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Editors: Jane Arthur, Nancy Brickhouse, & José Franco

DUST AND THE TEMPERATURE STRUCTURE OF ORION

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RESUMEN

En este trabajo se realizaron dos modelos de fotoionización: *(a)* con polvo, *(b)* con alta densidad. Se obtuvieron cocientes de lineas de [O III] y [N II] sensibles a la temperatura, los cuales fueron comparados con cocientes obtenidos de las observaciones.

ABSTRACT

In this work two photoionization models were calculated: *(a)* with dust, *(b)* with high densities. We compared the models with a new long slit spectrum of the Orion Nebula.

Key Words: **DUST: EXTINCTION — H II REGIONS — ISM: INDIVIDUAL (ORION NEBULA)**

1. OBSERVATIONS OF ORION

We obtained new observations of the central part of the Orion Nebula. These observations, described in more detail in González-Gómez & Mayya (1999), were taken at the Observatorio Astronómico Guillermo Haro (OAG). The spectrum covered the range 3600–9600 Å and the instrument used was a Boller & Chivens spectrograph mounted with a 1024 and 1024 TEK CCD.

2. PHOTOIONIZATION MODELS

We present photoionization models calculated with spherical geometry. Using the temperatures determined from the line intensity ratios $R_{[\mathrm{O\,III}]}$ = [O III] 4363/[O III] 5007 and $R_{[\mathrm{N\,II}]}$ = [N II] 5755/[N II] 6583, we investigate two possible interpretations of the differences we found between $T_{[\mathrm{N\,II}]}$ and $T_{[\mathrm{O\,III}]}$ as well as the spatial gradients in both these temperatures.

1. *First Model.* The presence of dust mixed with the ionized gas causes both $T_{[\mathrm{N\,II}]}$ and $T_{[\mathrm{O\,III}]}$ to be larger than the dust-free case (see Fig. 1*a*), as in Baldwin et al. (1991).
2. *Second Model.* The presence of a very high density zone near the ionizing star causes $R_{[\mathrm{N\,II}]}$ = [N II] 5755/[N II] 6583 to be larger (see Fig. 1*b*).

3. DISCUSSION

The behavior of the dusty model is overall in better agreement with the data since it reproduces well the gradient in $T_{[\mathrm{O\,III}]}$ although it fails to reproduce the gradient in $T_{[\mathrm{N\,II}]}$.

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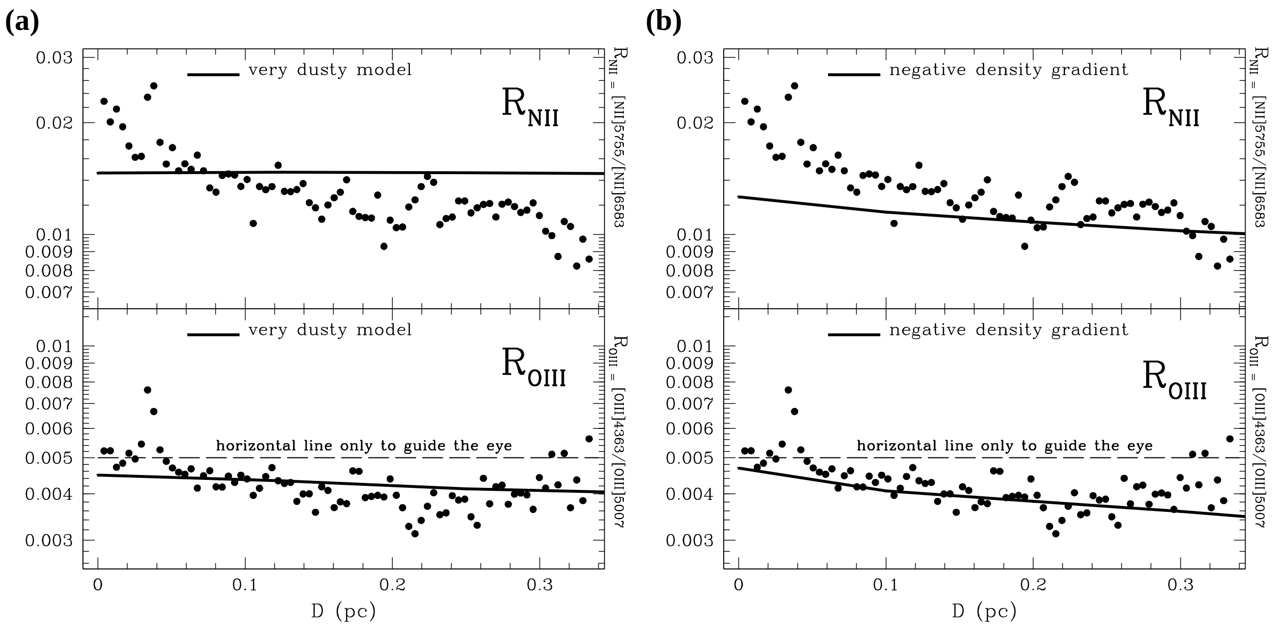

Fig. 1. The behavior of the temperature indicator line ratios $R_{[\mathrm{O\,III}]}$ and $R_{[\mathrm{N\,II}]}$ (see text) as a function of distance from the exciting star. *(a)* Model containing dust mixed with the ionized gas. *(b)* Model considering a strong density gradient from 5×10^4 cm^{-3} near the star decreasing with radius to 5×10^3 cm^{-3}.

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