

ANOMALOUS [NII]-EMISSION FROM Mz-3

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We obtained high resolution spectra of the red [NII]-lines in the bipolar nebula Mz-3. This object probably is a proto-planetary nebula (see e.g. Lopez and Meaburn, 1983 and Meaburn and Walsh, 1985). The spectra were taken in July and September 1982 at La Silla using the Coudé Auxiliary Telescope (CAT) combined with the Coudé Echelle Spectrograph (CES). The resolution depending on the slit width was 30000 and 100000, respectively. Fig. 1 shows the [NII]-lines at 6583.6 and 6548.3 Å together with H_α. The structure of the 6583.6 Å line, which is quite complicated in detail, is dominated by two narrow peaks, similar to the profiles of

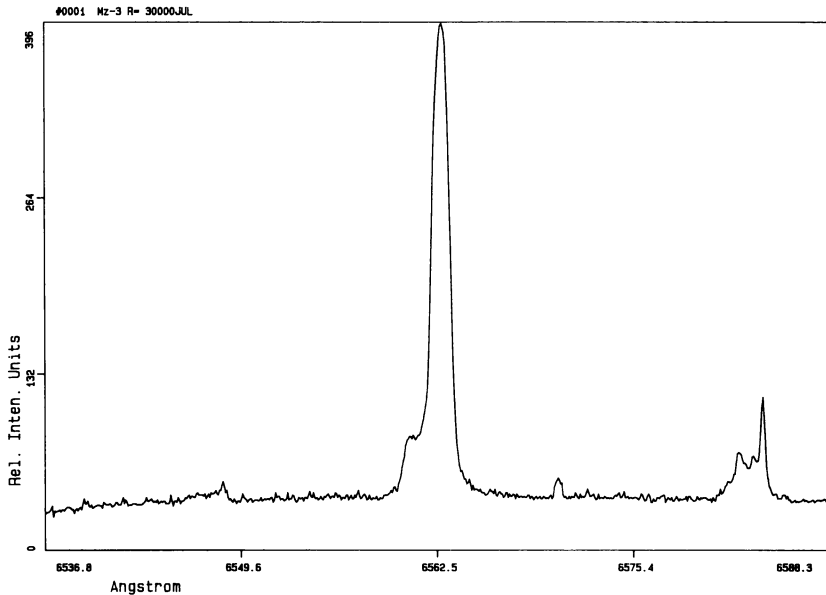


Figure 1. Spectrum showing [NII] $\lambda\lambda$ 6548, 6584 and H_α.
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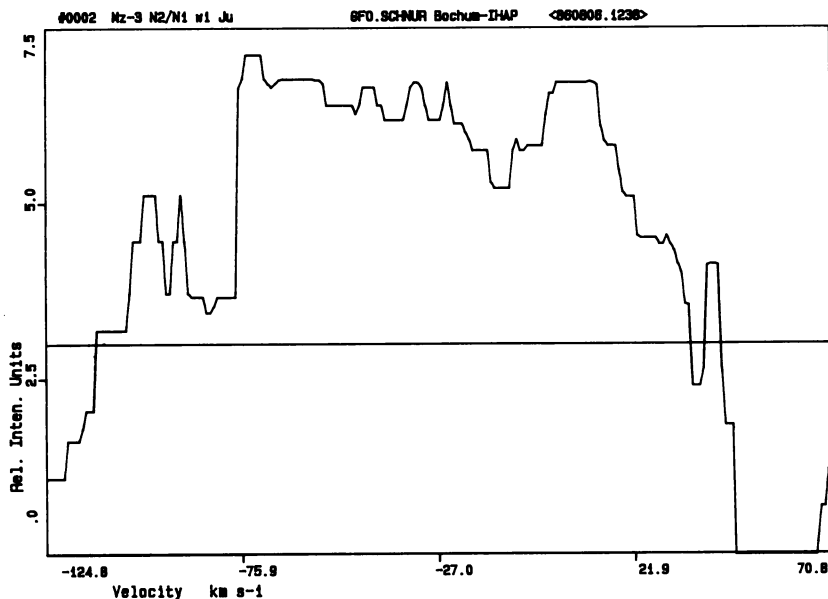


Figure 2. Intensity ratio $I(6584)/(6548)$ as function of V_r .

circumstellar OH-masers. The profile varies strongly with the slit width and shows substantial differences between the observations in July and September. - The most striking result of our observations is that the intensity ratio 6584/6548 deviates strongly from the canonical value of 3 as shown in Fig. 2.

We interpret the anomalous intensity ratio as being due to optical pumping in an anisotropic radiation field. This leads to a polarization of the NII-ions and renders also the emission to be anisotropic, the angular dependence for the two lines being different. A prediction of this model is that the two lines should be linearly polarized with the polarization vectors being perpendicular to each other. Therefore, the deviation of the intensity ratio from the canonical value will be even larger when one observes light of only one polarization direction. This may have happened in our observations, since the CAT/CES combination is likely to be sensitive to polarized light due to some grazing incidence of the light beam in the telescope and spectrograph. - Further predictions of our model are an intensity of the $\lambda 5755$ Å-line comparable to that of the $\lambda 6584$ Å-line, and population inversion for the FIR lines at 122μ and 204μ .

References

- Lopez, J.A., Meaburn, J.: 1983, *M.N.R.A.S.* 204, 203
 Meaburn, J., Walsh, J.R.: 1985, *M.N.R.A.S.* 215, 761