On the Variations of [OIII] Lines Intensities in the Spectrum of PN IC 4997

A.G. Yeghikyan

Garni Space Astronomy Institute, Armenia

The causes of asynchronous variations of the intensities of OIII ions forbidden lines in the spectrum of compact planetary nebula IC 4997 are considered on the basis of the observational data of [1-3]. It is shown that the rise of the intensity of line 4363 Å and decrease of the intensities of N_1 and N_2 lines may be best explained by increase of mass-loss-rate from nucleous from 5×10^{-8} up to 2×10^{-7} $M_\odot$/yr within a few years (at constant nucleous effective temperature), with appropriate change of ionization structure of nebula. The arguments of existence of variable hot stellar wind are discussed. The theoretical intensities of lines are calculated by the ionization model of planetary nebulae [4], gyven the radiation fields of the nucleous and hot stellar wind with electron temperature T_e= 500 000 K.

We used the nebular parameters of [1]. The influence of the stellar wind on the nebular ionization is considered similar to [5].

The twelve levels model of OIII ion was used in calculations. Some atomic data of OIII ion used in calculations (the transition probabilities and electronic collision strengths for higher levels) are results of our one-configuration calculations in the intermediate coupling approximation. The depopulation rates of lower metastable state $^1D_2$ by nonresonance fluorescence, due to quanta of star's and wind's continuous radiation fields also were considered.

We find that lines of [OIII] are produced in zones with electron density $n_e = 10^{+6}$ cm^{-3} and T_e, increased from 12 000 K to 15 000 K, and that in any case the asynchronous variations of the lines intensities can't be explained by an increase of star's temperature.

Also it is shown that the X-ray luminosity from nucleous wind above energy 0.2 keV is 10^{+35} erg/s at mass-loss-rate about of 2×10^{-7} $M_\odot$/yr, but interstellar extinction excludes the observations of this object.

REFERENCES

Hyung S., et al., 1994, Astrophys.J. Suppl.Ser., 93, 465-483.
Kostyakova E.B., 1991, Trans.Sternberg Astr.Inst., 62, 58-64.
Feibelman W.A., 1982, Astrophys.J., 258, 562-566.
Egikyan A.G., 1989, Astrofizika, 30, 270-281.
Adam J. and Köppen J., 1985, Astron.Astrophys., 142, 461-475.