

HUBBLE FLOWS AND GRAVITATIONAL POTENTIALS IN OBSERVABLE UNIVERSE

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We consider the Universe deep inside of (the cell of) uniformity. At these scales, the Universe is filled with inhomogeneously distributed discrete structures (such as galaxies, their groups and clusters). These inhomogeneities perturb the homogeneous background, described satisfactorily by the Friedmann model!

We propose mathematical models with conformally flat, hyperbolic and spherical spaces. For these models, we derive the gravitational potential for an arbitrary number of randomly distributed inhomogeneities. In contrast to the case of (the) spherical space, in both cases of flat and hyperbolic spaces, the potential is finite at any point, including spatial infinity, and valid for an arbitrary number of gravitating sources. For both of these models, we investigate motion of test masses (for example, dwarf galaxies) in the vicinity of one of the inhomogeneities. We show that there is a distance from the inhomogeneity, at which the cosmological expansion prevails over the gravitational attraction and where test masses form the Hubble flow. For our group of galaxies, it happens at a few Mpc, and the radius of the zero-velocity sphere is of the order of 1 Mpc. Both these theoretical results are very close to the experimental data. Outside of this sphere, the dragging effect of the gravitational attraction goes very fast to zero.