



UBVRI Photometry of the 2017 Superoutburst of the WZ Sge-Type Dwarf Nova ASASSN-17pm

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Cataclysmic variables are close binary systems consisting of a white dwarf (WD) and a late-type red dwarf (M_2) filling its Roche lobe. Matter transferred through the inner Lagrange point forms an accretion disc around the WD. The disc and its bright structures usually dominate in the optical range. WZ Sge-type stars are a subgroup of SU UMa-type dwarf novae that undergo rare but powerful superoutbursts, with recurrence times of several years to decades and amplitudes of up to 7–9 mag. During superoutbursts, the accretion disc becomes elliptical and starts to precess, producing periodic optical brightness variations known as superhumps. Three main types of superhumps are observed. **1) Early superhumps:** the disc retains its nearly circular shape, and the period is approximately equal to the orbital period. **2) Ordinary superhumps:** Their period $P_{SH}=1/P_{ORB}-1/P_{PR}$, where P_{ORB} and P_{PR} are the orbital and disc precession periods, respectively. In this stage the disc becomes elliptical, and the superhump period is typically a few percent longer than the orbital period. **3) Late superhumps:** the disc's elliptical structure begins to decay, the oscillations become less coherent, their amplitude decreases. By this stage, the outburst has usually ended.

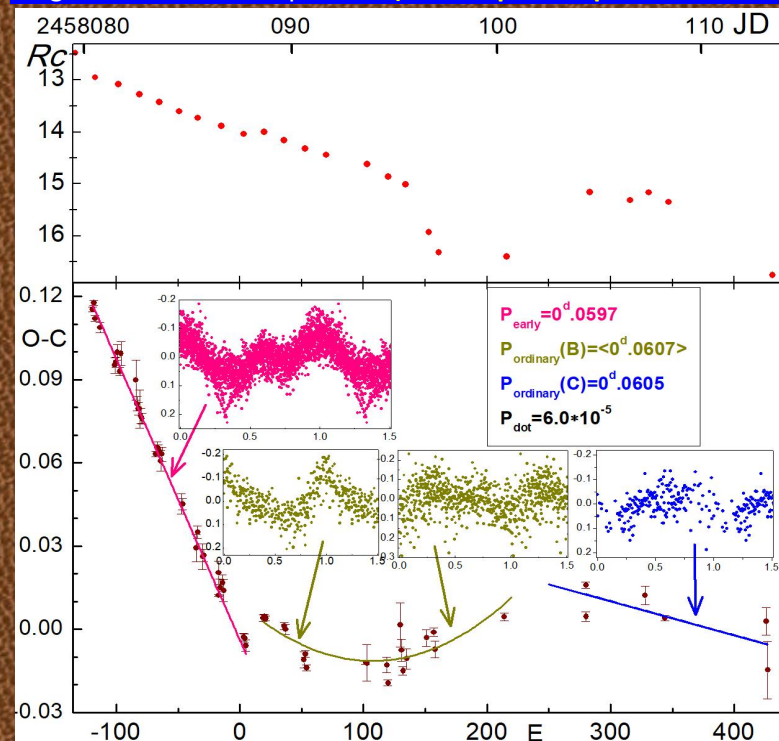
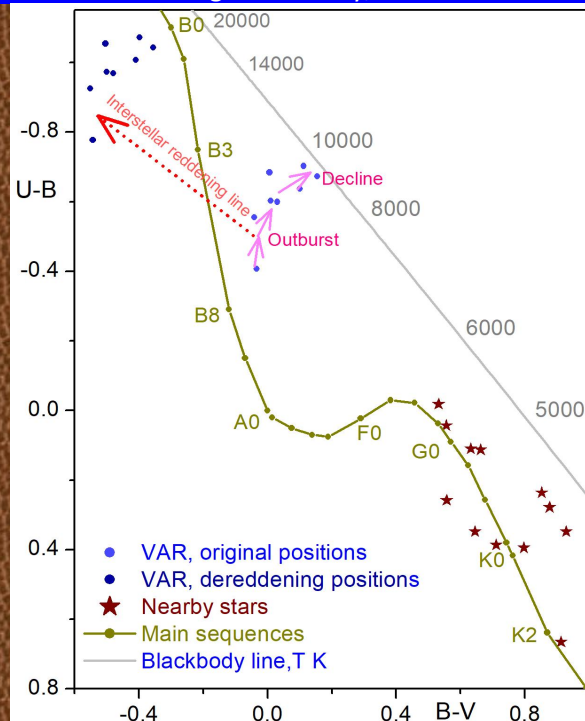
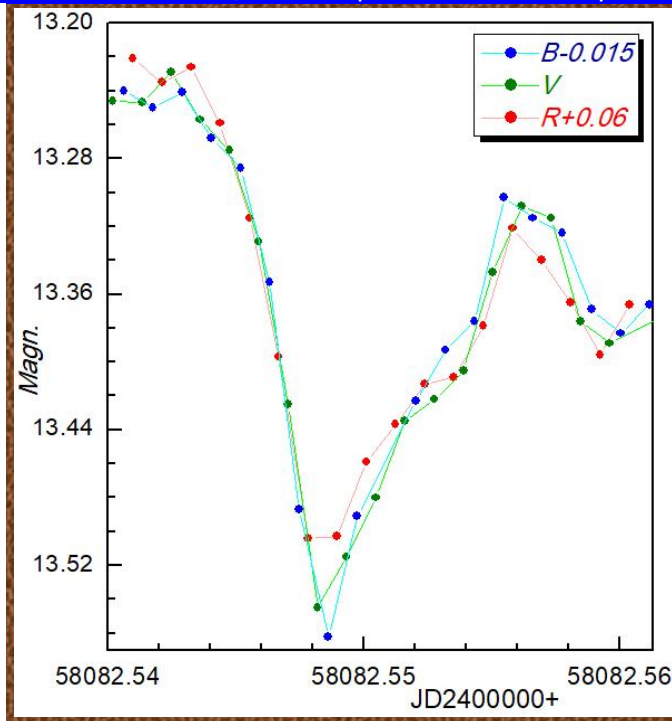


Fig.1 Based on an analysis of our and AAVSO observations, we constructed the outburst light curve (top), showing daily average magnitude. Using the Gaussian process (GP) method, we determined the times of superhump extrema and calculated the O–C diagram (bottom) for a period of $P \sim 0.0607d$. The linear O–C trend during the early superhumps changes to a parabolic trend during ordinary superhump stage. A linear trend is also visible towards the end of the interval. Insets show the phase light curves for the corresponding stages. Also rebrightenings were detected.



The variable's evolution track in the two-colour diagram. Both observed and dereddened positions are shown. We adopted $E(B-V) = 0.51$ from the literature. The colour temperature during the outburst is $T \sim 20000$ K, higher than the typical 10000–15000 K of similar stars.



Partial disc eclipse during the early superhump stage. The eclipse is deeper in B than in R passbands, as expected when a hot disc is eclipsed by a red star.

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MAIN RESULTS

We obtained a next periods of superhumps: **early - 0.0597d**, **ordinary - 0.0607d** (average value of B stage), and **- 0.0609d** (C stage). The period excess of $\epsilon = 1 - P_{ORB}/P_{SH} = 0.016$, and a period derivative of $P_{DOT} = \dot{P}/P = 6.0 \times 10^{-5}$ derived from the parabolic O–C fit during stage B. Using the empirical ϵ – q relation, we obtained a mass ratio of $q = M_2/M_{WD} = 0.09$. The P_{DOT} – q relation gives $q = 0.10$ (Kato 2009, 2022). Assuming an average mass of $M_{WD} = 0.8 M_{SUN}$ and an average $q = 0.095$, we find $M_2 = 0.09 M_{SUN}$. Using Kepler's third law gives a binary separation of $a \sim 0.6 R_{SUN}$. For $P_{ORB} = 0.057d$, using the relations from Patterson (2011) and Kato (2015) and adopting $E(B-V) = 0.51$, we obtain an absolute magnitude of $M_V = 5.3$ and a distance of $r \sim 100$ pc. The average colour temperature during the outburst is $T \sim 20000$ K. **One rebrightenings** was observed.