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Discovery of solar neutrinos from the CNO fusion cycle within the Sun by the Borexino experiment

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Borexino has now been observing the Sun shining in neutrinos since over 14 years. The last and among the most important results obtained with this large liquid scintillator detector at the underground Laboratori Nazionali del Gran Sasso is the discovery of neutrinos from the Carbon-Nitrogen-Oxygen (CNO) cycle of fusion reactions.

Previously unobserved, the CNO cycle is predicted to be a dominant energy production mechanism for massive stars, while it remains secondary for stars of the mass of the Sun. Consequently, its small neutrino flux is hard to detect and poses real challenges for due to cosmogenic (^{11}C) and intrinsic (^{210}Bi) backgrounds within the detector. We present here the strategy adopted by the Borexino experiment to succeed in this challenge, including the extraordinary performance and stability achieved by the detector and the data analysis developed for the task, as well as the implications of this result on solar physics.

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