Composition of Stars

Ms. Larsh

Properties of the Sun

The Sun contains more than 99 percent of all the mass in the solar system

How does the Sun’s Density Compare to the planets?

The Sun’s average density is similar to the densities of the gas giants

Does the Sun have a Core?

No, like many other stars, the Sun’s interior is gaseous throughout because of its high temperature in the center

What is Plasma?

Plasma is the state of matter used to describe the interior of a star

The Interior of a Star

Due to extremely high temperatures, all the gases at its center are completely ionized, meaning the interior is composed only of atomic nuclei and electrons

The Sun’s Atmosphere

The Sun’s outer regions are organized into layers

Each layer emits energy at wavelengths resulting from its temperature

Photosphere

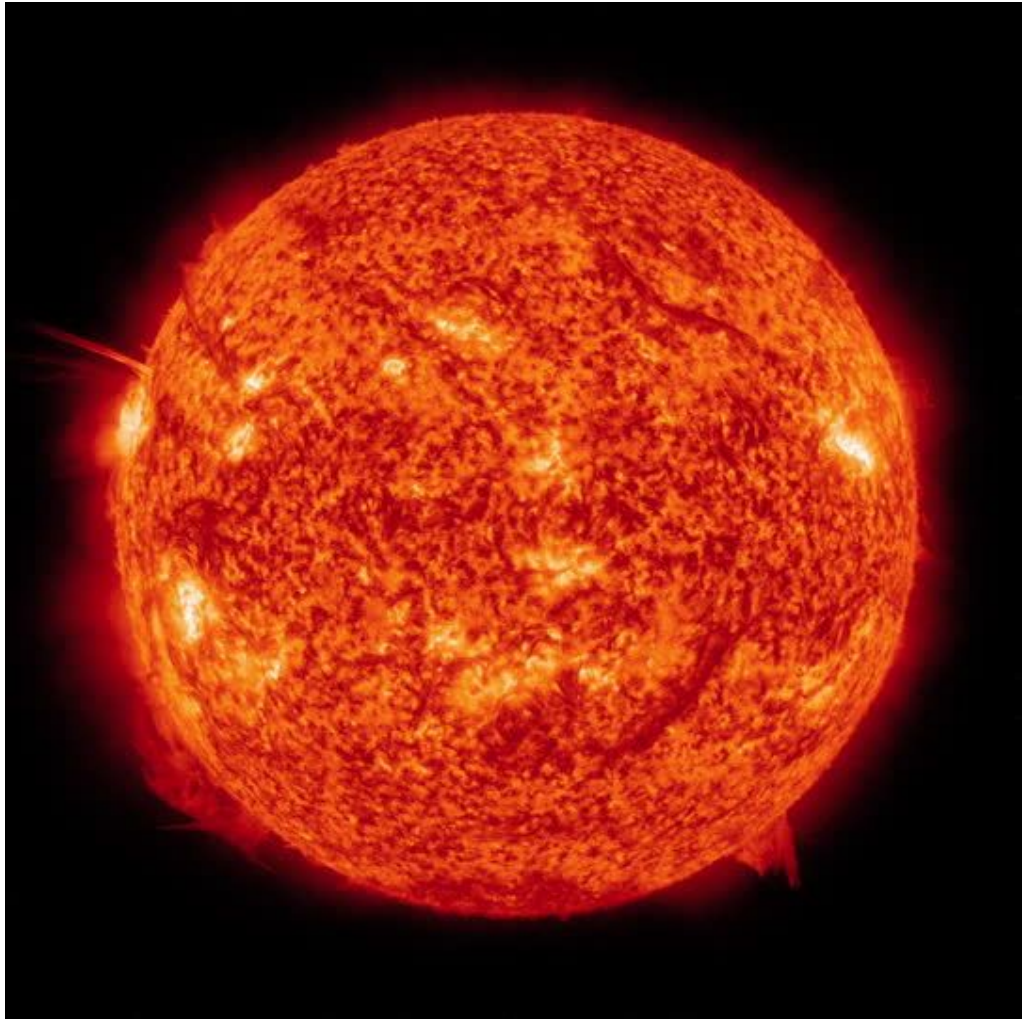
The photosphere is the visible surface of the Sun

Roughly 400 km thick & temperatures of 5800 K

Innermost layer of the Sun

Emits most of the visible light emitted by the Sun

Sun’s Photosphere



Chromosphere

The middle layer of the Sun’s atmosphere

Roughly 2500 km thick & temperatures of 15,000 K

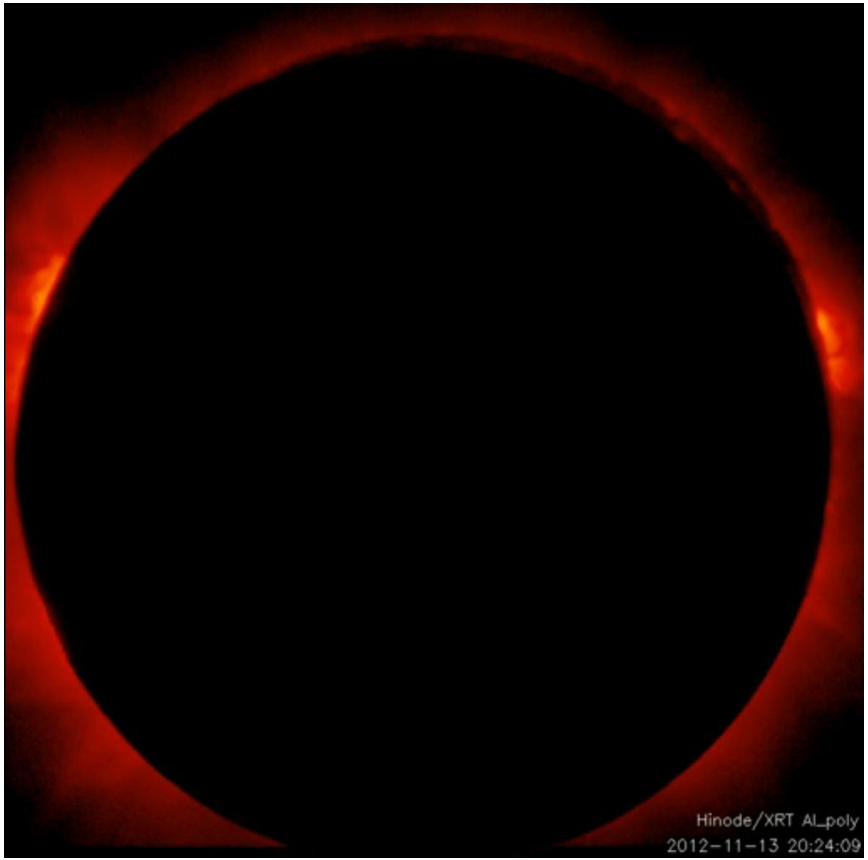
Usually only visible during a solar eclipse

Chromosphere continued . . .

Appears red because its strongest emissions are a single band in the red wavelength

Emits mostly ultraviolet wavelengths

Sun’s Chromosphere



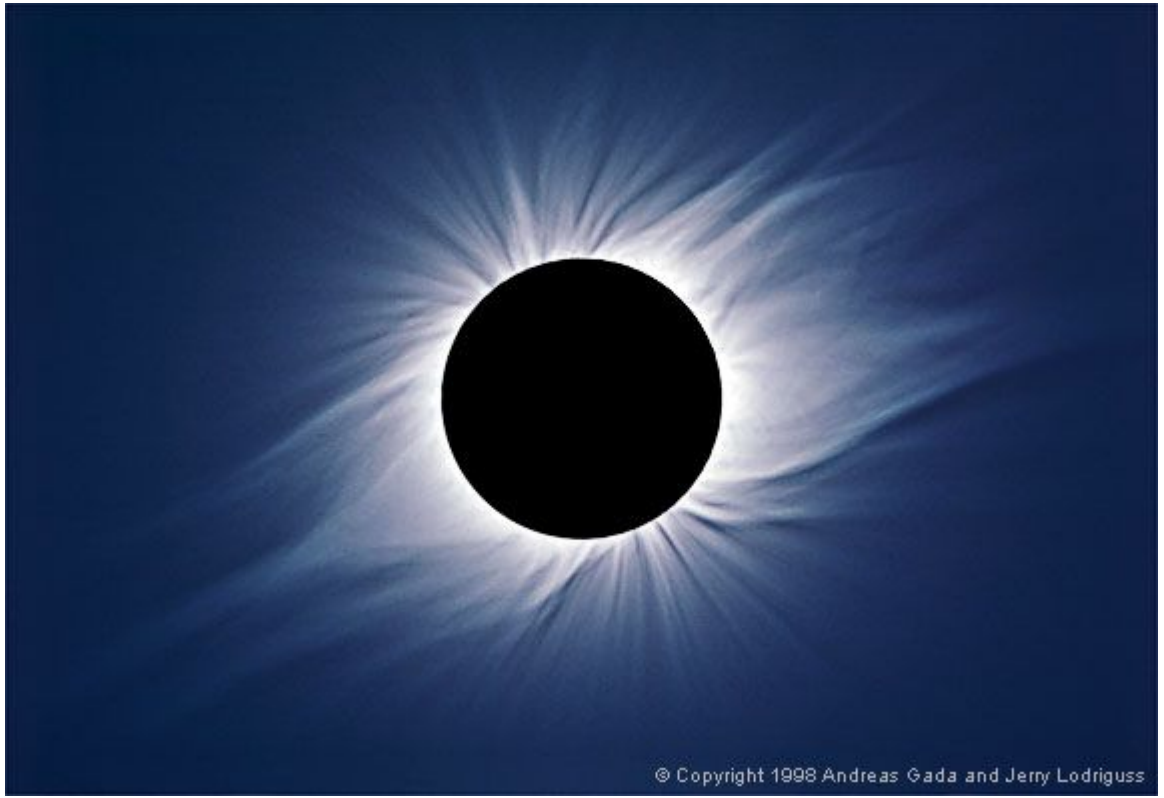
Corona

The outermost layer of the Sun’s atmosphere

Roughly several million km thick & temps of 3 to 5 million K

Emits mostly X-rays

Sun’s Corona

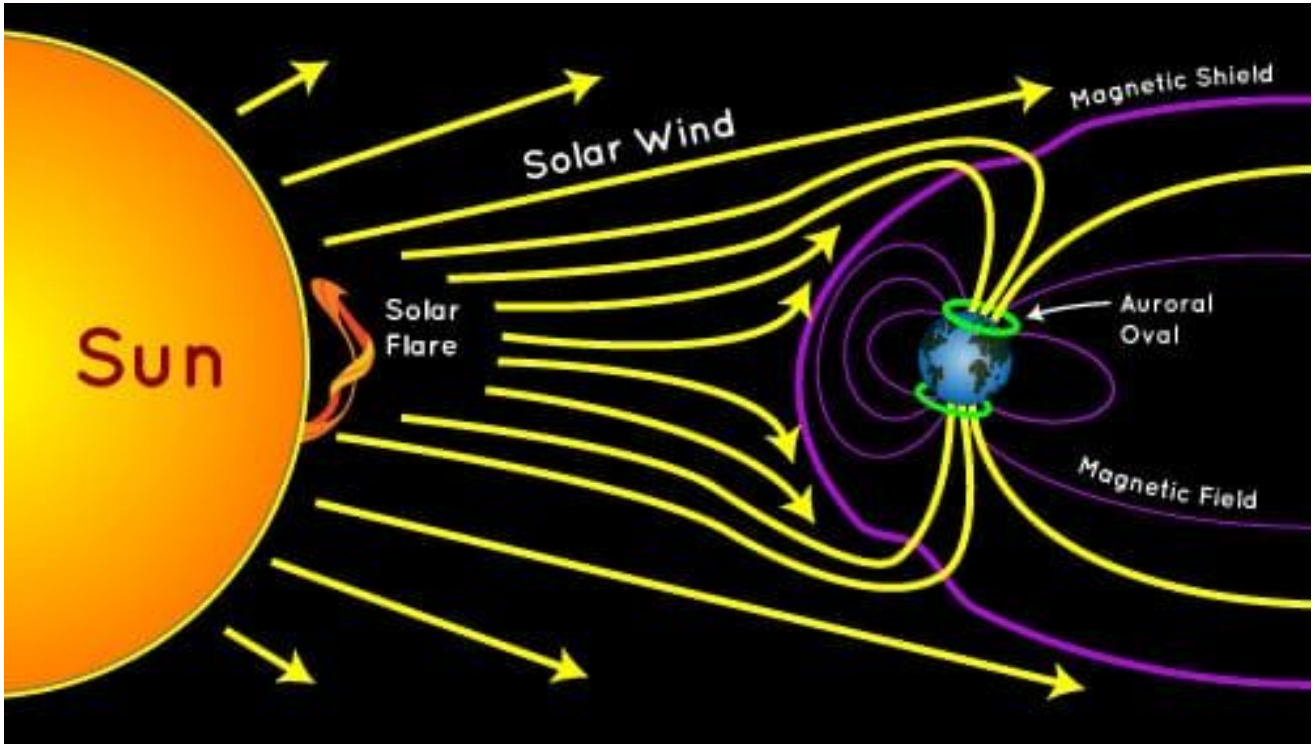


What is Solar Wind?

Plasma flows outward from the Corona at high speeds

As this wind of charged particles, called ions, flows outward through the entire solar system, it bathes each planet in a flood of particles

Solar Winds are not uniform


Sun
Solar Wind
Solar Flare
Magnetic Shield
Auroral Oval
Magnetic Field

Solar Wind & Auroras

Many of the charged particles are deflected by Earth's magnetic field & trapped in two huge rings called Van Allen belts

The high-energy particles in these belts collide with gases in Earth's atmosphere and give off light

Critical Thinking

Why do you think Aurorae are generally seen from Earth in the polar regions?

Solar Activity

While solar wind and the layers of the Sun’s atmosphere are permanent features

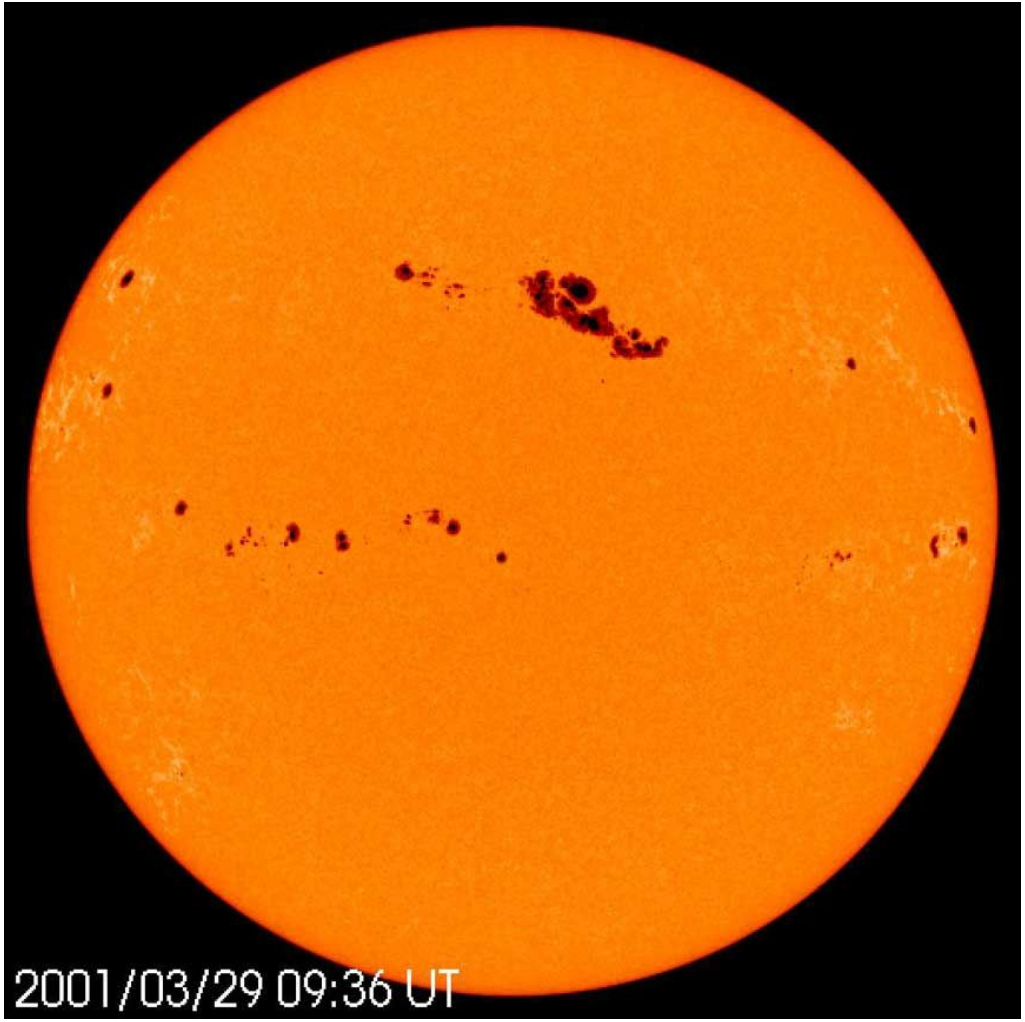
Solar Activity - the process in which features on the star/sun change over time

Sunspots

Dark spots caused by the Sun’s magnetic field which disturbs the solar atmosphere periodically

Sunspots appear dark because they are cooler than the surrounding atmosphere

Sunspots



Sunspots Continued . . .

Sunspots occur in pairs, with opposite magnetic polarities - with a north and a south pole similar to a magnet

Sunspots typically last several days, but can last for many months

Solar Activity Cycle

Sunspots change in a predictable and set pattern

The “Sunspot Cycle” takes about 11 years to complete

During this time the Sun’s magnetic field reverses

Critical Thinking

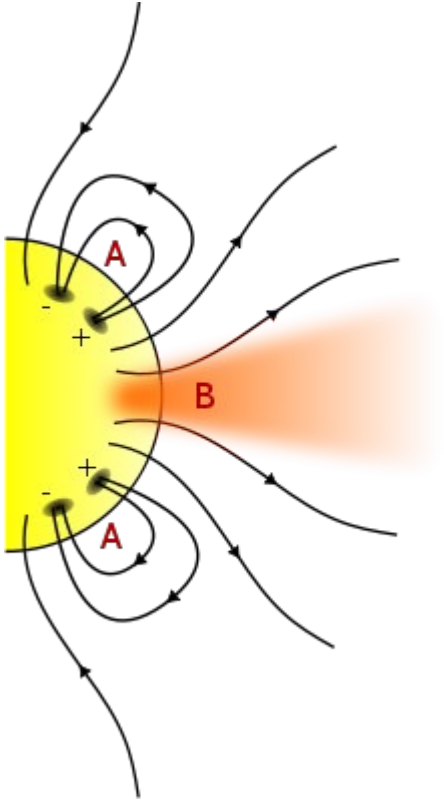
How long would it take for the Sun’s polarity to resume its “normal” position of magnetic North and South?

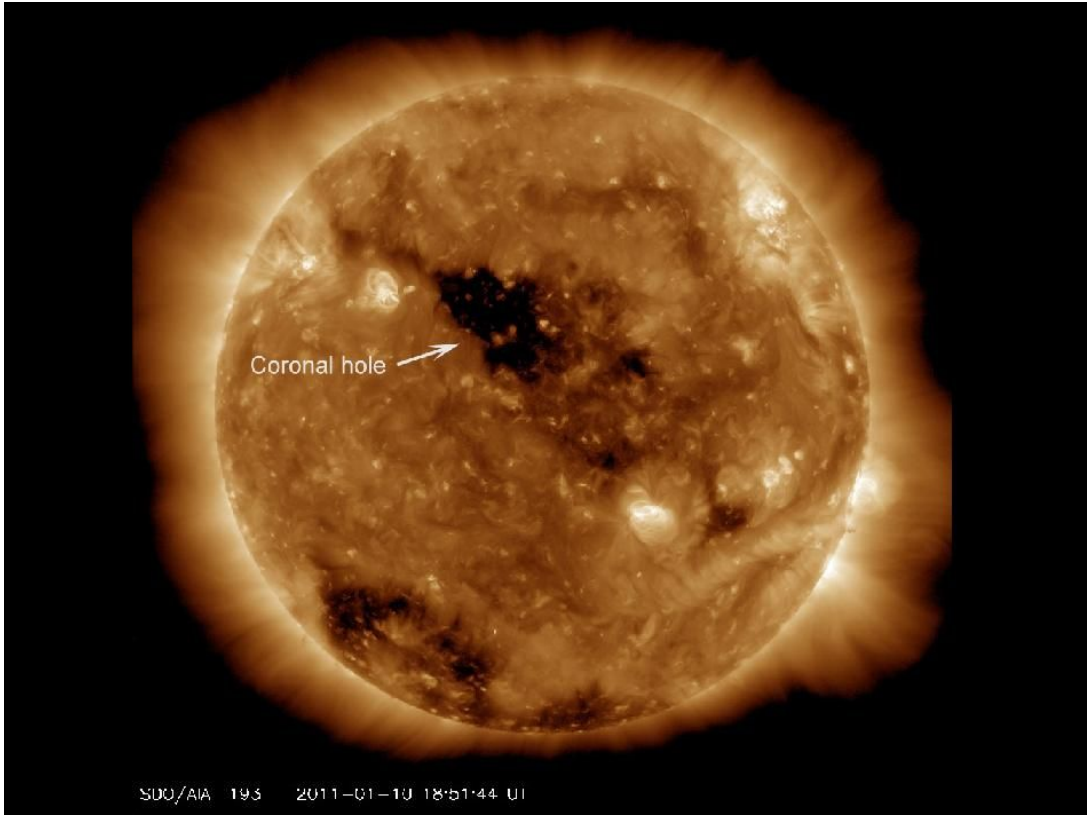
Coronal Holes

Coronal holes are only detectable in X-ray photography

Coronal holes are areas of low density in the gas of the corona, and are often located over sunspot groups

Coronal Holes



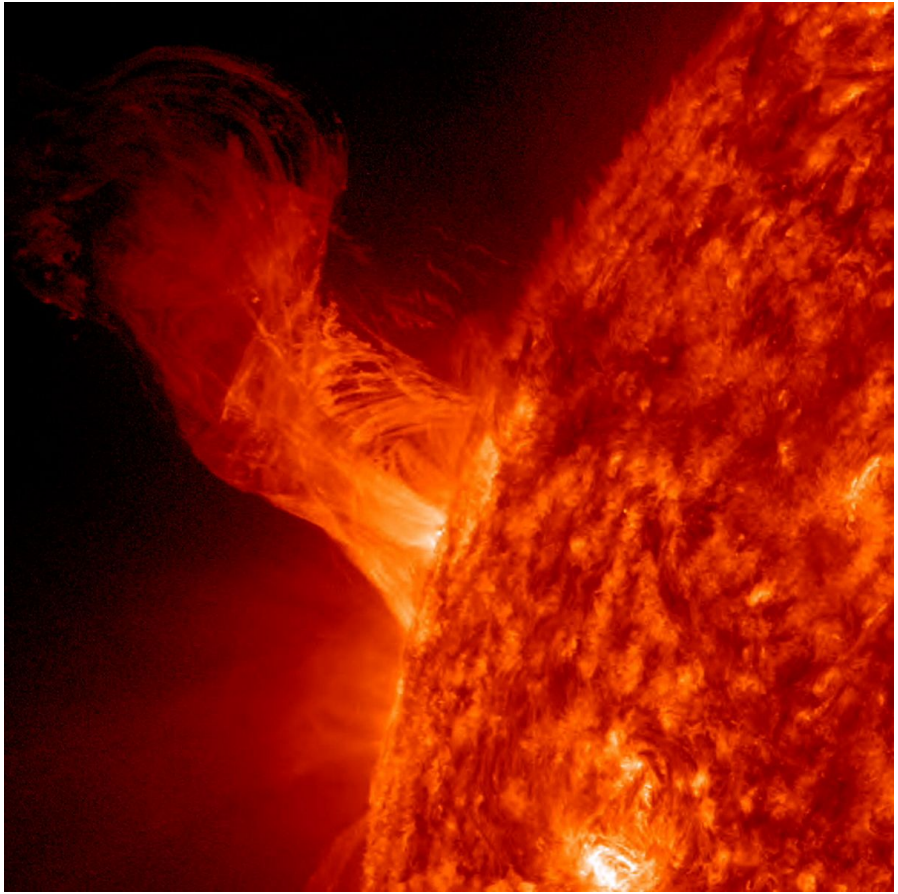


Solar Flares

Solar Flares are violent eruptions of particles and radiation from the surface of the Sun

These particles are carried by solar wind out into the Solar System

Solar Flares

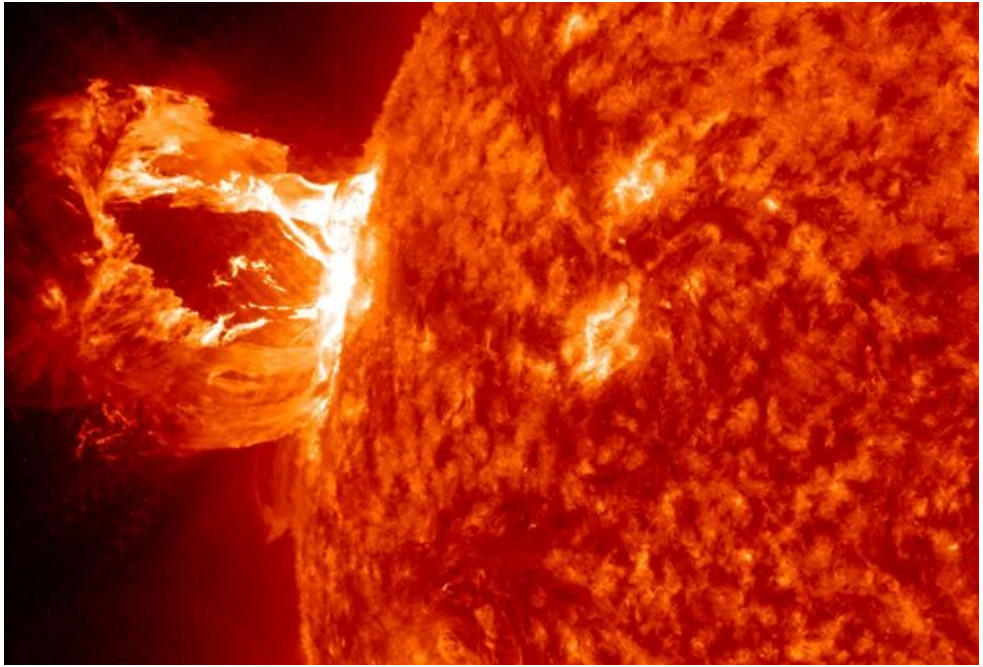


Solar Prominence

Associated with solar flares, a prominence is an arc of gas that is ejected from the chromosphere, or is gas that condenses in the inner corona and rains back to the surface

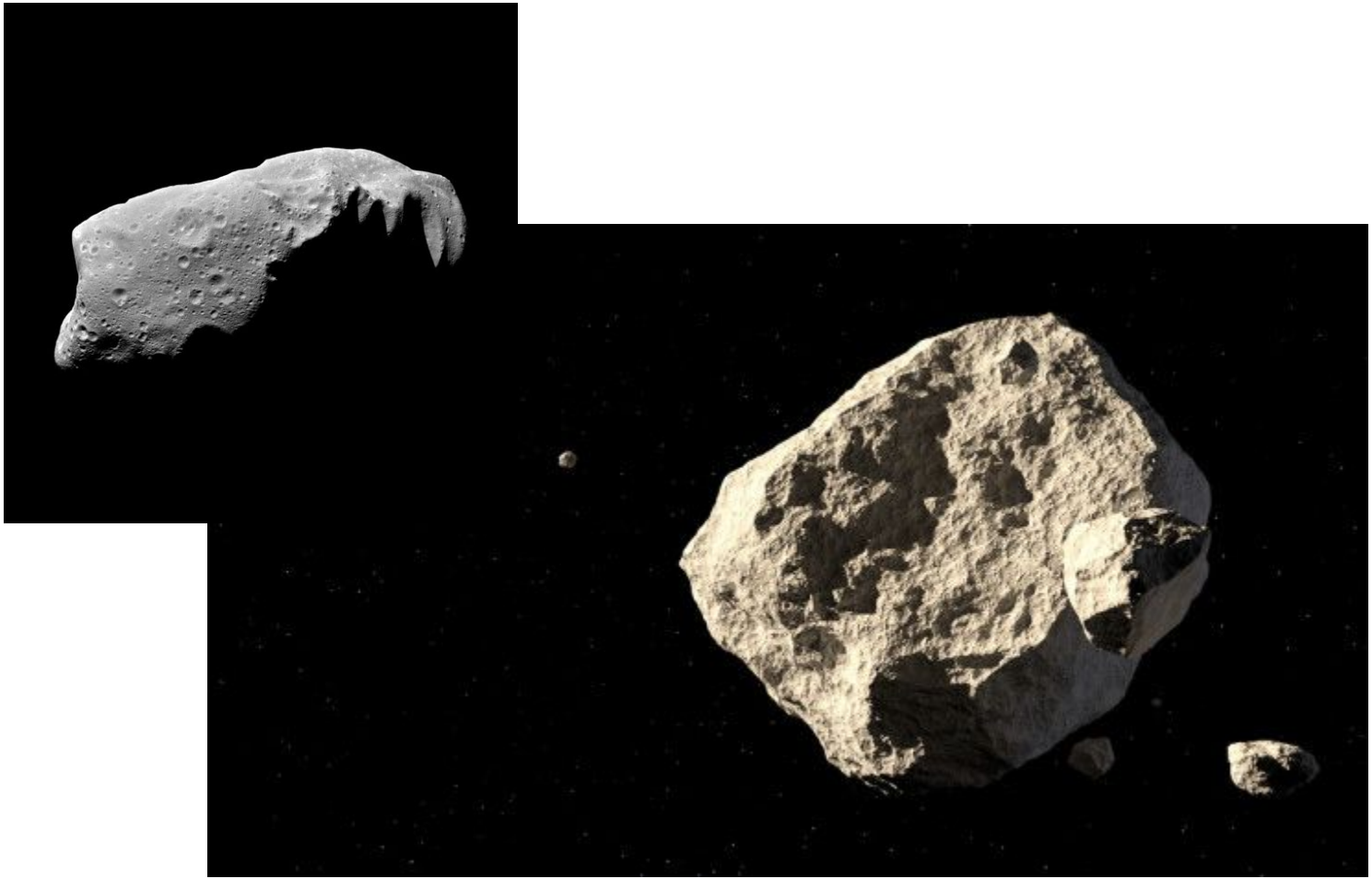
Solar prominences can last from a few hours to a few months & are associated with the Sun’s magnetic field

Prominence



Asteroids

Metallic or silica-rich object, 1m to 950 km in diameter, that bombarded early Earth, generating heat energy; rocky remnant of the early solar system found mostly between the orbits of Mars and Jupiter in the Asteroid Belt



Meteoroids

Piece of interplanetary material that falls toward Earth and enters its atmosphere


Meteoroids

Meteors

Streak of light produced when a meteoroid falls toward Earth and burns up in Earth’s atmosphere

Meteorites

A small fragment of an orbiting body that has fallen to Earth, generating heat; it does not completely burn up in Earth’s atmosphere and strikes Earth’s surface, sometimes causing an impact crater

Comets

Small, eccentrically orbiting body made of rock and ice, which have one or more tails that point away from the Sun

Critical Thinking

Why do comet’s tails always point away from the Sun?

Comets