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ON AN IMPORTANT COSMOLOGICAL PROBLEMS SOLUTION IN THE FRAME OF A NEW COSMOLOGICAL MODEL

Abstract

A modification of the Einstein – Friedmann cosmological model allows to solve a basic cosmological fundamental and observational problems, such as these ones: the vacuum energy and dark energy problems, horizon problem, flatness problem, supernovae low brightness at the high redshift ($z > 1$). In the proposed model frame the background relict radiation dipole anisotropy is explained, limits of the Relativity principle may be deduced. Also the generalized Neter's theorem and some hypothesis on the connection between the Universe insularity and its origin are formulated.

1. Introduction

As it is known, the real supernovae luminosity is lower than this one predicted by the Friedmann model *without* the non-zero cosmological constant. In order to obtain an optimal correspondence a searching for more convenient values of the $\mathbf{\Omega_m}$ and $\mathbf{\Omega_\Lambda}$ was performed. These optimal values were found equal $\mathbf{\Omega_m} = 0,25$, $\mathbf{\Omega_\Lambda} = 0,75$ (**[Perlmutter]**). The figure 1 shows the difference ($\Delta m_{0.75} = + 0,6$ at $\mathbf{z} = 1$) between this model and the "reference" curve ($\mathbf{\Omega_m} = 1$, $\mathbf{\Omega_\Lambda} = 0$) as well as the maximal difference ($\Delta\, m_{real} = + 1$ at $\mathbf{z} = 1$) between the "reference" model and the possible real values.

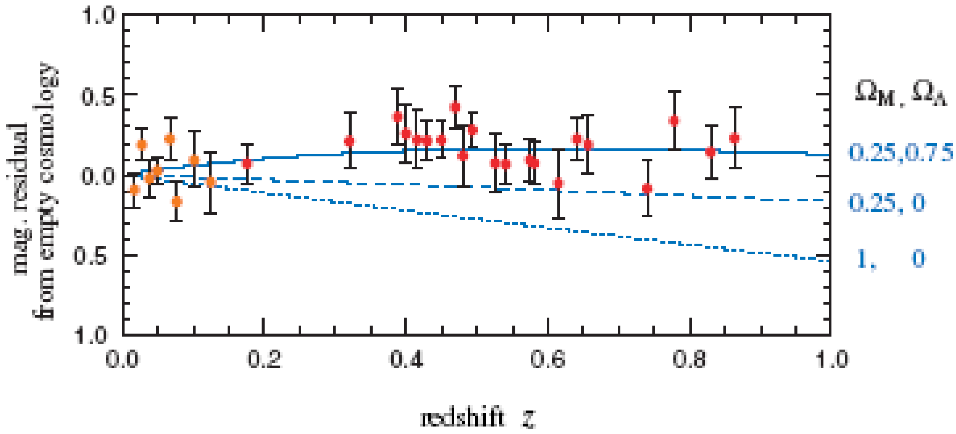

Figure 1. The supernovae luminosity difference vs. red-shift

One can deduce a difference between two theoretical models A and B from the relationship

$$\Delta m = 5 \cdot \lg\, (\boldsymbol{r}_A(\boldsymbol{z}) \,/\, \boldsymbol{r}_B(\boldsymbol{z}))$$

where $\boldsymbol{r(z)}$ is so called coordinate distance between an observer and a star (this distance doesn't account the Universe scale parameter increasing with time). The figure 2 shows the dependences $\boldsymbol{H_0\, a_0\, r(z)}$ for selected models ($\boldsymbol{H_0}$ and $\boldsymbol{a_0}$ are the Hubble parameter and scale parameter at the current time). In fact, we can see that two lowest curves get the difference $\sim 0,6$ at $\mathbf{z} = 1$. Note, the both lowest curves are nonlinear.

Unfortunately, a model including a non-zero cosmological constant is accompanied by an unremovable difficulty that consists in enormous vacuum energy. Moreover, we need in a "fitting" of a cosmological constant value depending on a real data. Also, there are some others familiar problems of the modern cosmology (flatness, horizon, CMBR dipole anisotropy, etc.). The question may be stated: Is it possible to propose another cosmological model able to get a better solution?

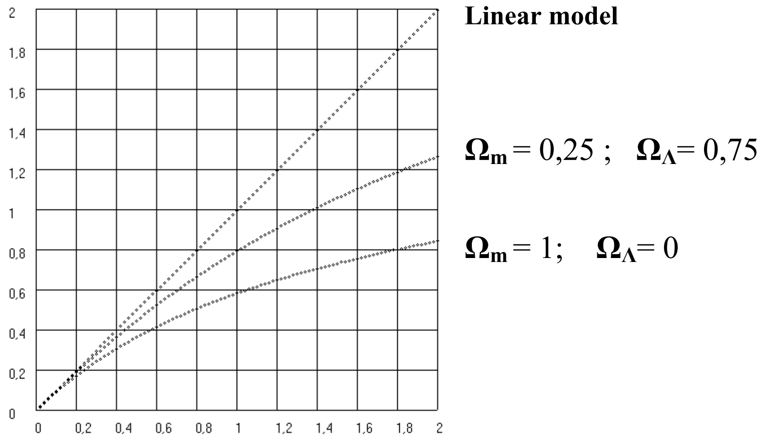

Figure 2. The dependences $\boldsymbol{H_0\, a_0\, r(z)}$

2. New cosmological model

The upper curve on the figure 2 is linear. Hence, it gets the more luminosity difference ($\Delta m = 1{,}16$ at $\mathbf{z} = 1$) than any cosmological Friedmann model. I believe, only real luminosity observations at $\mathbf{z} > 1$ will allow us to choice surely between different models (see table 1).

Table 1

z	1,0	1,5	2,0
$\mathbf{\Delta m_{linear}}$	1,16	1,54	1,88
$\mathbf{\Delta m}$ ($\mathbf{\Omega_\Lambda = 0{,}75}$)	0,66	0,80	0,88

So, the linear version has a chance to explain a low supernovae's luminosity. But is it able to be used as a base of a new cosmological model? I think, yes. I develop such model since 1993. Briefly, it states that the Universe age is always *strongly proportional* to the Universe radius **[Shulman]**. There are many of very important and consistent consequences that may by deduced from this model. That allow us to solve automatically the most of the fundamental cosmological problems.

Above all, it predicts the strict amendment value that should be added to the magnitude for the figure's 1 lowest curve ($\mathbf{\Omega_m} = 1$, $\mathbf{\Omega_\Lambda} = 0$).

In the proposed model we don't need in any cosmological constant, but a static matter pressure in the equations of movement has to be introduced. The pressure is not postulated. Contrary, this one and a matter density are searching as a functions of the Universe curvature (see **[Shulman]** for more details). Thus, we get two very interesting result in this model: a current *static pressure* is negative, and *a matter density* is always equal to the so called critical density, in spite of the Universe positive curvature. The relation between a pressure and a matter density ($\boldsymbol{P = -\rho c^2/3}$) is the same as a dark energy requires. So, we may hope the notorious vacuum energy problem to be solved.

Further, the proposed model allows us to solve two another problems. In fact, *the horizon problem* is solved because there is not here any nonlinear dependence of the Universe scale parameter on its age. Also, *the flatness problem* disappears because a current matter density is always equal to its critical value.

And this is not all. As is it well known, a cosmic background radiation dipole anisotropy was recently discovered. It points out that an absolute motion in the Universe exists, but this statement contradicts to the Relativity principle. Meanwhile, the new cosmological model predicts an absolute reference frame existence (this prediction I made before I knew about the dipole anisotropy).

There is one more important aspect of the proposed theory. One usually believes that the time is uniform, so the energy and matter conservation law is correct. It is a convenient base of the Einstein-Friedmann equations solution. However, it is not correct. In fact, the fundamental metric tensor depends on a curvature, which changes with time. Note, the time uniformity can be deduced from an equation of motion. So, the new theory allows us to deduce a linear energy and mass evolution with time. Then, we come to a Neter's theorem generalization and to the energy and mass *variation* law. Of coarse, such relative variation is very small in the current epoch (10^{-10} for year), but for the Sun it is 5 order more than a radiation loss.

Finally, the new theory opens for us a new way to explain the time and motion nature. It also explains a possible insularity of the Universe, that may present a black whole in an external super-universe.

Bibliography

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