PRELIMINARY RESULTS OF IMPROVED MODEL FITS TO THE EXTREME AND FAR UV OBSERVATIONS OF CATACLYSMIC VARIABLES

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ABSTRACT. We present the first results of a study which will attempt to analyze the combined Voyager and IUE observations of cataclysmic variables using steady-state accretion disk models. Initially we use flux ratio diagrams to determine if a combination of models will suffice or if new ingredients are necessary.

1. INTRODUCTION

Classical steady-state accretion disk models predict that the disks present in cataclysmic variable systems should radiate predominantly at shorter wavelengths. This indeed is what is seen; however, there is not good agreement between the observed slope of the continuum flux distribution and the slope predicted by current accretion disk models. It is possible to achieve modest agreement in the IUE spectral region but the change of slope occuring near 1350A and its continuation into the Voyager region cannot be explained with current models. It has been shown (Carone, Polidan and Wade 1985; Polidan 1985) that modified accretion disk models (Wade 1984) which fit the continuum flux distribution in the IUE region fail to simultaneously fit the Voyager region.

We present the first results of a study which seeks to determine if the observed continuum flux distribution can be fit by a combination of steady state accretion disk models or whether new ingredients are necessary. We include accretion disk models incorporating both blackbody and Kurucz stellar atmospheres. We also show what role the introduction of high gravity model atmospheres (Wesemael et al. 1980) into the models would play.

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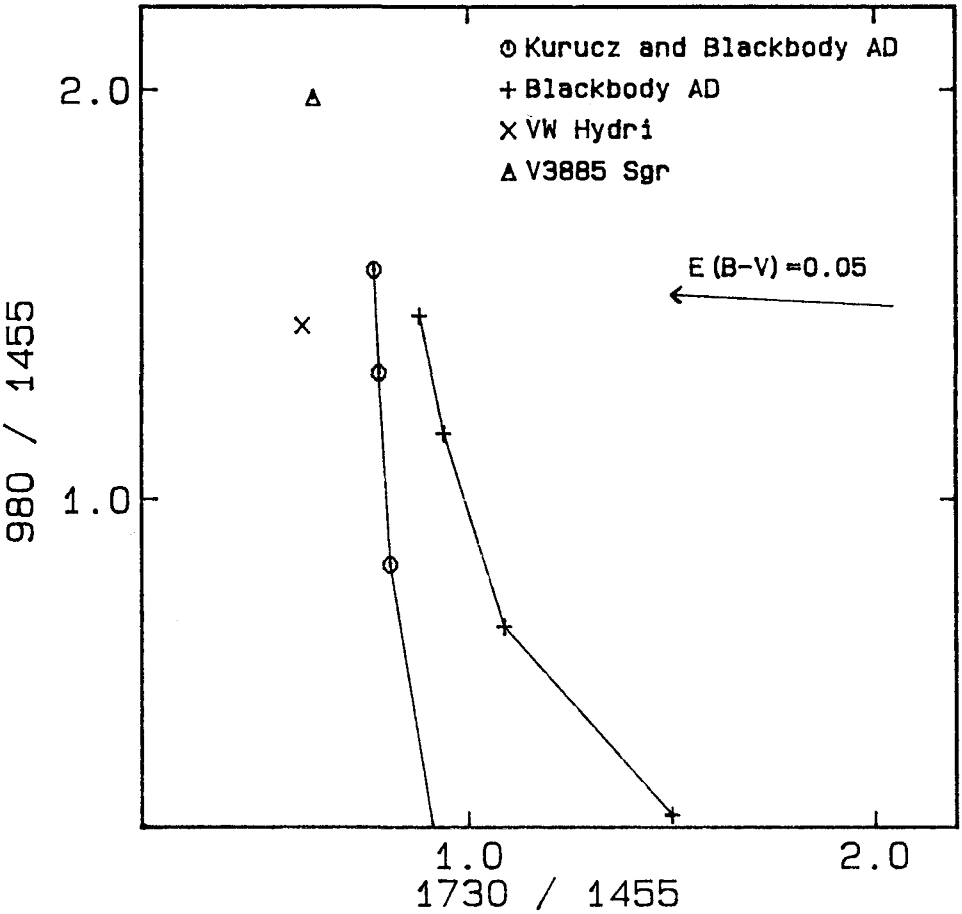

Figure 1. The positions of VW Hydri during superoutburst and V3885 Sgr relative to steady-state accretion disk models. These models have T_{min} = 6000K and $\dot{M}$ of 1.0E18, 1.0E17, 1.0E16 and 1.0E15 g/sec.

2. METHODOLOGY

We approach this problem by constructing flux ratio diagrams. The utility of this approach is discussed elsewhere (Wade 1982). We have chosen to use wavelength bandpasses of 60A centered on 980A, 1455A and 1730A. These wavelength bands were chosen to measure the continuum flux distribution with as little contamination from wind lines as possible. The ratio of the flux from 950-1010A to the flux from 1425-1485A is plotted against the ratio of the flux from 1700-1760A to the flux from 1425-1485A.

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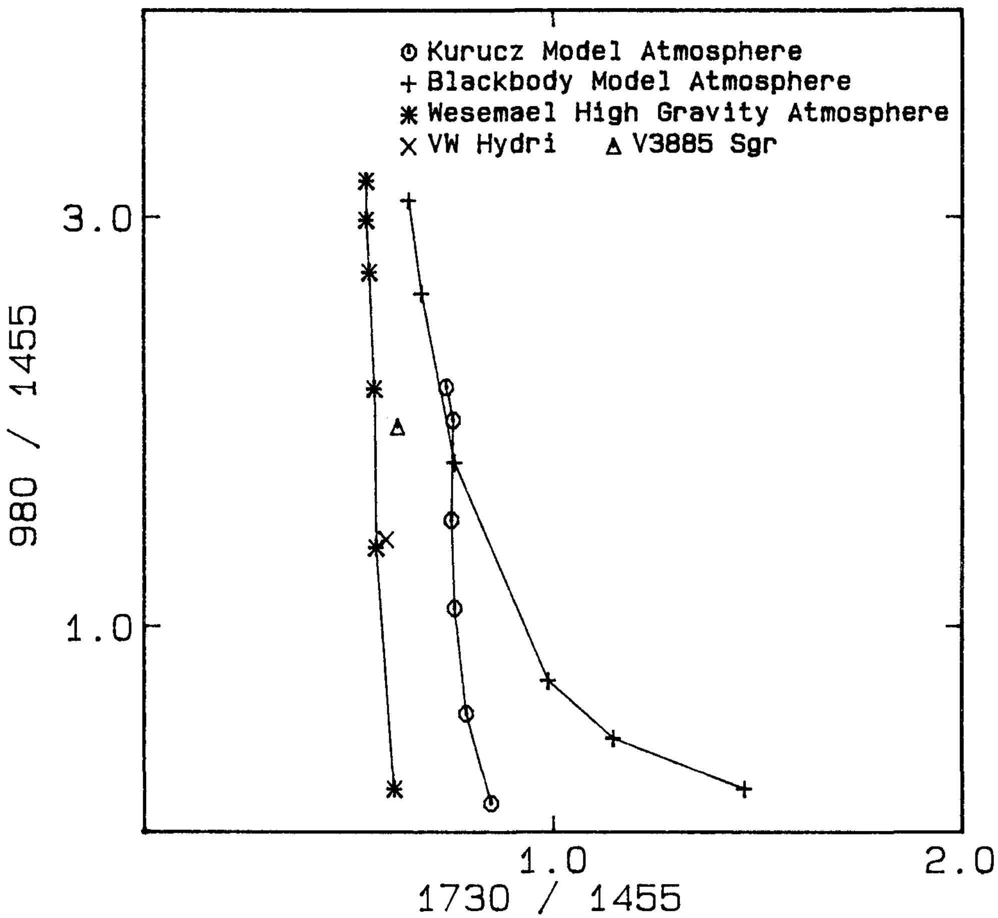

Figure 2. The positions of VW Hydri during superoutburst and V3885 Sgr relative to three types of model atmospheres: (a) Kurucz models at T = 15000-50000K, (b) blackbodies at T = 15000-200000K and (c) the Wesemael et al. models at T = 20000K-70000K.

3. DISCUSSION

We present two flux ratio diagrams in Figures 1 and 2. Figure 1 shows accretion disk models (Wade 1984) which use both stellar atmospheres and blackbodies and those which use just blackbodies. Also included are observations from Voyager and IUE of the superoutburst in VW Hydri and of V3885 Sgr. These objects were chosen because of their different orbital periods and because their E(B-V) are low. It is clear from the diagram that no combination of stellar atmospheres and/or blackbody

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disks is capable of explaining the observations. We point out that the data has not been dereddened. If it were, the data points would move in the direction of the arrow given at the top right of the diagram. This arrow shows how far a point would move if its E(B-V) were 0.05. Therefore, if the observations were dereddened, the situation would be even worse. These two objects also show the area of the diagram consistently occupied by the cataclysmic variable systems simultaneously observed with Voyager and IUE. To date all systems fall to the left of the line defined by the Kurucz atmospheres. The range of the 1730/1455 flux ratio is very restricted relative to the 980/1455 flux ratio.

In Figure 2 we present a flux ratio diagram for Kurucz model atmospheres, blackbodies and high gravity, pure hydrogen, line-blanketed atmospheres (Wesemael et al. 1980). Again it is clear that no combination of stellar atmospheres or blackbodies is capable of explaining the observations. However, the results seem to indicate that incorporating the high gravity atmospheres will allow an acceptable fit to be found to the observations using steady-state accretion disk models.

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