About incorrect application of the equations in cosmology (Neumann-Seeliger paradox and the Big Bang theory)

Valery G. Zhukov[1)]

The application of the Poissons equation solutions in the Neumann-Seeliger paradox for an infinite universe is incorrect. Also it is incorrect to use the metric and all the equations of the Big Bang theory for distances greater than the age of the universe, i.e. outside the event horizon for any point of the universe.

The Neumann-Seeliger paradox is a paradox of the classical Newtons theory of gravitation and was one of the impetuses to the development of the Big Bang theory.

Neumann-Seeliger paradox:

In an infinite Universe with Euclidean geometry and non-zero average density of matter, the gravitational potential has an indefinite value at any point. If the density of matter ρ is randomly distributed in space, in the classical theory the gravitational field created by it is determined by the gravitational potential φ. To find this potential, you have to solve the Poissons equation

$$\Delta\varphi = -4\pi G\rho \tag{1}$$

Here G is a gravitational constant. The general solution of this equation can be written as:

$$\varphi = -G\int_V \frac{\rho dV}{r} + C \tag{2}$$

It was found that if the average density of matter in the Universe is non-zero, the integral diverges.

Let us consider the Poissons equation. Gravitational potential, by definition, is a scalar function, which is numerically equal to the work the field produces when transferring unit mass from any starting point to a given point. A more general solution of Equation (2) for the body with a radius of $r0$, where R is a distance to the center of the body ($R >= r0$):

$$\varphi = \varphi(R) - G\int_0^{r_0} \frac{\rho dV}{r} \tag{3}$$

When $r_0 = \infty$, the application of the equation is incorrect, as an infinite Universe has no boundaries and the potential at the point R, with respect to which the calculation is made, can not be determined. Point R does not belong to the considered universe. And the potential between any two points belonging to the considered universe is zero and has an infinite value.

For a limited static universe, Equation (3) is correct.

But for a limited dynamic universe, the event horizon for each point of the universe is no more than the age of the universe. According to the current estimates of the Big Bang theory, the size of the universe is $\sim$160 billion light-years, the age of the universe $\sim$14 billion light-years, and the application of Equation (3) in terms of the special theory of relativity is incorrect.

It should be noted that the use of all the equations of the Big Bang theory in the context of the special theory of relativity can be correct only for distances of no more than 14 billion light-years, the rest of space is outside the event horizon. Negative time (before the Big Bang) in the Big Bang theory is not considered. I.e. in this case, as well as in the Neumann-Seeliger paradox, the equations operate on the indefinite space within this theory.

[1)] valeryzhukov@mail.ru / Valery Zhukov, Netanya, Israel

After the introduction of the inflation to the theory of the Big Bang, when solving the equations of Einstein (starting from the Friedmann equations) you can take into account the mass (and thus gravitational potential) only of that portion of the substance which is within the event horizon.

In addition, the introduction of the cosmological constant to the Einstein equation is the same error as in the Neumann Seeliger paradox and it contradicts with the basic idea of the theory - the difference of the gravitational potentials causes the curvature of space, introduction of the cosmological constant means the introduction of the difference of the gravitational potentials between each point of the universe and an abstract point, which may not belong to the considered universe. Einstein wrote his formula for an infinite universe. The distortion of space (cylindrical universe of Einstein) is obtained only as the result of viewing the universe from a point not belonging to it, in this case, an exceptional point appears in the universe.