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A SECONDARY PHOTOMETRIC PERIOD OF TT ARIETIS

The resemblance of TT Ari to intermediate polars, particularly to TV Col, prompted us to search for a secondary photometric period analogous to the 32 minutes X-ray and optical period of TV Col (Schrijver et al., 1984; Bonnet-Bidaut, Motch, and Mouchet, 1985). For this purpose we have collected 22 photometric runs of TT Ari obtained by various observers in various observatories, including 7 already published (Smak and Stępień, 1969). The observations were made during six seasons spanning the time interval from 1966 till 1985. The length of runs varied from one to more than 6 hours, most were at least 3 hours long.

These data were subject to the power spectrum analysis. In most runs the 3 hour period (Smak and Stępień, 1975) appeared with a high amplitude. However, we found in our power spectra another persistent feature corresponding to a secondary photometric period of about 20 minutes. This conclusion is based on the following facts:

i) A peak at the consistent position appeared on all nights, albeit its amplitude varied from night to night.

ii) In 13 of 22 nights the corresponding peak was the strongest feature in the relevant frequency band.

iii) We have used two techniques, the Fourier analysis and the maximum entropy method, which gave mutually consistent results.

iv) Same conclusions could be drawn from ours and Smak and Stepień's data separately.

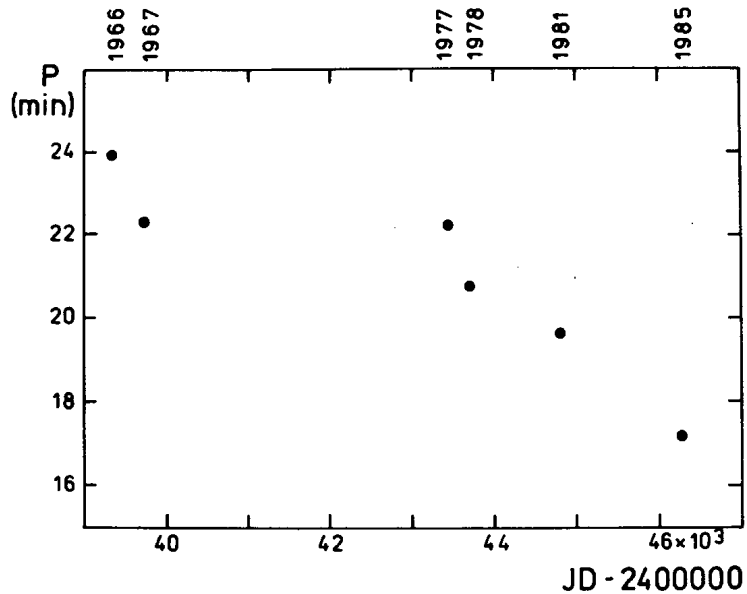


Figure 1

Although on different nights of a season the peak appeared at the same frequency, the period varied smoothly from season to season. In the time interval 1966 - 1985 the secondary photometric period decreased from the value of 24 minutes to the value of 17 minutes. The season mean values of the period versus time are plotted in Fig. 1.

We cannot say yet whether this periodicity is coherent or not. Williams (1966) and Smak and Stepień (1969) searched for periodic oscillations in data taken during a single night and could only conclude that quasiperiodic and transient fluctuations with the periods 14 - 20 minutes are present in their data. Our conclusion about persistence of this phenomenon is founded on more nights and two independent methods.

The fast rate of period decrease restrains us from identifying it with the rotation period of the compact star as it was done for the 32 minutes period of TV Col. We have analysed additionally the X-ray observations of TT Ari by Jensen et al.(1982) obtained on two consecutive days. In the power spectra for each day there were peaks at frequencies around 1 mHz although inconsistent with each other and with our optical data. Full details of our analysis will be given elsewhere.

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