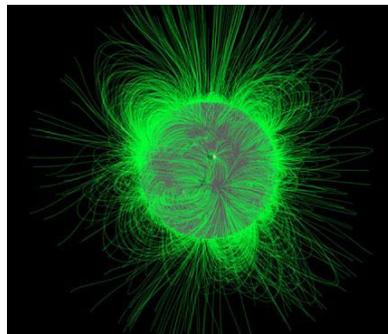


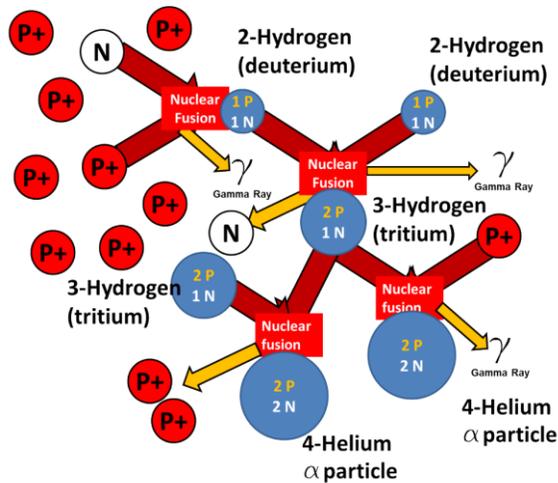
# HOW DOES THE SUN GENERATE ENERGY?



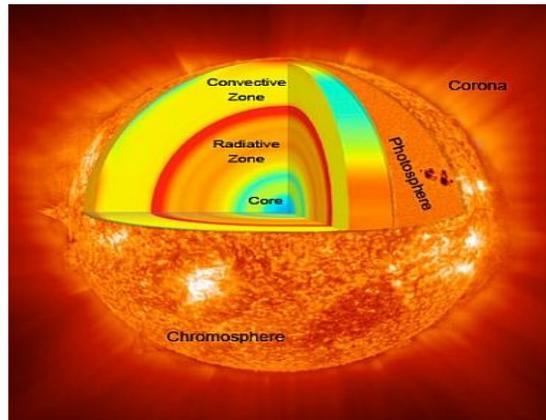
The interior of the sun is a kind of thermonuclear bomb of fusing material, mainly of hydrogen atoms under extreme pressure and temperature controlled at a giant scale, because of its enormous amount of particles interacting at high energy, it generates an electromagnetic field that helps maintaining it for an extremely long time.



In the Sun there are trillions of particles in constant rotation colliding, in constant fission and fusion, mainly using hydrogen ions to convert them in helium ions in a chain reaction.



In the sun it can be identified different layers that vary in density, temperature, pressure and behavior: the “thermonuclear core”, the “radiative zone”, the “convection zone”, the “photosphere”, the “chromosphere” and “solar corona”. The plasma is transparent to its own radiation.



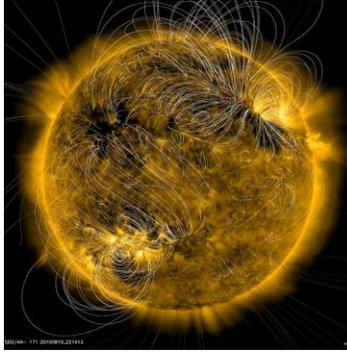
The “thermonuclear core” has a spherical shape due to the action of gravity on the particles compressing towards the center, with a radius of 170,000 km. which

represents 10% of the Sun's mass and 25% of its radius. It is 530,000 kilometers deep from its surface. The most central part of the core is already 60% helium, although here is generated 99% of the energy emitted by the sun (in form of highly energized shortwaves), none of the fusion products of the center have risen to the photosphere.

At the core of the Sun's gravity pulls all atoms to the center. Pressure is 340 billion atmospheres of Earth, thus generating an tremendous vibration and rubbing of particles so that the temperature reaches over 15 million ° C. Matter is in form of ultra dense plasma (150 t/m<sup>3</sup>) on this layer.

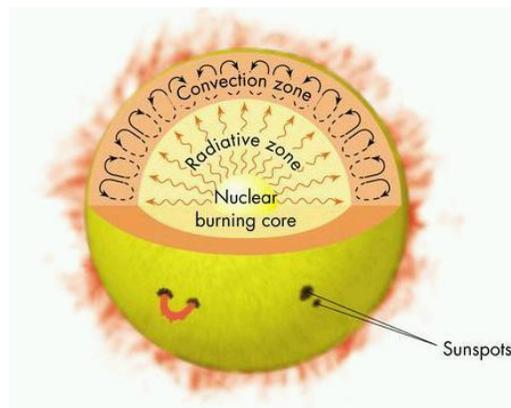


Each particle in the core has its own rotation. By adding the emitted charges of all the particles as a gigantic electromagnetic field rotation product of the rotation in the center of the sun, that will seek to be fed back through the poles, but being so close together, will add each other to generate a huge electromagnetic field of plasma around the core.



The “radiative zone” can include the core so that together it is credited a radius of 580,000 km, accounting for 80% of the radius of the sun. Without considering the core, this layer would be 410 000 km thick.

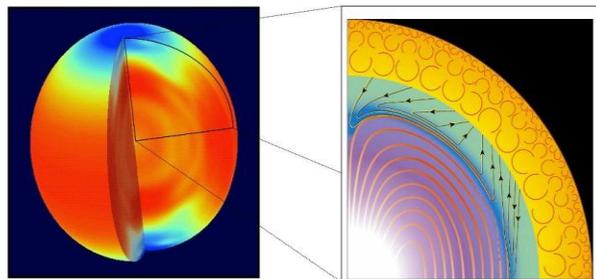
There is great compression on this layer, which is a bit less dense (20 tons/m<sup>3</sup> to 200 kg/m<sup>3</sup>), but the pressure and the energy from the core of energized atoms generates vibrations emanating short electromagnetic wavelengths that transport heat and light to the surface.



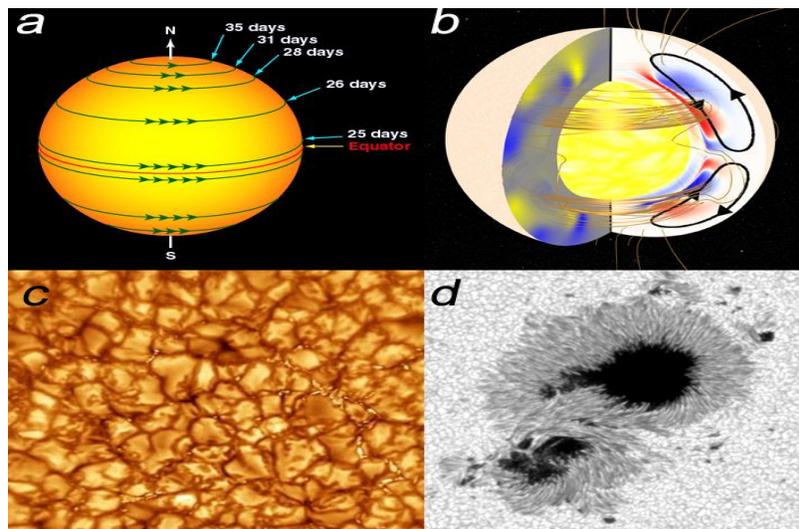
This layer is highly ionized (hydrogen and helium), and fed by electromagnetic radiation from the nucleus which allows heat to flow into transporting heat to the top layers, maintaining strong emission behavior in the center and towards the poles.

Maintaining high temperatures (from 10 million°C to 2 million ° C at the top) and pressures are still high (225 billion Earth atmospheres to 45 atmospheres billion earth) so that the plasma material remains in a state of uniform rotation behavior (presumably slower than the nucleus).

There is a layer called “tachocline” between the radiative zone (with plasma behavior) to the convection zone (with gas behavior) which is 150,000 km deep with a thickness of 30,000 km that is where the pressure and density is much lower.

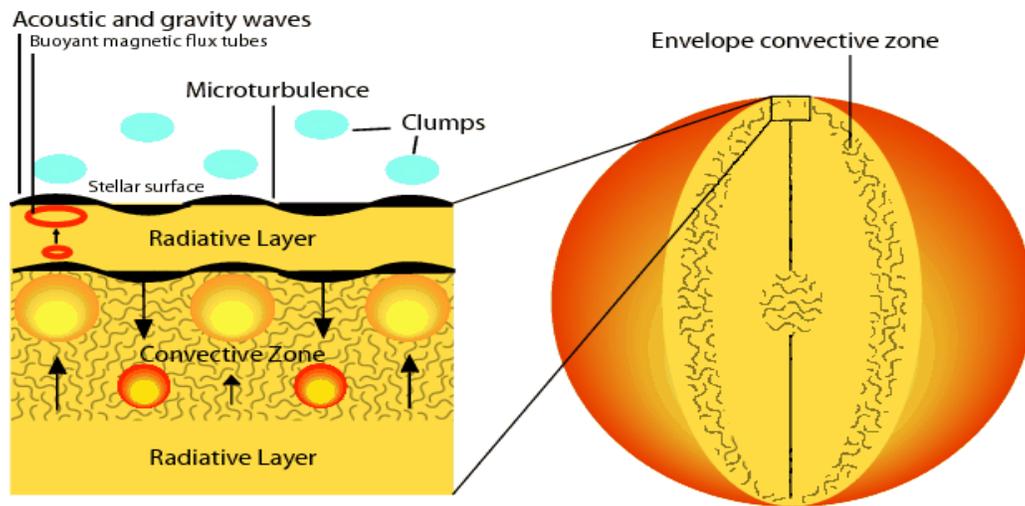


The mass in this layer behaves more like a gas or a liquid, and because of the existence of an electromagnetic field in the core where it is concentrated the largest emission of particles and energy, appears a bump in its equator, creating a turbulence in the center, causing a differential rotation in the center that rotates faster than the poles.



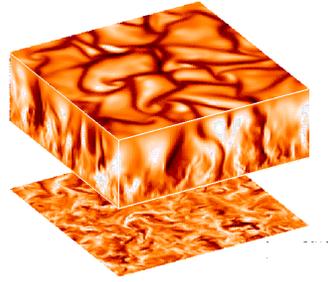
A chaotic movement of heat convection occurs, where higher vibrating particles rise to the highest parts where they emit their particles and high energy photons to the surface, losing energy and returning in the direction of the lower area to be reenergized by electromagnetic radiation, generating strong particles rub vibrations which translate into heat.

Above, there is a layer of “convection” of 150,000 km thick which extends to 500 km deep just below the photosphere, where the pressure is suddenly reduced and hence the temperature drops from its lower from 2 million°C to 6000 ° C.

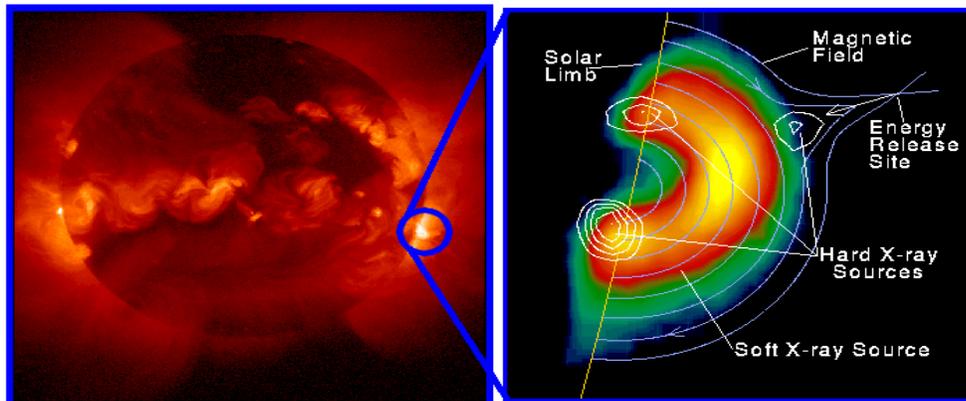


Matter is still in the form of plasma (the vast majority of hydrogen ions), but begins to have a behavior similar to an ocean. Convection processes occur where spin columns will generate large amounts of heat that carry hot materials to the photosphere of the Sun and other ionized atoms returning less energized to be energized again in the bottom.

These turns emit electromagnetic radiation perpendicular to the surface across the sun's surface that adds to the macro-electromagnetic emission from the sun with a different behavior of ultra energy photons.



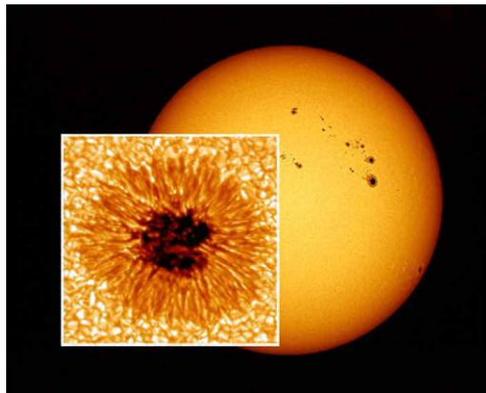
The “photosphere” is the thinnest layer of the sun (between 100 km and 500 km of depth) and is what we actually see with a density of from 0.2 to 0.0002 kg/m<sup>3</sup>. It has an average temperature between 6000 ° C and 4500 ° C on the surface. It is transparent to photons of certain waves and emits a continuous radiation spectrum. It is entirely gaseous, since there is virtually no pressure, and nothing can land on it. Convection cells have up to 1000 kilometers in diameter with a life of 8 minutes.



Yohkoh X-ray Image of a Solar Flare, Combined Image in Soft X-rays (left) and Soft X-rays with Hard X-ray Contours (right). Jan 13, 1992.

Sunspots are in this layer, and exist at 1000 ° K to 1500 ° K colder than the rest of the photosphere. The darker inner regions (umbra) are cooler (4,000 ° K) surrounded by lighter regions (penumbra) of 5,600 ° K.

The sun's magnetic field establishes the direction of the plasma columns, sunspots and other interactions in the sun and heat generated by friction. Sunspots will exist where the magnetic field of the sun is at its maximum rate.



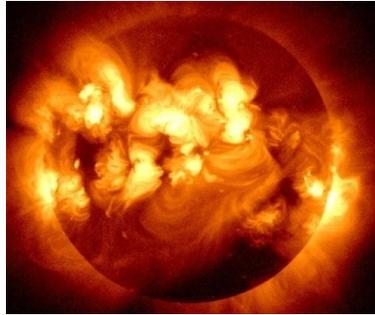
Each sunspot has its own magnetic pole. Reducing the emission of sunspots, will cool the Earth because solar output decreases, on the contrary, the Earth will increase the temperature if the issue of sunspots increases, thus the Earth will warm.



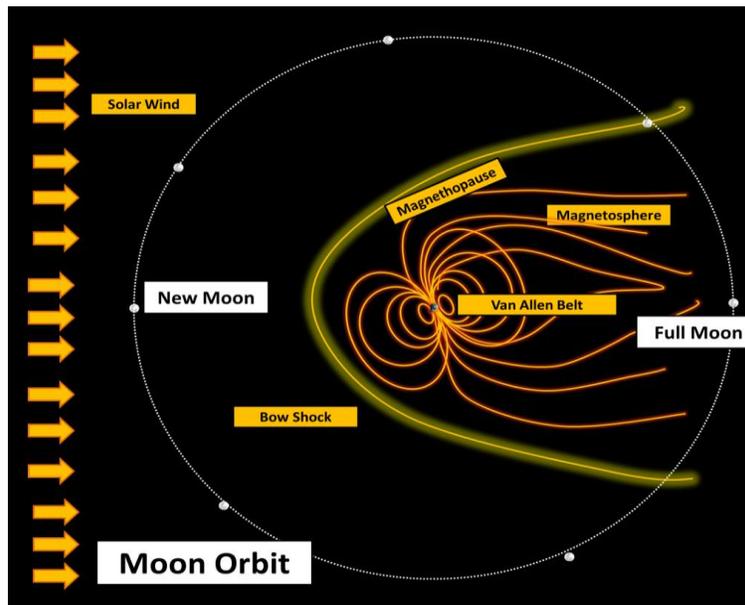
The “chromosphere” is the least dense layer of the sun ( $0.000005 \text{ kg/m}^3$ ), so it is in the plasma state with gaseous behavior. It has about 2,500 km thick and a huge volume, but here the pressure is much lower, the temperature increases again as it reaches the 2 million ° K. Here solar phenomena occur as peaks prominences and ionized atoms of hydrogen and helium.



During periods of high solar activity, the sun performs coronal mass ejections over  $10 \times 10^9$  tons of solar plasma that are emitted into space and speeds up to 1000 km per second. If these are directed to Earth they could significantly alter the magnetic environment of the Earth.



The “solar corona” has a density of  $1 \times 10^{-12}$  kg/m<sup>3</sup>. It is very light, it is trapped in the electromagnetic field of the sun, and is composed of hydrogen and helium atoms at high temperature in contact with the “chromosphere” (1 million ° C) which are ionized into plasma, where the heat is tenuous at high density and large volume, and charged particles move at different speeds energy. It can be seen during an eclipse when a new moon covers the photosphere.



If the ions of the chromosphere are issued quickly enough they can form a “solar wind” which is an electromagnetic river that extends up to 70 million kilometers into space, in addition to photons, gamma rays, neutrinos, electrons and positrons that travel on average speed between 400 and 700 km per second in all directions hitting the atmospheres of the planets and moons.

Source: <http://www.artinaid.com/2013/04/how-does-the-sun-generate-energy/>