

The Sun

What are the properties of our Sun and how does it create its own energy?

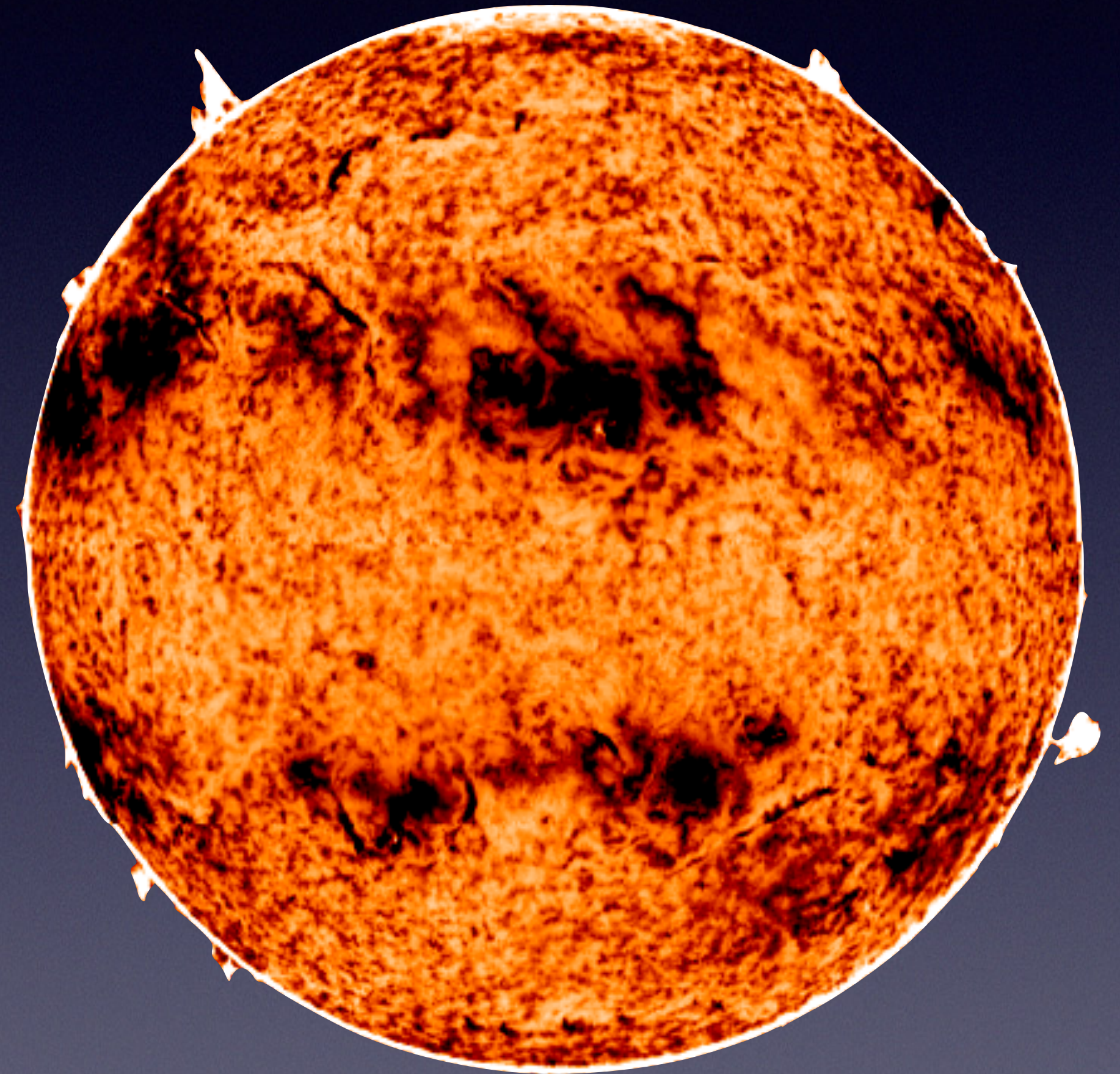


The Sun



The Sun

- Sun - the star around which the Earth orbits



The Sun

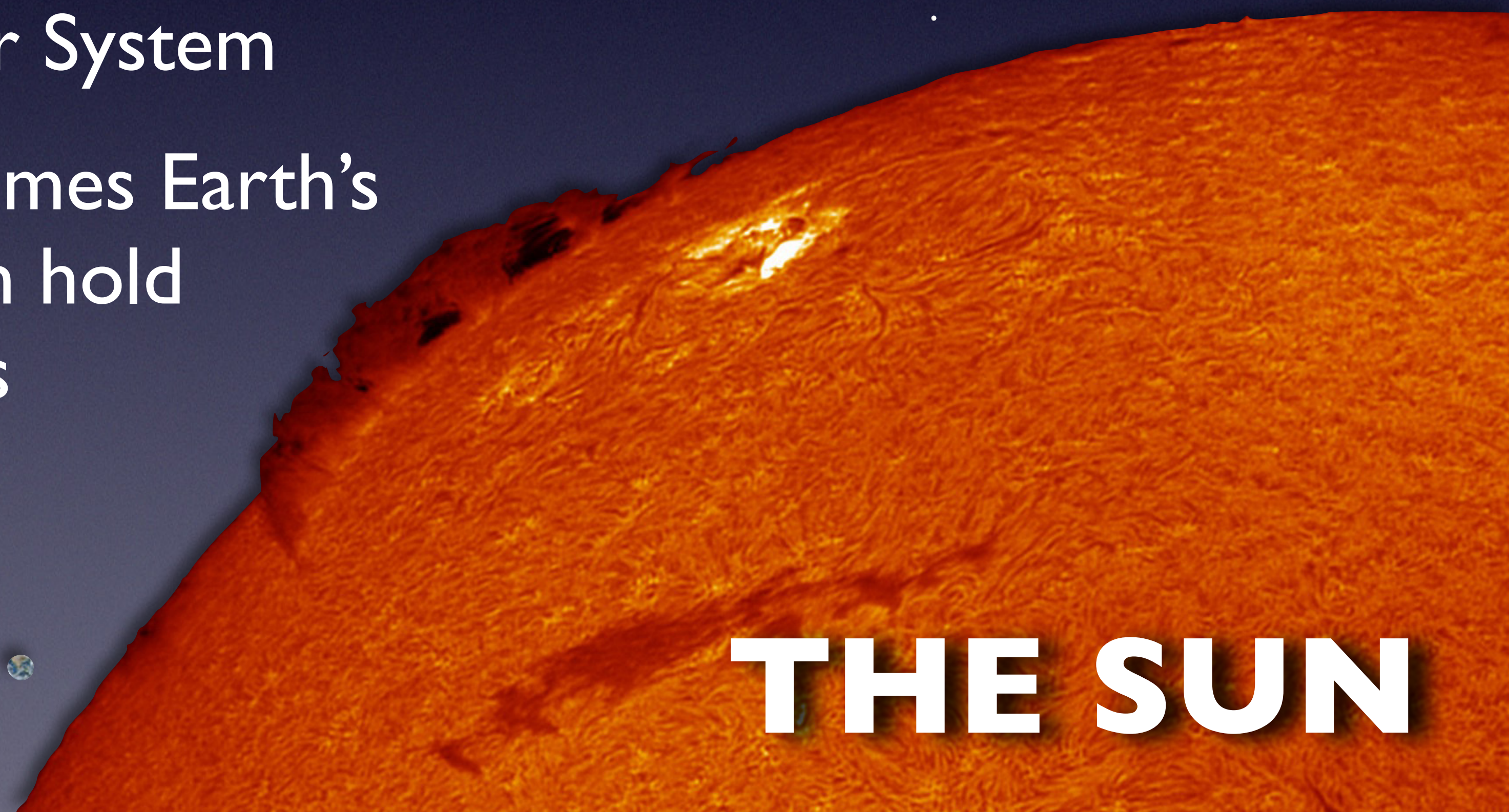
The Sun

- Properties of the Sun
 - The Sun makes up about 99% of the mass in our Solar System
 - The Sun is 109 times Earth's diameter and can hold 1,300,000 Earth's

The Moon

Earth → 

THE SUN



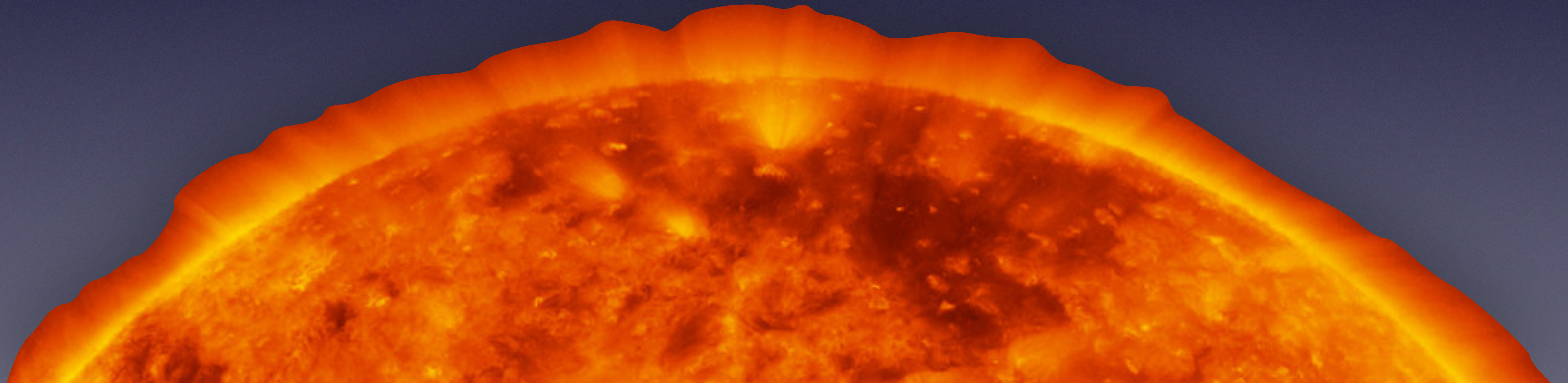
The Sun

- Properties of the Sun [continued]
 - The surface temperature is about $5,500^{\circ}\text{C}$
 - The interior temperature is about $15,000,000^{\circ}\text{C}$



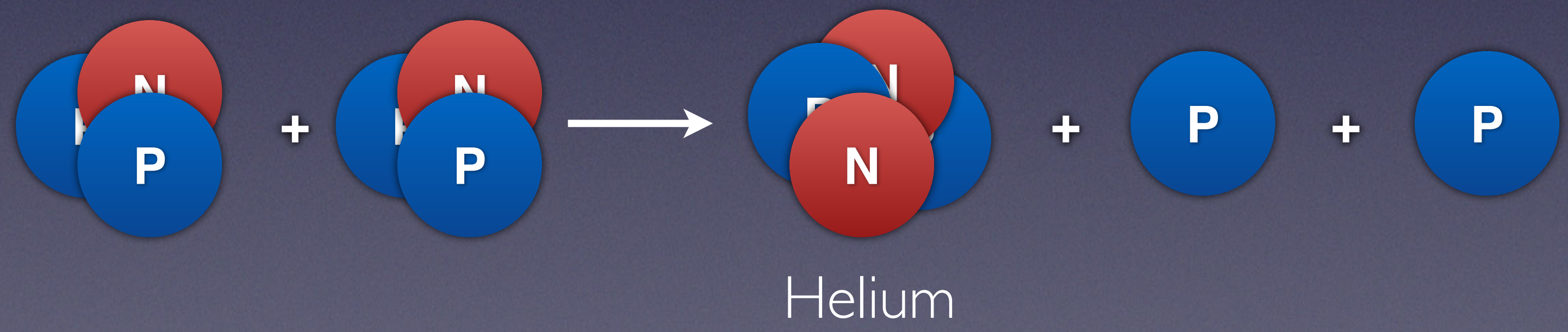
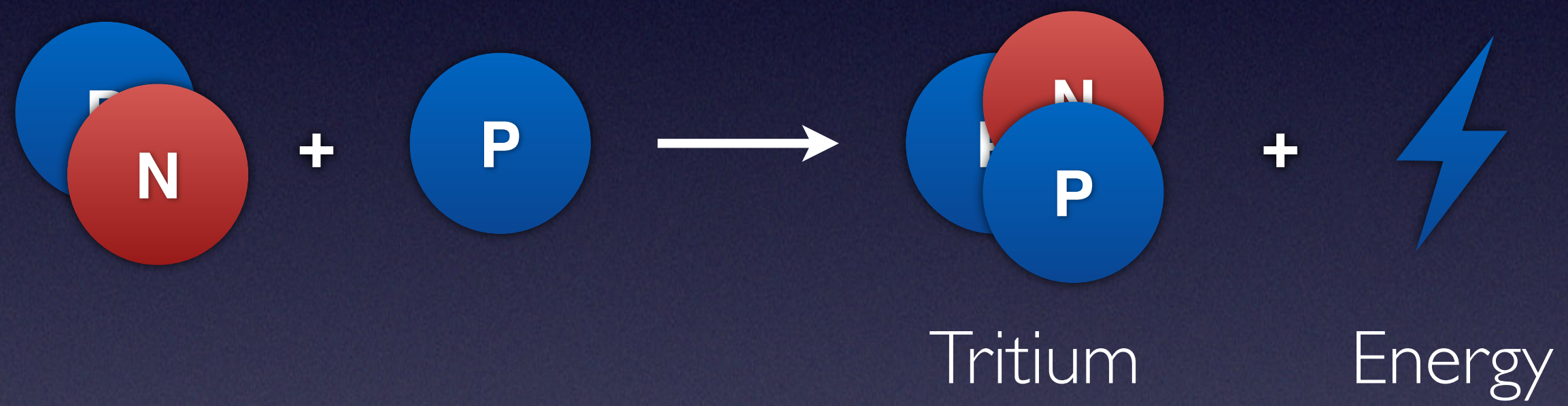
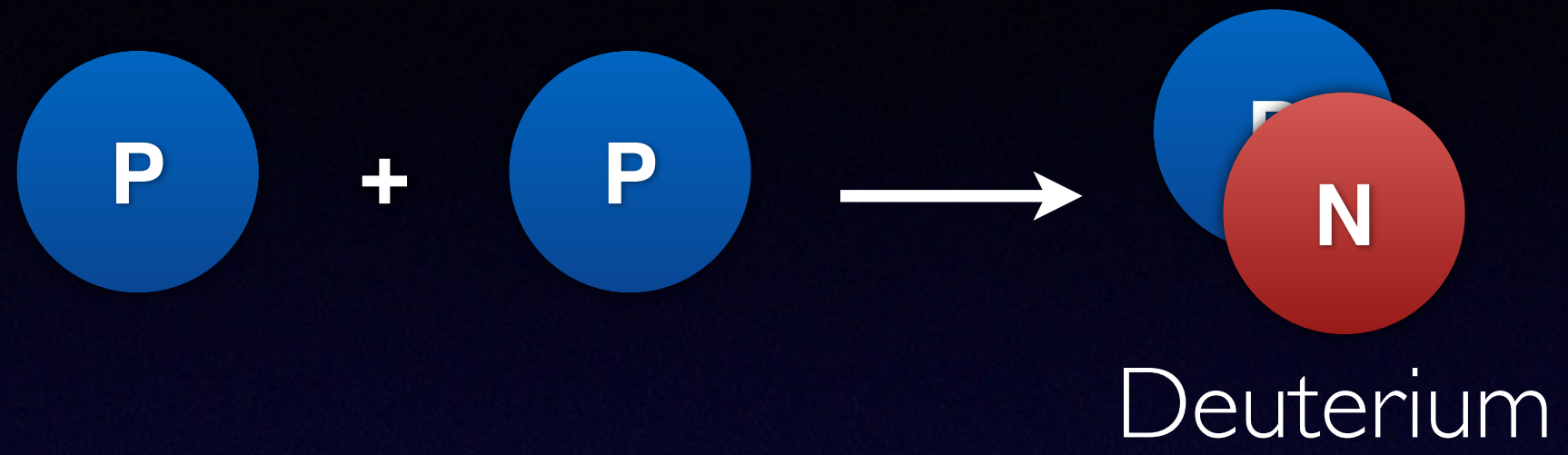
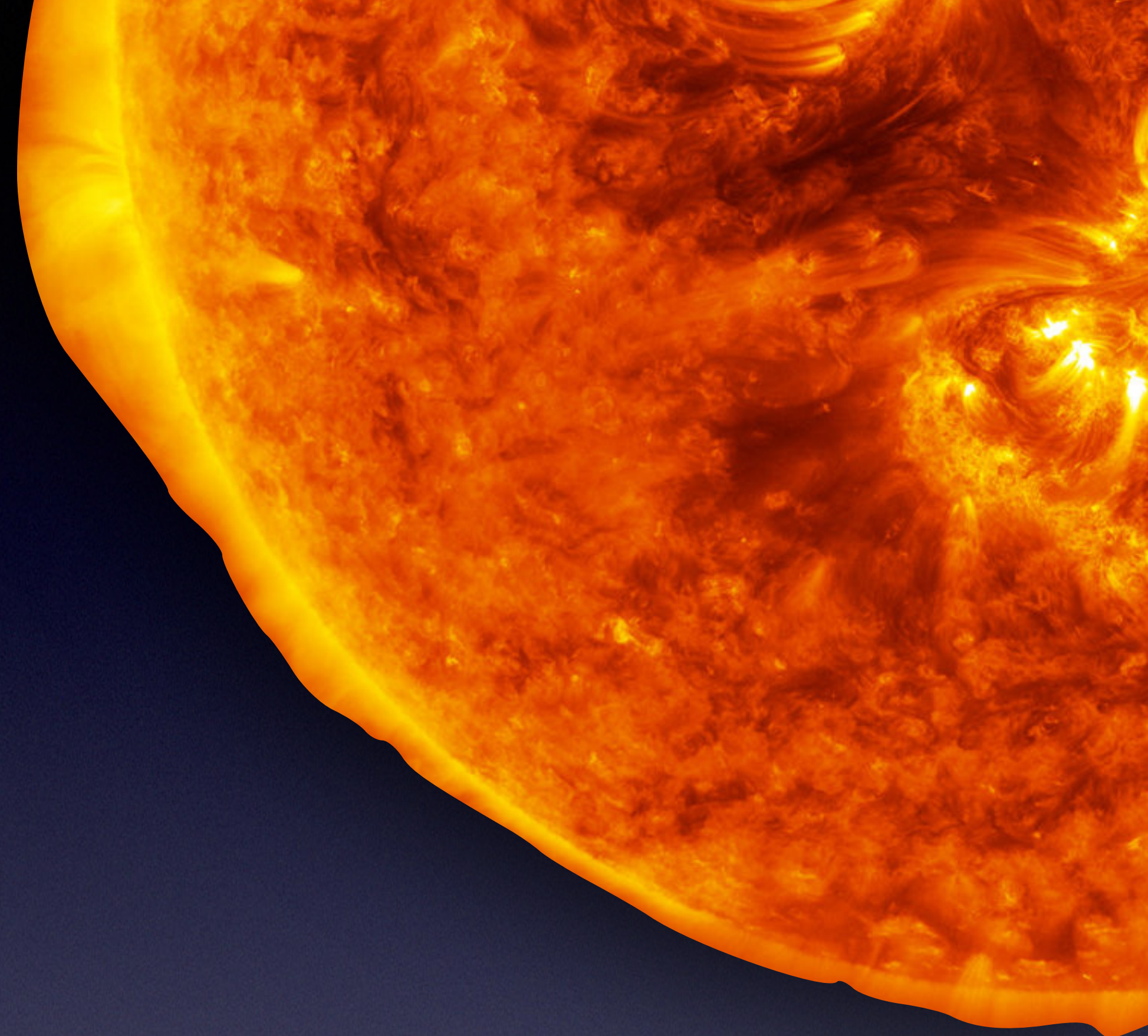
The Sun


- Thermonuclear Fusion - a way to achieve nuclear fusion by using extremely high temperatures
 - Manner in which the Sun creates energy



The Sun

- Four hydrogen nuclei [each with a mass of about 4.030 mass units] join to form a helium nucleus with a mass of only about 4.003 energy units
- The mass that is lost is converted into energy and radiated into space as light and heat

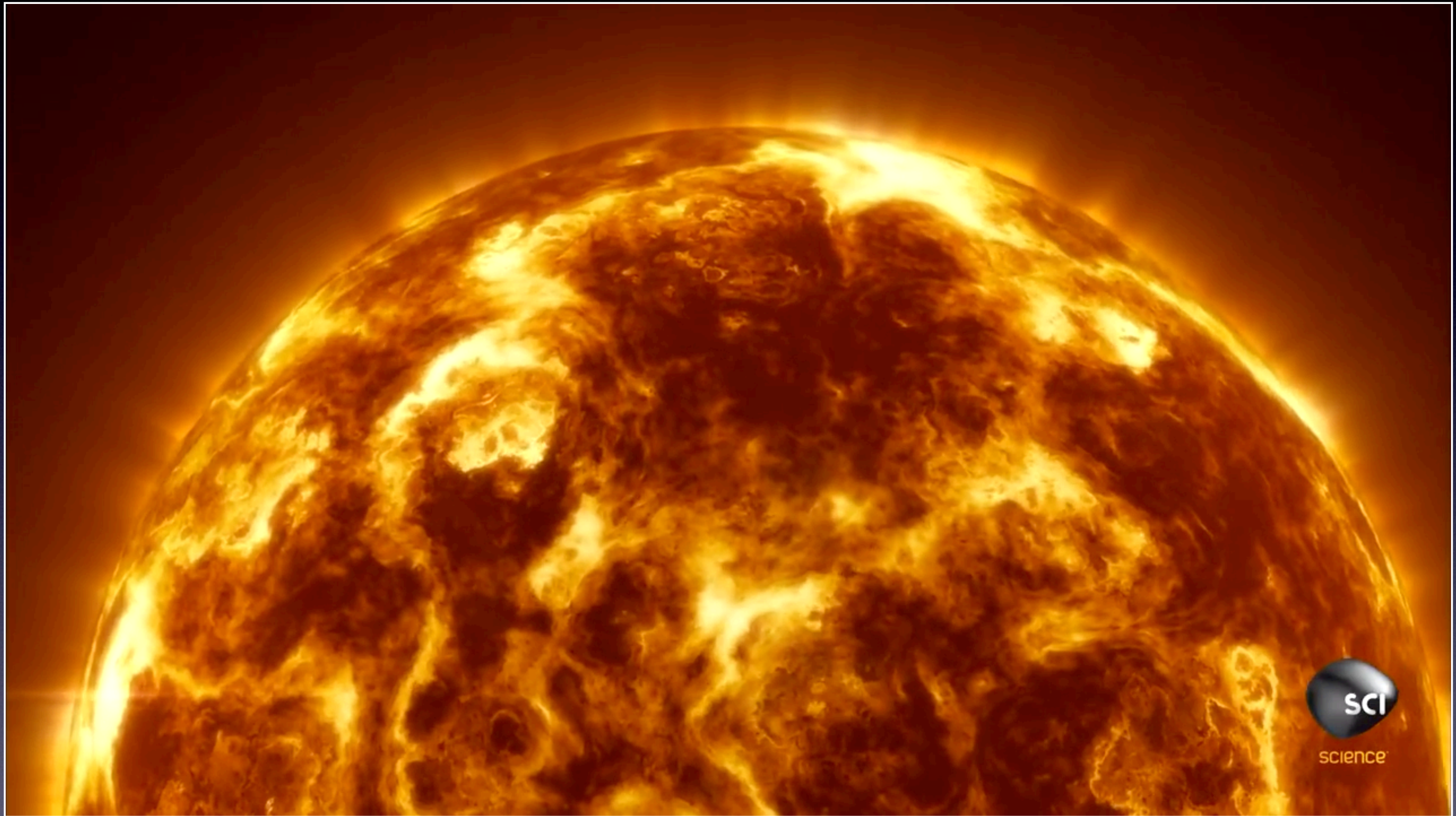


 P Proton
N Neutron

Nuclear Fusion

The Sun

- Estimates indicate that about 4 million metric tons of matter are converted into energy every second, but the Sun is massive, this process can continue for another five billion years!



Fusion in the Sun



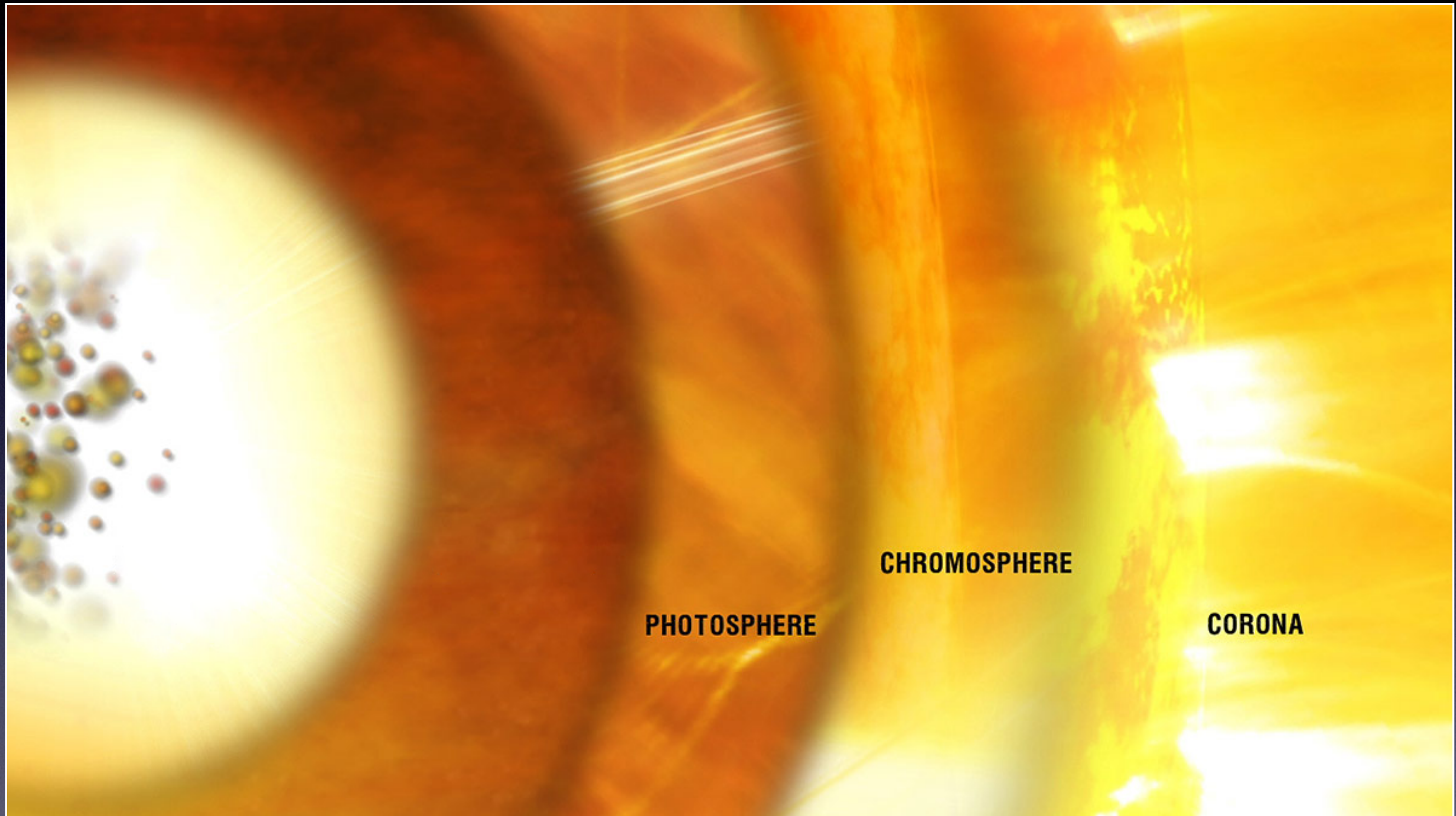
The Sun

- Photosphere - the luminous visible surface of the Sun
 - Less dense and lower portion of the atmosphere
 - Approximately 400 km thick
- Chromosphere - the reddish gaseous layer immediately above the photosphere of the Sun
 - Only seen during a solar eclipse

The Sun

- Corona - the thin lower gaseous envelope of the Sun
 - Only seen during a total solar eclipse

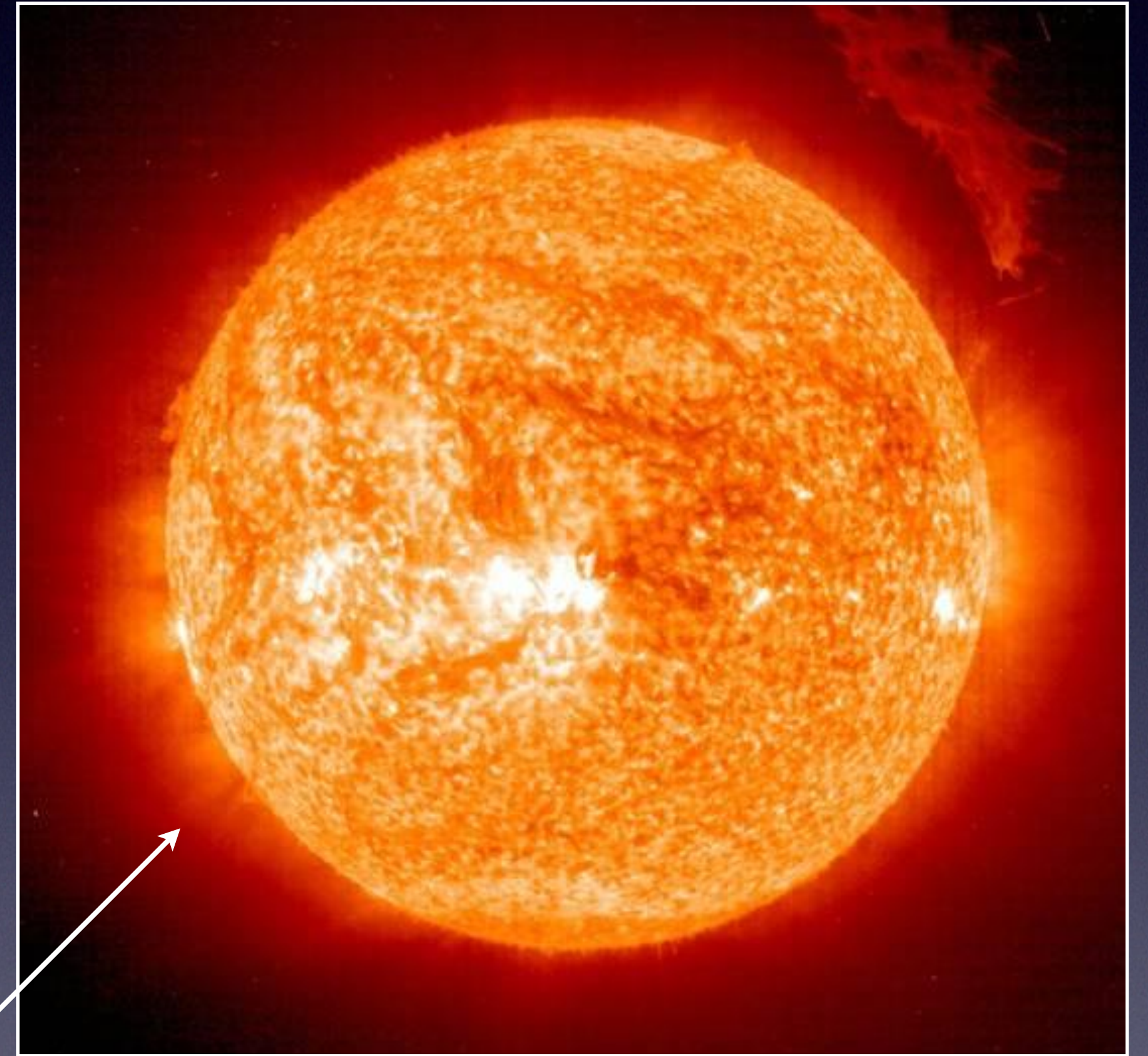




The Sun's Atmosphere

The Sun

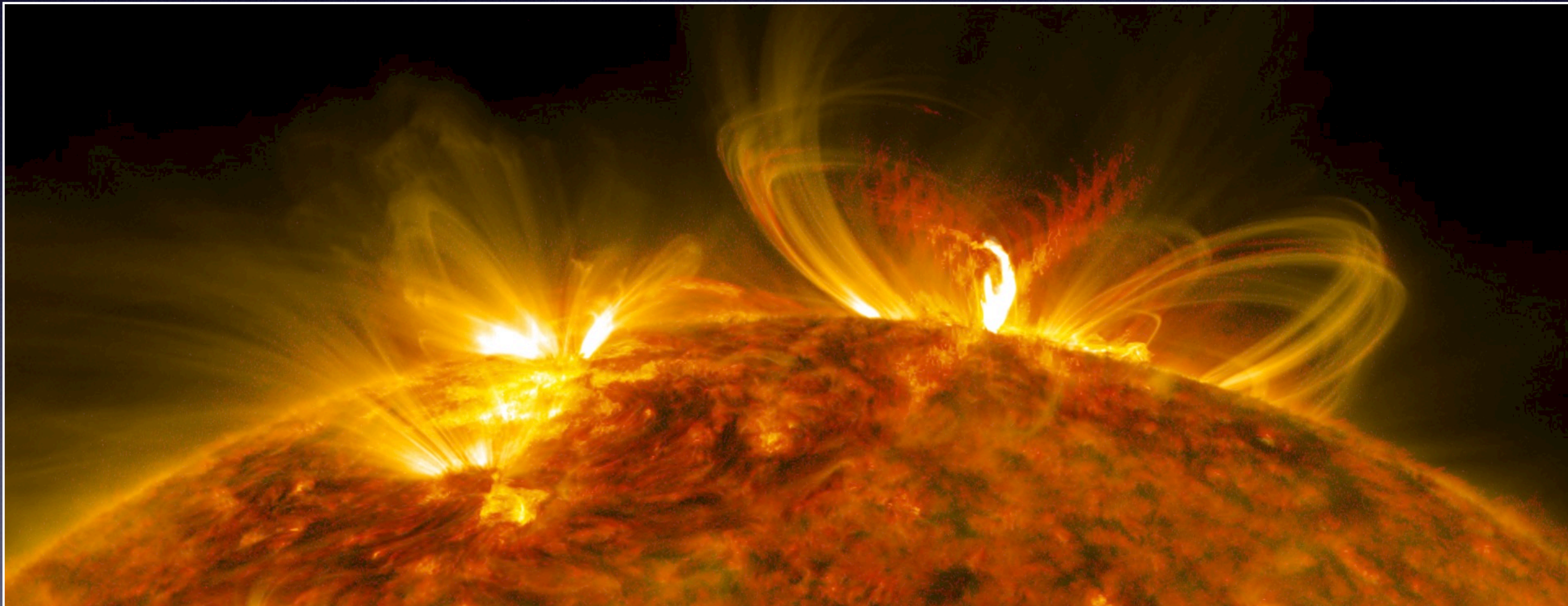
- Prominences - eruption of relatively cool, high-density gas from the chromosphere into the corona
 - May last for hours and can extend millions of kilometers above the photosphere

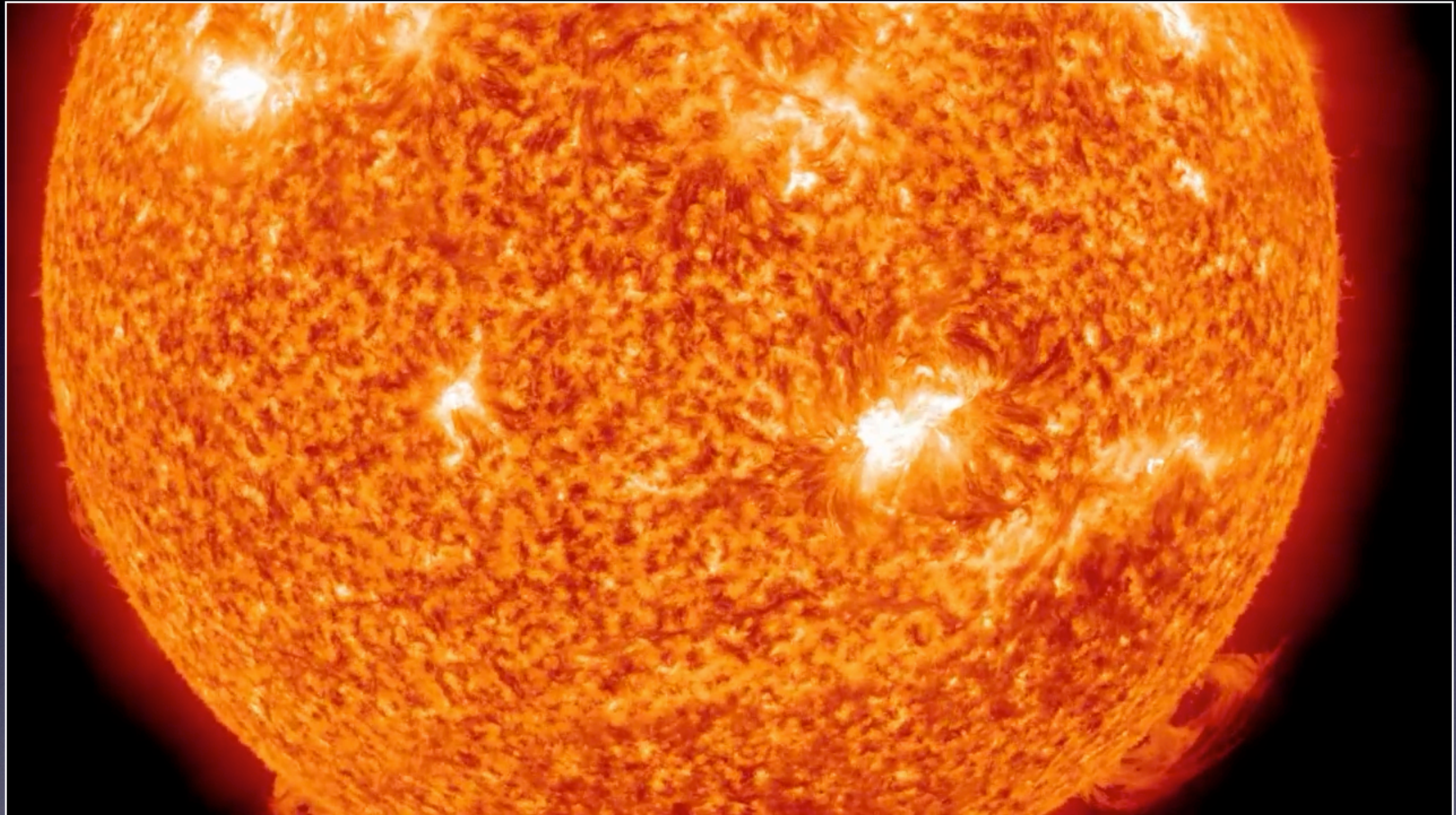


Prominence

The Sun

- Solar Flares - particles that are ejected from the Sun

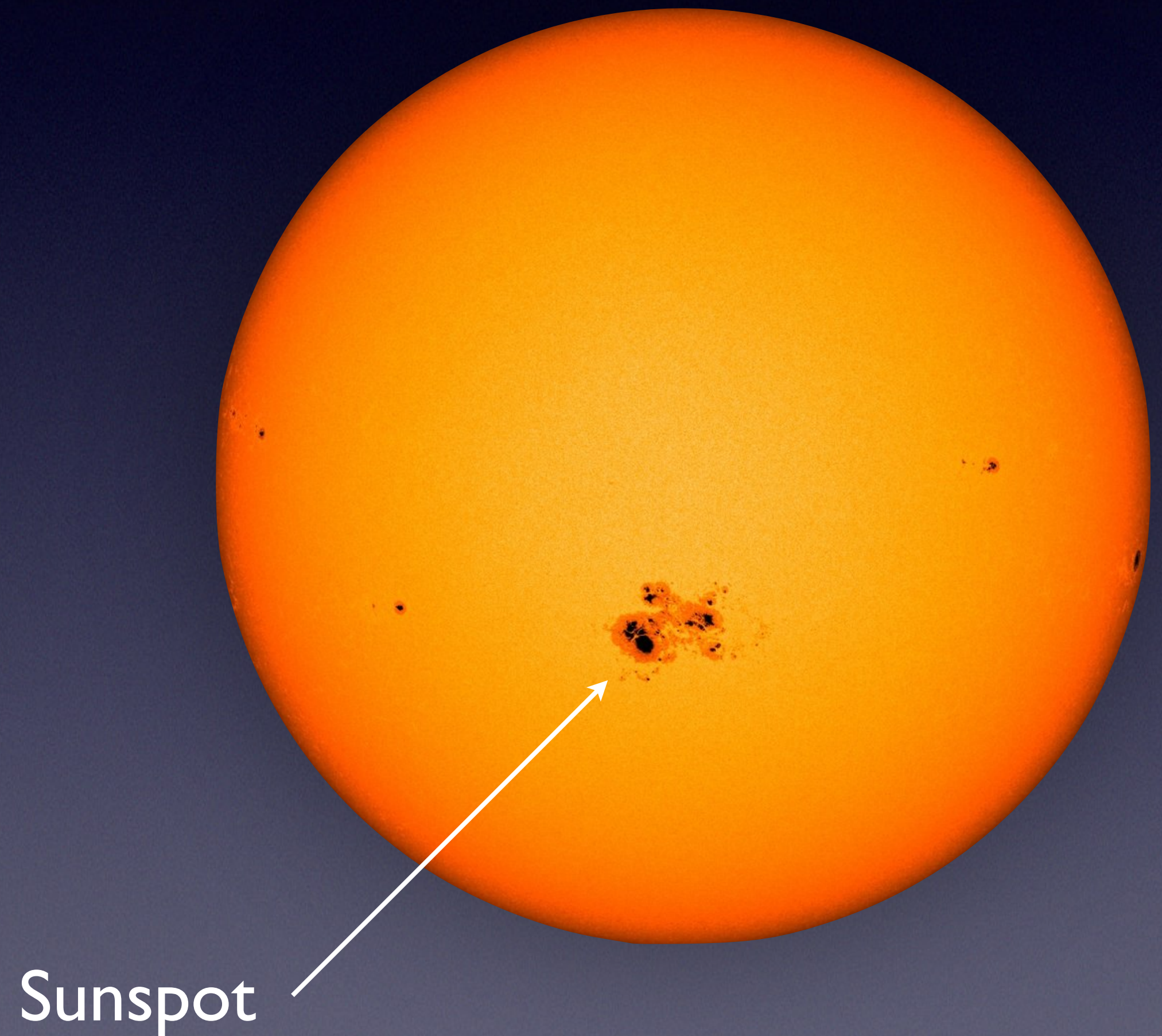


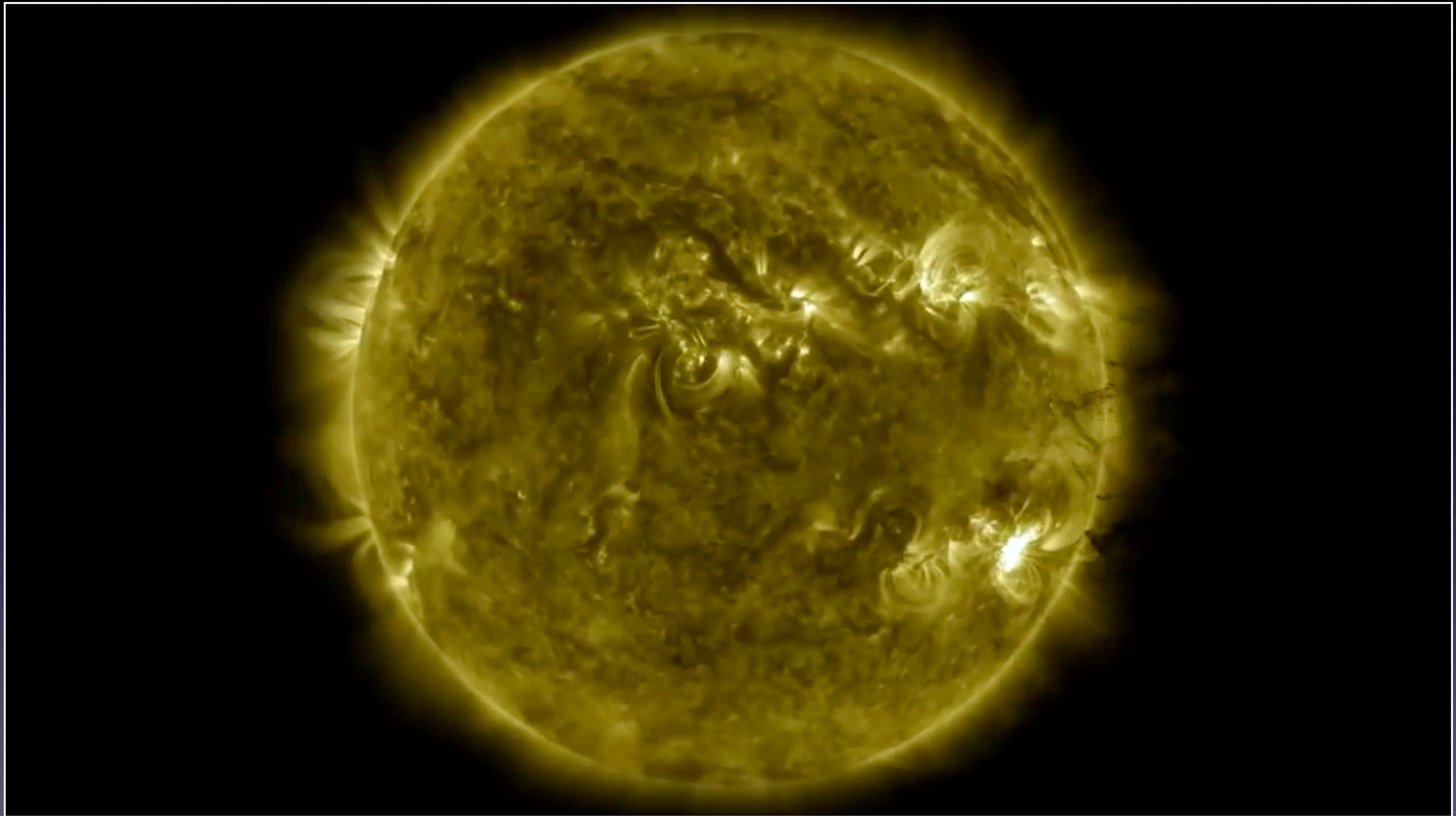


Solar Flares

The Sun

- Sunspot - dark spots on the photosphere, usually occurring in pairs due to magnetism, that are cooler than the surrounding surface
 - Cyclic phenomenon occurring approximately every 11 years



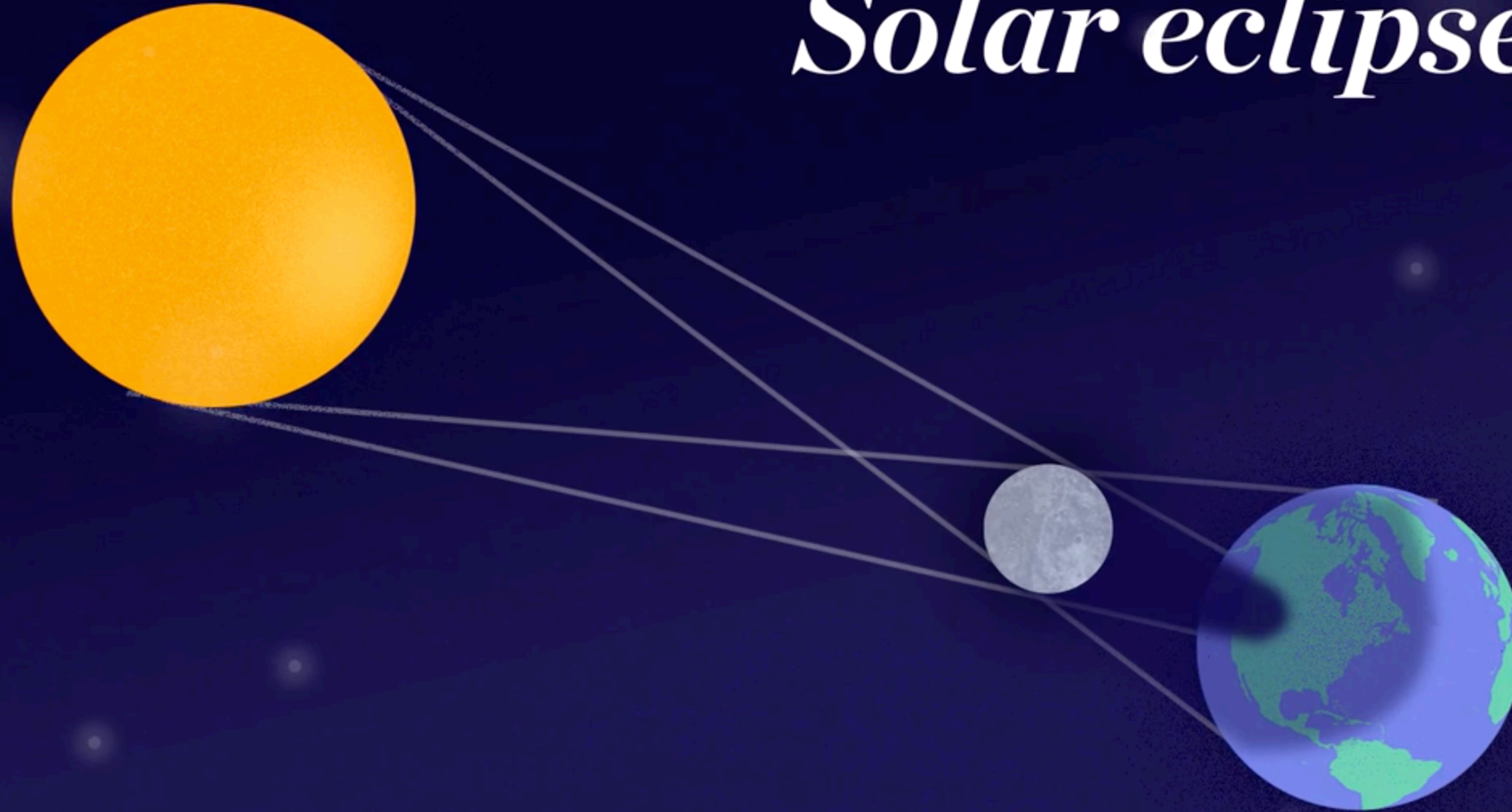


Sunspot Cycle

The Sun

- Solar Eclipse - when the Sun is obscured by the moon
 - Occurs only during a new moon
 - The moon's umbra has a width of about 269 km
 - Duration is up to 7 minutes as it passes over

Solar eclipse



Solar Eclipse



Solar Eclipse



The Sun

Celestial Object	Mean Distance from Sun (million km)	Period of Revolution (d=days) (y=years)	Period of Rotation at Equator	Eccentricity of Orbit	Equatorial Diameter (km)	Mass (Earth = 1)	Density (g/cm ³)
SUN	—	—	27 d	—	1,392,000	333,000.00	1.4
MERCURY	57.9	88 d	59 d	0.206	4,879	0.06	5.4
VENUS	108.2	224.7 d	243 d	0.007	12,104	0.82	5.2
EARTH	149.6	365.26 d	23 h 56 min 4 s	0.017	12,756	1.00	5.5
MARS	227.9	687 d	24 h 37 min 23 s	0.093	6,794	0.11	3.9
JUPITER	778.4	11.9 y	9 h 50 min 30 s	0.048	142,984	317.83	1.3
SATURN	1,426.7	29.5 y	10 h 14 min	0.054	120,536	95.16	0.7
URANUS	2,871.0	84.0 y	17 h 14 min	0.047	51,118	14.54	1.3
NEPTUNE	4,498.3	164.8 y	16 h	0.009	49,528	17.15	1.8
EARTH'S MOON	149.6 (0.386 from Earth)	27.3 d	27.3 d	0.055	3,476	0.01	3.3

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