MASSIVE CLOSE BINARIES IN THE MAGELLANIC CLOUDS

VIRPI S. NIEMELA[1*] and LILIA P. BASSINO[2]
1. *Instituto de Astronomia y Fisica del Espacio, CC67, Suc. 28, 1428 Buenos Aires, Argentina.*
2. *Facultad de Ciencias Astronomicas y Geofisicas, U.N.L.P., Paseo del Bosque s/n, 1900 La Plata, Argentina.*

ABSTRACT. We present spectroscopic orbits for 4 eclipsing binary systems in the Magellanic Clouds. The minimum masses that we find for the binary components in the LMC are: 34 + 17 M⊙ for HV 2241 and 26 + 15 M⊙ for HV 2543, and for the ones in the SMC: 21 + 25 M⊙ for AzV 73 and 17 + 19 M⊙ for HV 1620.

1. Introduction

The study of eclipsing binaries in the Magellanic Clouds provides an opportunity to investigate the structure and evolution of stars in an environment of lower metal abundances than our galaxy; thus, the determination of empirical stellar masses may reveal systematic differences depending on chemical composition.

The case of massive stars is particularly interesting not only because they are bright enough to be observed individually in other galaxies, but also for being stars with high mass loss rates.

2. Observations

The observations have been carried out with the CTIO 1-m telescope and the Cassegrain spectrograph. The spectra of HV 2543 and part of HV 2241 and HV 1620 were obtained with image tube at a dispersion of 45 Å/mm, on baked Kodak III-aJ plates and widened to 1 mm. They were measured with the Grant oscilloscope-display engine at IAFE (Buenos Aires).

All the other spectra were obtained with the 2-D photon-counting detector at the same dispersion. They were reduced with the CTIO data analysis facilities at La Serena.

---

* Visiting Astronomer CTIO, NOAO, operated by AURA Inc. under cooperative agreement with NSF. Member of the Carrera del Investigador, CIC, Prov. Buenos Aires, Argentina.

Y. Kondo et al. (eds.), Evolutionary Processes in Interacting Binary Stars, 497–499.

3. Results

The spectroscopic orbital elements of the observed eclipsing binaries are listed in Table 1.

TABLE 1. Circular orbital elements for 4 binary systems in the Magellanic Clouds.

Element	HV 2241	HV 2543	HV 1620	AzV 73
Period (days)	4.342634[a]	4.829052[a]	3.62646[b]	4.6068[c]
V_{01} (km/s)	321	299	165	134
V_{02} (km/s)	302	285	133	153
K_1 (km/s)	162	160	243	247
K_2 (km/s)	322	272	214	212
$a_1 \sin i$ (R⊙)	14	15	17	22
$a_2 \sin i$ (R⊙)	27	26	15	19
$M_1 \sin^3 i$ (M⊙)	34	26	17	21
$M_2 \sin^3 i$ (M⊙)	17	15	19	25

References to Table 1: a- Payne-Gaposchkin (1971)
b- Payne-Gaposchkin and Gaposchkin (1966)
c- Shapley and McKibben Nail (1953)

3.1. ECLIPSING BINARIES IN THE LMC

HV 2241: We estimate the spectral types for the primary and secondary components to be, respectively:

O7 V + O8 V:

During the principal eclipse the O7 star, which is the more massive and brighter component, is behind the O8 component. From the light curve solution (Davidge 1987) we can estimate the radii of the components to be: r(O7) = 15 ± 3 R⊙ and r (O8) = 13 ± 3 R⊙.

HV 2543: The estimated spectral types are:

O8 V + O9 III:

The O8 star is the more massive and brighter component, and according to the ephemeris given by Payne-Gaposchkin (1971), is behind the O9 star during the principal eclipse.

3.2. ECLIPSING BINARIES IN THE SMC

HV 1620: The spectral types of both components are similar, and we estimate them to be:

O9.5 III + O9 V

The O9 star is the more massive, but the O9.5 has stronger lines. According to the ephemeris of Davidge (1988), the O9 component is behind the O9.5 during the principal eclipse.

AzV 73: We estimate the spectral types of the components as:

B0 III + O9 V

This system appears spectroscopically similar to HV 1620, with the B0 III component having stronger spectral lines and being the less massive. There is still no published light curve solution for this system.

Acknowledgements

The technical assistance of Mrs. S.D. Abal de Rocha is gratefully acknowledged. V.S.N. thanks the CTIO Director and Staff for their hospitality.

References

Davidge, T.J. (1987), Astron. J. **94**, 1169.
Davidge, T.J. (1988), Astron. J. **95**, 731.
Payne-Gaposchkin, C.H. and Gaposchkin, S. (1966), Smithson. Cont. Astrophys. No. 9.
Payne-Gaposchkin, C.H. (1971), Smithson. Cont. Astrophys. No. 13.
Shapley, H. and McKibben Nail, V. (1953), Proceedings of the N.A.S. **39**, 1.