The Sun is NOT dead - The present solar minimum

The solar cycle

The Sun has an activity cycle of around 11 year. During a minimum, like in 1996 and now, there are fewer structures in the solar corona and sunspots on the solar surface. During a maximum like in 2002, the solar surface is populated with active regions producing continuously small and large explosions. To visualize this, have a look at Figure 1.

Indices for solar activity

- The sunspot index: a measure of how much the solar surface is covered with black sunspots. It is the most known and oldest index.
- The TSI: the total solar irradiance, the sum of all solar radiation.
- The 10cm radio flux: the sum of the solar radiation with the wavelength of 10.7 cm.

These indices are plotted in Figure 2.

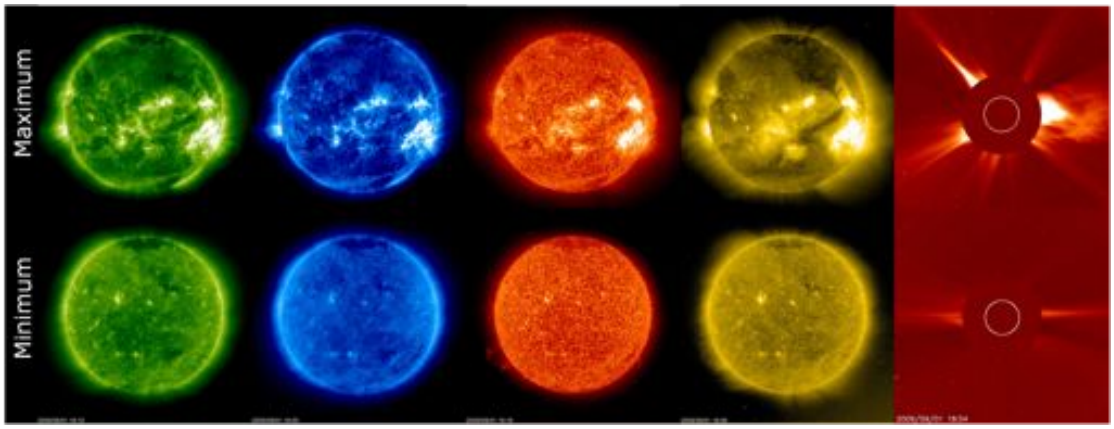


Figure 1 *The Sun in EUV taken by EIT and the space surrounding the Sun in visible light taken by LASCO. Both EIT and LASCO are onboard SOHO. The top pictures are taken at a particular day during the maximum, the bottom pictures are taken at a day during the present minimum. In the EUV spectrum, the difference between maximum and minimum is clearly visible. In the surrounding space, more structures are visible during a maximum compared with the minimum.*

The minimum in mathematical terms

The minimum of a solar activity cycle is the month with the smallest monthly smoothed Sunspot Number. We average over 13 months: 6 months before and 6 months after the considered month. At the moment, we don't know when the actual minimum occurred or will occur.

A peculiar minimum?

100 years ago, in 1913, the Sun felt into a similar deep minimum. At that time, she re woke. The present minimum is taking already a long time. Nobody expected this. In 2008, the daily International Sunspot Number was 268 times zero, in 2009 (up to November 25) 247. However, the next cycle, nr 24 has been already knocking on the door. In September, October, as well as in November 2009, we saw on a regular basis new cycle sunspots. Since the beginning of 2008, we spotted sporadically cycle 24 sunspots.

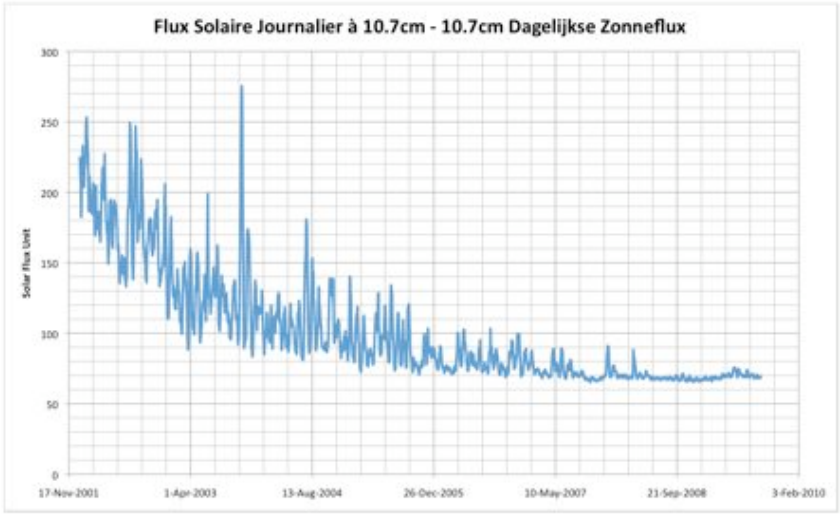
Will the temperature on Earth decrease?

The Sun is besides an enormous light bulb, a heater. Shut down the heating, and the temperature will decrease. During the night, it is indeed colder. But the variation of e.g. the infrared radiation over the

11-year cycle is so small that the influence on the Earth's temperature is negligible compared with the present climate fluctuations. The present minimum and the associated decrease of the total solar irradiance are too small to trigger a significant temperature decrease on Earth.

Some positive consequences of the minimum!

This extreme solar minimum is the good news show for satellites in an orbit around Earth. The Earth atmosphere is less dense in the top layers. The satellite feels less drag: less air molecules bump into the satellite. Earth observing satellites can be put now into a lower orbit without increasing the problems with the drag. Besides this, radio communication with for example airplanes on polar flights is more stable. GPS-signals are less disrupted.



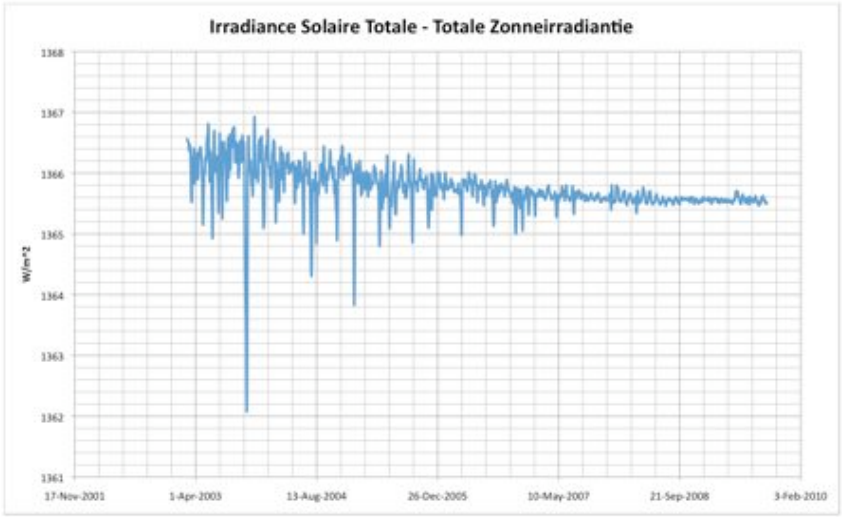


Figure 2 *In the top figure, the 10.7cm radio flux is plotted, in the second graph, the TSI and in the third graph the daily International Sunspot Number.*