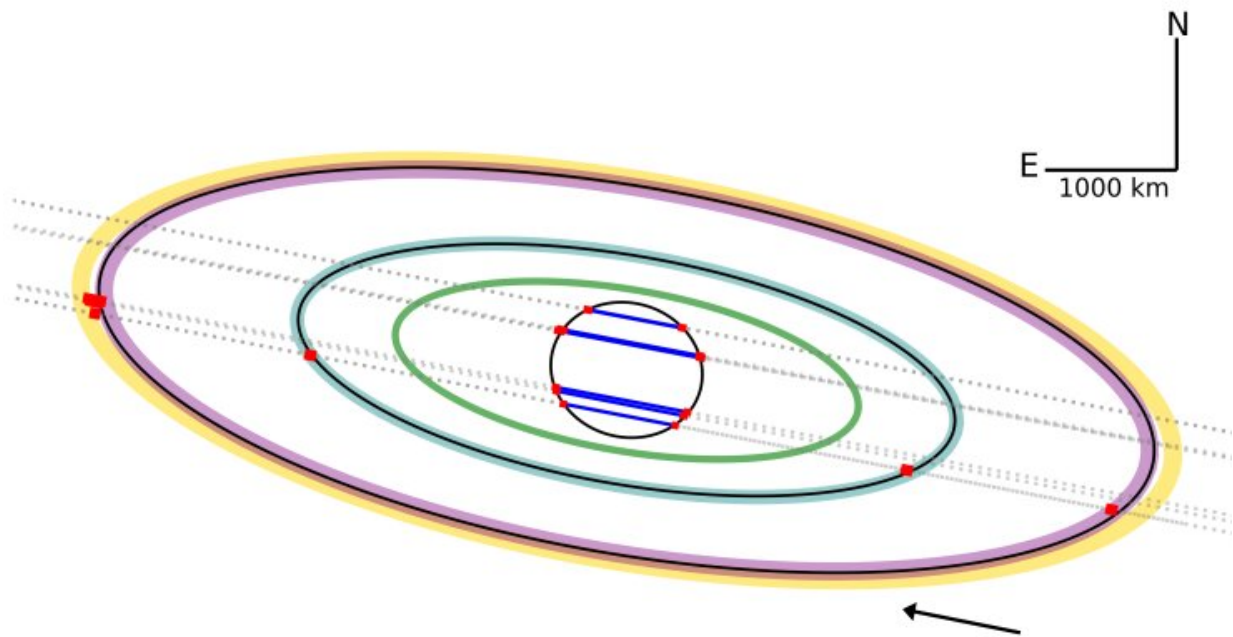


# Second ring found around dwarf planet Quaoar

April 28 2023, by Bob Yirka



Representation of our results on Quaoar's shape (center) and the detection of the two rings Q1R (outer ring) and Q2R (inner ring). The red segments correspond to the  $1-\sigma$  error bars on the particular events. The orbit of Q1R is determined from a simultaneous fit using the present work and previous detections of 018, 2019, 2020, and 2021 reported by Morgado et al. (2023). The solution for the orbit of the new Q2R ring assumes that this ring is co-planar and concentric with Q1R. The central part of the plot (occultation by the solid body) is enlarged in Fig. A.2. In yellow, we show the  $1/3$  SOR resonance with Quaoar, and in teal is the  $5/7$  SOR resonance. The purple ellipse represents  $6/1$  MMR with Weywot (considering the double-peaked rotation period), and the green ellipse presents the expected Roche limit, considering particles with a bulk density of  $\rho = 0.4 \text{ g}$

$\text{cm}^{-3}$ . The arrow shows the star's motion relative to Quaoar. Note: the orbital radius of Weywot is about three times larger than that of Q1R, and thus it is not shown in this representation. Credit: *arXiv*: DOI: 10.48550/arxiv.2304.09237

A large international team of astronomers has discovered that the dwarf planet Quaoar is circled by a second ring. In their study, accepted for publication in the journal *Astronomy & Astrophysics*, the group discovered the second ring while they were studying the first known ring.

Quaoar is a [dwarf planet](#) in the Kuiper belt. It was discovered by astronomers Michael Brown and Chad Trujillo in 2002. Since that time, studies have shown it to be approximately 1,110 km in diameter, which is approximately half the size of Pluto. Researchers have also found that it has water ice on its surface and has signs of cryovolcanism. It also has a small [moon](#) named Weywot. Both the planet and its moon were named after Native American mythological figures.

In February of this year, [a ring was discovered around Quaoar](#), which called into question theories regarding how ring systems and moons form. In this new effort, the research team found a second ring.

Both rings lie beyond the Roche limit, which contradicts theories that describe how moons and rings form. Previously, researchers believed that material within the Roche limit should be pulled apart by [tidal forces](#), meaning a ring should form. Material outside of the Roche limit, theory suggests, should coalesce, forming a moon. Why this is not the case with Quaoar is unknown and has led some to begin questioning such theories. Others suggest the rings could have formed due to the location of Weywot.

Neither of the two rings is visible using an ordinary telescope; both were found indirectly when Quaoar happened to pass over light from distant stars behind it. Dimming of the starlight in a certain way revealed the presence of a single ring last February. When another [occultation](#) occurred more recently, scientists were ready and pointed their equipment at the planet and its newly found ring. They were able to learn more about both—they found, for example, that the ring has a dense core that is just a few miles wide. They plan to study the second ring during future occultations.

**More information:** C. L. Pereira et al, The two rings of (50000) Quaoar, *Astronomy & Astrophysics* (2023). [DOI: 10.1051/0004-6361/202346365](#). On *arXiv*: [DOI: 10.48550/arxiv.2304.09237](#)

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