

Radiation-driven winds of hot luminous stars XVII. Parameters of selected central stars of PN from consistent optical and UV spectral analysis and the universality of the mass-luminosity relation

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Context: The commonly accepted mass-luminosity relation of central stars of planetary nebulae (CSPNs) might not be universally valid. While earlier optical analyses could not derive masses and luminosities independently (instead taking them from theoretical evolutionary models) hydrodynamically consistent modelling of the stellar winds allows using fits to the UV spectra to consistently determine also stellar radii, masses, and luminosities without assuming a massluminosity

relation. Recent application to a sample of CSPNs raised questions regarding the validity of the theoretical mass-luminosity relation of CSPNs.

Aims: The results of the earlier UV analysis are reassessed by means of a simultaneous comparison of observed optical and UV spectra with corresponding synthetic spectra.

Methods: Using published stellar parameters (a) from a consistent UV analysis and (b) from fits to optical H and He lines, we calculate simultaneous optical and UV spectra with our model atmosphere code, which has been improved by implementing Stark broadening for H and He lines.

Results: Spectra computed with the parameter sets from the UV analysis yield good agreement to the observations, but spectra computed with the stellar parameters from the published optical analysis and using corresponding consistent wind parameters show large discrepancies to both the observed optical and UV spectra. The published optical analyses give good fits to the observed spectrum only because the wind parameters assumed in these analyses are inconsistent with their stellar parameters. By enforcing consistency between stellar and wind parameters, stellar parameters are obtained which disagree with the core-mass-luminosity relation for the objects analyzed. This disagreement is also evident from a completely different approach: an investigation of the dynamical wind parameters.

Reference: Publication in A&A

Status: Manuscript has been accepted

Weblink: <http://arxiv.org/abs/1204.1200>

Comments:

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