[O II] Electron Density Mapping applied to NGC 6826

G. Dudziak[1], J. R. Walsh[1] and N. Walton[2]

[1]European Southern Observatory; [2]Royal Greenwich Observatory, La Palma

The [O II]3726,3729Å doublet is sensitive to electron densities in the range 100 to 10^4 cm^{-3}, typical of planetary nebulae, and thus provides an ideal tool for mapping the projected density structure. The first use of the imaging Fabry-Perot TAURUS-II to observe both the [O II] doublet lines, and hence map the electron density, is reported for NGC 6826. If sufficient spectral resolution is achieved both the [O II] lines can be resolved into separate components, opening the way to full 3-D density mapping of PN. Given the low finesse of the etalon and the low expansion velocity in NGC 6826 (10-15 kms^{-1}), this original hope could not be fulfilled. However, a restricted aim of seeing-limited electron density mapping was accepted.

The etalon was scanned in 65 steps each of 15.3kms^{-1}. The [O II] cube was continuum subtracted using the continuum level off the lines. The wavelength extent of each [O II] line was summed and the images ratioed; at each pixel, the electron density (N_e) was calculated adopting a single value of electron temperature (T_e = 9000K, Barker 1988), hence giving a N_e density map.

Two aspects are clear from this map: the electron density is relatively constant over most of the projected surface; the low ionization knots and their tails extending towards the central star are of higher density. The variation of the electron density with projected distance from the central star, excluding the knots, was fitted by least squares and shows a very flat slope $N_e \propto r^{-0.12}$. At the knots' position, an elevation above the surroundings is readily apparent and a trend to increased density with distance from the star (see figure). Even though the density increase over the knots is firmly confirmed, lower values of T_e can also partially contribute to the observed line ratio. The overdensities measured could also be the signature of an interacting region surrounding sub-arcsec high densities globules.

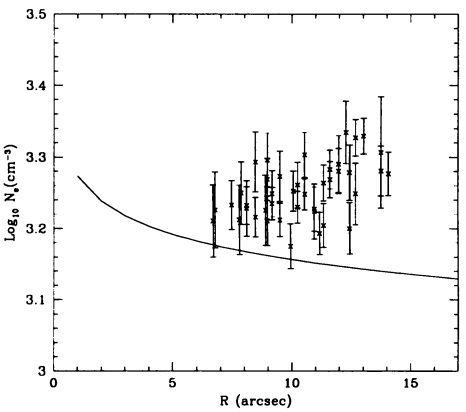

Figure 1: The line is the result of a least squares fit of Log N_e to Log distance (excluding the knots). Crosses represents the electron density at the knot position.

REFERENCES

Barker, T., 1988, ApJ, 326,164.

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