How to Analyze 2-D Nebular Spectra

K. Gesicki[1], A. Acker[2] and A. Zijlstra[3]

[1]Instytut Astronomii UMK, Toruń, Poland; [2]Observatoire de Strasbourg, France;
[3]ESO, Garching, Germany

For a nebula we construct a model, which is a spherical shell defined by inner and outer radii, density distribution and velocity field. The T_{eff} and the luminosity of the central star are assumed to agree with observations. Then the photoionization structure is calculated and the emission lines are integrated. Having found the density from analysis of images the deduction of velocity field in order to fit the observed shapes of spectral lines is relatively easy. A detailed description of computer codes applied for the analysis of nebular spectra is presented in our earlier paper: Gesicki et al. (1996). See also Górny et al. in this volume.

The new thing discussed here is application of these programs for analysis of 2–D long–slit spectra. The codes were prepared in a way which allows for computation of emission line from any part of the nebula, e.g. small squares cut out of the nebular image. The modeled nebula projected onto the sky is a circle observed through a long slit, positioned centrally on the nebular image. When PN is resolved then it could be observed in several places along the slit. These places at CAT/CES spectrograph are squares, 2" wide slit divided into 2" pieces.

Providing 2–D spectra for a nebula our computer programs allow for simultaneous analysis of two unknown parameters: velocity and density fields along the nebular radius. The shape of the line profiles is a result of the convolution of both fields. 1–D analysis, as presented in our earlier paper, requires therefore the knowledge of the density structure from monochromatic images, or a guess. 2–D spectra taken at several wavelengths originating in different places in the nebula provide additional valuable information. The relative strength of the profiles along the slit depends mainly on the density distribution. If the nebula is marginally resolved, like the many observed objects, the information is rather sketchy, but it is really a new information.

Analysis of nebulae observed with CAT/CES at ESO is in progress and a publication is in preparation.

Acknowledgements. This work was supported by KBN grant No. 2.P03D.026.09

REFERENCES

Gesicki K., Acker A., Szczerba R., 1996, A&A 309, 907
Górny S.K., Gesicki K., Acker A., this volume