SHORT ORAL CONTRIBUTIONS (ABSTRACTS)

THE EFFECTS OF SCATTERING BY INTERNAL DUST ON THE SPECTRA OF EMISSION NEBULAE

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The intrinsic reddening of H II-regions, as indicated by the Balmer decrement and the ratio between the auroral (PD) and transauroral (PS) lines of [S II], has been modeled on basis of analytical solutions for the transfer of radiation in a semi-infinite homogeneous distribution of emitting atoms and intermixed scattering dust. The scattering phase function has been specified by albedo ω_λ and asymmetry $\langle\cos\theta\rangle = g_\lambda$ as calculated by White (*Ap. J.*, 229, 954, 1979) for uncoated graphite and silicate particles. It has been found that the intrinsic color excess, over the recombination value, between the Hα and Hβ lines is $E(\beta - \alpha) = 0\overset{m}{.}20$. The intrinsic color excess between the [S II] lines, over their collisional excitation values, is $E([S\ II]PS\text{-}PD) = 0\overset{m}{.}71$. The effects of scattering by dust in a thin layer overlying the model H II-region has also been calculated. It has been found that for a layer with extinction optical depth $\tau_\beta = 0.50$, produces color excesses $E'(\beta - \alpha) = 0\overset{m}{.}03$ and $E'([S\ II]PS\text{-}PD) = 0\overset{m}{.}12$, practically impossible to discriminate against truly interstellar reddening. The results have been extended to obtain the unreddened *UV* energy fluxes of HH-objects, on the assumption that they contain well mixed scattering dust. For HH-1 it is found that the external extinction amounts only to $\tau_\beta = 0.50$, in comparison with the value $\tau_\beta = 1.67$ found from the [S II] lines when the extinction is assumed to be entirely interstellar. Consequently, the energy distribution of HH-1 in the *UV*, taking into account internal scattering, falls one full order of magnitude below that estimated by Böhm *et al.* (*Ap. J. (Letters)* 245, L113, 1981).

DISCUSSION

Böhm: In view of the small column density in HH-objects would not (for normal dust-to-gas ratio) the *internal* scattering in HH-objects always be very small?

Münch: If the dust to gas ratio were normal, the path for line formation would be indeed larger than observed (filling factor $\sim 10^{-3}$). In order to have the Hβ path of formation accounting for the fitting factor, the gas column density corresponding to optical depth unity at Hβ would have to be about 10^2 - 10^3 smaller than -say- in the Orion Nebula.

Königl: How do your analytical results compare with the recent numerical work by Mathis?

Münch: In regard to the Hβ - Hα color excess over recombination value they essentially agree.