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

Number 5664

Konkoly Observatory
Budapest
9 December 2005

HU ISSN 0374 – 0676

TT Ari: OUT FROM THE POSITIVE SUPERHUMP STATE

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TT Ari is one of the brightest cataclysmic variables, which was a target for few extensive observational campaigns (Andronov et al. 1999, Kraicheva et al. 1999, Skillman et al. 1998, Tremko et al. 1992, 1996, Semeniuk et al. 1987). Before 1997, the estimates of the photometric periods ranged from $0^d.13270$ to $0^d.13298$ (see the compilation by Tremko et al. 1996). In 1997, the photometric period has changed to a "positive superhump" one $P_{sh} = 0^d.14926(3)$ (Skillman et al. 1998). Our observations showed, that during these years, this state continued till at least December 10, 2004. For example, in 2004, it showed a typical asymmetric (M−m=0.316±0.007) shape with a period $P_{sh} = 0^d.14840(1)$, brightness range $10^m.84$-$11^m.03$ and the initial epoch for maximum HJD2453242.1239(7). The shape of the light curve in V and R in 2004 was the same within accuracy estimates (sent to a mailing list in 2004 by Andronov, Ostrova and Burwitz [VSNET-Campaign, 1555]).

The observations obtained in the Astronomical Observatory of the Athens University on October 14-19, 2005, have shown that the system went out of the "positive superhump" state (sent to a mailing list in 2005 by Andronov, Gazeas and Niarchos [VSNET-Campaign, 1630]). The superhumps practically disappeared, but the negative superhumps were not very prominent. The mean brightness for 4 nights was $\langle V \rangle = 11^m.21$, whereas for separate nights it varied from $11^m.08$ (October 18) to $11^m.28$. This differs both from the mean brightness level at the "positive superhump" stage ($10^m.9$, Skillman et al., 1998; $10^m.92$ Andronov et al. 2004 [VSNET-Campaign, 1555]) and at the "negative superhump" $10^m.69$ (Tremko et al., 1996). Kraicheva et al. (1999) have also noted the brightness difference between $V = 10^m.5$ in 1996-1997 and $11^m.0$ in 1998-1999. Despite small differences in the instrumental systems, the results by different authors showed a switch to "positive superhumps" with a luminosity "drop" by a few dozens per cent. Thus the current "non-positive superhump" state with even smaller luminosity is not a return to the high

luminosity state observed before 1997. Kraicheva et al. (1999) suggested 27.5 and 6.25 year cycles for the luminosity variations possibly caused by magnetic activity of the secondary.

Further monitoring carried out during 6 nights at the 40-cm telescope of the Chungbuk National University shows quasi-periodic oscillations, "negative superhumps" with variable amplitude and strong flickering. The sample light curves obtained on subsequent nights on Nov 8 and 9, 2005 are shown in Fig. 1 and Fig. 2. Significant difference in the brightness ($0\overset{\mathrm{m}}{.}35$) is noticeable, as well as the lack of the 3-hour wave in Fig. 1.

The most prominent peak at the "Λ"–scalegram (Andronov 2003) for the Athens University data corresponds to an effective period of quasi-periodic variations of $P_e = 0\overset{\mathrm{d}}{.}0095 = 13.7$ minutes and semi-amplitudes $0\overset{\mathrm{m}}{.}046$ and $0\overset{\mathrm{m}}{.}044$ for the filters V and R, respectively. On November 4, 2005 (filter B, Konkoly Observatory), this peak was split into three approximately equal ones at $0\overset{\mathrm{d}}{.}007 - 0\overset{\mathrm{d}}{.}024$ with effective semi-amplitudes $0\overset{\mathrm{m}}{.}062 - 0\overset{\mathrm{m}}{.}068$. These values are by a factor of 3 larger than that for the "positive superhump" state on December 10, 2004. The mean B magnitude has dropped from $10\overset{\mathrm{m}}{.}92$ to $11\overset{\mathrm{m}}{.}60$.

The current luminosity is much lower than expected from a continuation of the long-term fit (Kraicheva et al., 1999) to the present time (the range of B magnitudes is $10\overset{\mathrm{m}}{.}55$-$10\overset{\mathrm{m}}{.}80$). Moreover, at the previous minimum, the prolonged inactive ($B \sim 16^{\mathrm{m}}$) state was observed. A similar excursion to a low luminosity state may not be excluded after a current deep minimum, so continuation of monitoring is needed.

Acknowledgements. This work was partly supported by the Grant OTKA 34551 (LP), by the Ministry of Education and Science of Ukraine (ILA). VB and NIO are greatful to the Director of the OAM Salvador Sanchez Martinez for granting the observing time and partially supporting this work.

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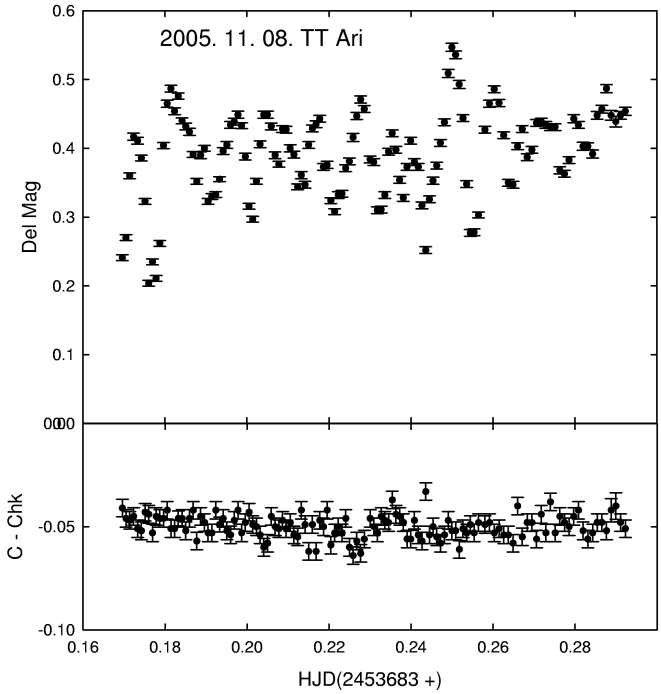

Figure 1. Light curve of TT Ari on November 8, 2005 in filter R (40-cm telescope of the Chungbuk University). The comparison and check stars are "c" ($V = 10\overset{\mathrm{m}}{.}99$, $B - V = 0\overset{\mathrm{m}}{.}69$) and "d" ($V = 11\overset{\mathrm{m}}{.}02$, $B - V = 1\overset{\mathrm{m}}{.}15$) (Götz, 1985).

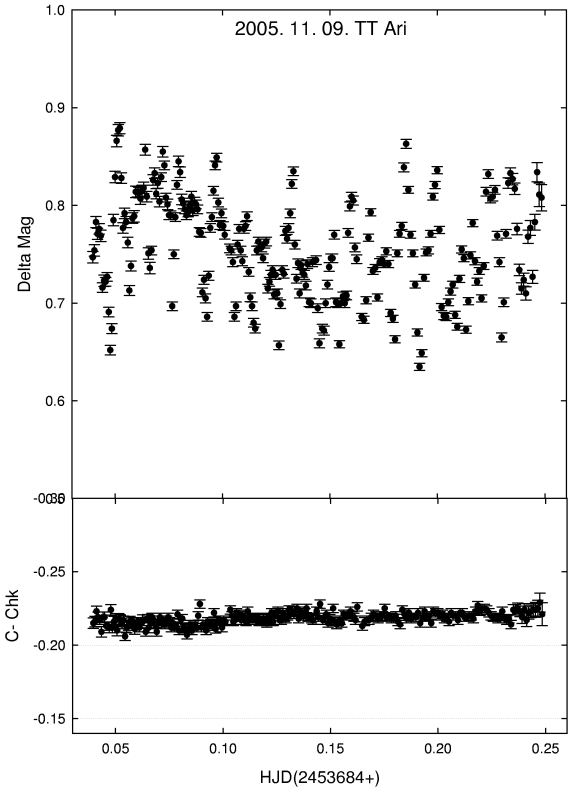

Figure 2. Light curve of TT Ari on November 9, 2005 in filter R (40-cm telescope of the Chungbuk University).