MODEL SPECTRA FOR THE HELIUM CATACLYSMIC VARIABLE: AM CVN

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Abstract. Accretion through Roche lobe overflow in the helium cataclysmic binary AM CVn is considered and its emitted spectrum is computed using model stellar atmospheres. The accretion disc in AM CVn is helium-rich and such discs have hitherto not been constructed. We have computed the models by numerically solving the radiative transfer equation for helium opacities. The method adopted is that of treating the accretion disc as a set of optically thick and geometrically thin concentric annuli. Each annulus is treated individually as a blackbody or as a stellar atmosphere. We find that our description of AM CVn is consistent with both photometric and spectroscopic measurements of the system which have been made using the *Nordic Optical Telescope* (NOT) and the *International Ultraviolet Explorer* (IUE). We find that the stellar model synthetic spectrum provides a better fit to the observed spectrum than the Planckian disc spectrum. Also, for a given accretion rate, the synthetic spectrum composed of the sum of a series of stellar atmospheres is flatter than the corresponding blackbody sum.

1. Introduction

Since its discovery some sixty years ago (Malmquist 1936) the number of publications devoted wholly or partly to AM CVn has risen to ~200. Despite the attentions of the scientific community this stellar system remains an enigma – is AM CVn a single white dwarf or does it have a mass donor companion?

A. Evans and J. H. Wood (eds.), Cataclysmic Variables and Related Objects, 133–134.

2. Our results

Even although the exact nature of AM CVn is still the subject of controversy (Bard 1995) there are compelling arguments in favor of a binary system in which mass transfer takes place (Patterson, Halpern & Shambrook 1993). Our calculations of the emitted spectrum are in good agreement with the binary model and the IUE data, as can be seen in Fig. 1.

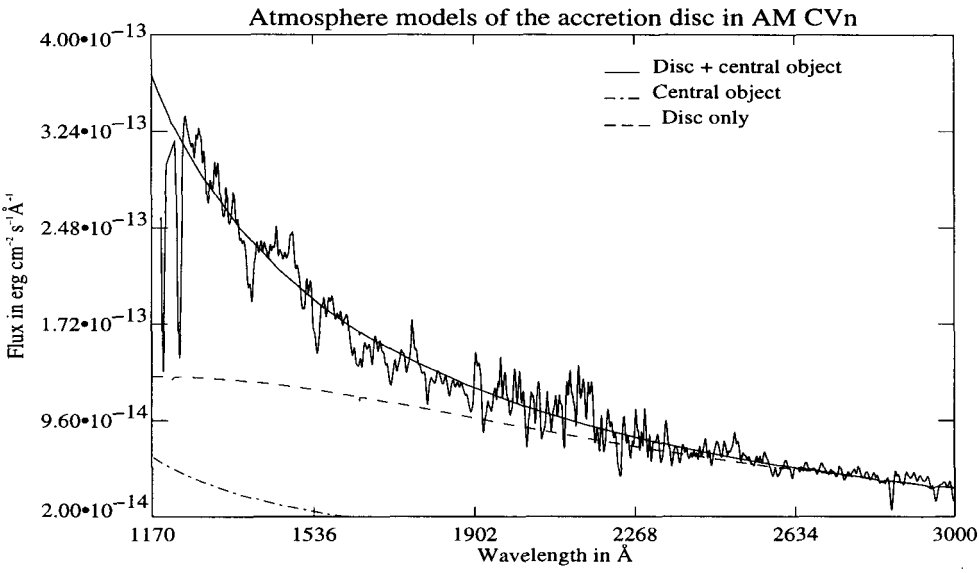

Figure 1. The stellar atmosphere disc approximation of the spectrum of AM CVn. Here the solid line is the sum of the DB white dwarf atmosphere and the central object, the dashed line is the disc alone, and the dotted-dashed line is the central object. The models are calculated in the LTE regime and are fully blanketed. $T_{\rm eff}$ and $\log g_{\rm eff}$ range from 30 000 K and 8.00 $\rm ms^{-2}$ to 11 000 K and 6.16 $\rm ms^{-2}$ respectively.

3. Discussion

The primary in AM CVn is likely to be a one solar mass white dwarf with an effective temperature of ~150 000 K. At these temperatures and gravities the models ought to be calculated in the NLTE regime. This will be the subject of future work.

References

Bard S., 1995, Masters thesis, p38
Malmquist K.G., 1936, Stockholm Obs. Ann., **12**, 7
Patterson J., Halpern J., Shambrook A., 1993, AJ, **419**, 803