



Basics of the Sun-Earth coupling

Space Climate lecture 1

NP00AF44 (@Oulu)
ELEC-E4540 (@Aalto)

Prof. Eija Tanskanen



ACADEMY
OF FINLAND

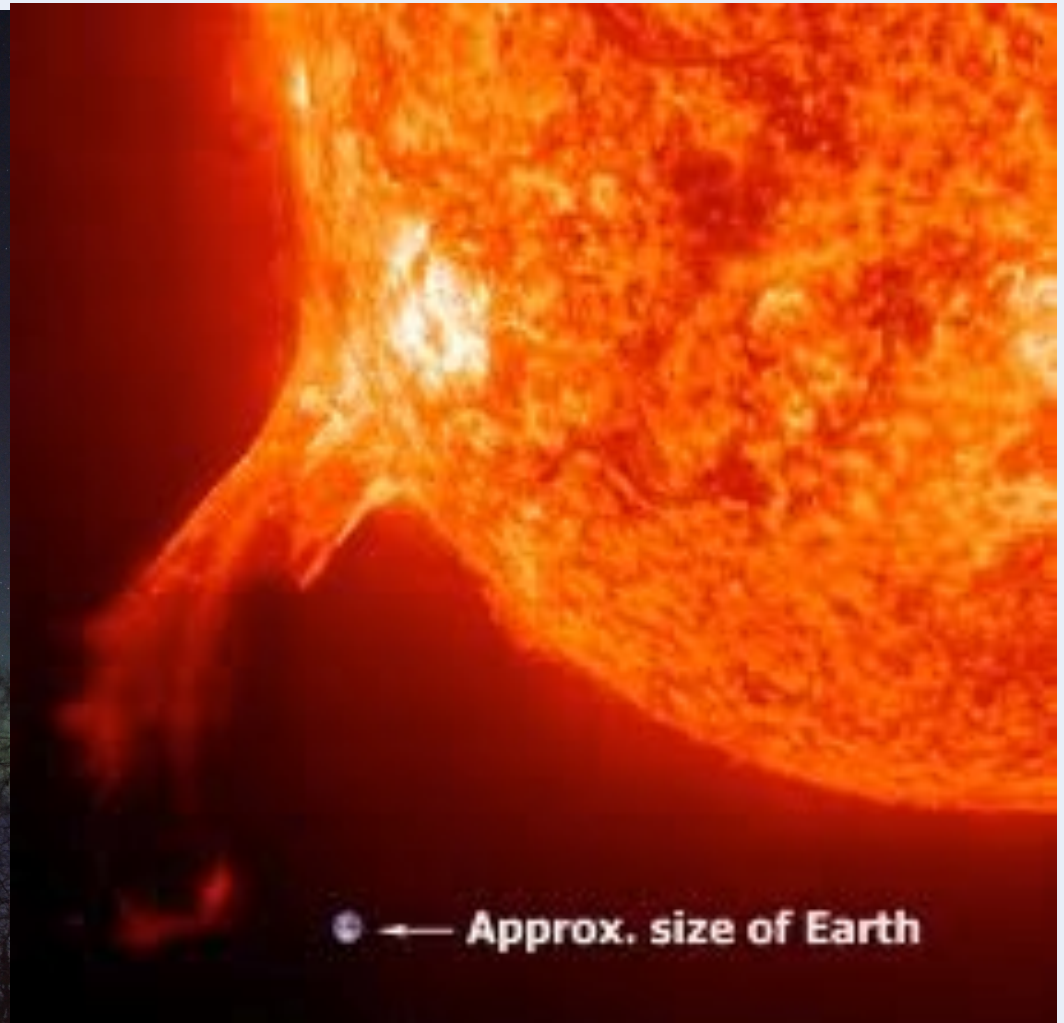


Dancing aurora & solar storms

A!



UNIVERSITY
OF OULU



In-house build instruments and long-term environmental observing capability

Drone fleet



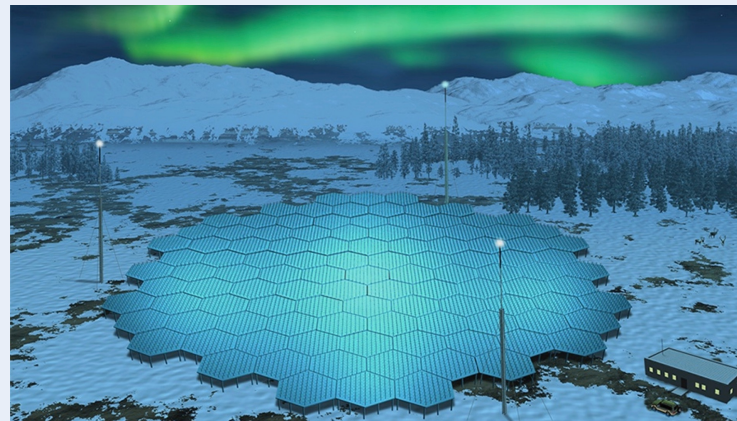
Small satellite on-board
stratospheric balloon
flight in 2020

Magnetic measurements since 1914

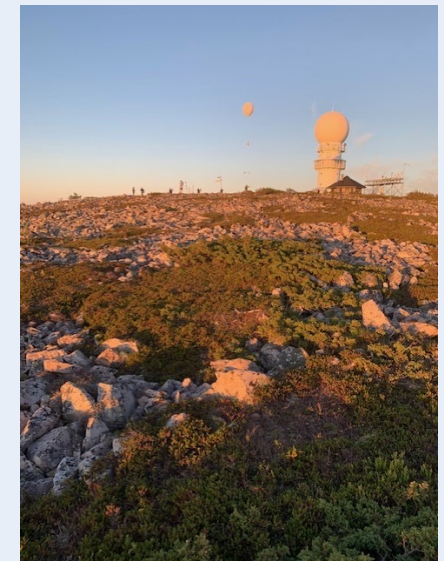


Picture credits Tero Raita

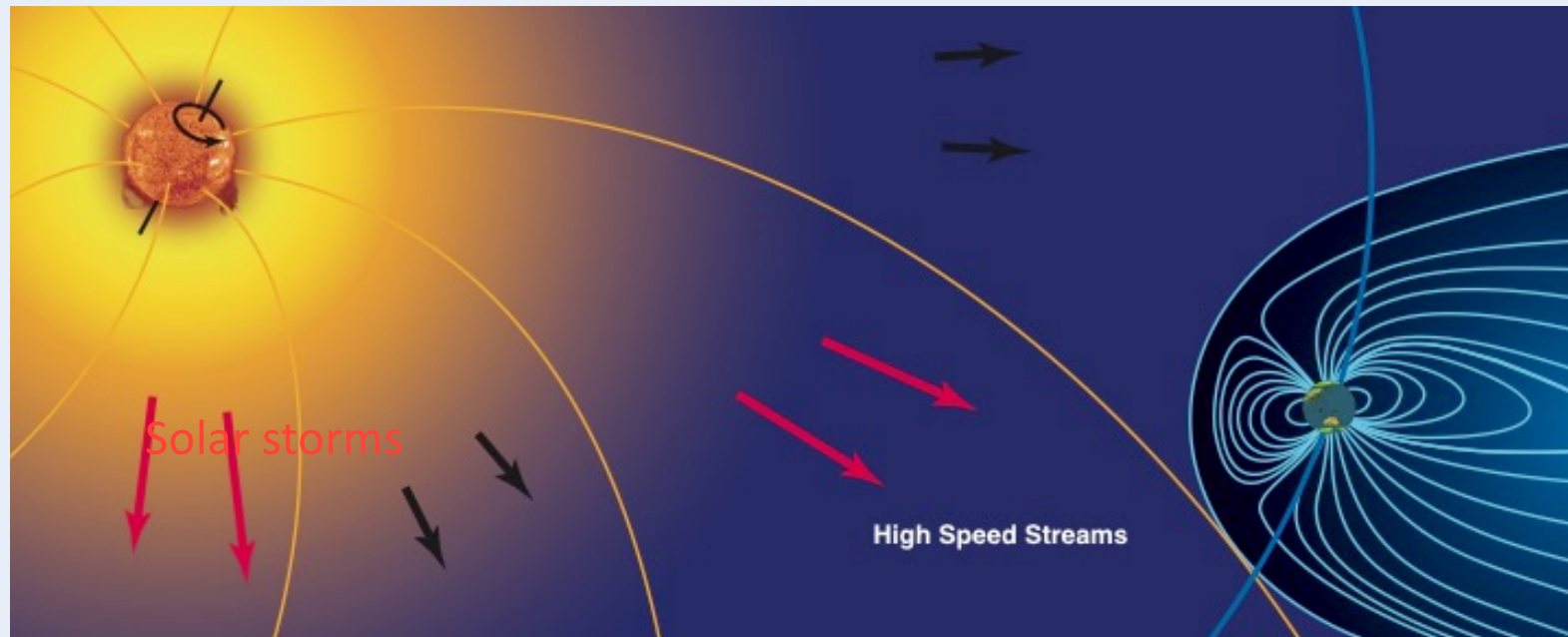
Atmospheric 3D profiles



Credits EISCAT Association



Credits Eija Tanskanen



Picture credits: Eija Tanskanen/NASA

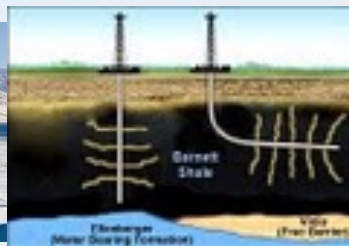
Electricity



Energy supply



Transportation



Telecommunication



Space safety



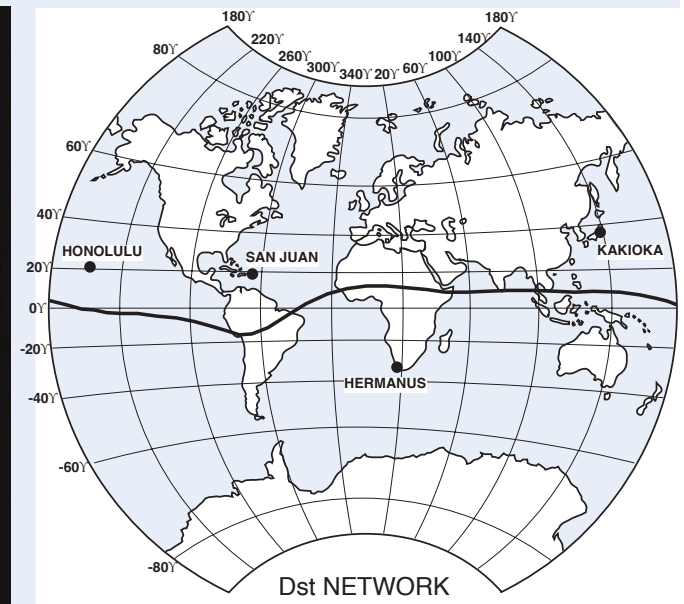
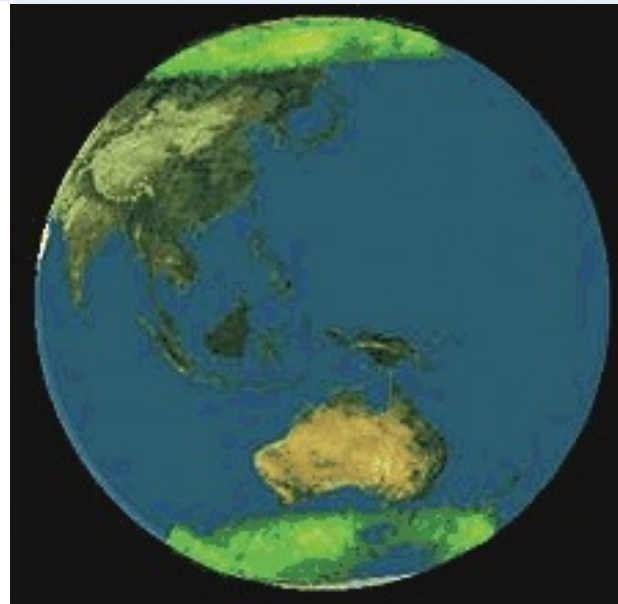
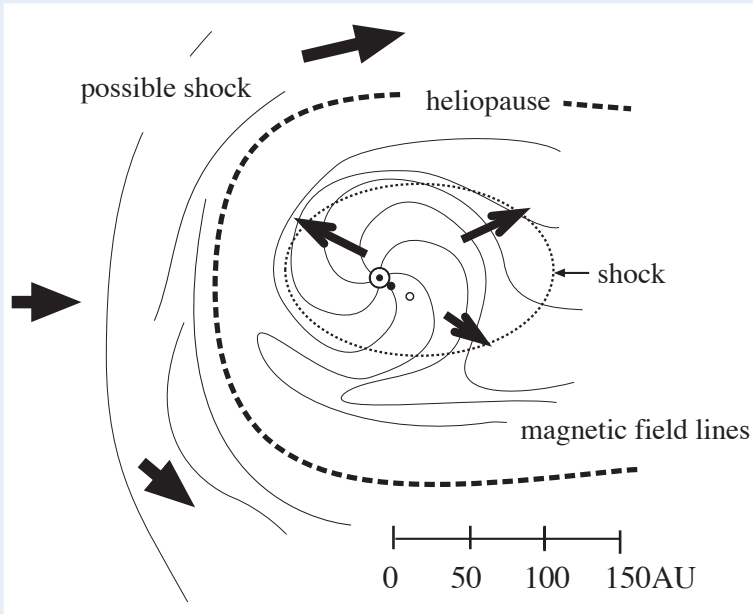
Aviation, navigation



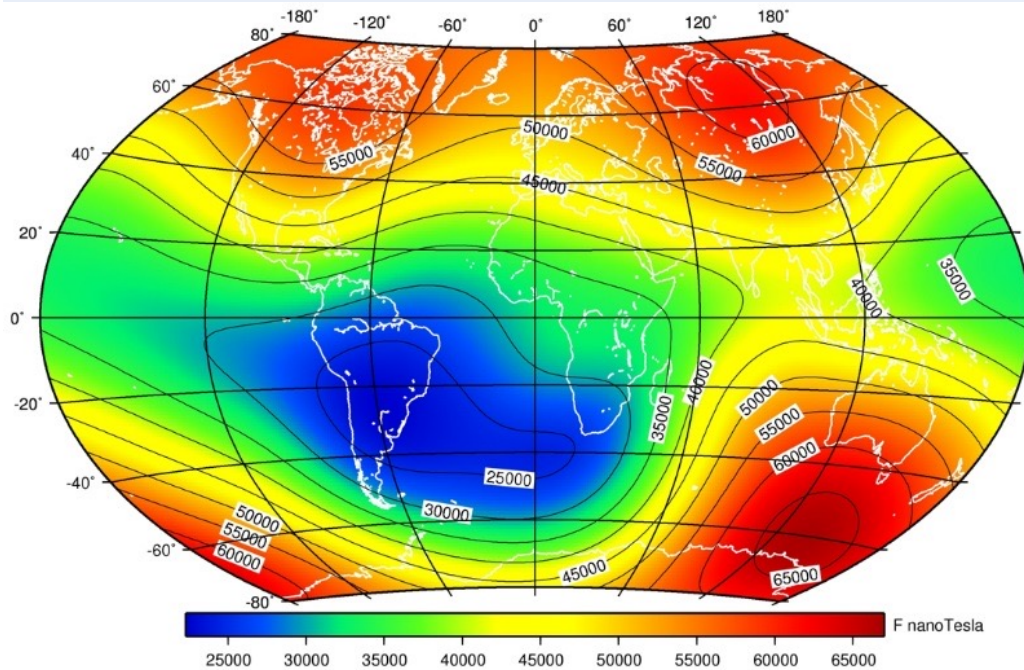
Heliospheric magnetic field

Auroral regions

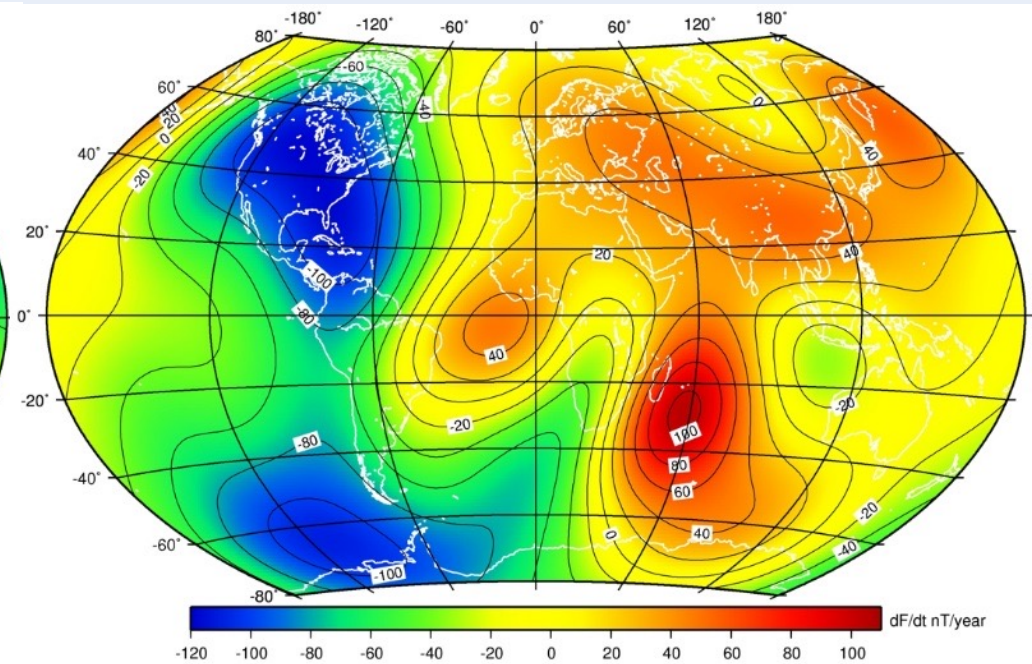
Magnetic equator



Earth's total field in 2015



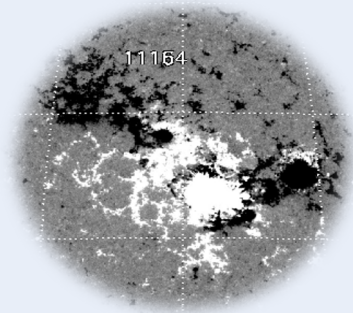
Year-to-year variability



The variability of the ground field...

... is due to the changes in the Sun, solar wind and solid Earth.

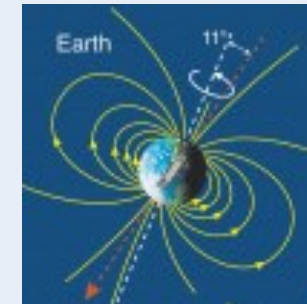
Solar B-field complexity



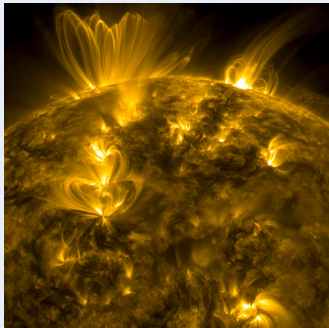
The Sun-Earth geometry



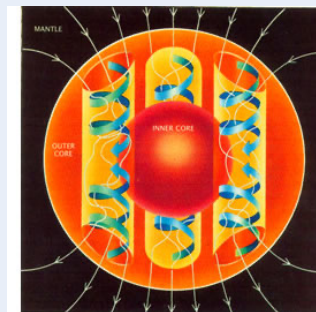
Dipole tilt



The solar storms



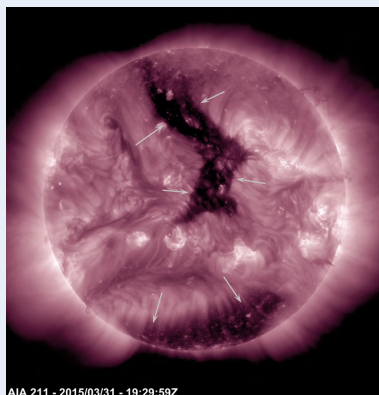
Core convection



Ionospheric conductivity

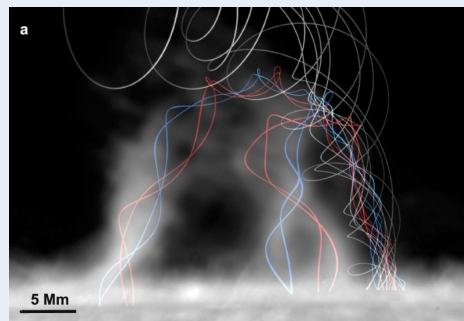


Surface morphology



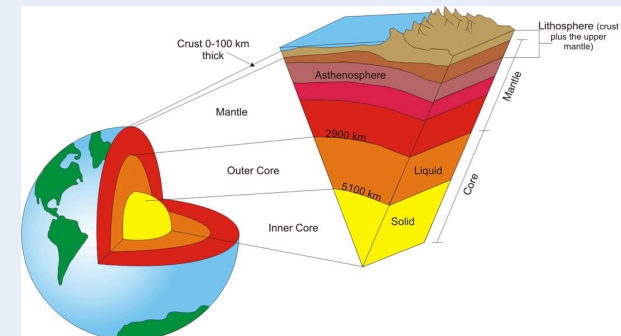
AIA 211 - 2015/03/31 - 19:29:59Z

Solar wind helicity

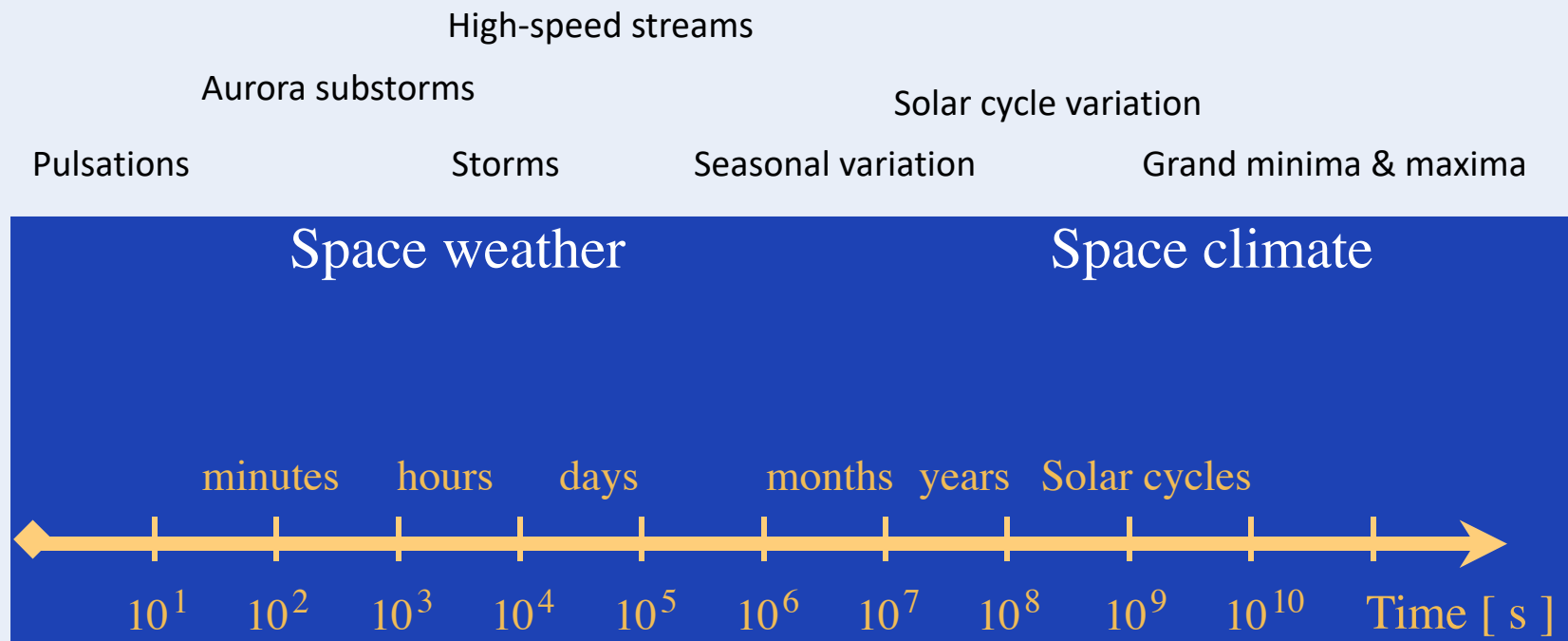


5 Mm

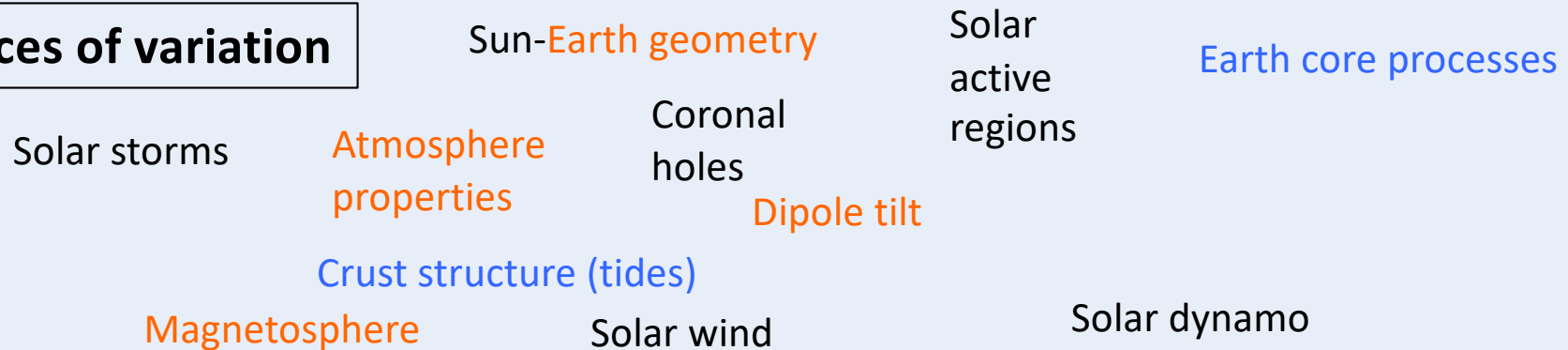
Lithosphere structure



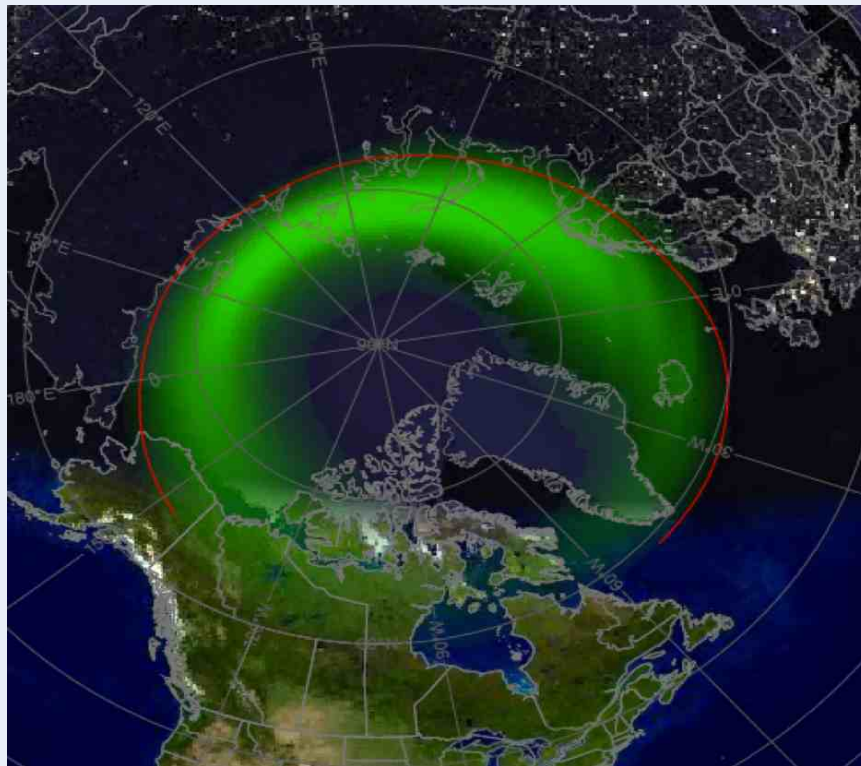
Phenomena observed



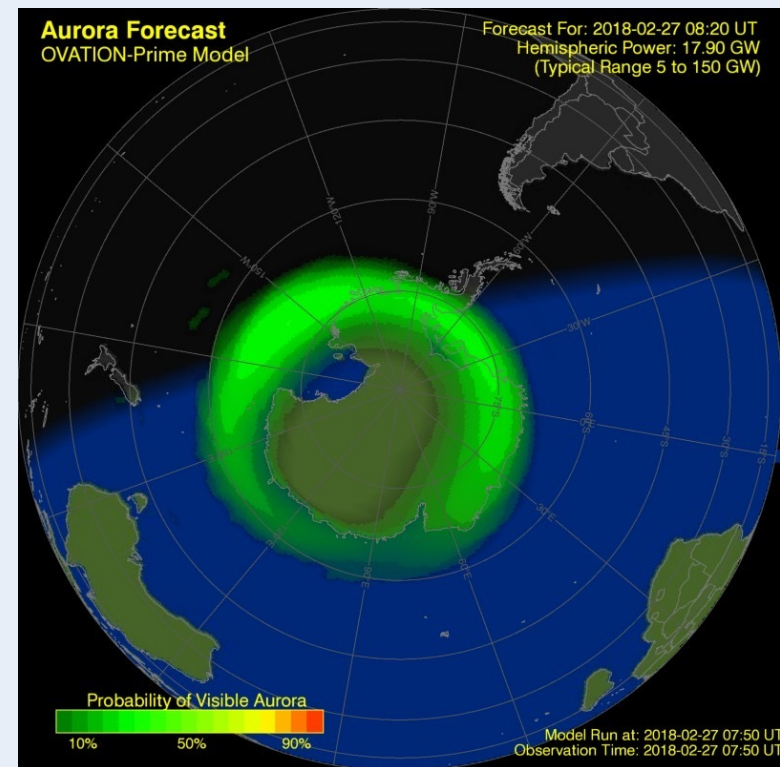
Sources of variation



- The variation of ground magnetic field is due to the external and internal (induction) sources
- The northern and southern hemisphere are not fully symmetric (location and shape)



Northern hemisphere



Southern hemisphere