The Extensive Study of Photometric Observations of Cataclysmic Variable Stars

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Among close binary stars there are cataclysmic variables containing a white dwarf (the primary) and a main-sequence star (the secondary or the donor). The primary accretes matter from the donor star through the inner Lagrangian point. In non-magnetic systems the material forms an accretion disk around the primary.

One of the subclasses of cataclysmic variables are dwarf novae and among them there are SU UMa type stars. They can be characterized by a short orbital period ($P_{orb} < 2.5$ h) and in their light curves we see two types of outbursts: normal and superoutbursts. Outbursts are about one magnitude fainter and last shorter than superoutbursts. Tooth-shaped oscillations, called superhumps, manifest their presence during superoutburts (Hellier 2001).

HT Cas was discovered 70 years ago and classified as a variable star (Hoffmeister 1943). Unfortunately, for 35 years this object did not receive any attention, until the eclipses of HT Cas were noticed (discovery made by Bond in 1978). Patterson called HT Cas "a Rosetta stone among dwarf novae" because of a variety of manifested features presented in light curves (Patterson 1981). Over 30 years since this statement literature concerning HT Cas is still growing, reaching several dozens of publications.

- After 25 years of quiescence or normal outbursts in November 2010 the superoutburst in HT Cas was detected.
- During the superoutburst mesmerizing superhumps manifested their presence.
- Based on the timinings of eclipses observed during the superoutburst, an orbital period with a value of $P_{orb} = 0.0736469(5)$ days was obtained and its value is in full accordance with results presented by other authors from earlier observations (Horne et al. 1991, Feline et al. 1998, Ioannou et al. 1999, Borges et al. 2008). No anomalies in the orbital period were detected as it was mentioned by Ioannou et al. (1999) or Borges et al. (2008).
- From the November 2010 superoutburst the period excess with a value of $\varepsilon = 3.30\% \pm 0.01\%$ was obtained and it has a typical value for SU UMa type stars.
- We report the detection of the hot spot in eclipsing dwarf nova HT Cas during its November 2010 superoutburst. The brightness of the bright spot was correlated with the stage of the superoutburst. The hot spot manifestation in November 2010 superoutburst in HT Cas is the newest observational evidence for the enhanced-mass transfer rate postulated by the EMT model proposed by Smak (2013b).

References

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