EG CANCRI: A NEW WZ SGE TYPE DWARF NOVA *

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Abstract. We present the optical light curve of EG Cancri during its outburst in 1996–1997. It displayed some brightness fluctuations in the phase of decline. Mini-outbursts were detected. Optical spectra obtained during the decline showed it to be a dwarf nova on account of its broad absorption lines superimposed on a blue continuum. Optical spectra near minimum brightness revealed doubled Balmer lines in emission, over broad absorptions, but no HeII4686. An additional heating presented in the last stage of decline. CCD time-resolved photometry showed a possible orbital period 0.0575(26) day. Superhumps was observed during outburst by Matsumoto(1996). EG Cancri is a short-period CV which has a large-amplitude outburst( 7 mag), a slow decline from outburst, and a long interval between outburst. From the above properties, a classification as a WZ Sge type DN is plausible.

1. Introduction

The cataclysmic variable EG Cancri was discovered by Huruhata (1983), who found a rapid change of brightness in 1977 Nov, when it reached m\textsubscript{po} = 11.9. The approximate magnitudes on the PSS prints are 18.6(red) and 18.0(blue) (McNaught, 1986). It is classified as a U Gem or a novalike variable (Downes et al., 1997). A recent outburst was discovered by Schmeer (1996) in November 1996. Its large outburst amplitude and rare outbursts link it to WZ Sge and related systems.

WZ Sge was originally classified as a recurrent nova, now it is classified as a prototype of WZ Sge subtype of dwarf novae (Bailay, 1979; Duerbeck, 1987; Downes, 1990; O’Donoghue et al., 1991). WZ Sge is a DQ Her star (Patterson, 1994) too. WZ Sge type stars are distinguished from most dwarf novae by their larger outburst amplitude, slower decline from outburst, and longer intervals between outbursts. WZ Sge stars’ superoutbursts have longer durations (several weeks) and larger amplitudes (6...9 mag) than SU UMa stars. And their orbital periods are the shortest ones observed for SU UMa stars. Superhumps were discovered during outburst of WZ Sge type stars, such as WZ Sge (Patterson et al., 1981), VY Aqr (Warner and Livio, 1987; Patterson et al., 1993), WX Cet (O’Donoghue et al., 1991), and HV Vir (Leibowitz et al., 1994). Periodic superhumps during

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superoutburst are a distinguishing characteristic of SU UMa stars (Vogt, 1980). So WZ Sge stars are a hypothetical extreme cases of SU UMa stars (Patterson et al., 1981; O’Donoghue et al., 1991; Leibowitz et al., 1994). SU UMa subtype of DN shows two types of outburst: superoutbursts and normal outbursts. Superoutbursts are brighter than normal outbursts by typically 0.5–1.0 mag and repeat periodically after, typically, several normal cycles. Brightness oscillations observed only during superoutburst (superhumps) repeat semi-periodically with a period slightly longer than the orbital period. Except TU Men, all of the SU UMa stars have $P_{\text{orb}} < 2.1$ hrs, they fall below the period gap. Superhumps and SU UMa stars have been reviewed by Vogt (1980), Warner (1985, 1995). The most significant parameter to distinguish between WZ Sge and SU UMa stars is $T/T_{\text{rec}}$ ($T$ is the outburst duration, $T_{\text{rec}}$ is the recurrence time), as expected from the observational definition of WZ Sge stars (Mennickent, 1995). The normal outbursts of WZ Sge stars are rare or apparently lacking.

The origin of the superhump phenomenon is not yet very clear. Whitehurst (1988), Whitehurst and King (1991), Hirose and Osaki (1990, 1993), and Lubow (1991a,b) explained the superhump phenomenon by the precessing eccentric-disk model. The development of a eccentric disk is a result of tidal resonance. Osaki (1989) explained the supercycle of SU UMa stars by the thermal-tidal instability model.

WZ Sge stars are also listed by Howell et al. (1995) as members of the peculiar group of DN known as TOADs (Tremendous Outburst Amplitude Dwarf Novae). They possess the primary defining characteristics of the group – the outburst amplitude exceed 6 mag, these outbursts are likely to be infrequent and mostly to be superoutbursts. TOADs may represent the terminal stage of the evolution of dwarf novae, which are characterized by a short orbital period and low mass transfer rate (Mennickent et al., 1996). The peculiar nature of TOADs may be explained by the disk-instability model towards a very low mass-transfer rate and low viscosity in quiescence (Osaki, 1995; Howell et al., 1995). It is shown that a normal outburst under such a condition always leads to a tidal instability triggering a superoutburst.

To our knowledge, no spectra were taken during the previous outbursts of EG Cnc in 1977, only one quiescent spectrum has been published by Munari et al. (1997). No orbital period has been reported. It is therefore important to obtain spectra, the recent outburst light curve and time-resolved photometry of this star.

2. Observation

The observations of this recent superoutburst of EG Cnc reported here all came from observations at XingLong Station of Beijing Astronomical Observatory (BAO) in China.