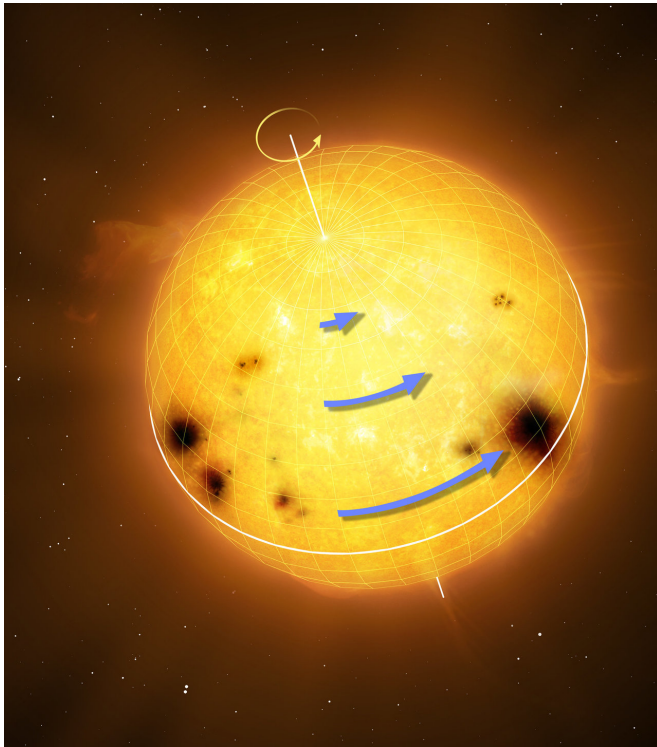


Astrophysicists measure precise rotation pattern of sun-like stars for the first time

20 September 2018



Sun-like stars rotate differentially, with the equator rotating faster than the higher latitudes. The blue arrows in the figure represent rotation speed. Differential rotation is thought to be an essential ingredient for generating magnetic activity and starspots. Credit: MPI for Solar System Research/MarkGarlick.com

Sun-like stars rotate up to two and a half times faster at the equator than at higher latitudes, a finding by researchers at NYU Abu Dhabi that challenges current science on how stars rotate.

Until now, little was known about the precise rotational patterns of Sun-like [stars](#), only that the equator spins faster than at higher latitudes, similar to the Sun.

Scientists at the NYU Abu Dhabi Center for Space Science used observations from NASA's Kepler

mission and asteroseismology—the study of sound waves traveling inside stars—to determine with precision how Sun-like stars rotate, which no other scientific method has been able to achieve.

Their study found that Sun-like stars, characterized as being like the Sun in mass and age, do indeed rotate in a similar manner as the Sun in that their equatorial regions rotate more rapidly than at mid-to high latitudes. But there's a key difference.

The [equator](#) of the Sun rotates about 10 percent faster than its mid latitudes, while equators of Sun-like stars spin up to two and a half times faster than their mid latitudes.

"This is very unexpected, and challenges current numerical simulations, which suggest that stars like these should not be able to sustain differential rotation of this magnitude," said Othman Benomar, research associate at the NYU Abu Dhabi Center for Space Science and lead author of the study published in *Science*.

"Understanding differential rotation—how fast one part of a star spins compared to the rest—is not only important for a complete understanding of how a star works, it will help us gain deeper insights about their magnetic fields," explained Katepalli Sreenivasan, principal investigator of the NYU Abu Dhabi Center for Space Science.

Magnetic fields on the Sun have been known to cause enormous solar storms that frequently disrupt orbiting [space](#) satellites and have knocked out power grids on Earth.

Scientists agree that the rotation of the Sun plays a crucial role in the generation of the solar magnetic field, but the exact details still remain a mystery, despite the Sun having been observed and studied in great detail.

Sreenivasan added, "learning more about how

stars rotate and generate their own magnetic fields could help us gain further insight into the solar dynamo, the physical process that generates the Sun's magnetic [field](#)."

More information: O. Benomar et al., "Astroseismic detection of latitudinal differential rotation in 13 Sun-like stars," *Science* (2018). science.sciencemag.org/cgi/doi/10.1126/science.aao6571

Provided by NYU Abu Dhabi

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