

# SPACE WEATHER INTRODUCTORY COURSE



Collaboration of



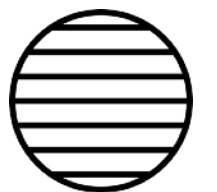
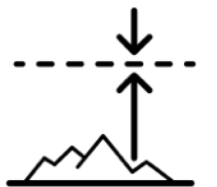
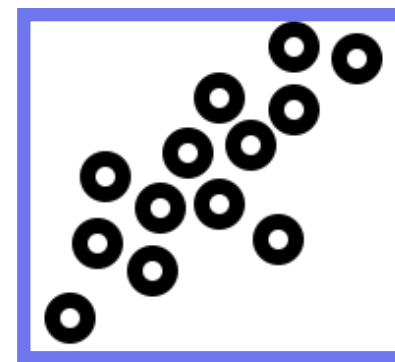
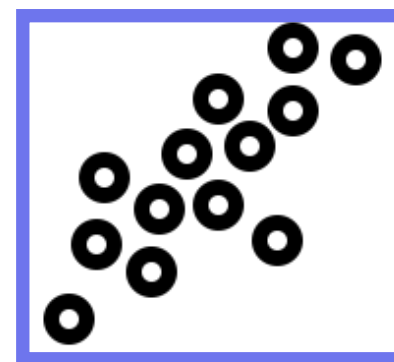
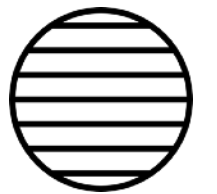
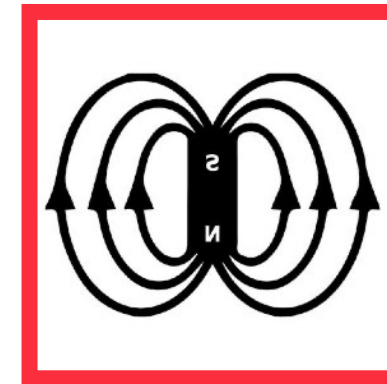
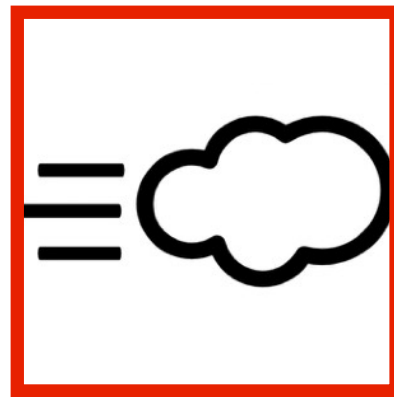
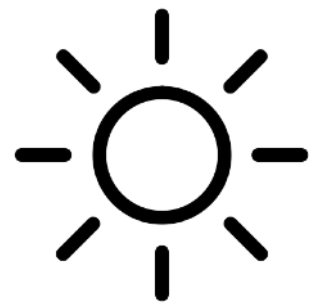
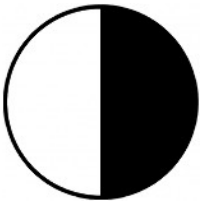
Solar-Terrestrial Centre of Excellence

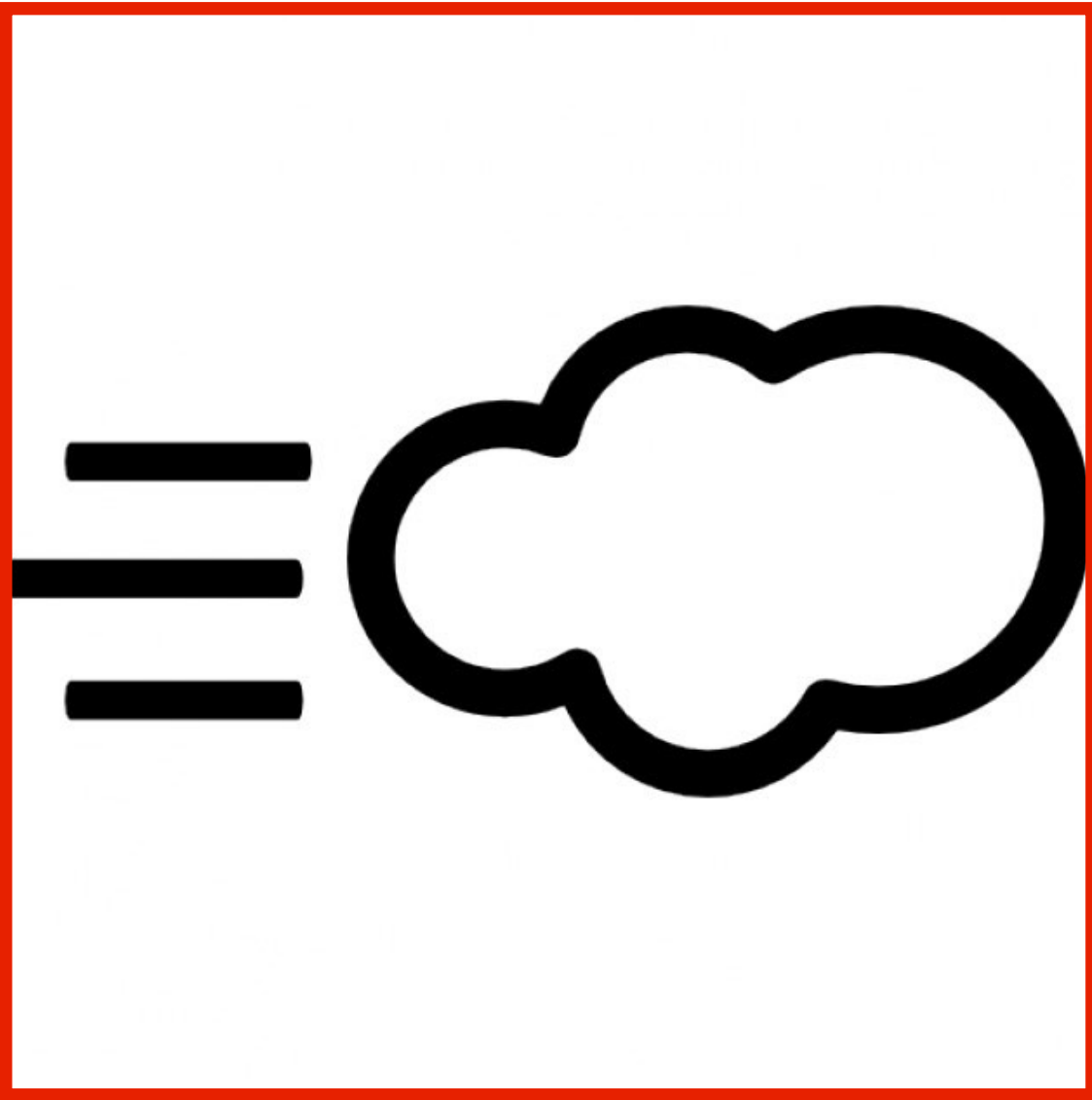


Koninklijke luchtmacht



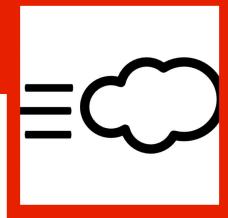
Koninklijk Nederlands  
Meteorologisch Instituut  
*Ministerie van Infrastructuur en Milieu*





SOLAR WIND

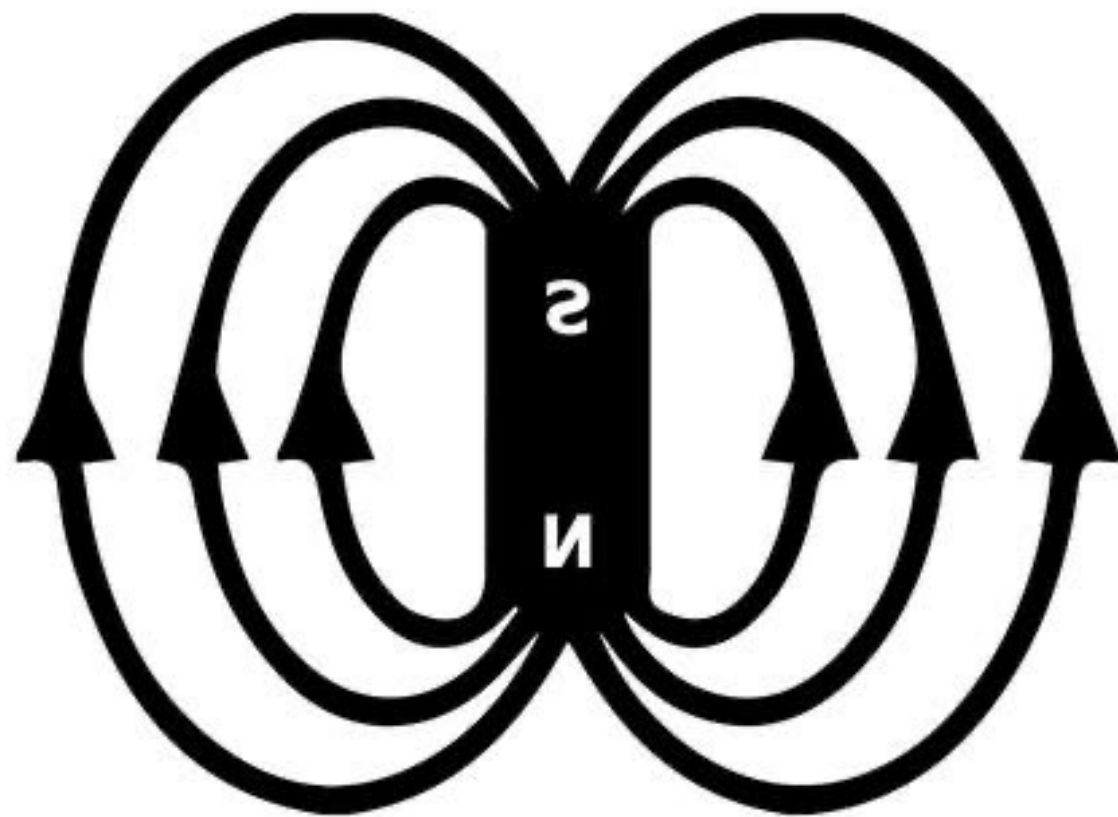
# SOLAR WIND



Continuous radial outflow of gas.

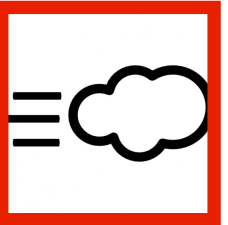
Consists of charged particles that can carry magnetic structures.

Shapes the IMF.

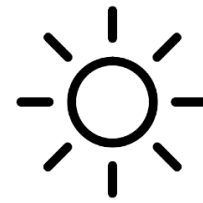


# GEOMAGNETIC STORM

# SOLAR WIND VARIATIONS

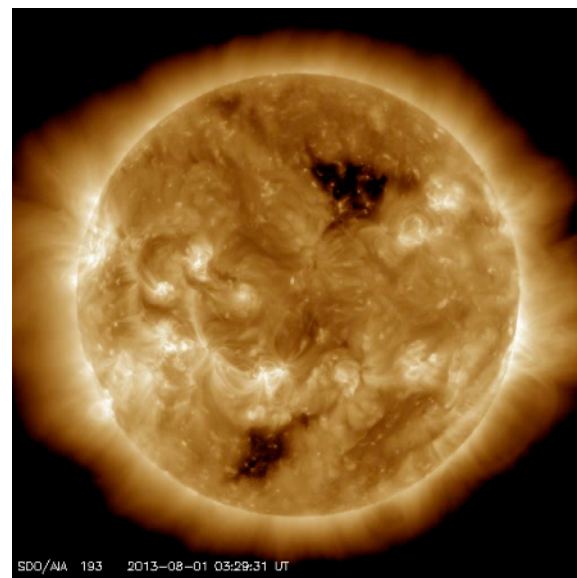


Non-eruptive  
No B reconnection

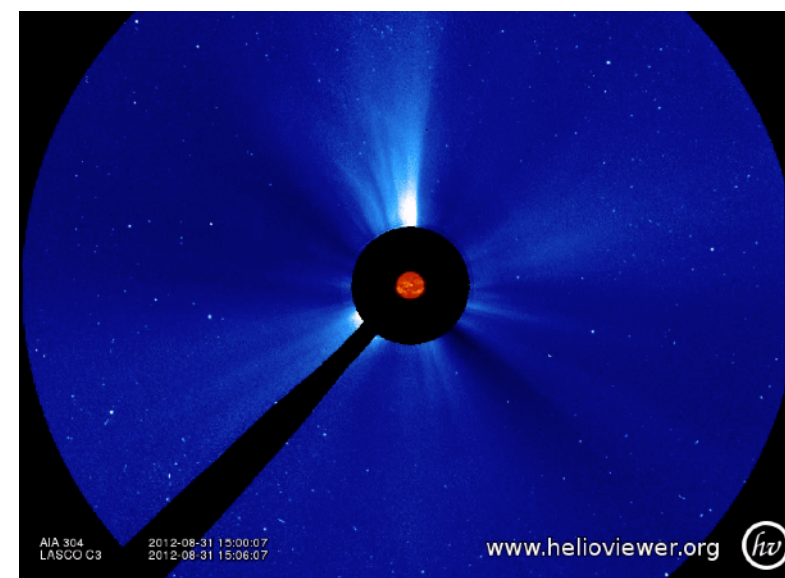


Eruptive  
B reconnection

Coronal Hole

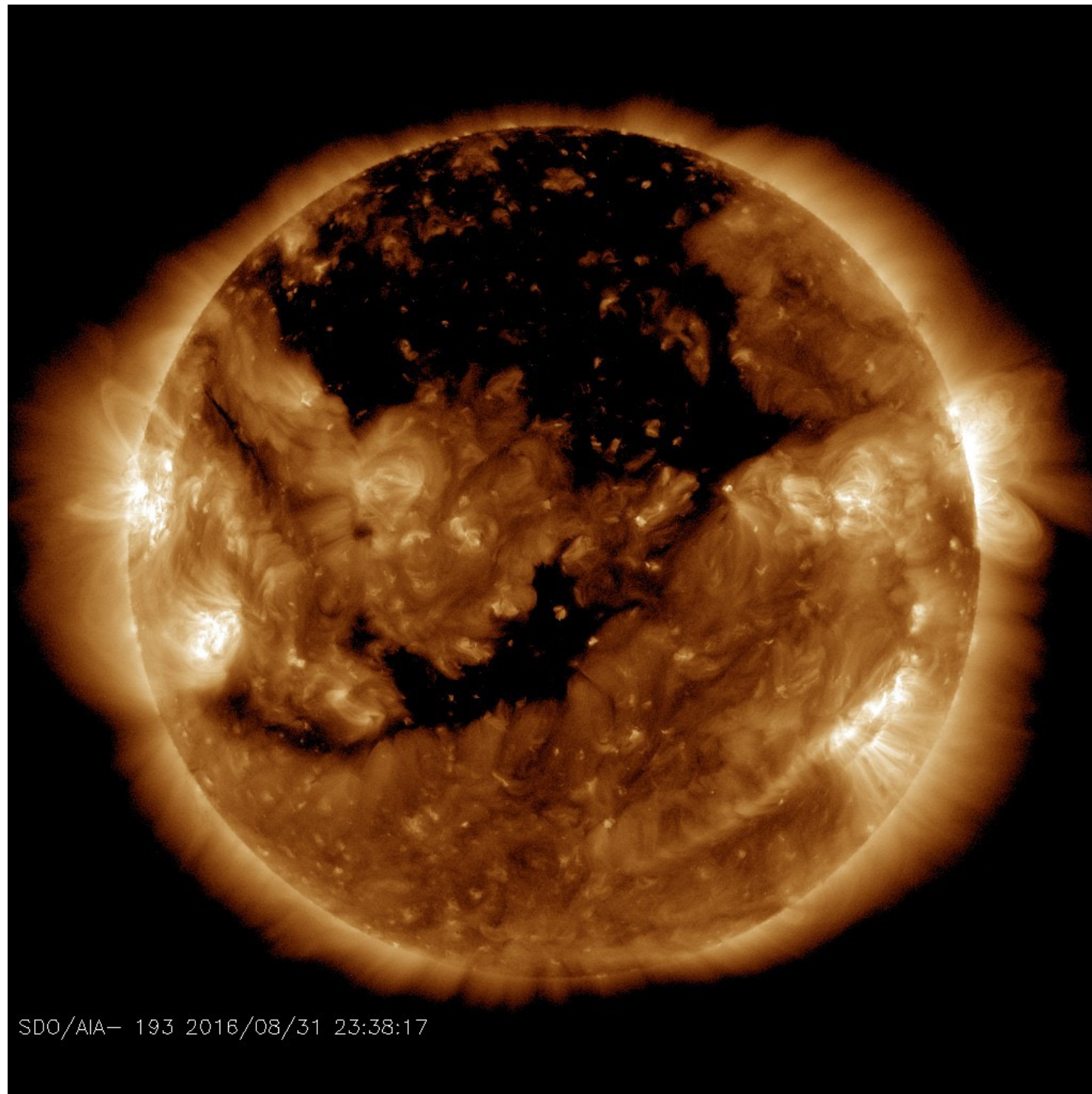
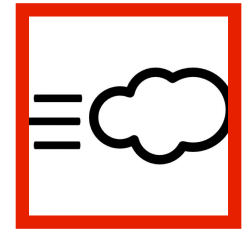
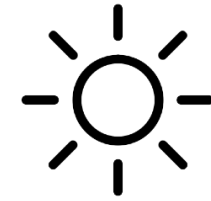


Coronal Mass Ejection



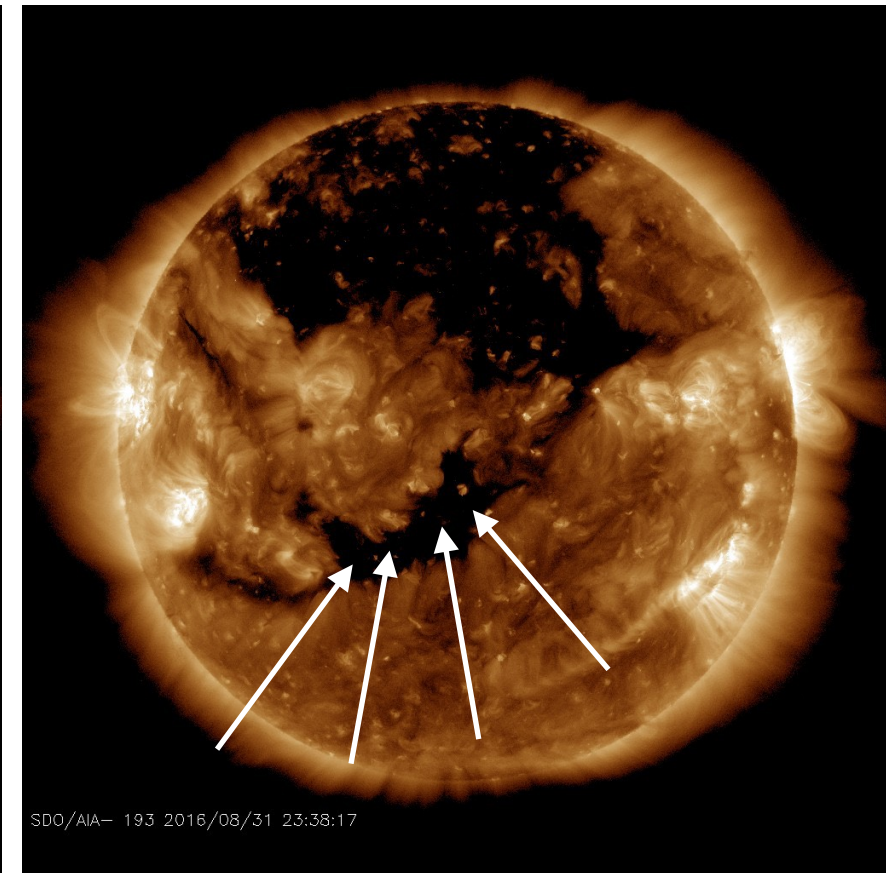
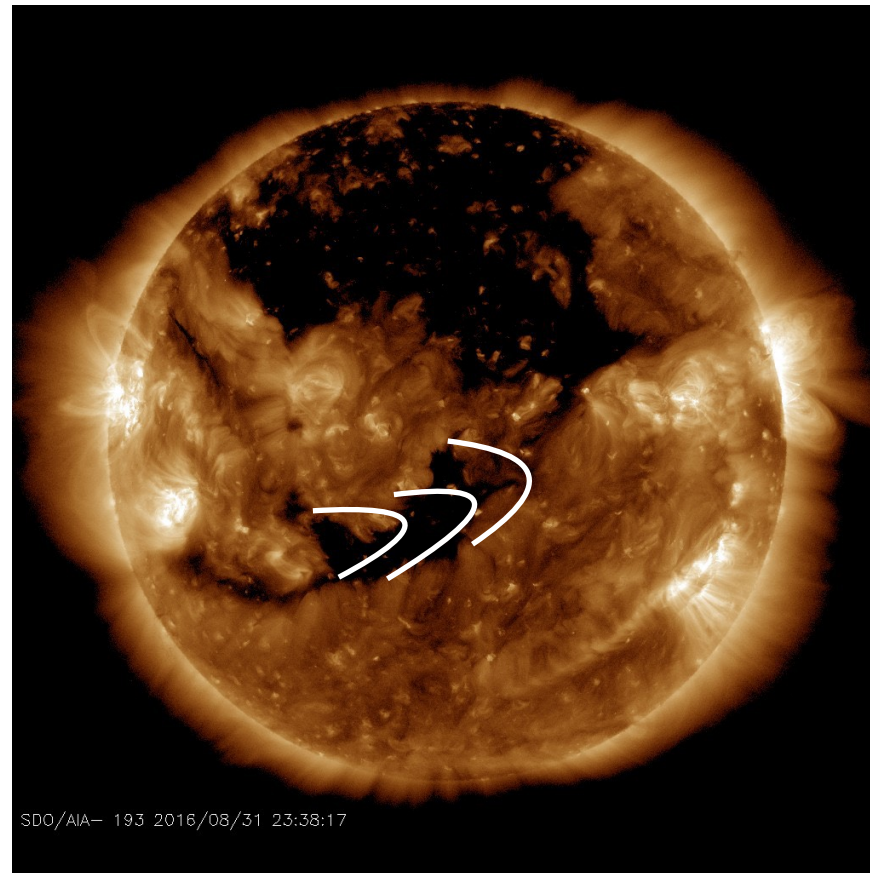
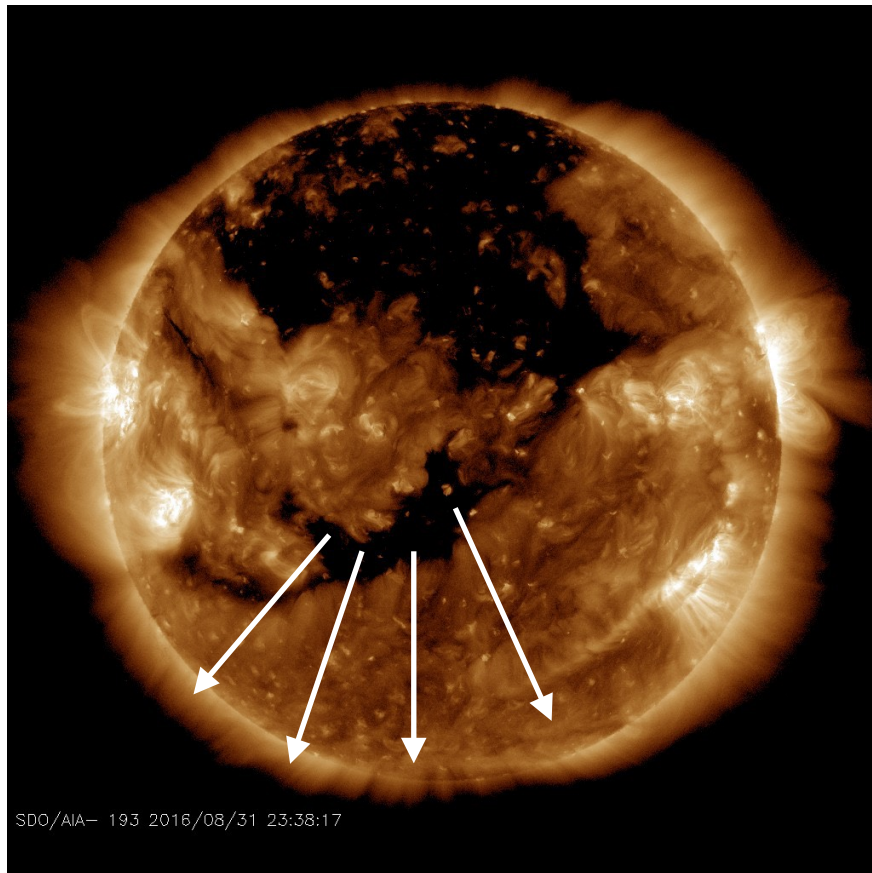
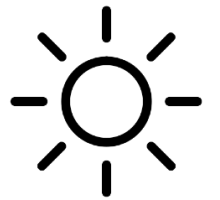
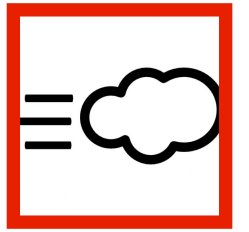


# CORONAL HOLE

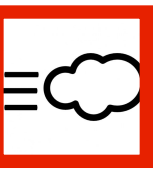


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# B OF CORONAL HOLE

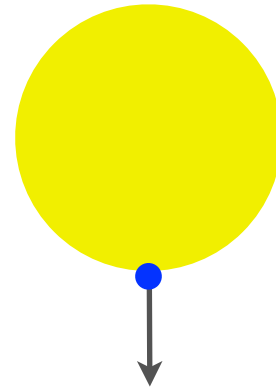


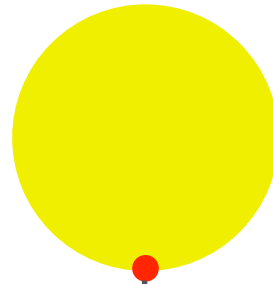
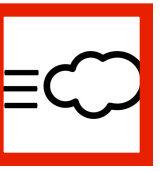


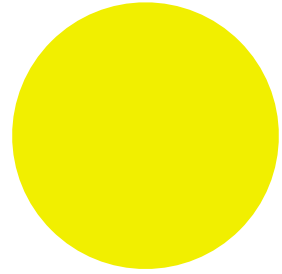
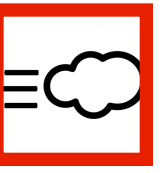


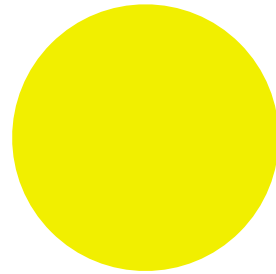
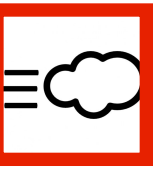
# WHAT HAPPENS WHEN FAST CATCHES SLOW?

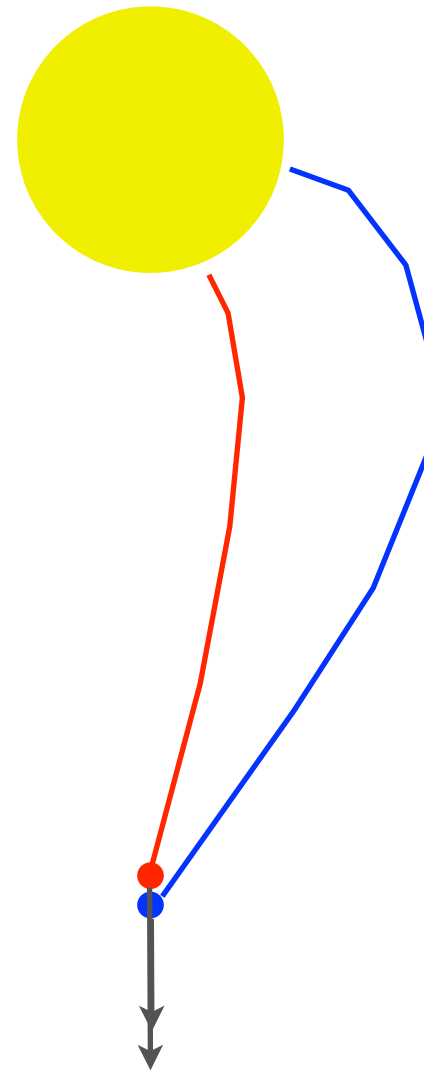
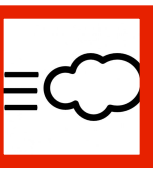
Top View











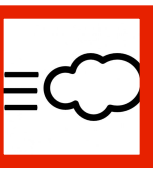
Interaction Region  
Rotates together with the Sun



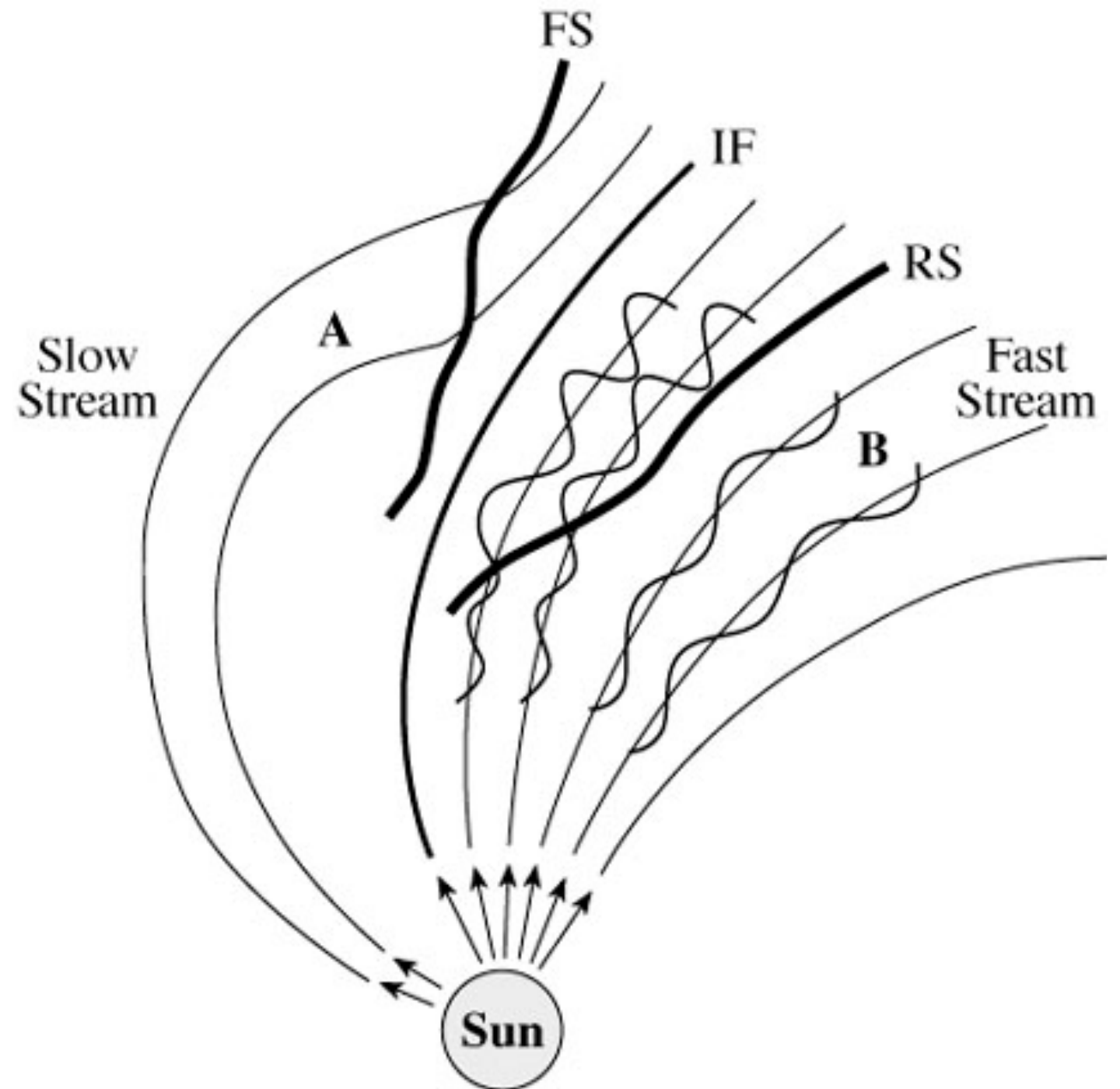
Co-rotating Interaction Region



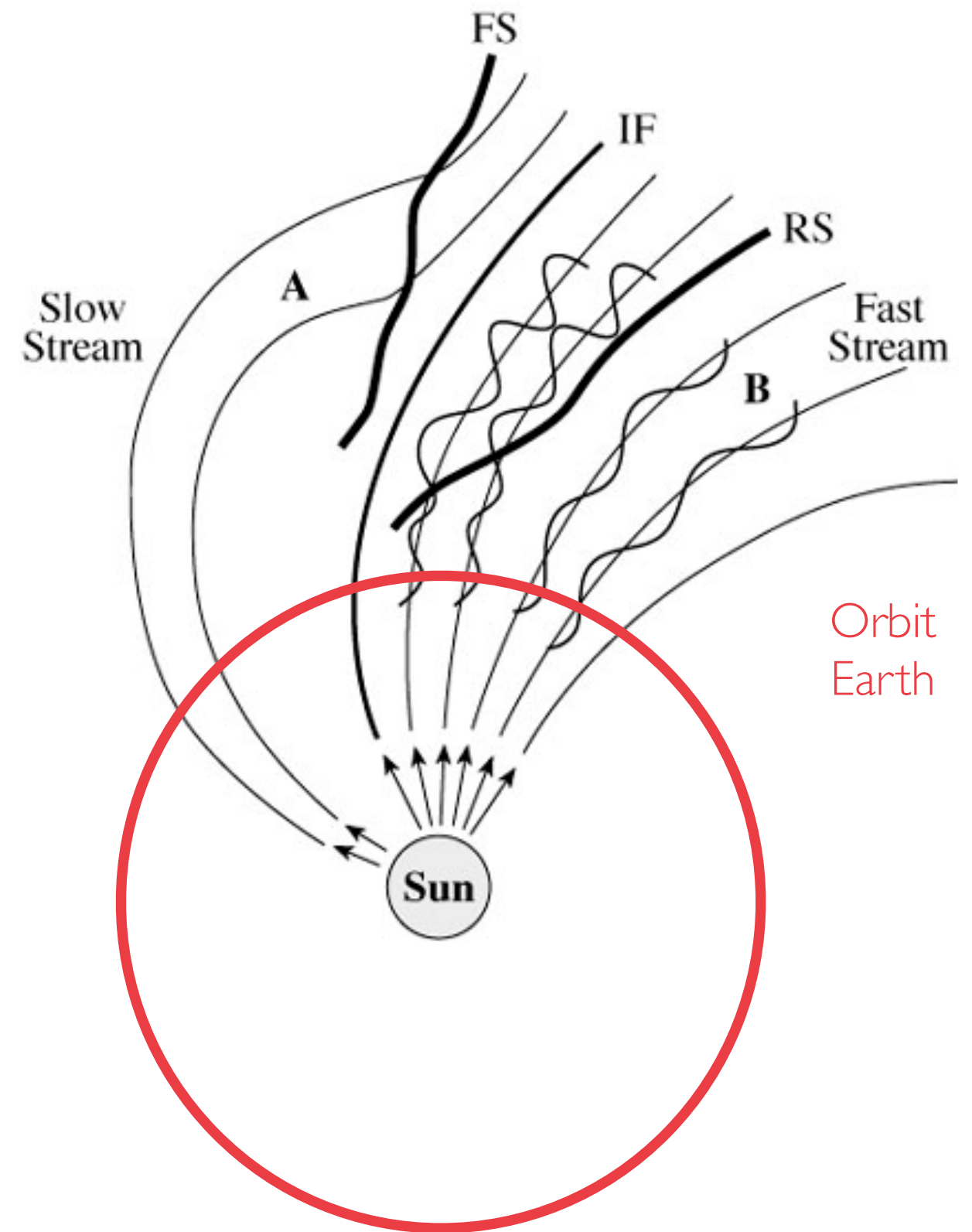
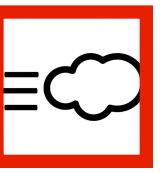
# Coronal Hole



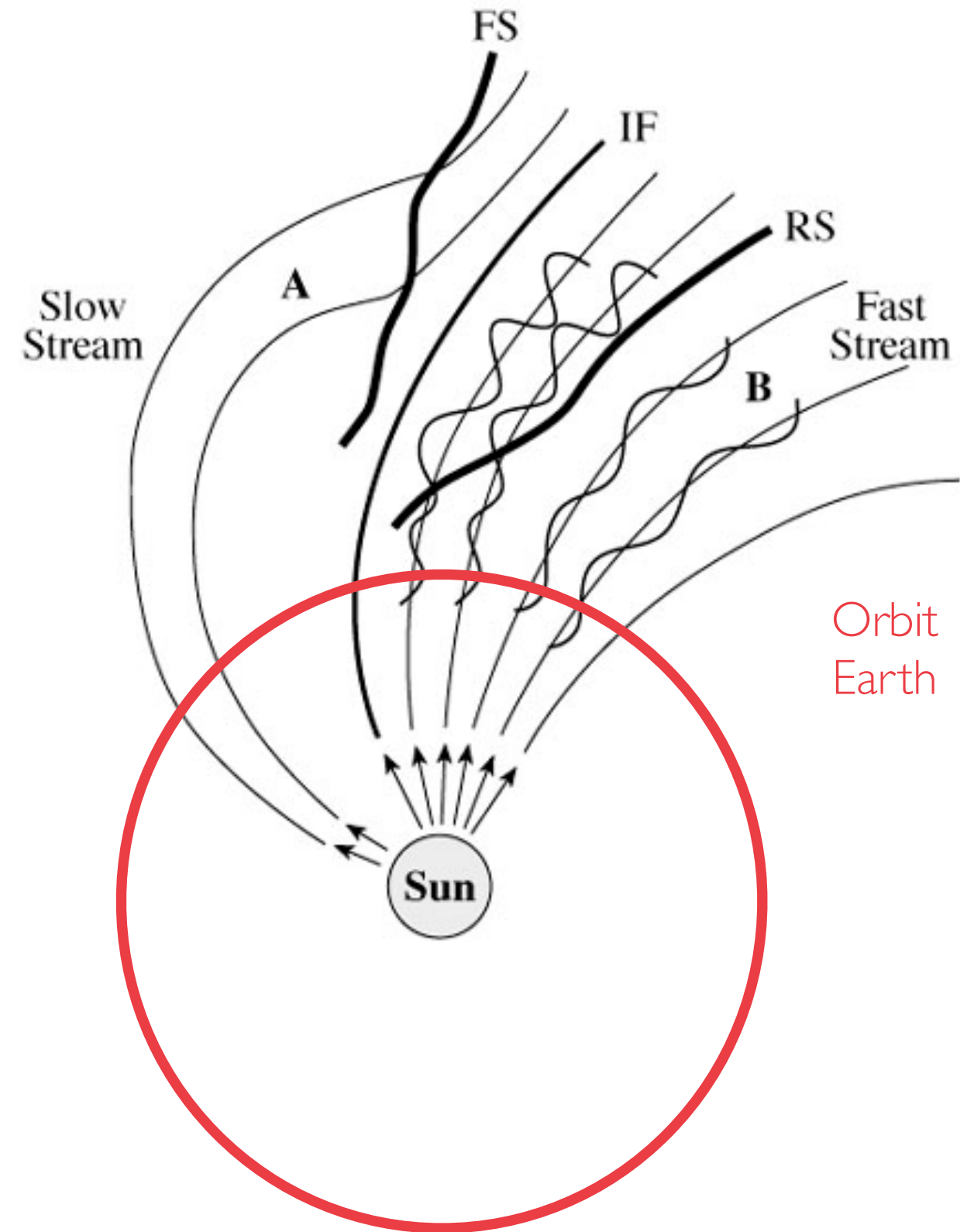
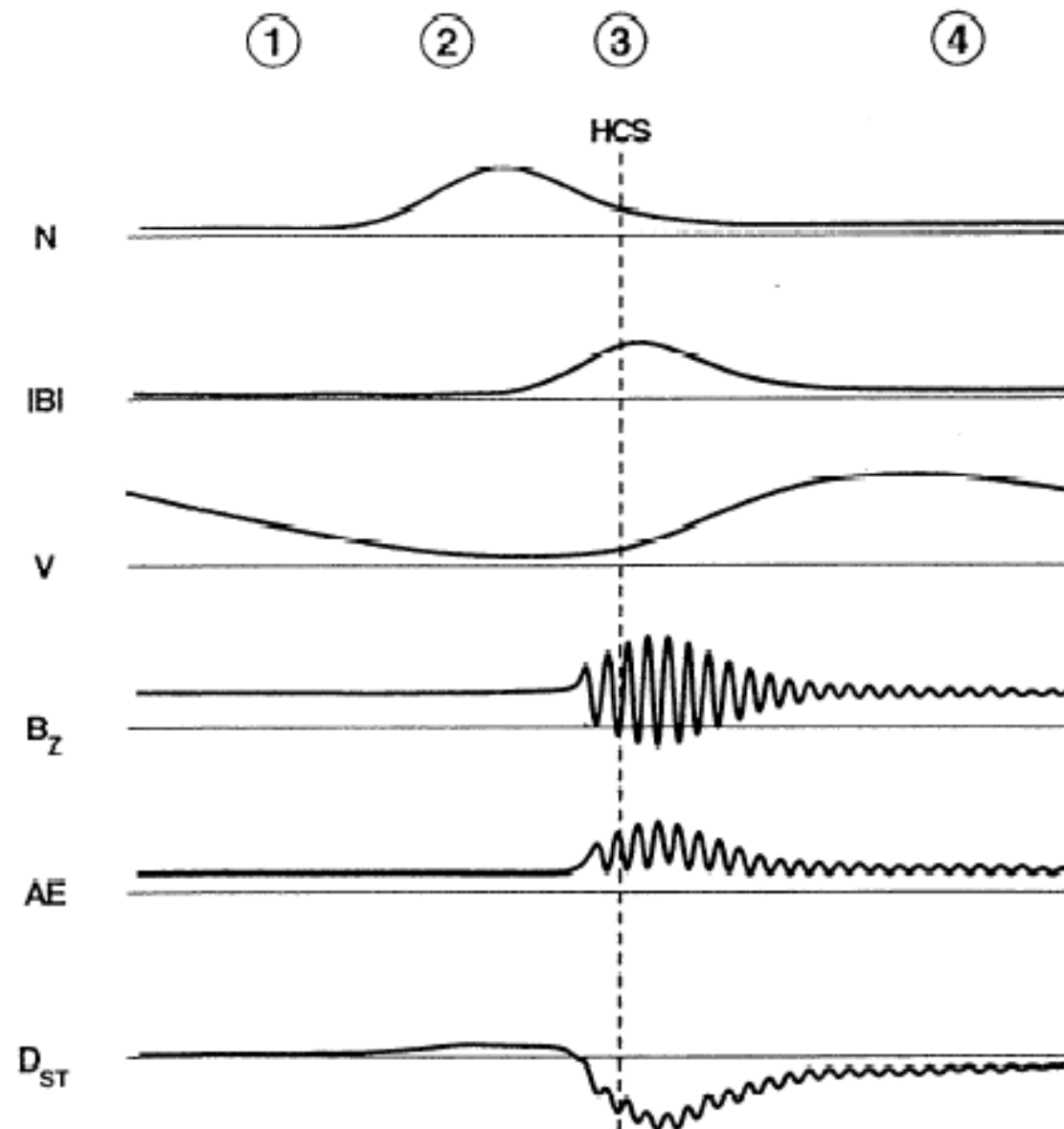
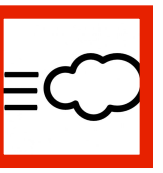
- Co-rotating structure
- Radial!
- No extra mass-flux



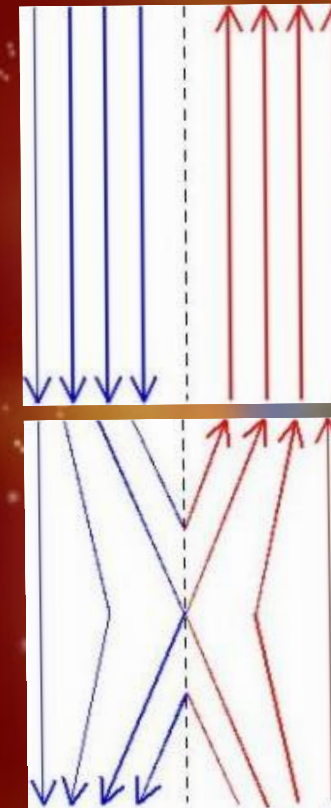
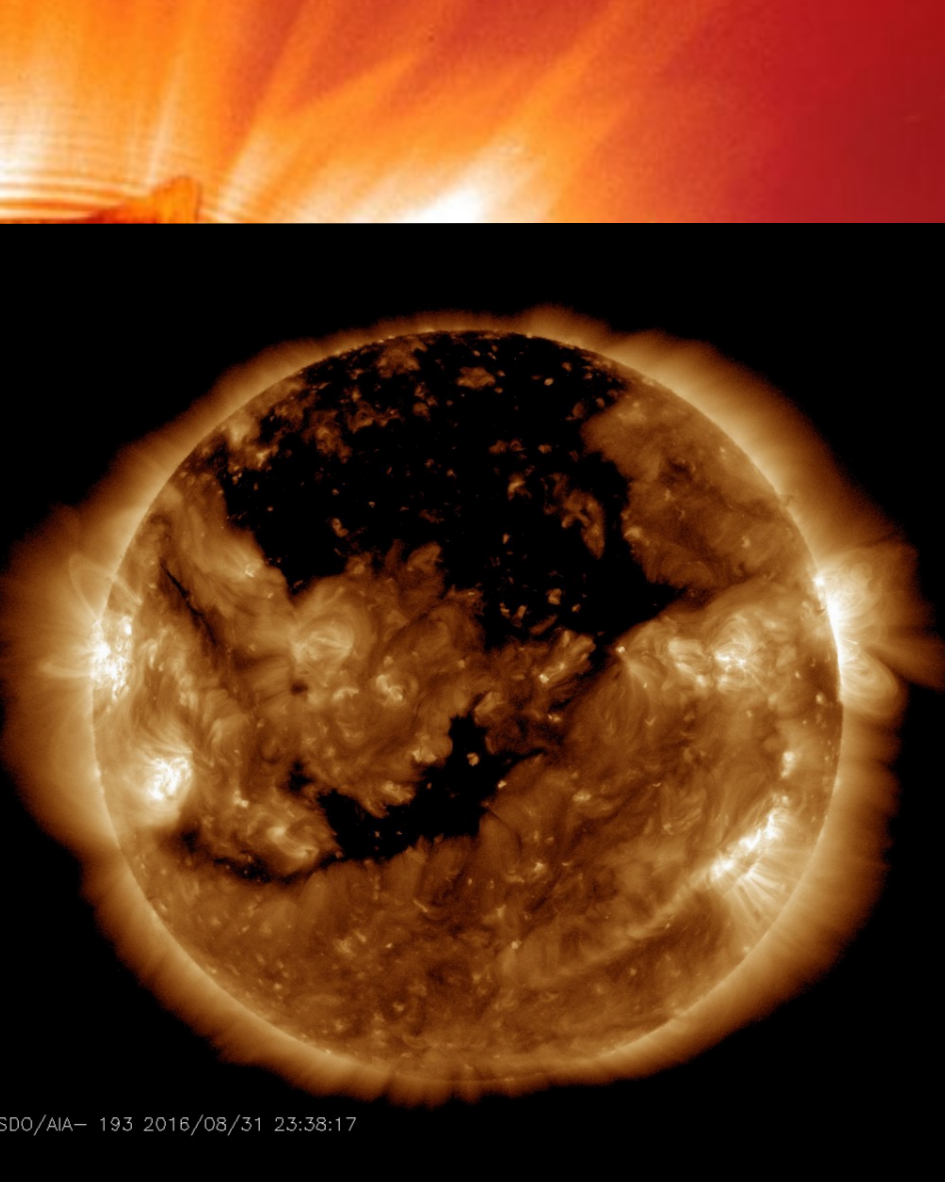
# Coronal Hole



# Coronal Hole





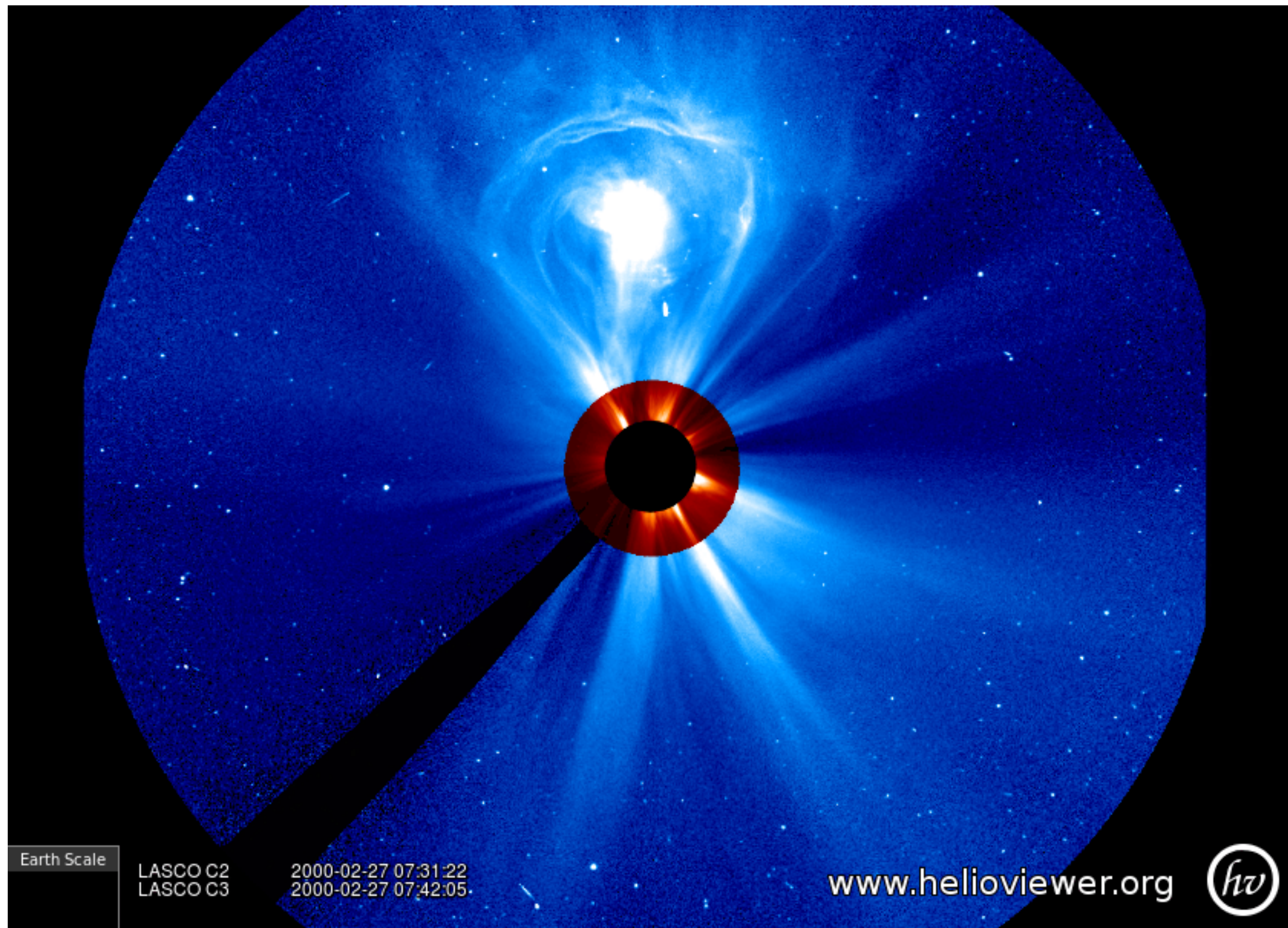
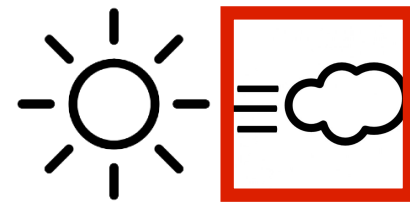


## RECONNECTION

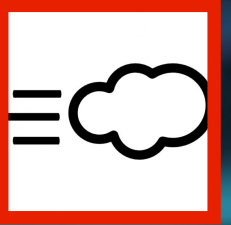
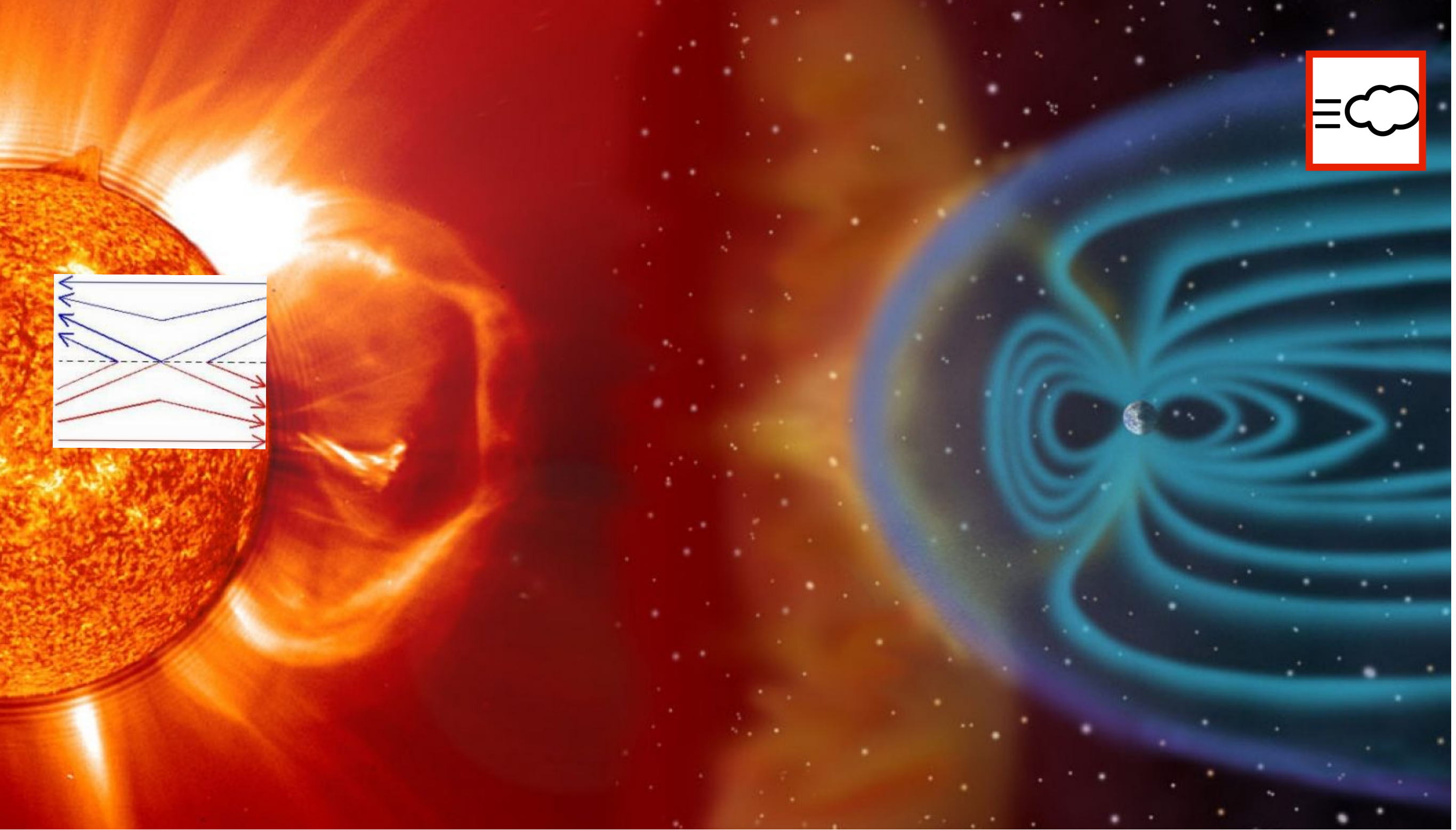
The magnetic field carried by the solar wind can couple with the magnetic field of Earth. This coupling is stronger when the solar wind magnetic field is opposite to the magnetic field of Earth.



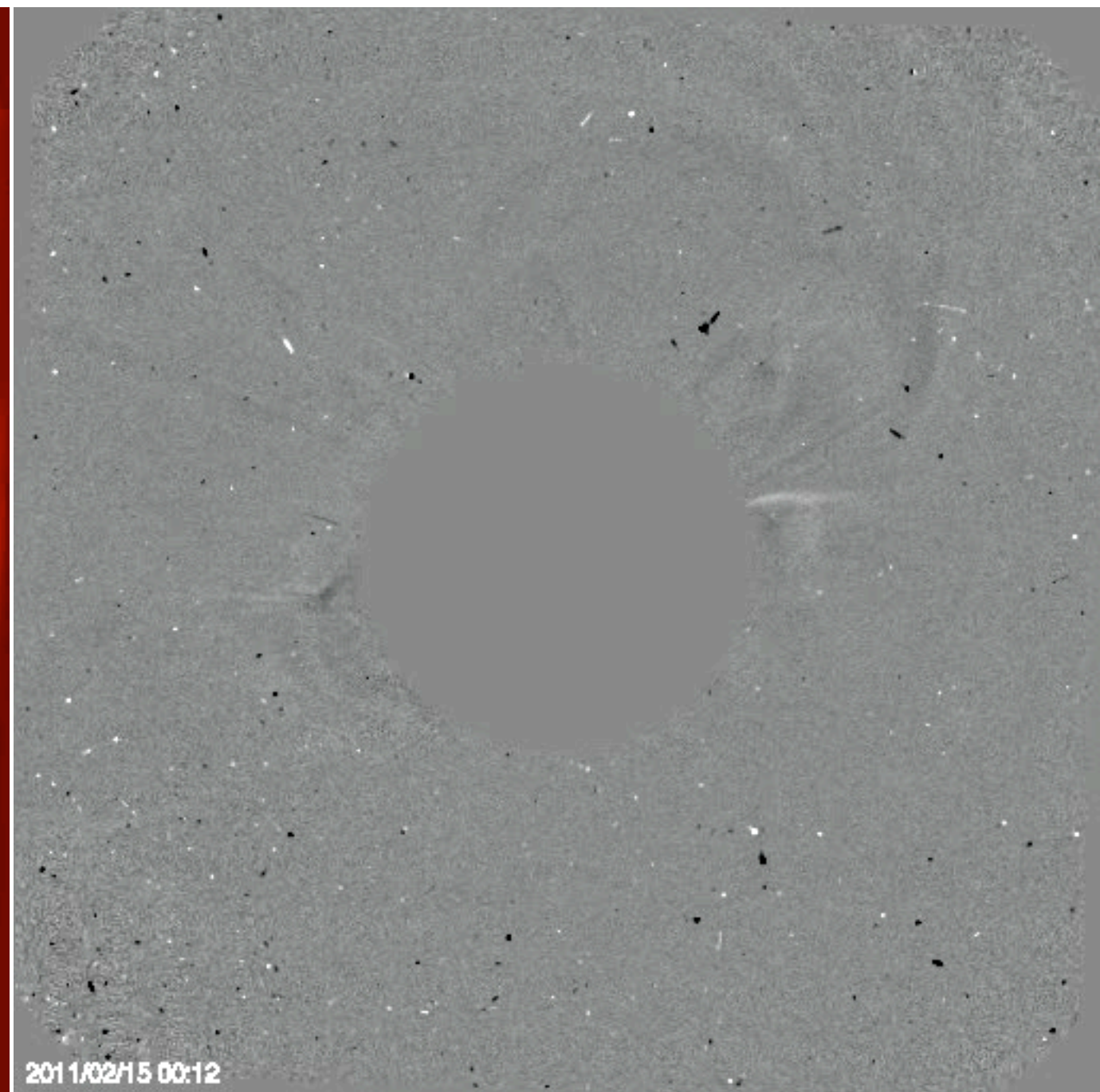
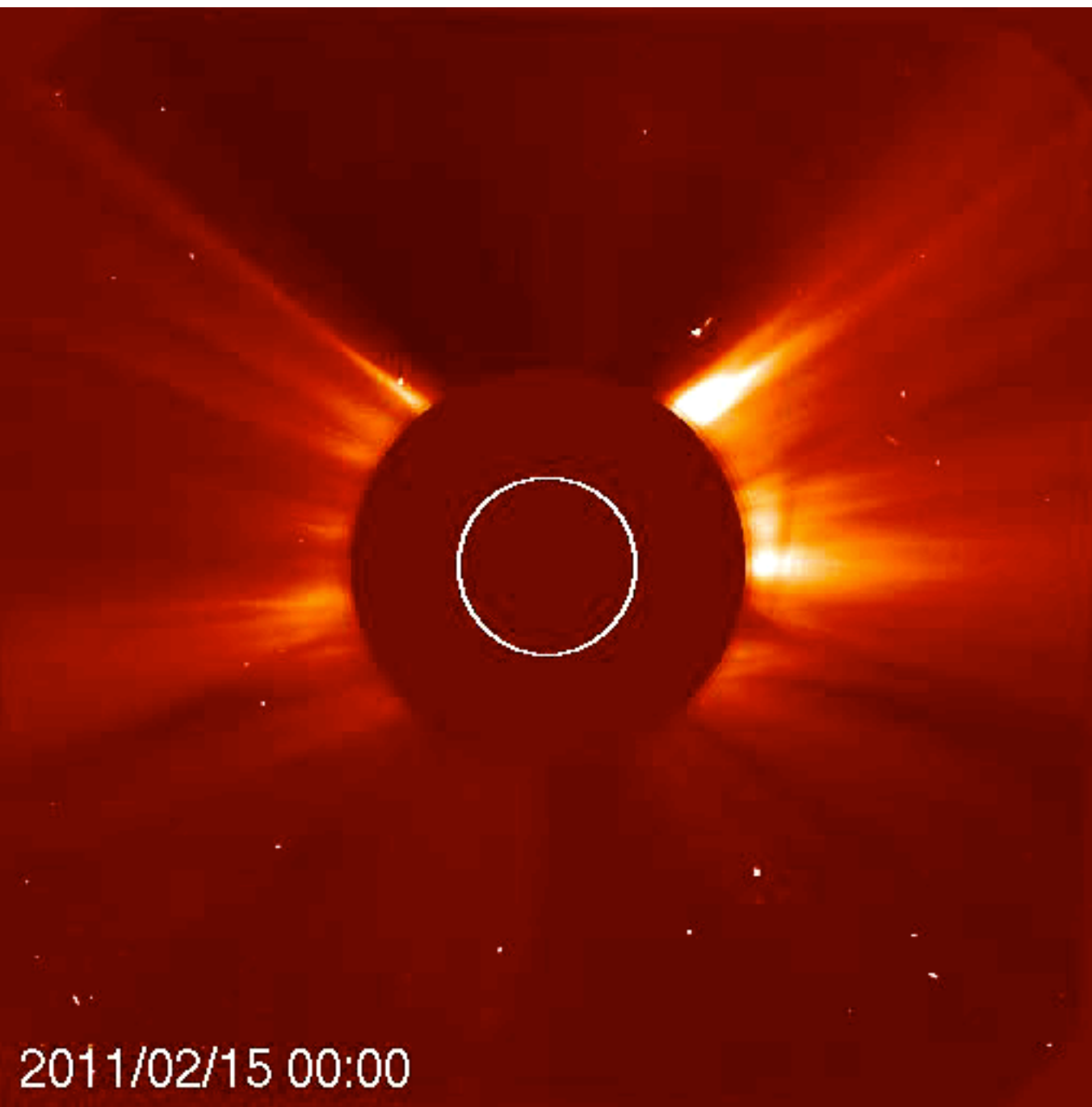
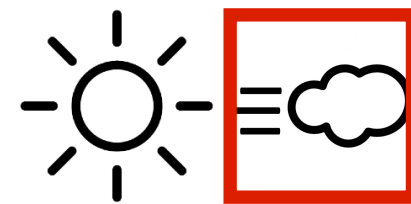
# CORONAL MASS EJECTION











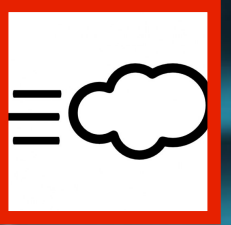
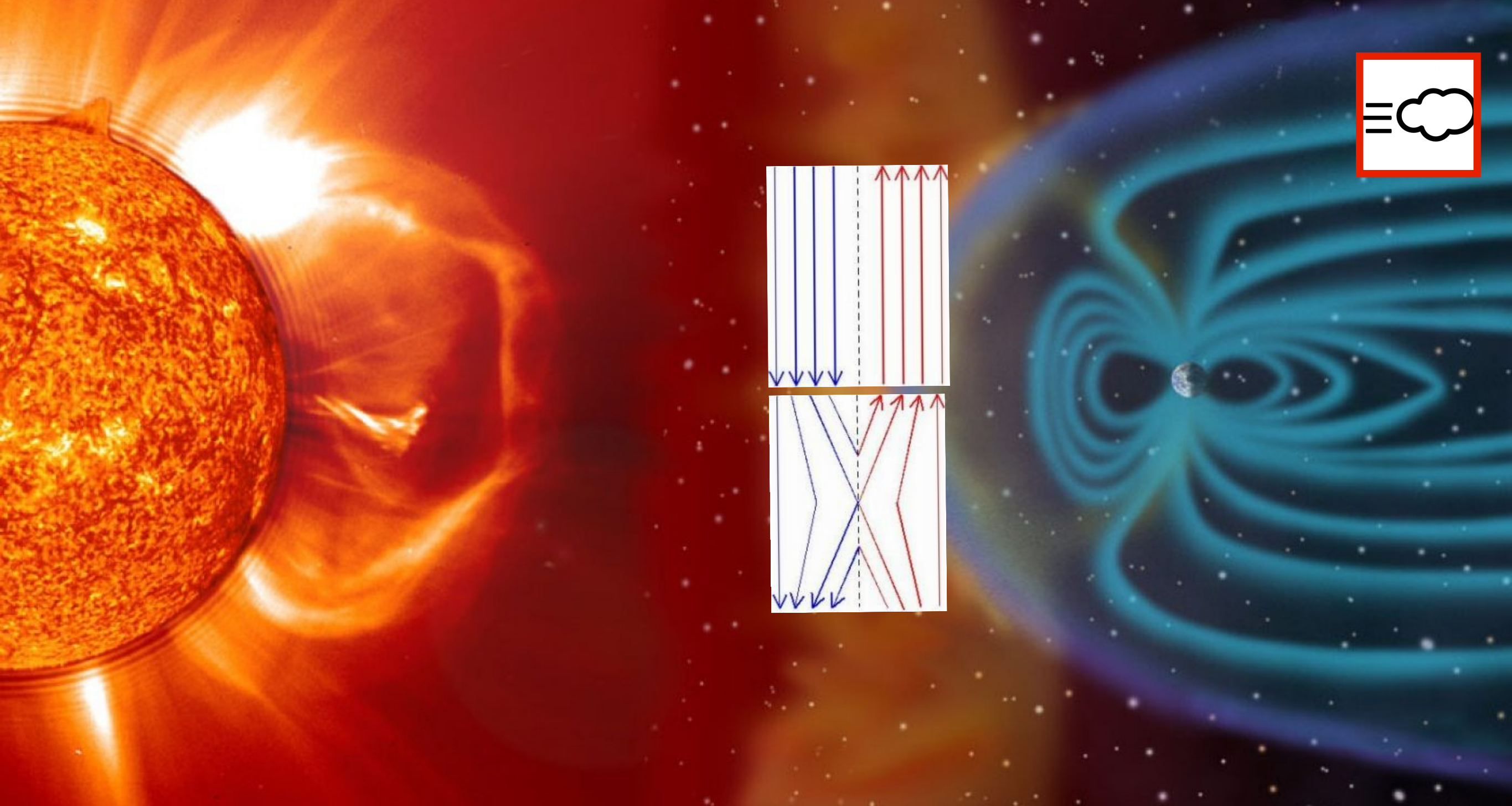
SOHO / LASCO c2



running difference

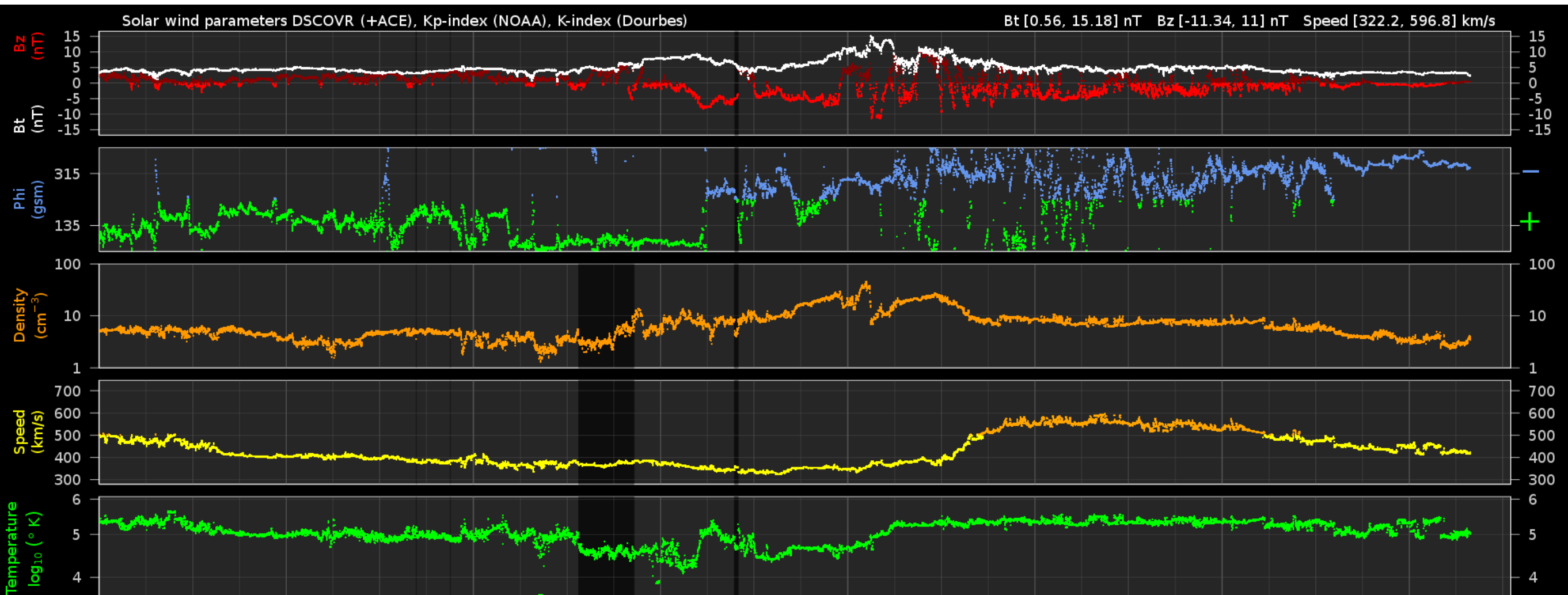






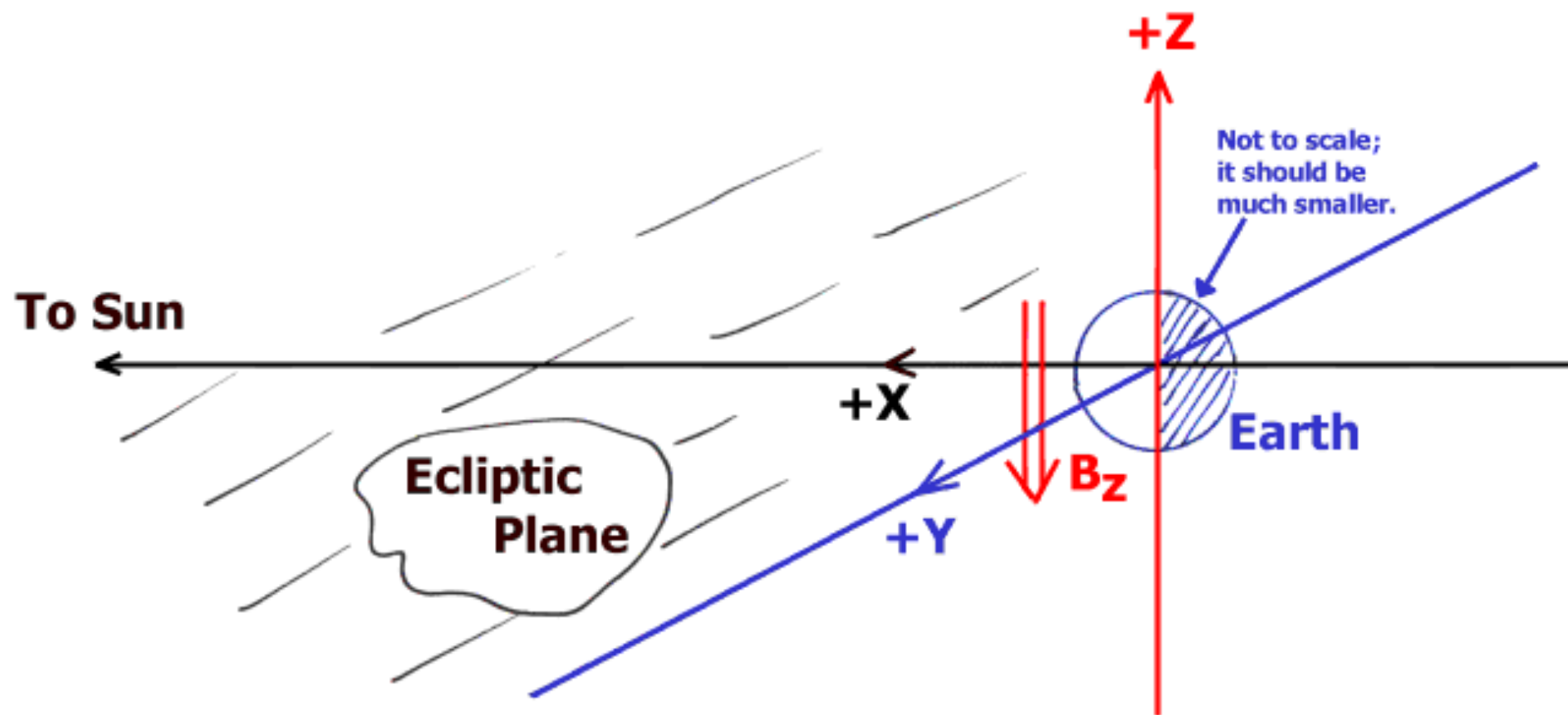
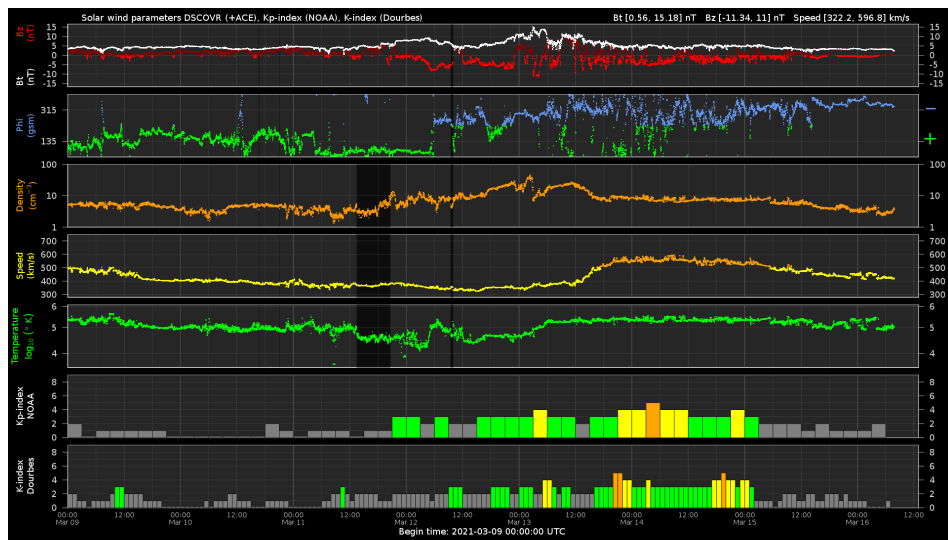
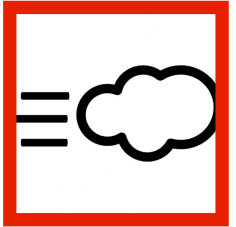
## RECONNECTION

The magnetic field carried by the solar wind can couple with the magnetic field of Earth. This coupling is stronger when the solar wind magnetic field is opposite to the magnetic field of Earth.



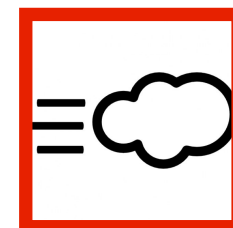
DSCOVR

# COORDINATE SYSTEM

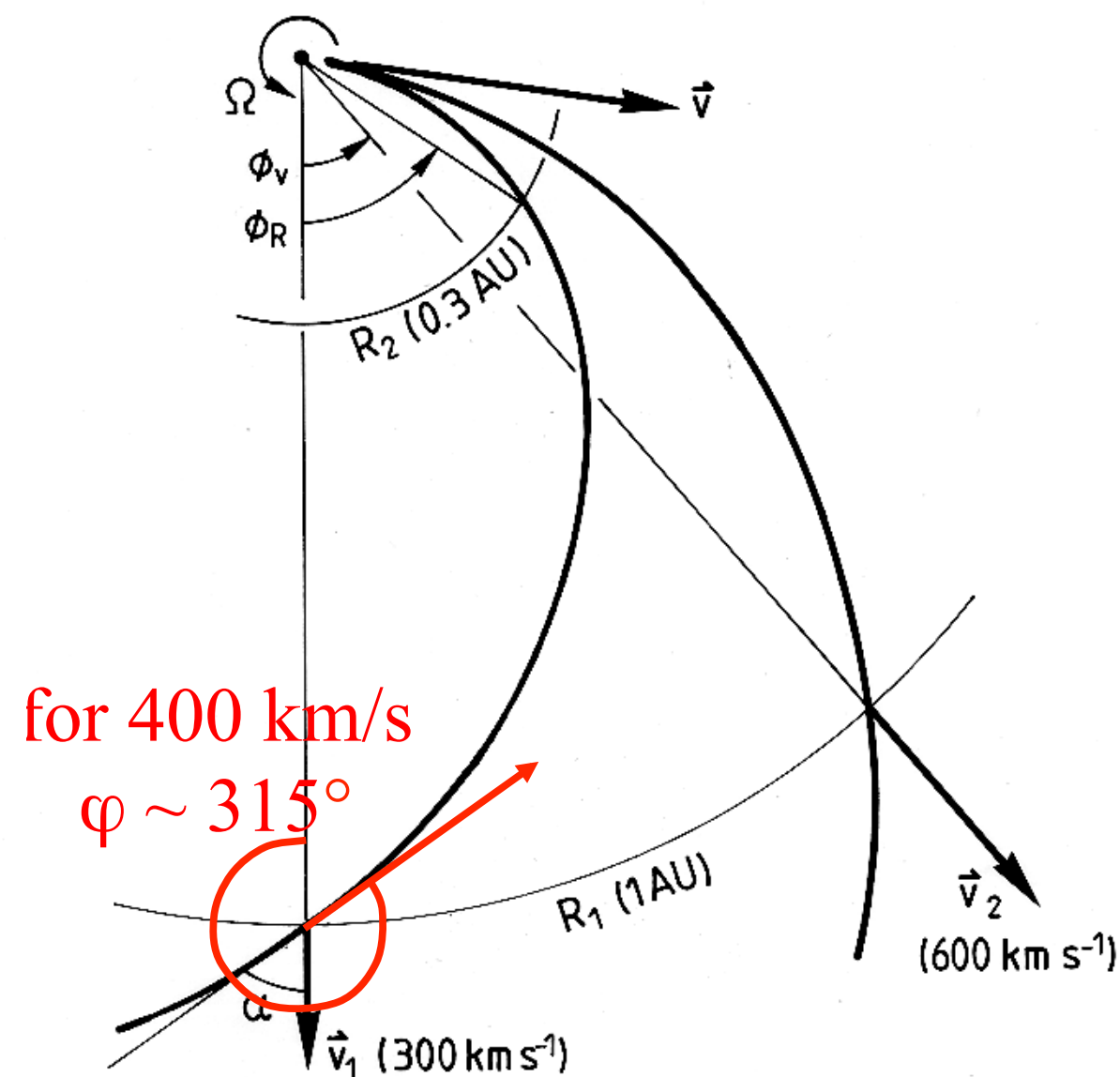
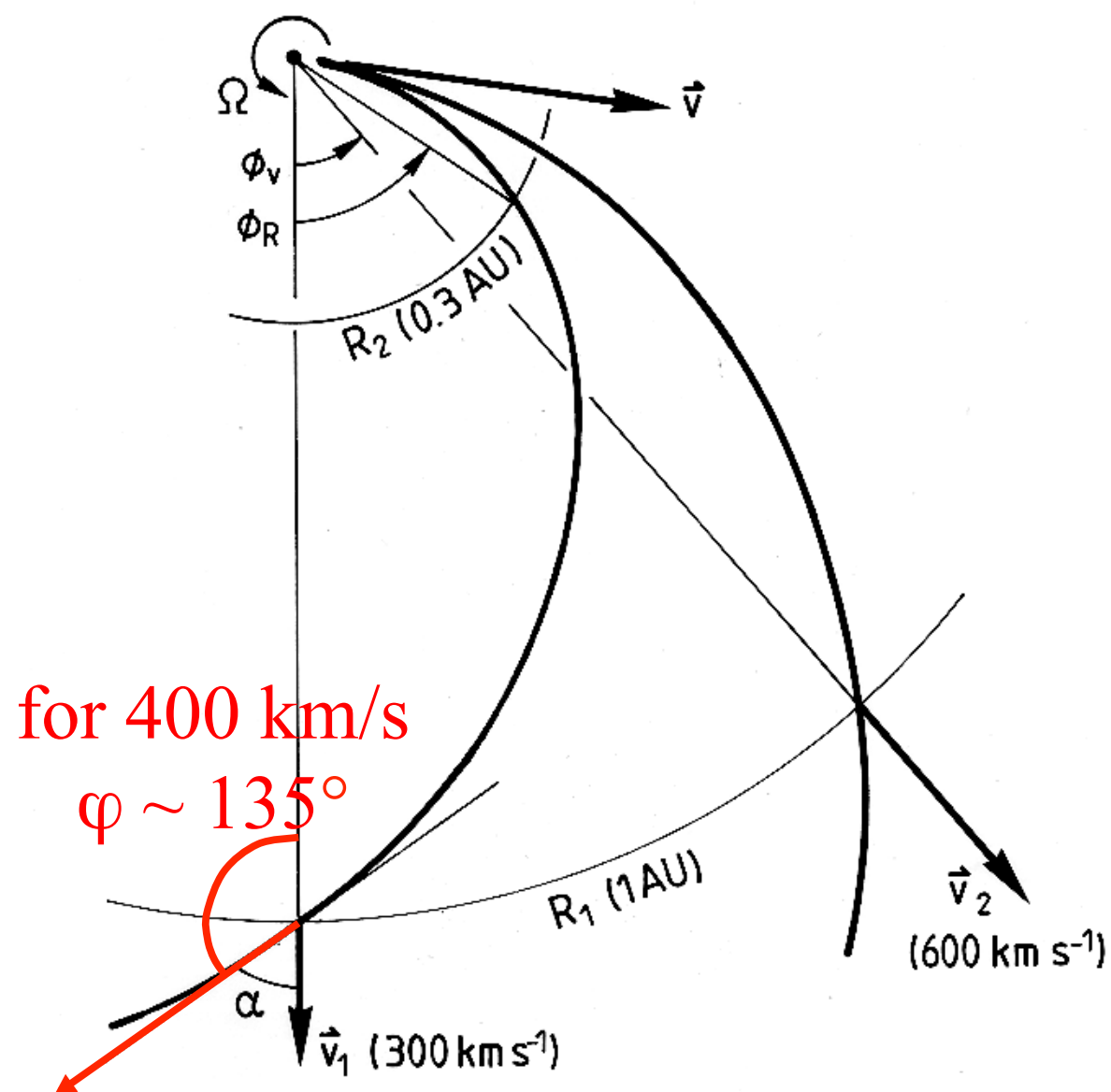


**+Z is perpendicular to the Ecliptic Plane.**

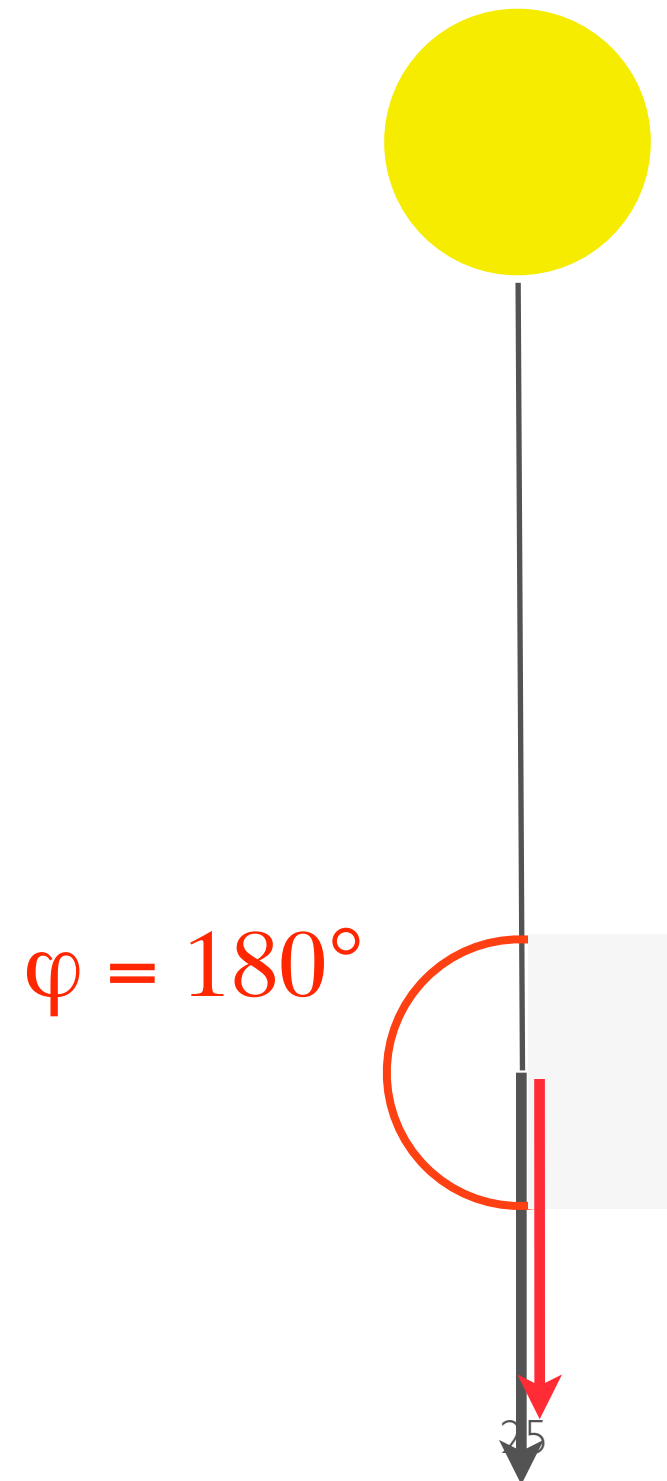
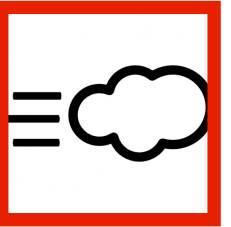




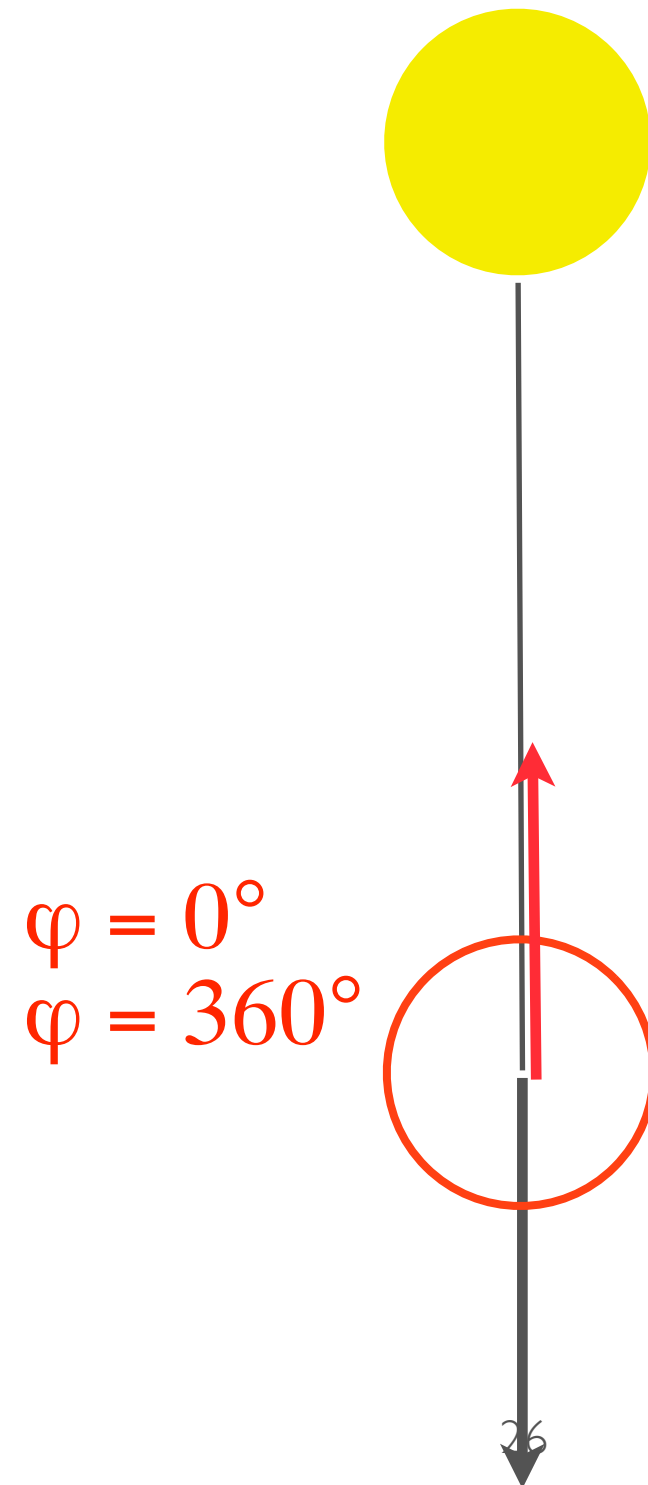
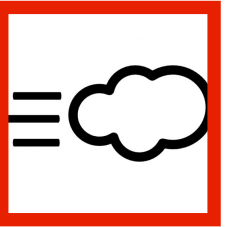
# IMF POLARITY



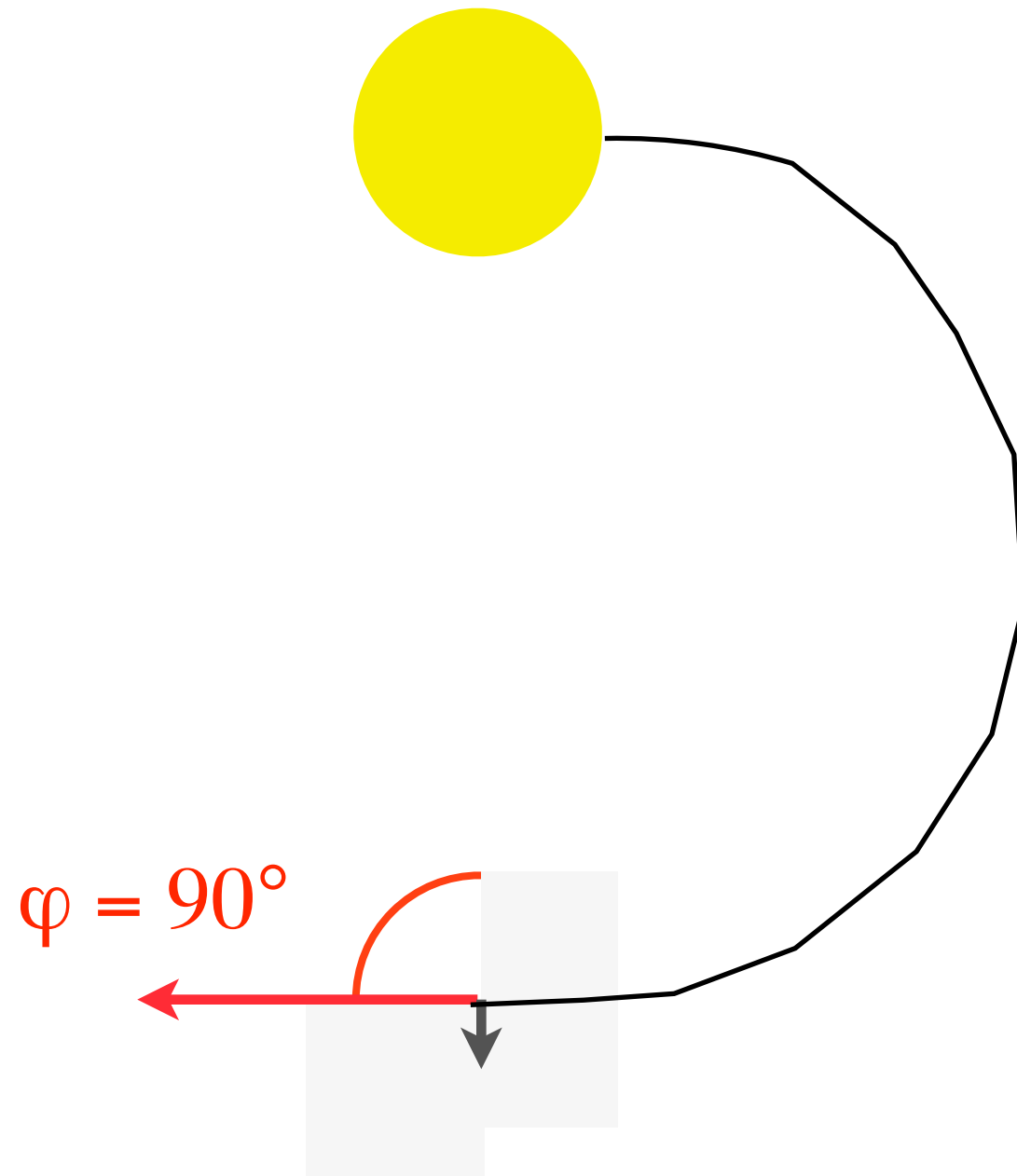
# EXTREME FAST



# EXTREME FAST



# EXTREME SLOW



Central Meridian

Solar rotation axis

Solar North Pole

Magnetic South Pole  
positive/outward  
yellow/white

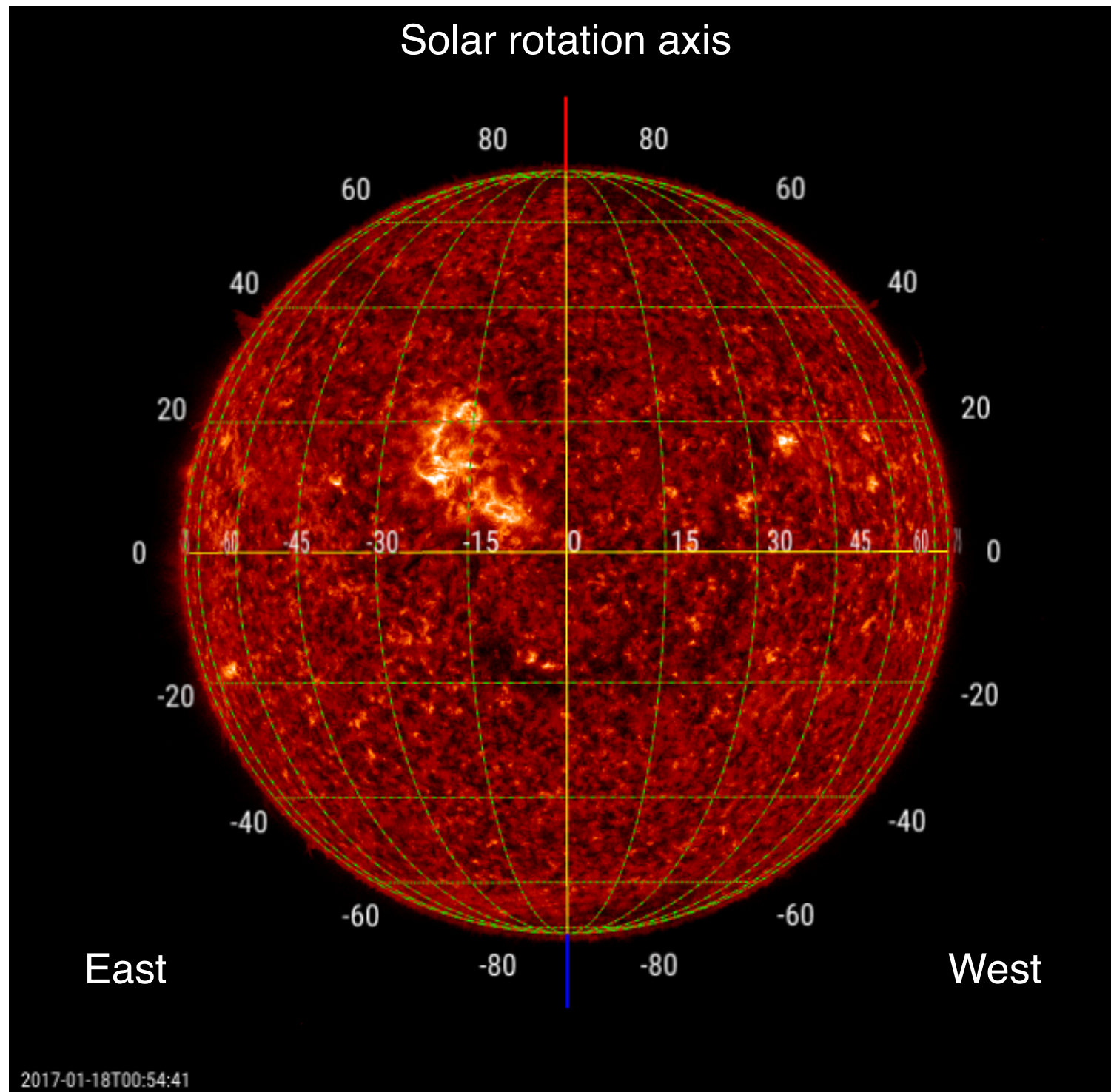
Northern hemisphere

Solar Equator

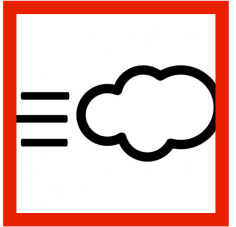
Solar South Pole

Magnetic North Pole  
negative/inward  
blue/black

Southern hemisphere

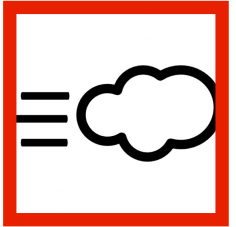






Beacon COR2 CME speed calculator

<https://www.sidc.be/cactus/>



# Exercices

<https://www.stce.be/presentations/SWIC2021/>