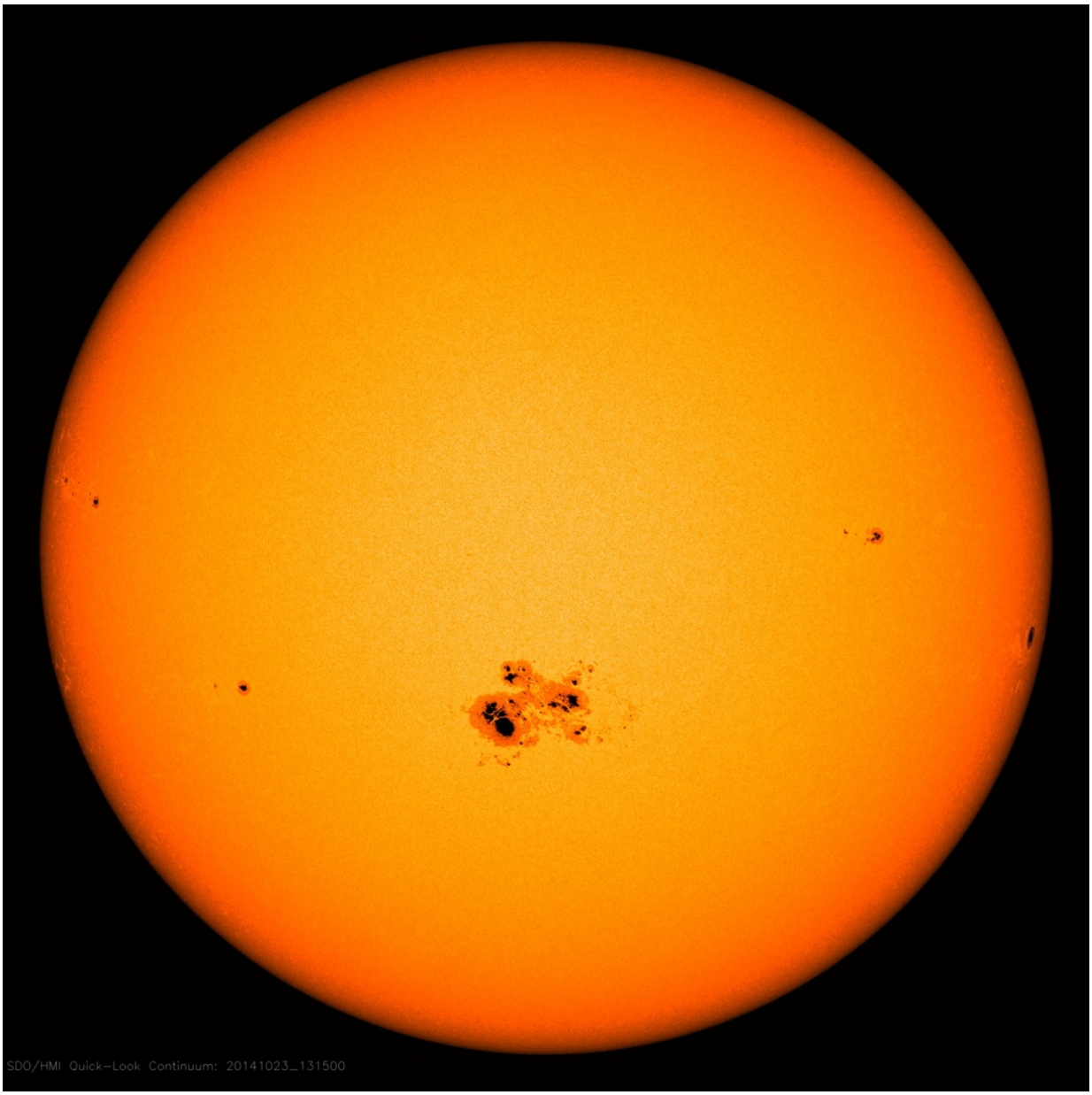
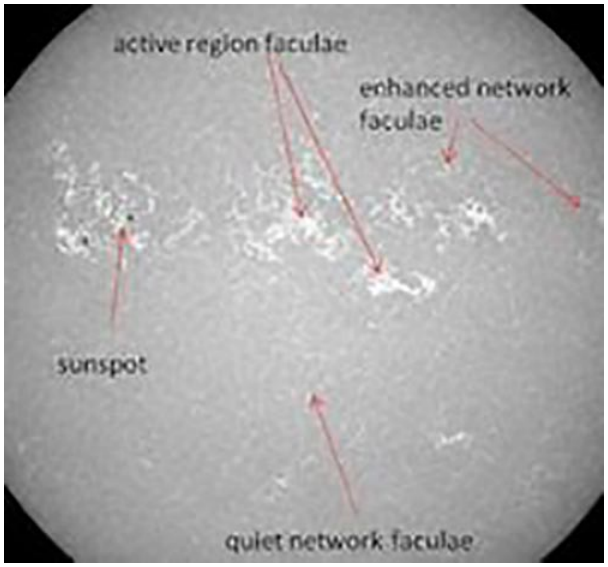
10.8: Major Solar Features



Photosphere, with SunspotsPublic Domain | Image courtesy of NASA.

The **Photosphere** is the visible portion of the sun. It consists of the area in which gaseous layers change from completely opaque to being transparent. The photosphere is also the lowest observable layer of the solar atmosphere.



Solar *Faculae*Image courtesy of courtesy of P. Foukal, Heliophysics, Inc.

Faculae are bright areas visible on the Photosphere. The term faculae is Latin for “little torch. ”

Image courtesy of Hinode JAXA/NASA/PPARC.

Granulation is vast gas bubbles, with rising centers and sinking edges. This bubbling pattern is due to solar convection, as noted in the sun’s regions. Each granulation cell is about 1,000 miles across; compare that to the diameter of Earth at a little under 8,000 miles. Granulation is also a photosphere feature.

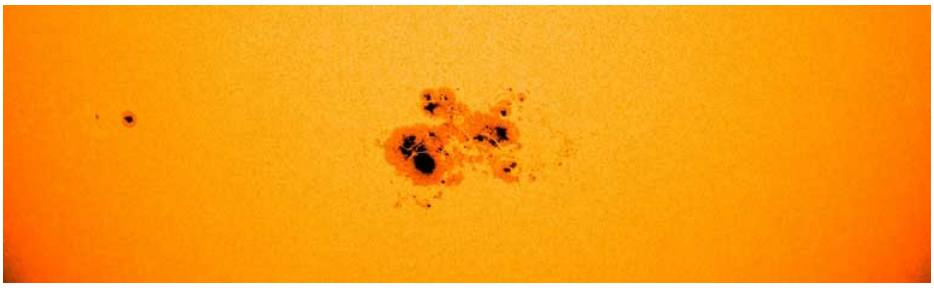


Image courtesy of Nasa/SDO.

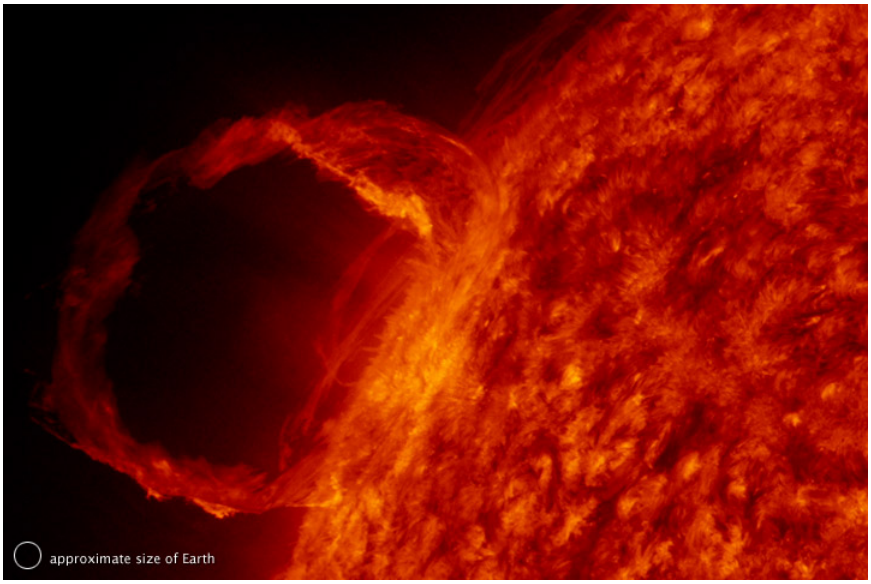
We observe **limb darkening** because the sun is a sphere, near what is seen as the edge of the solar disk, the light must travel farther through the solar atmosphere. This causes the limb to be dimmer than the rest of the disk.

Sunspots are temporary disturbed magnetic areas in the Photosphere. Sunspots come in many shapes and sizes, according to the status of the sun’s magnetic field. This magnetic field traps gas, slowing its motion, and making it cooler than the surrounding area. Sunspots look dark because it is cooler than the surrounding area. Usually, sunspots have two parts: a darker central region called the **umbra** surrounded by a lighter region called the **penumbra**. Astronomers have noted a sunspot cycle. This cycle averages in duration of slightly more than 11 years, in which **sunspot**frequencies varies from a maximum to a minimum and back to a maximum again.

Image courtesy of Mike Reynolds, Ph. D. of Florida State College at Jacksonville.

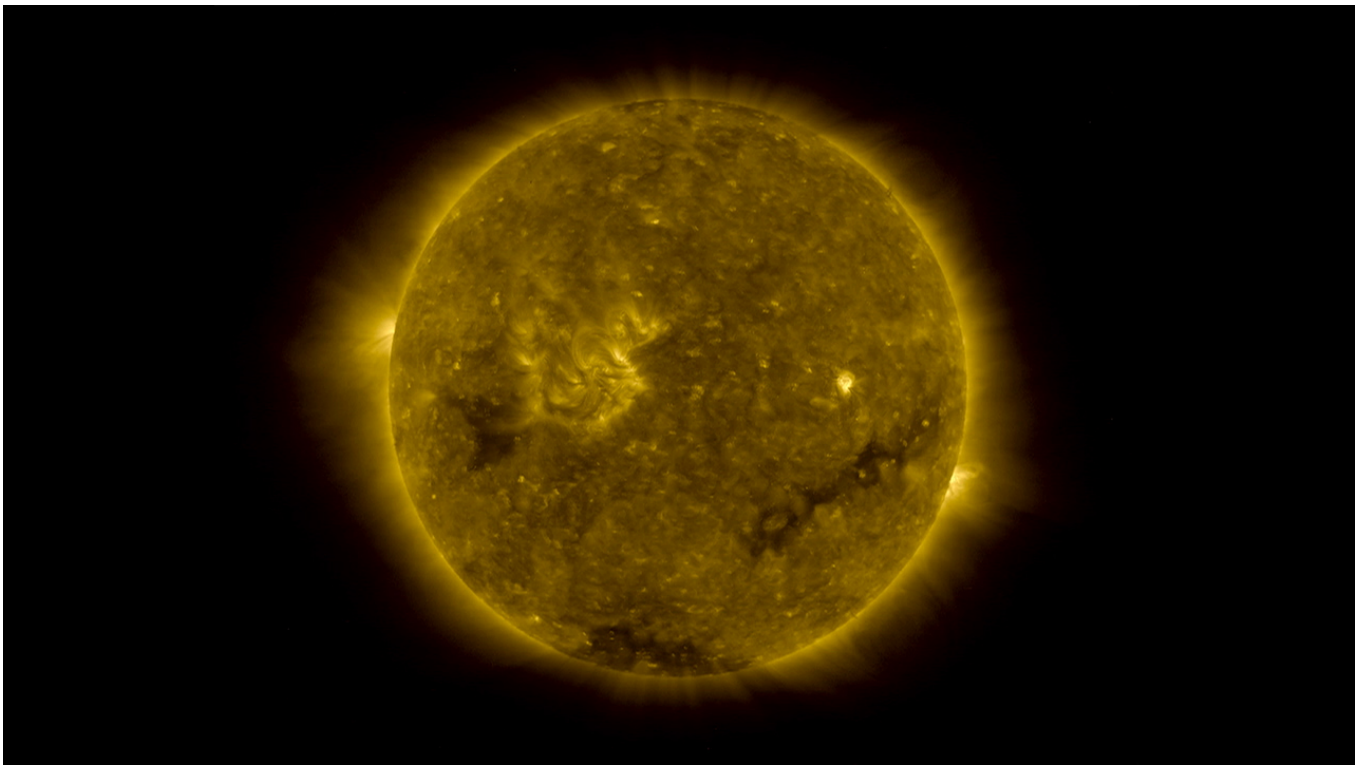
The **Chromosphere** layer of the sun's atmosphere located above the Photosphere / beneath the Corona. The term 'chromosphere' means the sphere of color. This is due to the fact that hydrogen atoms emit energy called hydrogen-alpha (H-α) radiation. The chromosphere is reddish in appearance, therefore it is hard to see.

Prominences are bright gas clouds ejected from the sun and shaped by the sun's magnetic field. They appear as spikes, loops, "trees," detached regions, and more when they occur at the sun's edge as seen from Earth. When seen straight on, however, prominences look like dark lines, known as **filaments**, silhouetted against the solar disk because they are slightly cooler than the surface beneath.



Solar Dynamics Observatory *Spacecraft*Image courtesy of NASA, image and animation from the Goddard Space Flight Center Scientific Visualization Studio and the Solar Dynamics Observatory.

Flares occur when the sun's atmosphere suddenly releases built-up magnetic energy. These emit radiation storms and are by far the Solar System's largest explosions.

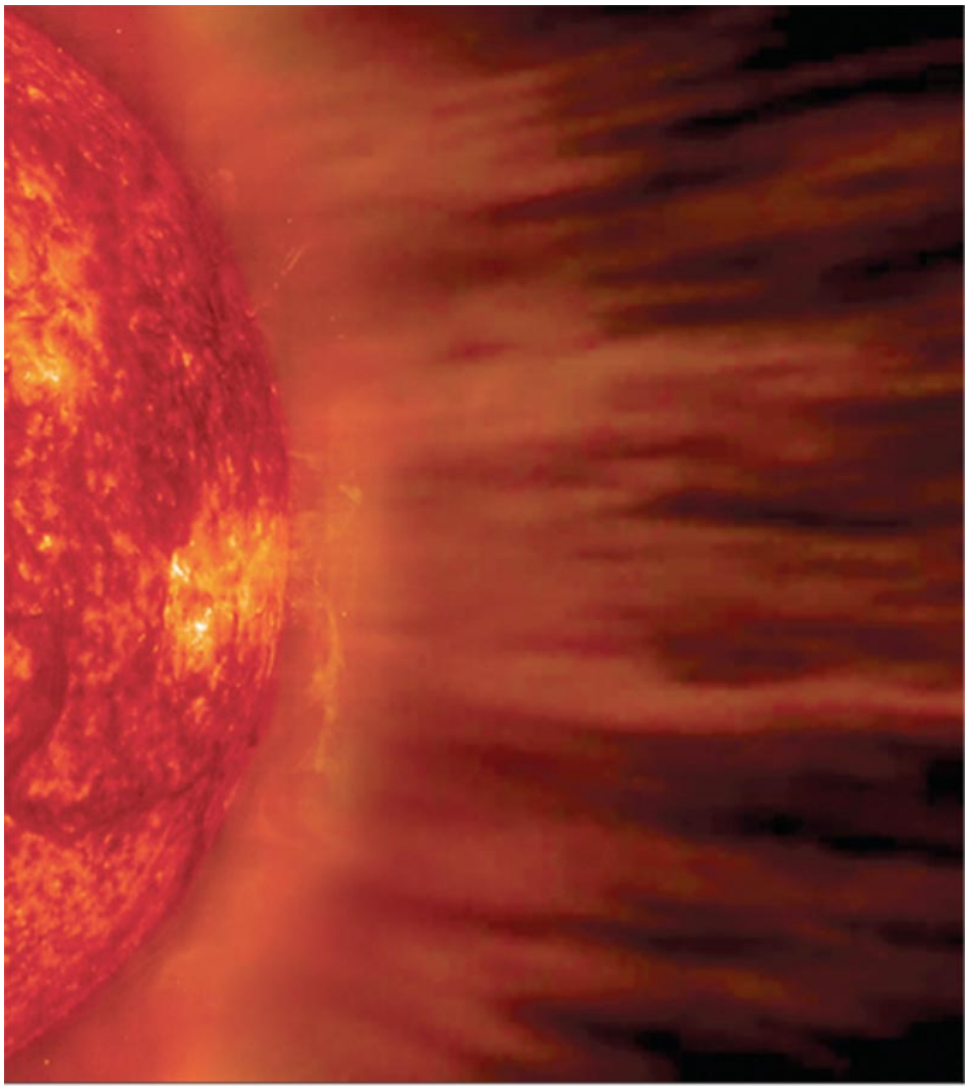


NASA SDO, Solar Dynamics Observatory SpacecraftPublic Domain | Image courtesy of NASA.

The **Corona** is the sun's outer atmosphere; charged particles and dust at low density and very high temperature (10 million K).

Solar *Corona*Image courtesy of Mike Reynolds, Ph. D. of FLorida State College at Jacksonville.

Solar Wind streams off of the sun in all directions at speeds of about 1 million miles/hour); the source of the solar wind is the sun's Corona.



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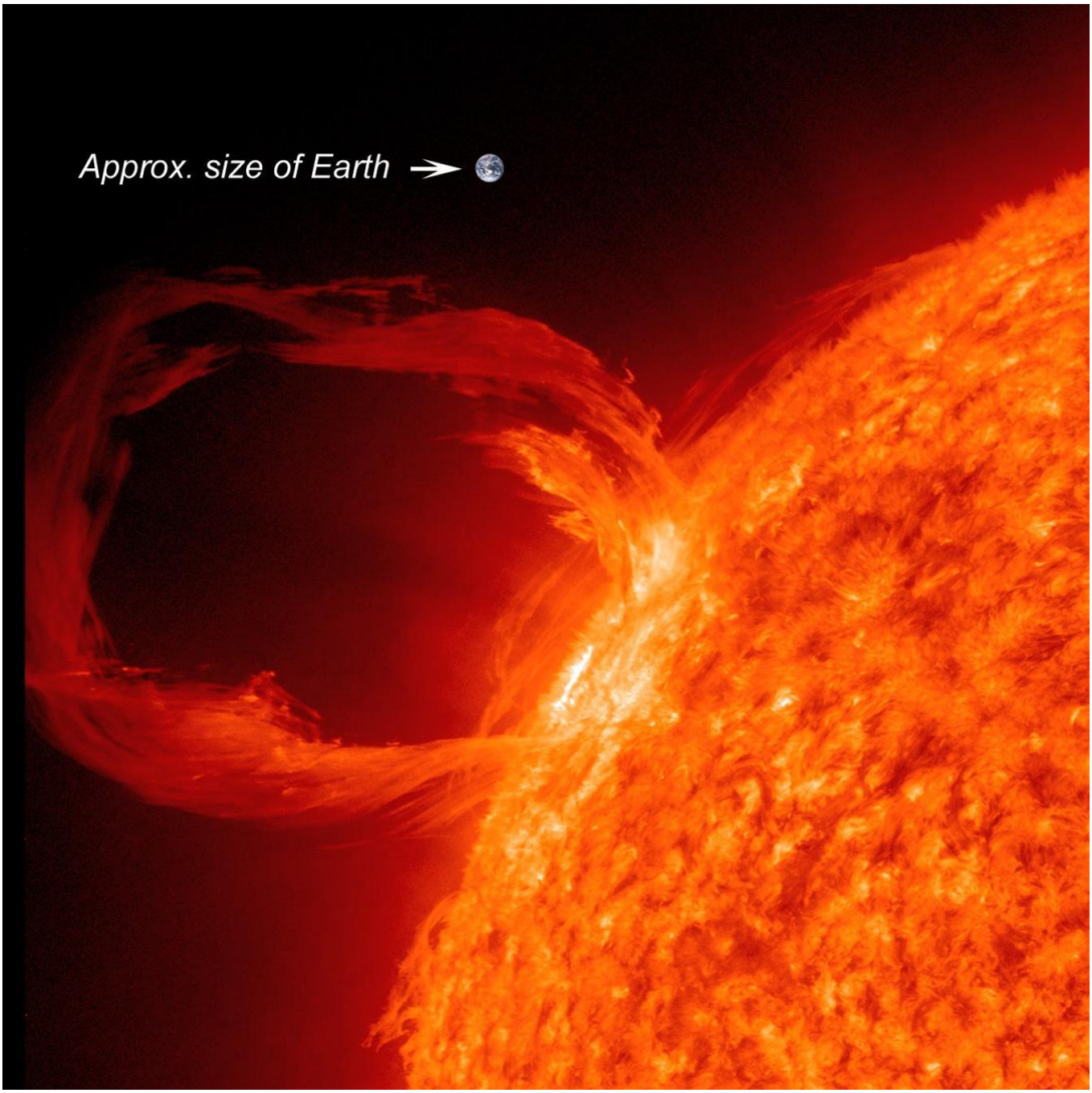
A **Coronal Mass Ejection** or **CME** occurs when huge gas bubbles threaded with magnetic field lines are ejected from the sun over several hours. If a CME directly hits Earth, the results can be catastrophic; from disruption of orbiting satellites to destroying electrical power stations. It takes 3 to 72 hours for a CME to strike Earth.



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