Physical parameters and chemical abundances of Planetary Nebulae in the Large Magellanic Cloud

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In the present work we have computed the physical parameters and chemical abundances for 45 planetary nebulae (PN) in the Large Magellanic Cloud (LMC) using the photoionization code CLOUDY, developed by Ferland (1993). CLOUDY is used as a subroutine in the code DIANA, developed by Elizalde & Steiner (1996), which minimises indices that measures the difference between the calculated and real nebula.

In our models we have considered variable density profile and have fitted physical parameters of the nebulae and central star as well as chemical abundances. We have only considered models that have fitted the [O III] λ4959/4363 and [S II] λ6717/6731 ratios within 10 % and 3 % respectively.

The main physical and chemical parameters that we obtain for our sample are: the initial and final densities and radiis of the nebulae, its optical depth, as well as the temperature and luminosity of the central star, and the chemical abundances of He, C, N, O, Ne, S, and Ar.

We built the HR diagram for the central stars of PN in the LMC. In this diagram it is clear that most of the PN are consistent with having Hydrogen burning central stars. It is also clear that some of them seem to be Helium burning stars. Our luminosities are higher than the results from the literature because we use a distance of 50 Kpc for the LMC and also our models contain grains.

A model for AGB stars was built with variable λ (0.3 for 0.93 $M_\odot$ and 0.78 for 5 $M_\odot$), variable η_{AGB} (higher for $M_I \geq 3.5\ M_\odot$, and lower for $M_I \leq 3.5\ M_\odot$), and M_C^{MIN}=0.64 $M_\odot$, where we basically reproduce the model by Groenewegen & de Jong (1994). The chemical abundances ratios for the main sequence in the model was obtained from LMC HII regions.

We have shown a correlation between the chemical abundances of C/O with O/N which is consistent with the result of hot bottom burning processes in the progenitor star. The same conclusion is obtained by Vassiliadis et al. (1996). We also show that this correlation is reproduced by the expected abundances from our synthetic AGB star models.

REFERENCES

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