NEWS FEATURE

Redistribution unrestricted | Online: 30 January 2025

JOURNAL OF GEOPHYSICS
Est. 1924
www.geophysicsjournal.com

Saturn vs. Jupiter & Jupiter vs. Sun… planets vs. stars & stars vs. stars… to Harmony!

Jupiter-turned-pulsar knocks out the Sun, revealing a galactic Snooker Shootout: stars dodging uninvited guests by playing dead (and awakening to superflare fireworks to celebrate a save)

by: the Journal of Geophysics staff
www.geophysicsjournal.com, office@geophysicsjournal.com

"The most important discovery of 2024: how stars are sorted out"

Key words— stellar multiplicity, binaries, planetary pulsars, pulsar classes, solar grand minima, solar superflares, Jupiter, Sun.

In a paper doublet published last month in the oldest geophysics periodical, Journal of Geophysics (https://n2t.net/ark:/88439/x001607 and https://n2t.net/ark:/88439/x010002), a global dynamicist Dr. Mensur Omerbashich spectrally analyzed >12 billion mission-integrated Galileo–Cassini–Juno 1996–2020 annual samplings of Jupiter's global magnetic field. He showed that Jupiter acts globally as a relatively high-power pulsar star while Saturn remains calm. Rather than being a bizarre planet traditionally designated "gaseous giant" (over previously recognized small-scale pulsarlike characteristics regarded back then as anomalies), Jupiter now reveals at least one primordial (since-birth) global attribute of an active star: a superoutbursting preparation phase.

Dr. Omerbashich made this discovery by building on the revolutionary Gauss-Vaniček spectral analysis (GVSA) to study the magnetic field variations. GVSA is the only rigorous method for detecting periodicities in incomplete data, simulating completed orbits and fleet formations from a single spacecraft, and directly computing relative field dynamics. Most recently, he used GVSA in 2023 to decipher first the Sun's global decadal dynamics and detect the solar core and its offset (https://www.openpr.com/news/3337049.html) and to show first that the solar wind is responsible for most of the strong seismicity on Earth, the Moon, and Mars (https://www.openpr.com/news/2982920.html).

Surprisingly, the Sun began reacting in 2002 to this tremendous Jovian dynamic that takes up to ~20% of Jupiter's total magnetic energy—by shutting itself down too in terms of magnetic activity (electromagnetic radiation and sunspots generation) to a sleep state called grand solar minimum. Thus, although the gaseous Jupiter has never succeeded in igniting the stellar core of its own so that classically it can be understood as a planet more than a star, from 1996-1999 on, it began preparations for firing superoutbursts in the same fashion magnetars and dwarf novae get ready. That same manner (of gradually increasingly/decreasingly sinusoidal change in total magnetic activity over several decades) is considered one of the rarest ways for energy dissipation in nature; on Earth, it is a feature of peculiar physicochemical reactions observed in few geological processes.

Previous grand solar minima (from over four centuries ago) can only be hypothesized about because no one counted sunspots back then. That makes it impossible to compare the current increase in Jupiter's magnetic dynamics with historical records of grand solar minima. However, we know that the Sun does fire superflares—overheated sparks with up to 10-100 times more energy than most energetic solar flares—which occur once every ~450 years based on the geological record. The previously noticed lack of global aurorae as natural companion events of such superflares over the past ~500 years means that superflaring on the Sun is overdue. Solar superflares are non-extinction events but are likely to cause dramatic damage to electric and telecommunication infrastructure on Earth and its vicinity, including artificial satellites.

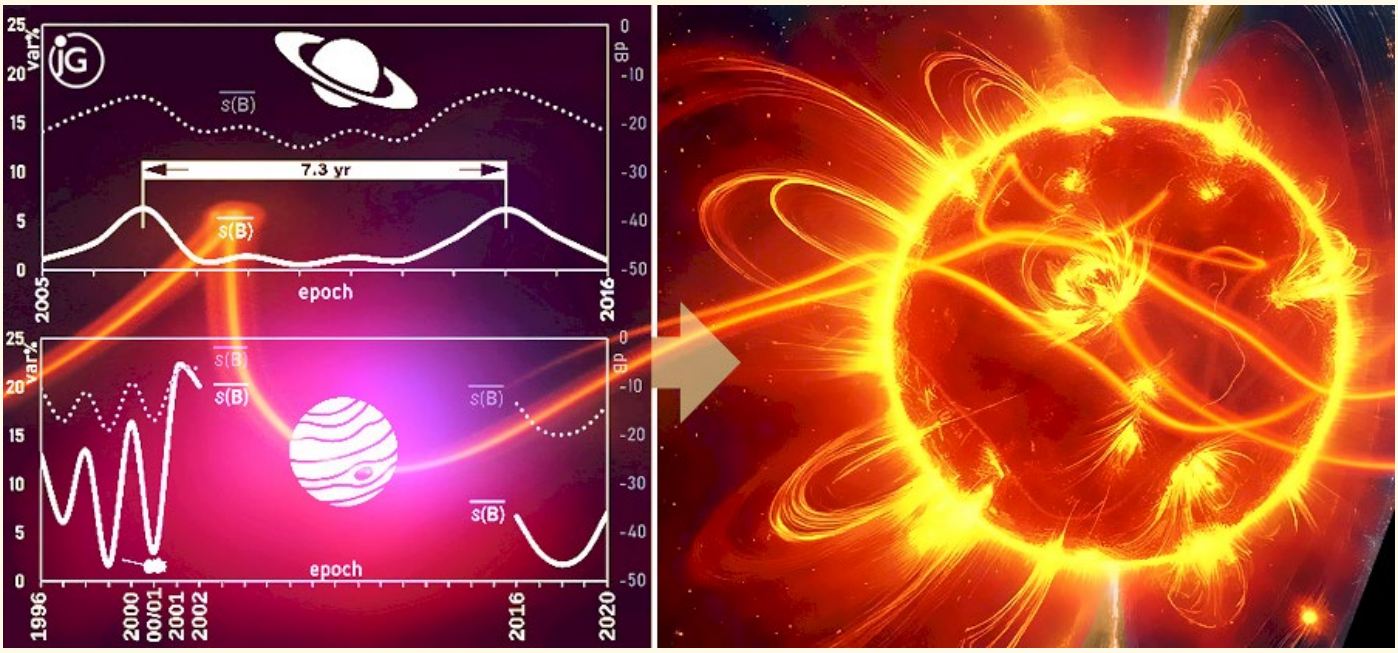
The discovered phenomenon does not depend on Jupiter's capability to draw enough of its rotational energy to superoutburst itself (say, as a beam of energy seen commonly in pulsars). Indeed, as soon as the Jupiter pulsar jump phase commenced, the Sun "closed the window blinds" in the inverse-matching fashion to Jovian activity increase. This primordial causal phenomenon akin to a camera lens shutter or a car shock absorber resembles Jupiter shooting bullets (or blanks) at the Sun that, seeing the flash of a weapon firing, still ducks—just in case.

But whatever occurs with Jupiter at the end (several years to decades from now) of its preparation phase, the Sun must eventually release the energy stored while quietest. This awakening of our host star will expectedly take the form of superflaring accompanied by atmospheric effects and superelectromagnetic impulses that, akin to paddles and rods for steering boats in rivers, act on all surrounding magnetic objects as orbit-correcting levers. So besides lowering solar activity, the discovered mechanism likely also keeps Jupiter at a safe distance by hindering its ability to correct orbit.

Cite as: News Feature (2025) Jupiter-turned-pulsar knocks out the Sun, revealing stars dodge guests by playing dead. *J. Geophys.* 66(1):58-59

Get the public press release from this News Feature (mirror)

ARK:https://n2t.net/ark:/88439/x020005



Since it is primordial, this last solar line of defense against incoming migrating stars reveals a universal stellar mechanism for preventing active stars and gaseous giants (failed stars) alike from ever leeching on, i.e., becoming binary-star companions and hot Jupiters (those orbiting closer than 1 AU from the host star or the average Earth-Sun distance of 150 million km). So when an uninvited guest penetrates a star's defenses and assumes a close-by orbit, the very existence of that host star and its planetary system become jeopardized.

Remarkably, the discovery thus explains the previously observed ~1:3 relative scarcity of binary (two-star-) systems and why binaries and multinary (three-or-more-star-) systems progressively so occur more often with the stellar mass increase. Namely, while this mechanism does a remarkably efficient sifting job amongst dwarfs as the predominant yet less massive star type, it weakens naturally in highly massive stars or at any place where gravity reigns supreme. The mechanism then safeguards most stars against incoming stars via a magnetism buffer effect. Since primordial, the newly found mechanism of magnetic tangling on stellar-system decadal scales could be essential to our understanding of the origin of Jupiter, star formation processes, and the very nature of gravity itself.

Cite as: News Feature (2025) Jupiter-turned-pulsar knocks out the Sun, revealing stars dodge guests by playing dead. *J. Geophys.* 66(1):58-59

Get the public press release from this News Feature (mirror)

ARK:https://n2t.net/ark:/88439/x020005 2643-9271/24/66/0058/0059 | © 2024 Journal of Geophysics under CC BY-NC-ND 4.0.