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PHASE-DEPENDENT MASS FLOW IN UW CMA

Mass flow in the interacting binary system UW CMA, consisting of an O7f primary and an O7 secondary (Batten, Fletcher and Mann 1978), has been studied using the Copernicus ultraviolet spectra by McCluskey, Kondo and Morton (1975), McCluskey and Kondo (1976) and Drechsel, Rahe, Kondo and McCluskey (1980). Mass loss rate has been estimated to be in the range of 2.3 to 3.0×10^{-6} solar mass per year.

However, as the Copernicus telescope spectrometer employed a single-channel detector system (Rogerson, Spitzer et al. 1973), it took a quarter of the orbital period or longer to complete the spectral scan in the spectral range 1000 to 1550 Å. This made a study of the phase-dependence of the absorption and emission features, many of which were of P Cygni type, quite difficult. Consequently, the results reported by McCluskey and Kondo (1976) were uncertain in this respect.

We have performed a preliminary examination of the ultraviolet spectra of UW CMA obtained with the IUE on 1978 June 2 and 4. The exposures were 80 and 100 seconds; thus, the time-resolution was excellent. The phase of observation was 0.84 and 0.24 for the respective dates.

The radial velocity changes observed in the shifting of the short-wavelength edge of the emission in the C III (1175 Å), N V (1238 and 1242 Å), Si IV (1393 and 1402 Å) and C IV (1548 and 1550 Å) P Cygni profiles corresponded to a value in the vicinity of 400 km s^{-1} ; the radial velocity was in the positive sense at phase 0.84 and negative at phase 0.28. Several absorption lines, e.g. Si III (1206 Å) and N IV (1718 Å), show no emission but are displaced by a constant value of 500 to 800 km s^{-1}

with the orbital velocity variation superimposed on top of this mean displacement. The radial velocity difference for the O7f star at these two phases was 406 km s^{-1} using $K_1=222.5 \text{ km s}^{-1}$ (Batten et al. 1978)⁶. The P Cygni absorption components of these lines also show a velocity change due to orbital motion superimposed on the $800 \text{ to } 1100 \text{ km s}^{-1}$ mean expansion velocity.

We have re-examined the previous Copernicus data. The radial velocity changes, although not conclusive, are basically not in disagreement with the current findings.

Incorporating the previous results, we conclude that the mass flow in UW CMA is primarily from the O7f primary and that the matter is being lost from the binary system at the rate of 2.3 to 3.0×10^{-6} solar mass per year. The P Cygni lines must arise within several stellar radii above the surface of the primary star in order to show such orbital motion effects.

GEORGE E. MCCLUSKEY

Division of Astronomy
Department of Mathematics
Lehigh University
Bethlehem, Pa. 18015, U.S.A.

YOJI KONDO

Code 685, Goddard Space Flight
Center, Greenbelt, Md. 20771
U.S.A.

JURGEN RAHE

Remeis-Sternwarte
Sternwartstrasse 7
D-8600 Bamberg,
Federal Republic of Germany

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