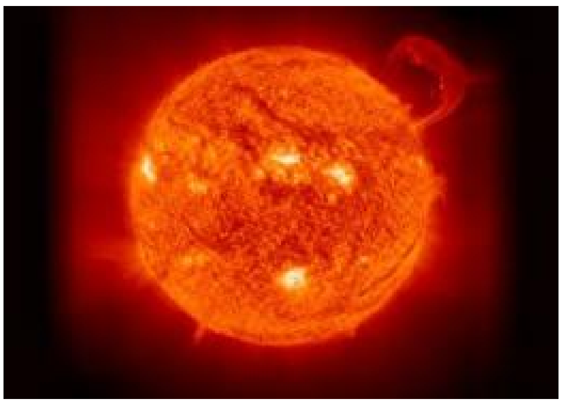
How can we use neutrinos to probe dark matter in the Sun?

September 9 2010



The existence of Dark Matter particles in the Sun's interior seems inevitable, despite dark matter never having been observed (there or elsewhere), despite intensive ongoing searches. Once gravitationally captured by the Sun, these particles tend to accumulate in its core.

In a paper to be published in the scientific journal *Science*, Dr. Ilidio Lopes and Professor Joseph Silk propose that the presence of dark matter in the Sun's interior causes a significant drop in its central temperature. Their calculations have shown that, in some dark matter scenarios, an isothermal solar core (constant temperature) is formed. The authors suggest that the neutrino detectors will be able to measure these types of effects.

In another paper published in The Astrophysical Journal Letters, the same authors suggest that, through the detection of gravity waves produced in the Sun's interior (identical to internal sea waves), Helioseismology can also independently confirm the presence of Dark Matter in the Sun.

Current detectors of solar neutrinos, Borexino and "Sudbury Neutrino Observatory" (SNO), as well as those currently being built, will be able to measure with precision the temperature in the Sun's interior. In particular, SNO is a Canadian experiment which also has European and American support. Portugal participates in the SNO and SNO+ experiments through the "Laboratório de Instrumentação e Partículas (LIP)".

The development of Helioseismology has been fundamental for increasing our scientific understanding of the Sun. The experiment Global Oscillation Low-degree Modes (GOLF) detector on the SoHO satellite seems to have identified gravity waves in the Sun for the first time. Future experiments in Helioseismology will be able to confirm these results.

More information: *Science*, 2010. DOI: 10.1126/science.1196564

Provided by Universidade de Evora