

Forecaster in less than 3 hours

Hitchhikers guide to the heliosphere



Overview

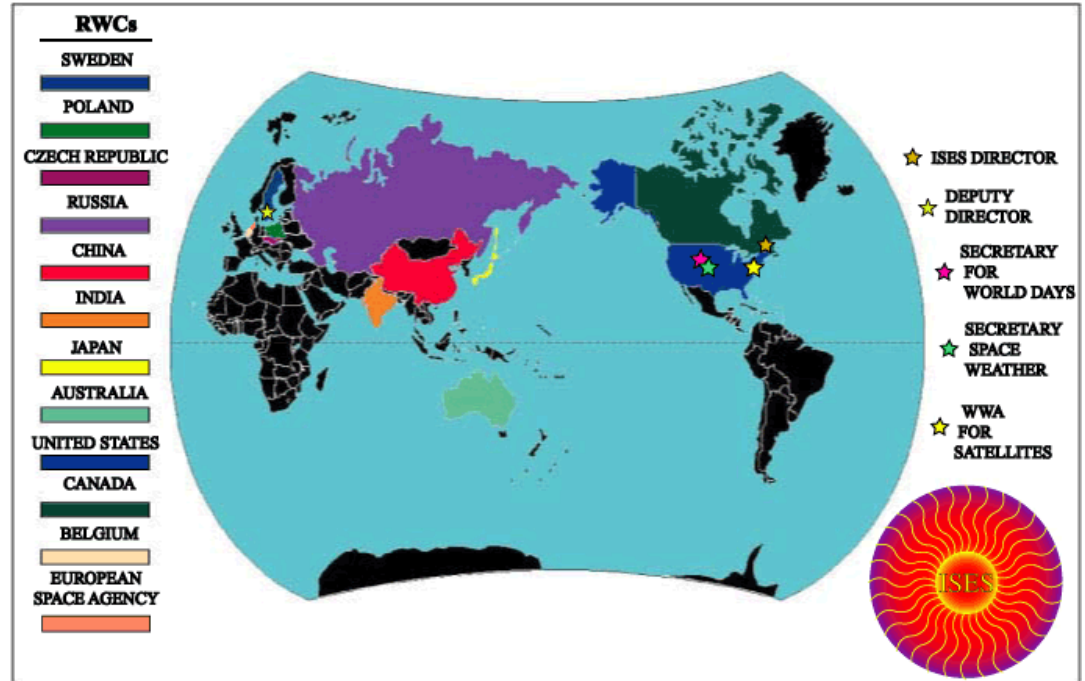
Part 1 – Space Weather

Part 2 – Recognize Space Weather

Part 3 – Space Weather appetizers

Part 4 – Top of the bill: your Forecast

We are not alone



SIDC - Solar Influences Data Analysis Center

Welcome to the Solar Influences Data Analysis Center (SIDC), which is the solar physics research department of the Royal Observatory of Belgium. The SIDC includes the World Data Center for the sunspot index and the ISES Regional Warning Center Brussels for space weather forecasting.

Most recent alerts

- 2010 Mar 14 15:04 UTC: A large CME starting most probably from NOAA-R1 11054 there is an E1 flare and also a B11 flare according to CACTUS (WDC-7) and a significant storm to the Earth on March 17-18.
- 2010 Feb 26 19:17 UTC: ... The SIDC - RWC Belgium expects (more) END OF ALL QUIET ALERT ...

Latest News

- Feb 11, 2010 - SIDC search Delayed to Feb 11
- Feb 08, 2010 - SIDC search Feb 10
- Feb 02, 2010 - PROB32 withdrawn an annular eclipse
- Jan 31, 2010 - PROB32 press release withdrawn document@sidc

The Australian Space Weather Agency

IPS Radio and Space Services

Space Weather

A large CME starting most probably from NOAA-R1 11054 there is an E1 flare and also a B11 flare according to CACTUS (WDC-7) and a significant storm to the Earth on March 17-18.

National Weather Service Space Environment Center

Current Space Weather Conditions

NOAA Scales Activity

Scale	Range	Current
Geomagnetic Storms	None	None
Solar Radiation Storms	None	None
Radio Blackouts	None	None

Solar X-ray Flux

Satellite Environment Plot

Space Weather



Sun – Space - Earth

Space weather describes the conditions in space that affect Earth and its technological systems. Space weather storms originate from the Sun and occur in space near Earth or in the Earth's atmosphere. These storms generally occur due to eruptions on the Sun known as solar flares, proton storms and the solar wind.

▶ What is Space Weather?

The Sun loses Energy

Radiation

Mass

Particles

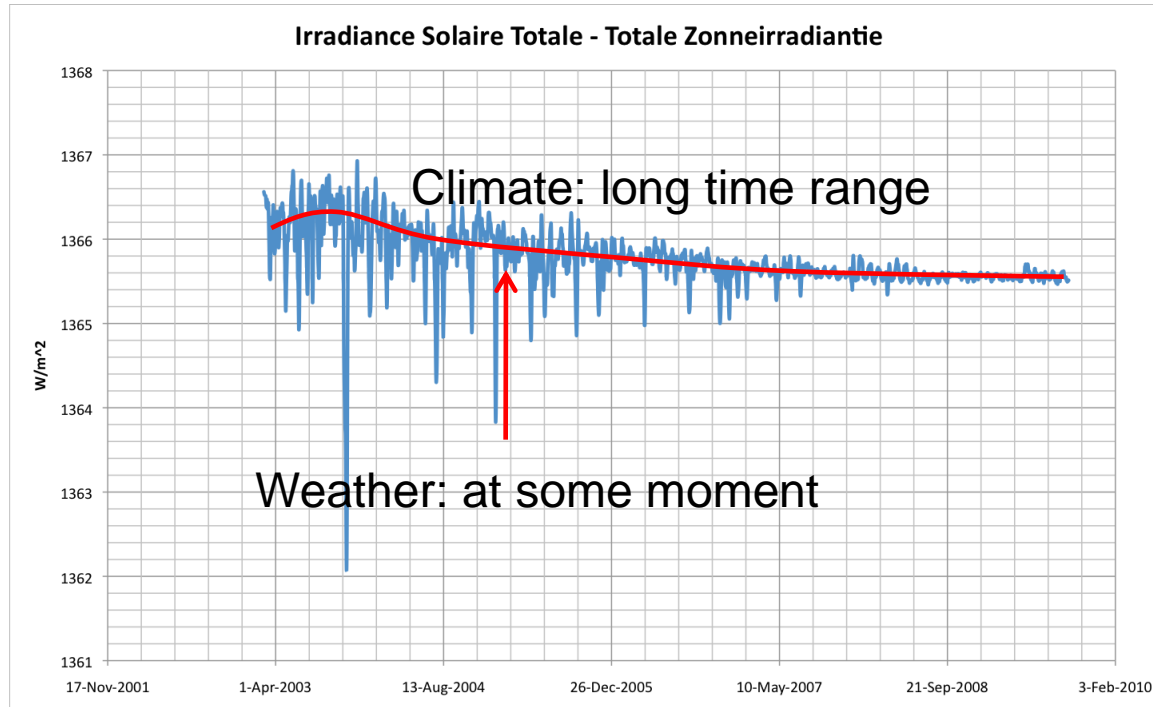
The Sun loses Energy – physical rephrasing

Total Solar
Irradiance

Solar
Wind

Fast
Particles

Radiation



Space Weather events

Flares

Holes
CME

Proton
Storm

Time scales

8 minutes

days

hour

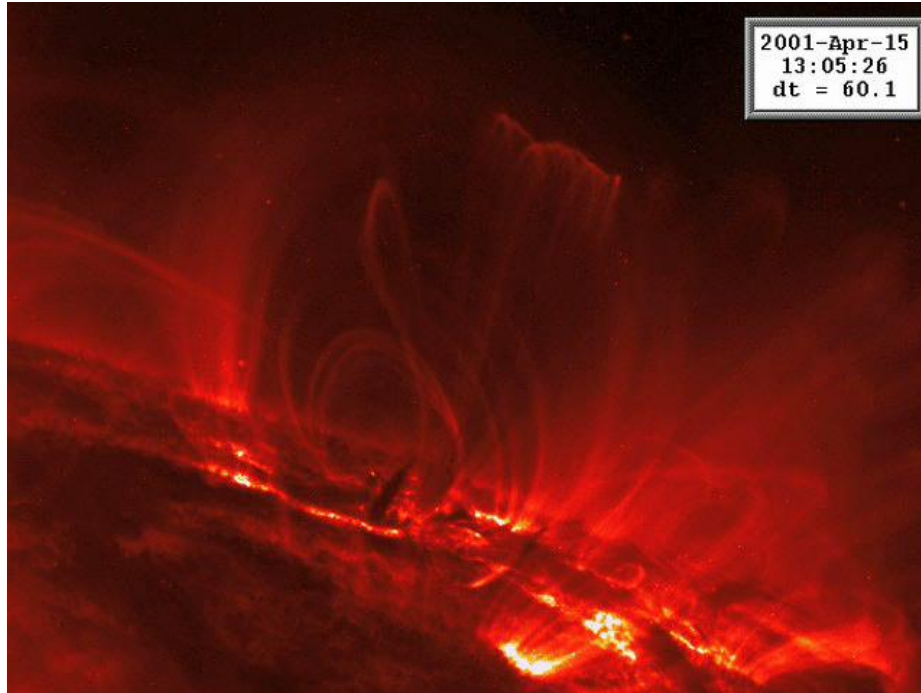
Predictions at the Space Weather Centre

Probability of
a flare to
happen

Behaviour of
solar wind

Probability of
a proton
storm

Flares and sunspots

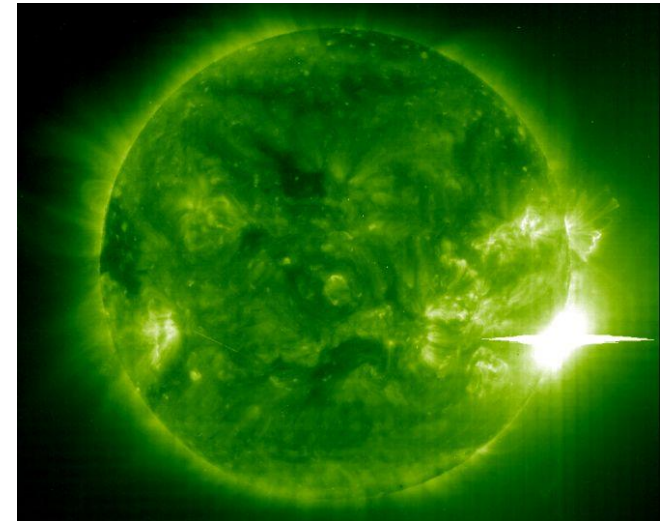
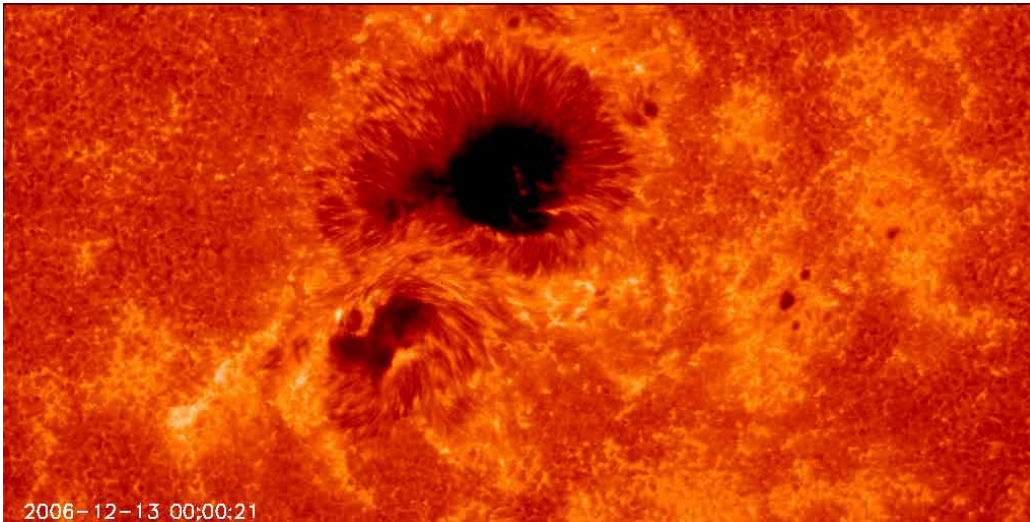


Radiation

A flare is a brutal solar process near sunspots in which a definite plasma volume of the solar atmosphere is heated to at least 10^7 K. Magnetic energy escapes in the form of radiation during a limited time period. This heating is the consequence of a fast reorganisation of the magnetic field.

Solar Flares

Light Flashes

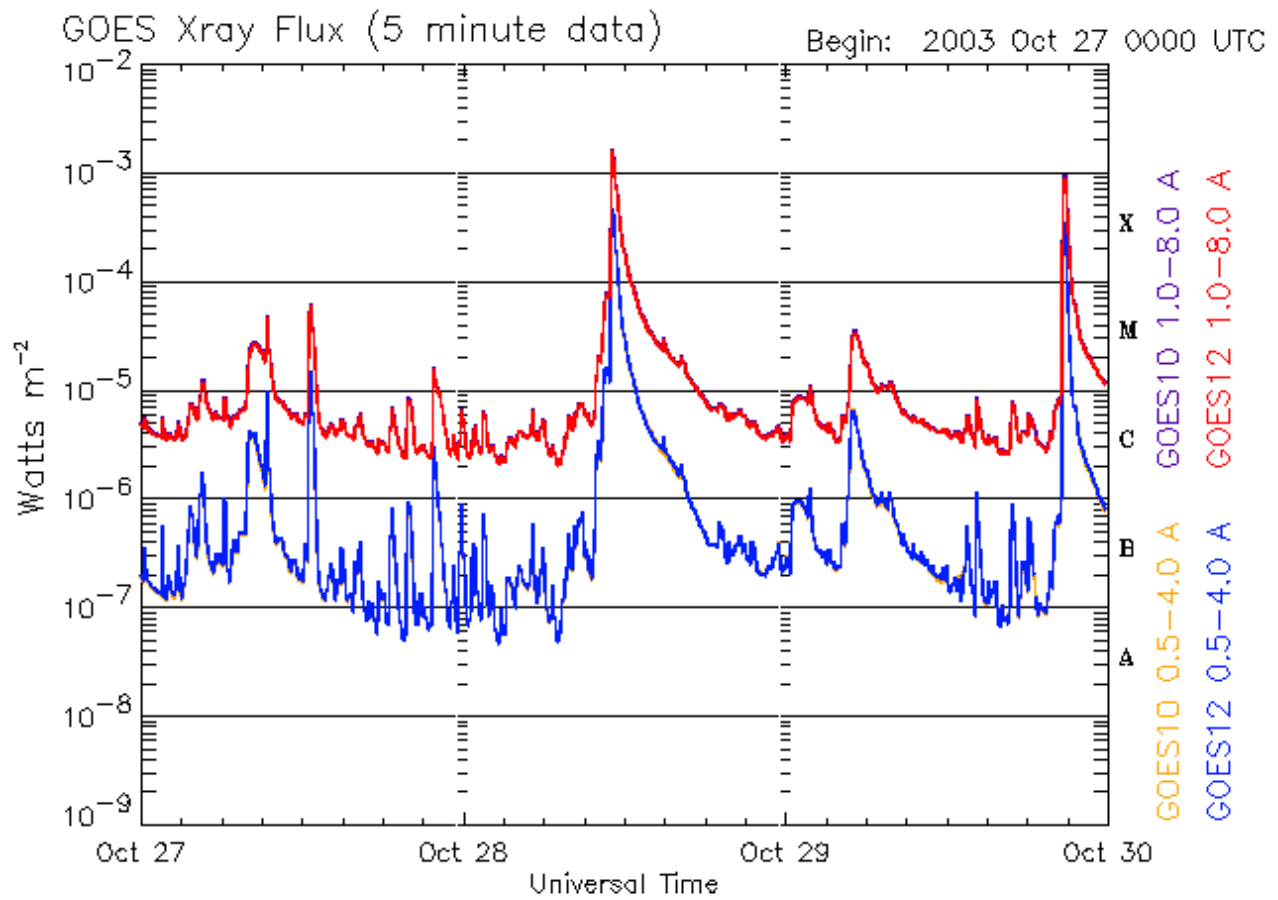


Solar Flares

Light Flashes



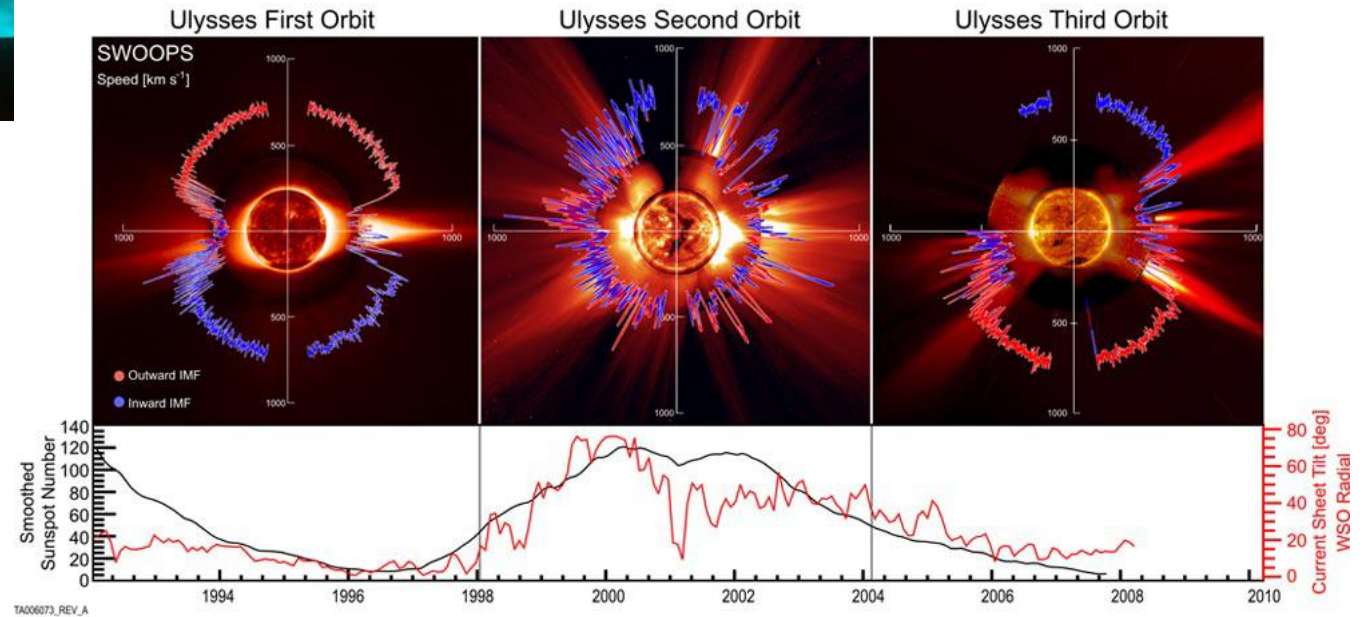
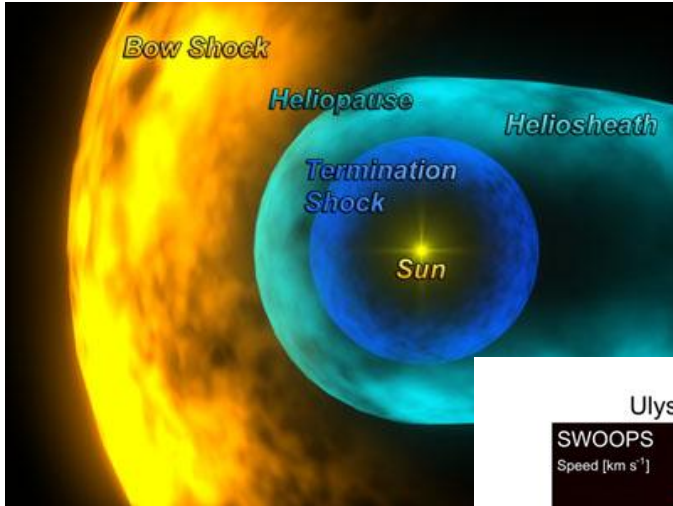
Klasse	Maximum Flux $\log_{10}(P)$ in Wm^{-2}
A	-8
B	-7
C	-6
M	-5
X	-4



Updated 2003 Oct 29 23:56:02 UTC

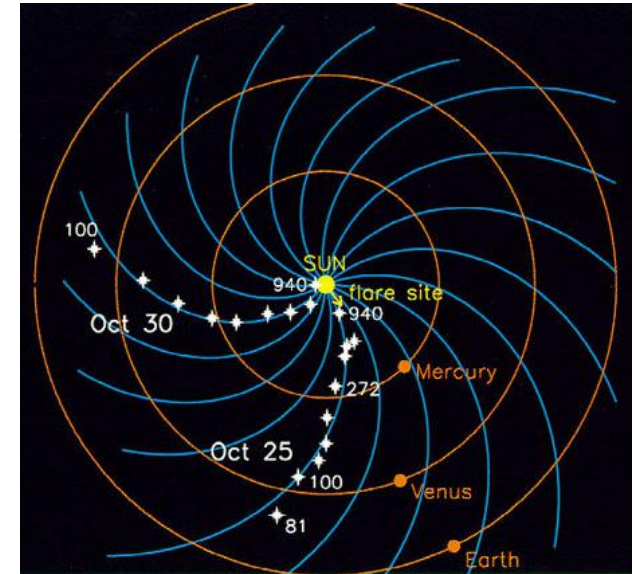
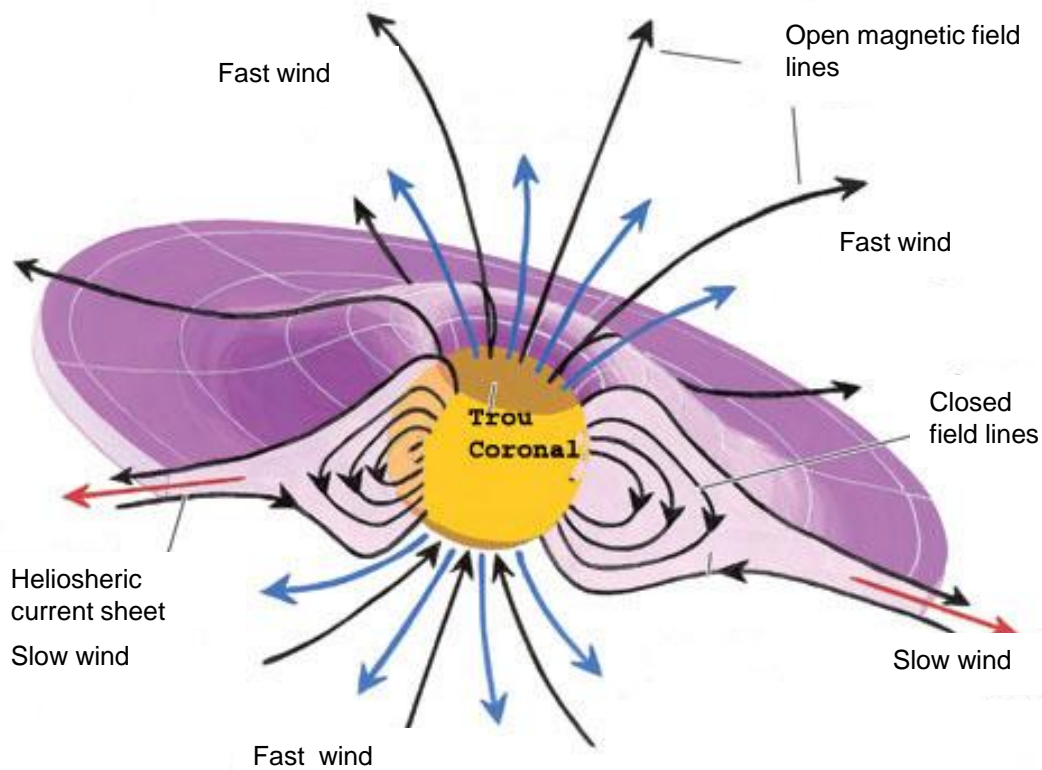
NOAA/SEC Boulder, CO USA

Solar Wind

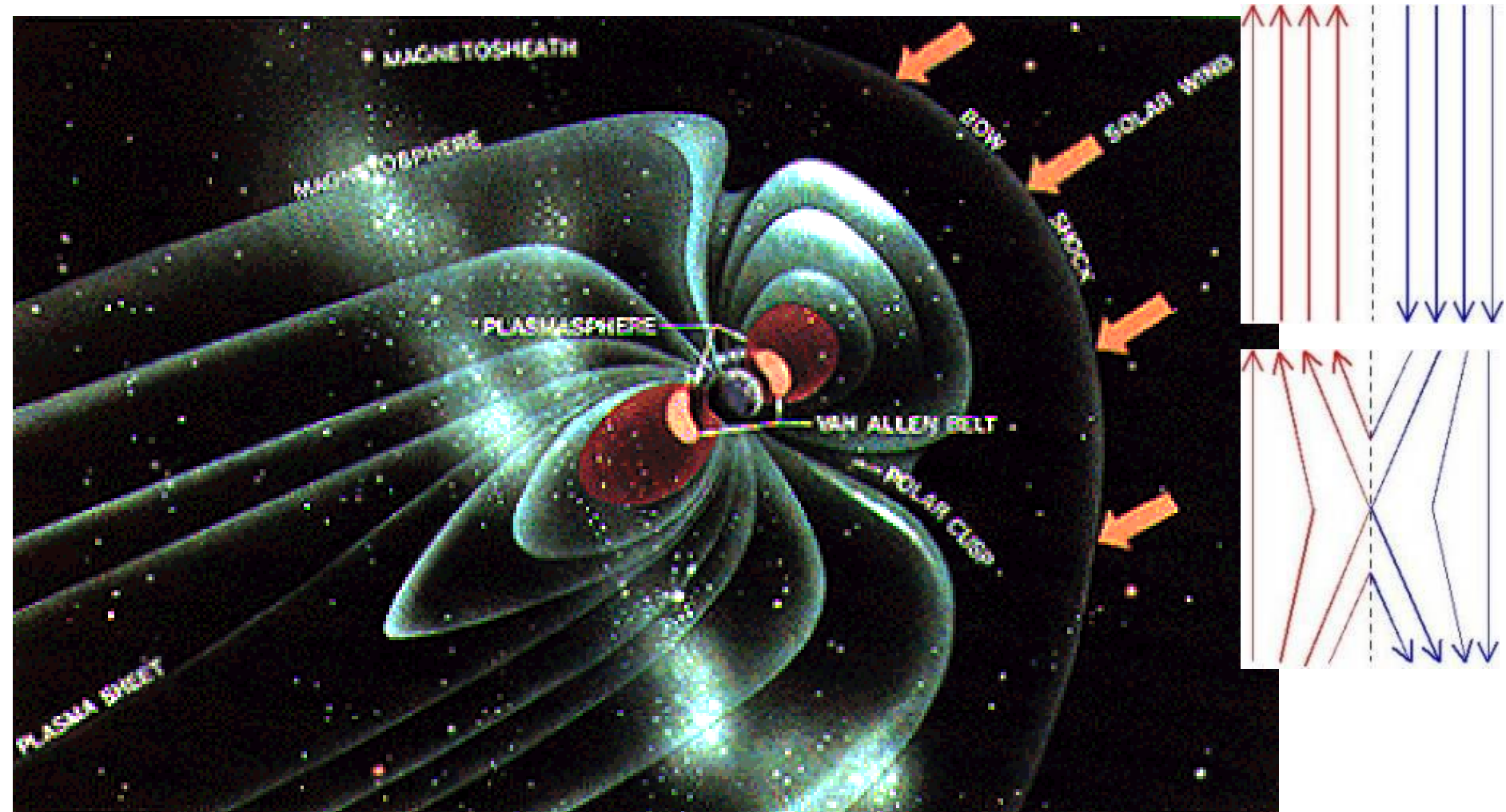


► Space Weather predictions – Solar wind

Solar Wind - Radial



Encounter with the Magnetosphere

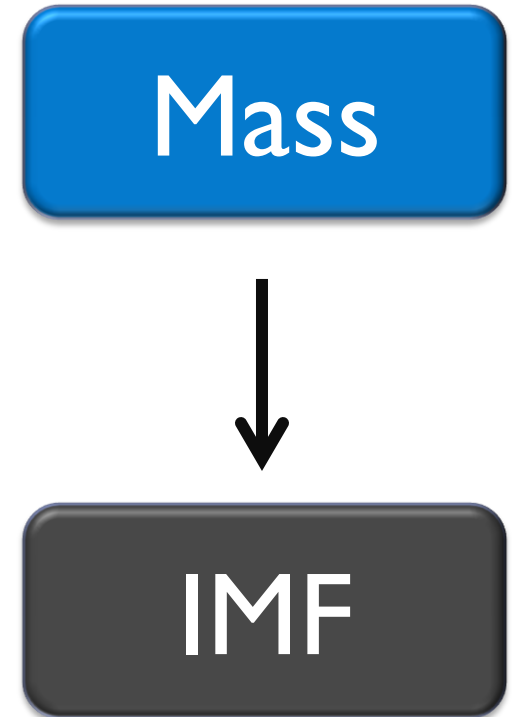
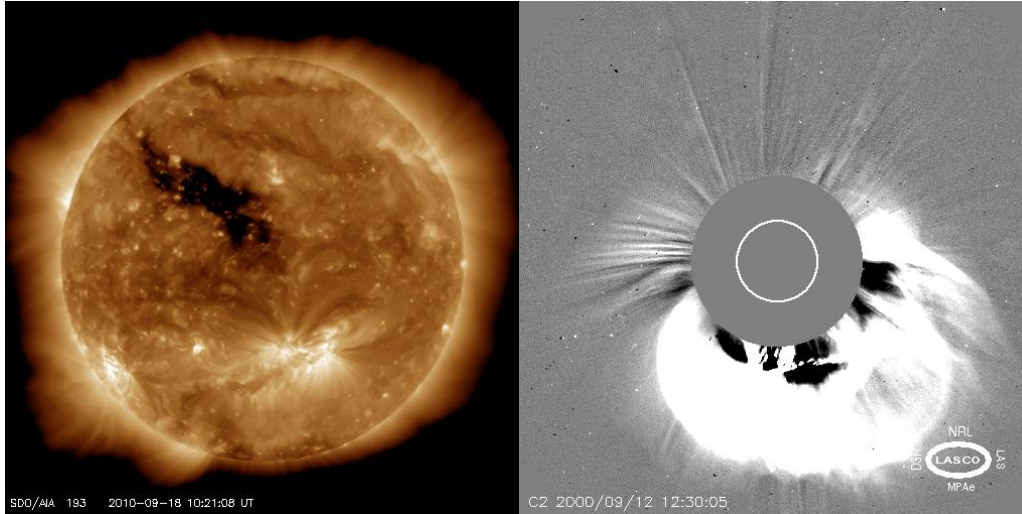


► Solar wind – conditions on Earth

Solar Wind

On top of the usual solar wind, two kind of geo-effective phenomena can happen:

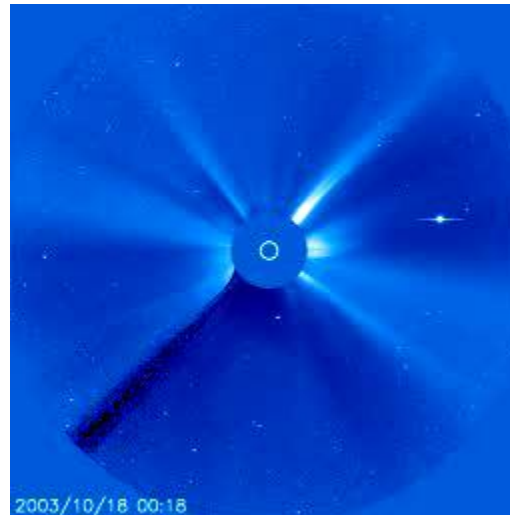
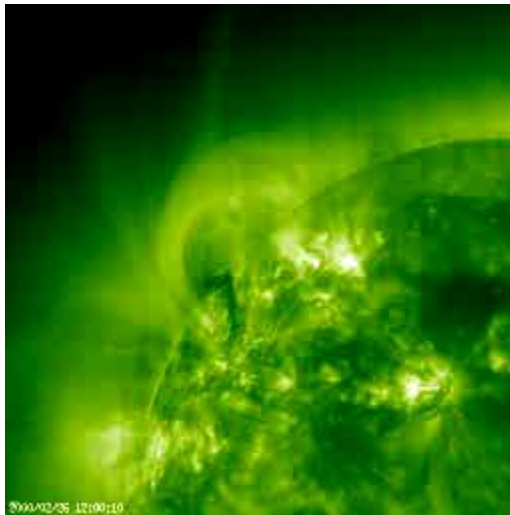
- ▶ Not-eruptive structures: coronal holes
- ▶ Eruptive structures: CME's



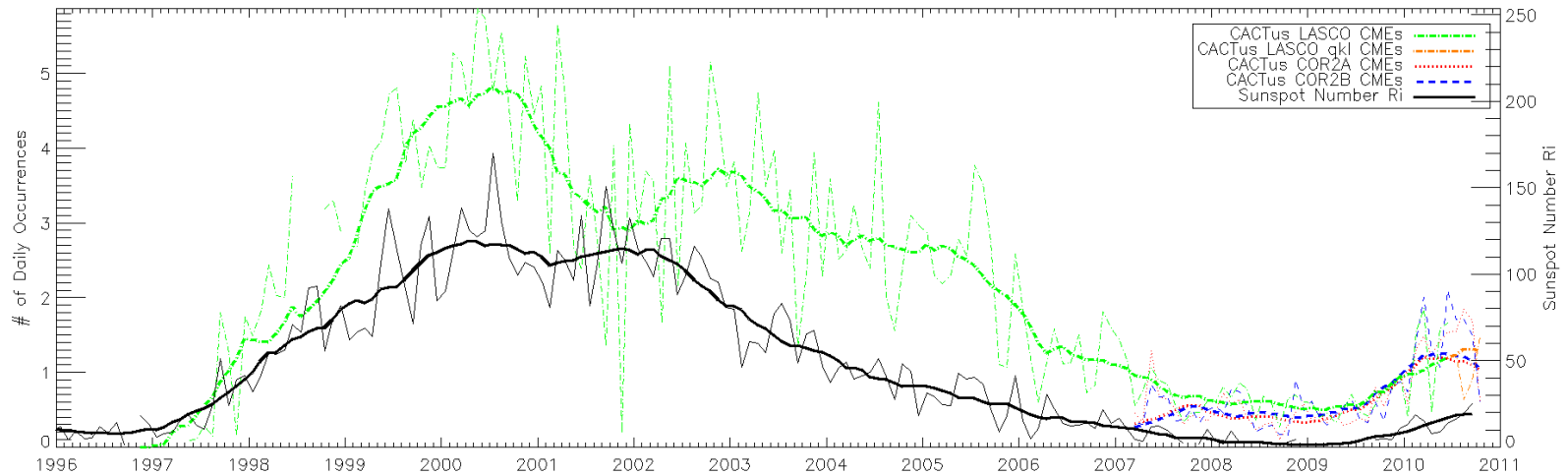
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- ▶ Solar wind – conditions on Earth

Plasma eruptions in EUV and visible light

- ▶ A new, discrete, bright white light feature in the coronagraph field-of-view with a predominantly, radial outward velocity.

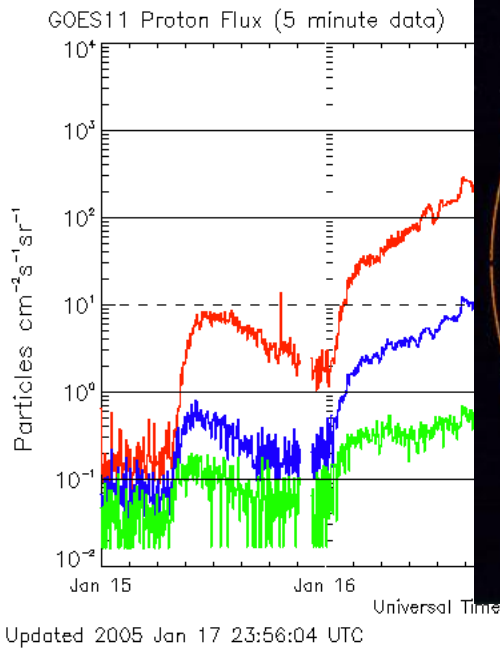


CME occurrence

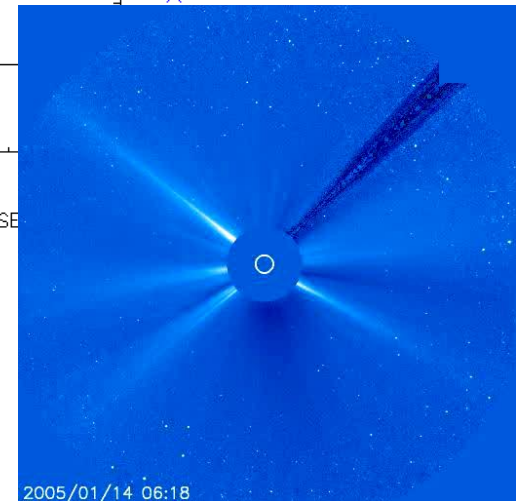
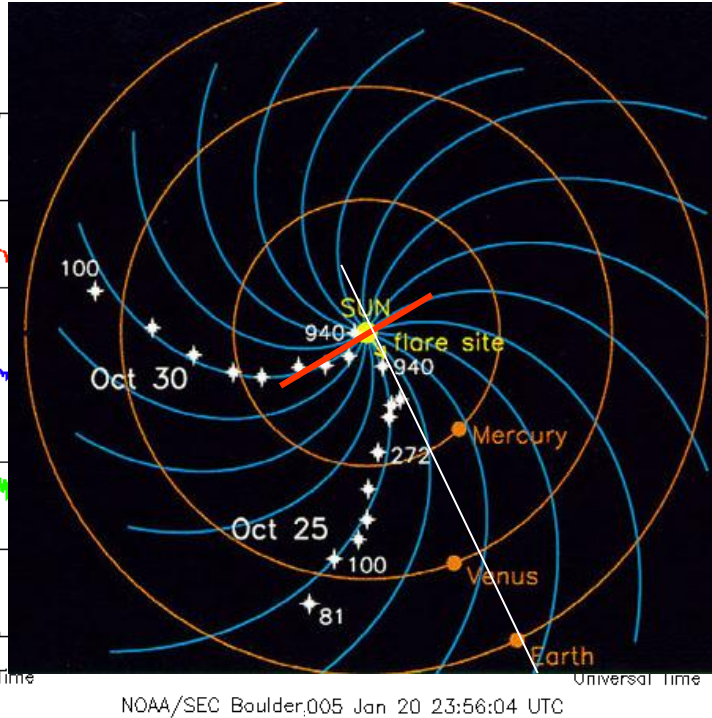
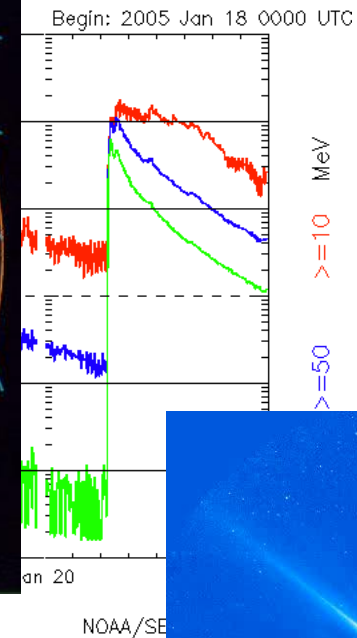


Proton event: In situ observations

CME driven
Gradual event



Flare driven
Impulsive event



Magnetic connectivity

Particles



IMF

Flare-Proton storm-plasma cloud hit Earth

- ▶ Light Flash: arrives in 8 minutes
- ▶ Particles with relativistic speeds: arrive in 30 minutes
- ▶ Plasma cloud: arrive in 1 to 4 days
- ▶ Magnetosphere: magnetic shield around Earth
- ▶ Plasma cloud bumps on Magnetosphere.
- ▶ Aurora near the poles



Space Weather

End Part 1

