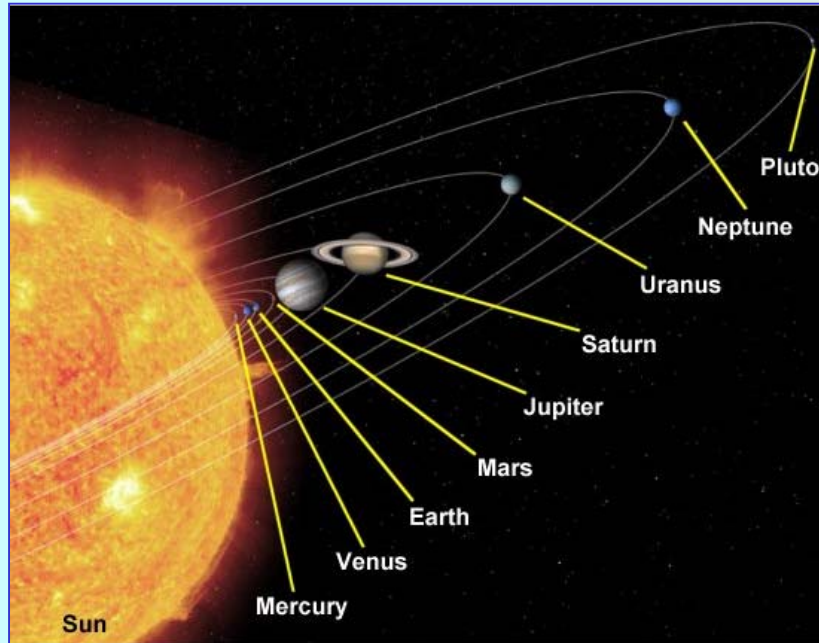


The Sun



<http://www.aerospaceweb.org/question/astromy/solar-system/solar-system.jpg>

The Sun

The **Sun** is the star at the centre of the Solar System. The Sun accounts for about 99.8% of the Solar System's mass.

Energy from the Sun, in the form of sunlight and heat, supports almost all life on Earth via photosynthesis, and drives the Earth's climate and weather.

The surface of the Sun consists of hydrogen (about 74% of its mass), helium (about 24% of mass), and trace quantities of other elements



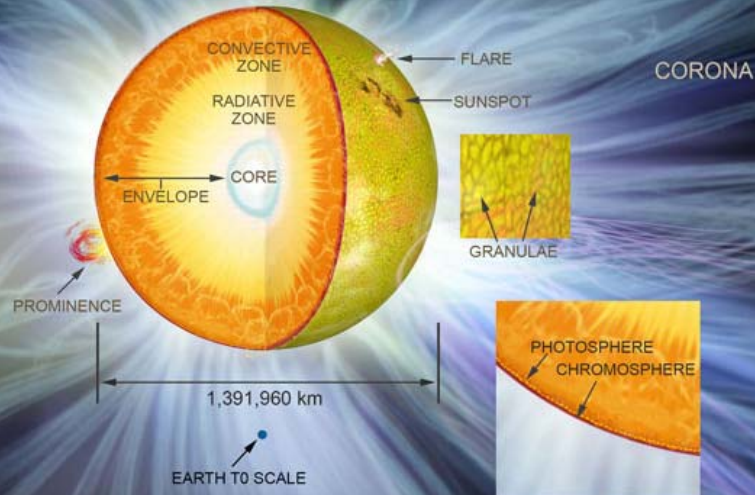
http://space.newscientist.com/data/images/ns/cms/dn12430/dn12430-1_550.jpg



http://www.michielb.nl/sun/images/sunset_1.jpg

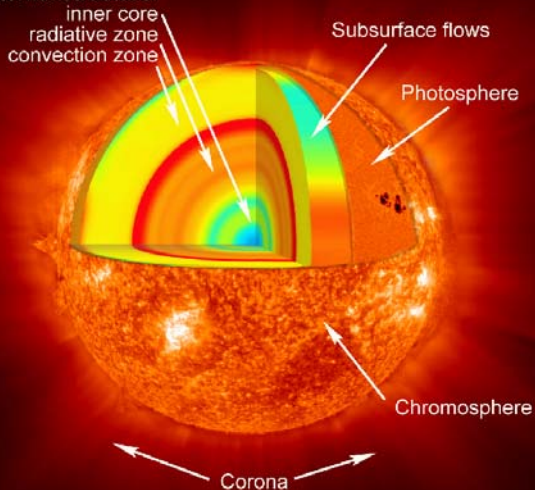
The Sun

Anatomy of the Sun



© 2007 DON DIXON / COSMOGRAPHICA.COM

Internal structure:



http://www.nasa.gov/images/content/171926main_heliolayers_label_lg.jpg

Structure of the Sun

1. Core

At the center of the Sun, thermonuclear reactions (nuclear fusion) convert hydrogen into helium, producing the energy that keeps the Sun in a state of equilibrium.

Temperature: 15,000,000 °C

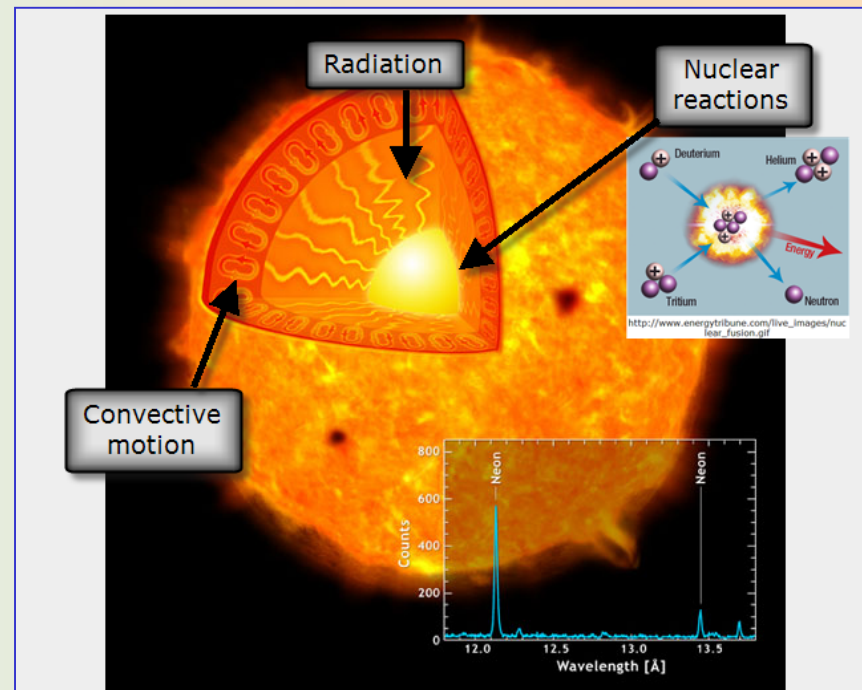
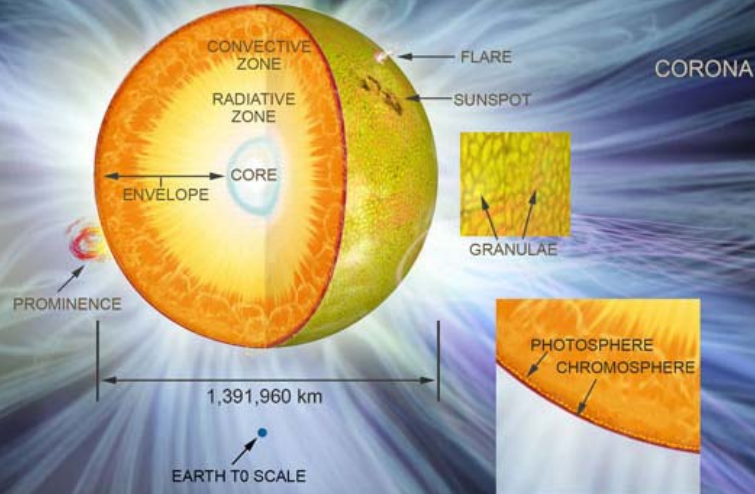


Image Credit: Spectrum: NASA/CXC/J.Drake & P.Testa; Illustration: NASA/CXC/M.Weiss

Neon, along with atoms of carbon, nitrogen and oxygen, plays an important role in regulating the rate at which energy flows from nuclear reactions in the Sun's core to its surface. The character of the energy flow changes dramatically about 125,000 miles from the surface on the Sun, where the stately diffusion of heat suddenly converts to a convective motion much like the unstable air in a thunderstorm.

The Sun

Anatomy of the Sun



Structure of the Sun

2. Radiation and Convection Zones

- Radiation zone: energy carried outward by high energy photons and
- Convection zone: heat slowly carried outward by the gas, continuously absorbed and re-emitted at decreasing temperatures.

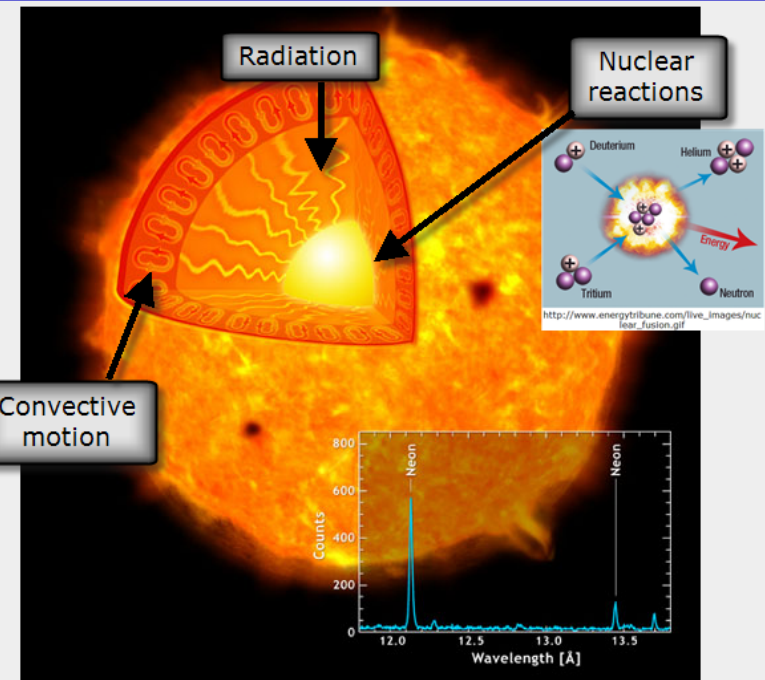
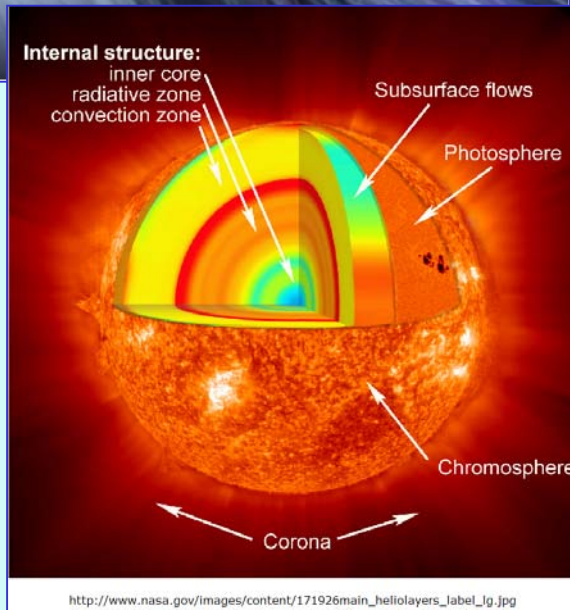
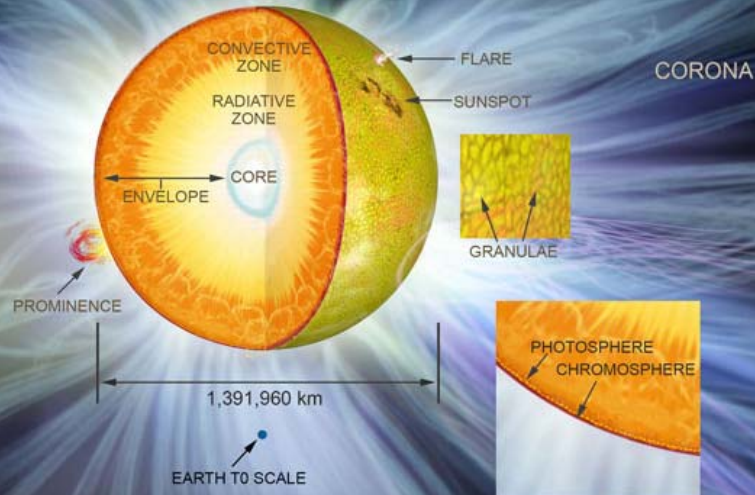


Image Credit: Spectrum: NASA/CXC/J.Drake & P.Testa; Illustration: NASA/CXC/M.Weiss

Neon, along with atoms of carbon, nitrogen and oxygen, plays an important role in regulating the rate at which energy flows from nuclear reactions in the Sun's core to its surface. The character of the energy flow changes dramatically about 125,000 miles from the surface on the Sun, where the stately diffusion of heat suddenly converts to a convective motion much like the unstable air in a thunderstorm.

The Sun

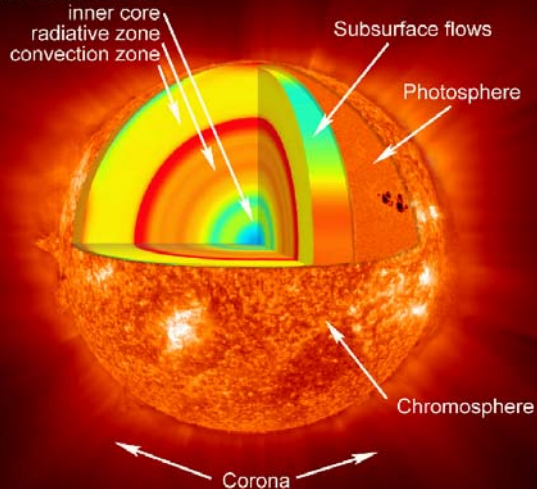
Anatomy of the Sun



Structure of the Sun 3. Corona

Extremely hot: more than 1,000,000 °C

Internal structure:



http://www.nasa.gov/images/content/171926main_heliolayers_label_lg.jpg

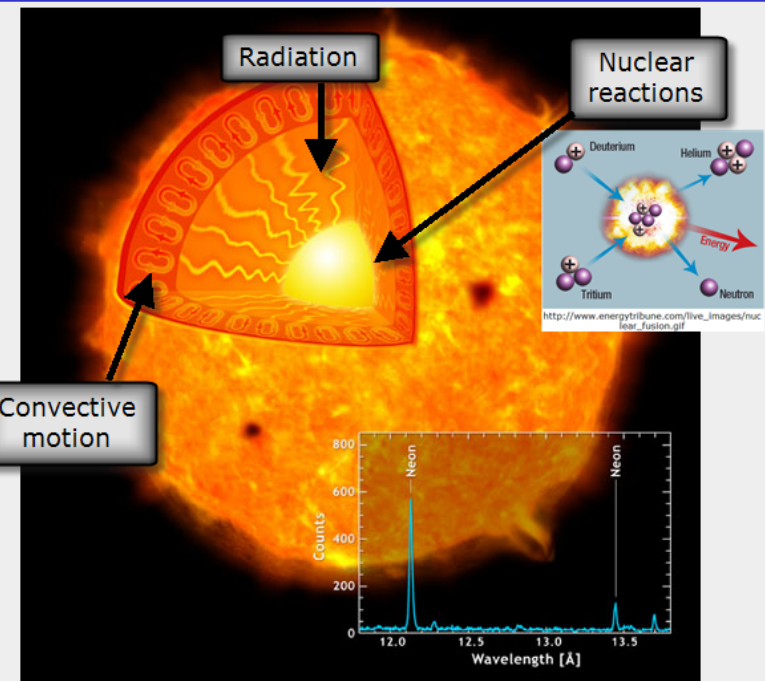


Image Credit: Spectrum: NASA/CXC/J.Drake & P.Testa; Illustration: NASA/CXC/M.Weiss

Neon, along with atoms of carbon, nitrogen and oxygen, plays an important role in regulating the rate at which energy flows from nuclear reactions in the Sun's core to its surface. The character of the energy flow changes dramatically about 125,000 miles from the surface on the Sun, where the stately diffusion of heat suddenly converts to a convective motion much like the unstable air in a thunderstorm.

The Sun

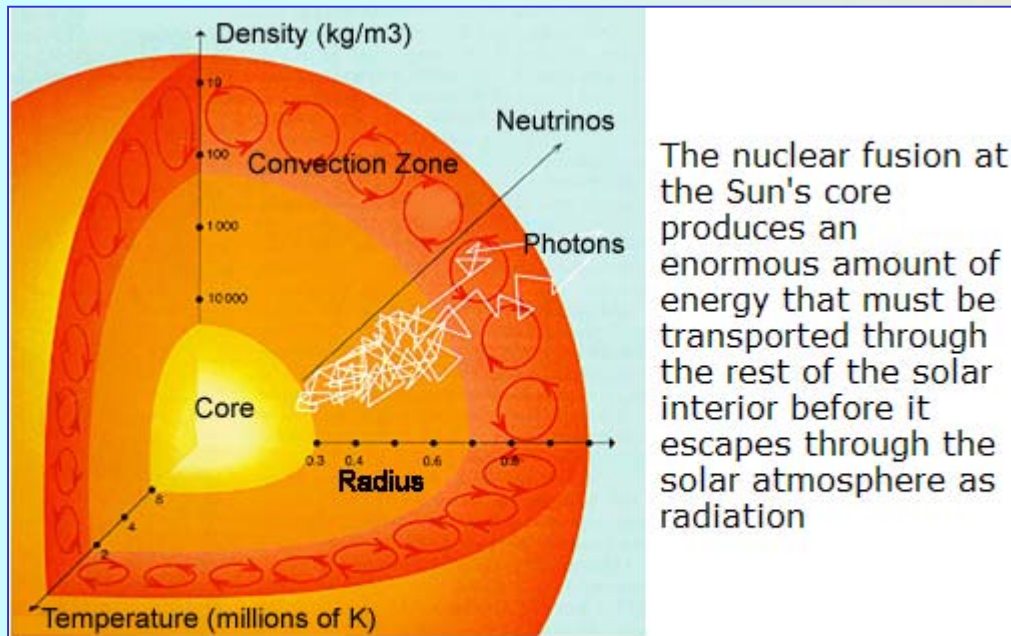


Figure 1: A cut-away schematic of the Sun from UCB's Center for Science Education

Nuclear Reactions in the Sun

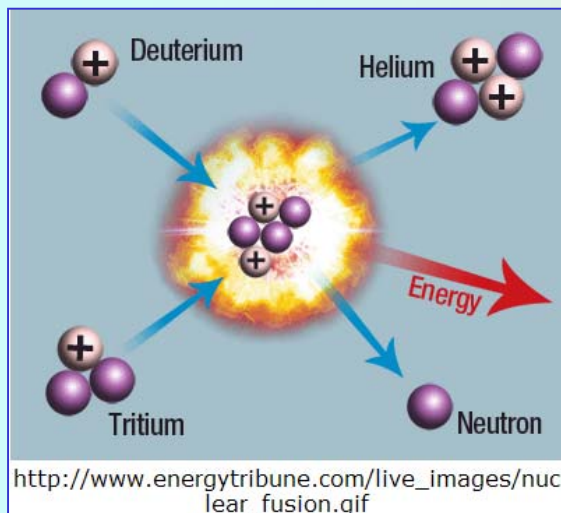
The center of the sun is very hot (about 15 million degrees Celsius) and the pressure is immense (about 100 billion times the air pressure here on Earth).

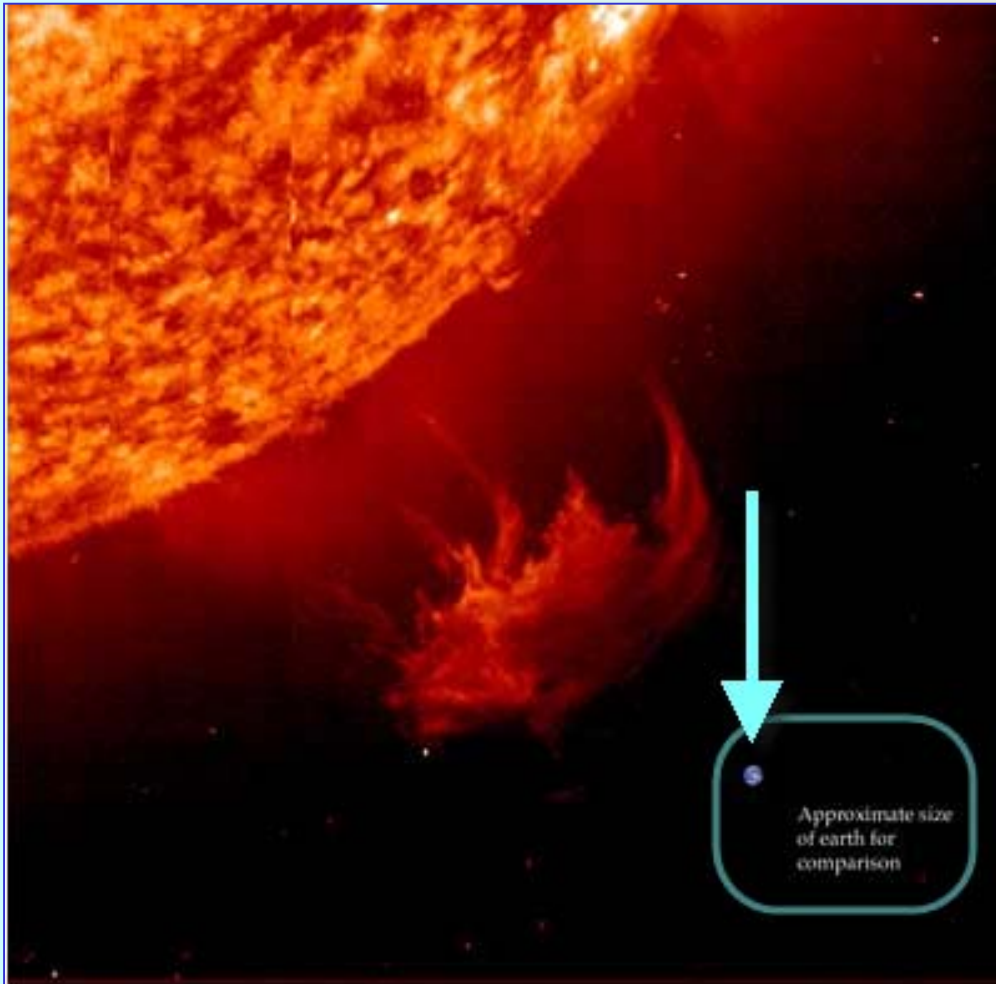
The Sun produces an amazing amount of light and heat through nuclear reactions.

The process that produces the Sun's energy is called nuclear fusion.

In nuclear fusion, two atoms come together to produce a heavier atom.

Fusion reactions release energy and tiny elementary particles.





http://son.nasa.gov/tass/images/cont_sunandearth.jpg

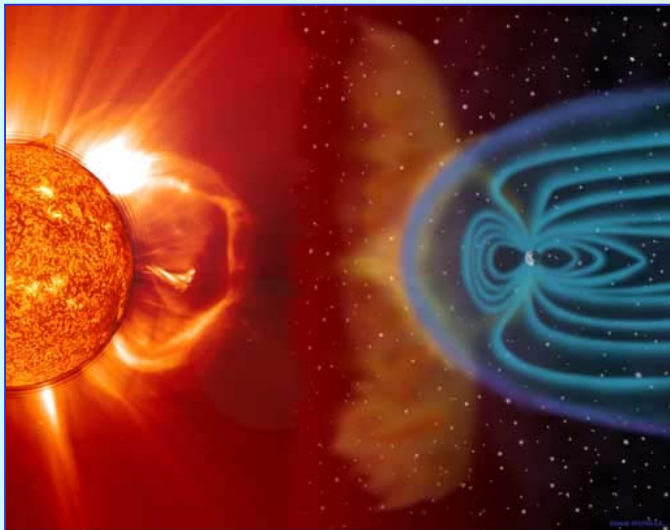
Solar Activity

Eruptions on the Sun's surface occur often. During normal solar activity the intense heat of the corona of about $1,000,000^{\circ}\text{C}$ to $2,000,000^{\circ}\text{C}$ accelerates the plasma to escape velocity.

A million tons of matter are hurled into space every second at an average speed of 400 km/s.

In the process the plasma drags the magnetic field lines of the Sun out into space.

The Sun



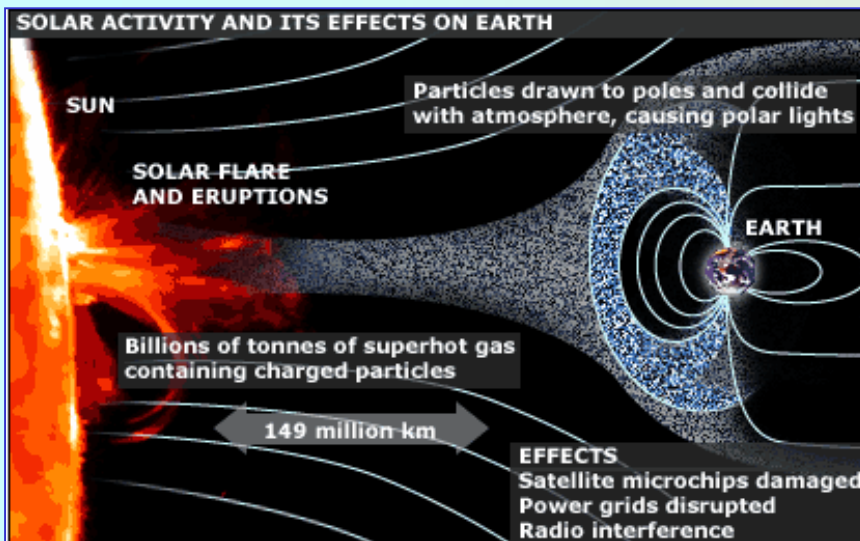
http://www.nasa.gov/images/content/156197main_sunearth_01_516x403.jpg

Solar Activity

CMEs (Coronal Mass Ejections) are randomly distributed across the surface of the Sun. Therefore, very few are aimed at Earth.

Most of the energy of a CME that does arrive at Earth is deflected by The Earth's Magnetosphere.

The energy from a CME directed at Earth can create auroras, damage satellites, disrupt radio communication, burn out power transformers and corrode pipelines

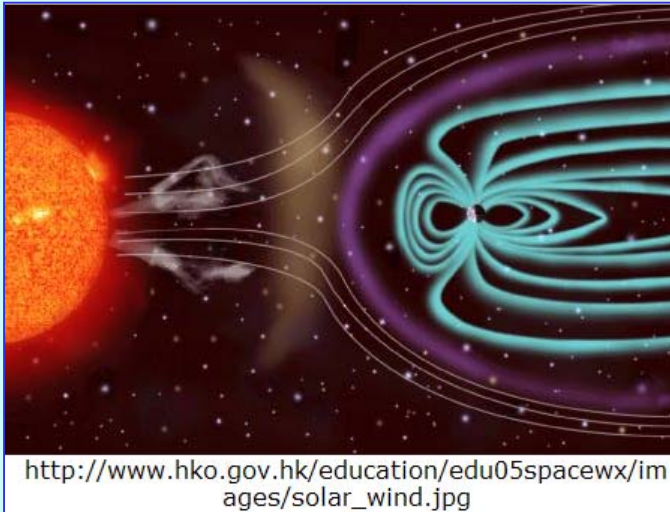


http://www.xradiograph.com/blog/imago/bbc_solar_flare_416.gif



http://antwrp.gsfc.nasa.gov/apod/image/0710/aurora_kuenzli_blg.jpg

The Sun



Solar Activity

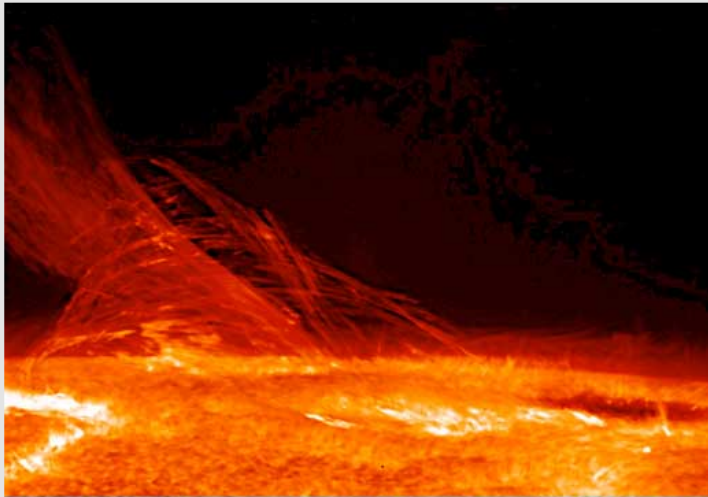
CMEs (Coronal Mass Ejections) are randomly distributed across the surface of the Sun. Therefore, very few are aimed at Earth.

Most of the energy of a CME that does arrive at Earth is deflected by The Earth's Magnetosphere.

The energy from a CME directed at Earth can create auroras, damage satellites, disrupt radio communication, burn out power transformers and corrode pipelines

Plasma of the Sun

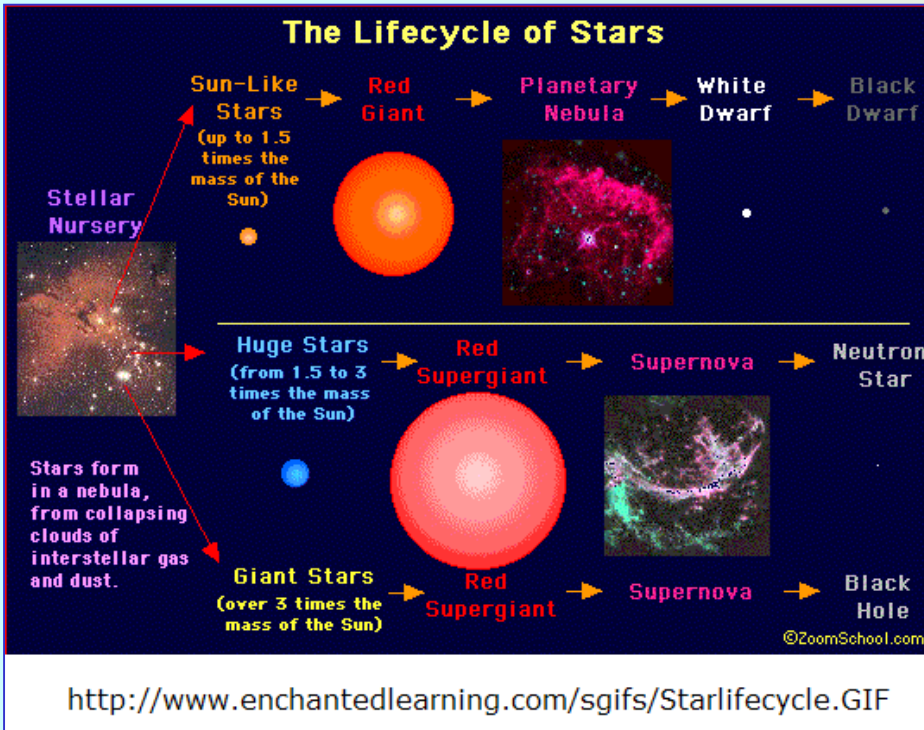
03.21.07



Taken by Hinode's Solar Optical Telescope on Jan. 12, 2007, this image of the sun reveals the filamentary nature of the plasma connecting regions of different magnetic polarity. Hinode captures these very dynamic pictures of the chromosphere. The chromosphere is a thin "layer" of solar atmosphere "sandwiched" between the visible surface, photosphere, and corona.

Image credit: Hinode JAXA/NASA

The Sun



Life Cycle of the Sun

The Sun does not have enough mass to explode into a supernova, instead in 4-5 billion years it will enter a red giant phase with its outer layers expanding and its core heating up.

Helium fusion will begin when the core reaches around 100,000,000 °C, and will produce oxygen and carbon

Following the red giant phase, the Sun will throw off its outer layers. The only object that will remain after the outer layers are ejected is the extremely hot stellar core, which will slowly cool and fade as a white dwarf over many billions of years

