Study finds our Sun is like other stars, resolving mystery

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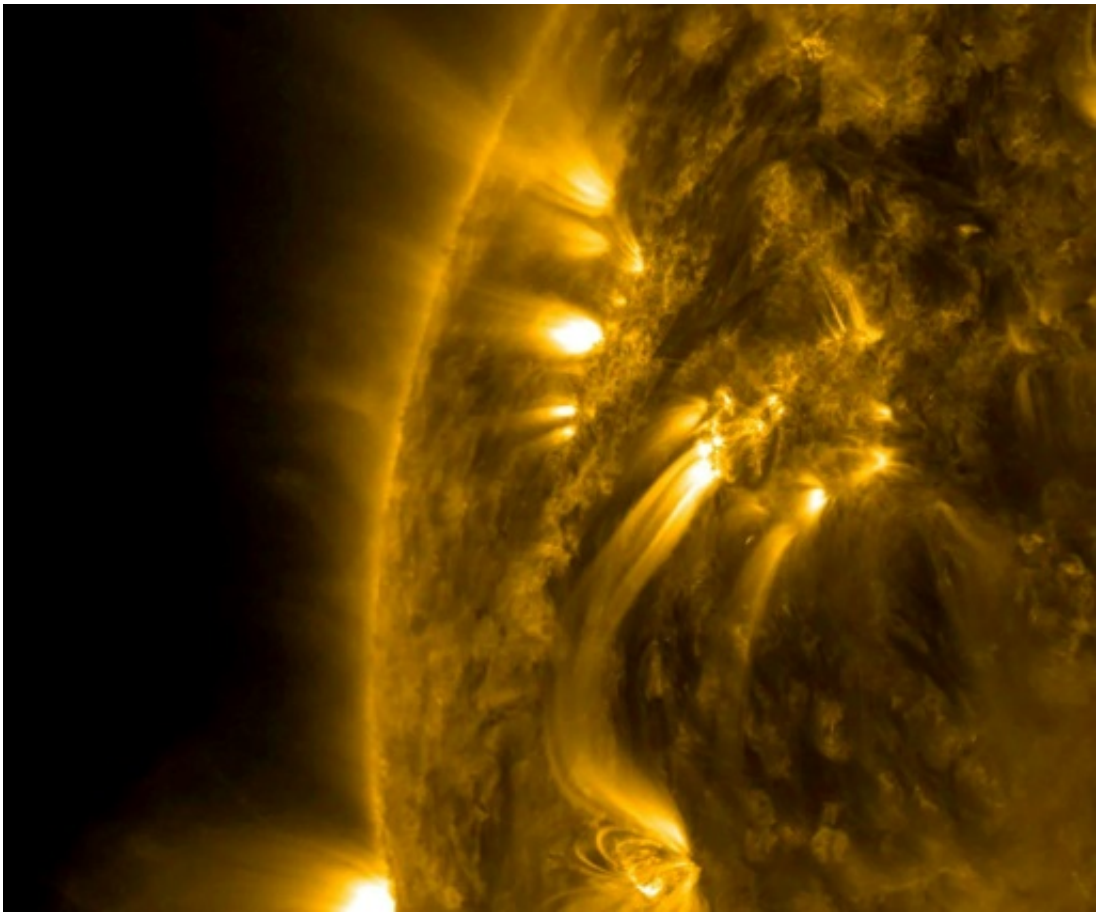


The Sun's magnetic poles flip every 11 years in a cycle determined by its rotation rate and luminosity, like other nearby, solar-type stars

Our Sun is much like other stars, and not an anomaly because of its magnetic poles that flip every 11 years, scientists said Thursday.

The report in the journal *Science* aims to lay to rest the controversy over whether our solar system's star is cyclic, like other nearby, solar-type stars.

"We have shed light on a fundamental mechanism which determines the length of these cycles, which helps us understand the cycle itself over the long-term," lead author Antoine Strugarek, a researcher at the University of Montreal, told AFP.

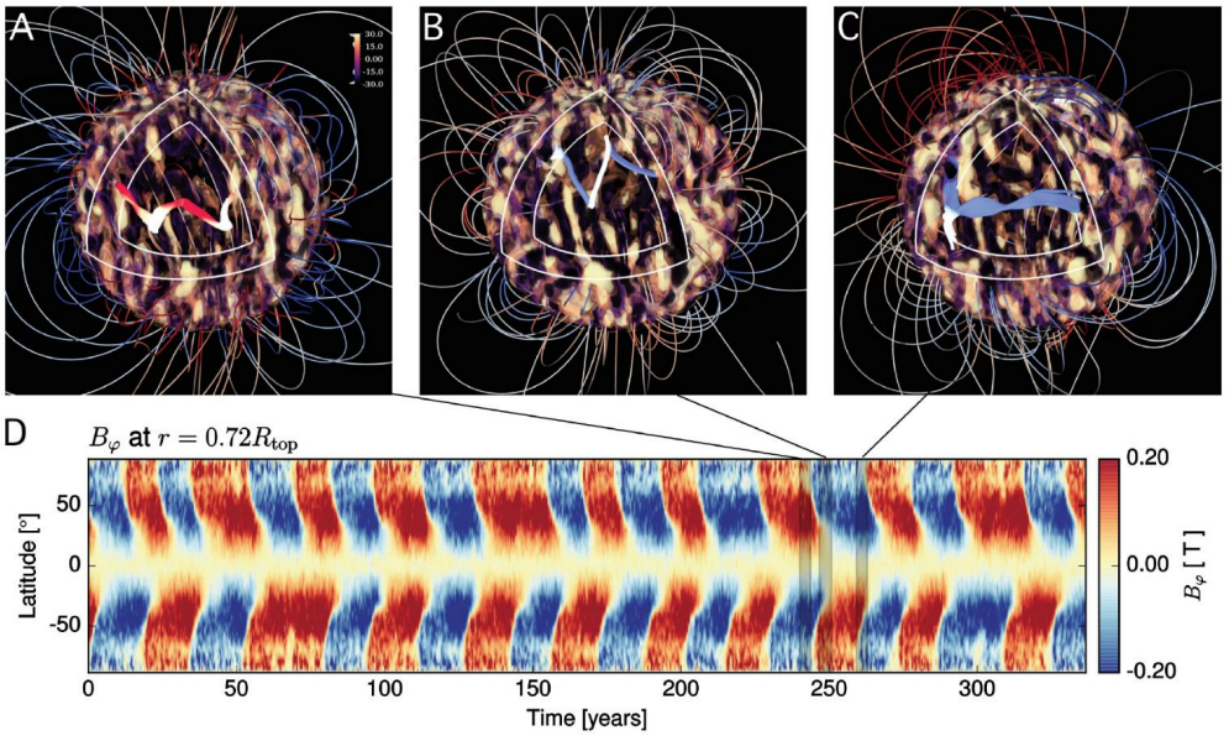
"We can therefore say of the Sun's next magnetic cycle in 10 or 20 years will be intense, long or short, which helps us understand among other things what kind of satellites to put in orbit and the most favorable launch windows."

Activity on the Sun, from the number of sunspots to levels of radiation and ejection of material, varies on an 11-year cycle.

These changes are driven by the Sun's magnetic field.

Scientists have long believed that our Sun was unusual because it did not match the magnetic cycles observed on other solar-type stars.

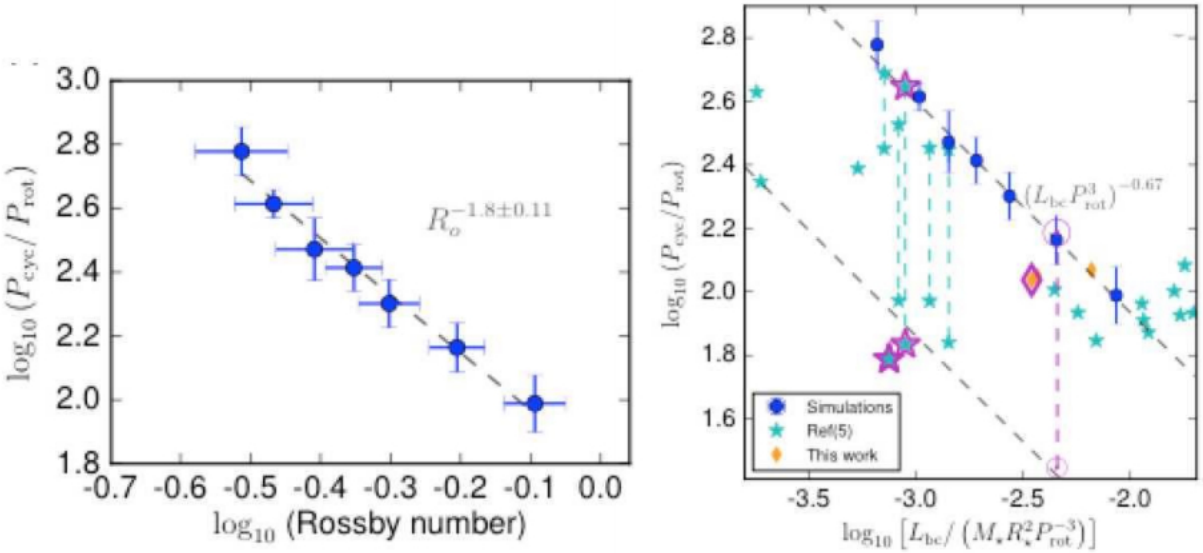
So researchers carried out a series of simulations of stellar magnetic fields, and showed that the Sun's magnetic cycle depends on its rotation rate and luminosity, said the report.



Longitudinal magnetic field as a function of latitude and time at the base of the convection zone. The magnetic field changes sign periodically and oscillates between symmetrical (same sign on both sides of the equator, e.g. between 10 and 140 years) and anti-symmetrical (opposite sign with regard to the equator of between 240 and 320 years) phases. Credit: DAp/CEA-AIM-Université de Montréal

They compared their simulations with observations of cyclic activity in nearby solar-type stars, and found that indeed, the cycle periods of the Sun and other solar-type stars all follow the same relationship.

"This research shows that the 11-year cycle is the principal cycle of all solar-type stars," said Allan Sacha Brun, Head of the Laboratory Dynamics of Stars and their Environment and principal investigator of the European Research Council project called STARS2.



Ratio of the magnetic cycle period to the rotation period of the star as a function of the Rossby number in turbulent 3D simulations (left). A power law decreases with the Rossby number results from the strong non-linearity of the dynamo operating in these simulations. On the right, the same ratio is shown as a function of star luminosity (normalized to the period of rotation of the star). This diagram includes the Sun (magenta circle with a point at its center) and other Sun-type stars (cyan stars and orange diamonds) for which a magnetic cycle was observed. The solar twins are highlighted in magenta. The simulations (blue disks) cross the solar point without parameter adjustment. The vertical dashed lines indicate stars possessing two magnetic cycle periods. Credit: DAp/CEA-AIMUniversité de Montréal

More information: A. Strugarek el al., "Reconciling solar and stellar magnetic cycles with nonlinear dynamo simulations," *Science* (2017). science.sciencemag.org/cgi/doi … 1126/science.aal3999