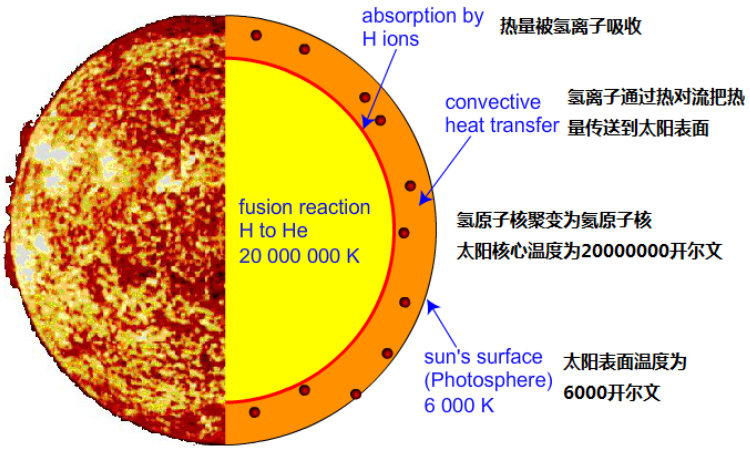
2.7 The Sun

太阳

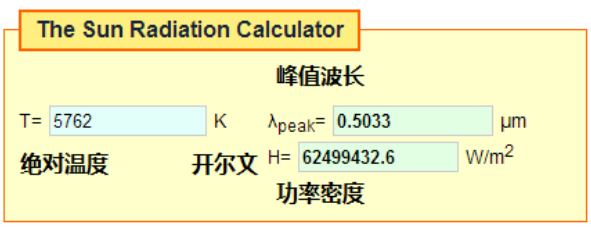
The sun is a hot sphere of gas whose internal temperatures reach over 20 million degrees kelvin due to nuclear fusion reactions at the sun's core which convert hydrogen to helium. The radiation from the inner core is not visible since it is strongly absorbed by a layer of hydrogen atoms closer to the sun's surface. Heat is transferred through this layer by convection[1]. The surface of the sun, called the photosphere, is at a temperature of about 6000K and closely approximates a blackbody (see graph). For simplicity, the 6000 K spectrum is commonly used in detailed balance calculations but temperatures of 5762 ± 50 K[2] and 5730 ± 90 K[3] have also been proposed as a more accurate fit to the sun's spectrum.

太阳是一个充满气体的热球，因为太阳核心在进行着由氢到氦的核聚变反应，其内部温度可达两千万开尔文。但是因为靠近太阳表面的一层氢原子强烈吸收太阳内核的辐射，我们看不到内核的辐射。通过这层氢原子，热量以对流的形式被传递出来[1]。太阳表面，又被称为光球，其温度为6000开尔文左右，可以被近似为一个黑体（见图片*）。为了简便，6000开尔文的光谱通常被用于细致平衡模型计算。但是，也有人提出采用温度为5762 ± 50开尔文[2]和5730 ± 90开尔文[3]的黑体辐射来模拟太阳光谱更为准确。

* http://www.pveducation.org/pvcdrom/properties-of-sunlight/atmospheric-effects

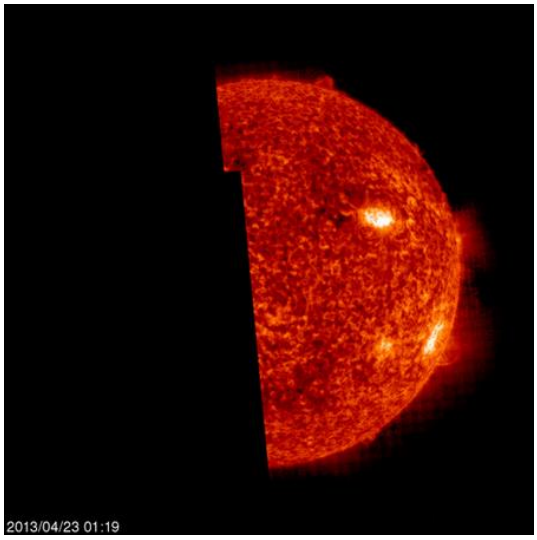


太阳辐射计算器



The total power emitted by the sun is calculated by multiplying the emitted power density by the surface area of the sun which gives 9.5×10^{25} W.

将太阳辐射出的功率密度乘以太阳的表面积，我们可以得到太阳辐射的总功率，约为9.5×10^{25}瓦。

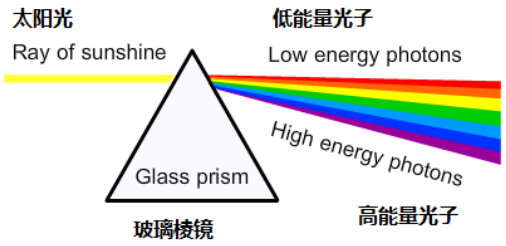


Current image of the sun (updated every few hours) from SOHO.

上图为太阳和太阳风层探测器所测到的当前的太阳图片（每隔几个小时更新一次）

The total power emitted from the sun is composed not of a single wavelength, but is composed of many wavelengths and therefore appears white or yellow to the human eye. These different wavelengths can be seen by passing light through a prism, or water droplets in the case of a rainbow. Different wavelengths show up as different colours, but not all the wavelengths can be seen since some are "invisible" to the human eye.

太阳辐射的总功率并不只含有单一波长，而是由很多波长组成。因此，人眼中的太阳呈现出白色或者黄色。使太阳光通过棱镜就可以看见各种各样的波长，或者使太阳光透过水滴就可以看见彩虹。不同的波长的表现形式为不同的颜色，但是并不是所有的波长的光都能被看见，因为一部分光对于人眼来说是不可见的。



参考文献

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2. Backus CE. Solar Cells. New York: IEEE; 1976 p. 512.

3. Parrott JE. Choice of an equivalent black body solar temperature. Solar Energy [Internet]. 1993;51:195 - 195. Available from: http://www.sciencedirect.com/science/article/B6V50-497TD5S-1HX/2/5b4be52ce15a1f2f2b664fe8bbb37cb6