ABSTRACT

Michele Dawn Leighton

RS CVn stars show a peculiarity in their light curve called a distortion wave, (observed in both eclipsing and non-eclipsing binaries) which could not be accounted for by the normal methods i.e., ellipticity or reflection effect. Since these stars were of a similar type as the Sun but larger it was suggested that these distortions were due to a phenomenon similar to that of sunspots but occurring on a greater scale.

In this thesis, a model is developed to reproduce the light curves of non-eclipsing binaries using spots containing two components i.e. umbra and penumbra. The maximum number of spots allowable was two, and these spots could in principle model clusters of much smaller spots. The different models were compared and it was shown that in the majority of cases the one component double spot model was sufficient in reproducing the light curves of the stars investigated. A genetic algorithm was introduced into the computer program to remove dependence on the user for input and also to speed up the modeling process.

Using this computer program we obtained sizes and locations of the spots on 26 RS CVn binaries over a period of years. We could not obtain the total spot coverage of the stars since they had inclinations that were less than 90° and hence most of one hempishere was not visible. This meant that we could not determine whether there was any relation between total coverage and the orbital period of the system. This problem plus the lack of continous data also affected the determination of the constancy of the sizes of the spots over the years. However,

for the three systems VY Ari, BM Cam, HD127535 with inclinations of 90°, 82° and 90° respectively, there did seem to be an increase in spot sizes with latitude.

The results of our testing of the Mona Campus of the University of West Indies showed that the site is unsuitable for photoelectric phototmetry because of the light pollution.