Central Stars of Planetary Nebulae in the Galactic Bulge

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Context: Optical high-resolution spectra of five central stars of planetary nebulae (CSPN) in the Galactic Bulge have been obtained with Keck/HIRES in order to derive their parameters. Since the distance of the objects is quite well known, such a method has the advantage that stellar luminosities and masses can in principle be determined without relying on theoretical relations between both quantities.

Aims: By alternatively combining the results of our spectroscopic investigation with evolutionary tracks, we obtain so-called spectroscopic distances, which can be compared with the known (average) distance of the Bulge-CSPN. This offers the possibility to test the validity of model atmospheres and present date post-AGB evolution.

Methods: We analyze optical H/He profiles of five Galactic Bulge CSPN (plus one comparison object) by means of profile fitting based on state of the art non-LTE modeling tools, to constrain their basic atmospheric parameters (Teff, log g, helium abundance and wind strength). Masses and other stellar radius dependent quantities are obtained from both the known distances and from evolutionary tracks, and the results from both approaches are compared.

Results: The major result of the present investigation is that the derived spectroscopic distances depend crucially on the applied reddening law. Assuming either standard reddening or values based on radio-Hbeta extinctions, we find a mean distance of 9.0 +/- 1.6 kpc and 12.2 +/- 2.1 kpc, respectively. An "average extinction law" leads to a distance of 10.7 +/- 1.2 kpc, which is still considerably larger than the Galactic Center distance of 8 kpc. In all cases, however, we find a remarkable INTERNAL AGREEMENT of the individual spectroscopic distances of our sample objects, within +/- 10% to +/- 15% for the different reddening laws.

Conclusions: Due to the uncertain reddening correction, the analysis presented here cannot yet be regarded as a consistency check for our method, and a rigorous test of the CSPN evolution theory becomes only possible if this problem has been solved.

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Weblink: http://www.usm.uni-muenchen.de/people/puls/papers/cspn.pdf

Comments: Though dealing with post-AGB objects, this paper might also be interesting for the "massive star community", since it investigates, among other topics, their line-driven winds and clumping.

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