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THE CHROMOSPHERIC STRUCTURE OF COOL CARBON STARS

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The temperature-density structure of the outer atmospheres of the N-type carbon stars are investigated through computer-generated synthetic spectra from model atmospheres. The synthetic spectra are compared to spectra obtained with the *International Ultraviolet Explorer (IUE)* spacecraft and ground-based photometry.

The nature of the severe violet flux falloff seen in cool carbon stars is investigated through photospheric synthetic flux calculations with the assumption of local thermodynamic equilibrium (LTE). A new candidate for the unknown opacity source that causes this flux falloff is proposed—a preponderance of neutral metal bound-bound and bound-free transitions from low energy states.

The chromospheric structure of these stars is also investigated through a semiempirical modeling technique. Such a technique involves attaching a chromospheric temperature rise to a radiative equilibrium model photosphere and generating a synthetic spectrum of chromospheric spectral lines using non-LTE radiative transfer. The chromospheric temperature-density structure is then altered until the synthetic spectrum matches the *IUE* observations of the singly-ionized magnesium resonance lines and the intercombination lines of singly-ionized carbon. TX Piscium is used as the N-type carbon star prototype since it has much observational data available. The chromospheric temperature-density structure of this star is ascertained through this semiempirical technique. The stellar-wind profile is also determined for this star via these calculations.

Through the above-mentioned non-LTE analysis of the atmospheric structure of these stars, the excitation and ionization equilibria are investigated. The excited levels of H I, C I, Na I, Mg I, and Ca I are overpopulated with respect to LTE in the middle and upper photosphere of these stars and all are overionized with respect to LTE. Photons from the chromosphere greatly influence the excitation and ionization of H I, C I, and Mg I.