

THE ABSOLUTE LUMINOSITY OF RR LYRAE VARIABLES

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We have taken UBVRi photoelectric photometry and CORAVEL radial velocities for 6 field RR Lyraes, i.e. SW And, YZ Cap, SW Dra, SS For, RV Phe and V440 Sgr, with the purpose of applying the Baade-Wesselink (B-W) method and determining their absolute magnitudes. The present improvements with respect to previous applications of the method are: a) the use of the (V-I) color, which shows the smallest sensitivity to gravity and metal abundance in the color-visual surface brightness plane. b) the use of a new grid of model atmospheres by Buser and Kurucz (1986), which include an improved treatment of opacity and convection. They provide a complete set of models for the relevant values of effective temperatures, gravities and metal abundances, thus avoiding the need of inaccurate interpolations or extrapolations.

The preliminary results of our analysis are summarized in Table I. The final results, along with a detailed discussion of the method and its individual aspects will be presented in two forthcoming papers.

A few remarks can be made: 1) For the stars affected by Blazhko effect (i.e. SW And and SS For) it was possible to match the light and radial velocity curves at the same phase in the Blazhko cycle. The effects of amplitude variations were then eliminated and the B-W method could be applied with some confidence. 2) Two stars (i.e. SW Dra and RV Phe) are affected by significant phase-lag between light and radial velocity curves. This prevents a correct application of the B-W method, in fact the values of M_v we have derived by a forced application of the method are unreasonably faint. Jones et al. (1987) have independently applied the B-W method to SW Dra, and found that the use of the (V-K) color and K magnitude minimizes the above mentioned phase-lag. The absolute magnitude they find for SW Dra is $M_v = 0.94 \pm 0.14$ mag. 3) For the c-type variable YZ Cap the method could not be applied, mainly because the scatter in the angular diameter curve derived from the photometry was too large.

Some conclusions can be drawn: 1) More stars need to be studied in

order to obtain a statistically significant sample, since a fraction of them present problems in the application of the B-W method which cannot be easily foreseen. In particular more information is needed on metal-rich stars, if one wants to assess the dependence (if any) of the absolute magnitude M_v on metallicity. 2) Improvements to the method can still be made, and better accuracies in M_v determinations can be achieved, by using infrared magnitudes and colors, which are less affected by shock waves in the atmosphere, and by studying in detail the structure of the atmosphere during the pulsation cycle.

Table I
Data for RR Lyrae Stars

Star	Period	Fe/H	T_{eff}	R/R_0	M_v	Remarks
SW And	0.4423	-0.15	6650	4.3	1.0	Blazhko effect
YZ Cap	0.2735	-0.23				B-W method not applicable
SW Dra	0.5697	-0.70	6500	3.8	1.3:	$\Delta\phi \sim 0.10$
SS For	0.4959	-1.50	6760	4.7	0.7	Blazhko effect
RV Phe	0.5964	-1.50	6460	4.1	1.3:	$\Delta\phi \sim 0.10$
V440Sgr	0.4775	-1.35	6700	5.2	0.6	

REFERENCE

Jones, R. V., Carney, B. W., Latham, D. W. and Kurucz, R. L. 1987 in IAU Symposium No. 126, Globular Cluster Systems in Galaxies, J. E. Grindlay and A. G. D. Philip, eds., Reidel, Dordrecht, p. 589.