The mysterious cataclysmic variable star Mu Centauri (Update)

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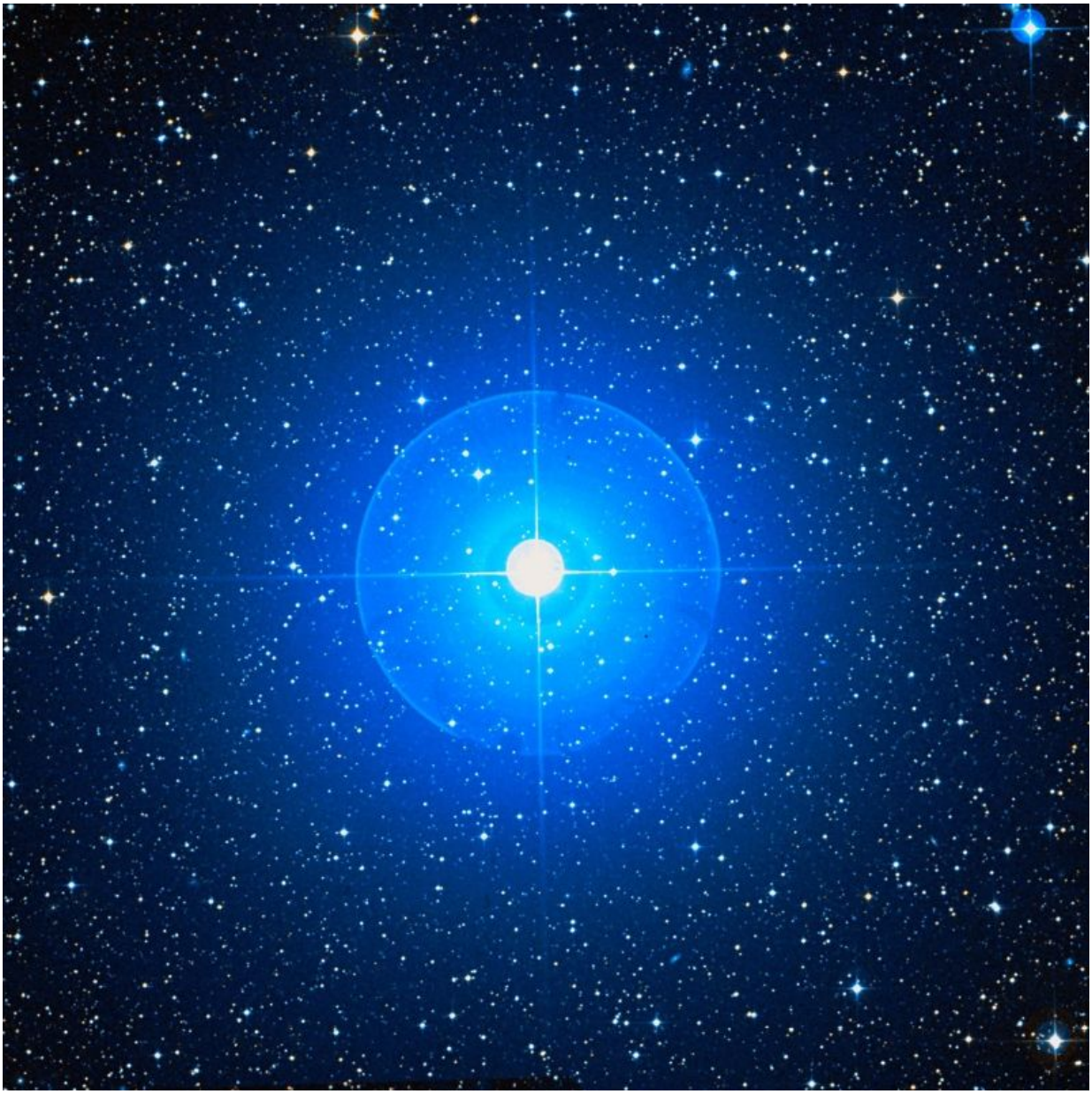

Mu Centauri. Credit: Palomar Observatory/STScI/WikiSky

(Phys.org)—Located about 510 light years from the Earth, Mu Centauri is a very interesting and mysterious cataclysmic variable star. It is a dwarf nova, a close binary star system in which a white dwarf accretes matter from its companion. Although little is know about Mu Centauri, we could observe temporal variations of its brightness and its flickering on a relatively low level. It was also found that this system's light curve contains odd consistent modulations on two different periods. A recent research paper published on Jan. 21 in the *arXiv* journal by Albert Bruch from the Laboratório Nacional de Astrofísica in Brazil, describes the mysterious nature of Mu Centauri.

Bruch used the 0.6-m Zeiss and the 0.6-m Boller & Chivens telescopes of the Observatorio do Pico dos Dias in Brazil, to observe the star. The photometric observations of its light curves were conducted during six nights in February, May and June 2015.

The brightness of Mu Centauri was measured as magnitude difference with respect to several comparison stars in the field. The observations showed a clear modulation on a time scale of about four hours. According to the author of the paper, this points to immediately ellipsoidal variations of the secondary star which should contribute a significant part of the light in this long period dwarf nova.

The star's flickering was found to be on a comparatively low level compared to most cataclysmic variables, what can be explained by the strong contribution of the secondary star to the total light. However, it's not surprising for Bruch that Mu Centauri experiences this phenomenon, because flickering is a distinctive feature of cataclysmic variable stars.

By studying the star's light curve, the researcher also detected consistent modulations on two different periods. The study reveals the orbital period to be approximately 0.34 days and the second period to be about 0.18 days.

"Apart from the dominating orbital period which is due to ellipsoidal variations of the secondary star, variability on a second period, slightly longer than a half of orbital period, was detected. There is no obvious simple relation between second period and orbital period," the paper reads.

Bruch emphasizes that the nature of these variations is unclear. One possible explanation offered by the scientist is that Mu Centauri could be an intermediate polar. The modulation may be due to the variable aspect of a magnetically confined accretion region on the surface of a white dwarf rotating with second period. However, the evidence collected so far to support this hypothesis is very weak.

The researcher was able to derive two important parameters of the system. According to his study, the orbital inclination should lie in the range from 50 to 65 degrees. The temperature of the secondary star was also determined to be about 5,000 K, similar to secondary star temperatures found in other cataclysmic variables with similar orbital periods.

Although the research peeks into Mu Centauri's mysterious nature and reveals important information about its orbit and temperature, Bruch noted that other crucial system parameters, such as the mass ratio, could not be constrained due to strong parameter correlations.

The research is another significant step toward better understanding of cataclysmic variable stars like Mu Centauri. The number of known systems of this kind has grown enormously in recent years, so there is a

vast catalog of these objects available for further studies. Many of them could be easily observed with comparatively small telescopes, making future observations more accessible.

More information: Photometry of the long period dwarf nova MU Centauri, arXiv:1601.05722 [astro-ph.SR], arxiv.org/abs/1601.05722

Abstract

Even among the brigher cataclysmic variables an appreciable number of objects exist about which not much is known. One of them, MU Cen, was observed as part of a small project to better characterize these neglected systems. The temporal variations of the brightness of MU Cen during quiescence were studied in order to find clues to the structure of the system and its behaviour on time scales of hours and shorter. Light curves observed in white light at a time resolution of a few seconds and with a duration of several hours, obtained in six nights and spanning a total time base of five months, were investigated using different time series analysis tools, as well as model fits. The light curve of MU Cen is dominated by ellipsoidal variations of the secondary star. The refined orbital period is P(orb) = 0.341883 days. Model fits permit to constrain the temperature of the secondary star to ~5000 K and the orbital inclination to 50 deg