ABSOLUTE Hα AND Hβ PHOTOMETRY OF LMC HII REGIONS

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A nebular photometer equipped with a scanning Fabry-Perot interferometer has been used at the ESO 50-cm telescope to observe about 50 HII regions of the LMC (Caplan and Deharveng, 1983). This instrumentation gives the profiles of the observed lines, thus allowing discrimination against unwanted continuum and line emission. The integrated fluxes were measured with a 4.9' diaphragm, to facilitate comparison with the 6-cm radio continuum fluxes obtained by McGee et al. (1972) with a similar resolution. Nebular reddening, from the Hα/Hβ ratio, is greatest for the 30 Doradus Nebula. Relatively high reddening was also observed for the following zones: N159 (at the border of the largest HI-molecular complex of the LMC) and N160; N79, N81 and N83; N48; N64. Reddening is rather low towards other HII regions, especially for those in the bar and for large bubble-shaped regions.

In addition to our measured Hα and Hβ fluxes, we have assembled other data for these same HII regions. Radio continuum fluxes at 6 cm are from McGee et al. (1972); HI column densities are from McGee and Milton (1964, 1966); B-V colour excesses of associated stars have been supplied by N. Martin, L. Prévot, E. Rebeirot and J. Rousseau (private communication). Among the possible comparisons are the following:

1. The nebular extinction as measured by the S(6 cm)/Hβ ratio is (as is usually found to be the case) higher than that estimated from the Hα/Hβ reddening using a standard interstellar extinction law. This fact suggests the presence either of dust inside the HII regions or of clumpy external dust.

2. Assuming reasonable HI/dust ratios (Koornneef, 1982), the HI column densities are too low to account for the extinction, even if one assumes that all of the neutral hydrogen observed in the direction of an HII region lies in front of the region. This effect could be caused by extinction due to dust associated with molecular material or within the HII region. Most likely, however, the HI column density is underestimated because of line saturation and/or the smearing effect of the radio lobe. In any case, it is certainly dangerous to use HI column densities

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to estimate the extinction of an HII region and of its associated cluster.

3. The colour excesses of the stars observed in the direction of or near the HII regions are too low to account for the nebular extinction. This may be due to a selection effect in the stellar observations. We think that the amount of interstellar extinction is generally correctly estimated from the colour excesses of the outlying stars, but that additional reddening in the Balmer lines results from internal dust. The amount of internal dust needed to explain this additional reddening is much greater than in the interstellar case, and corresponds to an A_V of several magnitudes. The most highly reddened stars inside each region would not be observed, and this would lead to an underestimate of the extinction. Because of this effect, stellar colour excesses should be used with caution when estimating the extinction of HII regions.

4. The colour excesses of the outlying stars in each HII region allow us, however, to correct the nebular extinction and reddening measurements (see § 1 above) for the effects of the interstellar dust. The residual nebular extinction tends to be large for the rather small amount of nebular reddening. This can be explained by clumpy external dust or, as discussed in § 3, by internal dust. Points plotted in a nebular extinction-vs-reddening diagram are consistent with an Hα albedo smaller than that for Hβ, according to model calculations of Mathis (1983) and of P. Cox (private communication) for HII regions with internal dust.

A catalogue-atlas of our observations is in preparation.

Similar observations have been undertaken for about 25 HII regions of the SMC.

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