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RADIAL VELOCITIES AND KINEMATICAL BEHAVIOR OF PNE WITH [WC] NUCLEI

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From high resolution spectroscopy (better than 0.2 Å), obtained with the REOSC echelle spectrograph, at the 2.1 m telescope, OAN-SPM-Mexico, and MIKE spectrograph at the Magellan telescope, Las Campanas, Chile, we measured heliocentric radial velocities and peculiar velocities for a sample of 40 planetary nebulae (PNe) with [WC] nucleus and 32 objects with normal central star. These data allow us to analyze the kinematical behavior and the galactic distribution of PNe with [WC] nucleus ([WC]PNe) in relation with the planetary nebulae with normal central star.

Data were obtained during several observing runs from June 1996 to June 2010. Radial velocities were determined from the $\lambda\lambda$[O III]5007,4959, [N II] 6583,6548, Hα, Hβ and Hγ nebular emission lines, by fitting a gaussian profile in the case of single profiles, and taking an average for the case of double-peak profiles. The observed wavelengths were compared with the rest wavelengths as given by Hyung et al. (2001) to derive radial velocities. Heliocentric velocities and velocities with respect to the Local Standard of Rest, $V_{\rm LSR}$, were determined by using the routine RVCORRECT in IRAF[3]. Our heliocentric velocities compare well, within uncertainties, with the values provided by Durand et al. (1998).

We also computed the circular velocities, $V_{\rm circ}$, corresponding to the circular velocity at the position of the object in the galactic disk, by assuming the distances to the galactic center given by Stanghellini & Haywood (2010). This allows us to determine the peculiar velocities of the objects, given by

$$V_{\rm pec} = V_{\rm LSR} - V_{\rm circ}.$$

Our preliminary results indicate that most of the objects with [WC] central star belong to the thin galactic disk, showing distances above the plane lower than 400 pc while the normal PNe show typical distances above the plane up to 800 pc. In Figure 1 we present the galactic distribution of the studied sample.

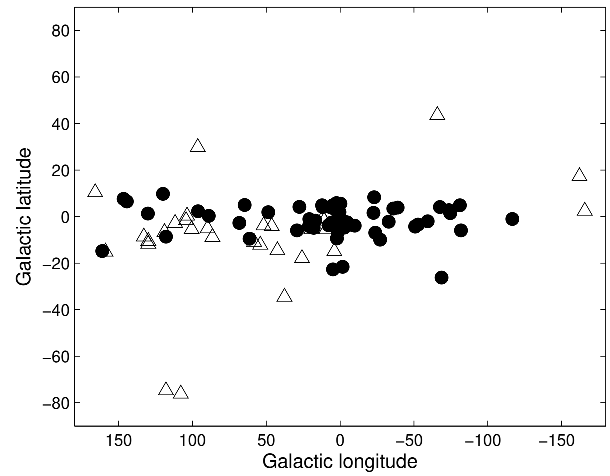

Fig. 1. Galactic distribution of the analyzed planetary nebulae. Filled circles: [WC]PNe, open triangles: PNe with normal central star.

The [WC]PNe with measured distances, were classified in Type I (those objects with N/O abundance ratio $\geq$0.5 and He/H abundance ratio $\geq$0.125; Peimbert 1978), Type II (those with $V_{\rm pec} \leq$ 60 km s^{-1}), and Type III (those with $V_{\rm pec} >$ 60 km s^{-1}). In this sample, 9 [WC]PNe belong to the Type I class (25.7%) and have an average of absolute $V_{\rm pec}$=37.6 km s^{-1}, 20 (57.2%) are of Type II and 6 (17.1%) are of Type III. Therefore the Type I [WC]PNe show low $V_{\rm pec}$ and correspond to the youngest PN population. The large number of Type II [WC]PNe are objects of the intermediate population of the disk, while there is a significant number of Type III [WC]PNe which belong to the high-velocity population.

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