

# The Humain project: Solar monitoring

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# Outlines

- Context
- Humain
- Radio projects
- Summary

# Context (Belgium)

- STCE work package: Ground based solar instruments (optic and radio)
- Started in 2008
- Two axes: Flux monitoring & radio spectrography
- Team of 5 persons: scientists, technicians, programmer
- Funding: STCE, ROB and Action 1 (Belspo)

# Context (Europe)

## Mixed bag in terms of instruments

- Radio imagery (Nançay)
- Flux monitoring (USAF, ~~Trieste~~)
- Radio spectrographs (DAM, Ondrejov, Artemis, ~~Potsdam~~, Callisto)

## Few new projects

- Imagery: LOFAR (NL, non solar dedicated), ALMA (non solar dedicated)
- Flux monitoring (ETH)
- Spectrograph: Fedome (Nançay)

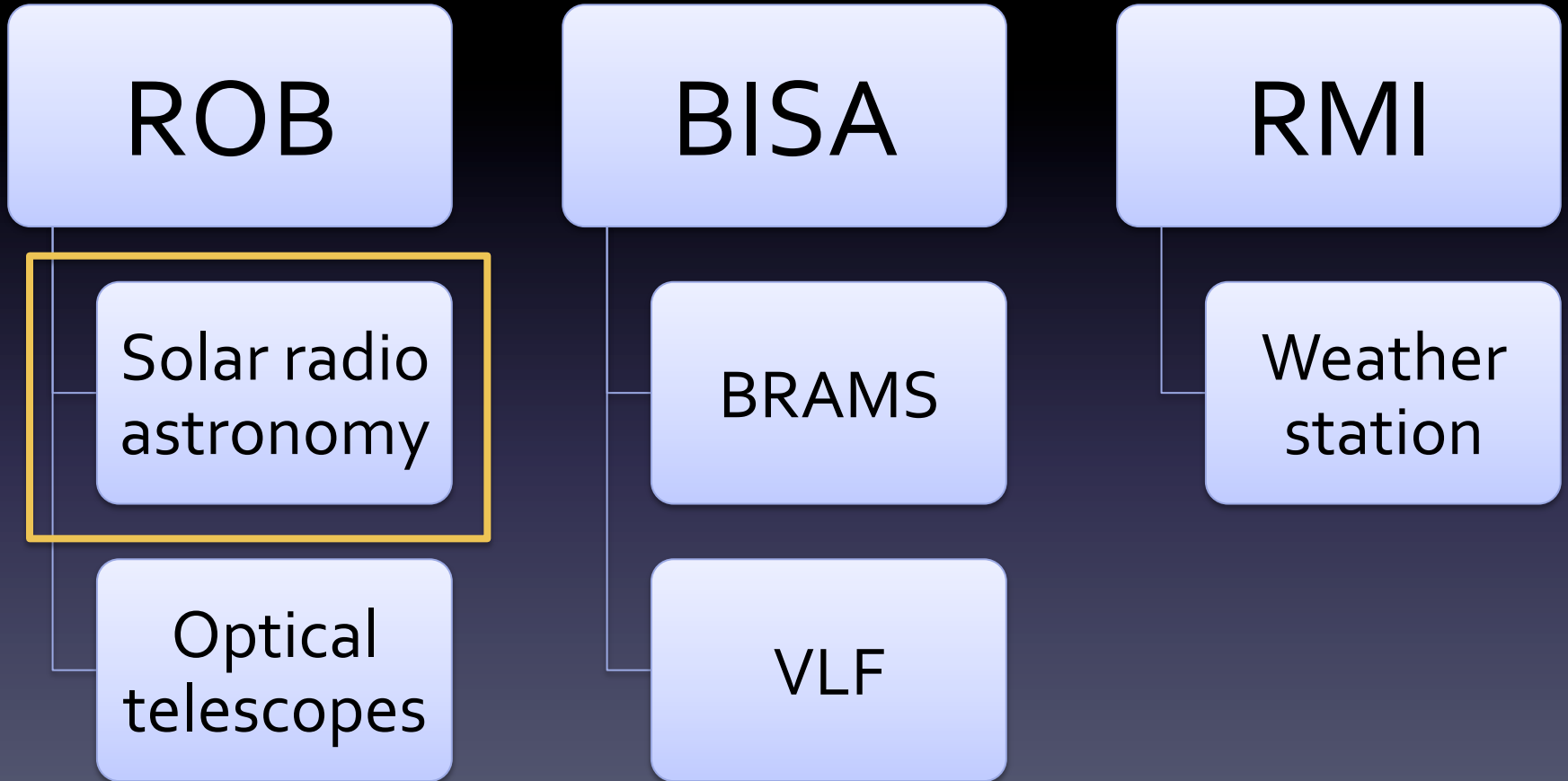
# The Humain station



©2008 Google - Imagerie ©2008 DigitalGlobe, Cnes/Spot Image, Données cartographiques ©2008 Tele Atlas - Conditions d'utilisation

SWWT Plenary Brussels June 28th 2011

# Humain today



# Solar Radio Astronomy

	Callisto	Phoenix 2	NGSFM
Frequency range	45-388 MHz	300 MHz - 3 GHz	1.4, 2.8, 4.9, 8.2, 10.6 GHz
Instrument	Spectrograph	Spectrograph	Radiometer
Polarization	Intensity	Stokes V & I	Intensity
Observing window	Sun rise/ Sun set	07-16 UT	07-16 UT
Data availability	15 min.	15 min.	Near real time
Operation	Since 2008	Summer 2011	2012

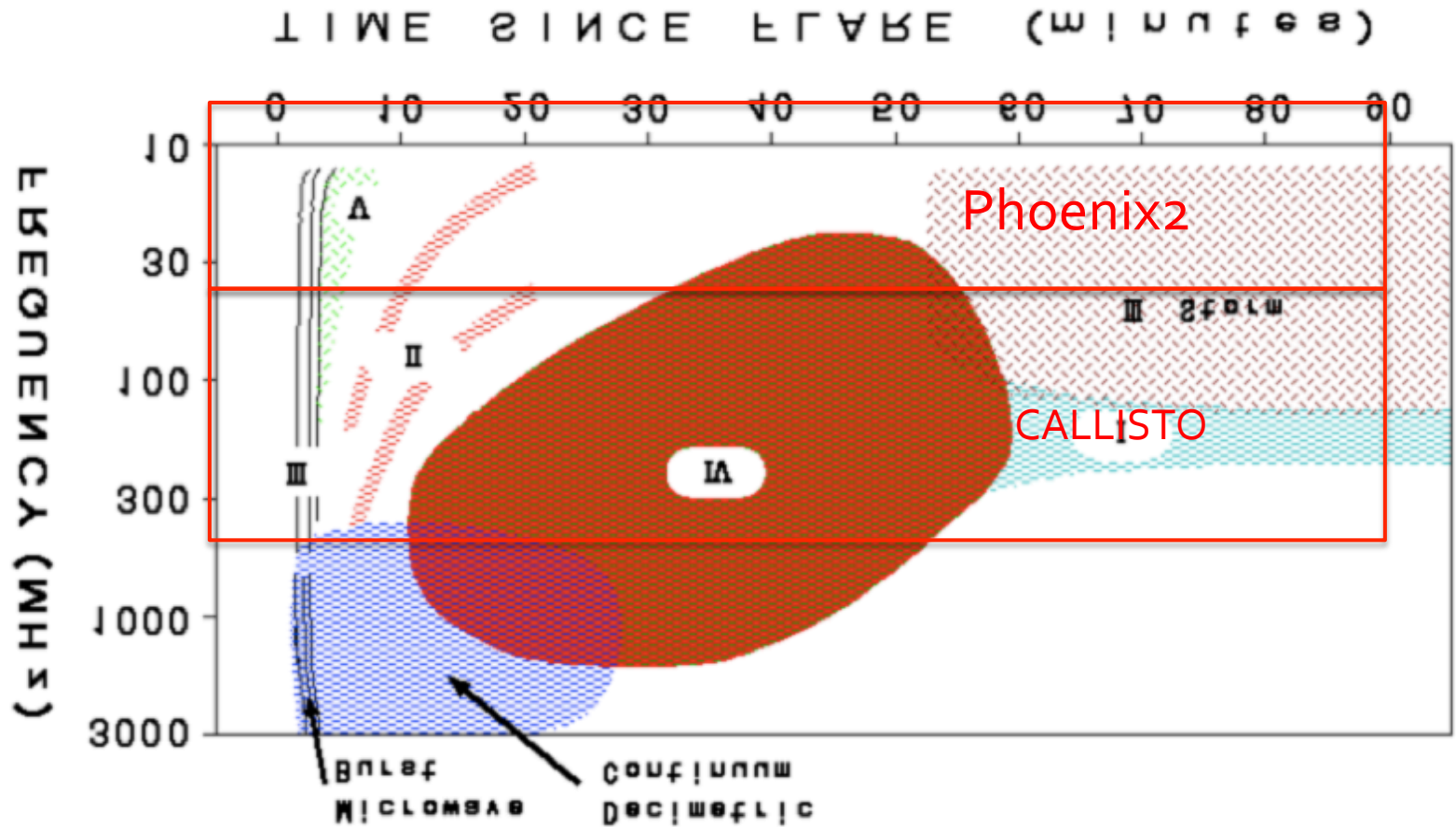
Corona

Low corona

Transition region

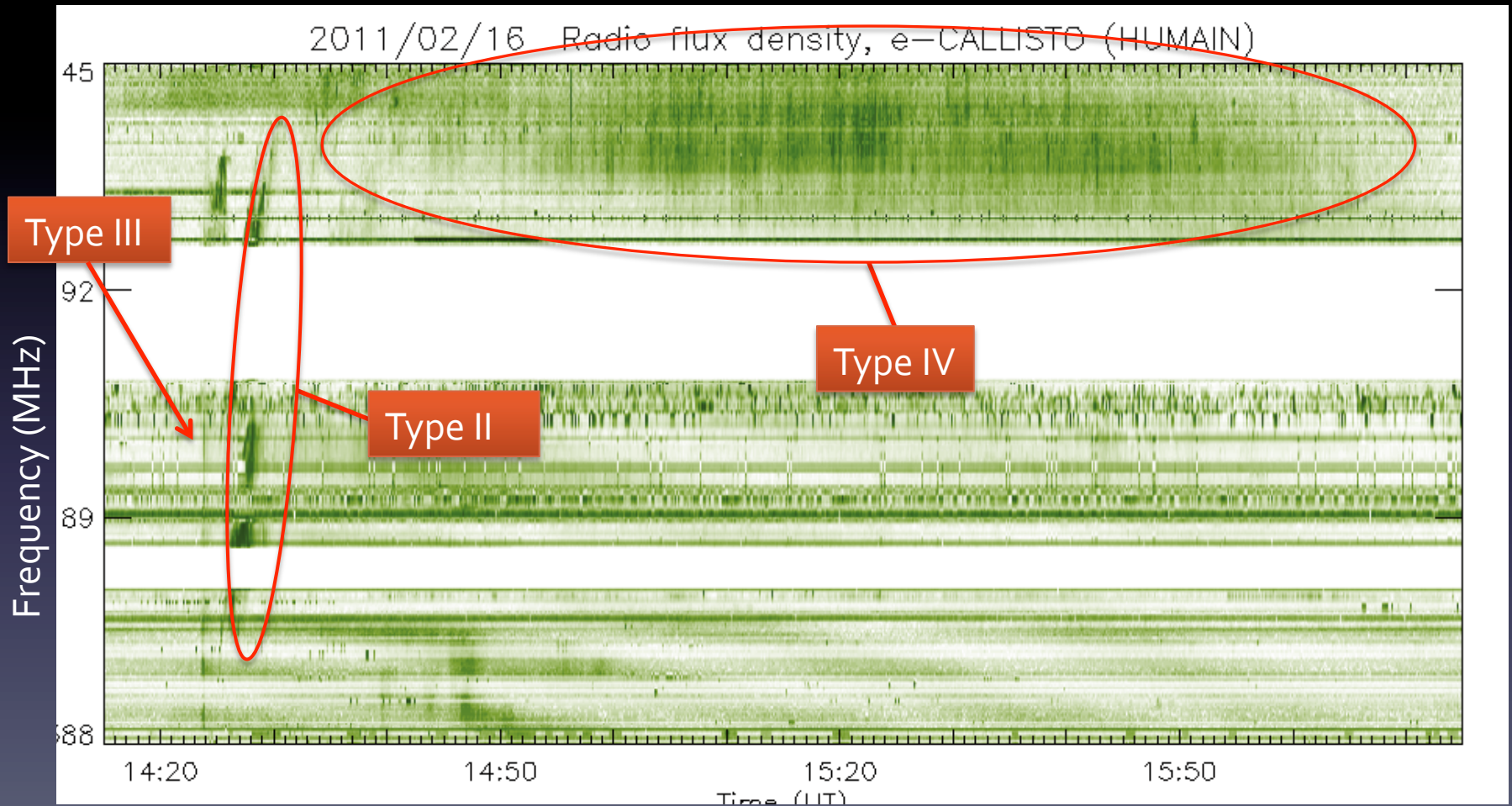
<http://sidc.be/humain>

# Spectral observation





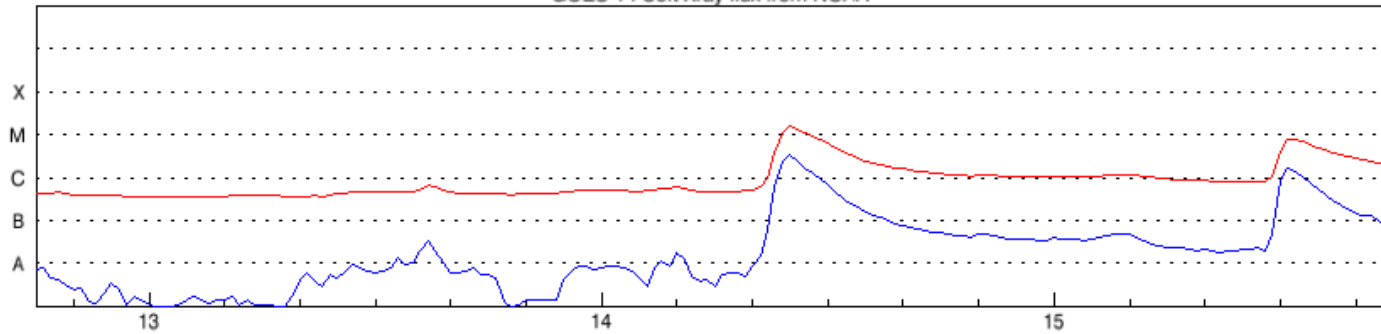
# Humain example



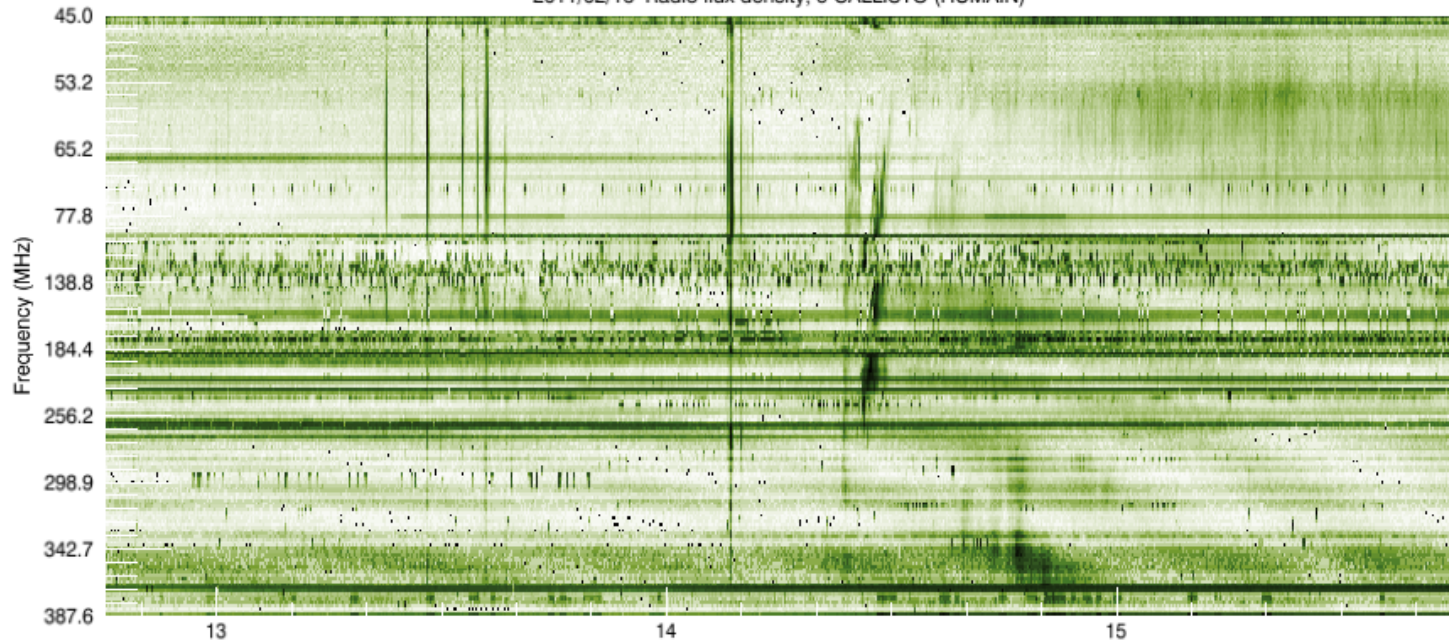
Time (UT)

# Near realtime display

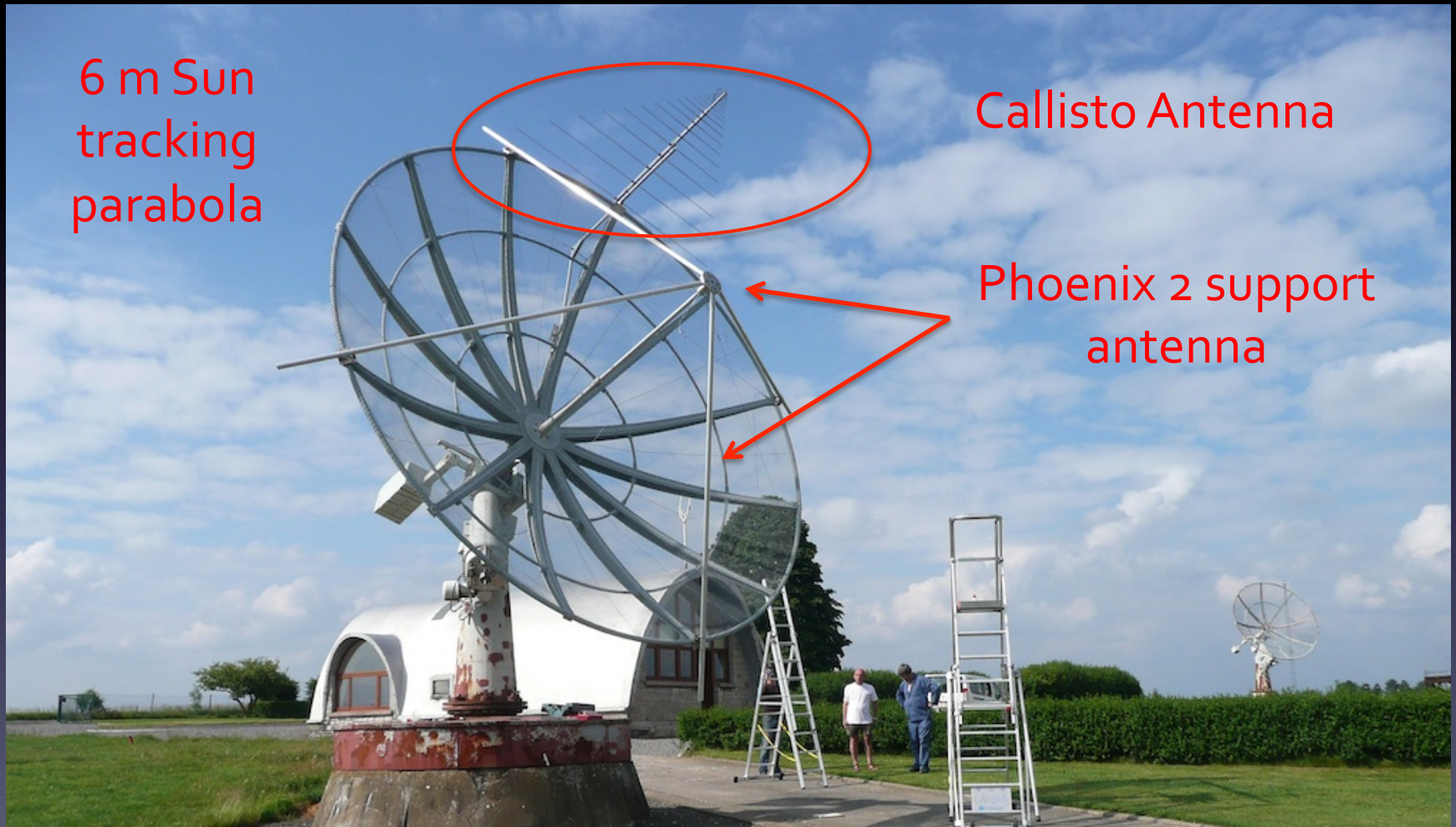
GOES-14 Soft Xray flux from NOAA



2011/02/16 Radio flux density, e-CALLISTO (HUMAIN)



# On site setup



# Radio Spectral observations & Space Weather

- Early warning of solar eruptive events
- Radio bursts give access to physical parameters (shock speed, magnetic field...)
- Combined with radio imaging: location of particle acceleration sites

# NGSFM

- Collaboration DRAO, NRCan (Design)
- Design phase (K. Tapping)
- Identical receivers in Canada and Belgium
- F<sub>10.7</sub> cm flux (2.8 GHz)
- Five frequencies (1.4, 2.8, 4.9, 8.2, 10.6 GHz)
- 100 ms cadence
- 3 absolute meas./day/site

# NGSFM (progress)

## Canadian

- Design of the pre-receiving chain complete (hardware)
- Concept of the receiver itself chosen (classic demodulation)
- Test of RF and HF hardware
- Telescope refurbishment in progress

## Belgium

- Antenna refurbishment in progress (mount & control system, control software)
- Aerial part purchased (3.4 m parabola, wide band horn)
- Pre-receiver hardware being purchased

# Summary

- Spectra and flux monitoring project
- Complementary to other European projects or instruments
- Full spectral observation capabilities (summer 2011)
- Prototype of flux monitoring in 2012