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An introduction to Space Weather

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Space weather refers to the environmental conditions in Earth’s magnetosphere, ionosphere and thermosphere due to the Sun and the solar wind that can influence the functioning and reliability of spaceborne and ground-based systems and services or endanger property or human health.

NSWP, ESA
The quiet Sun

Electromagnetic radiation

Particles – Solar wind
Solar activity: Sunspots
Solar activity: Solar cycle
Solar flares (radiation)
Drivers of disturbed space weather

Solar eruptions

- Magnetic Reconnection
  - Radiation
    - Solar flares
  - Particles
    - Proton events
    - Coronal Mass Ejections

Solar corona

- Solar wind
  - Particles
    - Coronal Holes
Effects from disturbed space weather

Solar flares

Proton events

CMEs

CHs
1 September 1859: Carrington event

http://www.geomag.bgs.ac.uk/education/carrington.html
13-14 March 1989: Québec event
28 October 2003: Halloween event
SWx and the military

18-19 September 1941 – Geomagnetic « Blitz »

23 May 1967 – Disturbance BMEWS

23 February 1956 - HMS Acheron

4 August 1972 – Unintended detonation sea mines
SWx effects during SC24

- **24-25 October 2011**
  - WAAS/EGNOS services interrupted; blood-red aurora

- **24 January 2012**
  - Polar flight detours

- **7 March 2012**
  - Polar flight detours

- **7 January 2014**
  - Delay launch supply rocket ISS

- **1 September 2014**
  - ST-B lost sun-lock

- **4 November 2015**
  - Swedish Air Traffic down

- **6-12 September 2017**
  - HF comms down during hurricane Irma
Questions?

- **SIDC:**
  - [http://www.sidc.be/](http://www.sidc.be/)

- **SSCC:**
  - [http://swe.ssa.esa.int/web/guest/contact](http://swe.ssa.esa.int/web/guest/contact)
  - [helpdesk.swe@ssa.esa.int](mailto:helpdesk.swe@ssa.esa.int)

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