COMMISSION 27 OF THE I.A.U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 3569

Konkoly Observatory
Budapest
7 March 1991

HU ISSN 0374 - 0676

RECENT MINIMA AND IMPROVED EPHEMERIDES FOR THE ECLIPSING HOT SUBDWARFS LB3459 (=AA DOR) AND BD-7° 3477 (=HW VIR)

The hot sdOB star LB 3459 (=AA Dor) was discovered to be an eclipsing binary by Kilkenny et al (1978) and has a rather short period of 6^h17^m. The parameters of the secondary star are not well known but it appears to be close to a degenerate configuration (Kudritzki et al 1982) and most of the visible light from the secondary is apparently reflected primary light. The sdB star BD-7° 3477 (=HW Vir) was discovered to be an eclipsing binary by Menzies & Marang (1986) during a survey of UV-bright objects. It has a very short period (2^h48^m) and the secondary could be a red main-sequence star (Menzies & Marang 1986).

Because of the evolved nature of the primary stars in these systems and the short periods, it seems highly likely that both could have passed through at least one "common envelope" stage (Paczynski 1980). Currently, both binaries appear to be detached so that mass exchange by Roche lobe overflow is not likely to be occurring. Angular momentum loss by gravitational radiation or by mass loss via stellar winds would affect the periods; the former should only be measurable after $\sim 10^2$-10^3 years (see, e.g. Paczynski 1967) but the latter might be more effective. We have therefore made occasional observations of eclipses of both systems with a view to establishing very accurate ephemerides to test for period changes.

The most recent ephemerides for AA Dor and HW Vir have been given by Kilkenny (1986) and Marang & Kilkenny (1989) respectively. The new timings of primary minima together with estimated errors are listed in Table 1, where the cycle numbers ,n, are determined from the above mentioned ephemerides. All observations were made with the 1.0m and 0.5m telescopes at the Sutherland site of the South African Astronomical Observatory. Various filters were used (see Table 1) with 20- or 30-second continuous integrations to obtain the eclipse curves. Sky measures were made before and after eclipse and usually near mid-eclipse; the sky corrections were then interpolated for all eclipse data.

The results for HW Vir are more accurate than those for AA Dor, probably due to the fact that HW Vir is rather brighter than AA Dor and that the latter is a foreground LMC object which means a smaller aperture is necessary and so scintillation and guiding effects are more serious.

Combining the new eclipse timings with published results, we obtain for HW Vir:

$$T_{min} = 244\ 5730.556071 + 0.1167196336n$$
$$\pm 0.000014 \quad \pm 0.0000000017$$

from 34 eclipses. T_{min} is the time of primary mid-eclipse and the errors are formal errors from a linear least-squares fit to the times of mid-eclipse.

For AA Dor we obtain

$$T_{min} = 244\ 3196.348685 + 0.2615397198n$$
$$\pm 0.000016 \quad \pm 0.0000000017$$

from 27 eclipses. The eight timings between cycles 1000 and 4000 are excluded from the linear least squares solution because these were either multicolour (uvby) and therefore of much poorer time resolution or were of poor quality. Including these data in the solution makes almost no difference to the ephemeris coefficients but does make the errors significantly worse.

TABLE 1 New timings of primary minima

	HJD		Est.error	n	Filter	Tel
AA Dor (=LB3459)	2446795.39692	±	0.00005	13761	V	1.0m
	6801.41230		0.00005	13784	V	1.0
	7121.53695		0.00010	15008	y	1.0
	7850.44822		0.00005	17795	V	1.0
	8267.34250		0.00003	19389	V	1.0
HW Vir (=BD-7° 3477)	2447968.53836	±	0.00002	19174	B	0.5m
	7972.50682		0.00002	19208	B	1.0
	8267.57410		0.00002	21736	V	1.0

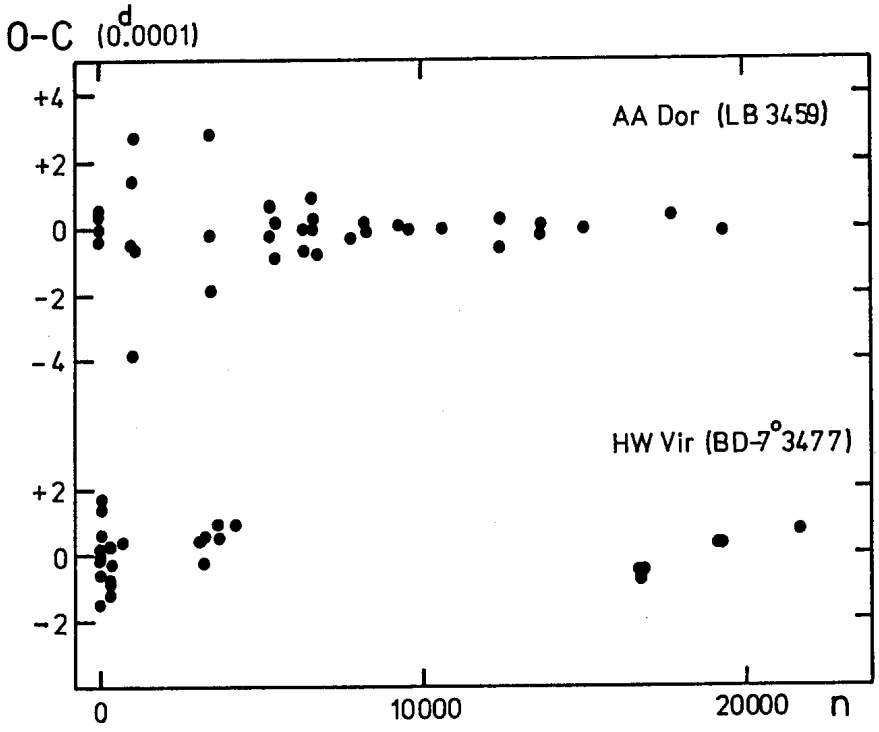

Fig. 1. (O-C) diagrams for AA Dor and HW Vir based on the ephemerides determined in this paper. The AA Dor data were obtained between 1977 and 1991; the HW Vir data between 1984 and 1991.

Figure 1 shows the (O-C) residuals for both binaries. In the case of AA Dor, the linear fit is very good and there is no evidence for period change. For HW Vir there is a weak indication in the most recent data that the linear fit may not be good enough.

It is unfortunate that no observations of HW Vir were made during 1986-1989 and it is clear that further data are very desirable.

D. KILKENNY, M. HARROP-ALLIN, F. MARANG
South African Astronomical Observatory
P O Box 9, Observatory 7935, S. Africa

References:

Kilkenny, D., Hilditch, R.W. & Penfold, J.E., 1978. Mon. Not. R. astr. Soc., **183**, 523.

Kilkenny, D., 1986. Observatory 106, 160.

Kudritzki, R.P., Simon, K.P., Lynas-Gray, A.E., Kilkenny, D. & Hill, P.W., 1982. Astr. Astrophys., **106**, 254.

Marang, F. & Kilkenny, D., 1989. Inf. Bull. Var. Star, 3390.

Menzies, J.W. & Marang, F., 1986. IAU Symposium 118, 305.

Paczynski, B., 1967. Acta. Astr., **17**, 287.

Paczynski, B., 1980. Acta. Astr., **30**, 113.