COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5093

Konkoly Observatory
Budapest
25 May 2001

HU ISSN 0374 – 0676

OSCILLATION DURING A STANDSTILL OF Z Cam

KATO, TAICHI

Dept. of Astronomy, Kyoto University, Kyoto 606-8502, Japan, e-mail: tkato@kusastro.kyoto-u.ac.jp

The standstill phenomenon in Z Cam stars has been still poorly understood, even in the present successful era of the disk instability model (for a review, see Osaki 1996). This phenomenon is usually regarded as a state of enhanced mass-transfer rate ($\dot{M}$) in dwarf novae (cf. Warner 1995), which mimics novalike (NL) systems having thermally stable disks. However, it has been an old and new problem for theoreticians to reproduce standstills by numerical simulations. Meyer and Meyer-Hofmeister (1983) proposed that a normal outburst below the critical surface density can trigger a standstill, which is maintained by an enhanced mass-transfer caused by increased irradiation. Even the most recent detailed modeling (Buat-Ménard et al. 2001), by taking irradiation and enhanced mass-transfer into account, is far from satisfactory reproduction of observed properties of standstills and Z Cam stars. The most striking departure from observations can be seen when the system enters a standstill. Theories involving enhanced mass-transfer are accompanied by the increased system luminosity, and the disk is thermally most stable at the beginning of standstills. Honeycutt et al. (1998) systematically studied standstills of Z Cam stars, and concluded that some of them showed damping oscillations when entering a standstill, on the contrary to theoretical predictions. The same feature in RX And was reported by Szkody and Mattei (1984). However, the conclusion by Honeycutt et al. (1998) was largely based on their observation of HX Peg, which differs from other "classical" Z Cam stars in that it shows relatively frequent and short standstills and rather anomalous behavior in its excursions between standstills and outbursting states (Honeycutt et al. 1998). Whether such damping oscillations when entering standstills are a common feature of Z Cam stars, is therefore left as an open question.

The author has examined visual observations of Z Cam reported to VSNET (http://www.kusastro.kyoto-u.ac.jp/vsnet/) and found small-scale outbursts occurring in the early part of a standstill (Figure 1). These visual observations used V-band comparison stars and have typical errors of $\sim 0\overset{m}{.}2$, which will not affect the discussion. The entrance to this standstill was not associated with a gradual brightening of preceding minima, as observed in Szkody and Mattei (1984) and Honeycutt et al. (1998). Hence the observed phenomenon does not have a feature of damping oscillations. The mean recurrence time of these small outbursts is 12 day, which is about the half of intervals (20–25 d) of preceding normal outbursts, which is different from the phenomenon in Szkody and Mattei (1984), who reported small outbursts during standstill having a similar recurrent time to those of usual outbursts. The present phenomenon strongly suggests the presence of weak disk instability occurring in the early stage of a standstill, when the accretion

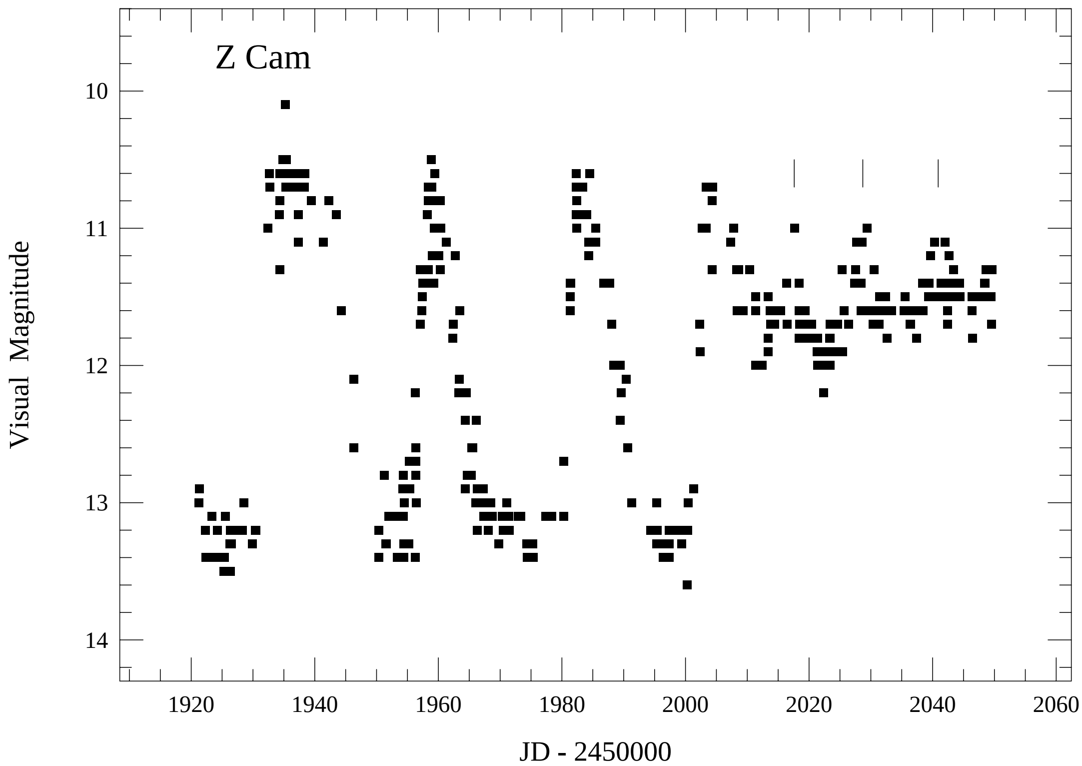

Figure 1. Light curve of Z Cam. Ticks show small outbursts in the early stage of standstill

disk is thought to be most stable. The present discovery of departure from theories in the prototypical, and most typical, Z Cam star also suggests that such departures are a common features of Z Cam stars, which need to be explained by future theories.

The authors are grateful to many VSNET members for providing vital observations.

References:

Buat-Ménard, V., Hameury, J.-M., Lasota, J.-P., 2001, *A&A*, **369**, 925
Honeycutt, R. K., Robertson, J. W., Turner, G. W., Mattei, J. A., 1998, *PASP*, **110**, 676
Meyer, E., Meyer-Hofmeister, E., 1983, *A&A*, **121**, 29
Osaki, Y., 1996, *PASP*, **108**, 39
Szkody, P., Mattei, J. A., 1984, *PASP*, **96**, 988
Warner, B., 1995, Cataclysmic Variable Stars (Cambridge Univ. Press, Cambridge)