MASS LOSS FROM CENTRAL STARS OF PLANETARY NEBULAE WITH WC SPECTRUM

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Abstract. We derived mass loss rates for 5 central stars (CS) having WC spectrum:NGC 5315, BD+30 3639, He2-99, He2-113, SwSt-1. The values are substantially higher than other previous estimates based on UV data. We consider that those stars have winds in which hydrogen is highly deficient (or absent) with helium and carbon being the dominant elements. The new mass loss rates reduce the timescale for the evolution along the horizontal track, but discrepancies with kinematic timescales still persist.

Key words: Planetary nebulae - Wolf-Rayet stars - Mass loss

1. Introduction

Post-AGB stars seem to have mass loss rates which are substantially higher than the predicted values using empirical formulae. UV spectra of CS's indicate that most of these stars are losing mass through a fast wind. The analysis by Cerruti-Sola and Perinotto (1985) led to the conclusion that all the CS's in their sample with a WR spectrum have a detected wind in the UV range.

In this work we estimate the mass loss rates for those 5 CS's considering that helium and carbon are the dominant elements in the chemical composition of the wind. Consequences for CS evolution are analysed later.

2. Mass Loss Rates and Results

If we assume that the helium lines are formed mainly by recombination and cascade, then the luminosity in a given transition can be expressed in function of the mass loss rate. Using such an equation and a velocity profile, we calculate the mass loss rate, finding 3.5×10^{-7}, 2.4×10^{-6}, 1.3×10^{-6}, 1.4×10^{-6}, 3.7×10^{-7} respectively for N5315, BD+30, He2-99, He2-113 and SwSt-1. These results show a clear trend in the sense that nebulae with a high $\frac{N}{O}$ ratio are associated with more massive CS's. We observed also a tendency of a decreasing mass loss rate as the gravity increases due to the contraction of the star, confirming the trend derived from UV data.

These rates of mass loss reduce the timescale along the horizontal track. A better agreement with the kinematic ages is found for some objects like N5315, but discrepancies still persist as Pottasch (1987) has emphasized.

An analysis of this problem with a larger sample including CS's with different spectral types is currently being done (Costa and de Freitas Pacheco 1991).

References

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