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HI DISTRIBUTION IN THE REGION OF THE LAC OB1 ASSOCIATION

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RESUMEN. Se analizan perfiles de la línea de 21 cm del hidrógeno neutro pertenecientes a la región $88^\circ \leq l \leq 106^\circ$, $-26^\circ \leq b \leq -10^\circ$, centrada en la asociación Lac OB1, con el fin de determinar la distribución y características cinemáticas del HI vinculado a la asociación y su relación con el anillo de gas y polvo del Cinturón de Gould.

ABSTRACT. We analyze HI 21 cm line profiles belonging to the region $88^\circ \leq l \leq 106^\circ$, $-26^\circ \leq b \leq -10^\circ$, centered in the Lac OB1 association. The main aim of this study is to determine the distribution and kinematics of HI associated with Lac OB1 and its relation to the ring of gas and dust of Gould's belt.

Key words: ASSOCIATIONS — LINE-PROFILE

. INTRODUCTION

The OB association Lac OB1 is located in the local arm, about 440 pc ar from the Sun. Blaauw (1958, 1964) distinguished two separate subsystems: a ɔunger region, concentrated in the neighbourhood of the bright star 10 Lac; ıd an older, more dispersed group located northeast of the former group. The [I region S 126 (Sarpless, 1959), excited probably by 10 Lac (O9V), would form art of Lac OB1 as well. Lac OB1 has been associated with the local gas elated to Gould's belt (Lindblad's feature A), which is thought to constitute ı expanding ring in whose perifery lie the local associations (Lindblad et l., 1973; Olano 1982).

In the present paper, we give preliminary results of the distribution ıd kinematics of neutral hydrogen in the vicinity of Lac OB1. The aim of this ɔrk is to know whether there exits a close relation between the OB association ıd the interstellar matter within which it was formed, i.e., Gould's belt ing.

[. ANALYSIS OF THE HI DATA

We analyse HI 21-cm line observations belonging to Heiles and Habing's [974) survey in the region $88^\circ \leq l \leq 106^\circ$, $-26^\circ \leq b \leq -10^\circ$, centered in the ɔunger subgroup of the association.

We assume that the intercloud medium is filled by a hot, low density as, whose contribution was evaluated by means of the same method applied by lano (1985) using standard physical parameters for this medium. The ıeoretical profile of the intercloud medium for $l = 99\overset{\circ}{.}5$, $b = -11\overset{\circ}{.}2$ is shown ı Fig. 1. The residual HI spectrum, obtained after subtracting the intercloud edium contribution, represents the emmision of the discrete interstellar louds. Residual HI-profiles were analyzed in order to determine the inematical behaviour of the different components present in the profiles and ıe corresponding HI column densities (and hence, the masses).

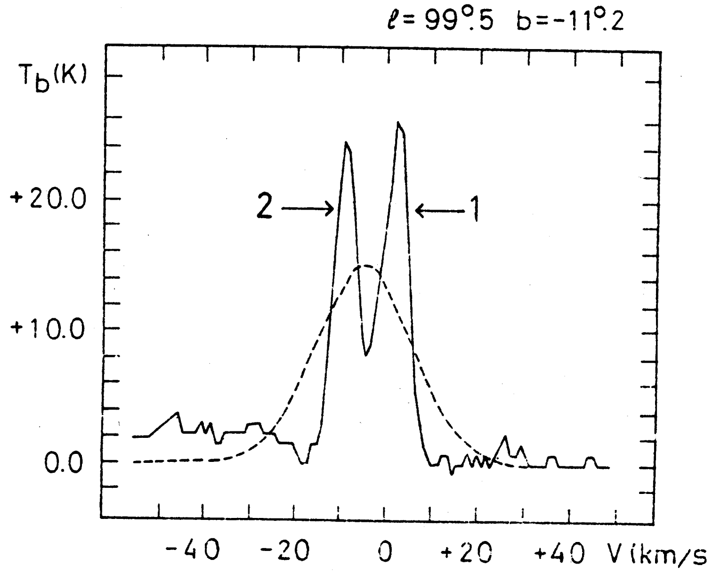

Fig. 1. HI-profile belonging to the region. The broken line represents the contribution of the hot, low density gas filling the intercloud medium. The full line shows the HI spectrum after subtracting the intercloud medium contribution. Components 1 and 2 are labeled.

III. RESULTS

Three main HI components are distinguished in the 21-cm spectra of the region. The one called Component 1, indicated in the HI profile displayed in Fig. 1, has LSR-radial velocities between 0 and +4 km/s, and is generally the most intense one. Its HI column density distribution is displayed in Fig. 2. Feature A has an LSR-velocity of about 2 4 km/s in the galactic longitude interval 90° to 105° (Olano 1982). Since this velocity is in good accordance with the LSR-velocity of Component 1, we identified it with Lindblad's feature A.

The Lac OB1 stars earlier than B3 (Guetter, 1976) are indicated by dots in Fig. 2. The group of stars near l = 96°, b = -17°.5 corresponds to the younger subgroup of the association. An HI gas deficiency is centered in the stellar subgroup, where S 126 is also located, suggesting that this void has been originated by OB stars through ionization and/or stellar winds.

The LSR-velocity determined for the OB stars of the association is about -2 km/s (Blaauw and Morgan, 1953), quite similar to the one corresponding to Component 1. This characteristic together with the clear spatial relationship of the distribution of Component 1 and the Lac OB1 stars, allow us to establish a close association between feature A and the OB stars.

The HI gas concentrations of Component 1 at l = 96°, b = -15° to -10° and b = -15°, l = 96° to 100° appear clearly associated with part of the arc shaped structure seen in the IRAS 100 μm map shown in Fig. 2 by hatched areas.

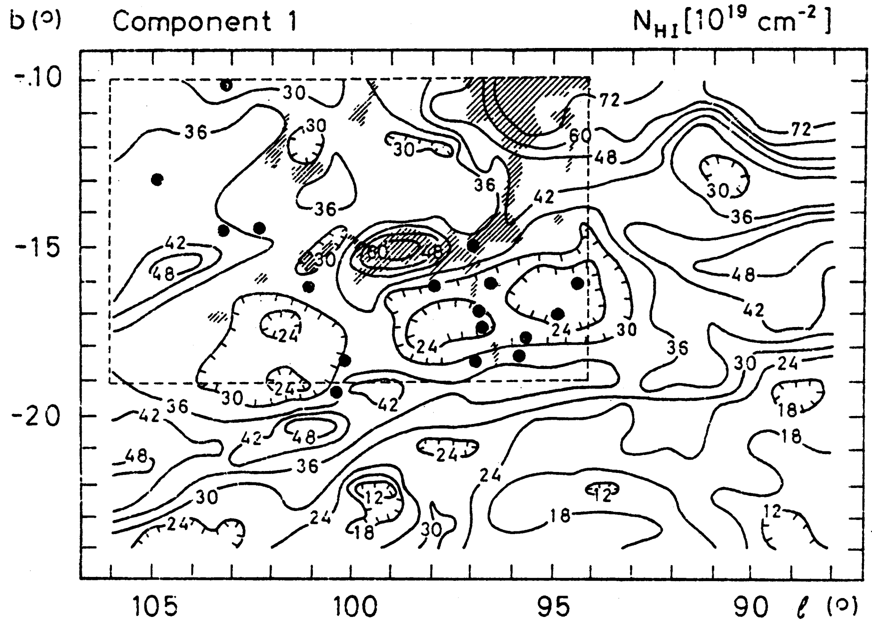

Fig. 2. Column density distribution of Component 1. The dashed lines show the boundaries of the region where we have represented the 100 μm IRAS emission. Regions with IR emission are indicated by hatched areas. The dots indicate the positions of the OB stars earlier than B3.

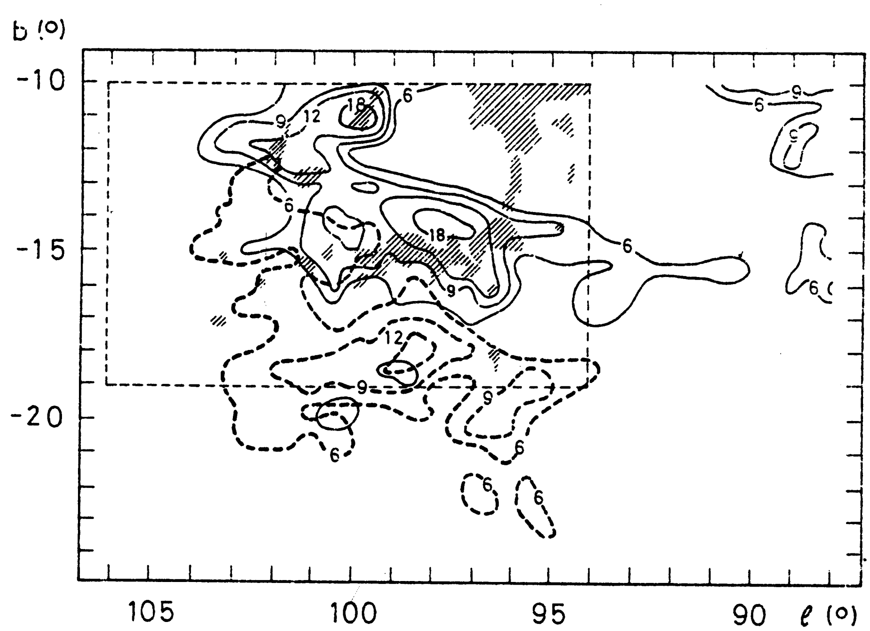

Fig. 3. Brightness temperature contour map at V = -8 (full lines) and -23 km/s (thick, broken lines), representing Components 2 and 3, respectively. The IRAS map is superposed as in Fig. 2.

The other two components, called Components 2 and 3, have radia velocities between -12 and -3 km/s, and about -30 and -20 km/s, respectively The brightness temperature distributions shown in Fig. 3 for V = -8 km/s and V = -23 km/s are representative of both components. Component 2 is also clearl associated with part of the arc-shaped structure seen in the IRAS 100 μm a high galactic latitudes, suggesting that both Components 1 and 2 are related On the other hand, the fact that Components 2 and 3 are complementary (see Fig 3) suggests also a real connection between them.

The behaviour of the gas in the region could be explained in terms o an incomplete expanding shell of neutral and molecular gas centered at $l = 99^{\circ}$ $b = -12^{\circ}5$. Its dimensions and mass are approximately 80 pc x 60 pc and 5×10^4 $M_{\odot}$, respectively (at a distance of 440 pc corresponding to the Lac OB association). If the expansion velocity is about 10-20 km/s, the age of th shell results $1\text{-}2 \times 10^6$ yr and the kinetic energy, $\sim 10^{49}$ erg. The expansio could have been produced by a SN explosion or stellar winds of the La association.

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