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NEW DOUBLE-LINED ECLIPSING BINARIES

High-resolution coudé spectrometric observations have been continued during the past 5 years as part of a program to determine accurate absolute properties of eclipsing binary stars. Previous progress reports (Lacy and Evans 1979, Lacy 1984, Lacy 1985) have discussed 45 of the stars in this program. Observations of an additional 8 eclipsing binaries are discussed here. These observations were obtained with either the 2.1 m reflector or the coudé feed telescope at Kitt Peak National Observatory (N.O.A.O.) and the coudé CCD spectrometer. Typically 100 Å in the blue (4500 Å) or red (6430 Å) were observed at a resolution of 0.2-0.3 Å. The individual binaries are discussed below.

Double-Lined Eclipsing Binaries

Name	V	Spec	P(days)	Name	V	Spec	P(days)
WW Cep	10.63	G3*	1.53*	RW Lac	10.65	F2*	10.37
EY Cep	9.79	A5*	5.52	V530 Ori	9.87	G0	6.11
NN Cep	8.10	A5*	2.06	V523 Sgr	9.56	A5*	2.32
V498 Cyg	9.83	B1:III:	3.49	TY Tau	12.01	K0V	1.08

* See notes below.

Only V523 Sgr and NN Cep have good photoelectric light curves. Photoelectric observers are encouraged to observe these systems in at least two well-calibrated colors in order to make possible the most accurate determinations of absolute stellar properties.

The V magnitudes listed above are preliminary results of UBV all-sky photometry obtained at Mt. Laguna Observatory in the Fall of 1989, except for V523 Sgr (see below). The spectral types and orbital periods are those listed in the *General Catalogue of Variable Stars* (1985). Notes on the individual systems are listed below.

WW Cep: Double lines were first detected in a spectrogram taken July 2, 1985. Preliminary color indices are consistent with a slightly reddened G9 main-sequence star.

If unreddened, the B-V index points to a K1 spectral type. Popper (1989) has found strong emission at the Ca II H and K lines. He hypothesizes that the system is of the RS CVn type. Narrow lines are seen in the red with a line depth ratio of about 6:1. Lines of both components have about equal widths. The ephemeris listed in the GCVS (1985) is inconsistent with my spectrograms.

EY Cep: Double lines were first detected in a spectrogram taken Sept. 8, 1989. The appearance of the available spectrograms and preliminary color indices are consistent with an unreddened F3 main-sequence star. The GCVS type, A5, is definitely too early. Narrow lines are seen in the blue with a line depth ratio near 1:1. Lines of both components have about equal widths. The spectroscopic near-equality of the two components is surprising since the eclipse depth ratio is about 2:1, but the light curve is very poorly known.

NN Cep: Double lines were first detected in a spectrogram taken Sept. 9, 1989. The appearance of the available spectrograms and preliminary color indices are consistent with a slightly-reddened F1 main-sequence star. The GCVS type, A5, is definitely too early. Moderately broad lines of the primary and narrower lines of the secondary are seen in the blue with a line depth ratio of about 3:1. A good photoelectric light curve has been obtained and analyzed by Güdür et al. (1983).

V498 Cyg: Double lines were first detected in a spectrogram taken Sept. 10, 1989. The appearance of the spectrum and preliminary color indices are consistent with a highly-reddened (E(B-V) = 1.28 mag) B1.5 main-sequence star. Broad 4471 Å He I lines are seen in the blue with line depth and width ratios near 1:1.

RW Lac: Double lines were first detected in a spectrogram taken Sept. 11, 1989. The appearance of the spectrum is that of late-F or G type stars. The preliminary color indices are somewhat anomalous - the B-V index points to G4 if unreddened, but the U-B index points to F8. No amount of assumed interstellar reddening can remove this anomaly.

Narrow, deep lines are seen in the red with a line depth ratio of about 2:1. Lines of both components have about equal widths.

V530 Ori: Double lines were first detected in a spectrogram taken Mar. 31, 1985. The appearance of the spectrum is that of late-F or early-G type stars. The preliminary color indices are somewhat anomalous - similar to, but less severe than, with RW Lac (see above). The B-V index points to G2 if unreddened, but the U-B index points to F9. Narrow, deep lines of the primary are seen in the red. Lines of the secondary are very shallow - the line depth ratio is about 12:1. The lines of the secondary appear to have about the same width as those of the primary.

V523 Sgr: Double lines were first detected in a spectrogram taken May 8, 1989. The appearance of the spectrum and color indices of Woodward and Koch (1989) are consistent with a slightly reddened A9 main-sequence star, significantly later than the GCVS type, A5. Moderately broad lines are seen in the blue with a line depth ratio of about 1.5:1. The widths of the secondary's lines are slightly less than those of the primary. Woodward and Koch (1989) has published and analyzed a photoelectric light curve.

TY Tau: Double lines were first detected in a spectrogram taken Dec. 2, 1985. The appearance of the spectrum and preliminary color indices are consistent with a main-sequence K star, but the color indices are somewhat anomalous. The B-V index points to K4, but the U-B index points to K1. There is a faint companion about 10 arcsec from TY Tau and about 2.5 mag fainter. This may have an effect on the color indices. Moderately narrow lines are seen in the red with a line depth ratio of 2.5:1 and nearly equal line widths.

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