grant agreement nr. 263506 [AFFECTS], and grant agreement nr. 263252 [COMESEP]
Solar Demon is still under construction.
(Legal notices - SWSC (Volume 5, A18, 2015) research article: Solar Demon - an approach to detecting flares, dimmings, and EUV waves on SDO/AIA images)

FLARE DETECTION AND LOCALIZATION (PROBA2/SWAP, <4H DELAY)

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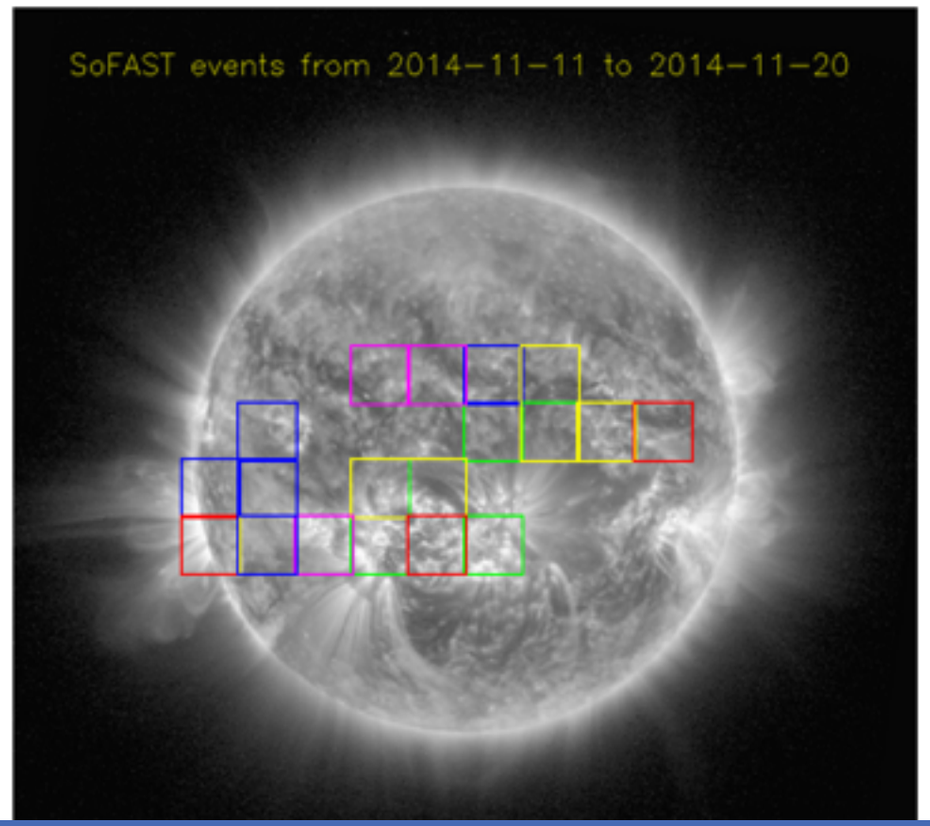
SoFAST 1.2.0

The 'Solar Flare Automated Search Tool'

EUV-flares detected by SoFAST

```
:Issued: Thu Nov 20 09:51:09 2014
:Product: SoFAST catalogue (http://www.sidc.be/sofast)
#-------------------------------------------------------------------------
# Instrument: SWAP| Detector: CMOS APS 1024 x 1024
# Flare-threshold : 2 | Rebinsize : 16 | Maxhits : 4 | Offset : 65
# Modus : (1) SW service
#
  first SWAP image this run: swap_lv1_20141111_000051.fits
  last  SWAP image this run: swap_lv1_20141120_055440.fits
#
#
#-------------------------------------------------------------------------
# Output: Detected EUV-flare list with the following characteristics:
#
#   EUV FLARE:          FLARE number
#   date:               Day of observation
#   start:              Start time, earliest indication of detection (hh:mm UT)
#   end:                End time, last indication of detection (hh:mm UT)
#   pos:                Derived position (Heliographic coordinates)
#   size:               Spatial size of event in number of macropixels
#   #images:            Duration of event in number of images (dt)
#   EUV-significance:   EUV relative variability, in %
```



26-APR-2018 - NEAR REAL TIME SERVICES

FLARE DETECTION (GOES + PROBA2/LYRA)

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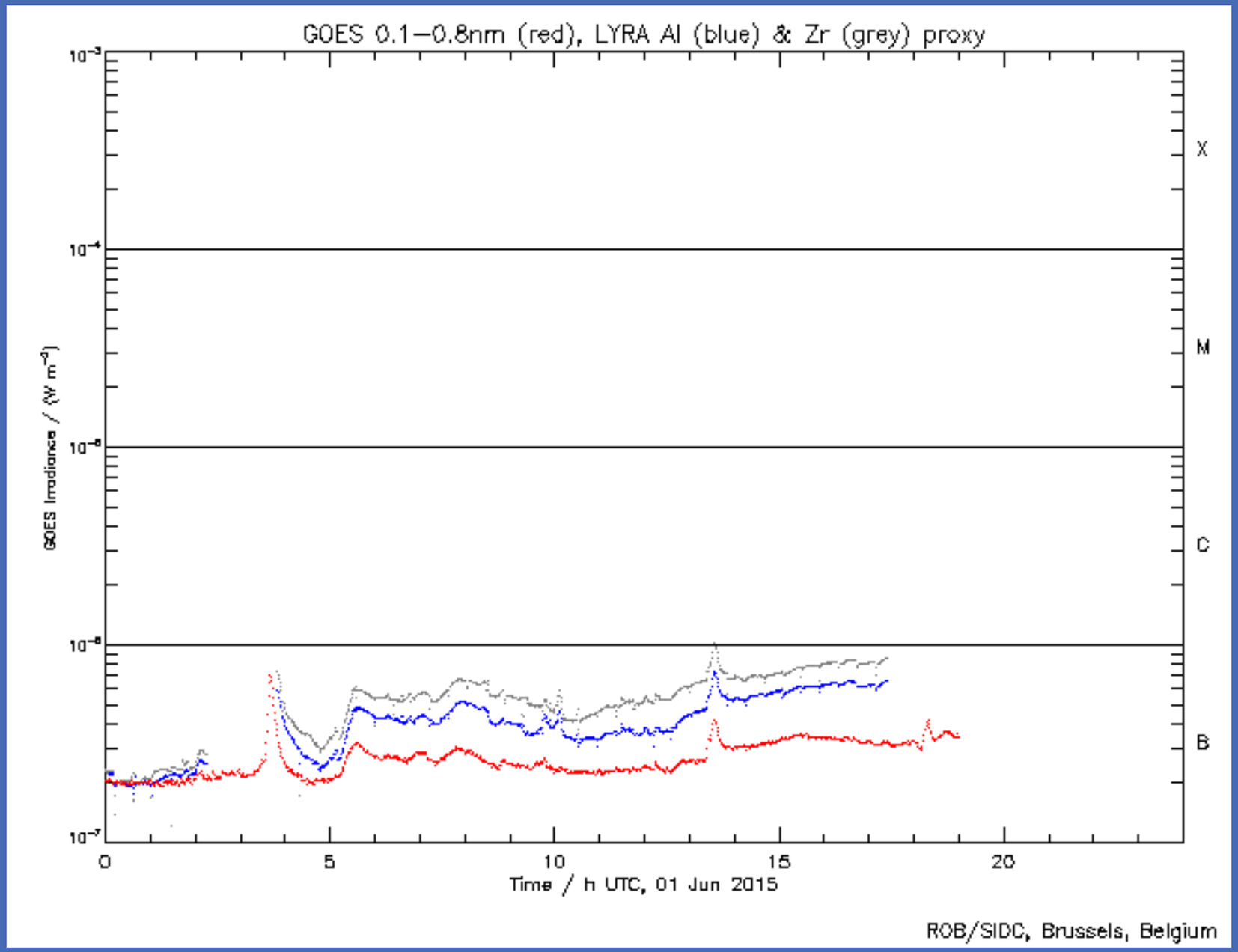
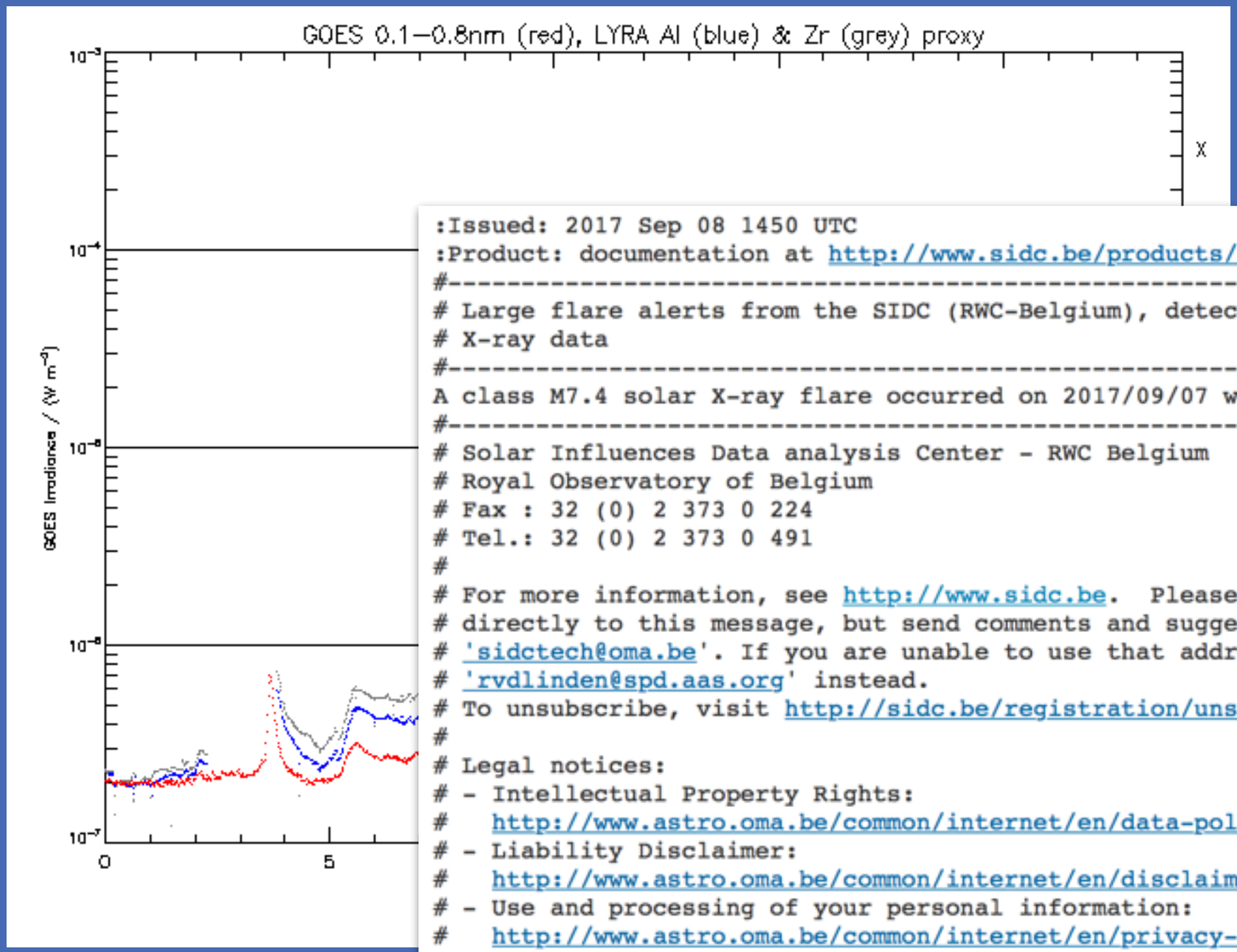


FLARE DETECTION (GOES + PROBA2/LYRA)

Royal Observatory *of* Belgium




```
:Issued: 2017 Sep 08 1450 UTC
:Product: documentation at http://www.sidc.be/products/flaremail
#-----------------------------------------------------------------#
# Large flare alerts from the SIDC (RWC-Belgium), detected in GOES  #
# X-ray data                                                      #
#-----------------------------------------------------------------#
A class M7.4 solar X-ray flare occurred on 2017/09/07 with peak time 14:54UT
#-----------------------------------------------------------------#
# Solar Influences Data analysis Center - RWC Belgium             #
# Royal Observatory of Belgium                                    #
# Fax : 32 (0) 2 373 0 224                                        #
# Tel.: 32 (0) 2 373 0 491                                        #
#                                                                 #
# For more information, see http://www.sidc.be.  Please do not reply #
# directly to this message, but send comments and suggestions to  #
# 'sidctech@oma.be'. If you are unable to use that address, use   #
# 'rvdlinden@spd.aas.org' instead.                                #
# To unsubscribe, visit http://sidc.be/registration/unsub.php     #
#                                                                 #
# Legal notices:                                                  #
# - Intellectual Property Rights:                                 #
#   http://www.astro.oma.be/common/internet/en/data-policy-en.pdf #
# - Liability Disclaimer:                                         #
#   http://www.astro.oma.be/common/internet/en/disclaimer-en.pdf  #
# - Use and processing of your personal information:              #
#   http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf #
#-----------------------------------------------------------------#
```

26-APR-2018 - NEAR REAL TIME SERVICES

CME DETECTION & CHARACTERISATION (SOHO/LASCO, <6H DELAY)

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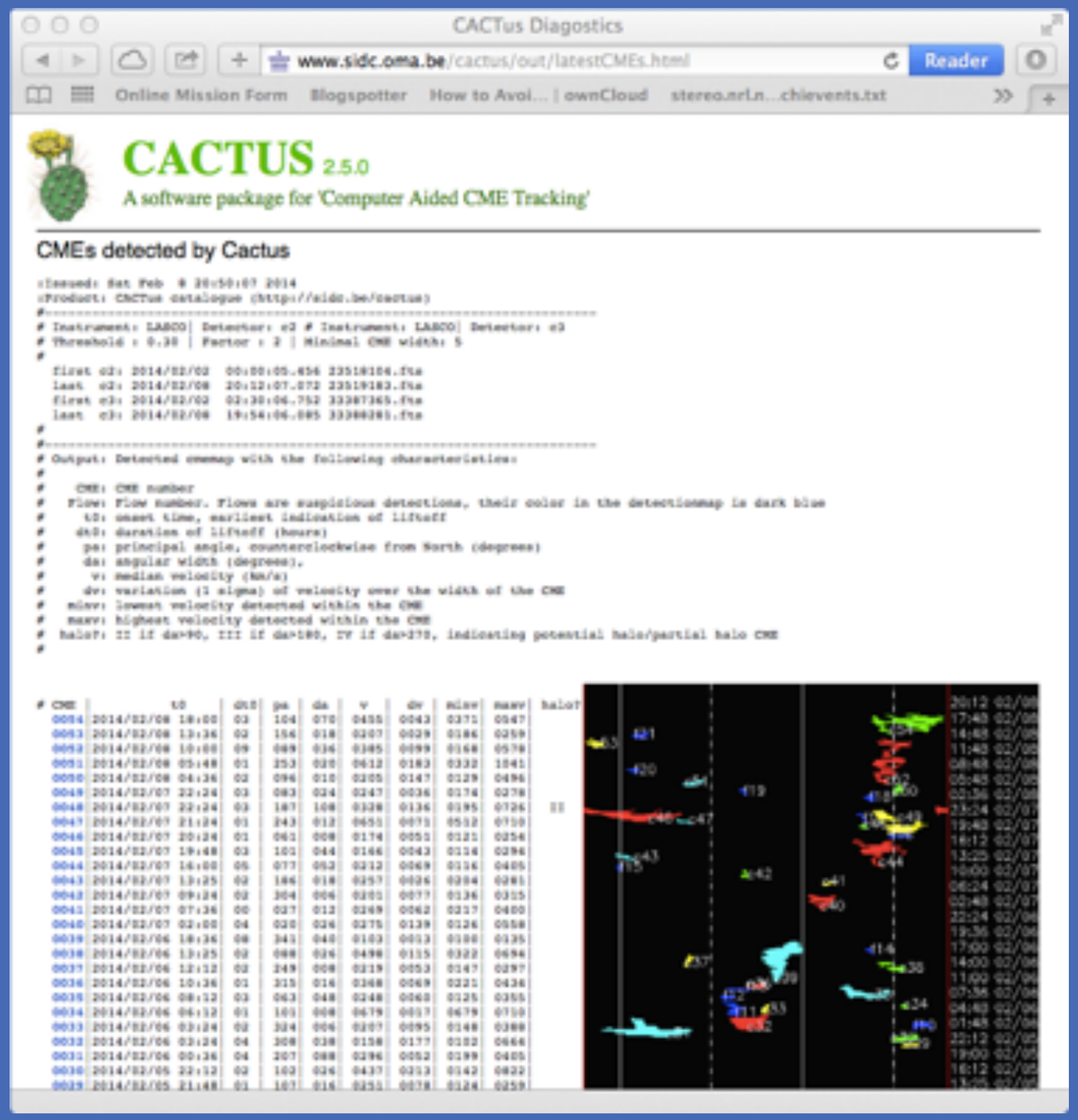

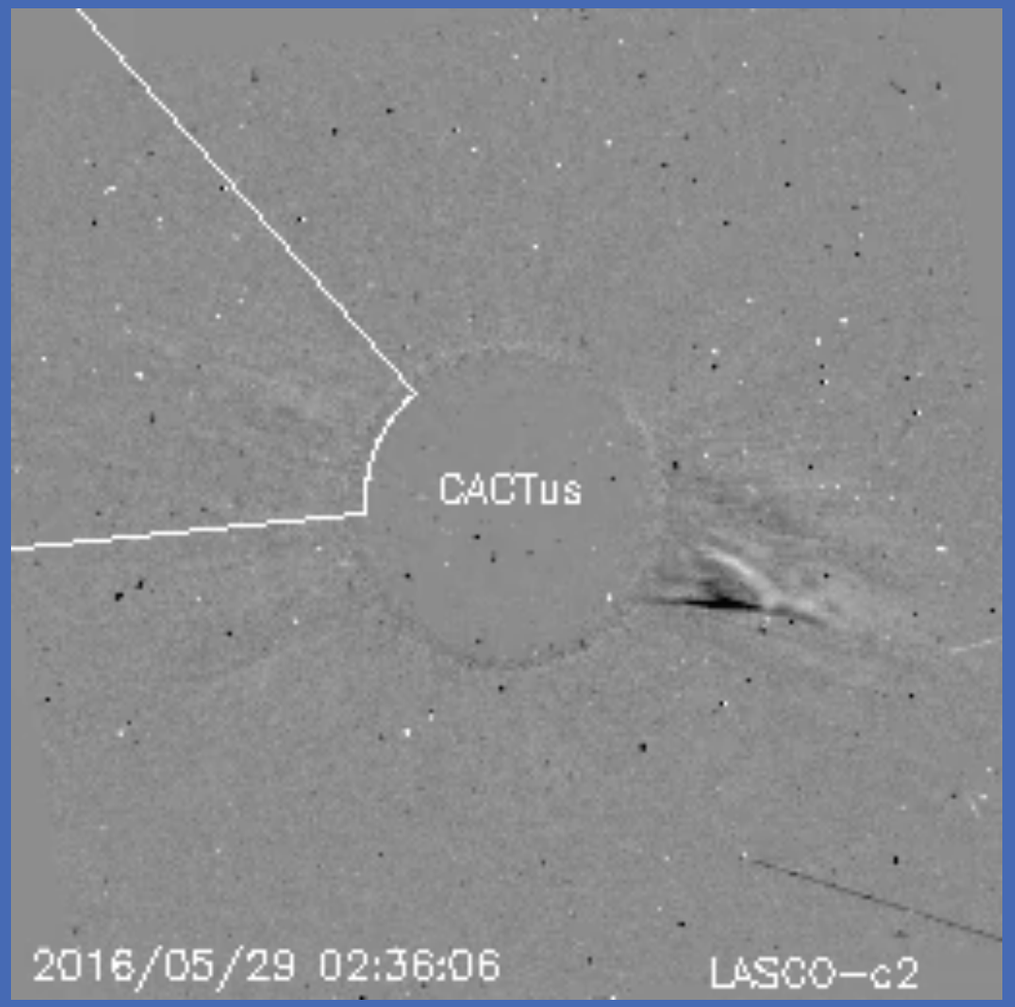

Email alerts of halo CMEs give a few days lead time for geomagnetic storms
http://sidc.be/cactus

RADIO BURST DETECTION (HUMAIN/ECALLISTO, <15MIN DELAY)

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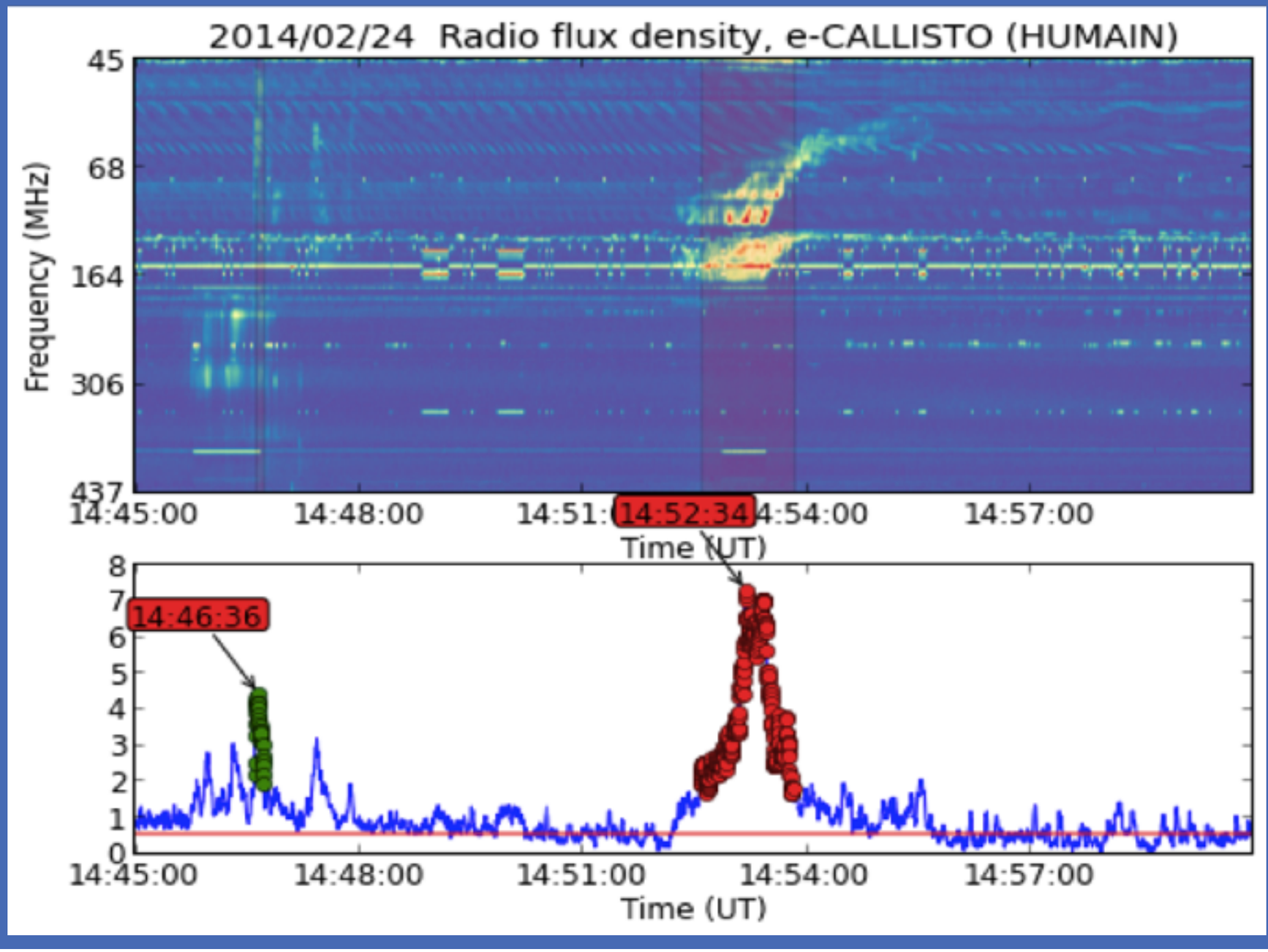
Autom. Burst detection



26-APR-2018 - FORECAST EXPERTISE

HUMAN EXPERT MODERATION/ ANNOTATION

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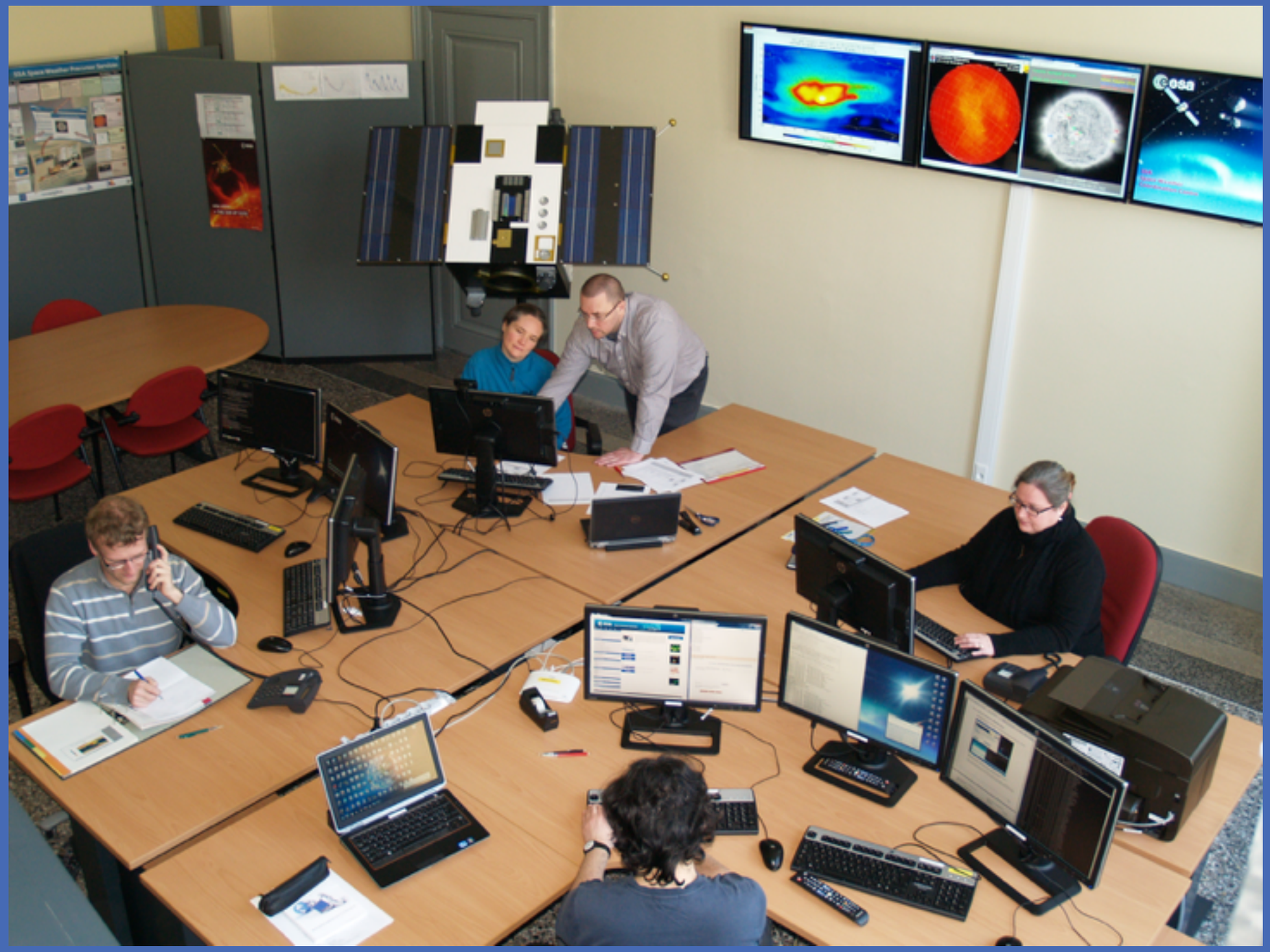

Tools

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TOOLS FOR STANDARD CALCULATIONS

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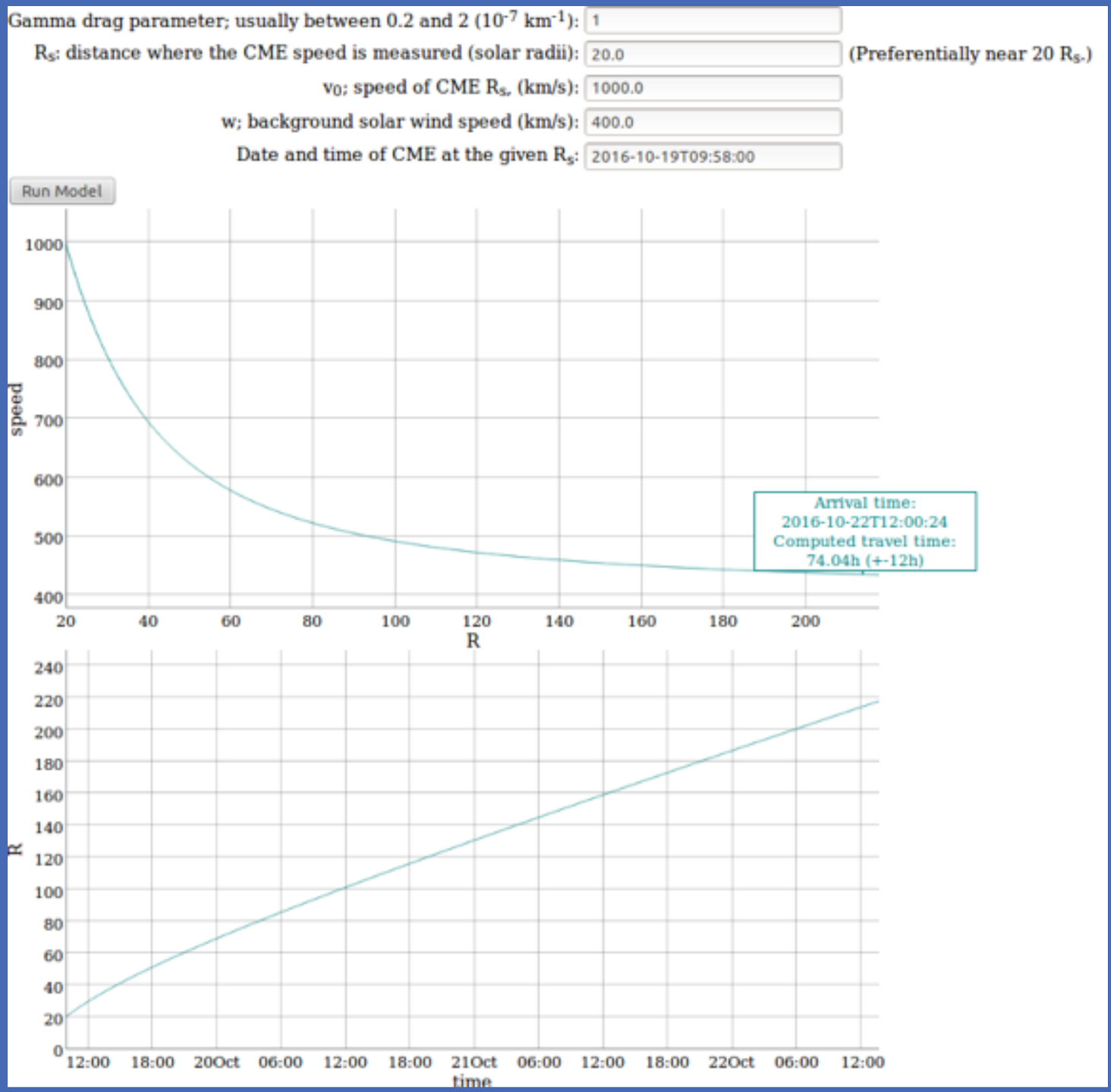

PHYSICS BASED MODELS: E.G. EUHFORIA

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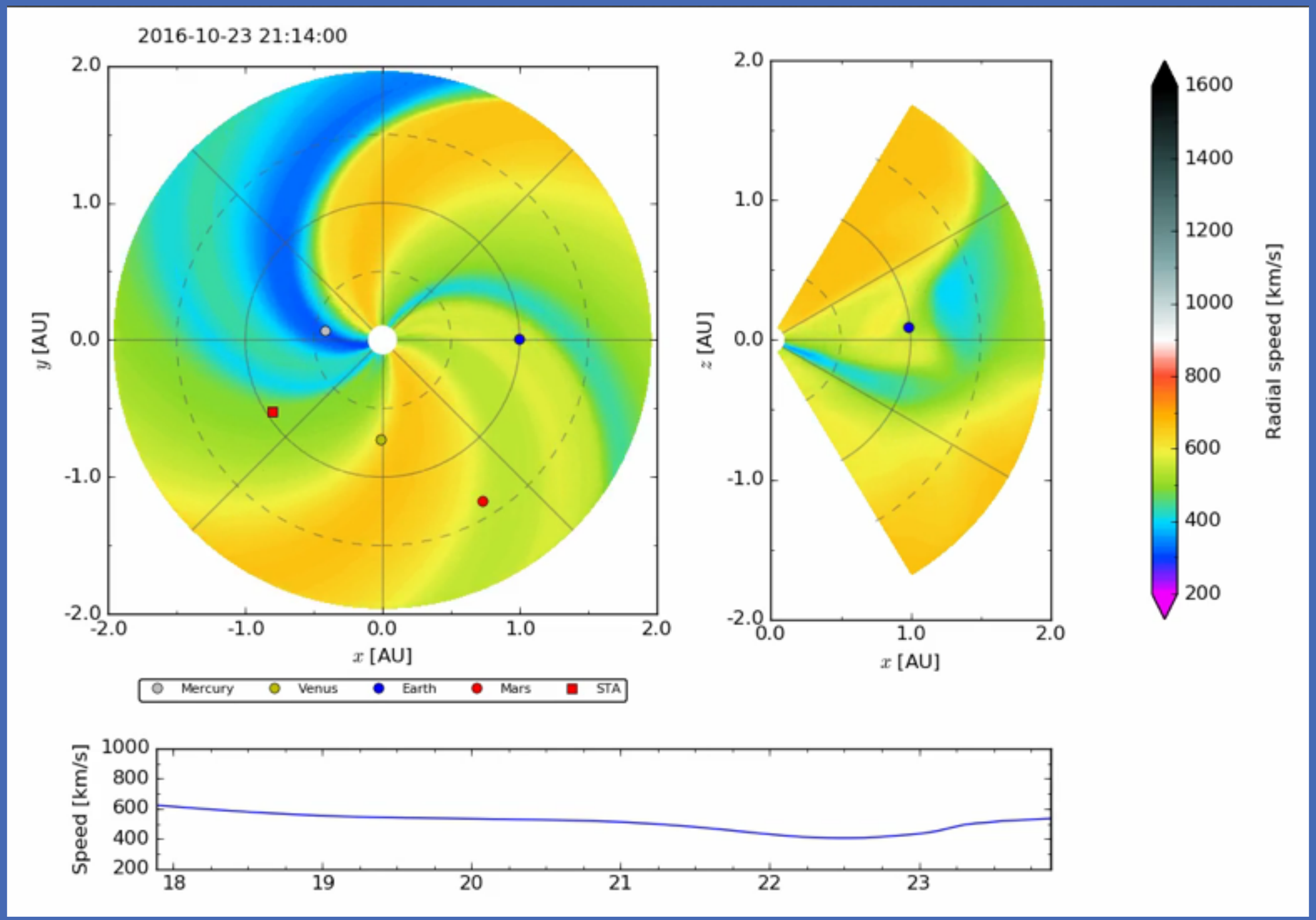
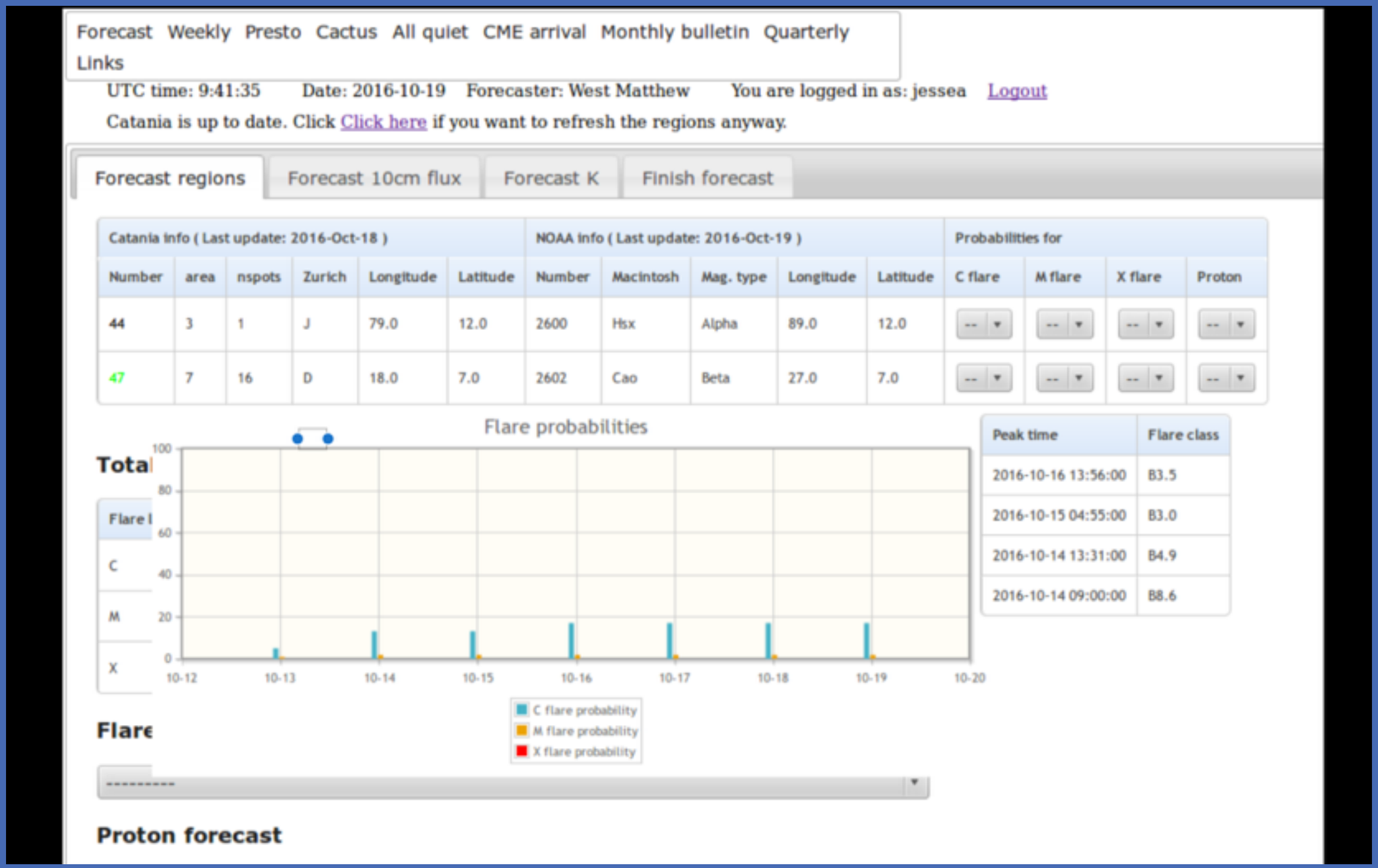


DEDICATED DUTY FORECASTER INTERFACES (INCLUDING STATISTICAL MODEL OUTPUTS + IMPORTED EVENTS)



26-APR-2018 - TOOLS

IMAGE BROWSING & ANALYSIS INTERFACES (JHELIOVIEWER)

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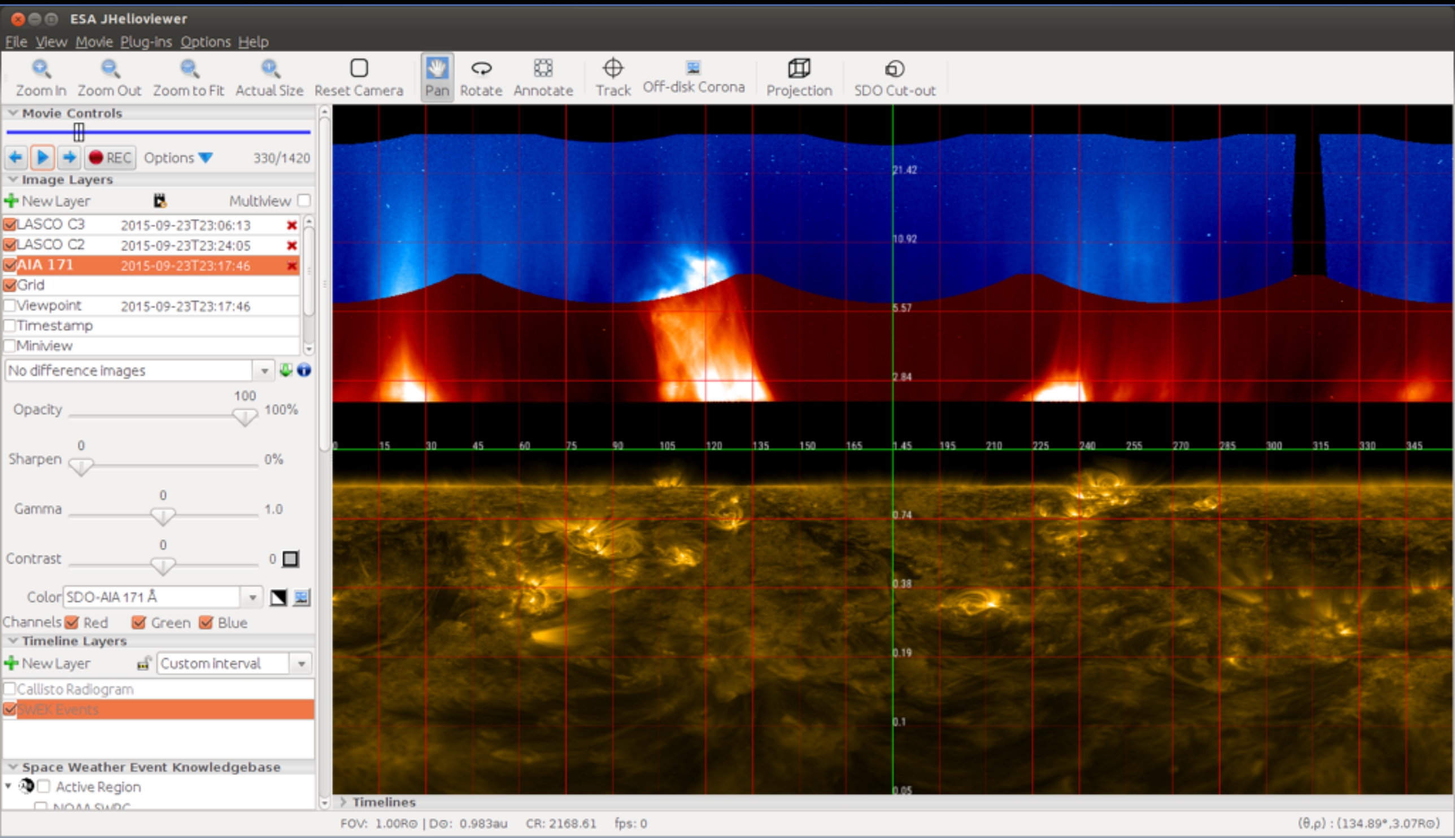

Solar Influences Data Analysis Centre www.sidc.be

TIMELINE DATA BROWSING (WWW.STAFF.OMA.BE)

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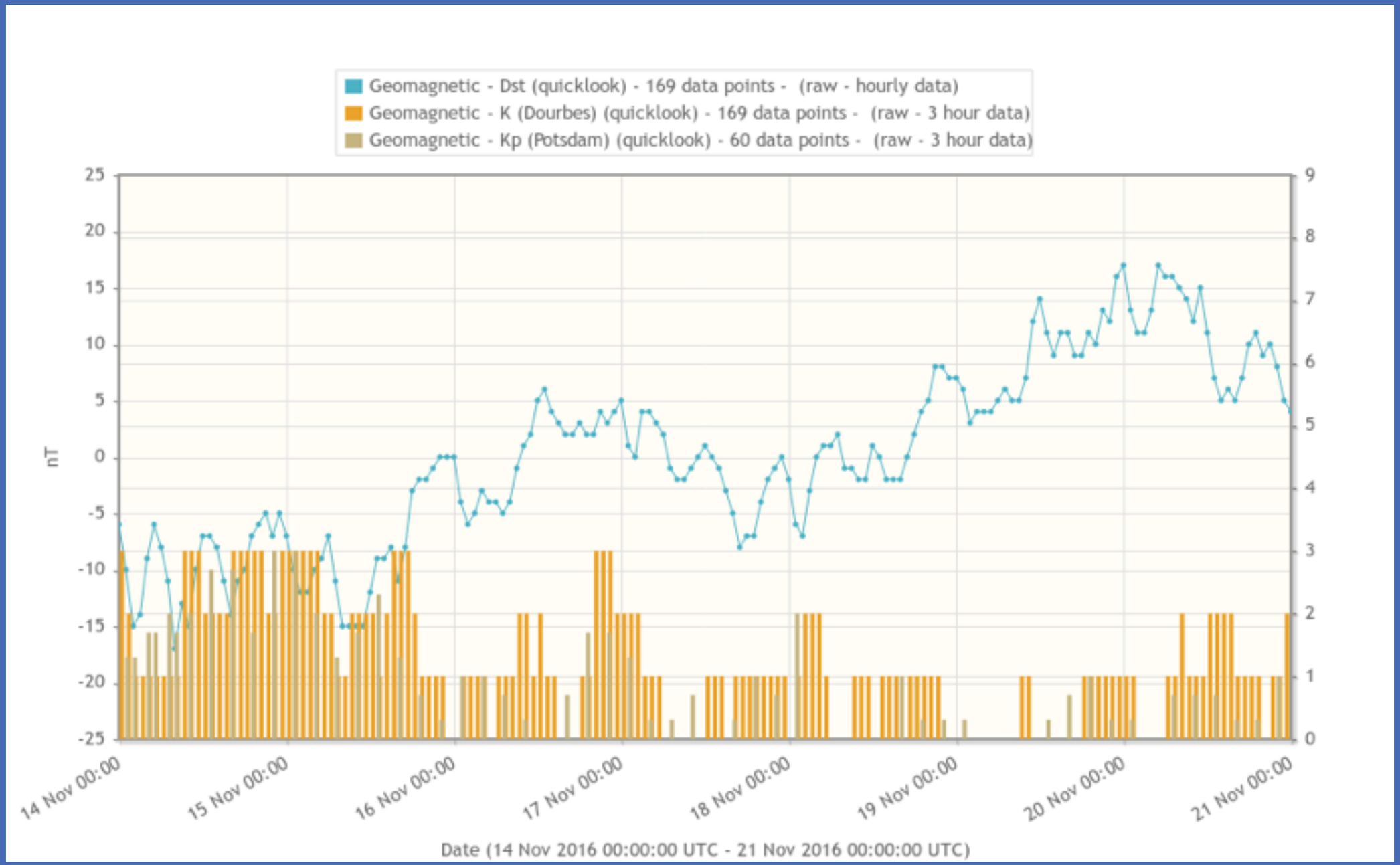

Output

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Data Analysis Centre
www.sidc.be

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26-APR-2018 - OUTPUT

DAILY BULLETINS

Royal Observatory *of* Belgium

```
:Issued: 2010 Dec 07 1233 UTC
:Product: documentation at http://www.sidc.be/products/meu
#-----------------------------------------------------------------#
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC  #
# (RWC Belgium)                                                   #
#-----------------------------------------------------------------#
SIDC URSIGRAM 01207
SIDC SOLAR BULLETIN 07 Dec 2010, 1222UT
SIDC FORECAST (valid from 1230UT, 07 Dec 2010 until 09 Dec 2010)
SOLAR FLARES   : Quiet conditions (<50% probability of C-class flares)
GEOMAGNETISM   : Quiet (A<20 and K<4)
SOLAR PROTONS  : Quiet
PREDICTIONS FOR 07 Dec 2010  10CM FLUX: 089 / AP: 002
PREDICTIONS FOR 08 Dec 2010  10CM FLUX: 089 / AP: 004
PREDICTIONS FOR 09 Dec 2010  10CM FLUX: 090 / AP: 006
COMMENT: The large filament on the south-east side of the Sun has
erupted yesterday afternoon around 15:35 UT. This was clearly observed
in PROBA2/SWAP and SDO/AIA data. Also STEREO/A COR2 images show the
event, starting at 18:54 UT. The direction of the associated CME suggest
the impact of this event on the Earth will be limited. The CME speed as
measured by CACTUS is approximately 550 km/s.
We expect quiet solar conditions for the coming days. A shock in the
solar wind speed was observed by ACE yesterday due to a sector boundary
change. The solar wind speed is still low around 380 km/s. There may be
unsettled geomagnetic conditions towards the end of the forecasting
period due to a recurrent coronal hole wind stream.
```

- Daily @12:30UT
- Email
- Fixed format (software readable)
- Available for free

Flare forecast (region / full disk)
Geomagnetism forecast (A/K)
F10.7 forecast

Textual report/forecast
- Solar weather
- Solar wind
- Geomagnetic conditions

ALERTS

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```
:Issued: 2017 Sep 08 1432 UTC
:Product: documentation at http://www.sidc.be/products/presto
#-----------------------------------------------------------------#
# FAST WARNING 'PRESTO' MESSAGE  from the SIDC (RWC-Belgium)      #
#-----------------------------------------------------------------#
A persistent and strongly negative value of the Bz component of the
interplanetary magnetic field (peak -17nT), is causing geomagnetic
storms at between moderate (local K 6) and severe levels (Potsdam and
NOAA Kp reaching to 8).

These storms are related to the September 6 CME.

Further geomagnetic storming is expected with the levels depending on
the evolution of Bz.
In general solar wind and geomagnetic conditions should slowly subside
over the next 24-48 hours.
#-----------------------------------------------------------------#
# Solar Influences Data analysis Center - RWC Belgium             #
# Royal Observatory of Belgium                                    #
# Fax : 32 (0) 2 373 0 224                                        #
# Tel.: 32 (0) 2 373 0 491                                        #
#                                                                 #
# For more information, see http://www.sidc.be. Please do not reply #
# directly to this message, but send comments and suggestions to  #
# 'sidctech@oma.be'. If you are unable to use that address, use   #
# 'rvdlinden@spd.aas.org' instead.                                #
# To unsubscribe, visit http://sidc.be/registration/unsub.php     #
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# - Use and processing of your personal information:              #
#   http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf #
#-----------------------------------------------------------------#
```

- Automated and/or human drive
- Email
- Available for free

Under development:

- Machine readable interfaces to events and associated alert
- Display of the events and alerts on multi-purpose interfaces (jHV, etc...)
- Ingest products on WIS (WMO Information System)

TAILORED PRODUCTS

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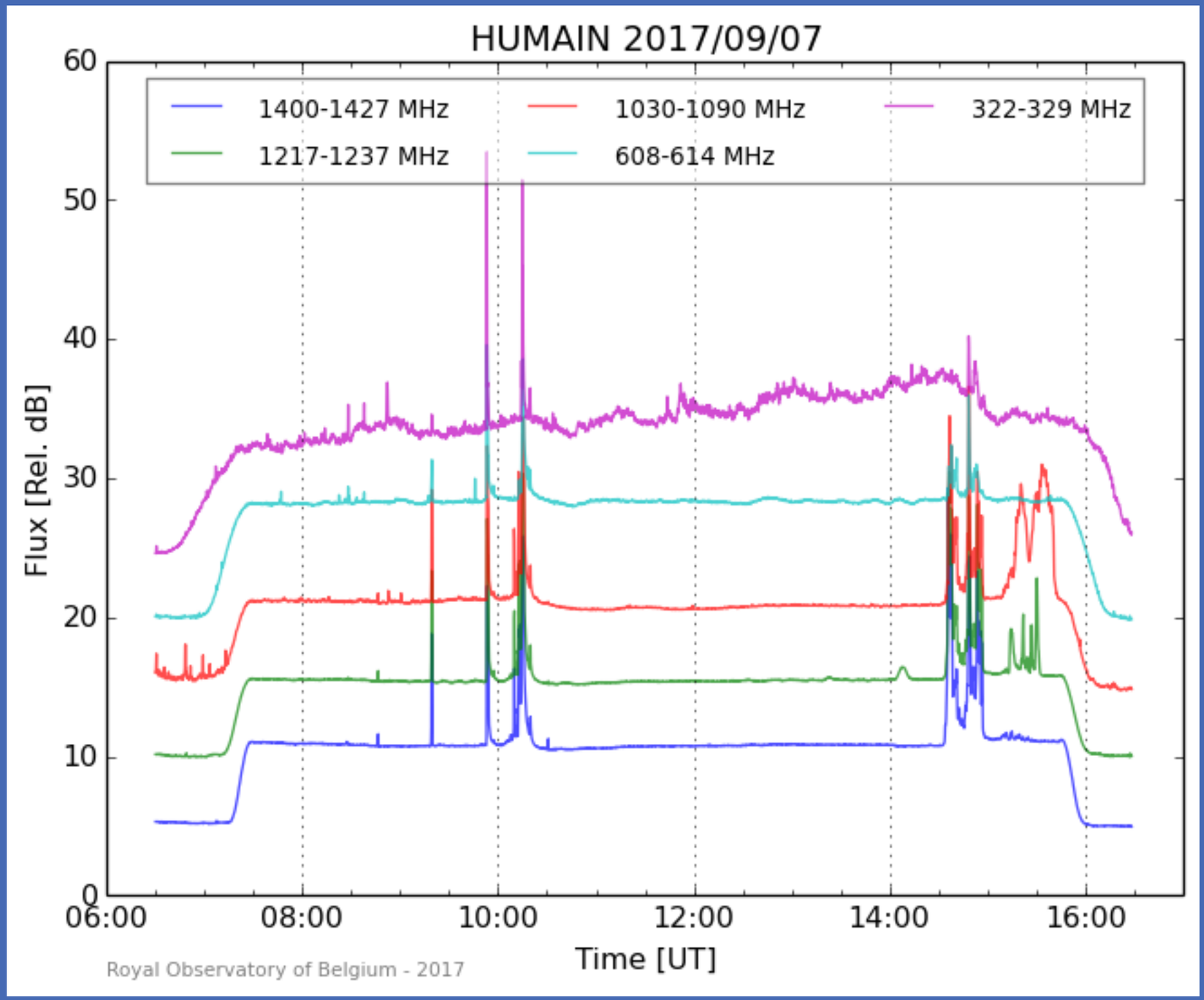

Discussion

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TESTING TOOLS

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We test the tools in real time, e.g. EUHFORIA.

How can we work with the CCMC, as an operational forecasting team we can help in verifying models?

CONSISTENCY

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We want consistency with the space weather community. Are we presenting the same data values/forecasts?

(We've worked on the flare scoreboard)
(Flare magnitude/width/energy?)
(Bz arrival time and magnitude?)

META DATA

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Are our data/model products available with the appropriate meta data to be easily used by the modelling community?

Are there standards in place?

COMMUNICATION

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A bi-annual web get together would be constructive to discuss:

Product/product development overlap.
Consistency in presented values.
Tools we need!
Tiger team development