

## LARGE-SCALE HI STRUCTURES IN GALAXIES AND THEIR CONNECTION WITH PROBLEMS OF GALAXY FORMATION

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1. The HI envelopes were discovered in galaxies of all types. The optical images of galaxies are always seen in the regions where the HI surface density  $N_{\text{HI}}$  is greater than some critical value  $N_1 \cong 5 \cdot 10^{20} \text{ cm}^{-2}$ . The molecular gas is embedded in those parts of galaxies where  $N_{\text{HI}} \geq N_2 = 2 \cdot 10^{21} \text{ cm}^{-2}$ . As follows from kinetics of molecule formation the molecular hydrogen forms at column densities greater than  $N_1$  and CO formation requires  $N \geq N_2$  (Arshutkin and Kolesnik (1981, *Astrofizika*, 17.359; 1984, *ibid.*, 21.147)). These results explain why the observations of external galaxies emphasize the column densities  $N_1$  and  $N_2$  as critical ones.

Transition of interstellar gas into molecular state and GMC formation can be stimulated by *gravitationally induced cold core formation process* (Kolesnik (1987, *Kinematics and physics of celestial bodies*, 3, 47; 1990, *Proc. workshop 'Physical Processes in fragmentation and star formation'* Kluwer)). As it was shown this mechanism in superclouds leads to cold core formation with the GMC's parameters and properties. Transferring these results onto galactic dimensions made understandable the nature of critical column densities  $N_1$  and  $N_2$ . The mechanism of gravitationally induced cold core formation shows how the thermal evolution can operate in the processes of galaxy formation.

2. The polar rings are widespread structures among elliptical and lenticular galaxies. We argue that unusual galaxy IC 2006 (Schweizer et al. (1989, *ApJ*, 338, 770)) and Hoag's object (Schwizer et al. (1987, *ApJ*, 320, 454)) can also be considered as polar ring galaxies. So it is worth to consider the internal protogalactic physics for their formations but not only mergers. We propose a model of successively embeded triaxial ellipsoids ('matreshka' model) to explain the nature of polar ring galaxies. In triaxial figures the two types of regular flows dominate: around the minor axis and around the major axis. So when inside such figure due to gravitationally induced cold core formation processes and molecule formation the stellar body is formed it will rotate in the plane perpendicular to external layers rotation where the polar ring can be created.