THE CONTINUUM EMISSION FROM PLANETARY NEBULAE

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ABSTRACT. The study of nebular continuum emission is important for several reasons (Pottasch 1984, *Planetary Nebulae*, Dordrecht: Reidel). First of all, it can provide information about the temperature and the density of the nebula, when the object is large enough, or when the central star is weak enough, so that the nebular continuum is easily observed without interference from the stellar continuum. On the other hand, for small planetary nebulae, both the central star and the nebula contribute to the observed continuum. In this latter case, in order to obtain the stellar continuum the theoretical nebular emission must be used. Thus, studies of the evolution of planetary nebula nuclei through the HR diagram rely on a good calculation of the theoretical nebular continuum.

In general, the theoretical nebular continuum is obtained following Brown and Mathews (1970, *Astrophys. J.*,160, 939), using average values for the physical conditions of the emitting gas obtained from the observed emission lines (Shaw and Kaler 1985, *Astrophys. J.*, 295, 537). This paper aims to present results for the theoretical continuum emission of planetary nebulae, based on photoionization models. The computer code described by Gruenwald and Viegas-Aldrovandi (1987, *Astron. Astrophys.*, in press) has been used. Optically thick models have been constructed considering the central star emitting a black body spectrum. The ionizing radiation is characterized by the stellar temperature in the range $2. \leq T_{\star}/10^4 \leq 15.$ K and ionization parameter $3.\times10^{-4} \leq 3.\times10^{-2}$. Three values for the hydrogen density, $n_H = 10^3$, 10^4 and 10^5 cm^{-3}, have been considered. The continuum spectrum emitted by the gas, in the range 2600 to 10,800 A, is calculated in each slab and integrated over the entire nebulae. In order to provide useful theoretical results, several diagrams have been plotted, including ratios of the nebular to the stellar continua. In particular, the B and V fluxes, and also the contribution of the emission lines to these filters, are given as a function of T. A comparison between the theoretical continuum emission, in B and V filters, calculated by the photoionization models and that obtained from the average physical conditions (also obtained from the models) shows that the latter overestimates the gas emission. The overestimate increases with increasing stellar temperature.

S. Torres-Peimbert (ed.), Planetary Nebulae, 226.