A Novel Method for Quantitative Spectral Classification of R Coronae Borealis Stars

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The purpose for analyzing the spectra of R Coronae Borealis (RCB) stars and carbon stars is to determine if R Coronae Borealis stars can be identified from spectral analysis rather than from light curve analysis. The hypothesis states that a new, quantitative method of identifying RCB stars by their spectra will be possible as quantitative criteria for their classification will be found. I wrote computer programs in the Interactive Data Language to plot the spectra of numerous RCB and carbon stars and to measure the equivalent widths of the bands of interest, particularly C2 and CN bands and other carbon compounds. I then found ratios of the equivalent widths to provide a more accurate means of comparison. The equivalent widths themselves showed visible differences, but the equivalent width ratios demonstrated extremely significant differences between the two groups, particularly with regard to the CN bands and ratios pertaining to the CN bands. Together, the equivalent widths, equivalent width ratios, and prior knowledge of hydrogen deficiency provide quantifiable criteria for classification of R Coronae Borealis stars using their spectra. The presence of quantifiable conditions provides evidence that a program to identify RCB stars is possible and can be created using spectral data. These results support the research hypothesis and lead to rejecting the null hypothesis.

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