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THE STRUCTURE OF BB DORADUS IN QUIESCENCE

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Spectroscopic observations during a low state of BB Dor reveal a complex emission distribution. Irradiation by the white dwarf as well as magnetic fields of the secondary star are needed for an explanation.

BB Dor is a cataclysmic variable of SW Sextantis type. With orbital periods between 3 h and 4 h, these stars populate the upper edge of the period gap and are known to usually experience very high mass transfer rates. We obtained time-resolved spectroscopy during a rare low state of BB Dor using FORS2 at VLT on 2009-01-17. 65 spectra were taken with an individual exposure time of 300 s covering about 1.5 orbital cycles. The data were reduced using standard procedures in IRAF and corrected for the instrument function to yield relative flux values.

The average spectrum is dominated by narrow emission lines of hydrogen and helium. A comparison with Rodriguez-Gil et al. (in preparation) shows that no mass transfer occurred during our observations. Around the He I emission lines one can detect weak but broad absorption features of the white dwarf primary while the atmosphere of the secondary star shows itself through the presence of weak TiO absorption troughs.

The Hα line profile consists of three components, a central emission line and two satellite lines with the same radial velocity amplitude which is clearly higher than that of the central line. They are symmetrically offset in orbital phase by ± 0.15. See Figure 1 for a Doppler map of the Hα emission distribution. Similar line profiles were observed during the long quiescence state of AM Her (Kafka et al. 2008) but it remained unclear whether these satellite lines follow two crossing sinosoidals or rather non-crossing, parallel ones. For BB Dor, we cleary see that the lines do not move parallel but that they cross at phases 0.25 (red side) and 0.75 (blue side). If the satellites in AM Her are also described by crossing lines, the phase offsets there will show exactly the same symmetry as for BB Dor. Having perfect symmetry in two cases seems to indicate rather a rule than a coincidence. Therefore any explanation for the presence of these lines will also have to explain their symmetry. An origin in random loops or prominences would not yield such an explanation and is thus refuted.

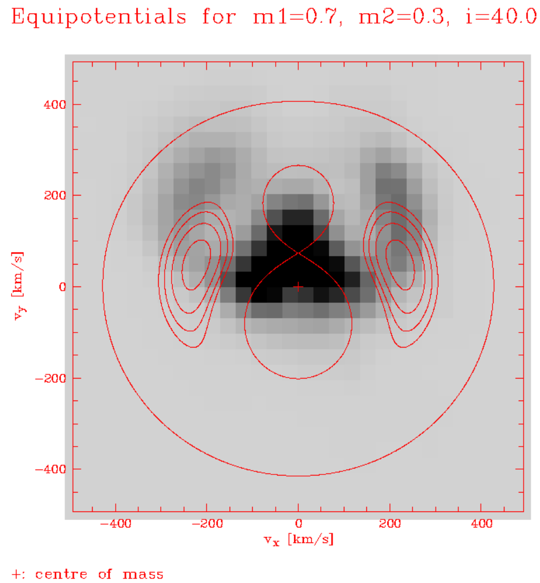

Fig. 1. Doppler map of the Hα emission of BB Dor in quiescence. Equipotentials for a mass ratio of 0.42 and an inclination of 40° are overplotted.

We would like to point out that the white dwarf in BB Dor is not known to be magnetic; its strength is not comparable with that of AM Her. It is thus unlikely that this feature is caused by the magnetic field of the white dwarf. We rather favour the influence of the magnetic field of the secondary star as an explanation for the presence of the two additional emission sources. A modified Roche geometry taking into account such an additional force might result in stable equilibrium points around the positions where the increased emission is observed.

For more details on this analysis, see Schmidtobreick et al. (2011).

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