Space Weather services around the world: a comparison

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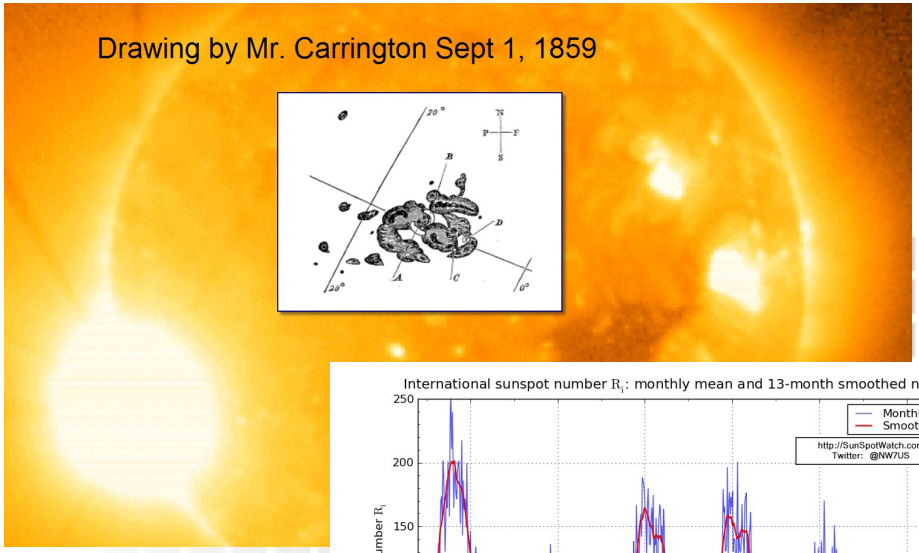
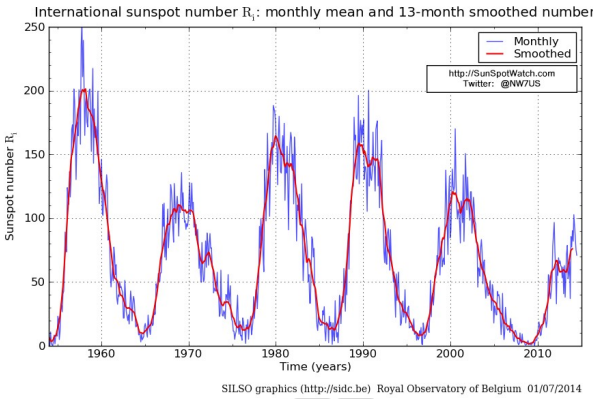
Encontro Ciência'17 Centro de Congressos de Lisboa, 3-7 of July

SUN: great driver of SW





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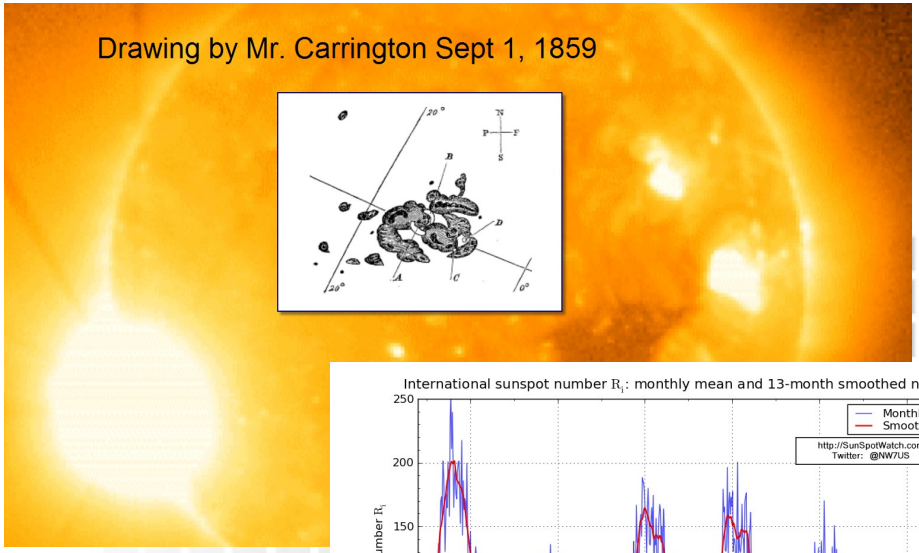

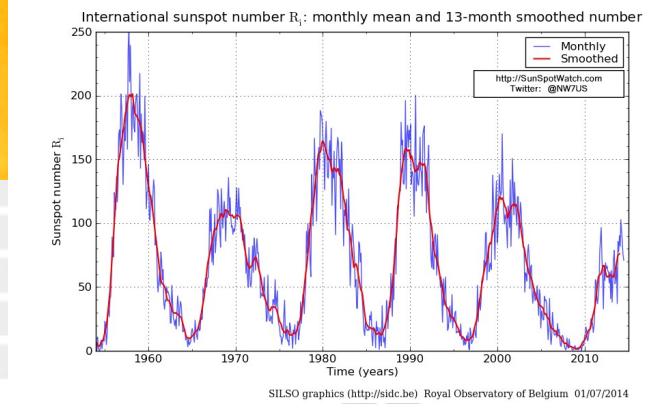

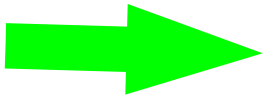

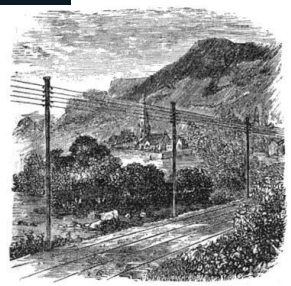

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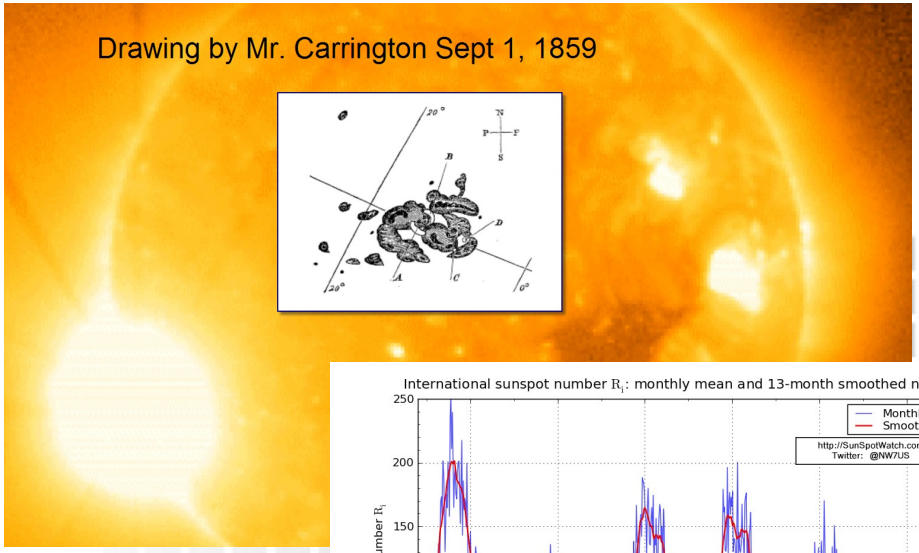
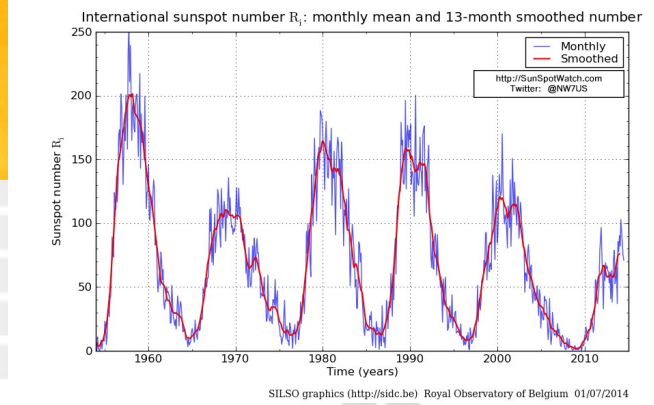
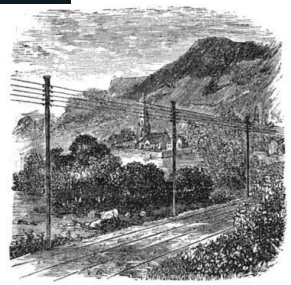
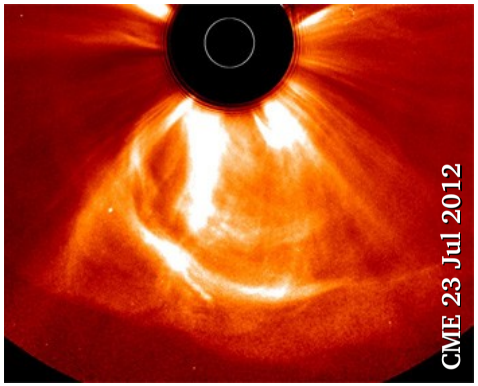






Not an unique event!!!



But at least we dodged that one...

Lloyds Insurance

The impact of a Carrington level geomagnetic storm to the North American electric grid could cost between 0.6 and 2.6 trillion USD

The impact of SW

GIC – Geomagnetically Induced Currents

Hydro-Québec
9 → 13 Mar 1989

Geomagnetic storms

The impact of SW

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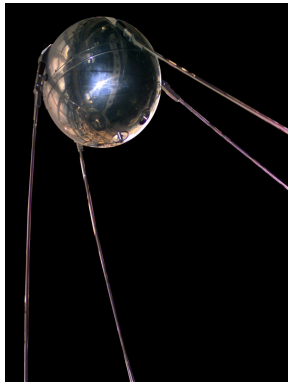
High En. particles

15-19 Jan 2015



Geomagnetic storms

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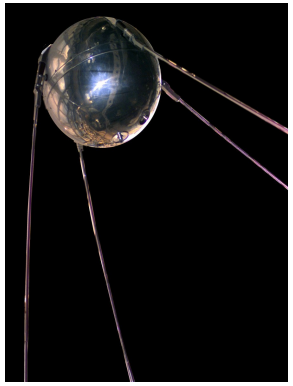

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UHF & Sat. Comm.

Battle of Takur Ghar
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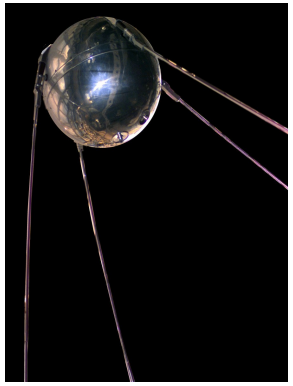

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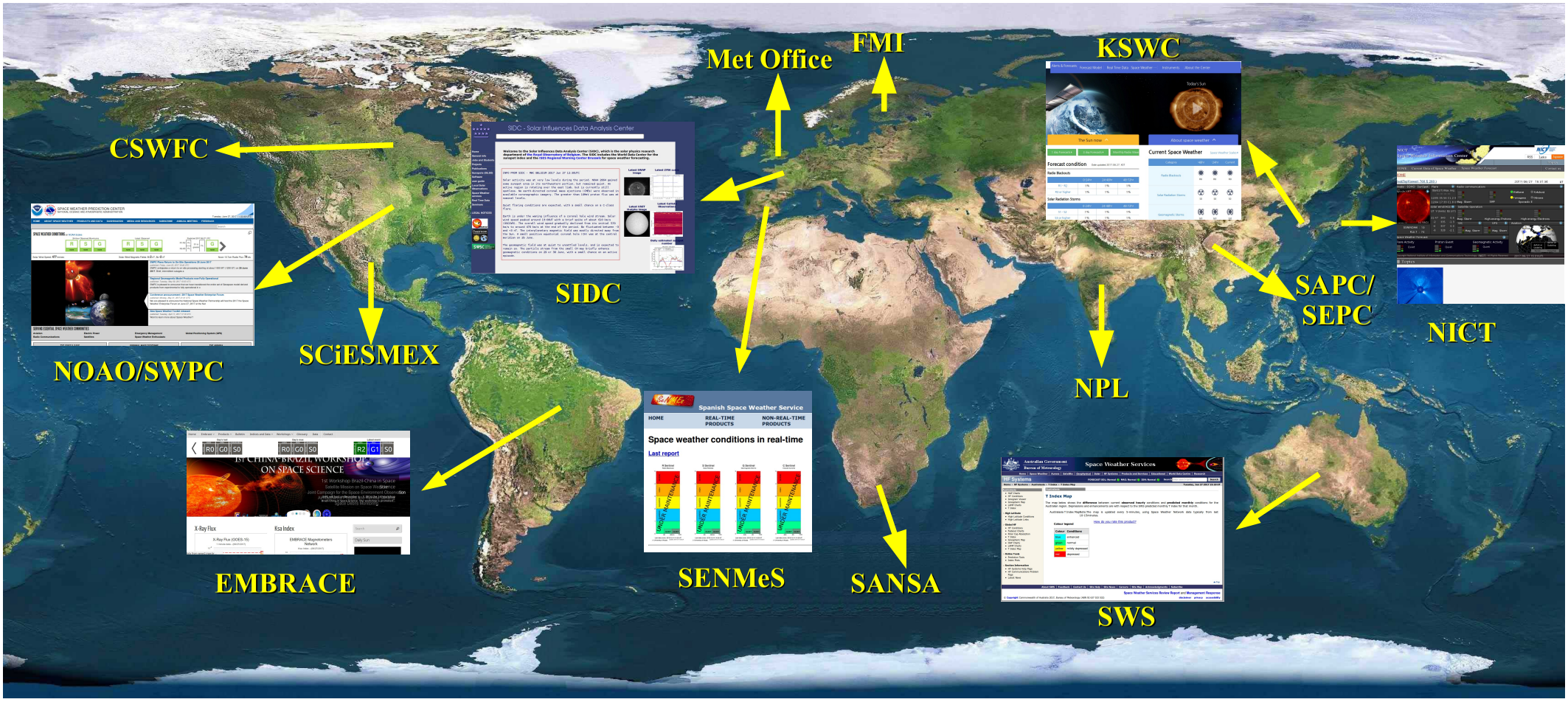
Global positioning

SW all over the world*

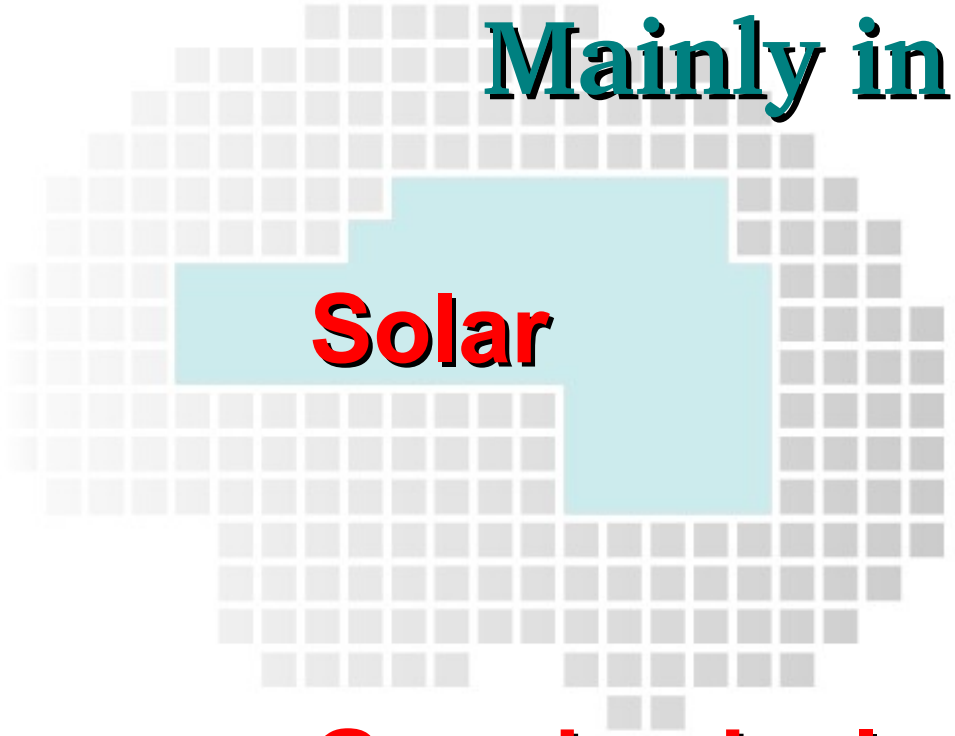


*Except in Portugal?

In order to create our own SW service we need to learn with everyone else's!

Monitoring & forecast

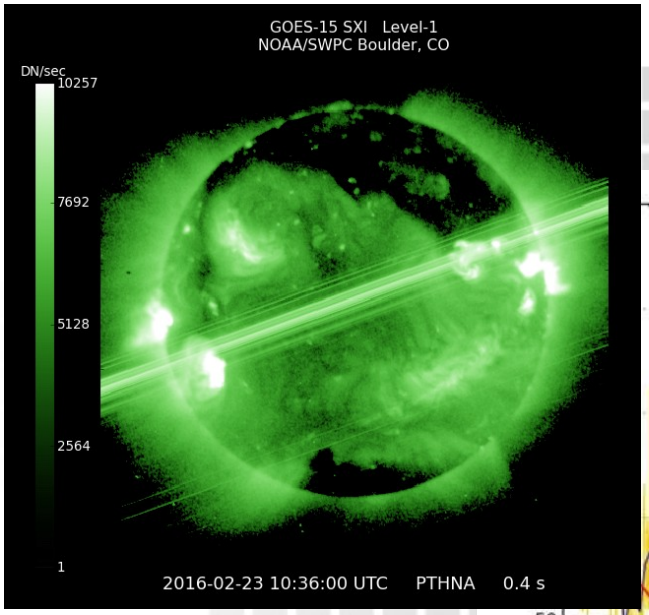
Mainly in 3 aspects:

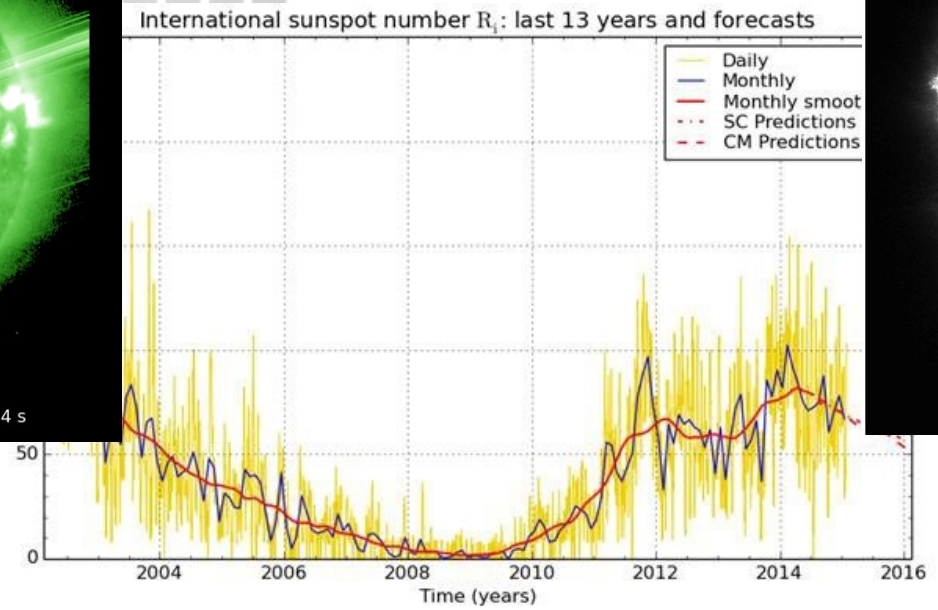


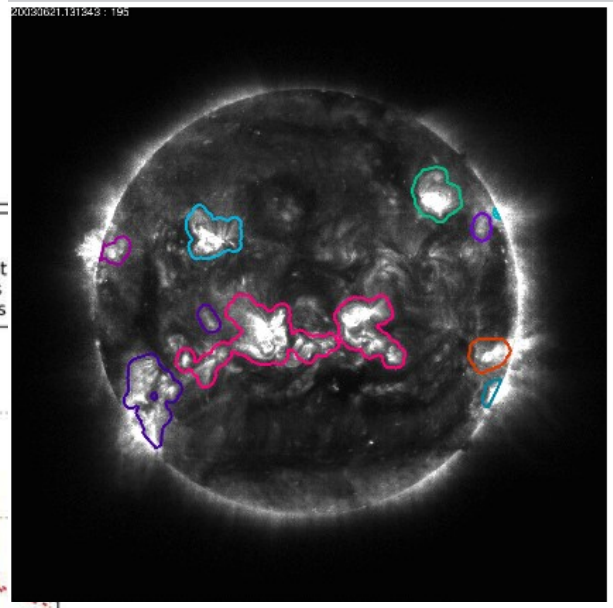
Also 3 scales for describing the degree of activity:

- Flare activity
- Energetic particle fluxes
- Geomagnetic activity

Solar data







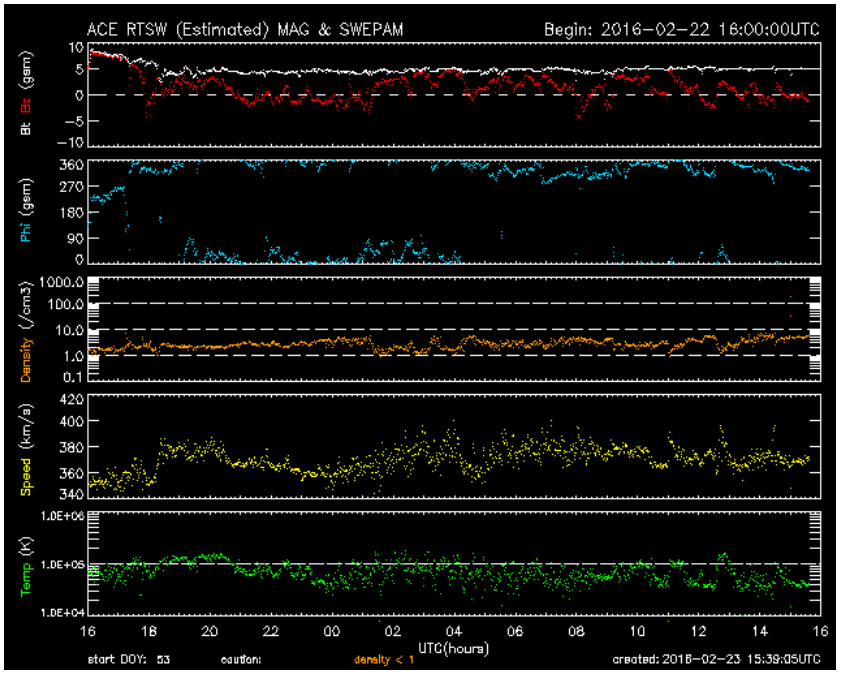
- Observations: optical, X-rays, radio...
- Identification of active regions (spots, filaments, coronal holes...)
- Monitorisation of events, Flares, CMEs...
- Solar parameters, sunspot number, 10.7cm flux, etc.

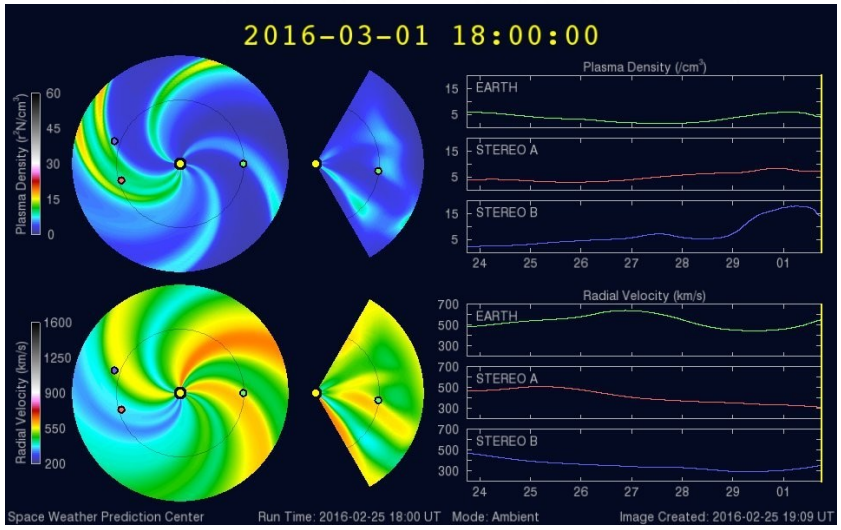
Interplanetary medium

- Solar wind properties:

  speed, density, mag. field., etc.
- Energetic particle fluxes @

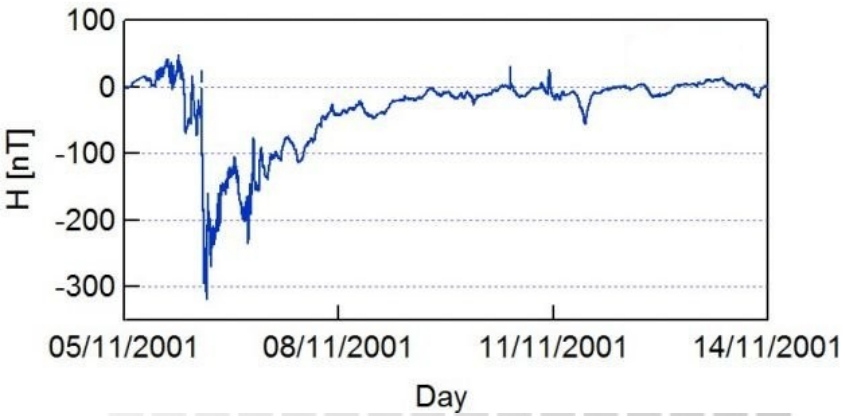
  geostationary orbit

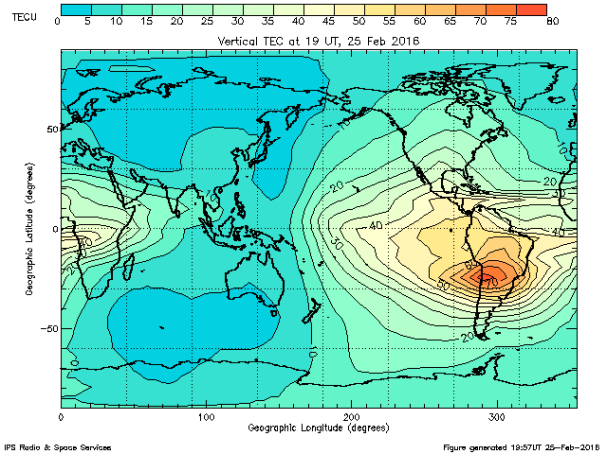




Geophysical data

Geomagnetic & Ionosferic





- Global indices: Dst, Kp...
- Local measurents of the field and their variability
- Geoelectric field

- Ionosferic parameters:

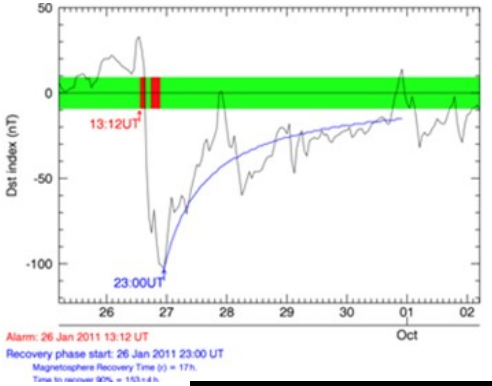
  TEC, scintilation, FoF2, MUF

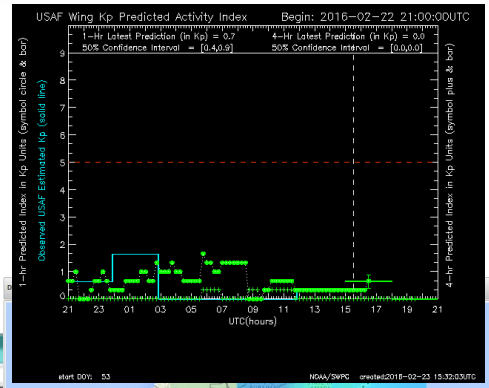
Other:

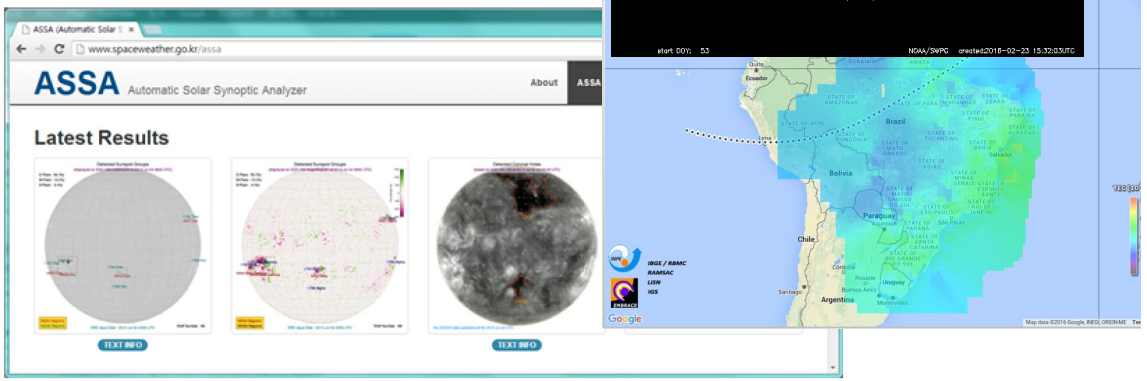
- Energetic particles @ groud level

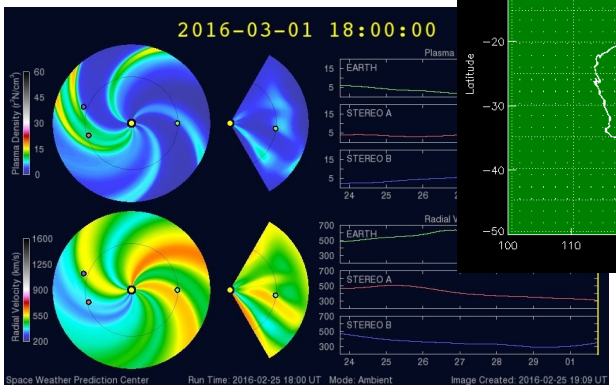
Models & tools

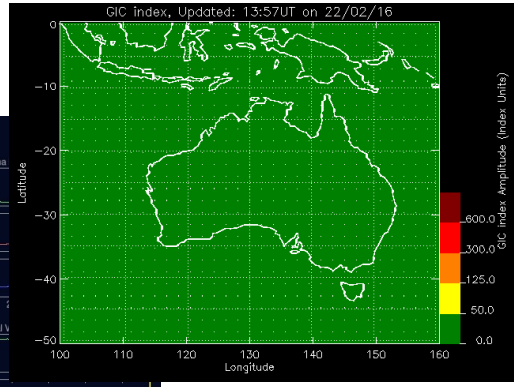
- Numerical and physical tools and models...
- For identifying solar features and events
- Characterizing magnetosphere and ionosphere
- Forecasting...
- etc...





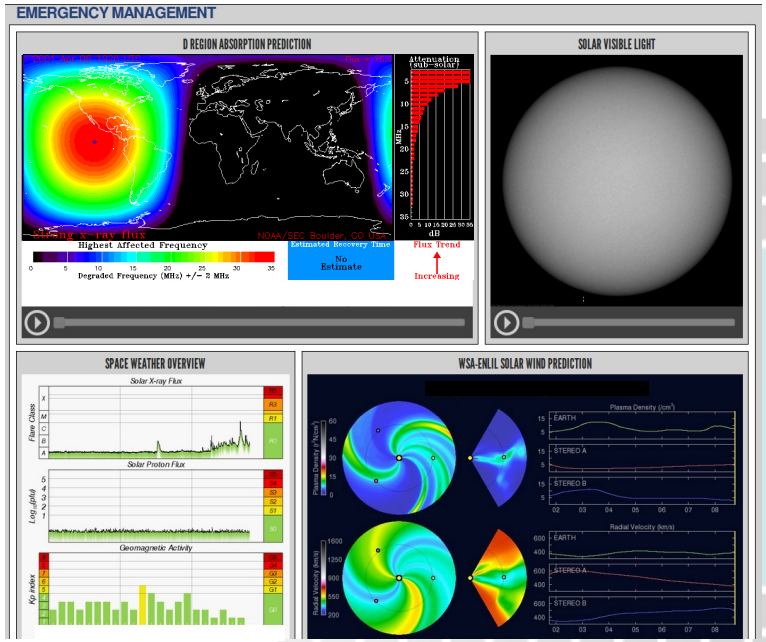






Too long for this talk...

SW dissemination



3 day forecast

:Product: 3-Day Forecast
:Issued: 2015 Oct 15 0030 UTC
Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center
#
A. NOAA Geomagnetic Activity Observation and Forecast

The greatest observed 3 hr Kp over the past 24 hours was 5 (NOAA Scale G1).
The greatest expected 3 hr Kp for Oct 15-Oct 17 2015 is 5 (NOAA Scale G1).

NOAA Kp index breakdown Oct 15-Oct 17 2015

	Oct 15	Oct 16	Oct 17
00-03UT	3	4	4
03-06UT	3	5 (G1)	4
06-09UT	3	4	3
09-12UT	3	3	3
12-15UT	2	2	3
15-18UT	2	2	3
18-21UT	4	3	2
21-00UT	5 (G1)	3	2

Rationale: Isolated G1-Minor storm levels are likely on days one and two (15-16 Oct) due to persistent CH HSS effects, but conditions are expected decrease on day three (17 Oct) as coronal hole effects wane.

- **Web portals, email, social media:**
  - **Information tailored to the needs of particular users**
- **Data:**
  - **Local observations**

    Solar obs., geomag and particle fluxes, TEC...

    (because of local impact of SW!)
  - **Global reference data**

    Dst, F107, data from space missions

    (many from the same sources

    → imporance of sharing!!)
- **Alerts & daily bulletins w/previous conditions and forecasts:**
  - **Require human analysis (e.g.: 30m meetings)**

    → in some cases no bulletins @ weekends...
- **Outreach!**

Conclusions/Remarks

- SW has great impact on human activities
- Monitorisation/forecast: Sun, Interp. medium, Geophys.
- The interdiciplinary nature of SW
- SW services tend to focus on phenomena of local relevance
- Local impact of SW → Importance of local monitoring

- Need of national SW service & assess national impact of SW!

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- SW services require human intervention!!

Thank you for your attention!!!