SPECTRAL CLASSIFICATION OF ECLIPSING BINARIES

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ABSTRACT. Approximately 375 classification spectra of 130 Southern Hemisphere eclipsing binary stars were obtained between 1978 and 1982 at Mt. John University Observatory, New Zealand using the 0.6 meter reflector, and at Cerro Tololo Inter-American Observatory, Chile using the 0.4, 0.6, 0.9, and 1.0 meter telescopes. The spectra have been classified by one of us (GWW) using a grid of standards obtained on the various spectrographs at each of the observatories. Since many of the spectra were taken during primary and secondary minima, it has been possible in many cases to classify separately each component in the binaries.

1. INTRODUCTION

New and improved computer modeling techniques used in the study of the nature and evolution of eclipsing binary stars have emphasized the need for accurate observational data on these systems. Among the most important information necessary for the detailed analyses are the temperature and luminosity of one, or preferably both, of the companions in a system under study. To ascertain these properties, the techniques of spectroscopy and standardized photometry are required.

To obtain a broad base of such information for researchers in this area, Hilditch and Hill (1975) have published a uvby photometric survey, and Hill et al. (1975) an MK spectrographic survey of eclipsing binaries observable from the Northern Hemisphere. To fill the need for information on Southern Hemisphere systems, the present authors have undertaken similar, but modified, uvbyβ photometric and spectrographic surveys. The results of the former survey have already been published by Wolf and Kern (1983). We report here on the completion of the first phase of the MK spectrographic survey.

2. THE OBSERVATIONS

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eclipsing binary stars were obtained between 1978 and 1982 at Mt. John Observatory in New Zealand using the 0.6 meter reflector, and at Cerro Tololo Inter-American Observatory in Chile using the 0.4,0.6,0.9, and 1.0 meter telescopes. The reciprocal dispersions of the spectra were 62 A/mm for all the Mt. John spectra, and 91,91,62, and 43 A/mm, respectively for the Cerro Tololo spectra. Although only small telescopes were used for this survey, it was possible to obtain spectra of stars down to 10th magnitude in reasonable amounts of time (to avoid phase spread) on hydrogen hyper-sensitized IIIa-J or IIa-O photographic plates.

As in the photometric survey, the present study included specific phase coverage, usually at the minima and quadratures, for all binaries. The intention with this was to attempt to separate the spectral types of the binary members. Prior to each observing run, ephemerides were calculated for photometric phases 0.00, 0.25, 0.50, and 0.75 for all stars on the program using the best available times of minimum and periods from the Eclipsing Binary Card Catalog of the University of Florida, or from recent IBVS circulars. Events were combined, sorted by date and time, and arranged into nightly observing lists.

The spectra have been classified by one of us (GWW) using a fine grid of MK standards obtained on the various spectrographs at each of the observatories. Since many of the spectra were taken during primary and secondary minima, it has been possible in many cases to classify separately each component in the binaries. A comparison of this study with the results of the uvbyβ photometry on the same stars is presently underway. Preliminary results indicate a close correlation in the temperatures determined from each technique. The actual results of this analysis and the MK spectral classifications will be published elsewhere.

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