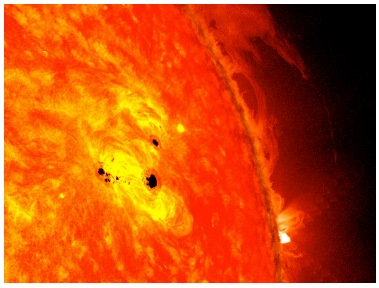
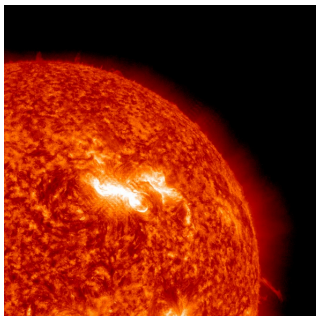
Visible Features of the Sun using a Hydrogen-alpha Telescope

Sunspots are areas that appear dark on the surface of the Sun. They appear dark because they are cooler than other parts of the Sun's surface.



The surface of the Sun is a very busy place. It has electrically charged gasses that generate areas of powerful magnetic forces. These areas are called **magnetic fields**. The Sun's gasses are constantly moving, which tangles, stretches and twists the magnetic fields. This motion creates a lot of activity on the Sun's surface, called **solar activity**.

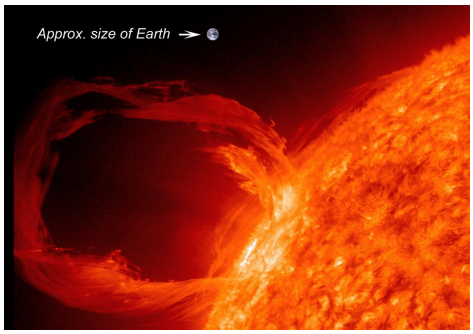
Sometimes the Sun's surface is very active. Other times, things are a bit quieter. The amount of solar activity changes with the stages in the solar cycle. Solar activity can have effects here on Earth, so scientists closely monitor solar activity every day.



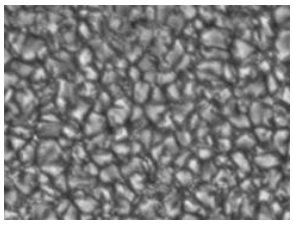
Solar Flares The magnetic field lines near sunspots often tangle, cross, and reorganize. This can cause a sudden explosion of energy called a **solar flare**. Solar flares release a lot of radiation into space. If a solar flare is very intense, the radiation it releases can interfere with our radio communications here on Earth.

Solar flares are sometimes accompanied by a coronal **mass ejection** (CME for short). CMEs are huge bubbles of radiation and particles from the Sun. They explode into space at very high speed when the Sun's magnetic field lines suddenly reorganize.

When charged particles from a CME reach areas near Earth, they can trigger intense lights in the sky, called auroras. When particularly strong, a CME can also interfere in power utility grids, which at their worst can cause electricity shortages and power outages. Solar flares and CMEs are the most powerful explosions in our solar system.

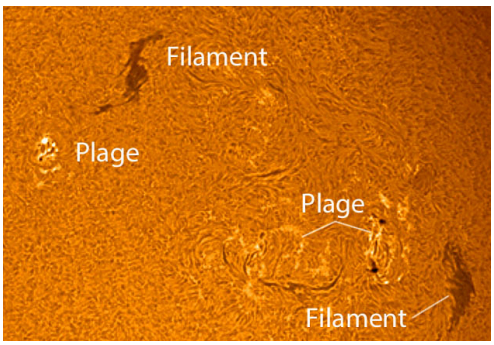


Prominences A solar eruptive prominence as seen in Ha light on March 30, 2010 with Earth superimposed for a sense of scale. Credit: NASA/SDO A solar prominence (also known as a filament when viewed against the solar disk) is a large, bright feature extending outward from the Sun's surface. Prominences are anchored to the Sun's surface in the photosphere, and extend outwards into the Sun's hot outer atmosphere, called the corona. A prominence may persist in the corona for several months, looping hundreds of thousands of miles into space. Scientists are still researching how and why prominences are formed.
The red-glowing looped material is plasma, a hot gas composed of electrically charged hydrogen and helium.

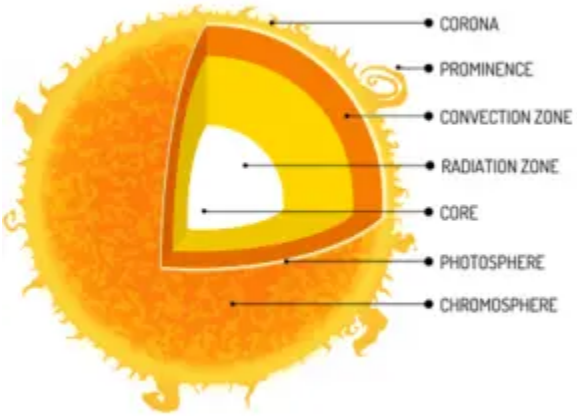


Granules are small (about 1000 km across) cellular features that cover the entire Sun except for those areas covered by sunspots. These features are the tops of convection cells where hot fluid rises up from the interior in the bright areas, spreads out across the surface, cools and then sinks inward along the dark lanes. Individual granules last for only about 20 minutes. The granulation pattern is continually evolving as old granules are pushed aside by newly emerging ones. The flow within the granules can reach supersonic speeds of more than 7 km/s (15,000 mph) and produce sonic "booms" and other noise that generates waves on the Sun's surface.

Filaments and Plage Filaments are dark, thread-like features seen in the red light of hydrogen (H-alpha). They are also referred to as prominences when viewed on the edge of the sun. These are dense, somewhat cooler, clouds of material that are suspended above the solar surface by loops of magnetic field. Plage, the French word for beach, are bright patches surrounding sunspots that are best seen in H-alpha. Plages are also associated with concentrations of magnetic fields and form a part of the network of bright emissions that characterize the chromosphere.



Sun Facts



-The Sun is approximately 4.5 billion years old.
-Astronomers believe it's about halfway through its lifespan.
-It's the largest object in our Solar System, comprising 99.8% of the system's mass.
-The Sun is composed of 91% hydrogen, 8.9% helium, and smaller amounts of oxygen, carbon, iron, neon, and other elements that were created from other stars.
-The Sun is in the center of our Solar System with Earth orbiting 93.603 million miles away—a distance also known as 1 AU (astronomical unit).
-Sol is a medium size star classified as a yellow dwarf.
-There are many stars in the Universe that are larger and smaller than our Sun.
-The Sun's magnetic field spreads throughout the Solar System by the solar wind.
-The Sun's hot plasma takes the shape of a near perfect sphere with a diameter of 865,370 miles.
-It takes about eight minutes for light to travel from the Sun to the Earth.
-The Earth and Sun's interactions result in seasons, ocean currents, climate, and the auroras (northern/southern lights).
-1.3 million Earths could fit in the sun's volume..
-The solar surface temperature is 10,000 degrees Fahrenheit. Temperatures can reach more than 27 million degrees Fahrenheit within the core.
-In the core, hydrogen atoms, under high temperature due to intense gravitational pressure, are fused into helium atoms and eventually into other heavier elements. A portion left over from this nuclear fusion process releases an immense amount of electromagnetic energy that is outcast into the solar system in the form of UV, Visible light, IR and other radiation..
-A Coronal Mass Ejection (CME) is an explosive outburst of billions of tons of superheated plasma from the Sun. When CMEs hit the Earth, our atmosphere usually protects us; the Earth's magnetic field deflects the electrified plasma to the north and south poles where they light up the night sky as aurora. If a CME penetrates the magnetosphere, it has the potential to wreak havoc on the power grid and satellites, interfering with electrical and communications equipment.
-Like all the planets, the Sun rotates on its axis. One solar day lasts about 27 Earth days. It spins fastest at its equator, where it takes about 24 days to rotate. The poles take more than 30 days.
-The Sun's gravitational force is so strong that it can hold all eight planets, many dwarf planets, at least 170 moons, and countless comets, asteroids, and meteors in its orbit.
-The Sun emits different forms of electromagnetic radiation: visible light, infrared, and ultraviolet rays, which make up 99% of these radiations.
-When it uses up its supply of hydrogen and helium and nears the end of its lifespan, the Sun will expand and swallow up the inner planets. It will then collapse and become a white dwarf.
- Earth is farthest from the Sun in July and is closest to the Sun in January.

- Images of the Sun's Corona, Chromosphere, and Photosphere: