The cause of the increased luminosity distances of supernovae recorded in the cosmological data

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Abstract

The law of selfvariations quantitatively determines a slight increase of the masses and charges as the common cause of quantum and cosmological phenomena. It predicts and explains the totality of the cosmological data. In this article we present the prediction of the law concerning the increased luminosity distances of distant astronomical objects. The prediction we make is in agreement with the cosmological data for the luminosity distances of type Ia supernovae.

The law of selfvariations [1] predicts the relation

$$r = \frac{c}{k}\ln\left(\frac{A}{1-(1+z)(1-A)}\right)$$

between the distance r and the redshift z of distant astronomical objects. For the dimensionless parameter A, it holds that $A \to 1^-$, since it obeys the inequality

$$\frac{z}{1+z} < A < 1$$

for every value of the redshift z. The parameter k is constant, and is related to the Hubble parameter H through equation

$$\frac{kA}{1-A} = H$$

The law of selfvariations predicts that the energy $E(z)$ resulting from fusion, and which powers the distant astronomical objects, is decreased compared with the corresponding energy E measured in the laboratory, according to relation

$$E(z) = \frac{E}{1+z}$$

Because of this, the luminosity of distant astronomical objects is decreased, relative to the expected one. This has as a consequence that the luminosity distances R of distant astronomical objects are measured larger than the actual distances r, $R > r$. From the mathematical calculations [1] we obtain

$$R = r\sqrt{1+z}$$

between the distances R and r.

Combining the previous equations we get the luminosity distance R as a function of the redshift z of distant astronomical objects:

$$R = \frac{cA\sqrt{1+z}}{(1-A)H}\ln\left(\frac{A}{1-(1+z)(1-A)}\right)$$

Below we present the diagram of $R = R(z)$ for $A = 0.975$, $A = 0.990, A = 0.995$ $A = 0.999, H = 60\frac{km}{sMpc}, c = 3\times10^5\frac{km}{s}$ up to $z = 1.5$ .In order to explain the inconsistency of the Standard Cosmological Model with the following diagram, the existence of dark energy was invented and introduced.

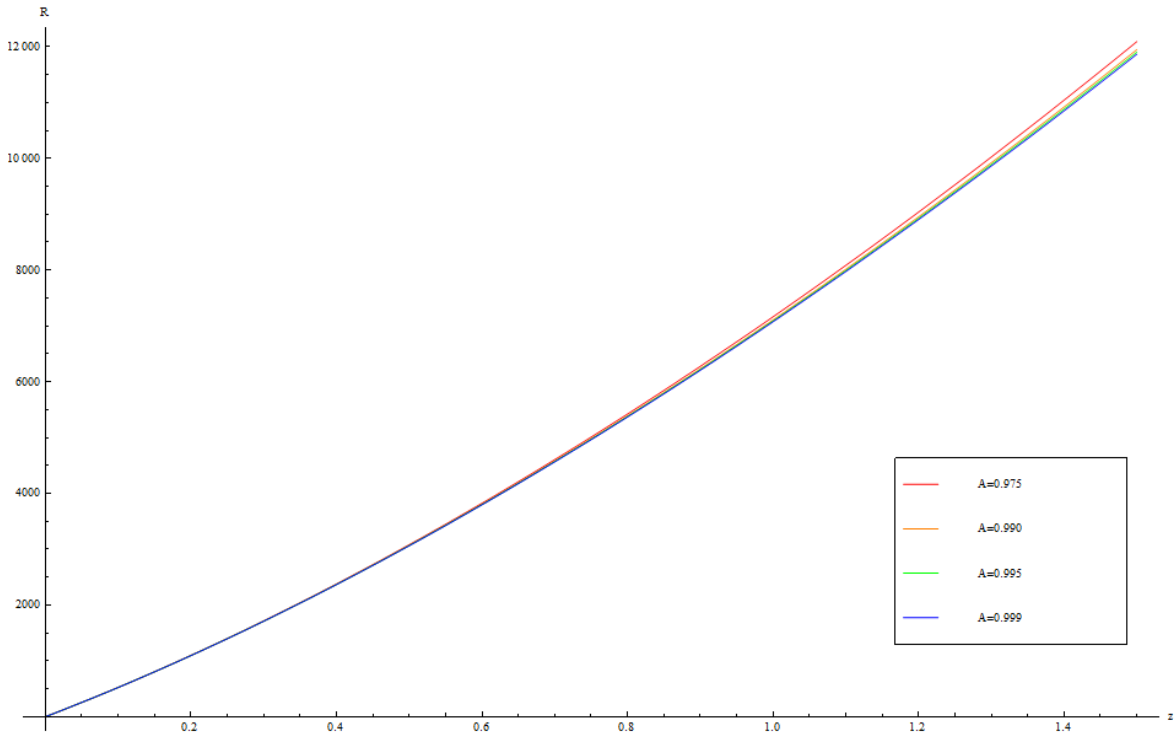

Diagram: The diagram of $R = R(z)$ for $A = 0.975, A = 0.995, A = 0.990$, $A = 0.999, H = 60\frac{km}{sMpc}$ up to $z = 1.5$. The measurement of the luminosity distances of type Ia supernova confirms the theoretical prediction of the law of selfvariations.

Type Ia supernovae are astronomical objects for which we can measure their luminosity distance for great distances. The measurements already conducted [2,3] agree with the above diagram.

In the measurements conducted for the determination of the Hubble parameter H, the consequences of equation $R = r\sqrt{1+z}$ have not been taken into account. For small values of the redshift z, the value $H = 60\frac{km}{sMpc}$ results. The measurements made up to date, have included astronomical objects with a high redshift z, thus raising the value of parameter H to between 72 and $74\frac{km}{sMpc}$. Today we perform measurements of very high accuracy. Taking into consideration the consequences of equation $R = r\sqrt{1+z}$, we predict that the value of parameter H will be measured independently of the redshift z of the astronomical object. We, of course, refer to measurements of the parameter H that are based on the luminosity distance of the astronomical objects.

[1] Manousos E., *A common underlying cause for quantum phenomena and cosmological data,* 2013, viXra:1302.0115 v2

[2] Adam G. Riess *et al.* 1998 *The Astronomical Journal* **116** 1009

[3] Perlmutter, S. *et al.* , 1999, *The Astrophysical Journal*, Volume 517, Issue 2, pp. 565-586