What are solar electromagnetic radiatiatons?

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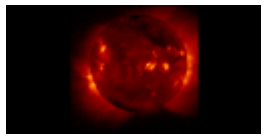
The Sun

The Sun is located at a distance of about 150 million kilometres from the Earth. It provides Earth with energy and heat. Without this energy and heat life on Earth would be impossible.
The sun consists of chemical elements that we can, indeed in other quantities, find on Earth: e.g. helium, hydrogen, calcium, sodium, magnesium, iron… The temperature in the Sun is so high that these elements appear as extremely hot gasses.



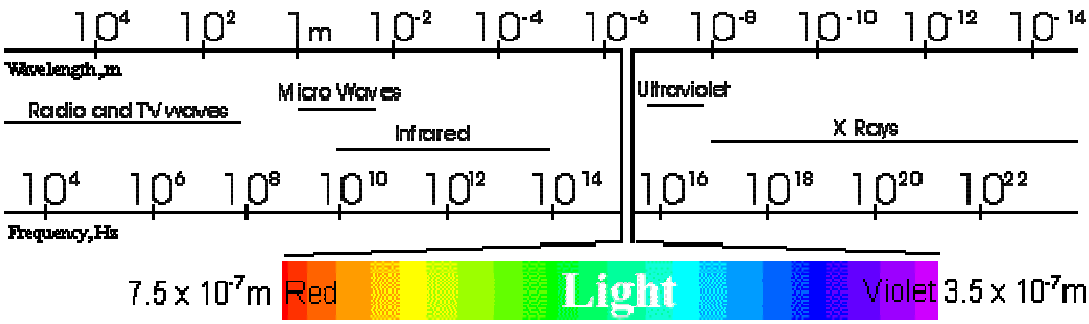
A few numbers concerning the Sun:

- •Diameter: about 1,4 million kilometres
- • Distance to the Earth: 150 million kilometres
- • Mass: 300 000 times the mass of Earth
- • Age: 4.5 billion years
- • Temperature on the surface: 5780 K
- • Temperature inside the Sun: 16 million K

These numbers however, don't make the Sun an oddity. These numbers are characteristic for a "standard star", like a billion others to be found in the universe. The importance of the Sun for us, "inhabitants of the planet Earth", results from the small distance Earth-Sun.

Radiations emitted by the Sun

In the Sun, a large amount of nuclear and chemical reactions constantly convert lighter atoms as hydrogen and helium in heavier atoms. Furthermore the Sun emits electromagnetic radiations in all directions of the interstellar space. The nature of these radiations depends on the composition, the temperature and the nature of the reactions. The emitted photons are characterised by energy corresponding to a certain wavelength. The radiation spectrum shows the way in which photons are spread over the different wavelengths. Not all wavelengths are present in even quantities. The spectral scale is given in the following diagram, in which the energy of the photon increases from left to right. (NB. 1 meter = 10^9 nanometers (nm)).



Radiations coming from the Sun cover a broad wavelength area, from the radio waves, (long wavelengths) to the X-rays (short wavelengths). Radiations show a maximum round 410 nm. The human eye senses only a limited part of the solar spectrum, namely the visible radiations between 400 and 750 nm (from violet to red). The wavelengths between 220 nm and 400 nm (invisible for the human eye) are called ultraviolet radiations (in short UV-radiations). The shorter the wavelength, the larger the amount of energy transported and the more substantial the effect caused by the interaction of radiations and substances. Fortunately the atmosphere of the Earth protects us against the very harmful X-rays and most of the UV-radiations.

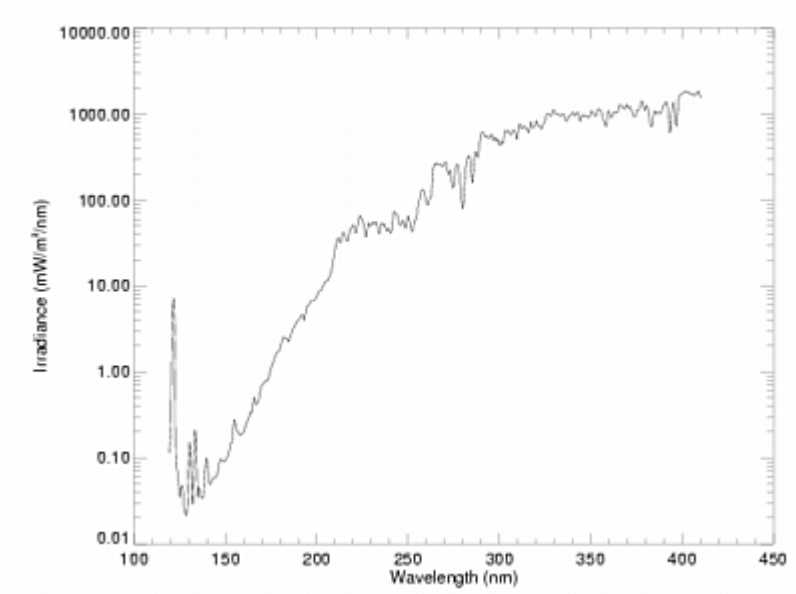
UV-radiations are divided in 3 wavelength ranges: A, B and C.

Gamut	**Area**	**Influence on the surface of the Earth**
UV-A	315-400 nm	...
UV-B	280-315 nm	Less than 1% of the total UV-flux at the Earth's surface
UV-C	220-280 nm	Completely absorbed in the atmosphere

Although the most energetic UV-B- and UV-C-radiations are absorbed before reaching the surface of the Earth, the amount of UV-A and UV-B-radiations that does reach the Earth's surface, can't be neglected. From the 100 W/m2 emitted by the Sun, in the UV-C- and UV-B-ranges, the total amount reaching the surface of the Earth is of the order of 1,5 W/m2.

Observation of the Sun

An exact knowledge of the total radiation flux emitted by the Sun, which is also called neutral luminosity, is necessary to discover what happens within the Sun itself, but also to study the effects at a distance of 150 million kilometres, namely on Earth. Before anyone ever talked about space travel, the measurement of the neutral luminosity of the Sun was only possible from the ground or with instruments on board of stratospheric balloons. The problem is that measurements with instruments on board of stratospheric balloons are influenced by atmospheric disturbance, causing an important experimental error.



The development of instruments boarded on satellites, nowadays allows scientists to conduct, with great precision spectral measurements from outside the atmosphere of the Earth. Several instruments are presently on board of satellites and offer us daily data on spectral activity of the Sun in wavelengths ranging from X-rays to microwaves.