

# SPACE WEATHER INTRODUCTORY COURSE



Collaboration of



Solar-Terrestrial Centre of Excellence



**Koninklijke luchtmacht**

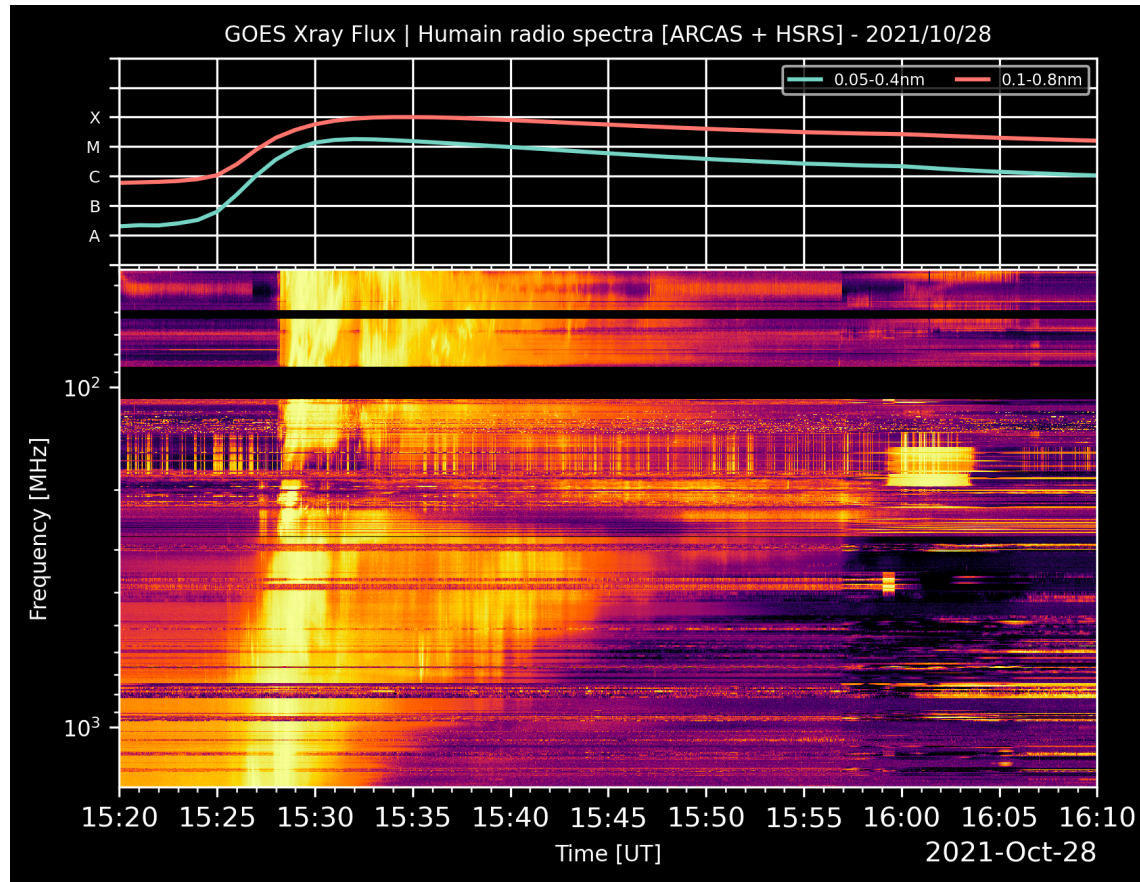


Koninklijk Nederlands  
Meteorologisch Instituut  
*Ministerie van Infrastructuur en Milieu*



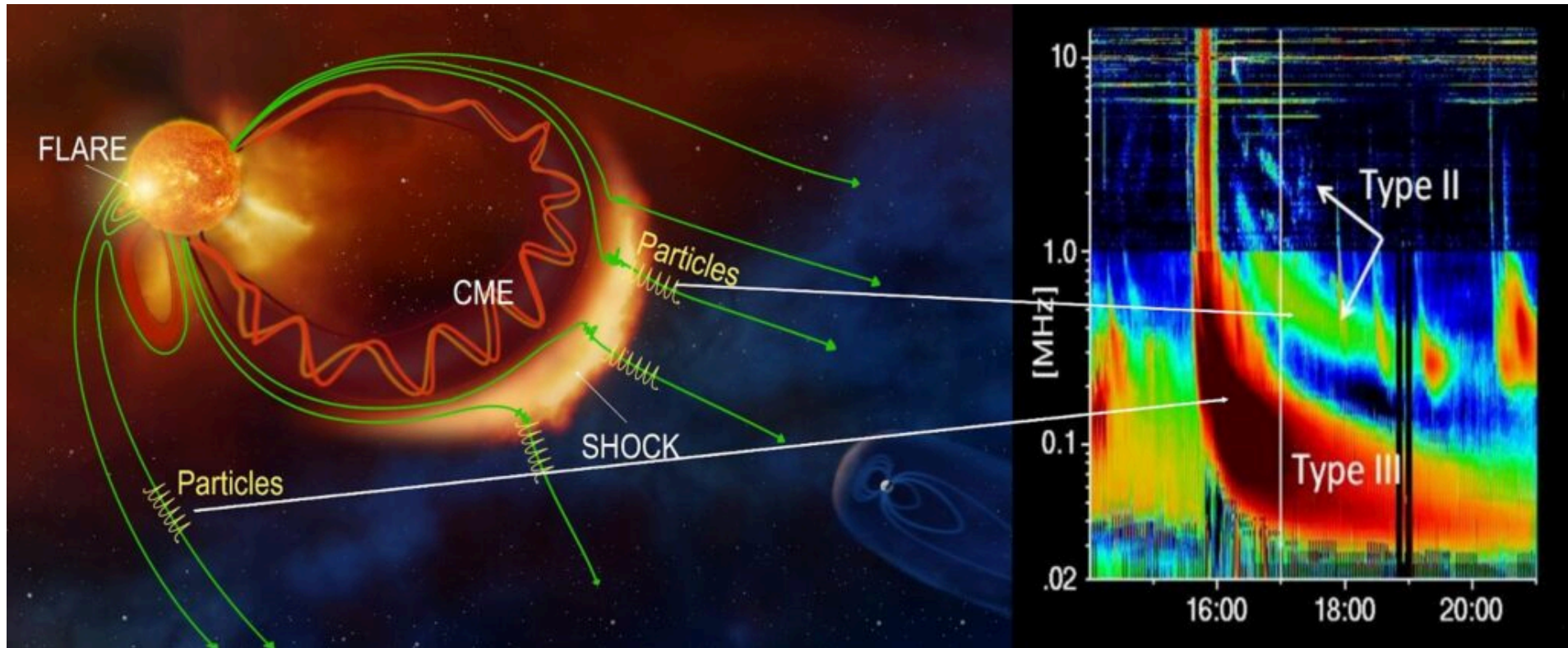


# RADIO BURSTS



Humain

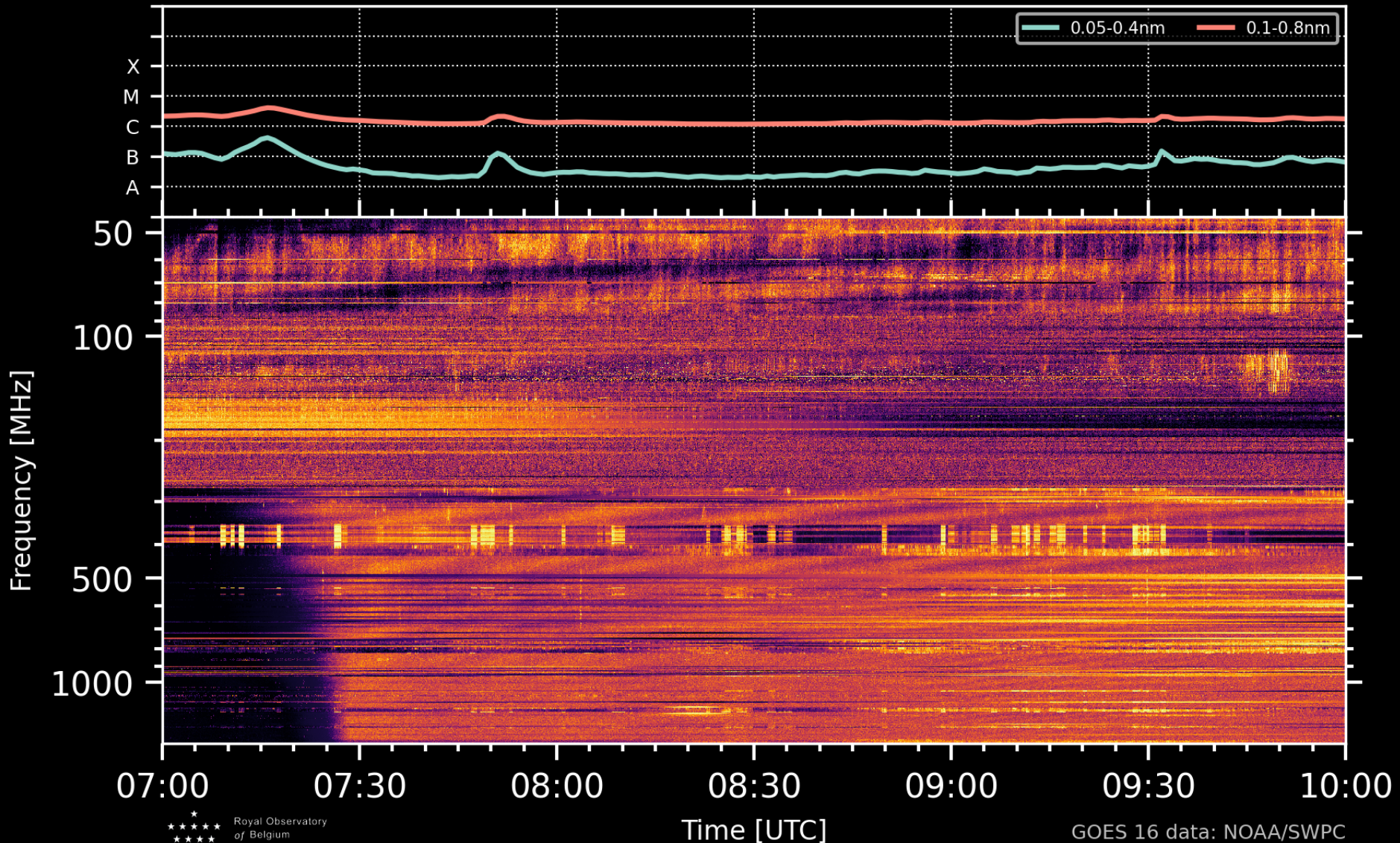








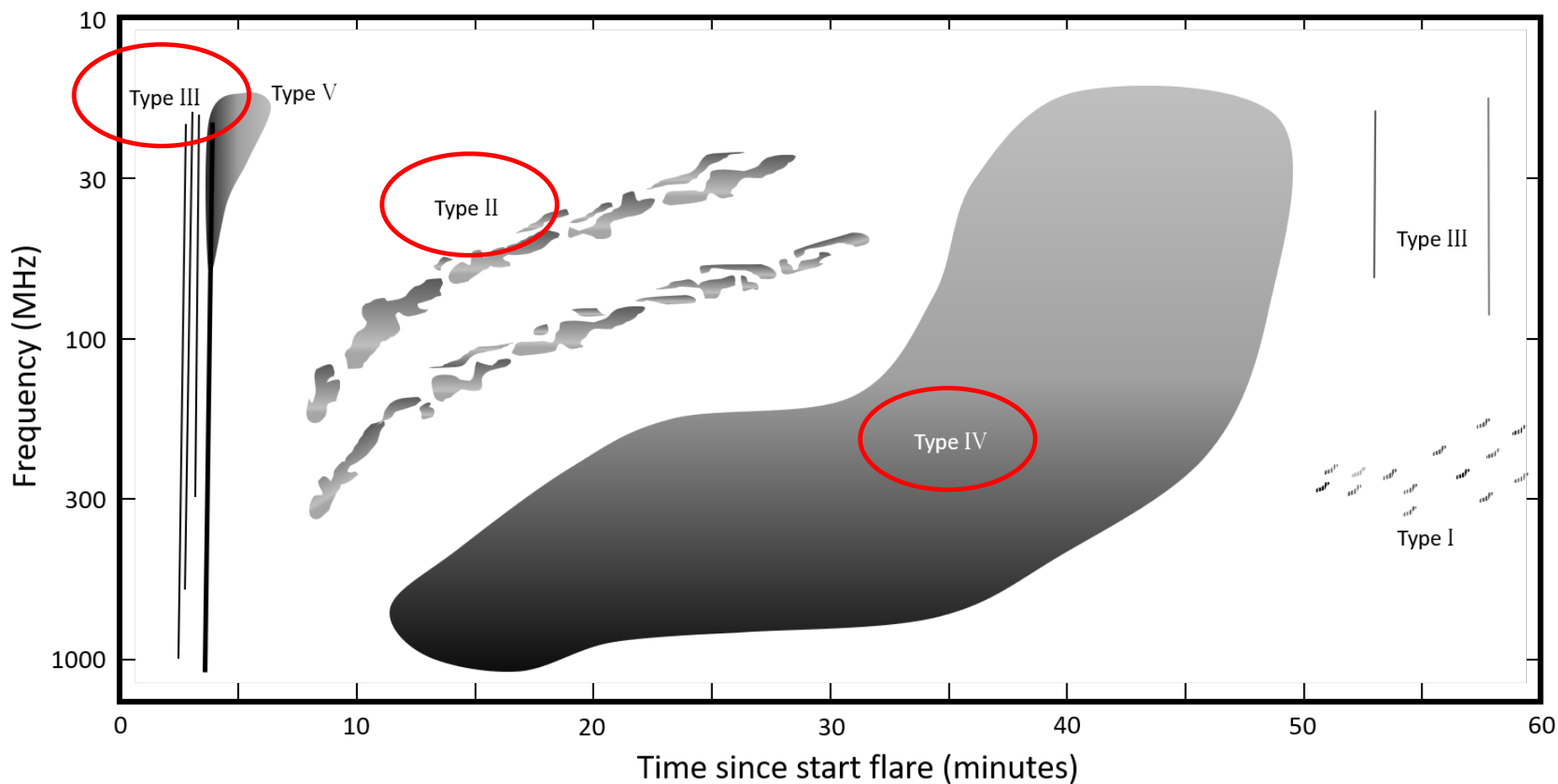
2023-05-23 - GOES X-ray Flux | ARCAS + HSRS (HUMAIN)







# RADIO BURSTS

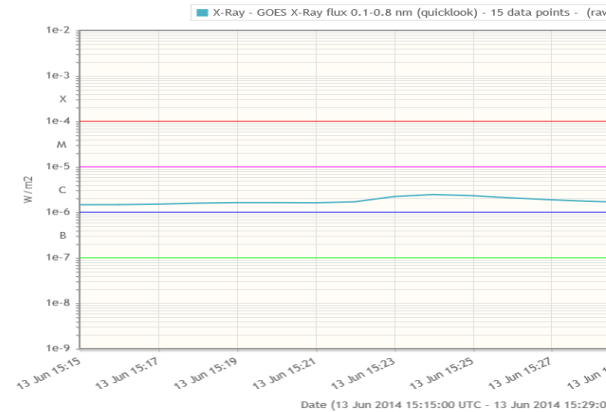




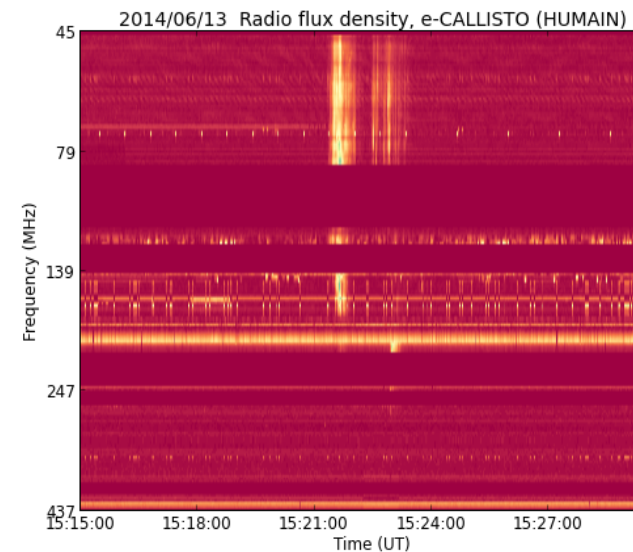
# RADIO BURSTS

## Type III

- Source:
  - accelerated electrons propagating along open magnetic field lines
- During impulsive phase of flares
- Duration
  - Seconds (isolated) to minutes (groups)
- Frequency
  - 10 kHz-1 GHz



GOES



Humain



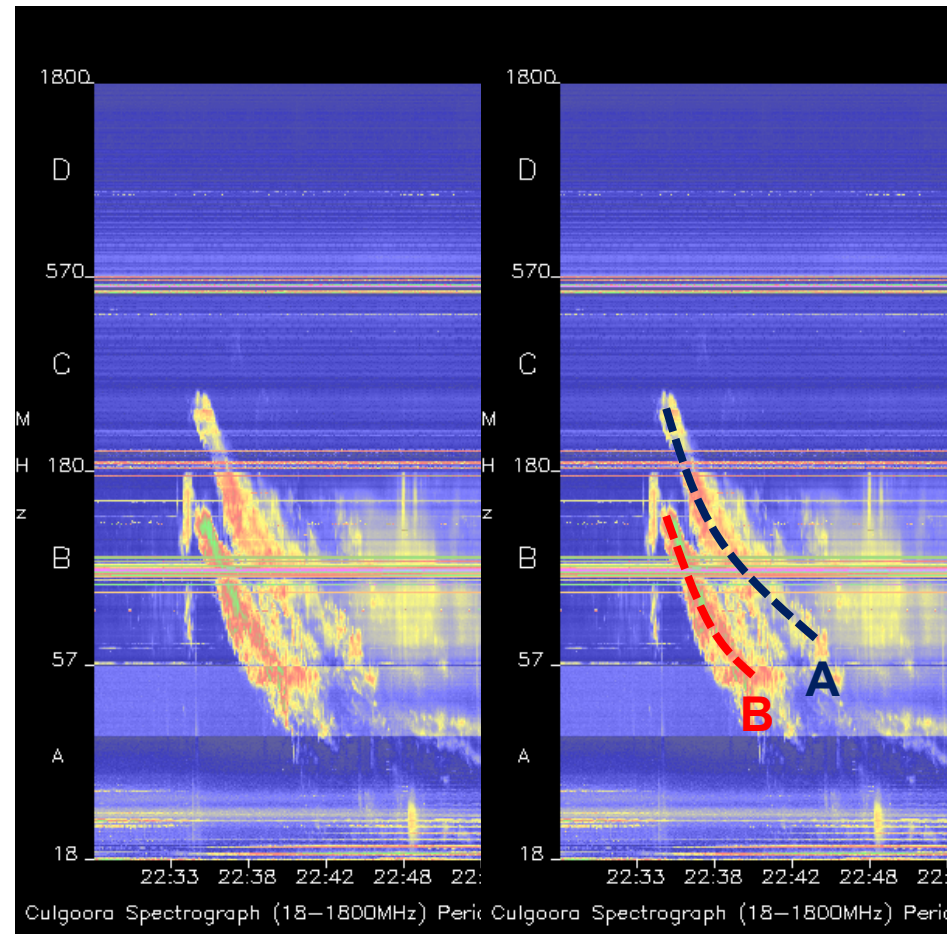




# RADIO BURSTS

## Type II

- Source:
  - electrons accelerated in shocks
  - Indicates CME
  - Shock speed can be derived from fundamental band (B)
- Start at peak in soft X-ray flux of flare
- Duration  
3-30 minutes
- Frequency  
20-150 MHz



Culgoora

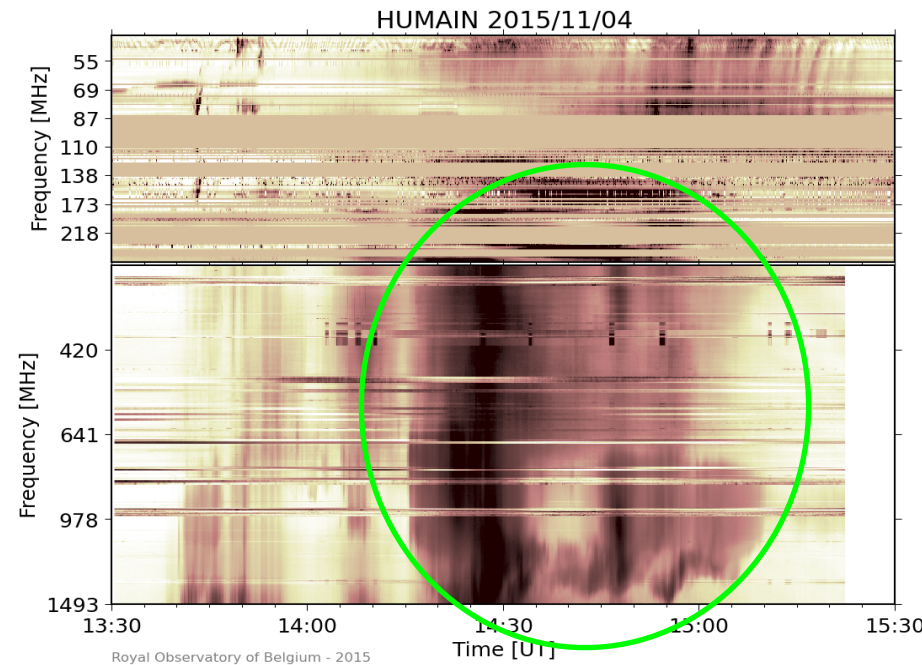




# RADIO BURSTS

## Type IV

- Source
  - Electrons trapped in post-eruption arcades behind CMEs
  - Related to very energetic CMEs  
(average speed: 1200 km/s)
- During decay phase of solar flares  
Connection with SEPs
- Duration  
Hours (to days)
- Frequency
  - 20 to >1000 MHz
  - Lowest: 8 +/-5 MHz



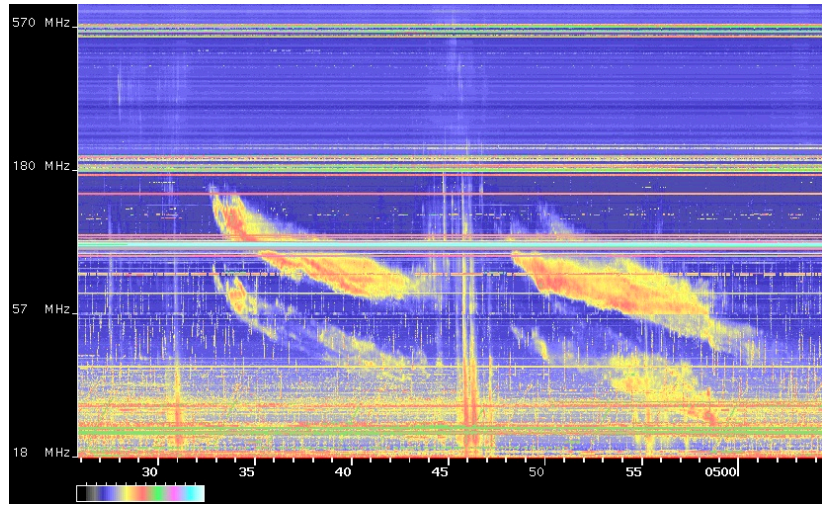
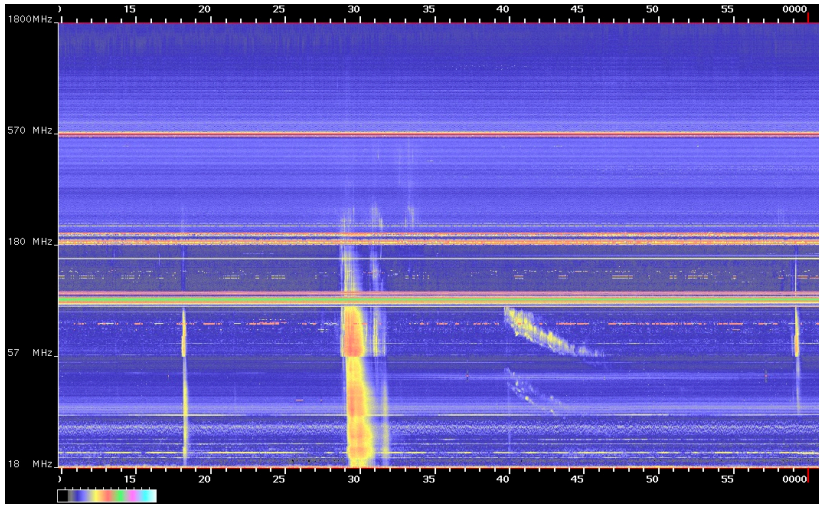
Humain







# RADIO BURSTS

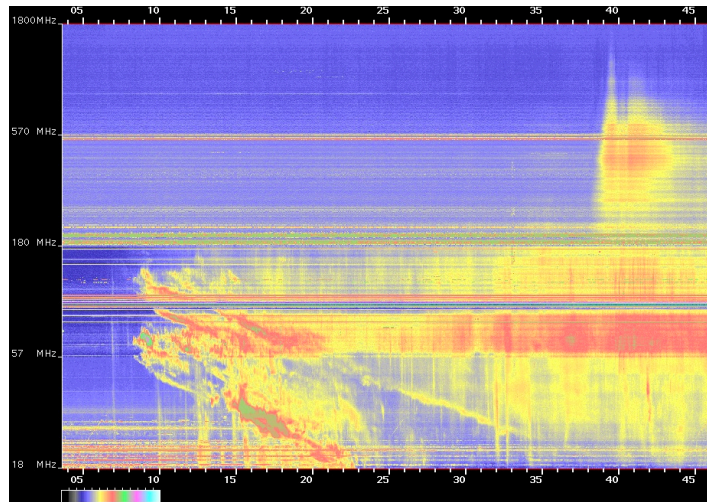


Type II preceded by Type III bursts

Two Type II bursts with background noise



Culgoora

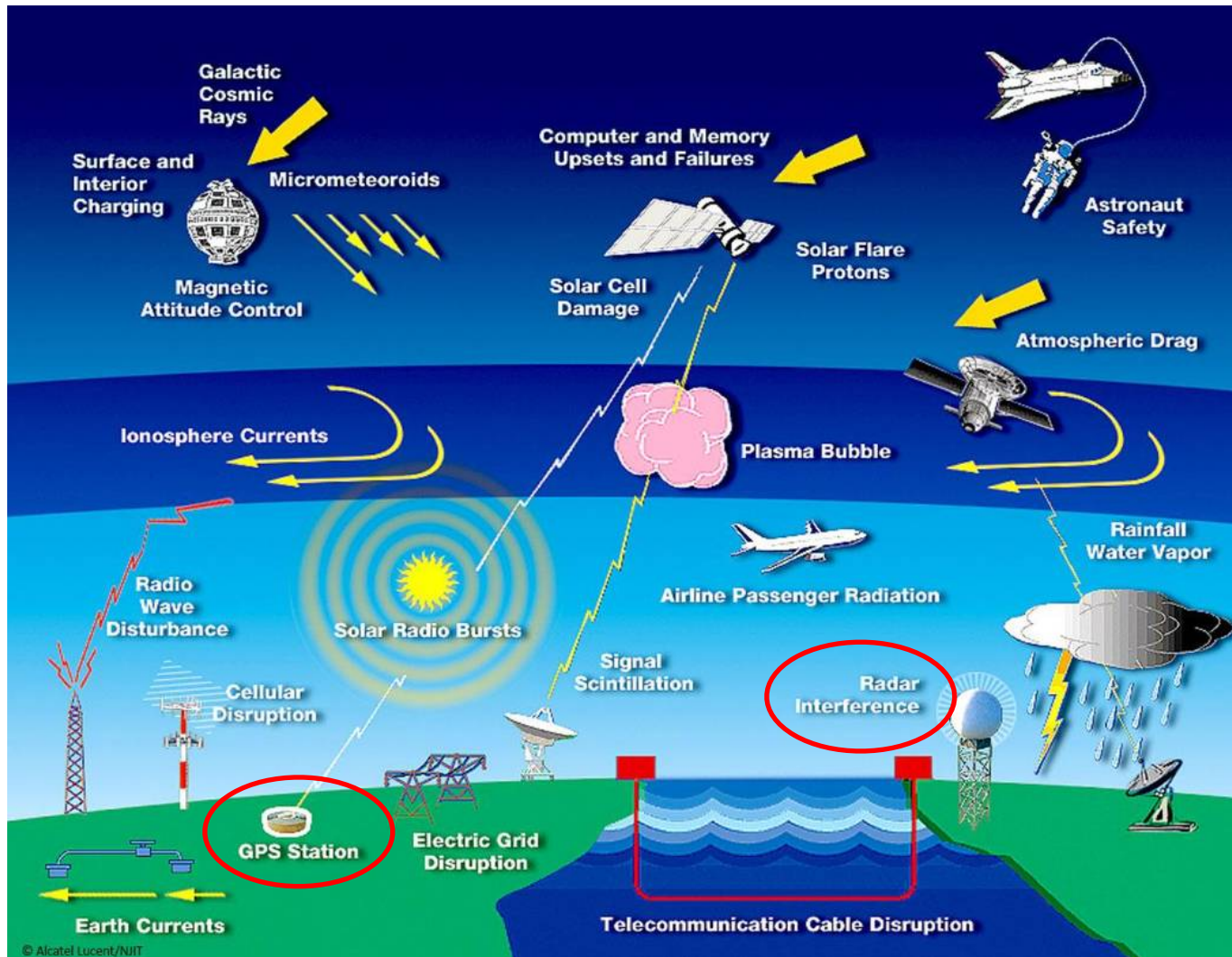


Long duration Type II with Type IV continuum





# IMPACT?





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:Issued: 2023 Mar 06 1246 UTC
:Product: documentation at http://www.sidc.be/products/meu
#-----#
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #
# (RWC Belgium) #
#-----#

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SIDC URSIGRAM 30306
SIDC SOLAR BULLETIN 06 Mar 2023, 1245UT
SIDC FORECAST (valid from 1230UT, 06 Mar 2023 until 08 Mar 2023)
SOLAR FLARES : M-class flares expected (probability >=50%)
GEOMAGNETISM : Active conditions expected (A>=20 or K=4)
SOLAR PROTONS : Quiet
PREDICTIONS FOR 06 Mar 2023 10CM FLUX: 181 / AP: 013
PREDICTIONS FOR 07 Mar 2023 10CM FLUX: 178 / AP: 011
PREDICTIONS FOR 08 Mar 2023 10CM FLUX: 170 / AP: 006

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COMMENT: Solar flaring activity was high in the past 24 hours with a five M-class flares detected and several C-class flares. NOAA Active Region (AR) 3242 (magnetic type Beta, Catania group 5) produced two M1 flares yesterday at 16:41 UT and 17:01 UT, NOAA AR 3243 (magnetic type Beta), produced two M5 flares yesterday at 21:36 UT and today at 02:28 UT, while NOAA AR 3234 (magnetic type beta-gamma-delta) an M1 flare at 09:12 UT today. NOAA AR 3238 (magnetic type Beta, Catania group 1), 3242, and 3243 have a fair chance of producing more M-class flares, while there is still a small chance for an isolated X-flare in the next 24 hours.

Several Coronal Mass Ejections and flows were observed in the currently available SOHO/LASCO coronagraph imagery and automatically detected by the Cactus tool over the past 24 hours. However, no clear Earth-directed CME were identified.

The greater than 10 MeV proton flux was at nominal levels over the past 24 hours and is expected to remain so for the next 24 hours. The greater than 2 MeV electron flux was above the 1000 pfu alert threshold and is expected to fluctuate around this threshold during the next 24 hours. The 24h electron fluence was at nominal levels and is expected to remain so. The 24-hour electron fluence was at moderate levels and is expected to remind at moderate levels over the next 24 hours.

The Solar Wind (SW) conditions remain under the influence of the fast solar wind streams associated to the equatorial coronal hole of negative polarity that reached the central meridian on March 02. The SW speed ranged between 500 km/s and 630 km/s. The total interplanetary magnetic field (Btot) had values between 3 nT and 8 nT, and its North-South component (Bz) fluctuated between -7 nT and 6 nT. The solar wind conditions near Earth are expected to remain at the same level for the next 24 hours.

Geomagnetic conditions were moderate to active both globally and locally (NOAA Kp and K Dourbes 2-4) over the last 24 hours. The are expected to remain at the same level both globally and locally in the next 24 hours.

TODAY'S ESTIMATED ISN : 192, BASED ON 12 STATIONS.

SOLAR INDICES FOR 05 Mar 2023

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WOLF NUMBER CATANIA : ///
10CM SOLAR FLUX : 180
AK CHAMBON LA FORET : 037
AK WINGST : ///
ESTIMATED AP : 027

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ESTIMATED ISN : 155, BASED ON 12 STATIONS.

NOTICEABLE EVENTS SUMMARY

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	Catania/NOAA	RADIO_BURST_TYPES
05	1624	1641	1653	N10W12	M1.0	SF	101	01/3238	
05	1653	1701	1711	/////	M1.0		05	05/3242	
05	2129	2136	2141	/////	M5.0		91	///3243	
06	0208	0228	0235	N19W65	M5.8	2N	480	06/3243	IV/IIII/VI/2
06	0857	0912	0937	/////	M1.3		//////	III/1	



Finding your way  
in the  
URSIgram



Radio bursts

Importance: weak - normal - strong

