DECODING DARK ENERGY BY USING THE MASS - ENERGY RELATION

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ABSTRACT

The mysterious phenomenon of dark energy has been explained by me in my previous papers on the basis of molecular diffusion model. In this paper I present an additional proof to further support the molecular diffusion model.

Key words: cosmology: theory - dark energy.

1 INTRODUCTION

The cosmological constant denoted by Λ is equivalent to the energy density of empty space or vacuum (vacuum energy density). However, a huge discrepant problem is associated with the theoretical calculation of the cosmological constant according to the quantum field theory. Quantum field theory provides us with the value of the cosmological constant to be 10^{120} times greater than the observed small value of the cosmological constant; this is very disturbing. 120 orders of magnitude discrepancy stumbled upon would cause the vacuum catastrophe to become inevitable.

Since the discrepancy associated with the cosmological constant is very large, therefore, instead of considering that empty space possesses energy, my previous papers emphasized upon the possession of energy by the large-scale structures.

The main objective of this paper is to prove further my claim, that energy is possessed by the large-scale structures instead of energy being possessed by empty space.

2 MASS - ENERGY RELATION TO THE RESCUE

The mass of ordinary matter within the observable Universe is 10^{53} kg (Davies 2006). The diameter of the observable Universe is 8.8 x 10^{26} m (Bars and Terning 2009). The volume of the observable Universe is 3.5681 x 10^{80} m^3. Since 10^{53} kg of matter accounts for 4.8 % of ordinary matter within the observable Universe, therefore, total matter content at 31.7 % should equate to 6.6 x 10^{53} kg; this yields a matter density of 1.8497 x 10^{-27} kg m^{-3}.

Using Sir Albert Einstein's mass-energy relation, $E = mc^2$, the energy equivalent to this mass turns out to be 5.94 x 10^{70} J, and, the energy density equates to 1.6647 x 10^{-10} J m^{-3}.

Now, the dark energy density is 5.96 x 10^{-27} kg m^{-3} (Planck 2015 results). This is about 2.1265 x 10^{54} kg, that is, 1.9138 x 10^{71} J. This yields an energy density of 5.3636 x 10^{-10} J m^{-3}.

It can be seen that the values obtained for dark energy surprisingly match with the corresponding values obtained for matter. Such coincidence not only solves the discrepant problem, it also suggests that the energy is possessed by matter instead of energy being possessed by empty space. The actual mass of matter within the observable Universe should be 2.1265 x 10^{54} kg.

CONCLUSIONS

Since the obtained values for matter and dark energy coincide, therefore, it becomes very evident that large-scale structures possess energy instead of energy being possessed by empty space.

ACKNOWLEDGEMENTS

I am thankful for reviewing my manuscript.

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