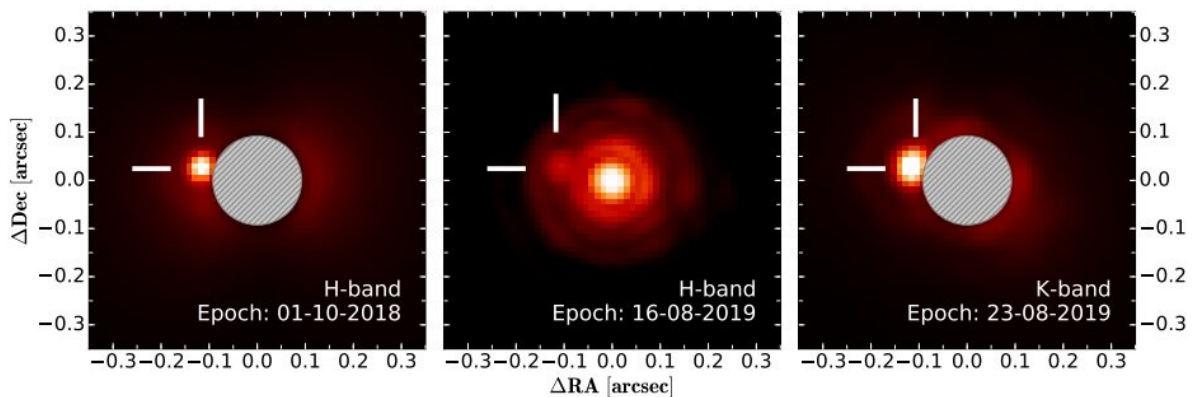


Variable star RZ Piscium has a low-mass stellar companion, study finds

June 8 2020, by Tomasz Nowakowski



SPHERE/IRDIS observations of RZ Psc A's companion. Credit: Kennedy et al., 2020.

Using ESO's Very Large Telescope (VLT), an international team of astronomers has uncovered the presence of a low-mass stellar companion to a young variable star known as RZ Piscium. The newly detected object is about eight times less massive than the sun, and orbits the primary star at a distance of around 23 AU. The finding is reported in a paper published in *Monthly Notices of the Royal Astronomical Society*. A pre-publication version is available on arXiv.org.

Located approximately 640 [light years](#) away from the Earth, RZ Piscium (or RZ Psc for short) is a UX Orionis type variable star showcasing irregular photometric dimming events. Such behavior suggests the presence of a substantial mass of gas and dust orbiting the star.

Astronomers are interested in studies of [stars](#) with circumstellar dust as these objects may offer clues into the formation and evolution of planetary systems. So a group of astronomers led by Grant M. Kennedy of the University of Warwick, U.K., employed the Spectro-Polarimetric High-contrast Exoplanet REsearch (SPHERE) instrument at VLT to investigate RZ Psc in detail.

Kennedy's team used SPHERE's InfraRed Dual-band Imager and Spectrograph (IRDIS) with a dual-beam polarimetric imaging (DPI) mode in order to conduct observations of RZ Psc from October 2018 to August 2019. The monitoring campaign resulted in the detection of a companion object to this dust-obscured star.

"Here, we present the discovery that RZ Psc is a binary with a sky-projected separation of 23 AU based on high-contrast imaging observations with VLT/SPHERE," the astronomers wrote in the paper.

According to the study, the newfound stellar companion, designated RZ Psc B, has a mass of about 0.12 solar masses and is separated from the primary star by approximately 23 AU. The calculations were made assuming that RZ Psc A is a 20 million-year-old star of spectral type K0V, with a mass of about 0.9 solar masses.

Trying to learn more insights into the system's circumstellar disk of dust, the astronomers found that this structure must be orbiting RZ Psc A. The authors of the paper explained that the RZ Psc B is sufficiently faint (around 40 times fainter than RZ Psc A in H-band), so it could not be the object being dimmed. Moreover, the luminosity of RZ Psc B (about

2.5 percent of RZ Psc A's luminosity) is less than the infrared excess, therefore, it cannot solely heat the dust.

Furthermore, the researchers assume that RZ Psc B and the circumstellar disc may not share the same orbital plane. More observations of the system are required to investigate how the companion star interacts with the dust orbiting RZ Psc A.

"It is possible that the companion strongly influences the disc dynamics, for example, via truncation at about one-half to one-third of the companion's semi-major axis (...) If the disc is gas-poor, the companion may have recently destabilized a newly formed planetary system or planetesimal belt, which is now colliding and producing a significant mass of [dust](#), some of which passes between us and the star," the scientists concluded.

More information: Grant M. Kennedy et al. *Monthly Notices of the Royal Astronomical Society*. A low-mass stellar companion to the young variable star RZ Psc, arXiv:2005.14203 [astro-ph.SR]
arxiv.org/abs/2005.14203

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