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PHOTOELECTRIC SCANNER OBSERVATIONS OF CENTRAL STARS OF PLANETARY NEBULAE

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SUMMARY: We have derived color temperatures and visual magnitudes for a sample of 12 central stars of planetary nebulae, combining data for the optical continuum recently obtained by us with the UV fluxes measured by the ANS satellite. Zanstra temperatures are also calculated and compared with our results.

I - INTRODUCTION

In order to test evolutionary models of nuclei of planetaries, knowledge of respective luminosities and effective temperatures are needed. The first quantity is subjected to great uncertainties reflecting the errors associated with the distance scale for these objects. On the other hand, very often we observe significant discrepancies between the hydrogen and helium Zanstra temperatures. This could be a consequence of one of the assumptions not being corrected when deriving such temperatures. The lack of good models to describe the continuum radiation of the central stars and the possible interaction of the ionizing radiation with dust inside the nebula are certainly reasons that can also be invoked to explain such differences. In this work we present color temperatures derived from black-body fitting to continuum fluxes recently obtained for several planetaries.

II - OBSERVATORIO AND TEMPERATURE DETERMINATIONS

Continuum fluxes of 12 planetary nuclei have been measured in the spectral range 3400-6200 Å, using the photoelectric scanner of the Brazilian Astrophysical Observatory. For details see S.J.Codina Landaberry et al. (1985). We selected adequate continuum bands in order to minimize the contribution from the nebular lines. The band widths used were 40Å and 80Å for data obtained on the 1.6m and the 0.6m telescope respectively.

The nebular continuum flux was subtracted in each band through theoretical computations including recombination and free-free emission due to H, HeI and HeII, and two-quantum emission from H. The reddening correction was performed using the results by Seaton (1979) . Once the stellar fluxes were derived, we combined our data with the ANS results (Pottasch et al. 1978), corrected in the same way for the nebular continuum and we fitted the data with black--body curves. Our results are shown in table I. We present also the derived geometrical dilution factor and color excess E_{B-V}. The ionic abundances of He^+ and He^{++} are also given as an indication of the excitation class of the planetaries. Those abundances are of the nebular continuum with respect to the total observed flux.

From the estimated flux at λ5500 Å we derived the visual magnitudes for the central stars. The values given in table I are reddened magnitudes. Finally, we present also the Zanstra temperatures, using the fluxes observed in the H_β and HeII λ4686 lines and our new continuum data.

III - DISCUSSIONS

With exception of two planetaries (N6751 and N6891) where a good fitting with a black-body curve was not obtained, the agreement between the color temperatures and the Zanstra temperatures is quite good. From our results it is quite clear that the HeII Zanstra temperature is a better temperature indicator. Great discrepancies are bound only for the more extended nebulae (N1360, A36, N4361) which are probably optically thi to both the HeII and H Lyman continuum radiation. It is worth noting that the low excitation nebula IC 4593 has a HeII Zanstra temperature (T_Z(HeII) $\simeq$ 4700k) considerably higher than the H Zanstra temperature and the color temperature, both close to 25000K. This is probably due to an excess of extreme UV radiation or an important contribution from the atmosphere of the star (wind?) to the emission of the observed HeII λ4686 line.

TABLE I

Object	E_{B-V}	m_{5500}	He^+/H^+	He^{++}/H^+	T^Z_H(K)	T^Z_{HeII}(K)	T^{BB}(K)
I4593	0.04	10.9	0.095	0.001	27000	47000	24450
He2-131	0.13	10.8	0.04	-	32000	-	25050
I418	0.20	10.1	0.11	0.0001	36500	-	37350
N6751	0.30*	13.5	0.10	-	28000	-	30000
N6629	0.60	13.4	0.115	-	37250	-	66550
N6891	0.15	13.0	0.115	-	38000	-	59000
N6572	0.30	12.6	0.118	0.0005	60000	59000	60000
N5882	0.30	12.4	0.108	0.003	40000	61000	60000
N5315	0.41	14.6	0.145	0.009	72000	87000	-
N1360	0.10	11.2	0.02	0.09	19000	57000	>100000
A36	0.20	11.2	-	0.099	18000	54000	>100000
N4361	0.15	13.2	-	0.103	33000	80000	>100000

References for extintion: * Pottasch (1984); others - this present work.

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A full version of this work will appear elsewhere.

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