A composite space image featuring Earth, the Sun, the Moon, Mars, Jupiter, a comet, and a galaxy. The Sun is a large, glowing orange sphere in the center-left. Earth is a large blue and white sphere in the top-left. The Moon is a smaller grey sphere in the center. Mars is a reddish-brown sphere in the center-right. Jupiter is a large, striped gas giant in the bottom-right. A comet with a long tail is in the top-right. A galaxy is in the top-right. A satellite is orbiting Earth.

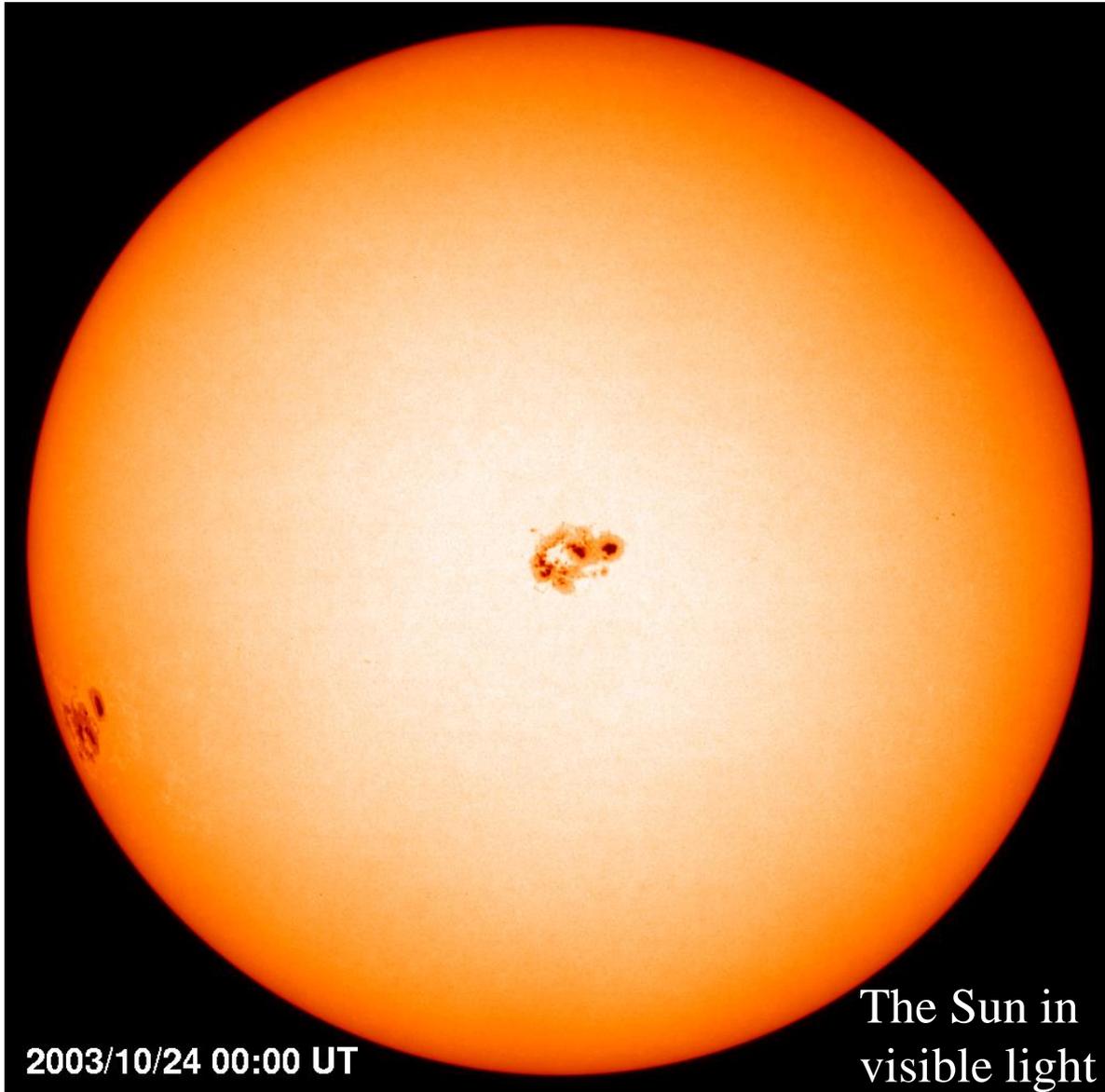
**Dr. Eric R. Christian**

**Research Scientist  
Heliophysics Division  
NASA Goddard Space Flight Center**

**Studying the Sun with satellites and eclipses**



# THE SUN

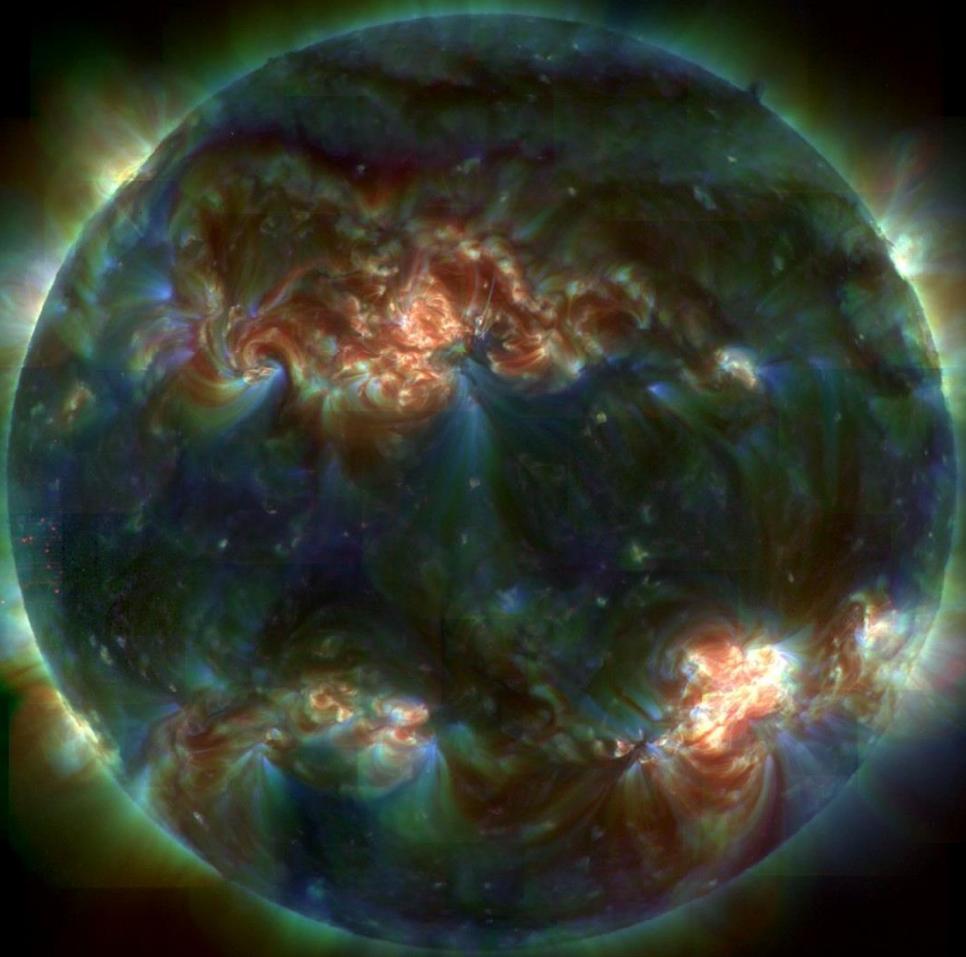


The Sun is a variable star.

That variability is driven by its magnetic field.

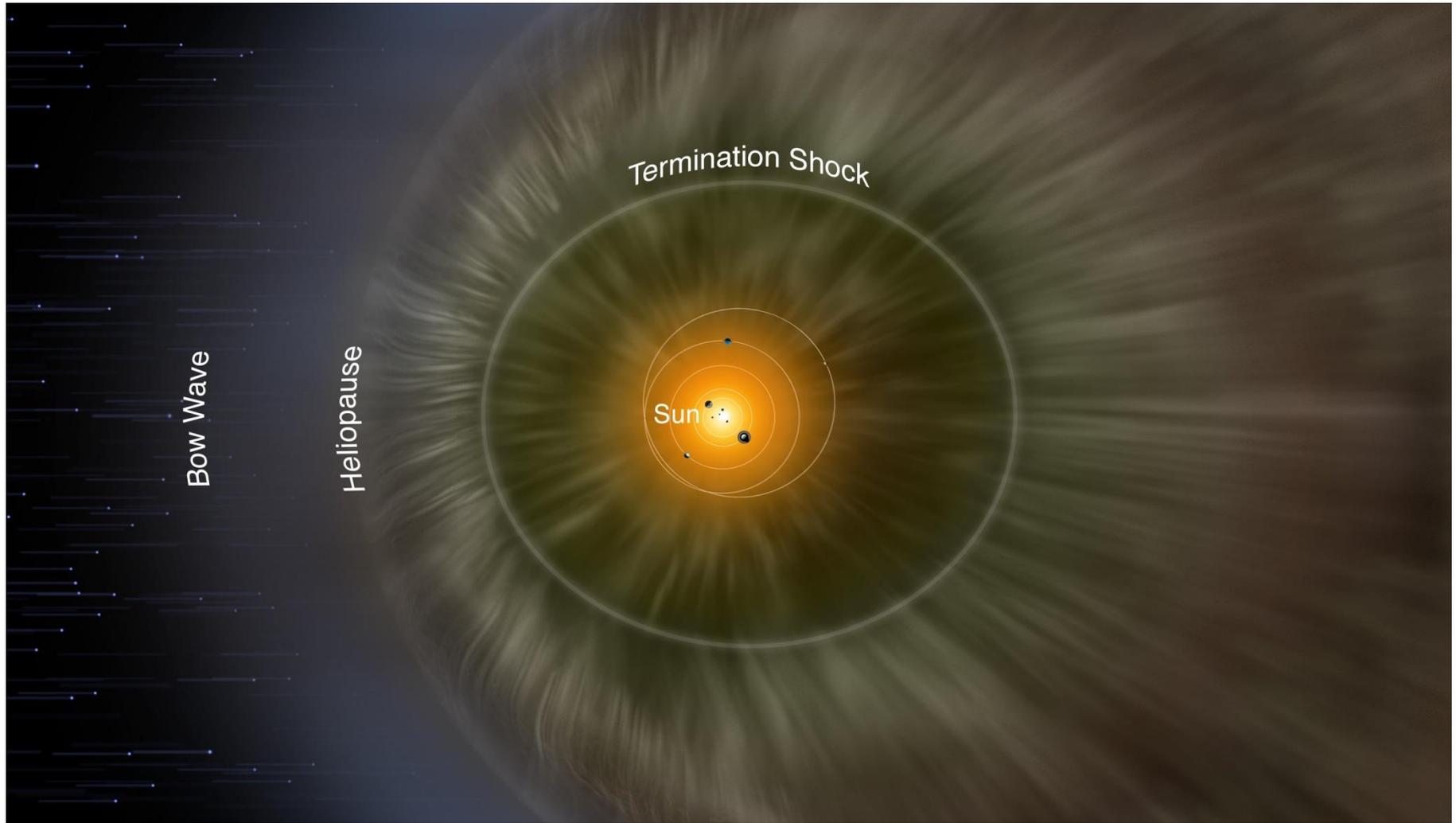
The Sun emits infrared, visible, UV, X-ray, and gamma ray photons (light), solar wind, solar energetic particles, and magnetic field.

The output is variable for ALL of these components



The Sun in  
X-rays

# The Heliosphere (the atmosphere of the Sun)



The solar wind has blown a bubble in space that extends way beyond the orbit of Pluto. We call this bubble the “Heliosphere”

# SOHO (Solar and Heliospheric Observer)

Launched in 1995

Orbiting L1 Lagrange Point

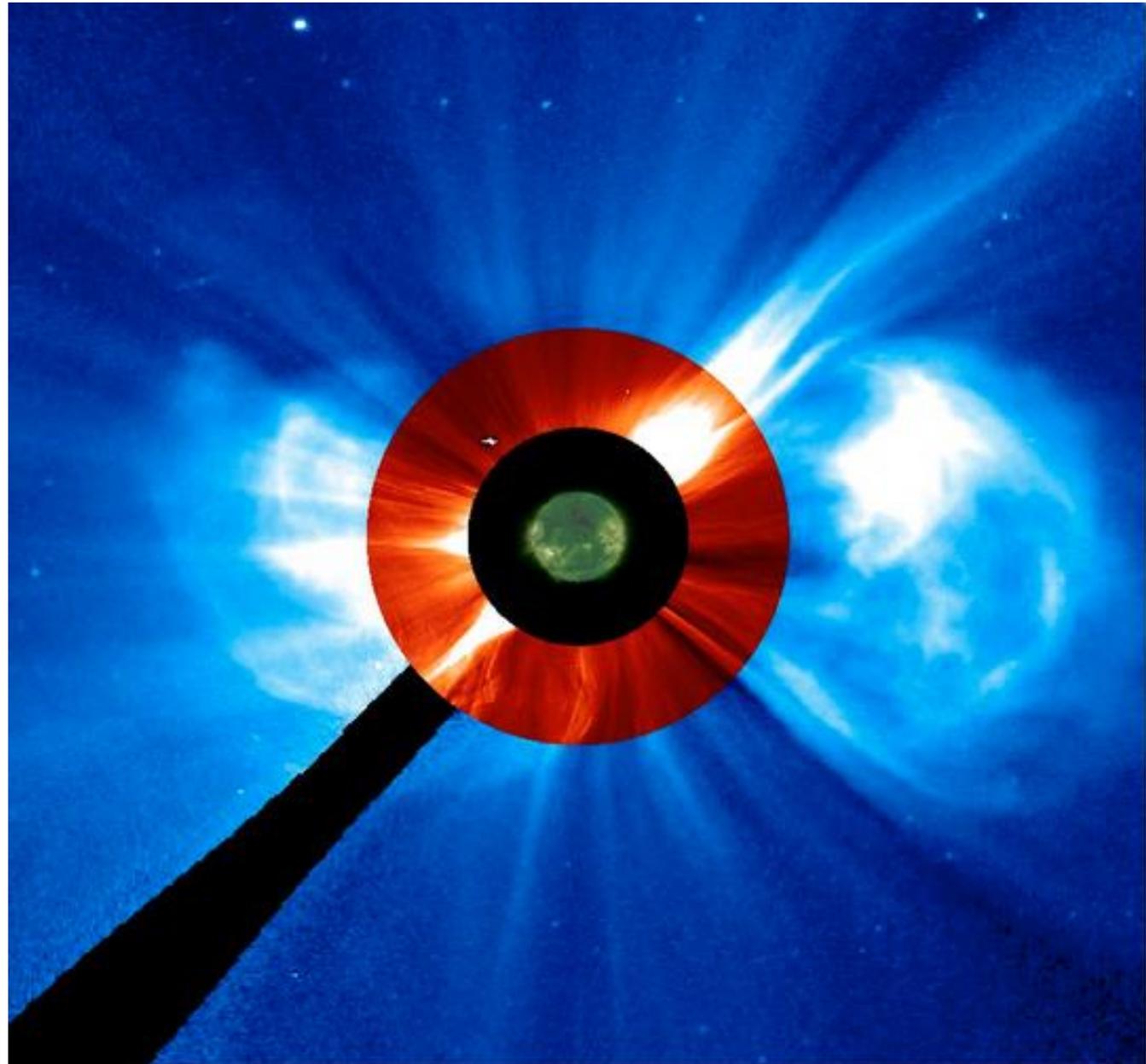
Composite image from three SOHO telescopes:

EIT (Extreme ultraviolet Imaging Telescope, green)

C2 Coronagraph (red)

C3 Coronagraph (blue)

10/26/2003

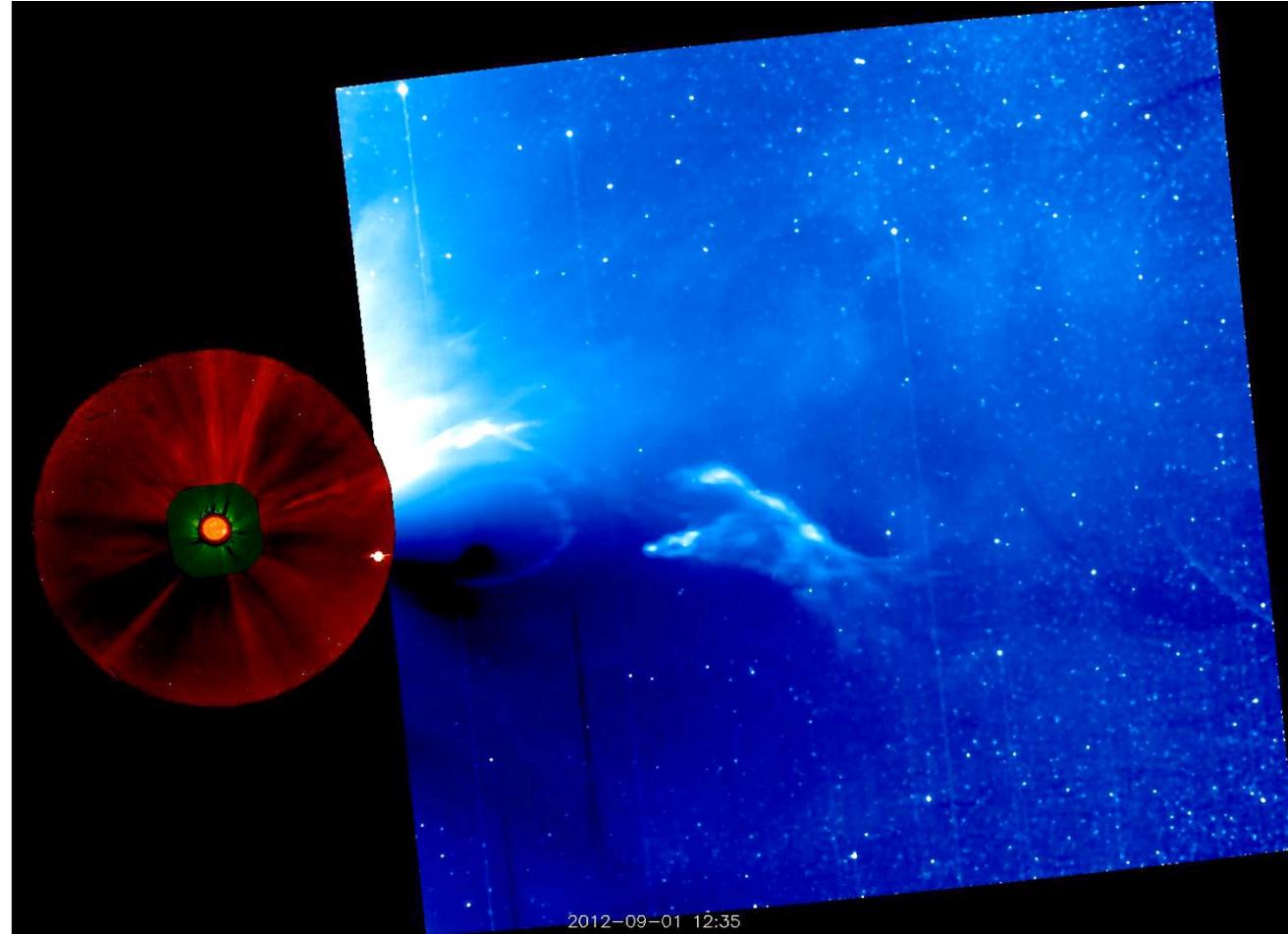


# STEREO (Solar Terrestrial Relations Observatory)

Launched in 2006

Two spacecraft that moved away from the Earth. Both are now on the far side of the Sun

Composite image from four STEREO telescopes:  
EUVI (Extreme UltraViolet Imager, orange)  
COR1 (green)  
COR2 (red)  
HI 1 (blue)



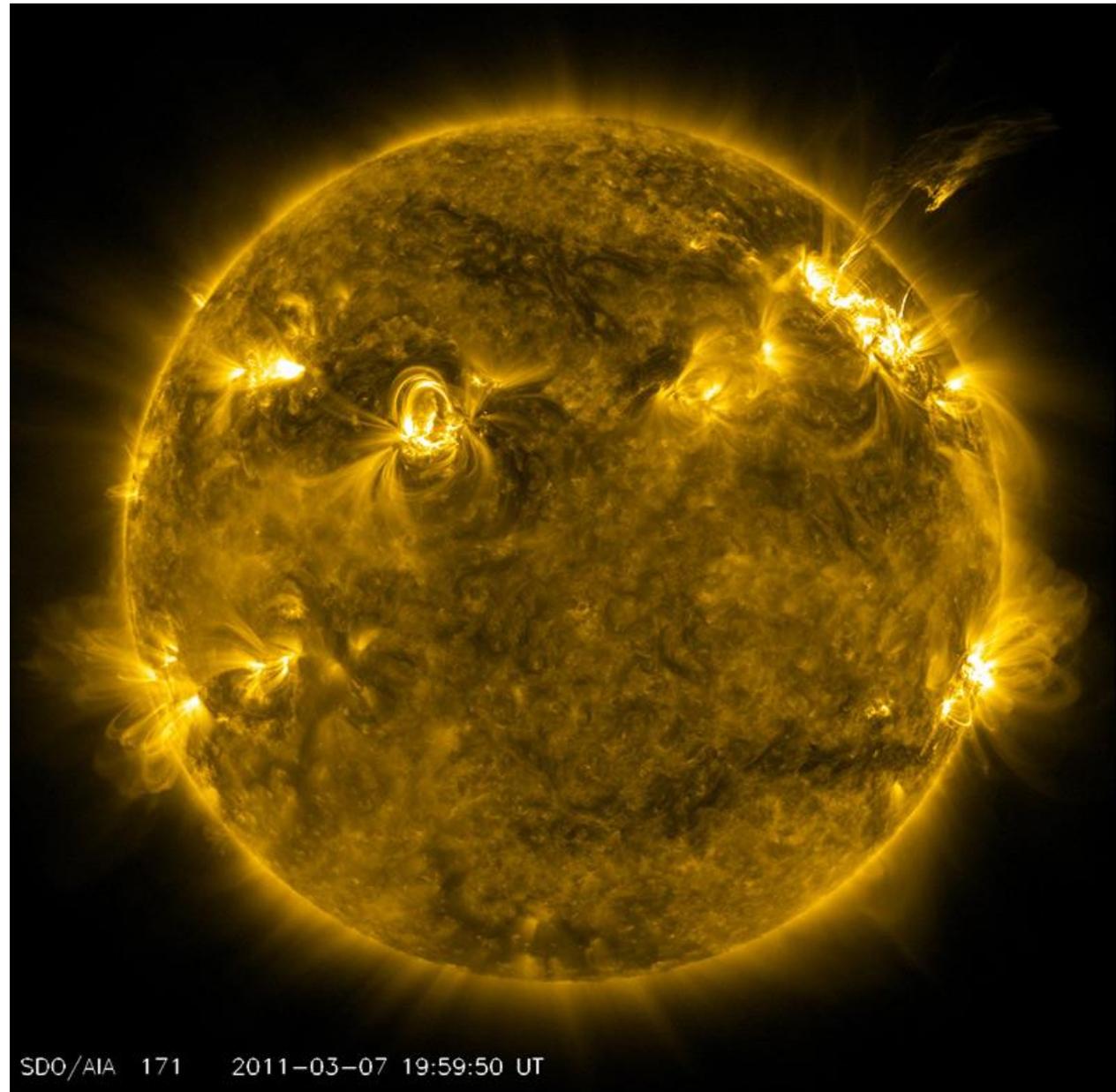
08/31/2012

# SDO (Solar Dynamics Observatory)

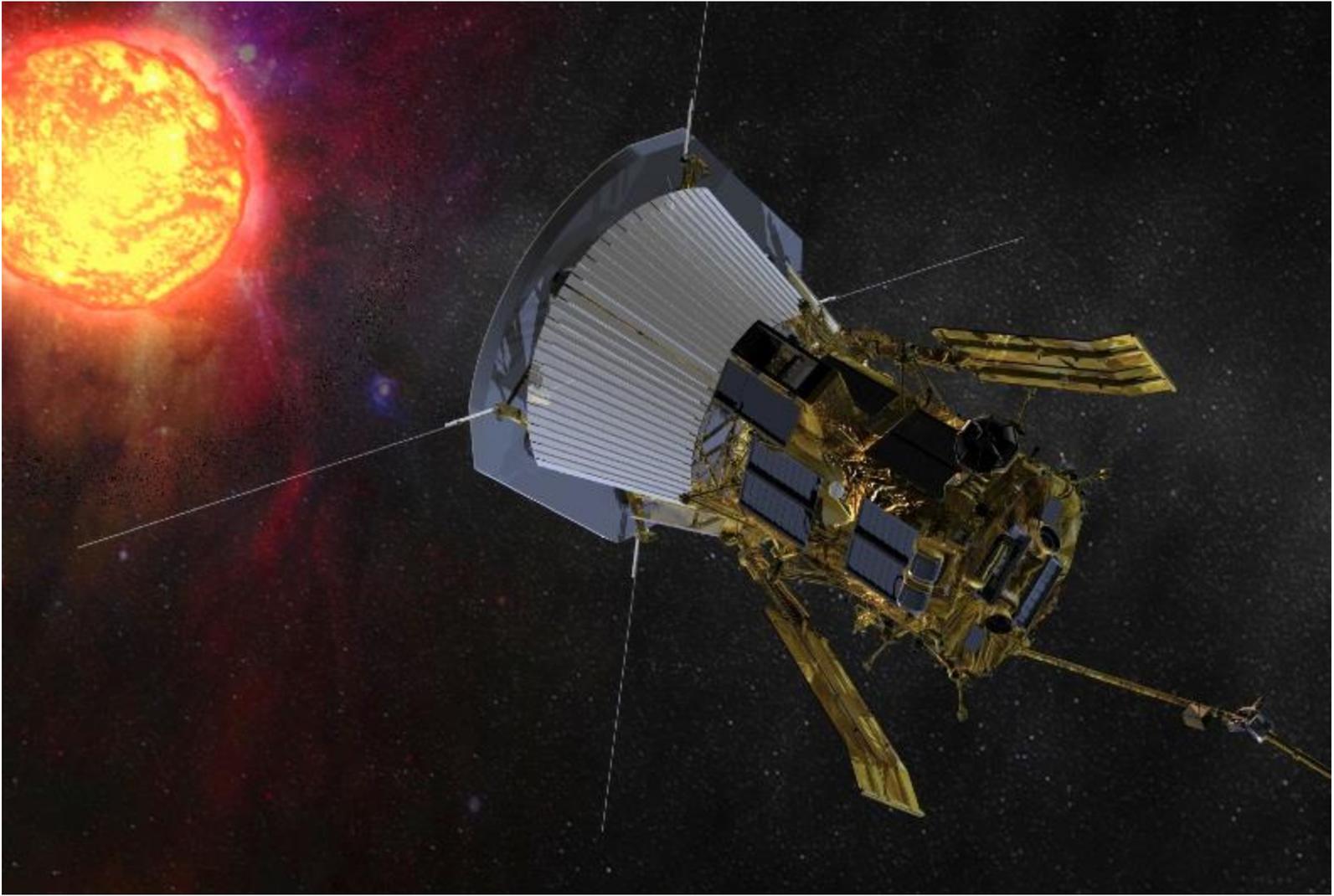
Launched in 2010

In a tilted (non-equatorial)  
geosynchronous orbit

Image from AIA  
(Atmospheric Imaging  
Assembly)

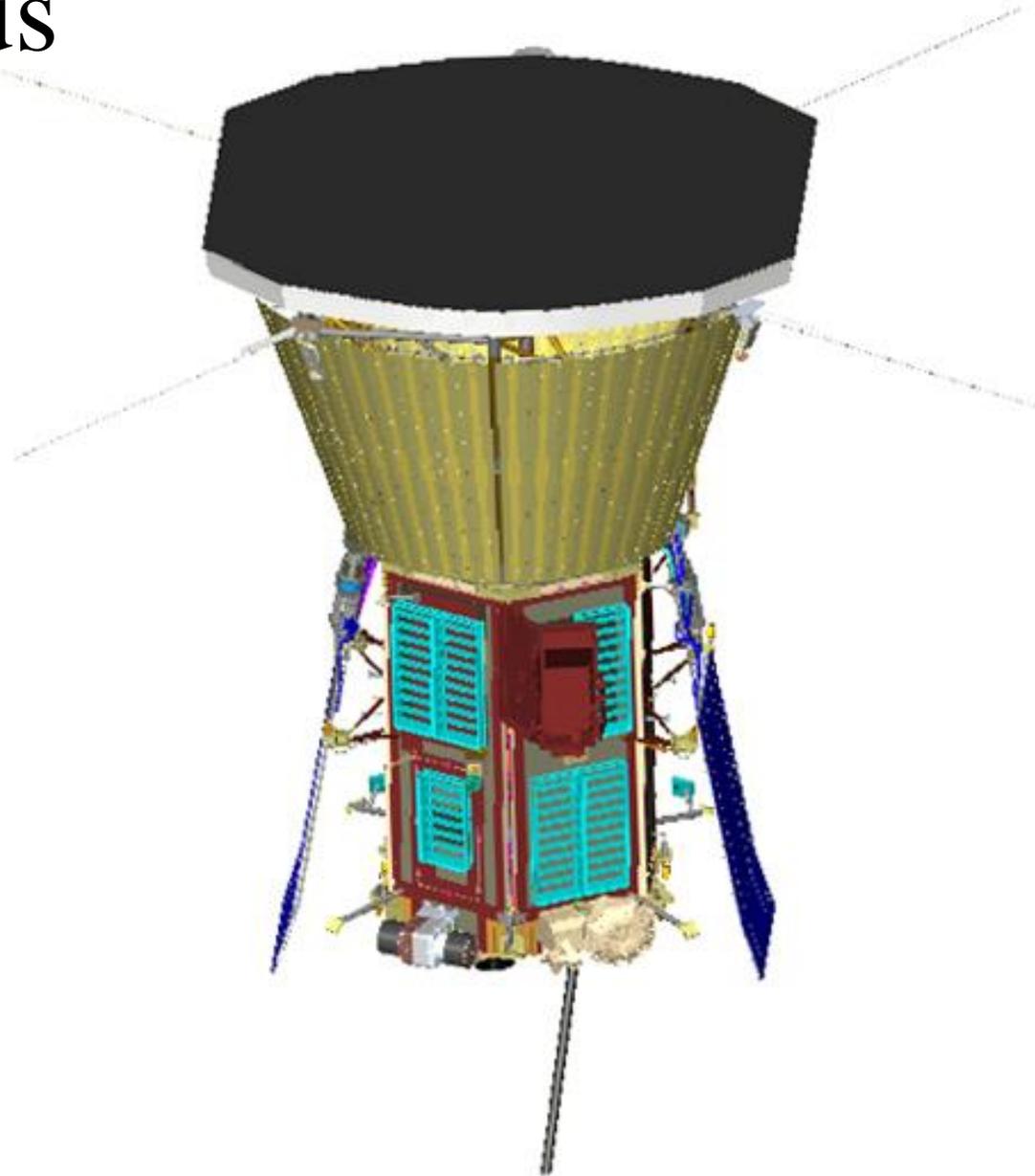


# Solar Probe Plus



# Solar Probe Plus

Solar Probe Plus is a large (685 kg, 4 meters tall) spacecraft that will launch in 2018 and travel to within 4 million miles of the Sun's surface. The Earth is 25 times further away and even Mercury is 10 times further.



# How close will Solar Probe Plus get?

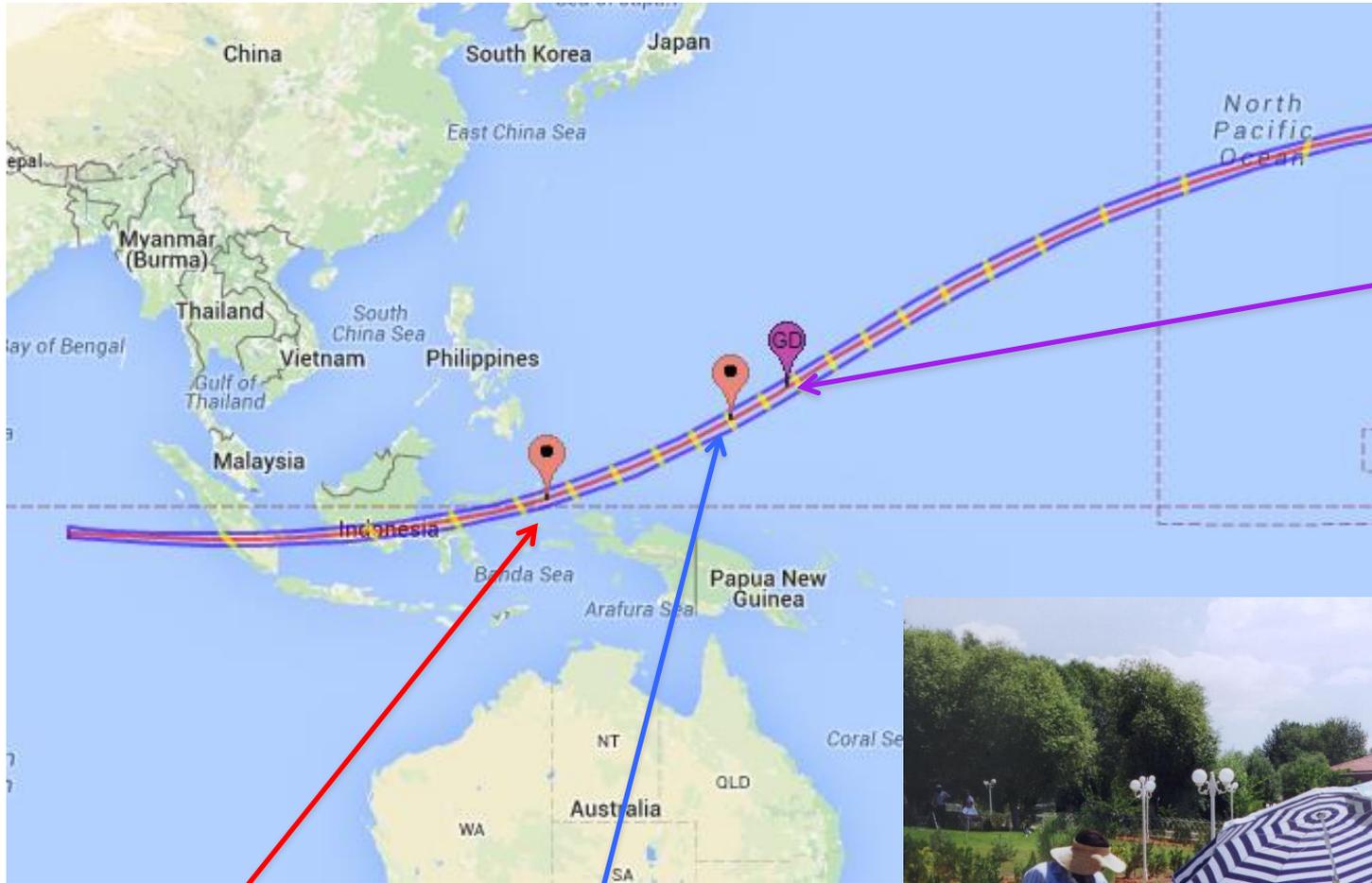


# Really close!



• Solar Probe Plus  
Closest Approach

# NASA 2016 Eclipse Science



Greatest  
Duration of  
Eclipse

Maba, Indonesia

Woleai, Micronesia



1999 Turkey