THE SPATIAL DISTRIBUTION OF LINE RATIO O III/O II IN HIGH EXCITATION PLANETARY NEBULAE

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ABSTRACT. Previous attempts to model the integrated line ratio [O III] 5007 A/[O II] 3727 A for high excitation planetary nebulae (Che and Köppen 1983) have suggested that the charge exchange coefficient (k) for the reaction

$$O^{+2} + H^0 \rightarrow O^+ + H^+$$

could be 10 times smaller than the predicted theoretical value. The influence of other factors that may contribute to differences in the O III/O II ratio, such as the ionizing spectrum and the nebular gas density distribution, seem to be relatively small in the high excitation nebulae.

We are undertaking a more detailed analysis of high and low excitation nebulae using "standard" ionization bounded models (Péquignot 1985), in particular to study the sensitivity of the spatial profile of [O III]/[O II] as a function of the charge exchange rate. We report here some of our preliminary results on the high excitation cases.

Changes in k not only affect the ratio of the integrated spectra (as expected) but also the entire distribution of the emission accross the nebular gas. While the overall shape of the O III/O II spatial distribution for different k's is fairly similar near the edge of the nebula, at inner and intermediate radii the distribution changes enough that, in principle, observations could constrain the charge exchange rate to within a factor 3 or 4.

S. Torres-Peimbert (ed.), Planetary Nebulae, 228.