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DUST CLOUDS IN ORION AND THE INTERSTELLAR HYDROGEN DISTRIBUTION

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This progress-report is about the detailed study in the neutral hydrogen radio line of an extended region in Orion containing dust clouds of different sizes and structure. Preliminary results of observations are given also.

1. INTRODUCTION

According to the published examples of the far infrared observations in the Orion and its surroundings several well-defined dust clouds of different sizes and structure are present here. Such a clear image of the clouds, in particular of the dense ones, makes the pictures in the far infrared to be a convenient material to study them together with the neutral hydrogen distribution at a range of velocities. The combined discussion of these two kinds of observations could reveal the possible influence of the dust clouds on the behaviour of the gas in the interstellar medium there.

2. THE DATA IN THE HI RADIO LINE

On the approximate scheme given in Fig.1 the Great Dust Clouds (GDC) as well as clouds I, II, III and IV are shown. Cloud I is situated in the galactic plane and is extended along the longitude direction. Cloud II is near the Rosette nebula, cloud III - the NGC 2183-85; the details in the surroundings of λ Orionis are marked also. To the north of them is the region IV filled with infrared cirrus.

We could realize two possibilities of getting the neutral hydrogen distribution.

2.1 The first possibility

For comparison of these clouds with the neutral hydrogen distribution on the area of more than thousand square degrees the data from Pulkovo Sky Survey in the interstellar neutral Hydrogen Radio Line (Bystrova, 1980) were used. From the materials of Pulkovo HI Survey we took the data about the emission at ten velocities between -21.8 and +25.6 km/s LSR for the structural component of the

interstellar hydrogen emission. The structural component of the HI emission is free from the seasonal spill-over effects together with the smooth component of the HI emission. In Fig.1 the maps are given with isolevels of the antenna temperature of the Large Pulkovo radio telescope. These levels were drawn beginning from T_A = 0.75 K which is near the 3 σ-level. The first contour interval was 0.25 K, then 0.5 K up to T_A=6.0 K and for T_A>6.0 K the interval was 1.0 K. The areas on the maps where T_A is less than 0.75 K are marked with "<<"; T_B=2.3 T_A. The maps are generated in the equatorial coordinate system as on the infrared picture is.

Also the maps were used with the results of the Gauss-analysis of the profiles giving the isolevels of central velocities of the lines when approximating with one gaussiane. One page from the Atlas of the line profiles was also used for the structural component in this region (Bystrova and Tselovalnikov, 1983).

2.2. The second possibility. Special observations with the RATAN-600

A special set of observations was organized for scanning this region in Orion with the RATAN-600 telescope (beamwidth is 2.5′ × 2.5°, bandwidth - 30 kHz, sens. 0.2 K). The range of declinations was taken from +20° to -20° for every degree, the right ascension interval was from 4^h30^m to 6^h30^m. The observations are practically finished now. Before the maps of the HI distribution at fixed velocities will be generated,the two stage procedure of the structural component extraction is realized now. The spline interpolation is the first stage and the corrections of the positions of some nodes are made taking into account the Pulkovo Survey where the scans lasted 24 hours.

3. PRELIMINARY RESULTS OF OBSERVATIONS

The comparison of positions which have the infrared objects and HI details leads to the following preliminary conclusions.

Cloud I has HI connected with it at the velocities from -6.1 to +15 km/s, the additional antenna temperature above the background is ~ 10 K.

The isolines of antenna temperature are projected on cloud II, which repeat its shape and have the velocities from -0.8 to +15 km/s, additional T_A being 6 K.

To cloud III belongs the gas with velocities from -0.8 to +9.7 km/s, T_A ~ 3-4 K, and for the object IV - from -21.8 to 9.7 km/s, T_A ~ 8 K.

On the whole Orion's GDC HI contours are projected from -6.1 to +9.7 km/s. The gas with the velocities from +4.5 to 15 km/s belongs mainly to the western more bright part of the Orion's GDC. Very remarkable is the behaviour of the HI at the borders of the GDC: at the velocity +25.6 km/s between the declinations -2° + 12° the main body of the HI around the galactic plane begins exactly at the eastern border of the GDC and of the details connected with λ Orionis. To the south from decl. -2° to this border ajoins the HI at +15 km/s. At the south-western direction to the GDC HI cloud at -0.8 km/s till δ = -10° belongs.

Exactly at the western border of the GDC the known bright HI cloud which

stretches itself for 12-13 degrees till declination +3° is situated, T_A being near 6 K and the central velocity -11.3 km/s. Some concentrations of HI project themselves on this cloud at +9.7 and +15 km/s. Further to the north at the border of the GDC the gas at -6.1 km/s is.

The infrared details connected with λ Orionis are situated on the borders of the HII-zone, the full extent of which was shown by J.Sivan (Sivan, 1974). The brightest and narrow HI signal ($T_A \sim 12$ K, $\Delta\lambda \sim 1.2°$) mentioned by us (Bystrova et al., 1970) at the IAU Symposium No.38 is situated between the western border of the HII-zone and the bright extended detail being more to the west.

The whole picture of the HI motion in the area studied will be possibly received using the RATAN-600 observations after their full reductions.

4. REFERENCES

Bystrova N.V.: 1980, in: Contour maps to the Pulkovo Sky Survey in the interstellar neutral hydrogen radio line, Nauka, Leningrad.

Bystrova N. V., Tselovalnikov A. M.: 1983, Sky maps constructed from the profiles of the interstellar neutral hydrogen radio line. VINITI, No. 5036-83 Dep.

Sivan J. P.: 1974, Astron. Astrophys. Suppl., **16**, 163-172.

Bystrova N. V., Gosachinskij I. V., et al.: 1970, Radio observations of some details in the HI local spiral arm. in: Spiral structure of our Galaxy, Proc. of IAU Symp. No. 38, Basel, Switzerland.

The Cambridge Atlas of Astronomy. Cambridge University Press, 1989.

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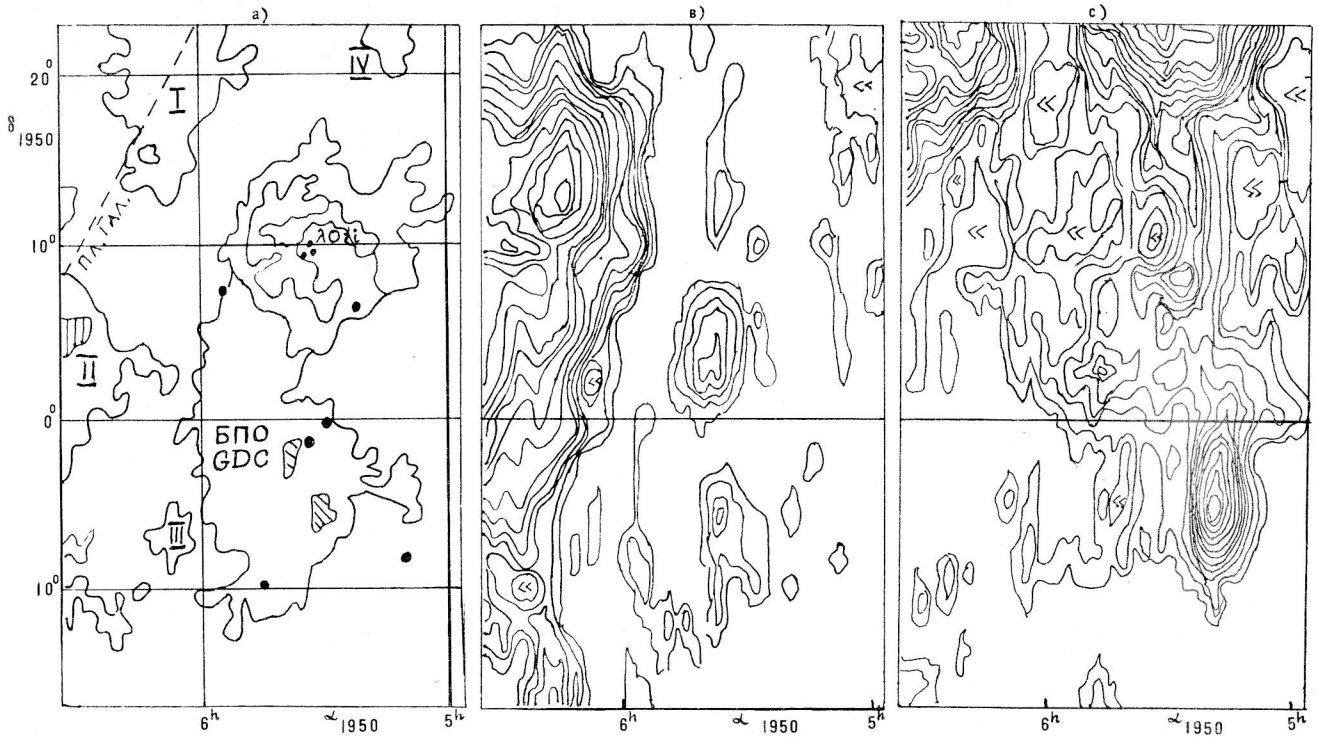

Fig. 1. a) Schematic presentation of the infrared picture for Orion region from the Cambridge Atlas of Astronomy; b) HI emission at the velocity +25.6 km/s; c)HI at the velocity -11.3 km/s.