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ON A NEW MECHANISM OF THE SPIRAL-VORTEX STRUCTURE GENERATION IN GASEOUS GALACTIC DISKS[†]

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Point of kinks on the rotation curves of gaseous disks observed in the most of spiral galaxies as well as jumps of the surface density lead to the spiral-vortex structure generation unknown earlier. We show that there is a new type of waves in the gaseous disk caused by a jump of the density or a kink of the rotation velocity. For this wave we have found a criterion of the excitation, containing several conditions. One of them constrains the parameters of the system in the region of the resonance and it was used in the literature earlier. It can be written in the form of an inequality $A > 0$. We have found that this criterion is not universal and depends on other conditions. We offer examples when the system can be stable though $A > 0$. We have studied two different limiting equilibrium steady states: $P = \text{const}$ and $S = \text{const}$, and have shown that instability conditions are essentially different for these cases and even may be opposite. We have found conditions when a traditional viewpoint about the dominant role of resonance effects relative to radiation ones is wrong.

KEY WORDS Gas disks – dynamics: instabilities

DISCUSSION

Surdin: What is the reason of the existence of the gas in the density wave?

Khoruzhij: There are several possibilities:

1. The gas inside the central cavity is fully ionized. Thus the observed density wave is a density wave of the ionized gas.
2. The ionization is due to an external source (blue stars) and the density of the ionized gas is proportional to the density of the neutral gas.
3. If the ionization mechanism result in a higher density of the ionized gas in the regions where the neutral gas density is lower, the observed picture can present the density wave of rarefaction not condensation.

[†]Proceedings of the Conference held in Kosalma

Orlov: Could you interpret the spiral as an orbit of the central black hole?

Khoruzhij: The existing radio interferometric data are consistent with Sgr A being stationary in the Galaxy to better than 27 km/s (L. Blitz *et al.*, *Nature* **361**, 417, 1993).