Space Weather

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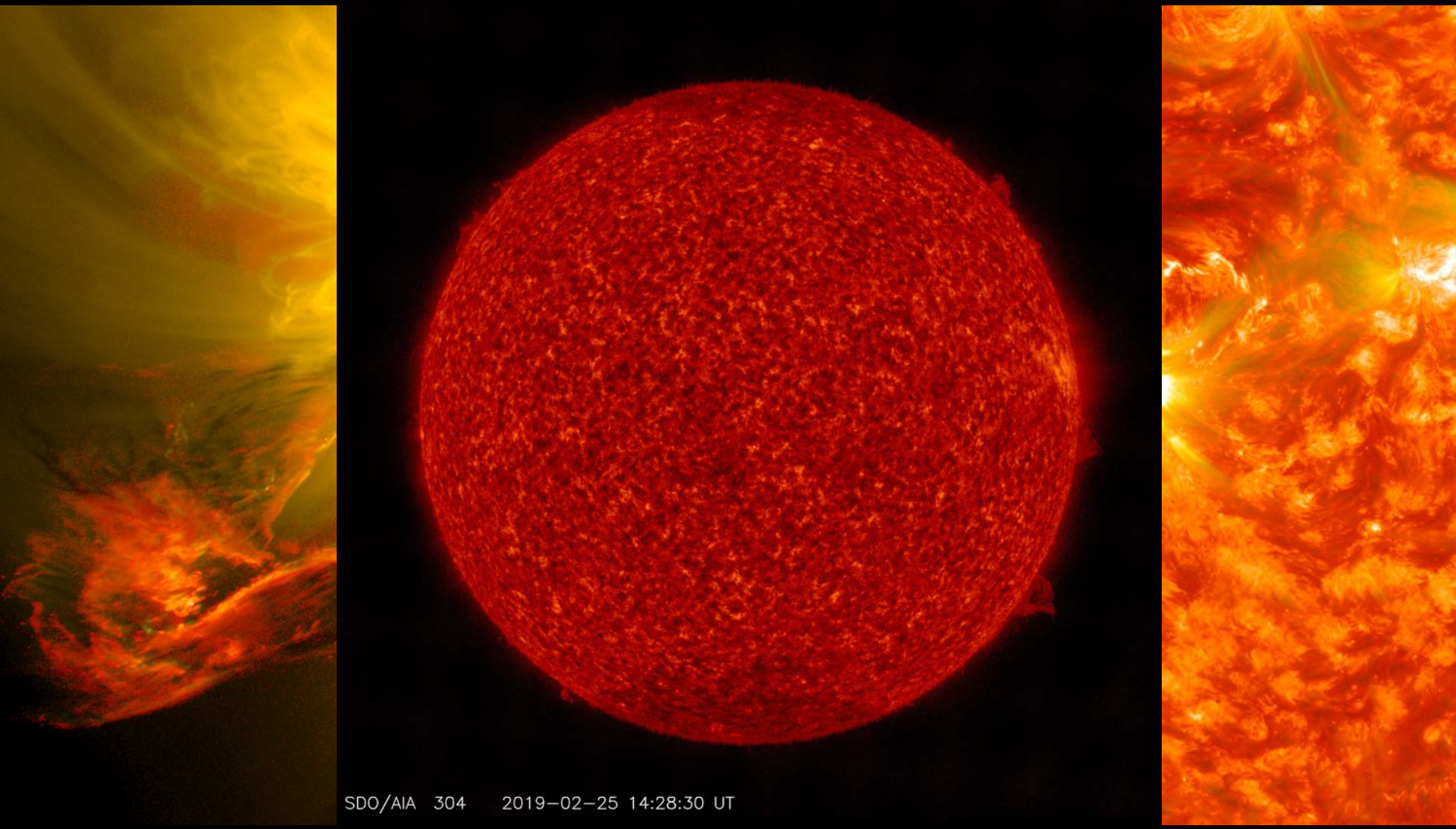
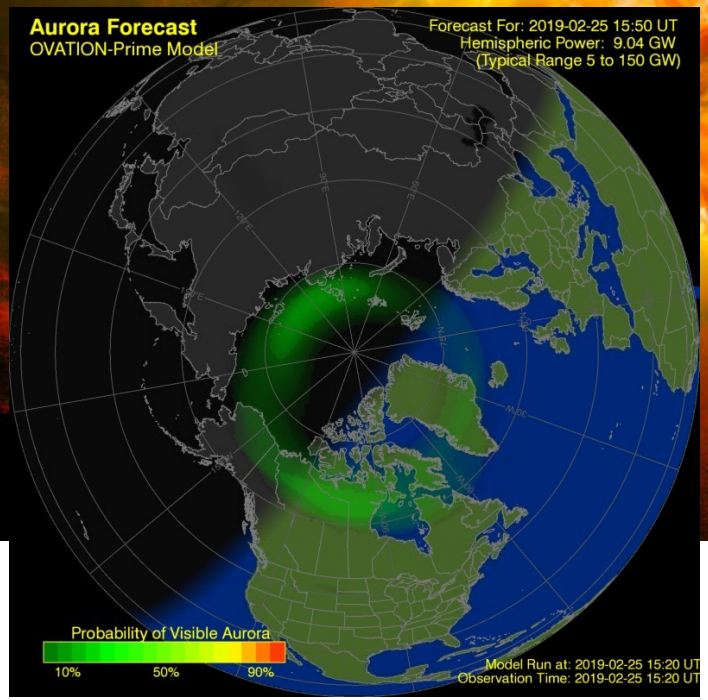
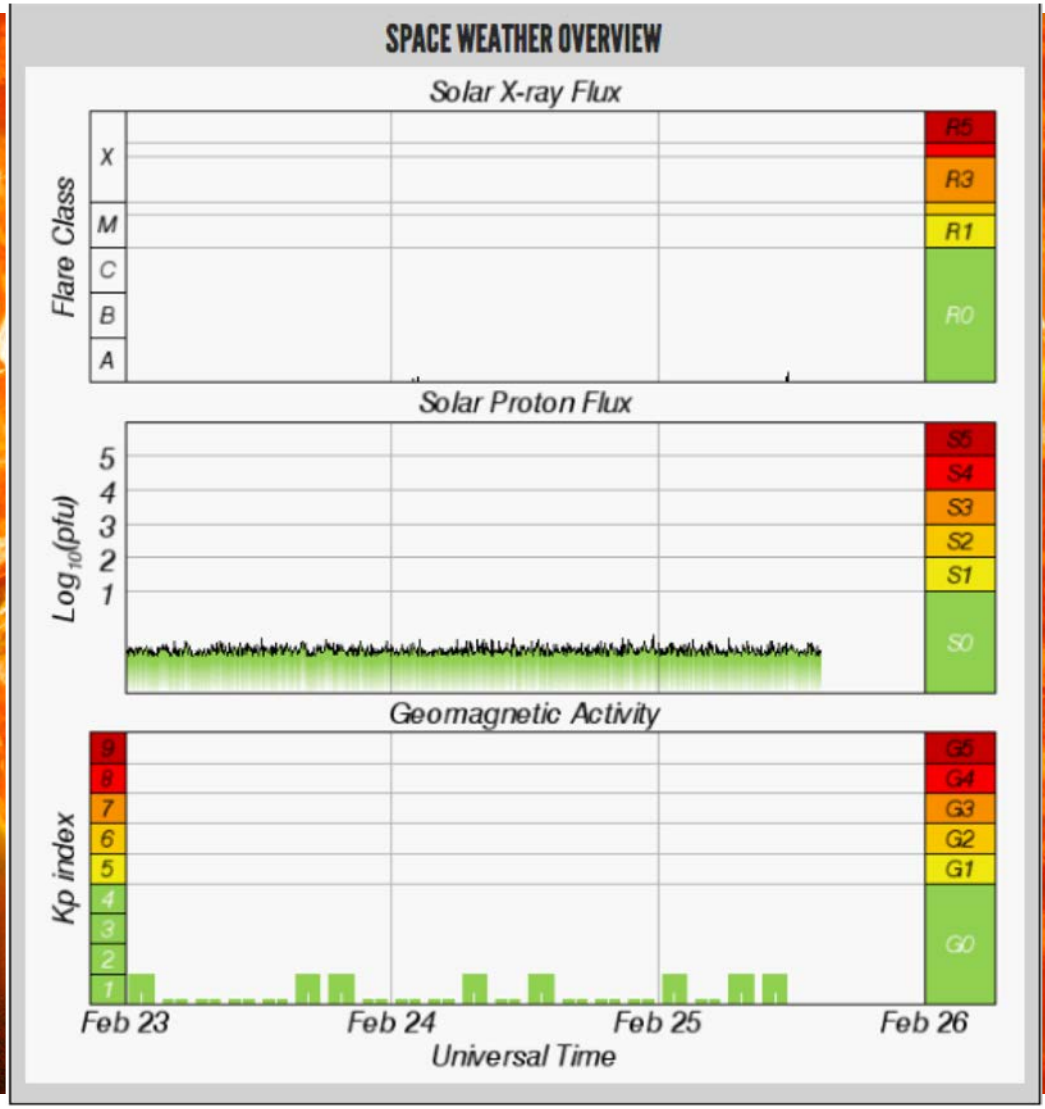
Today's Space Weather

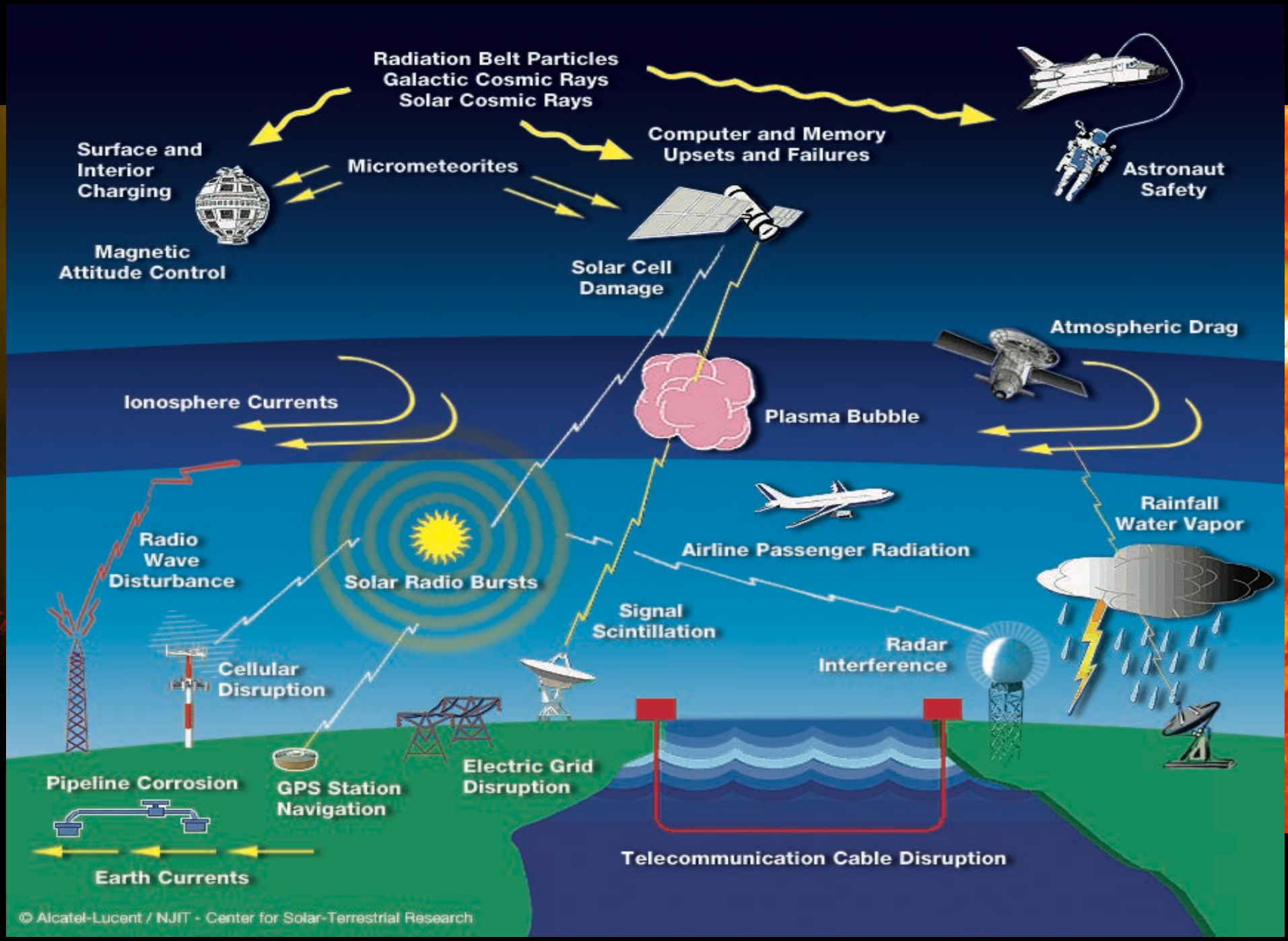


from **thesuntoday.org/the-sun-now/**

Predicted Space Weather






Radiation Belt Particles
Galactic Cosmic Rays
Solar Cosmic Rays
Surface and Interior Charging
Micrometeorites
Computer and Memory Upsets and Failures
Astronaut Safety
Magnetic Attitude Control
Solar Cell Damage
Atmospheric Drag
Ionosphere Currents
Plasma Bubble
Rainfall Water Vapor
Radio Wave Disturbance
Solar Radio Bursts
Airline Passenger Radiation
Signal Scintillation
Radar Interference
Cellular Disruption
Pipeline Corrosion
GPS Station Navigation
Electric Grid Disruption
Telecommunication Cable Disruption
Earth Currents
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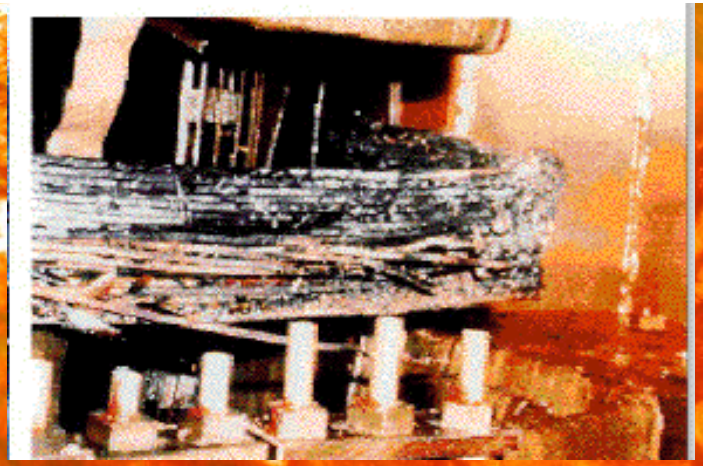
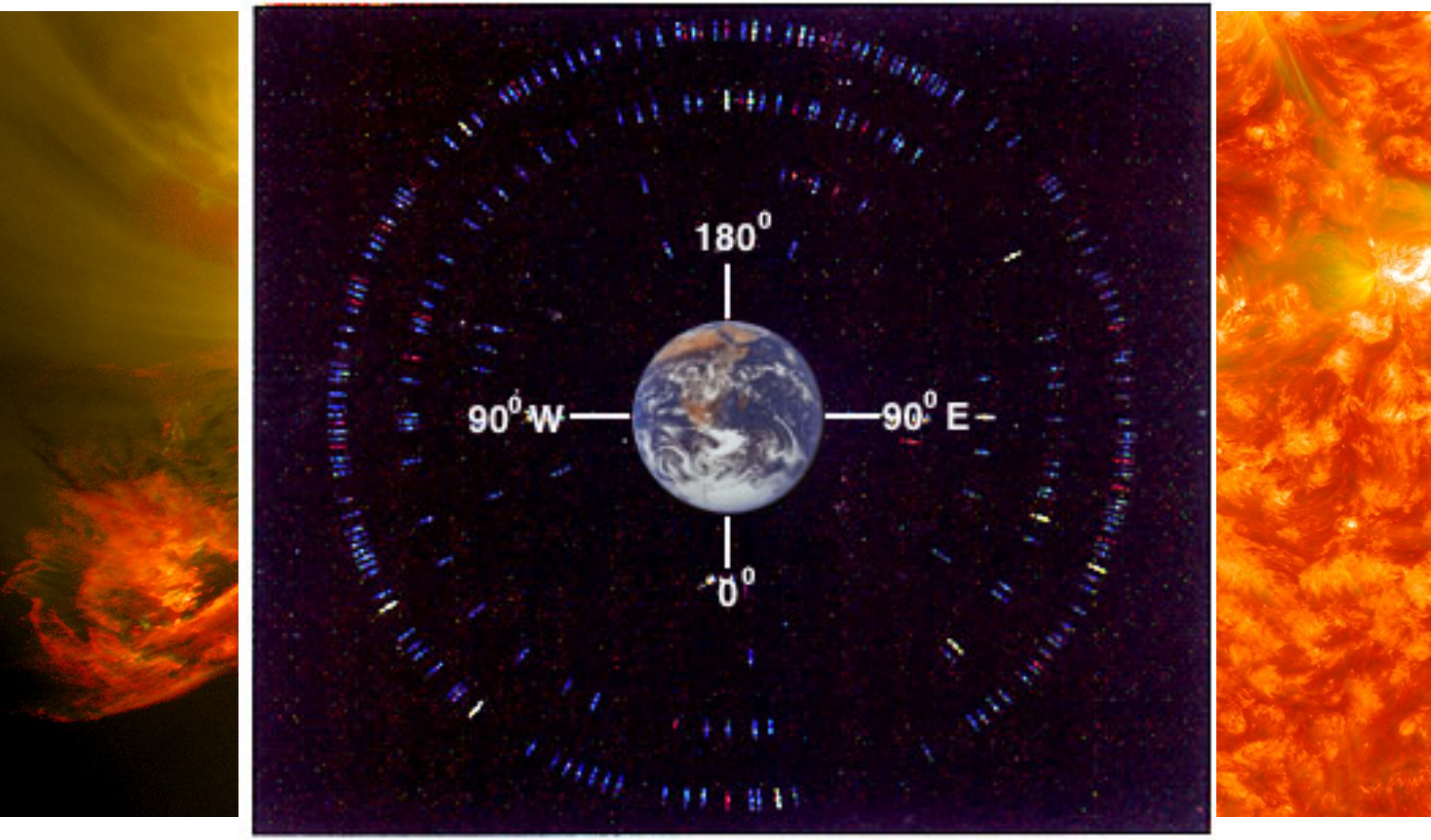
Solar storm causes blackout in 1989

In 90 seconds, 6 million people lost power for 9 hours.



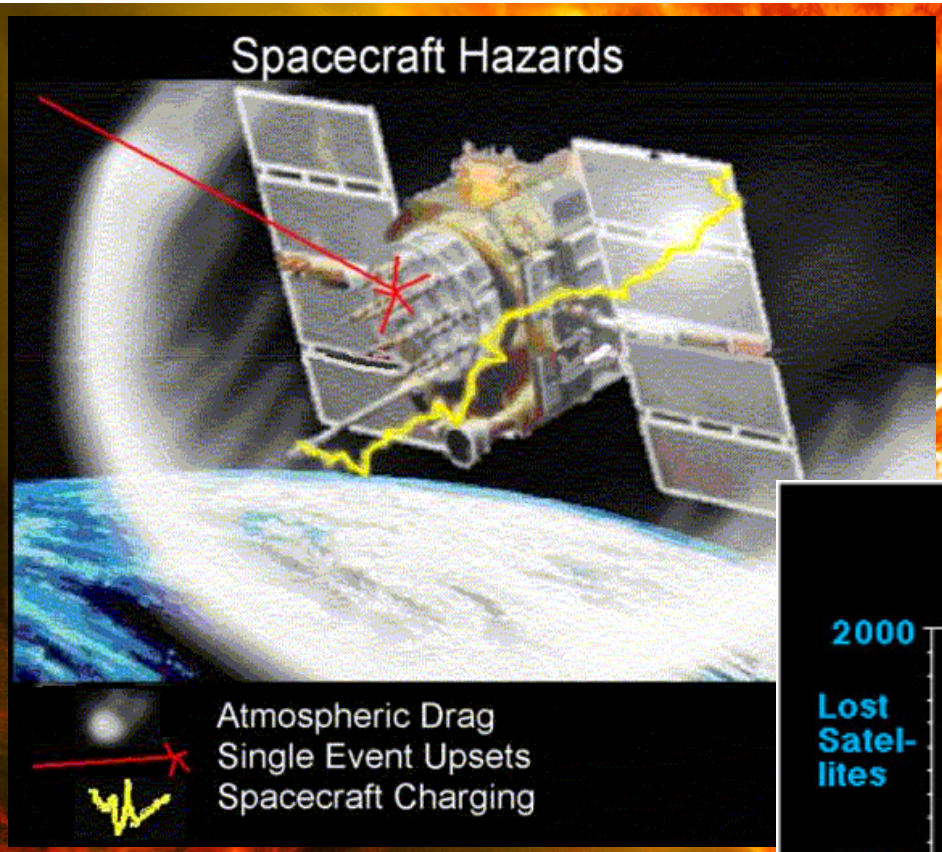
An October 2003 solar storm knocked out the Mars Odyssey probe

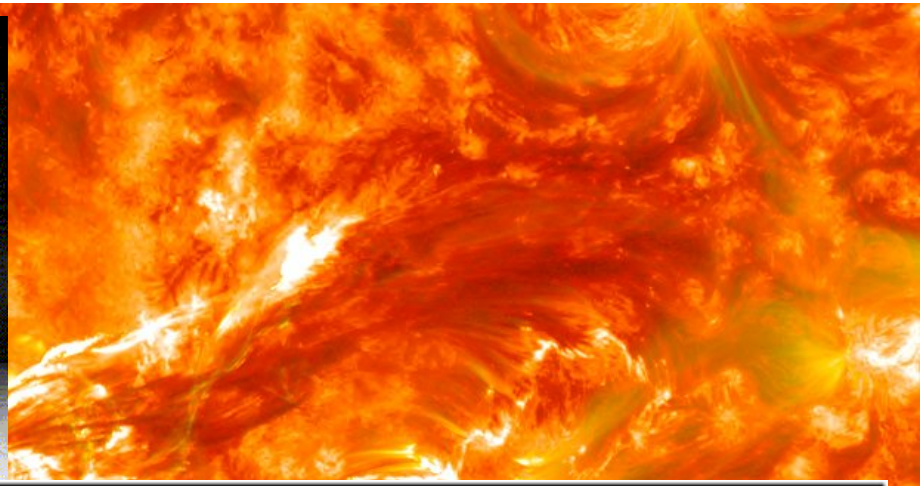
Low Earth Orbit

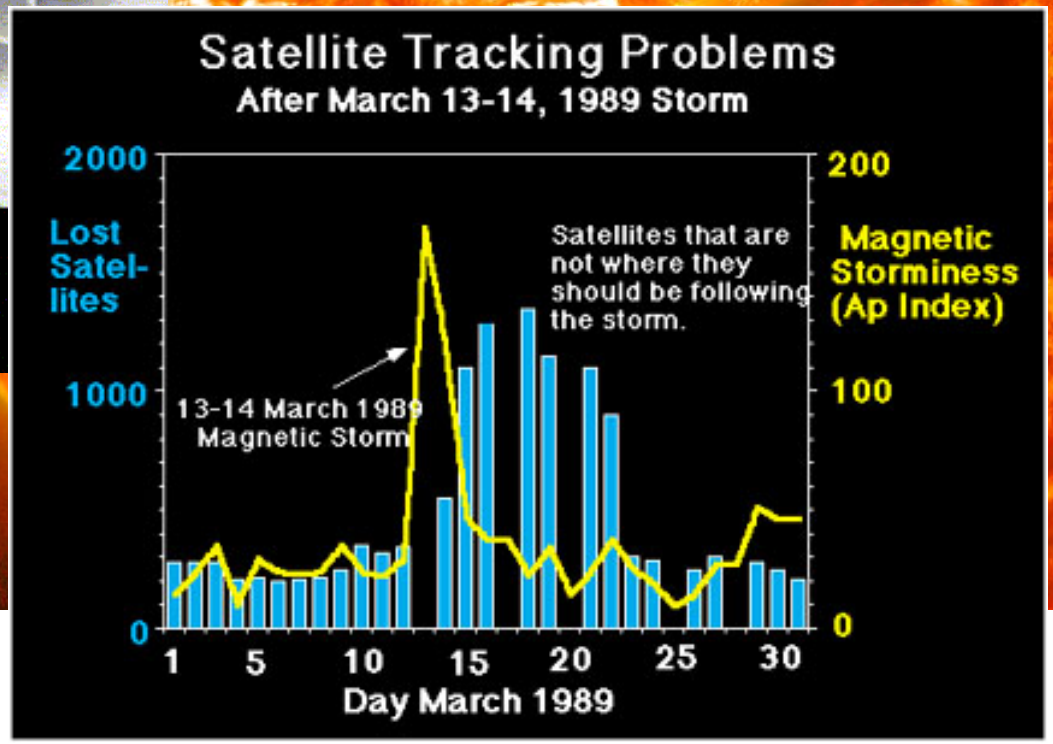


Over 4,000 Spacecraft orbit in LEO

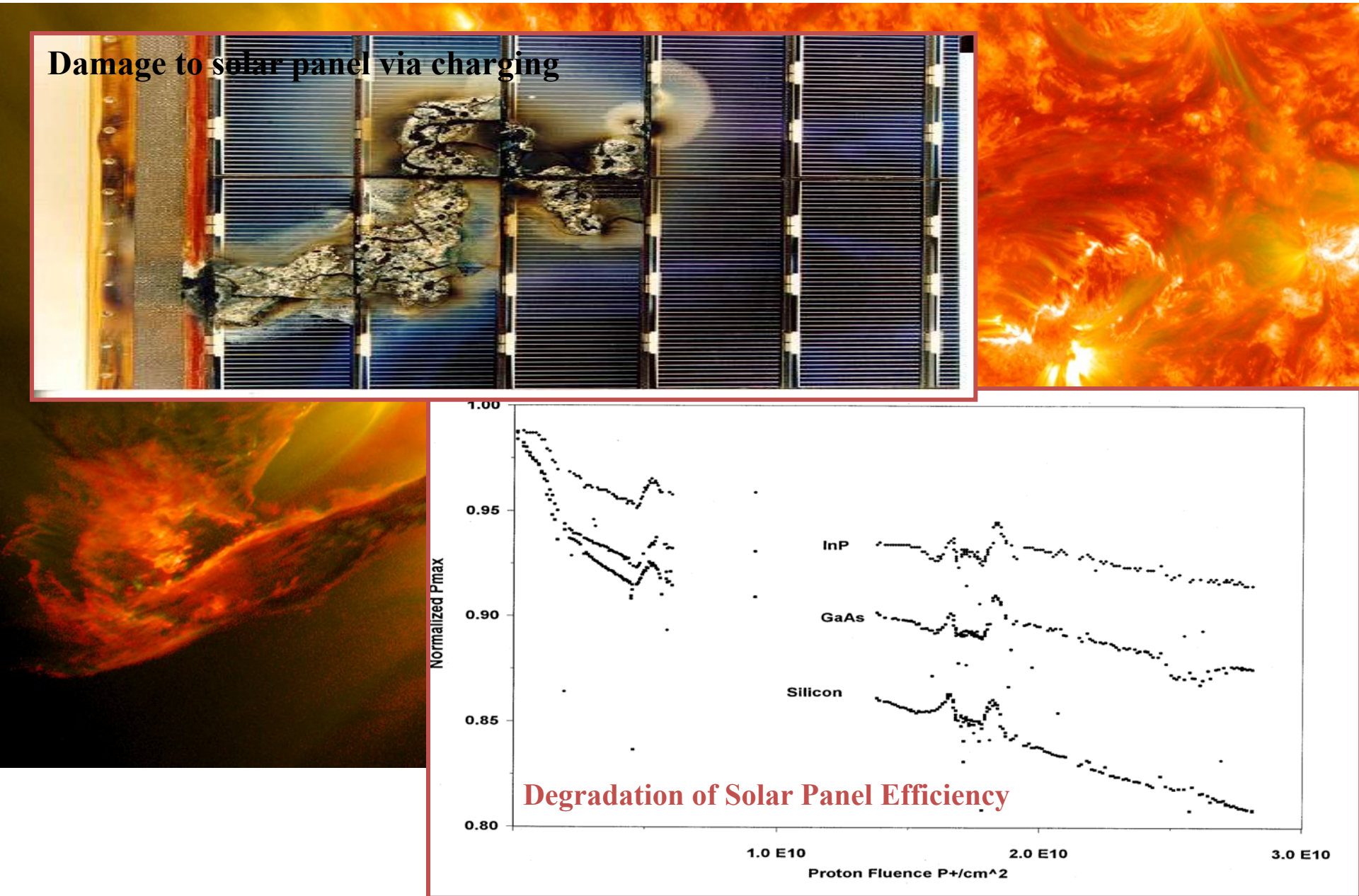
Spacecraft Hazards



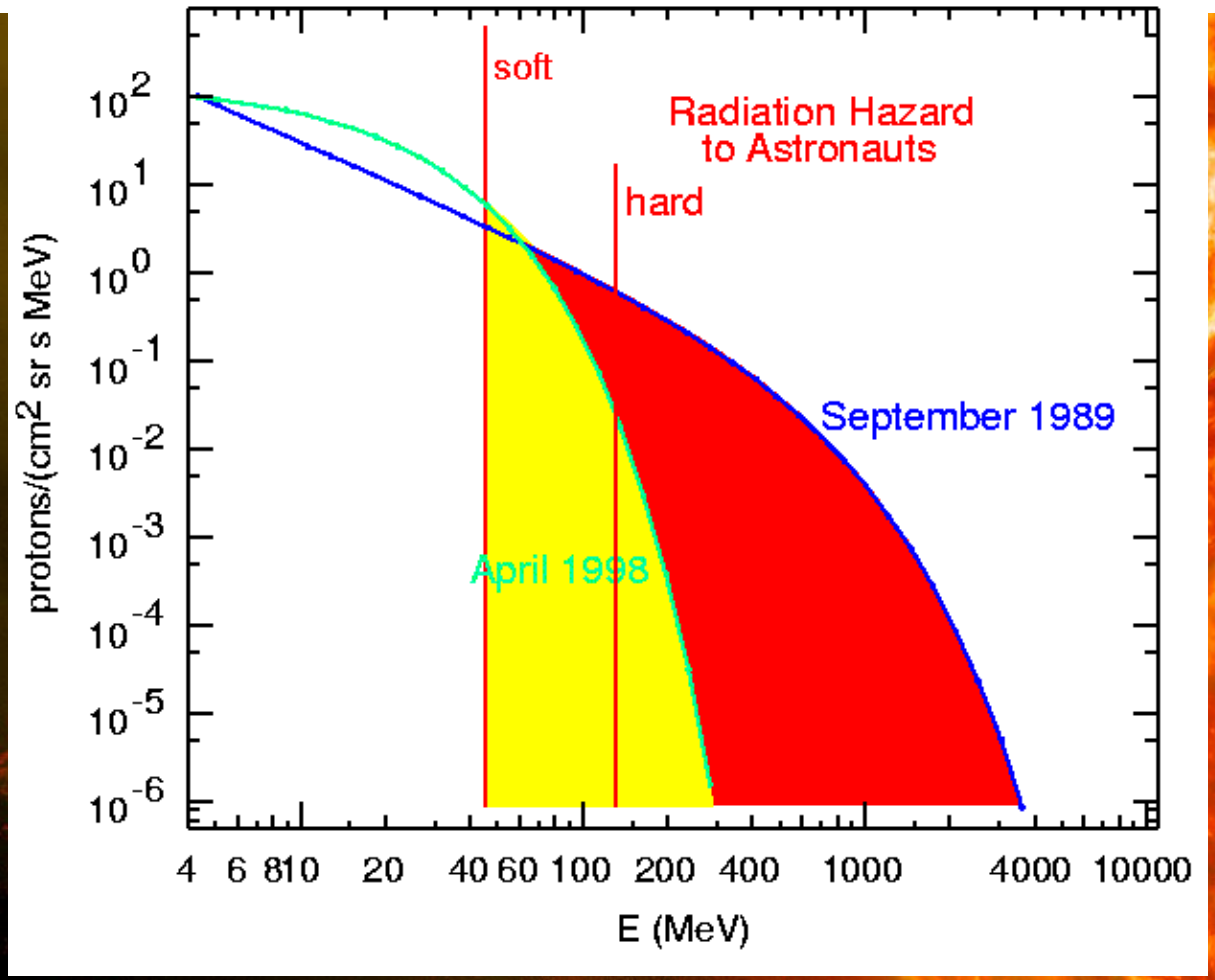




Spacecraft Hazards



Solar Particles & Astronaut Radiation Exposure



Proton spectra from 2 events, both produced by ~2000 km/s CMEs on the west limb.

Behind 10 g/cm² aluminum, these spectra produce:

50 mrem/hour*

4 rem/hour*

For comparison:

Average Person:

360 mrem/year

Radiation Worker Limit:

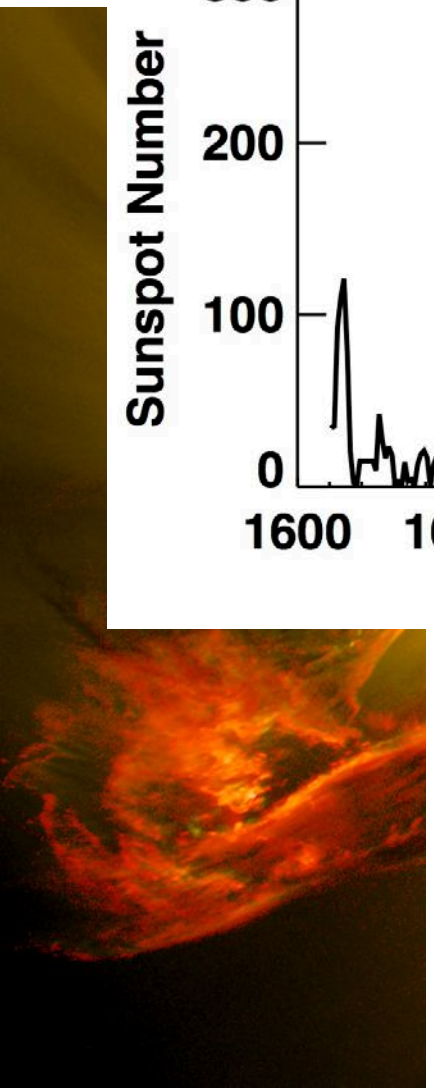
5 rem/year

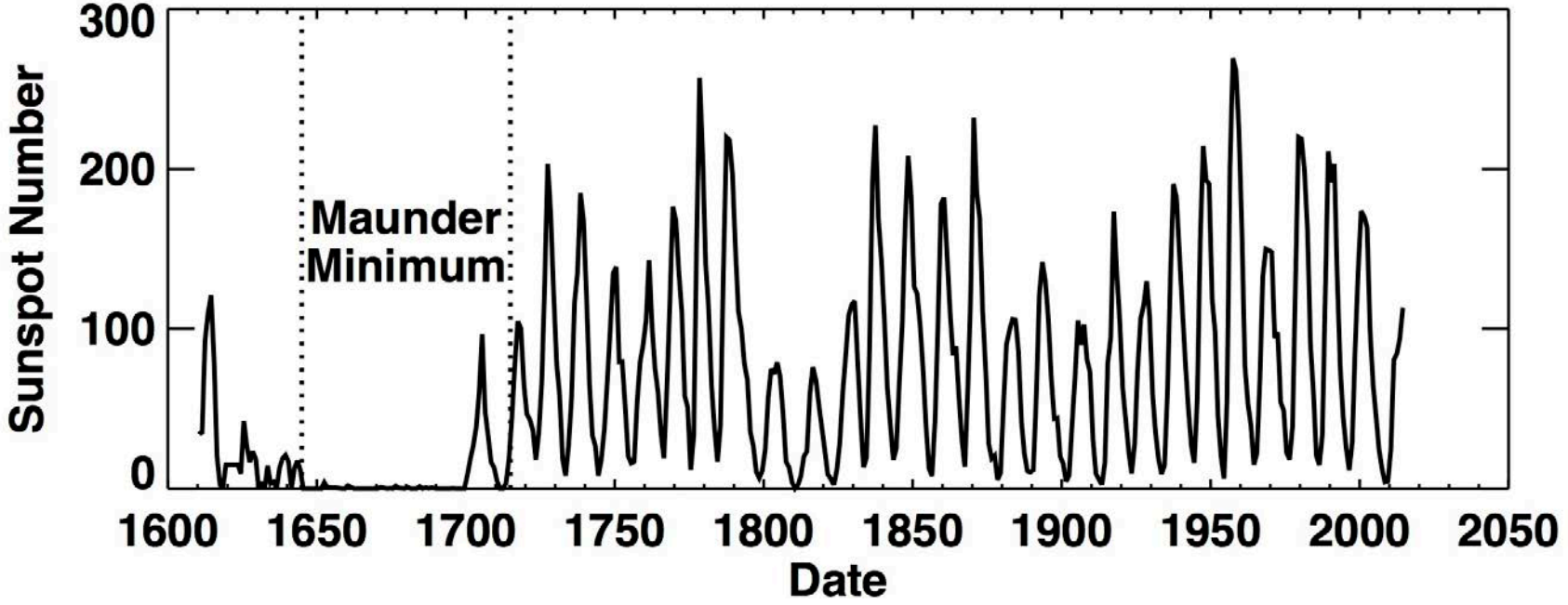
Astronaut Limit:

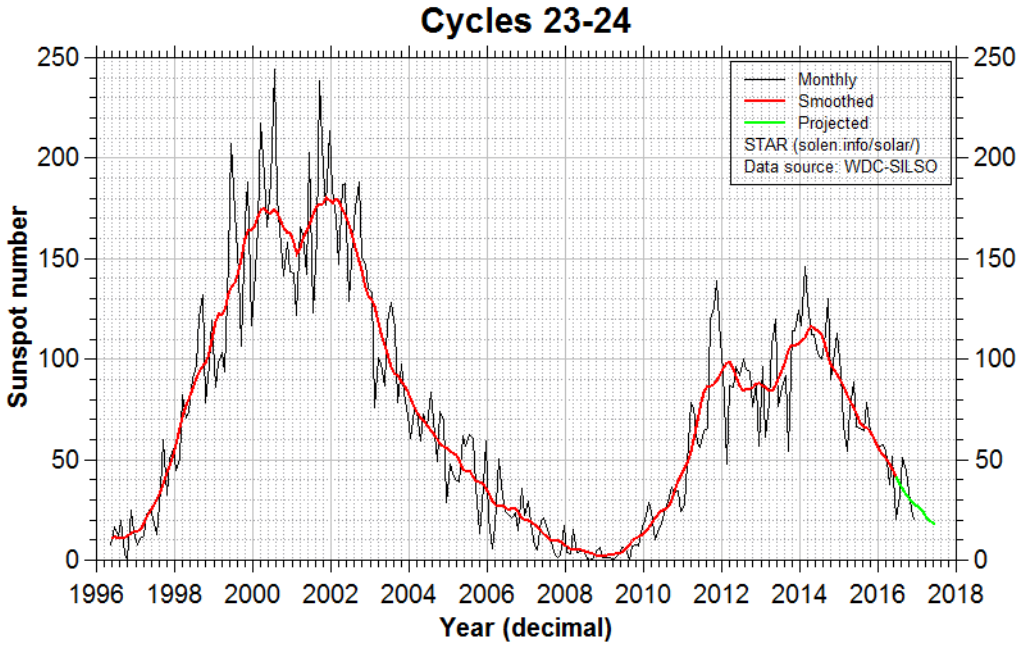
50 rem/year

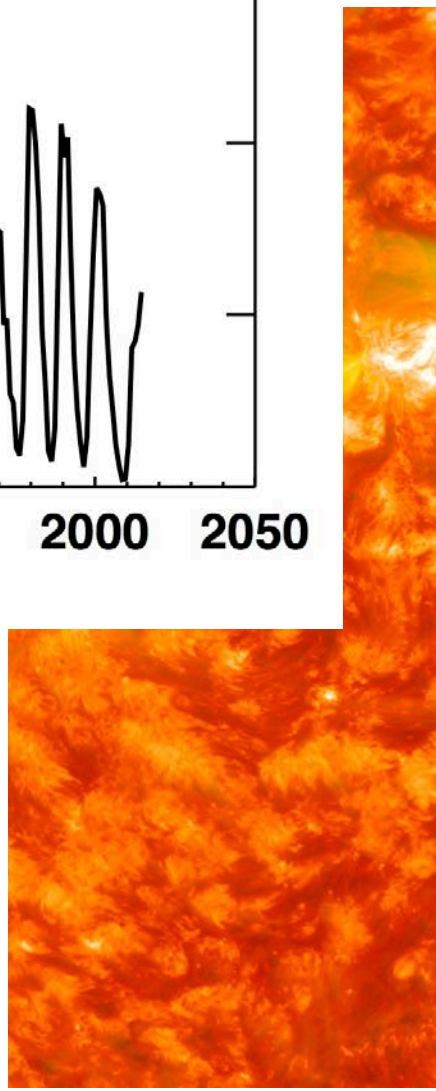
**These dose calculations are for interplanetary space, without the shielding effect of Earth's magnetosphere. Also, the dose calculations do not include secondary neutrons produced in the shielding material. (Aluminum would not be a good choice for the shielding material in a solar "storm shelter".)*

The Solar Activity Cycle

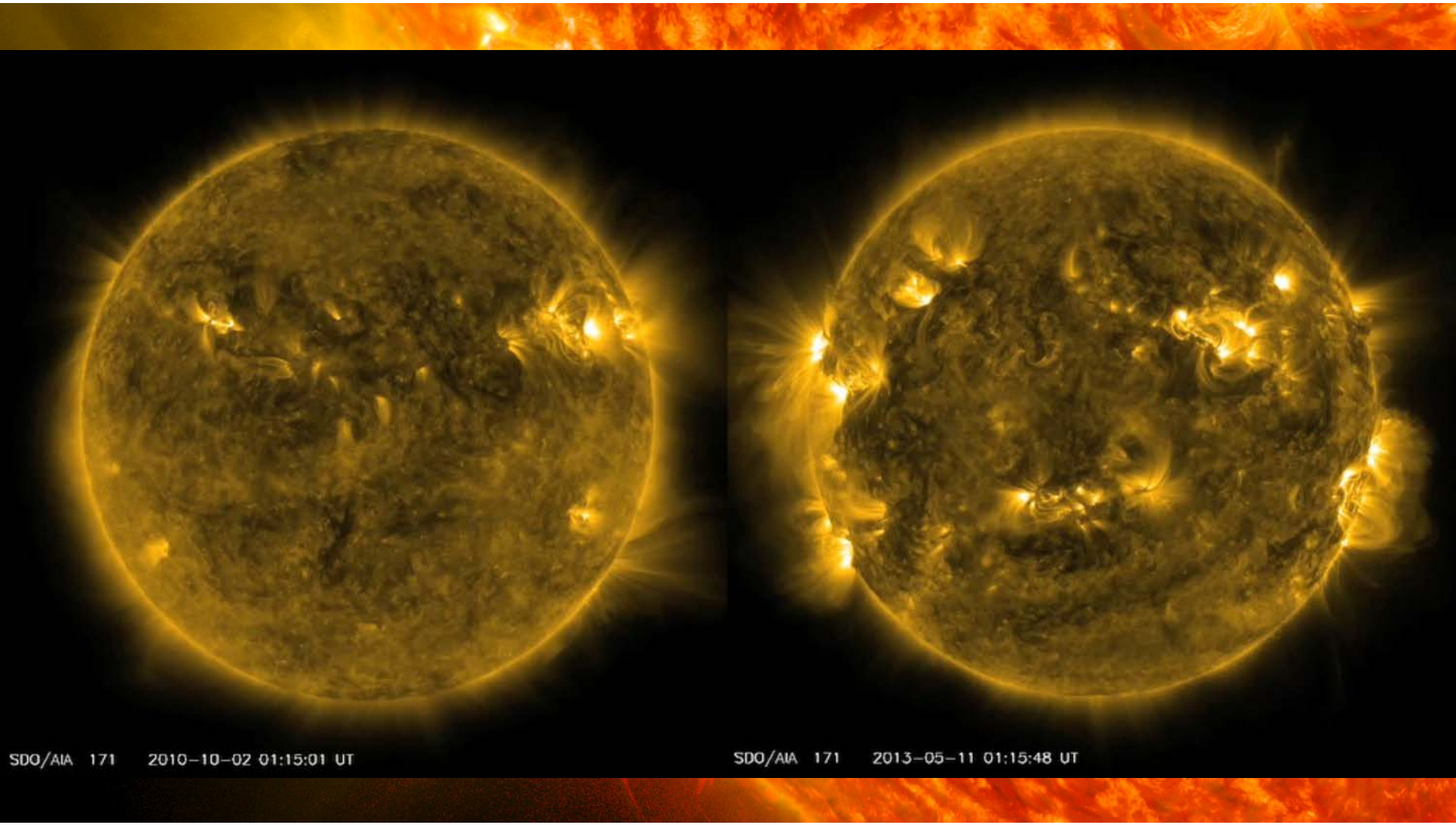




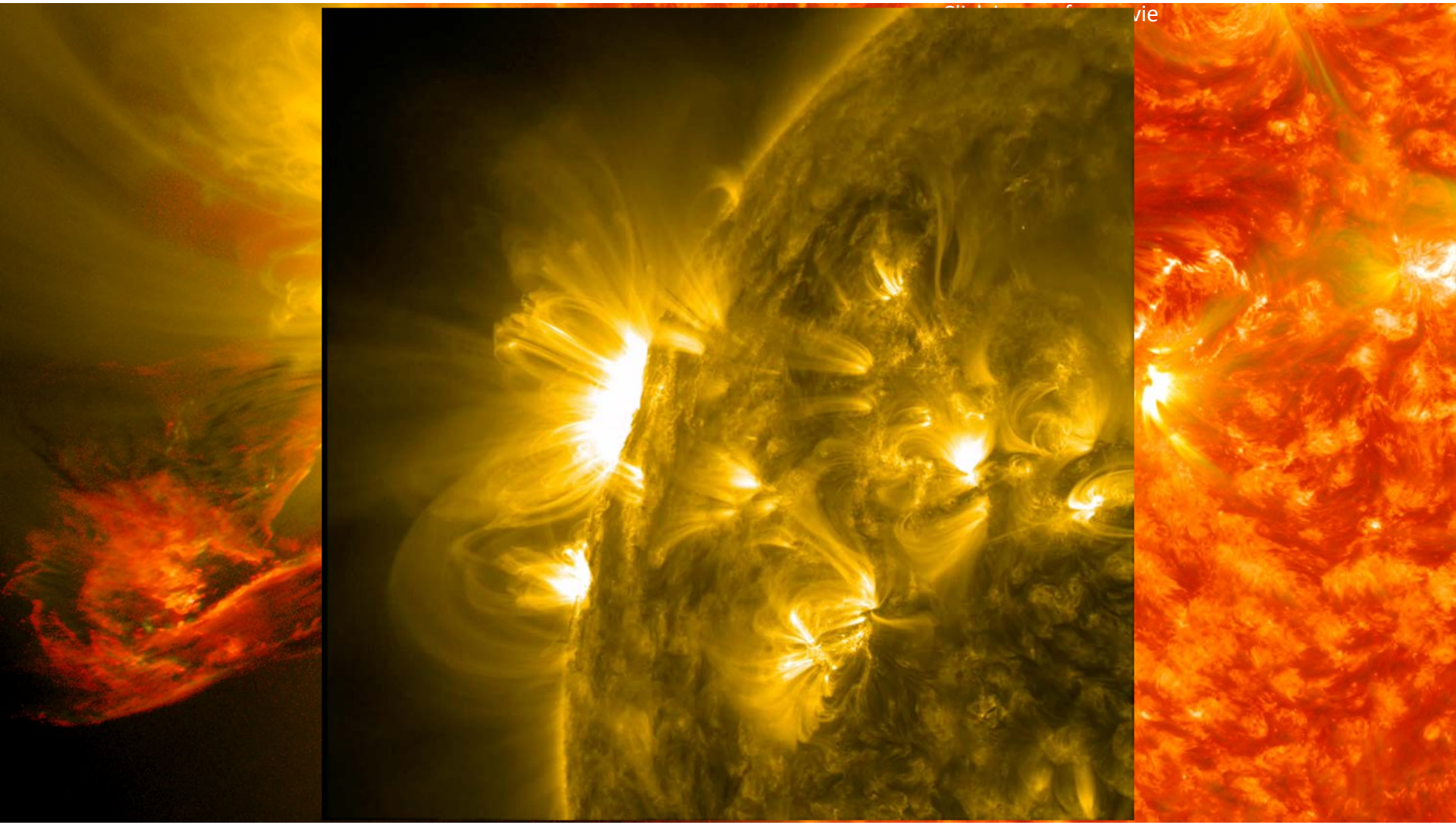




Solar Cycle: Temporal Behavior

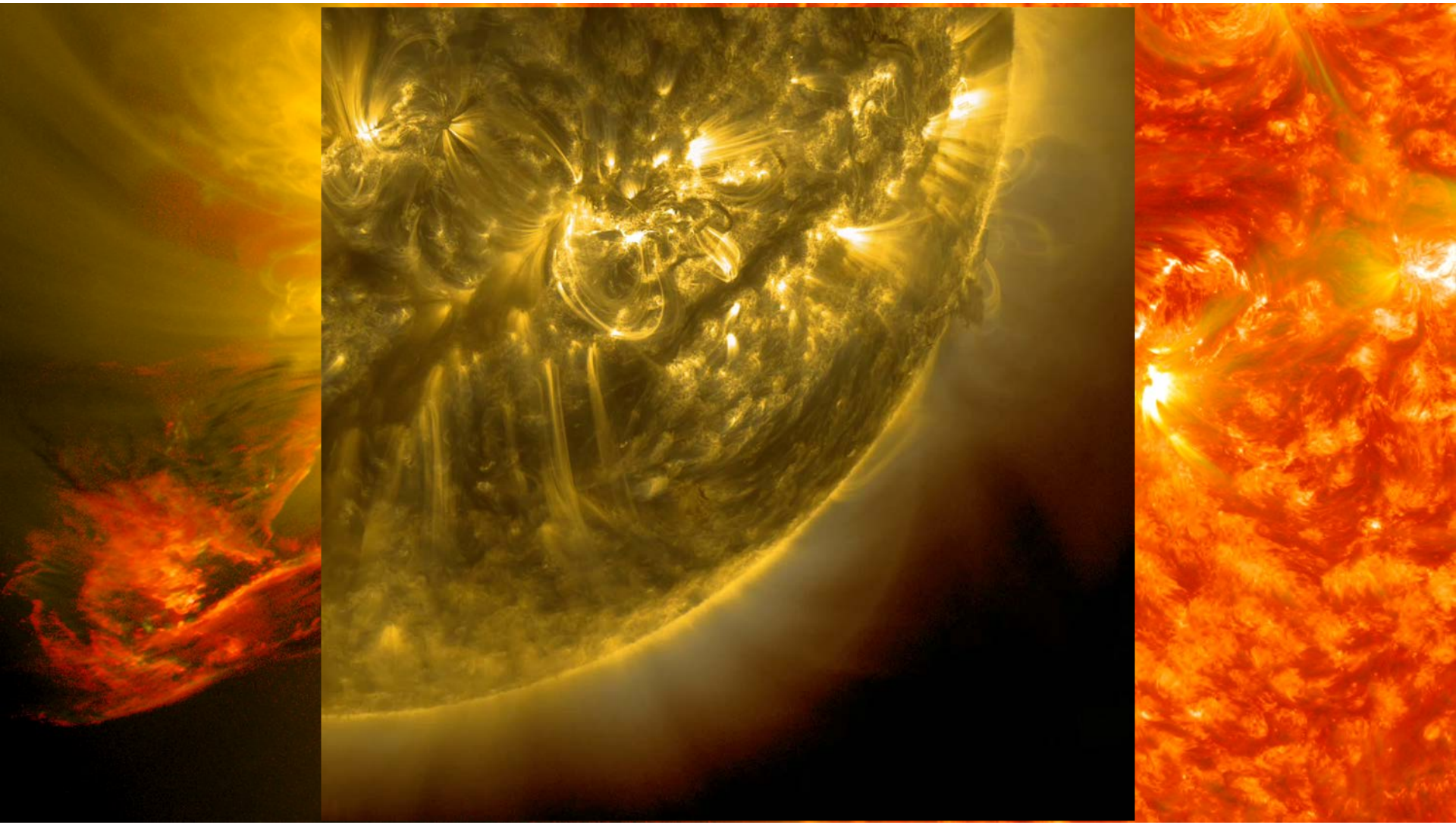


Solar Corona



The atmosphere responds to the surface motions in dramatic fashion

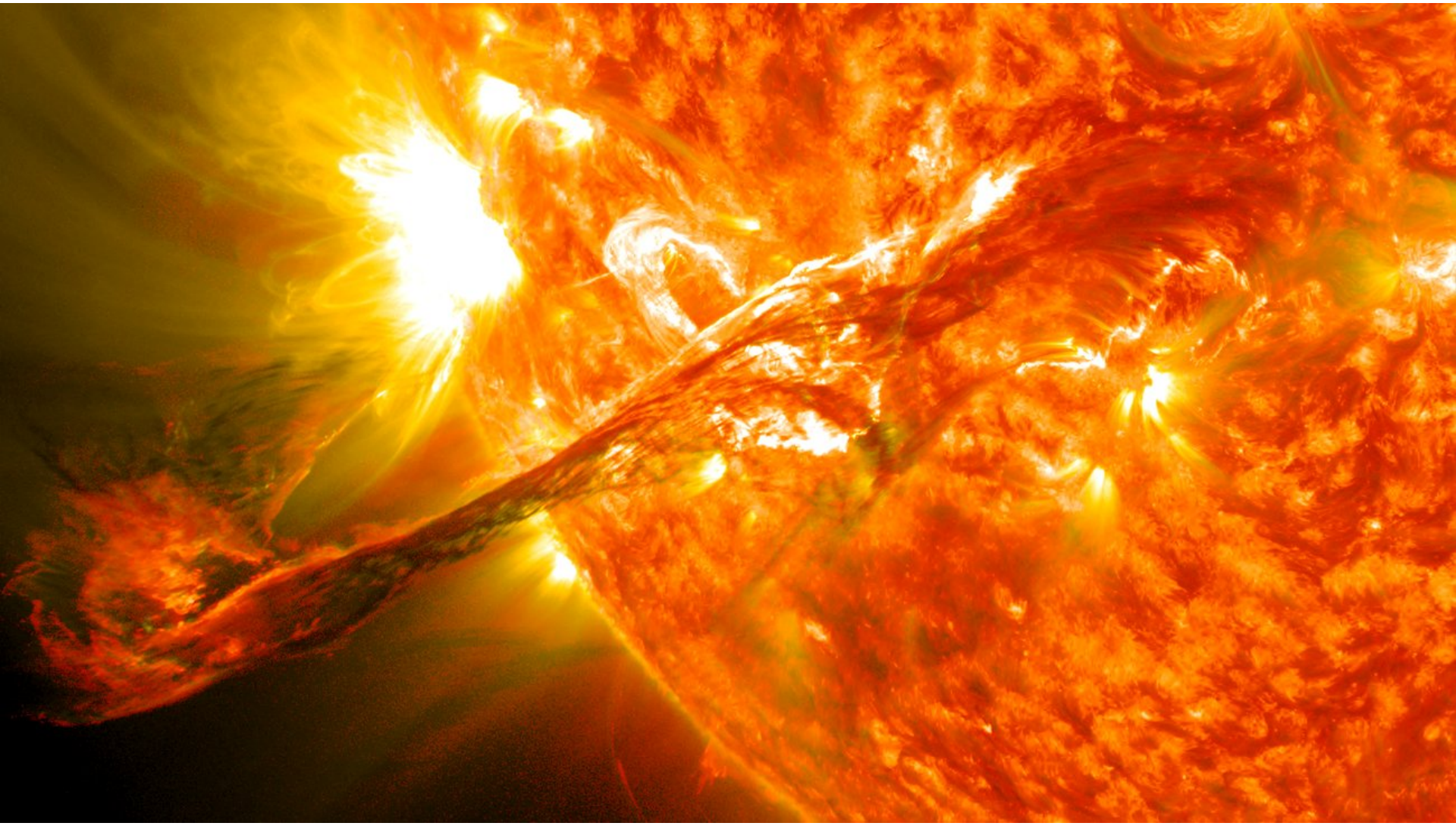
Solar Flares



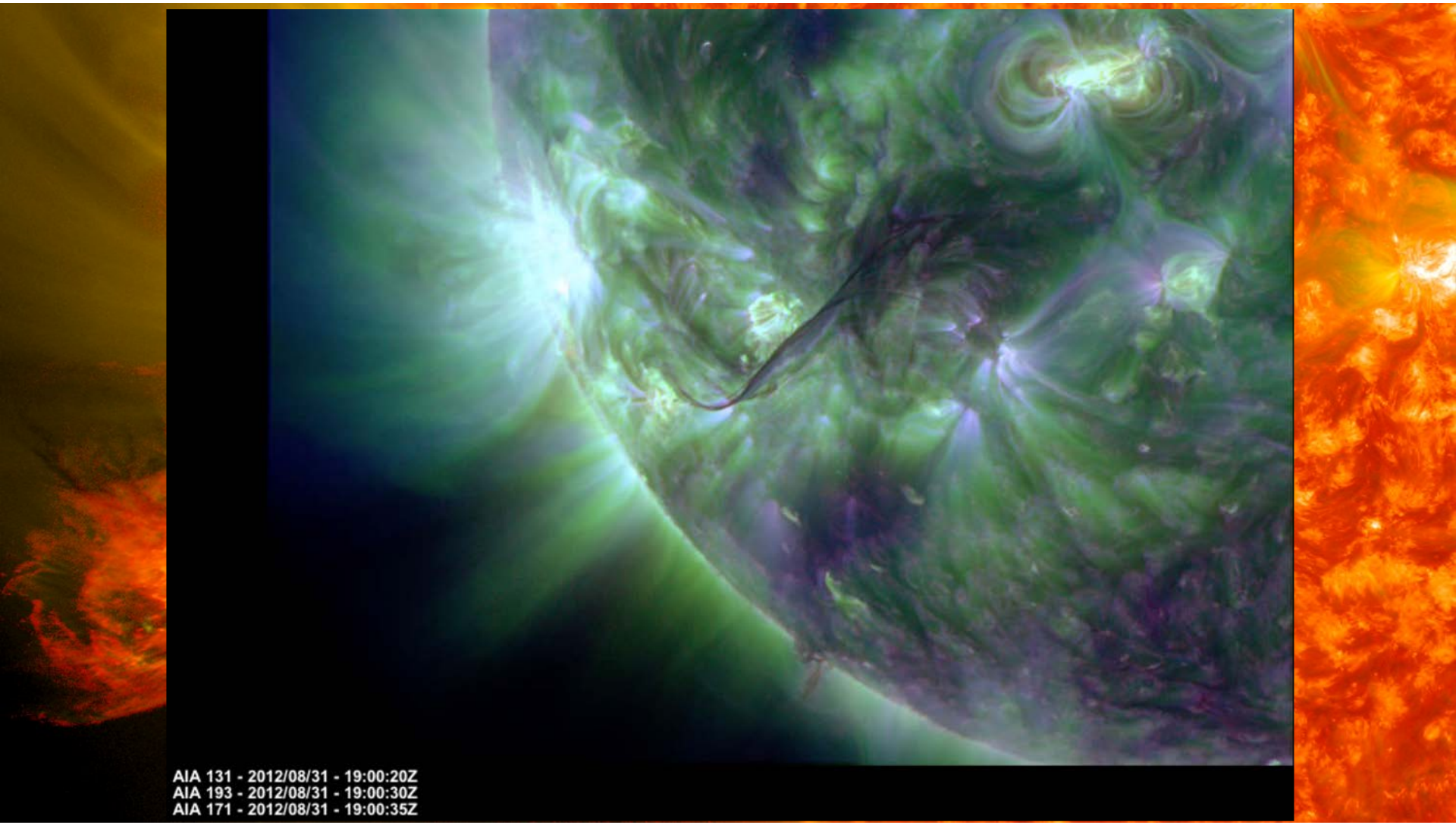
Solar flares are “explosions” in the solar atmosphere which generate lots of radiation and energetic particles.

Solar Flares

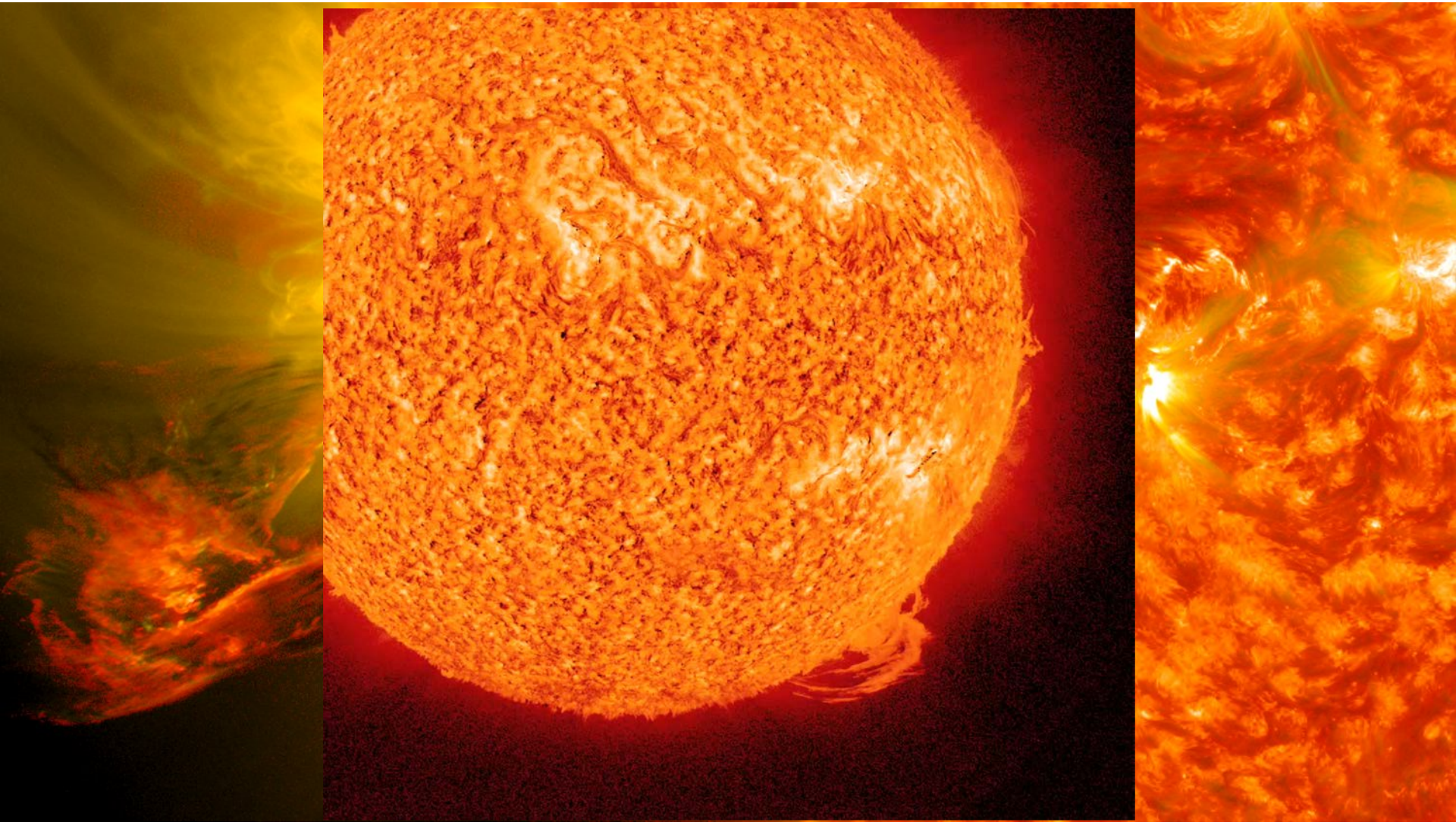
Solar Filaments



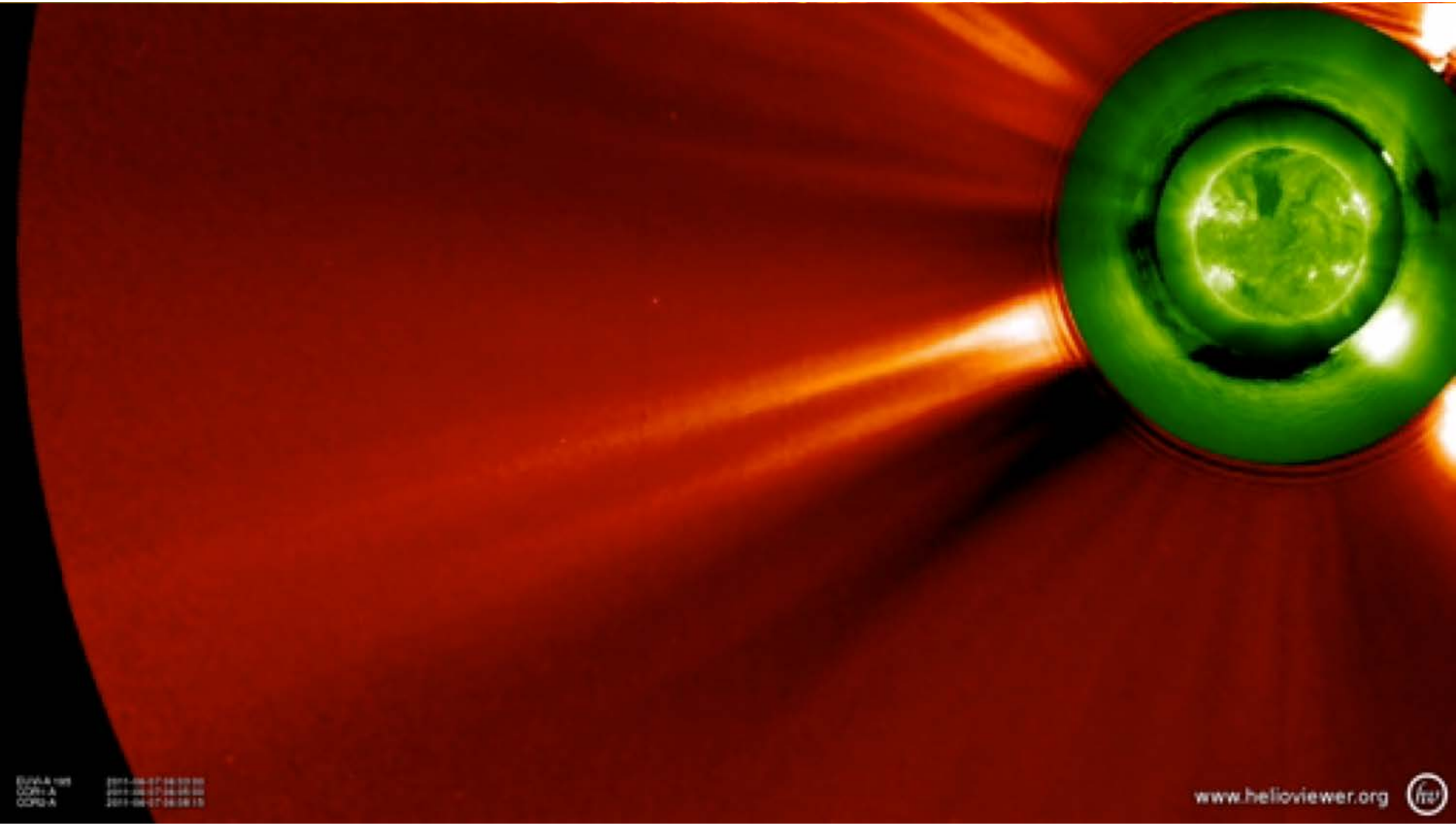
Erupting Filaments



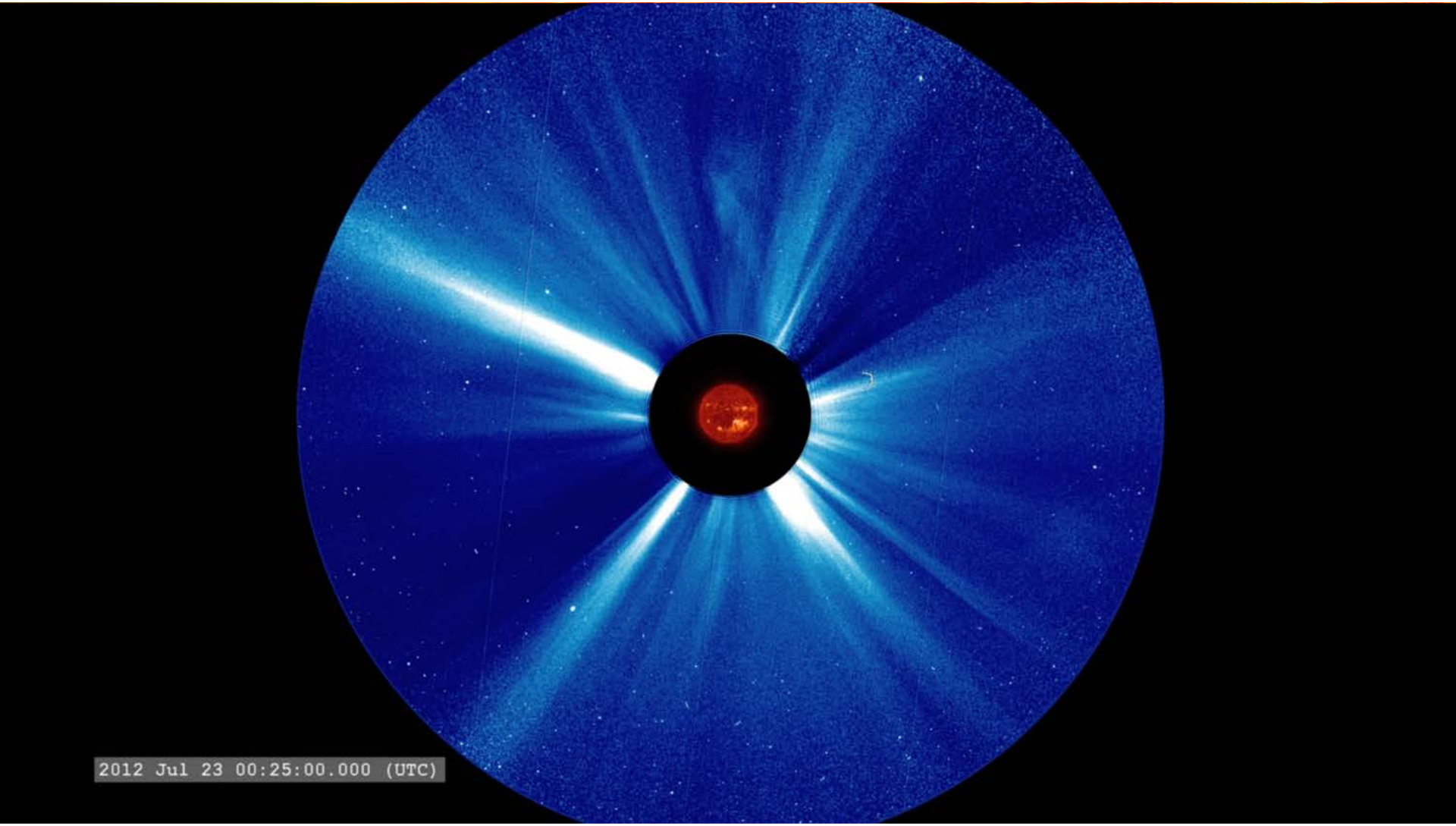
Erupting Filament



Coronal Mass Ejections

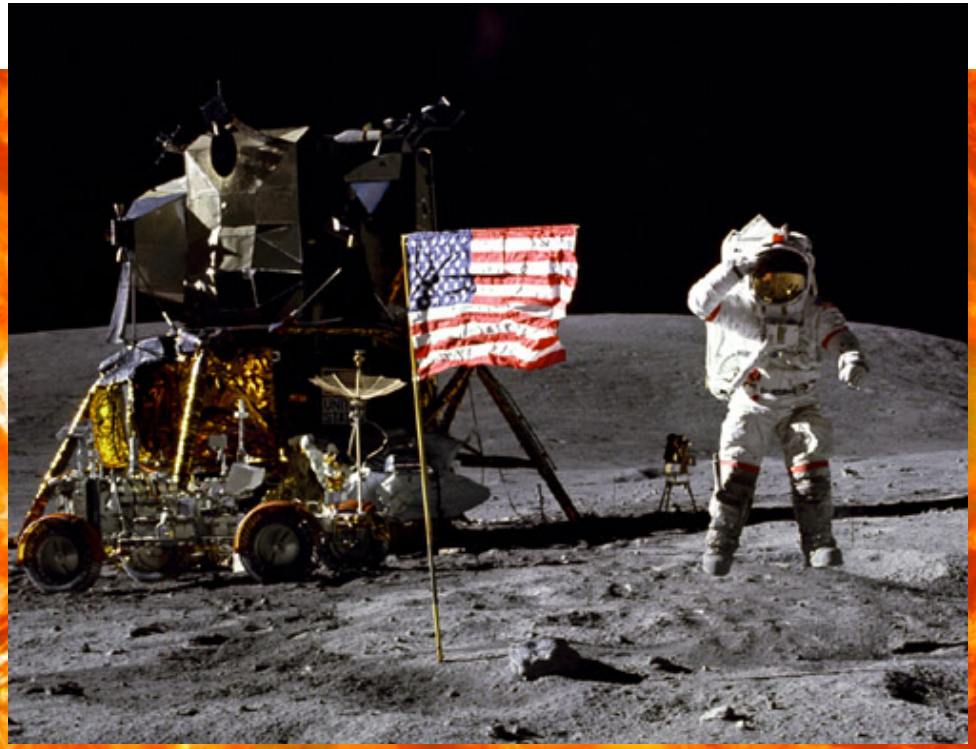


Halo CMEs

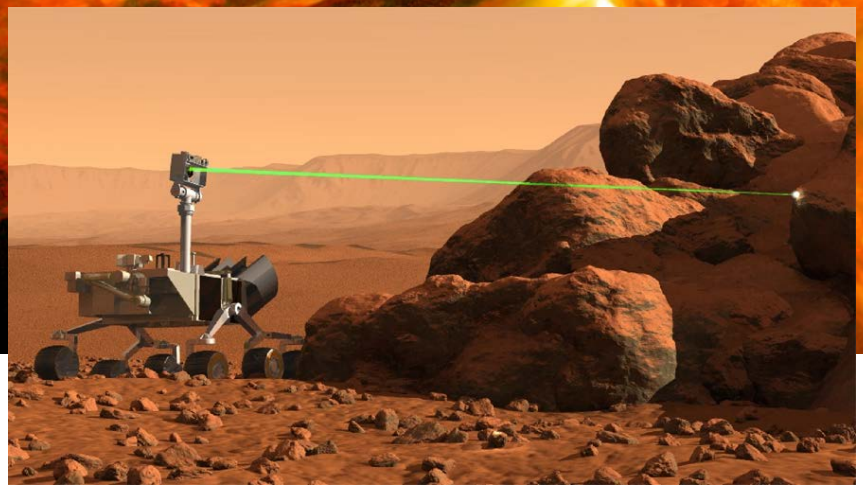


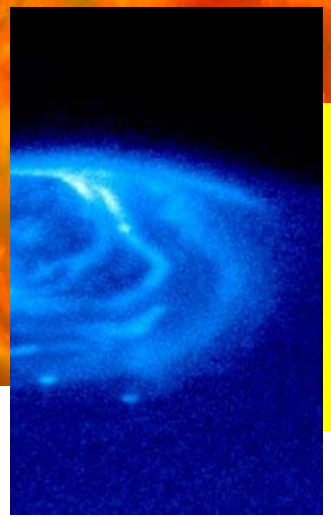
Parker Solar Probe

Space Weather affects the Moon and other planets we hope to explore.



Mars





Aurorae on Neptune, Saturn, and Jupiter