COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 3746

Konkoly Observatory
Budapest
9 July 1992
HU ISSN 0324 - 0676

THE POSSIBLE ECLIPSES IN THE T TAURI SPECTROSCOPIC BINARY SYSTEM GW ORIONIS

Mathieu et al. (1991) discovered that the classical T Tauri star GW Ori is a spectroscopic binary with an orbital period of 242 days. Besides, they described the properties of GW Ori including the spectral energy distribution in the near- and far-infrared regions. The mass function is f(M)=0.026 $M_\odot$ and the orbital amplitude is K=4.7±0.3 km/s. Bouvier and Bertout (1989) detected the rotation modulation period P=3.25 days and the axial velocity *vsini* = 43.0±2.5 km/s for GW Ori. The view angle i_o between the rotation axis and the line of sight was computed by Bouvier and Bertout (1989) using these two quantities as well as the stellar radius. The latter was calculated from the bolometric luminosity and the effective temperature of the star ($R=8.5R_\odot$, $L=110L_\odot$, T_e=5660 °K, $i_o=15°\pm1°$). Mathieu et al. (1991) found the inclination angle of the spectroscopic orbital plane to be $15°<i<60°$ and assumed a primary mass of $M_1=2.5M_\odot$ and the secondary mass $0.31<M_2<1.27M_\odot$. Neither value of the inclination angle (i_o, i) permits an eclipse observation in GW Ori binary system.

At the same time we have detected several Algol-like light fadings close to spectroscopic phase 0.00 on the photoelectric light curve.

Our observations of GW Ori have been carried out since 1987 at the Mt. Maidanak using 0.6-m and 0.5-m reflectors with identical UBVR pulse-counting photometers. Limits of light variations, average colours, number of observations and intervals of phases calculated according to Mathieu et al. (1991) are listed in Table I. Maidanak UBVR-photometry is stored in Tashkent Astronomical Institute Bank Data: (Shevchenko V.S., Astronomical Institute of Acad. Sci. RUz., Astronomicheskaya str. 33, Tashkent, 700052 CIS (S.U.)), and are available.

The folded light curves of GW Ori based on Maidanak photoelectric observations, Bouvier and Bertout's observations and some other ones are shown in Figure 1. Our phase values obtained at Maidanak are very close to those of Mathieu et al. (1991), (T_o=2447909 and T_o=2447903, respectively). Algol-like fadings are distinguished near phase 0.00 in spite of significant irregular light variations. There are sufficiently complete observations of two Algol-like minima in 1988 and 1990. They are shown in Figure 2. It is most probable that minima of 1988 and 1990 occurred due to occultation of the T Tauri star GW Ori by a circumstellar formation surrounding the secondary component. This provides an inclination angle of the orbital plane $80°<i<90°$ and the secondary mass $M_2<0.25M_\odot$.

Table I. UBVR data

Year	Epoch 2440000+	Phase	N	V max–min	<U–B>	<B–V>	<V–R>
1987	7031–7133	0.37–0.79	38	9.815–10.058	0.324	0.977	0.955
1988	7392–7549	0.86–0.51	69	9.867–10.310	0.205	1.001	0.967
1989	7767–7887	0.41–0.91	51	9.848–10.026	0.307	1.018	0.950
1990	8135–8279	0.93–0.53	58	9.860–10.119	0.339	1.003	0.946
1991	8489–8589	0.39–0.81	52	9.759– 9.970	0.298	0.982	0.923

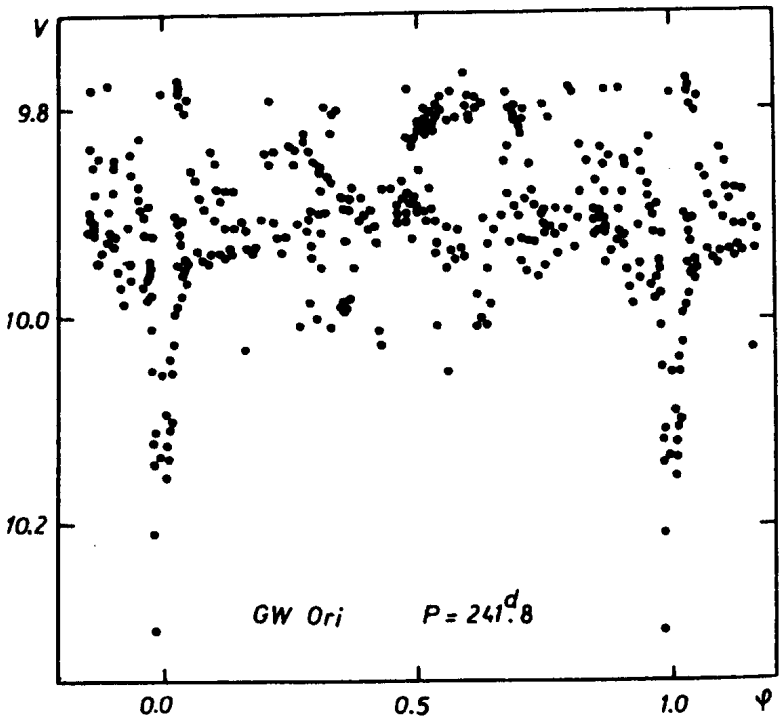

Figure 1. The folded light curve of GW Ori in V-band

To search for a short-period component in the light variability, our observations made in 1987–1991 were analysed by method of digital spectral analysis (Berdnikov et al., 1991; Grankin et al., 1991). But no significant period shorter than $100^d$was revealed by this analysis, though the light curves outside eclipses contain waves of different duration. Two power spectra are shown in Figure 3 as a sample. At the same time less reliable periods $1.5<P_o<10$ days may be revealed in shorter intervals (< 20 days). So, a similar period

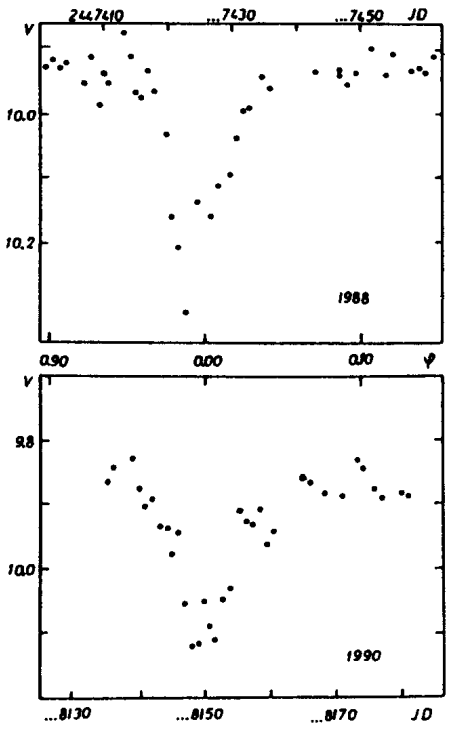

Figure 2. The 1988 and 1990 minima of GW Ori

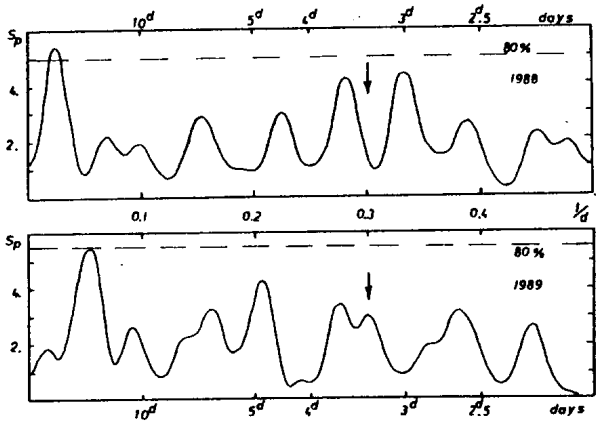

Figure 3. Samples of power spectra for GW Ori. The dashed line indicates 80% confidence interval. The period in the 3–4 day interval (arrows) is absent.

$3.0<P_o<3.8$ days was confirmed by Bouvier and Bertout's (1989) data covering an interval of 13 days.

The circumstellar formation around the low mass secondary component seems to consist of dust and molecular gases having a dimension of $(10\text{-}50)\times10^8$km. The masses of the secondary stellar body and its circumstellar formation can be comparable.

We suppose that the next eclipse will take place on 10 September 1992 near zero phase.

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