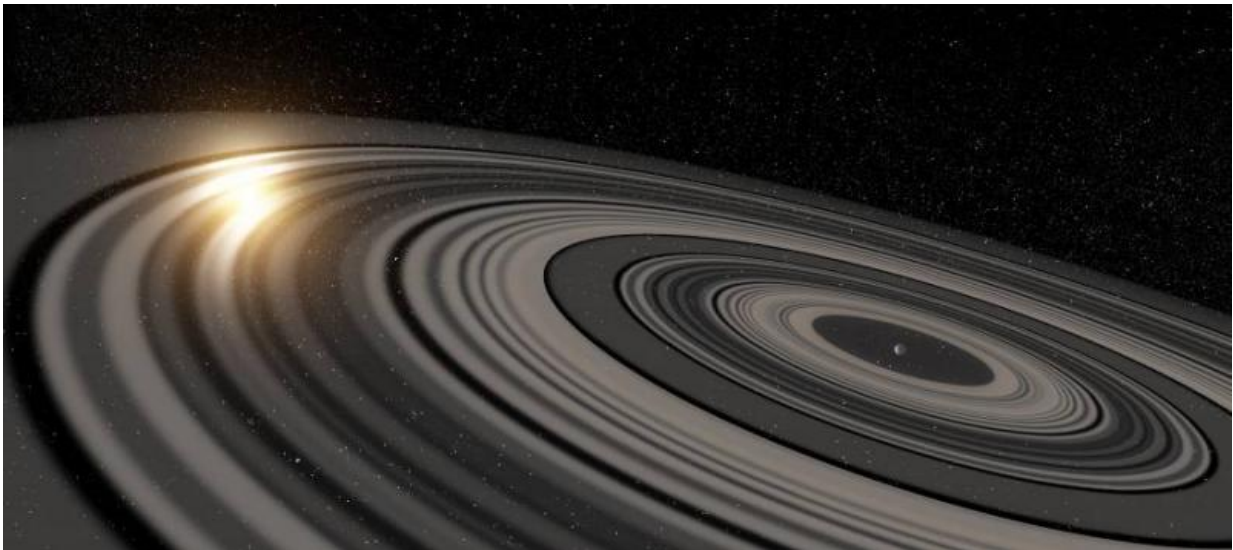


Giant rings around exoplanet turn in unexpected direction

October 12 2016



Artist's conception of the extrasolar ring system circling the young giant planet or brown dwarf J1407b. The rings are shown eclipsing the young sun-like star J1407, as they would have appeared in early 2007. The best fit model is consistent with a system of at least 30 rings, and there are gaps where satellites (“exomoons”) may have already formed. Credit: Ron Miller. Credit: Astronomie.nl

Researchers from Japan and the Netherlands who were previously involved in the discovery of an exoplanet with huge rings have now calculated that the giant rings may persist more than 100,000 years, as long as the rings orbit in the opposite direction compared to that of the

planet around the star. Their findings are accepted for publication in the journal *Astronomy & Astrophysics*.

The researchers Steven Rieder (RIKEN, Japan) and Matthew Kenworthy (Leiden University, the Netherlands) studied the star J1407. This young sun-like star showed a strange series of eclipses in 2007. The researchers proposed an explanation in 2015: there should be a planet with a gigantic ring system that is orbiting the star. The rings should be over a hundred times larger than the rings of Saturn.

In 2016, the researchers carried out simulations to see whether such a massive ring system can be stable for a long time. Before the simulations there were doubts about this hypothesis since the [exoplanet](#) orbits in a very eccentric orbit - sometimes the planet gets close to the star, and the gravitational effect of the star could disrupt the rings.

Now the simulations show that the system is stable and can persist for more than 10,000 orbits of 11 years. According to lead author Steven Rieder there is one premise, though: "The system is only stable when the rings rotate opposite to how the planet orbits the star."

Rings that turn in this sense (retrograde rings) are not common. Therefore the [researchers](#) suspect that there has been a catastrophe that caused the rings (or the planet) to turn the other way around.

Rieder: "It might be far-fetched: massive rings that rotate in opposite direction, but we now have calculated that a 'normal' ring system cannot survive."

The star eclipses could still be caused by a free floating object. "The chance of that is minimal," says Rieder. "Also, the velocity measured with previous observations may not be right, but that would be very

strange, because those measurements are very accurate."

In future research, the astronomers want to investigate how the ring structure could form and how it changes over time.

More information: Constraints on the size and dynamics of the J1407b ring system. arxiv.org/abs/1609.08485

Provided by Netherlands Research School for Astronomy

Citation: Giant rings around exoplanet turn in unexpected direction (2016, October 12) retrieved 17 July 2024 from <https://phys.org/news/2016-10-giant-exoplanet-unexpected.html>

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