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ORIGINAL ARTICLE

Detection of eclipses in the suspected V Sge star IPHAS J025827.88+635234.9

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Abstract We report results of photometry of the suspected V Sge star IPHAS J025827.88+635234.9. The observations were obtained over 25 nights in 2011 and 2012. The total duration of the observations was 153 h. We discovered eclipses typical of cataclysmic variables and flickering, which is also a hallmark of cataclysmic variables. These discoveries characterise this star as a normal cataclysmic variable but not as a star of the V Sge type, as was previously supposed. The eclipse period is equal to 5.882274 ± 0.000008 h. Its depth is equal to 0.3 mag. The full eclipse width is quite large and equal to $(0.160 \pm 0.011)\,P_{\rm orb}$. We obtained an eclipse ephemerid with a formal shelf life of about 500 yr (a 1σ confidence level). This ephemerid is good for investigations of long-term period changes. The eclipse has a complicated two-component V-shaped profile. This profile suggests that the accretion disc is very structured and can consist of an extended disc halo and a quite distinct central part. The off-eclipse light curve is also complicated. It shows two orbital humps at the orbital phases 0.4 and 0.9 and a deep depression at the orbital phase 0.14. By using the period-luminosity-colours relation found by Ak et al., we estimate the distance of this star in the range 660–730 pc. The corresponding absolute visual magnitude is roughly by 1 mag brighter than that for an average cataclysmic variable with the same orbital period. The noted unusual properties of the eclipse profile and off-eclipse light curve can be related with this enlarged luminosity.

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1 Introduction

Cataclysmic variables (CVs) are interacting binaries in which a white dwarf accretes material from a late-type companion filling its Roche lobe. The path that the transferred material takes depends strongly on the magnetic field of the white dwarf. A bright accretion disk forms in non-magnetic systems, while the material swirling along field lines releases energy in their magnetic counterparts. Nova-like variables (NLs) are an important subset of CVs. By definition, NLs should not display any dwarf nova outbursts. Their almost steady brightness is thought to be due to their high mass transfer rate exceeding the upper stability limit (Osaki 1996). As a consequence of such a vague definition, the NL class is a very heterogeneous group of stars, the subclasses of which are defined by their photometric and spectroscopic behaviour (e.g. VY Scl, SW Sex and UX UMa stars) and the presence of magnetic fields (polars and intermediate polars) (Steiner and Diaz 1998; Neustroev et al. 2011). One of the most striking photometric characteristics common to all CVs are the variations with amplitudes from some hundredth of a magnitude up to one magnitude which have timescales ranging from seconds to a few dozen minutes, where higher amplitudes of variability occur at lower frequencies. This phenomenon is called flickering (Bruch 1992). Comprehensive revives of CVs are given in la Dous (1994) and Warner (1995).

A few unrelated objects, however, refuse to be properly identified among the NL subclasses. These are objects that exhibit peculiar properties or systems for which very little is