HIGH MASS RATIO CONTACT BINARIES: RECENT EVOLUTION INTO CONTACT?

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(Not reviewed)

Recent theories of the origin and evolution of contact binaries suggest that the two stars evolve into contact through angular momentum loss (AML; Mochnacki 1981, Vilhu 1982). When in contact, the system then evolves toward smaller mass ratio through mass transfer from the secondary to the primary component (Webbink 1976, Rahunen and Vilhu 1982). Most contact binaries have mass ratios of 0.3 to 0.5.

Systems with high mass ratio would then represent objects which only recently have evolved into contact. Three contact binaries are known to have mass ratios larger than 0.8, and we will discuss new data for two of these - OO Aql and VZ Psc. New spectroscopic data have been obtained for each. From these, we have (1) obtained precise spectroscopic mass ratios using the cross-correlation technique, (2) investigated chromospheric activity using the IUE and ground-based (DAO) telescopes, (3) determined kinematic properties of the systems, and (4) determined precise absolute parameters of OO Aql, and from these investigated its evolutionary state.

VZ Psc (P=0.26 d, K3) possesses the largest mass ratio yet determined for a contact binary, 0.92 ± 0.03 (Hrivnak and Milone 1989). However, the system does not eclipse, $i=36^{o}$, and thus the parameters are not strongly determined. The light curve analysis leads to a large temperature difference between the components and also a large degree of overcontact; these two results are difficult to reconcile with each other. IUE observations indicate variable Mg II emission, and strong Ca II emission is also observed from each component. However, neither is phase-locked and thus they do not provide a key to understanding the light curve. The system is a high-velocity object, which probably belongs to the old disk population.

OO Aql (P=0.50 d, G3) has a mass ratio of 0.84 ± 0.01, with the more massive component eclipsed at primary minimum (A-type). Precise absolute parameters have been determined for the system, which indicate that the solar-type primary component is close to the TAMS, with an age for the system of 8 ± 3 Gyr. Mg II emission has been detected with the IUE throughout the orbital cycle.

The large ages deduced for the systems and the observed chromospheric activity are consistent with the idea that the systems have recently

Space Science Reviews **50** (1989), 348–349.

evolved into contact through AML.

This study is supported by a grant from Research Corporation and NASA grant NAG 5-964.

References

Hrivnak, B.J, and Milone, E.F. 1989, A.J., in press.
Mochnacki, S.W. 1981, Ap. J., **245**, 650.
Rahunen, T., and Vilhu, O. 1982, in Binary and Multiple Stars as Tracers of Stellar Evolution, ed. Z. Kopal and J. Rahe (Dordrecht: Reidel), p. 289.
Vilhu, O. 1982, Astr. Ap., **109**, 17.
Webbink, R.F. 1976, Ap. J., **209**, 829.