RADIAL-VELOCITY VARIATIONS OF DY HERCULIS

Joy (1950) was the first to measure the radial velocity of
DY Her. From three spectra he obtained a mean velocity of $\gamma=-50$
km s^{-1} and estimated a radial velocity amplitude of 70 km s^{-1}.
Later on Bonsack (1957) obtained complete radial velocity curves
of some of the short-period variable stars. DY Her was also in-
cluded in his programme in which he made 11 spectra for radial
velocity measurements of this star on four nights in 1955 and
1956. The radial velocity curve of DY Her determined by him dif-
fered in shape from that of other short-period variables. Using
Bonsack's radial velocity curve Hardie and Lott (1961) have al-
ready attempted to determine the radius of this star by Baade's
and Wesselink's method. Their results, however, were very much
affected by the lack of sufficient precision of photoelectric
photometry and radial velocity measurements. It is thus hardly
surprising that they failed to get a reliable radius.

Radial velocity measurements were secured from a single-
trail spectrogram of DY Her by McNamara (1978). Utilizing the
high precision uvbyβ photometry of Breger et al. (1978) he found
a radius of 2.7 R⊙ using Wesselink's method. This value is con-
siderably smaller than the value one would expect from McNamara
and Feltz's (1976) expression for the dependence of the radius
on the period derived from surface gravity measurements. McNamara
(1978) remarks that "increasing the velocity amplitude of DY Her
to 35 km s^{-1} would lead to a Wesselink radius near to this (ex-
pected) value". Comparing the total velocity amplitude 2k=30 km s^{-1}
of DY Her obtained by McNamara (1978) with the total velocity
amplitudes of other dwarf cepheids (e.g. 2k=45.5 km s^{-1} for EH Lib
and 44 km s^{-1} for SZ Lyn given by McNamara and Feltz, 1976) we
suspect that it has been underestimated.

In order to clarify this problem it seems to be worth pub-

lishing our radial velocity measurements. In 1971 five spectro-
grams (at a reciprocal dispersion of 60 Å mm^{-1}) were secured
with the Cassegrain spectrograph of the 72 inch telescope of
the Dominion Astrophysical Observatory on baked IIa-O plates on
two nights. The plates were measured on the DAO Arcturus measur-
ing machine. Spectrograms of a number of standard-velocity stars
were also secured on both nights and measured to check on possi-
ble systematic errors. None were found. In Table I we list the
plate number, the date and Julian day of each spectrogram, the
number of lines measured, the radial velocity and the phase.

Table I

Radial velocities of DY Her

Plate No.	Date	Heliocentric J.D.	No.of lines	R.V. kms^{-1}	Phase
71321	1971.06.30	2441132.757	19	-30.9 ± 3.8	0.7850
71322		.800	16	-60.6 ± 4.7	0.0743
71323		.847	13	-49.4 ± 3.4	0.3906
71415	1971.07.22	2441154.750	12	-36.0 ± 4.6	0.7554
71416		.806	13	-65.8 ± 4.6	0.1322

The phases were calculated using our elements with a quadratic
term (Szeidl and Mahdy, 1979):

$$\text{Max.hel.} = \text{J.D. } 2433439.4865 + 0\overset{d}{.}148631349 \times E - 18\overset{d}{.}04 \times 10^{-13} \times E^2.$$
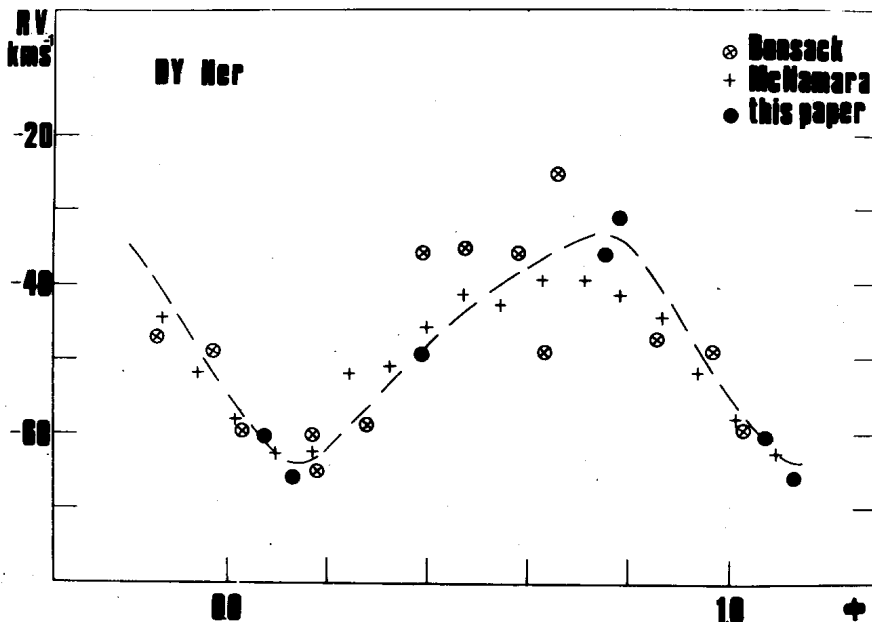
In Figure 1 we have plotted Bonsack's, McNamara's and our radial
velocity measurements against phase; a free-hand velocity curve
has been drawn through our observations. A mean velocity of about
$\gamma=-47$ km s^{-1} was found from our velocity data. (Bonsack obtained
a mean value of -45.8 km s^{-1}; McNamara gave the mean velocity as
$\gamma=-49$ km s^{-1}) Relying on our own data we fix the maximum and
minimum velocities of the DY Her velocity curve at about -32 km s^{-1}
and -66 km s^{-1}, respectively, which yield a velocity amplitude of
34 km s^{-1}.

Although our results confirm that the radial velocity ampli-
tude of DY Her is smaller than the amplitudes of EH Lib and
SZ Lyn, these results nevertheless suggest a larger Wesselink
radius for DY Her than the value obtained by McNamara (1978).

New radial velocity measurements of DY Her with higher dis-
persion and higher time resolution are needed to obtain a more
reliable radius of this star.

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