# A NEW EVOLUTIONARY INTERPRETATION OF THE IRAS TWO-COLOUR DIAGRAM

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ABSTRACT. A new evolutionary interpretation of the sequence of colours observed in the IRAS two-colour diagram by AGB and post-AGB stars is given, which is capable of explaining the observational properties of both kind of objects. It is useful to define a parameter $\lambda$ to define the position of a given star in this "infrared main sequence" ($IRMS$). Adopting

$$[12]-[25]=\frac{1}{1.096}\,Ln\lambda \qquad [25]-[60]=-2.42+0.72\lambda$$

and from the analysis of the expansion velocities, mass loss rates and luminosities observed in a selected sample of non-variable OH/IR stars with no optical counterpart in the Galactic bulge as a function of $\lambda$, we conclude that the position in the IRAS two-colour diagram at which a star leaves the $IRMS$ ($\lambda_{max}$) only depends on the initial mass $M_i$ of the progenitor star, so that only massive objects can reach the upper end of this sequence. The relation found is:

$$\lambda_{max} \;=\; 3.2\;log\;\frac{M_i}{M_\odot}\;+\;2.45$$

Expansion velocities increase with the initial mass while every point in the $IRMS$ is found to be associated to a certain value of the mass loss rate. This model also predicts the evolution with time of the mass loss rate during the AGB as a function of the initial mass of the progenitor star, and confirms that most known planetary nebulae are the result of the evolution of considerably massive stars (between 2-3 solar masses) which means that the contribution of processed material to the interstellar medium is considerably higher than what theoretical models predict. Type I PNe are the result of the evolution of $3-5\ M_\odot$ progenitors while progenitors with $M_i \leq 1.2\ M_\odot$ probably do not give PNe. The model is also in agreement with the narrow distribution of core masses found in central stars of PNe and white dwarfs and with the usual expansion velocities found in OH/IR stars.

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