THE STRUCTURE OF COLLIDING STELLAR WINDS

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ABSTRACT. We report on progress in the theoretical modelling of colliding winds in WR binary systems, concentrating on two WR+O systems, namely V444 Cygni, and HD 193793.

1. Introduction

A large fraction of WR stars are observed to be in binary systems with either a massive O or WR star companion, or an unseen low mass companion (possibly a compact object). In the first case, both stars have significant stellar winds, and the wind-wind interaction zone will give rise to some very interesting shock related phenomena. We report on progress on the theoretical modelling of these wind-wind interactions in close system such as V444 Cygni (WN5+O6, period=4 days), and very wide systems such as HD 193793 (WC7+O4-5, period=8 years). A full discussion of this work will be presented elsewhere in Pollock *et al.* (in preparation).

2. Results

HD 193793

The (WC7+O4-5) system HD 193793 is a widely separated (semi-major axis$\sim$ 3000 $R_\odot$), and eccentric system ($e = 0.8$), with a period of 2900 days (Williams *et al.* 1990). The WR wind dominates the system ($\dot{M}_{WR}/\dot{M}_O \sim 35$). However, even at periastron the shock front lies away from the surface of the O-star. In HD 193793 the wind interaction is essentially adiabatic throughout the orbit. The cooling parameter χ defined as the ratio of the cooling timescale to the dynamical timescale has the value 2.5 for the wind of the WR star, and a value of ~ 20 for the wind of the O-star.

V444 Cygni

In V444 Cygni the situation is reversed, with χ being small ($\chi = 1.0$ for the O-star wind, and 0.05 for the WR star wind), and cooling is important to the dynamics. Here, the shock structure collapses down almost onto the contact discontinuity between the winds, leading to a thin dense shock structure.

Work is continuing to calculate the X-ray luminosity and observed spectrum (including attenuation, which will be significant at soft X-ray energies) of the systems. With the advent of *ROSAT* observations of such systems, this will allow detailed comparisons of theory and observations for these systems.

References

Williams, P., *et al.* 1990. *M.N.R.A.S.*, **243**, 662.

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Wolf-Rayet Stars and Interrelations with Other Massive Stars in Galaxies, 253.