

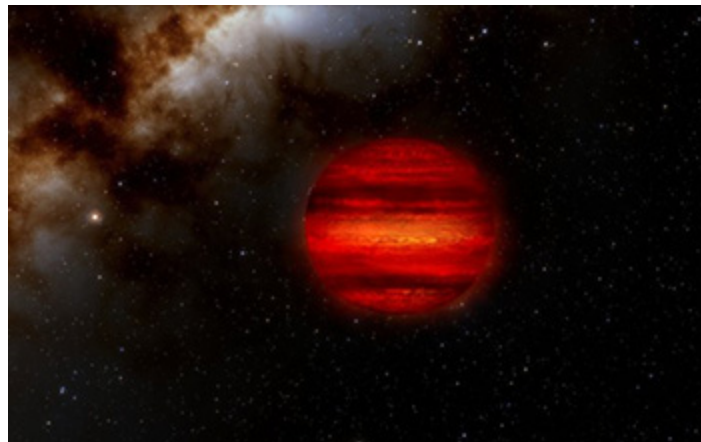


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Research News

# Caught speeding: Clocking the fastest-spinning brown dwarfs

Gemini North observations help identify rotational speed limit for brown dwarfs



Three brown dwarfs, often called "failed stars," are spinning faster than any others.

[Credit and Larger Version \(/discoveries/disc\\_images.jsp?cntn\\_id=302522&org=NSF\)](/discoveries/disc_images.jsp?cntn_id=302522&org=NSF)

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Astronomers have discovered the most rapidly rotating brown dwarfs -- three brown dwarfs that each complete a full rotation roughly once every hour. The rate is so extreme that if they rotated any faster, they could come close to tearing apart.

Brown dwarfs are, simply put, failed stars. They form like stars but are less massive and more like giant planets.

Astronomers first measured the rotation speeds of these brown dwarfs using the Spitzer Space Telescope and confirmed them with follow-up observations with the Gemini North telescope on Maunakea in Hawaii and the Magellan Baade telescope in Chile. Gemini North is one of the pair of telescopes that make up the [international Gemini Observatory \(/cgi-bin/good-bye?https://noirlab.edu/public/programs/gemini-observatory/\)](https://noirlab.edu/public/programs/gemini-observatory/), a program of NSF's [NOIRLab \(/cgi-bin/good-bye?https://noirlab.edu/public/news/noirlab2114/\)](https://noirlab.edu/public/news/noirlab2114/).

"We seem to have come across a speed limit on the rotation of brown dwarfs," said Megan Tannock of Western University. "Despite extensive searches, by our own team and others, no brown dwarfs have been found to rotate any faster. In fact, faster spins may lead to a brown dwarf tearing apart."

Tannock and Western University astronomer Stanimir Metchev worked with international collaborators to find three rapidly rotating brown dwarfs. They spin approximately 10 times faster than normal, and about 30% faster than the most rapid rotations previously measured.

The astronomers confirmed the rapid rotations by measuring alterations in the brown dwarfs' light and using a computer model to match those alterations to spin rates. The researchers found that these brown dwarfs spin with speeds of about 350,000 kilometers per hour (around 220,000 miles per hour) at their equator, which is 10 times faster than the spin of Jupiter.

"These unusual brown dwarfs are spinning at dizzying speeds," said Sandy Leggett, an astronomer at Gemini North who studies brown dwarfs. "At about 350,000 kilometers per hour, the relatively weak gravity of the brown dwarfs is barely holding them together. This exciting discovery has identified rotational limits beyond which these objects may not exist."

The team's results, funded in part by the [U.S. National Science Foundation](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1539773&HistoricalAwards=false) [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1539773&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1539773&HistoricalAwards=false), will appear in an upcoming issue of *The Astronomical Journal* ([/cgi-bin/good-bye?https://arxiv.org/abs/2103.01990](https://arxiv.org/abs/2103.01990)).

"Through its combination of near infrared sensitivity and nimble reaction to new astronomical finds, the Gemini-North telescope has confirmed and further characterized the fascinating nature of these valuable discoveries," said Martin Still, a program director in NSF's Division of Astronomical Sciences.

-- NSF Public Affairs, [researchnews@nsf.gov](mailto:researchnews@nsf.gov) (<mailto:researchnews@nsf.gov>)