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FINE STRUCTURE IN HIGH VELOCITY CLOUDS

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RESUMEN

Dos nubes de alta velocidad, NAV 287.5 + 22.5 + 240 y HVC 333–15.5–90, han sido observadas en la línea de 21 cm de H I, con una resolución angular de 35′ y una resolución en velocidad de 2 km s^{-1}. Los mapas muestran componentes no resueltas rodeadas por estructuras anchas. Los perfiles muestran una dispersión de velocidad más pequeña en las concentraciones. Se concluye que ninguna de las nubes pertenece a la corriente magallánica.

ABSTRACT

Two clouds, HVC 287.5+22.5+240 and HVC 333–15.5–90, have been observed in the H I 21 cm line, with an angular resolution of 35′ and a velocity resolution of 2 km s^{-1}. The maps show unresolved components embedded in broad features. The profiles show also smaller velocity dispersion for the concentrations. It is concluded that neither of the two clouds belongs to the Magellanic Stream.

Key words: GALAXIES-MILKY WAY – GALAXIES-MAGELLANIC CLOUDS – GALAXIES-INTERGALACTIC MEDIUM

I. INTRODUCTION

High velocity H I surveys have shown the existence of large number of clouds with negative velocities. Only a ew have positive velocities and these have been studied /ith much less detail, spectroscopically and spatially, han the negative velocity ones.

The observations of HVC's with high angular and requency resolution show, in general, that they consist of small H I condensations with halfwidth in velocity of to 8 km s^{-1} embedded in much broader H I areas with alfwidth velocities between 20 and 25 km s^{-1}. This louble structure is seen in most of the HVC's but not in he clouds belonging to the Magellanic Stream. The louds in this stream show only a broad component with velocity halfwidth of 20 to 40 km s^{-1}. No double tructure seems to be present and this has been used as a riterion to determine whether a cloud belongs to the tream or not.

To carry a thorough study of the HVC's it is then ecessary to observe them with a good sensitivity and a uitable velocity resolution. The new facilities provided y the IAR receiver fulfill these requirements and they re being used to observe HVC's in he southern emisphere. Here we present some observational results or HVC 287.5+22.5+240 and HVC 333–15.5–90.

Because of their position in the sky these objects ould be part of an extension of the Magellanic Stream. Our observations intend to clarify the situation using the mentioned criterion.

II. OBSERVATIONS

The observations were done with the IAR 30-m dish (HPBW = 35′). At the back end a set of 112, 10 kHz wide analog filters were used. The system temperature was 85°K. A Dicke switching observing mode provided for 10 minutes integration time an rms error of 0.07 °K.

The observations were carried out on a grid of 1° × 1° (ℓ × b). In the region of higher intensities the grid was of 0°.5 × 0°.5. In total 137 points were observed for HVC 287.5 + 22.5 + 240 and 43 points for HVC 333–15.5–90.

III. RESULTS

a) *HVC 287.5+22.5+240*

The region around ℓ = 280°, b = + 22° was earlier observed by Wannier *et al.* (1972). They detected an H I complex with high positive velocity (v = + 240 km s^{-1}). These observations were done with an angular resolution of 2° on a grid of 2° × 2° and with a velocity resolution of 16 km s^{-1}. Their data then cannot be used for a detailed study of the structure of the clouds.

Mathewson *et al.* (1974) and Hulsboch (1975) suggest that this complex, as well as the one centered at ℓ = 267°, b = 26°, may belong to the Magellanic Stream, even if they are at the other side of the Magellanic Clouds.

Giovanelli and Haynes (1976) studied the H I com-

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plex centered at $\ell = 267°$, $b = 26°$. They found a double structure similar to the structure found for the HVC's with negative velocities in the northern hemisphere. In the same paper these authors show an H I profile of region close to $\ell = 287.°5$, $b = 24°$, with a similar shape

Our observational data have been used to draw th contour map of Figure 1 which shows the H I densit distribution for the velocity range $200 < v < 300$ km $^{-1}$ As can be seen in the figure, this high positive velocity H complex has an elongated shape with several unresolve structures. In the figure we also indicate the velocities o the peak intensities of those concentrations. They seer to indicate the presence of a velocity gradient.

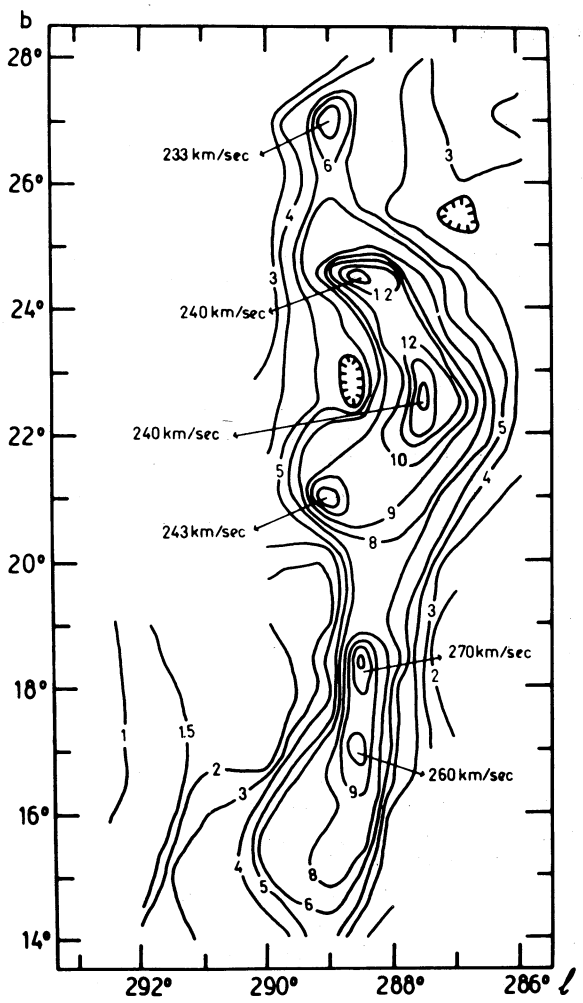

Fig. 1. H I density distribution for HVC 287.5+22.5+240 in the velocity range $200 \leqslant v \leqslant 300$ km s^{-1} in units of 10^{19} cm^{-2}.

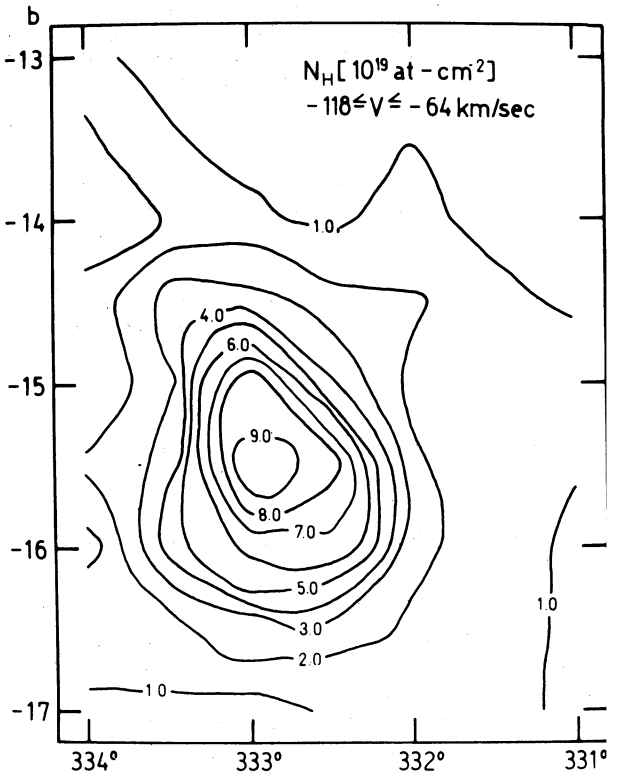

Fig. 3. H I density distribution for HVC 333−15.5−90 in tl velocity range $-118° \leqslant v \leqslant -64$ km s^{-1}.

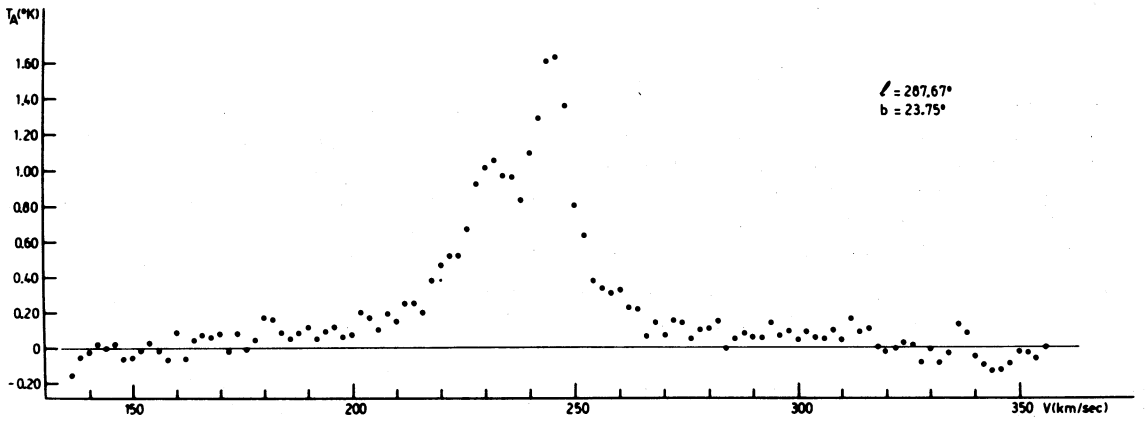

Fig. 2 H I velocity profile at $\ell = 287.°66$, $b = 23.°75$.

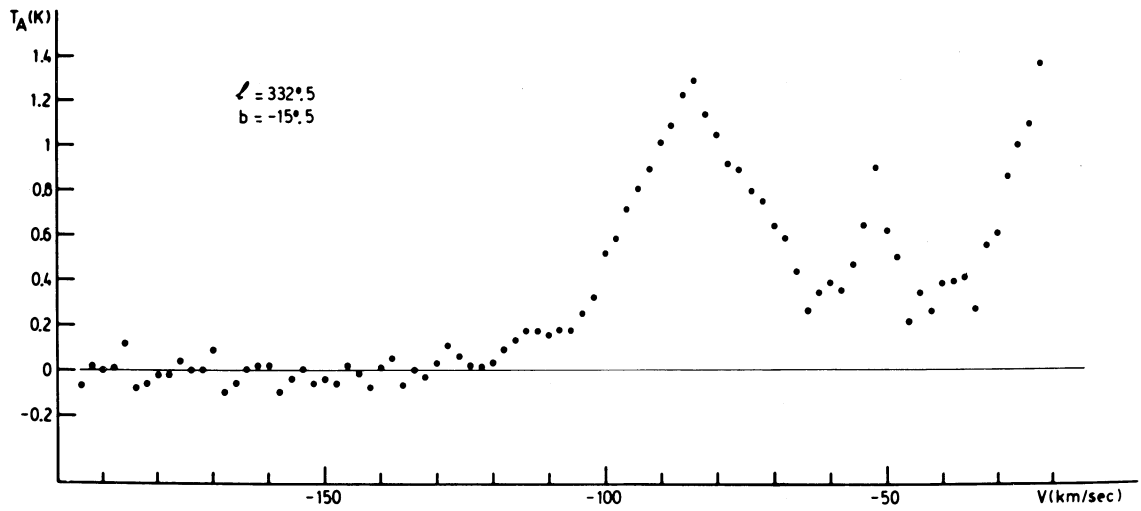

Fig. 4. H I velocity profile at ℓ = 332°.5, b = −15°.0.

The velocity structure of these clouds however is quite complicated. The presence in the spectra of one or two narrow features superposed on a broad feature suggests that this complex does not belong to the Magellanic Stream. Figure 2 shows a typical profile of the area showing two narrow components.

The mass for this complex, from our measurements, is 4000 d^2, where d is the unknown distance in kpc.

The characteristics of this object are similar to the characteristics of some HVC's with negative velocities but it is not possible to explain its origin by means of Oort's model (Oort 1967, 1969, 1970) because of the reasons indicated by Hulsbosh (1975). Wannier *et al.* (1972) suggest that these complexes may be part of an extension at high z of a spiral arm of the galaxy at 50 kpc from its center and 20 kpc above the plane. Kerr and Sullivan (1969) suggested that these clouds could be satellites of our galaxy.

b) *HVC 333–15.5–90*

Figure 3 shows the H I density distribution derived for this cloud from our observations. It is an isolated object first detected by Mathewson *et al.* (1974). The cloud presents a bright unresolved peak and an extended envelope typical of the isolated HVC's found in the northern hemisphere.

The H I profiles of this cloud also show two component structure (Figure 4) suggesting as in the previous case that it does not belong to the Magellanic Stream as was indicated by Mathewson *et al.* (1974).

The mass has been estimated as 490 d^2. The distance d, as in the case of the first complex, is unknown. Any description of the physical properties of the cloud depends on the distance, hence only speculations about the origin of the cloud are possible. Some of these speculations have been mentioned previously. Due to the coordinates of this object the Oort model mentioned above could be applicable. It could also be an extension of a spiral arm under the plane. In this case the kinematic distance would be 2.5 or 7.6 kpc. At these distances the clouds, according to the virial theorem, would be unstable. For a correct application of this theorem, however, it is necessary to have better knowledge of the physical properties of the medium in which the clouds are embedded.

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DISCUSSION

Peimbert: ¿Se ha detectado CO en alguna nube de alta velocidad?
Morras: No, las nubes solamente han sido detectadas en 21 cm y todos los intentos para detectarlas en otras líneas espectrales han dado resultados negativos.

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