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New Ionization-Correction Factors for the Chemical Composition Determination of Galactic Planetary Nebulae and HII Regions in Blue Compact Dwarf Galaxies

Holovatyy V.V., Havrylova N.V., Melekh B.Ya.

Astromical Observatory of Lviv National University, Ukraine

The photoionization models (PhM) grid of the planetary nebulae (PN) and the HII regions in the blue compact dwarf galaxies (BCDG) was calculated. For grids modeling we used the CLOUDY94 code (Ferland G.J. 1999). Free parameters for PN grid were: (1) energy distribution, that corresponds to temperature of each of 15 chosen models (Clegg & Middlemass 1987); (2) chemical composition of nebular gas in models; (3) filling factor with its values, for every model, being equal to 0.1, 0.5 and 1.For HII regions the free parameters were: (1) energy distribution in the spectra of nuclei emission obtained for HII regions in BCDG by our method (Golovaty 1987, Melekh 2000) from high-quality observations (Izotov, Thuan, & Lipovetsky 1994, Izotov, Thuan, & Lipovetsky 1997, Thuan, Izotov, & Lipovetsky hys. J. 1995) of these objects (the method uses stellar atmosphere models of O-B stars (Schaerer et al. 1996, Schaerer & de Koter 1997)); (2) nebular gas filling factor with the values ranging from 0.0001 to 1; (3) the relative abundance of heavy elements; (4) the concentration of hydrogen atoms n_H. All PhM were assumed to be spherically-symmetrical. As a result, 135 PN PhM and 270 HII regions PhM were calculated.

Integral spectra of these models were considered as "observed", and then they were analyzed with the standard method of nebular gas diagnostics. Thus, the model values of T_e, n_e and the averaged ionic abundances $(A^{+i}/H^+)_{diagn}$ were determined. These parameters will be located on FTP server of Astronomical Observatory of Lviv National University:

ftp://astro.franko.lviv.ua/pub/PN/PN_Grid.tar.gz for PN

and *ftp://astro.franko.lviv.ua/pub/BCDG/DG_Grid.tar.gz* for HII regions.

We considered the $(A^{+i}/H^+)_{diagn}/(A/H)_{mod} - (X^{+k+1}/X^{+k})_{diagn}$ dependences which allowed to determine the chemical composition as $lg(A/H) = lg((A^{+i}/H^+)_{diagn}) - f(x)$. Here X^{+k+1}/X^{+k} corresponds to He^{++}/He^+, O^{++}/O^+, S^{++}/S^+ or Ar^{3+}/Ar^{2+} and $x = lg(X^{+k+1}/X^{+k})$. Some of these correlations for HII regions are shown in Figure 1. They were approximated by polynomial function

$$f(x) = \sum_{n=0}^{8} C_n \, x^n,$$

where C_n are the polynomial coefficients.

These expressions were tested for the purpose of reproduction of chemical composition set in PhM. The deviations from 1 of $(A/H)_{calculated}/(A/H)_{models}$

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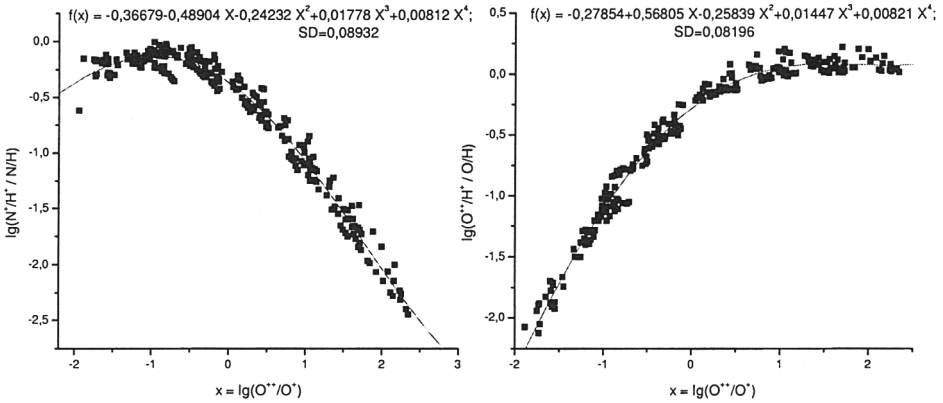

Figure 1. Fits to the chemical composition correlations.

ratio were less than 10% for best ICF expressions of PN and HII regions in BCDG. The expressions of new ICF for PN and HII regions of BCDG were obtained. They will be located at:

ftp://astro.franko.lviv.ua/pub/BCDG/PN_ICFs.ps for PN
and *ftp://astro.franko.lviv.ua/pub/BCDG/DG_ICFs.ps* for HII regions.

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