THE ORIGIN OF THE ZANSTRA DISCREPANCY: UV EXCESS IN THE CENTRAL STAR CONTINUUM?

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ABSTRACT. The temperature of a planetary nebula central star (CPN) may be determined by observing the nebular flux in an H I or He II recombination line and the stellar flux in a continuum band. The former measures the integrated UV stellar continuum blueward of the ionization edge of the recombined ion. By assuming a continuum shape (usually a blackbody), the ratio of these two fluxes yields an effective temperature for the CPN. This particular method, first introduced by Zanstra (1931), has an advantage over others in that the observables are relatively straightforward to obtain. However, this method also carries a troublesome ambiguity with it: CPN temperatures determined using He II recombination lines. This *Zanstra discrepancy* is reviewed by Kaler (1985) and Henry and Shipman (1986). Examples of He II and H I temperatures for numerous CPNs are given in Pottasch (1984), where it is shown that the He II Zanstra temperature often exceeds the H I temperature by several times 10^4K.

Possible explanations for the Zanstra discrepancy include arguments related to nebular optical depth, effects of dust, and a UV excess in the stellar continuum relative to a blackbody. We have employed photoionization calculations and a broad assortment of model stellar atmospheres to study the effects of UV excess.

Our results show that an atmosphere composed of pure H, such as those associated with DA white dwarfs, has an adequate UV excess to explain the size of most observed Zanstra discrepancies. We also find that the UV excess associated with the non-LTE atmospheres near the Eddington limit calculated by Husfeld *et al.* (1984) and representing an AGB star with a strong wind may also be capable of explaining many of the observed discrepancies. Finally, in each model the calculated emission line ratio, [O III]λ5007/[O II]λ3727, which is an indicator of the level of nebular excitation, is reasonably consistent with observed ratios in nebulae which exhibit Zanstra discrepancies.

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