ON THE TOTAL KINETIC ENERGY OF OUR GALAXY WITH THE CONTRIBUTION OF THE POPULATIONS

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ABSTRACT. The total kinetic energy of our Galaxy is estimated to be $(0.55 - 3.3) \times 10^{16}$ $M_\odot\, km^2 s^{-2}$ and the specific one to about $4 \times 10^4\, km^2 s^{-2}$.

The kinetic energy of the Galaxy is calculated through the potential energy by assuming the virial theorem. In the calculation of the latter one it is assumed that there are three main contributors: the (central) bulge, the (thin) disc and the (dark) corona.

One also examines the contributions to the total kinetic energy of different galactic populations such as: thin disc, thick disc, bulge, halo, corona etc. According to what we know about the structure and kinematics of individual subsystems of the Galaxy (e. g. [1], [2], [3]) it seems that the kinematics of their internal parts (where the density is not negligible) suggests rms velocities of about $200\, kms^{-1}$, or slightly less. As a rough approximation one may use the statement that the fractions of the galactic populations in its total kinetic energy are equal to those of the mass. However, a more refined analysis discovers that the specific kinetic energy of the corona becomes the highest, especially in the case of a very high contribution of its to the total mass of the Galaxy (high local escape velocity). The case of the thin disc is, certainly, the most favourable since its kinematics can be approximated by a pure rotation and the structure by an exponential law. Since the effective boundary of the thin disc is much smaller than that of the corona, the extension of the latter one has no influence on the kinetic energy of the disc. There are no reasons to be different in the case of the other subsystems containing the "visible" matter. Thus one concludes that the specific kinetic energy of the dark corona is probably the highest among the galactic populations and therefore its fraction in the total kinetic energy of the Galaxy slightly exceeds that of its mass.

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