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Unification of Newtonian Dynamics and General Relativity in Cosmology with Constants Confirmed

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Abstract: Most equations under the General Relativity in cosmology can be derived by Newtonian classical methods with the light velocity equation from the *System Field Theory*. With data of light velocity C, gravitational constant G and age of cosmos t, many important constants in Cosmology, included the mass, density, radius, temperature and Hubble constant of the cosmos were calculated accurately. Most equations about cosmos included the space-time equation, light speed equation, gravitation equation, temperature equation, density equation and Hubble constant equation for the cosmos were also given. The equations derived with Newtonian classical methods are all the same as those from general relativity, but they are methodically simple. They solve almost all the difficulties in cosmology under general relativity, such as a Black Hole, Curvature, and the Event Horizon difficulties. A unified way for the Newtonian dynamics and the general relativity was found in this paper.

Key words: superluminal, cosmos constant, black hole, event horizon.

1. Introduction

The constants of mass, radius, temperature, light velocity, and the gravitation constant of cosmos are very important in cosmology that they may be inherent to interactions of matter in cosmos. Besides the mass, other constants are variable with cosmos time. Yet even today, besides the light velocity C, gravitation constant G, and age t of cosmos were determined by experiments or observations, other constants can just estimated by nowadays physics. In this paper, I use the light velocity formula (1-1) from System Field Theory as a hypothesis to deduce some important equations of an independent idea system such as cosmos (*Cosmic System*). Then I calculate some important constants in cosmology with above determined constant C, G, and t. Surprisingly, all the conclusions derived by Newtonian classical methods in this paper are all the same as those from the general relativity. This encourages us to believe that the light velocity and gravitation constant is variable, and it has a profound significance to astrophysics and cosmology.

The light velocity formula derived from Lorentz Transformation for a cosmic system under the *System Field Theory* is given as following.

$$C = \frac{2ZM}{R} \quad , \tag{1.1}$$

and the gravitation constant is given as.

$$G = ZC \quad , \tag{1.2}$$

where M is the mass, and R is radius of a system, and Z is a constant, which can be determined with formula (1.2). The current value for Z is:

$$Z = 2.22 \times 10^{-19} m^2 s^{-1} kg^{-1} \quad . \tag{1.3}$$

2. Superluminal Radiation in Galaxy Nuclei

An additional superluminal constant C_0 for a heavenly body is given as following

$$C_0 = \frac{2ZM}{r} \quad . \tag{2.1}$$

Here, M is the mass of the heaven system; r is the distance to the center. We use C for the light velocity of cosmos and C_g for light velocity in heaven systems.

$$C_g = C + C_0 \quad . \tag{2.2}$$

Superluminal radiation is a universal phenomenon in every heavenly system. The superluminal constant in earth’s surface is only $0.4ms^{-1}$. At the sun’s surface it’s about 10^3ms^{-1}. But in some large and dense galaxy nuclei, it can be far higher than the light velocity C.

The expansion of a cosmic system is adiabatic and entropy conservative. It results in decreasing of its velocity and increasing of its disorder. Formula (2.1) shows that the light velocity only depends on matter conditions in where the light is. So, we cannot find superluminal radiations from the lights we catch on earth. The more difficult thing is that, a superluminal radiation can only happens inside a very small area around a high dense source (see formula (2.1)). So, the only way we can find a superluminal radiation is to observe the transverse radiations in these sources with high-resolution technology like VBLI. Formula (2.1) shows that if an obvious superluminal radiation happens in a parsec wide area, the mass of the galaxy nucleus must be 10^{43}kg or more. But if the VBLI resolution increases enough for us to picture clearly inside a milli-arcsecond area, we can observe superluminal radiations from a 10^{40}kg galaxy nucleus.

3. Important Equations in Cosmology

As it’s mostly an idea gas system, the cosmos expands with light velocity. So we have the following relation.

$$dR = Cdt \quad . \tag{3.1}$$

From formula (1.1) and (3.1), we can get the space-time relation as.

$$R = 2Z^{\frac{1}{2}} M^{\frac{1}{2}} t^{\frac{1}{2}} \quad . \tag{3.2}$$

From formula (1.1) and (3.2), we get the light velocity relation as

$$C = Z^{\frac{1}{2}} M^{\frac{1}{2}} t^{-\frac{1}{2}} \quad , \tag{3.3}$$

and the gravitation coefficient relation as

$$G = Z^{\frac{3}{2}} M^{\frac{1}{2}} t^{-\frac{1}{2}} \quad . \tag{3.4}$$

The Hubble constant can be defined as

$$H = \frac{C}{R} \quad . \tag{3.5}$$

From formula (3.3), (3.2) and (3.5), we get the Hubble constant relation as

$$H = \frac{1}{2} t^{-1} \quad . \tag{3.6}$$

4. Average Density and Critical Density

The mass M, radius R and average density ρ of the cosmos have the following relation

$$M = \frac{4}{3} \pi R^3 \rho \quad . \tag{4.1}$$

From formula (1.1) and (4.1), we get the following relations.

$$R = \left(\frac{3C}{8\pi Z \rho} \right)^{\frac{1}{2}} \tag{4.2}$$

$$M = \left(\frac{3C^3}{32\pi Z^3 \rho} \right)^{\frac{1}{2}} \quad . \tag{4.3}$$

From formula (4.2), (3.2) and (3.6), we get the density relation as

$$\rho = \frac{3H^2}{8\pi G} \quad . \tag{4.4}$$

The average density of cosmos shown with formula (4.4) is the same as the critical density in cosmology under general relativity. **[1][2]** From formula(3.3), (3.4), and (4.1), we get the density relation as

$$\rho = \frac{3}{32\pi G} t^{-2} \quad . \tag{4.5}$$

Again, formula (4.5) is the same as that under general relativity. **[1][2]**

5. Average Temperature of Cosmos

The cosmos is mostly made up of gases. The relation between density and temperature of a system (in nature unit system of $C = h = k = 1$) was derived from the Planck's formula for an idea gas system as **[1][2]**

$$\rho = \frac{\pi^2 N T^3}{45} \quad . \tag{5.1}$$

And the relation between the entropy density and the temperature as

$$S = \frac{2\pi N T^3}{45} \quad . \tag{5.2}$$

From formula (4.5) and (5.1), we get temperature relation as

$$T = \left(\frac{45}{16\pi^3 NG} \right)^{\frac{1}{4}} t^{-\frac{1}{2}} \quad . \tag{5.3}$$

From formula (5.2) and (5.3), we get the entropy relation as

$$s = \left(\frac{N}{11520\pi G^3} \right)^{\frac{1}{4}} t^{-\frac{3}{2}} \quad . \tag{5.4}$$

The entropy of cosmos is conservative in any phenomenon, so

$$sR^3 = const. \tag{5.5}$$

Formula (5.2) and (5.5) shows that

$$TR = const. \tag{5.6}$$

All these equations here are the same as those under the general relativity. **[1][2]**

6. Cosmos Constants

Because of too much uncertainty in red shift of starlight and the distance needed to calculate the Hubble constant, it's not a good idea to use the Hubble constant to calculate the density of cosmos. But the age of the cosmos can be confirmed directly by determining the age of the oldest objects in our Galaxy. As we know that the age of the oldest stars is almost the same as the age of cosmos. Independent ages of old stars can be obtained from nucleochronology. We know that most of nuclei in old stars were formed at only about 10^{-4}s in the very early cosmos, as we will see in table 7-1. So, use formula (4.5) to calculate the density of the cosmos with its age is more creditable.

The most reasonable age of cosmos from nucleochronology is about 120~130 billion years. But here I prefer to use the data from MAP released by NASA in February 11, 2003, the age of the universe is about 13.7 billion years or $4.3\times10^{17}s$. Then, the average density of cosmos calculated with formula (4.5) is

$$\rho = 2.4\times10^{-27} kgm^{-3} \quad . \tag{6.1}$$

The mass of the cosmos can be calculated with the formula (4.3) as

$$M = 1.8\times10^{53} kg \quad . \tag{6.2}$$

The radius of the cosmos can be calculated with formula (4.2) as

$$R = 2.7 \times 10^{26} m \quad . \tag{6.3}$$

The Hubble constant can be calculated with formula (3.6) as

$$H = 1.2 \times 10^{-18} s^{-1} = 38 km/s/Mpc \quad . \tag{6.4}$$

The average temperature of the cosmos can be calculated with formula (5.3) as

$$T = 8.0 \times 10^{-13} Gev \quad . \tag{6.5}$$

The average temperature of cosmos calculated with formula (5.3) is higher than the relic radiation temperature, but it’s reasonable because the temperature in stars can be billion times higher than that of the relic radiation in the cosmos today.

7. Four Important Epochs in History of Cosmos

All the important constants of cosmos in any time t, included the light velocity C, gravitation constant G, radius R, density ρ and temperature T can be calculated accurately by formula (3.3)，(3.4)，(4.2)，(4.5) and (5.3). Tabble.7-1 shows these constants in four important epochs in the history of the cosmos.

Tabble.7-1 Four Important Epochs in History of Cosmos

t (s)	$R\ (m)$	ρ (kgm^{-3})	T	Events
10^{-20}	10^{8}	10^{30}	$10^{5} Gev$	Mesotrons, leptons thermo-equilibrium with mass-magnetic quantum.
10^{-14}	10^{10}	10^{22}	$1 Gev$	**Big Nuclear** epoch. Hadrons formed.
10^{-4}	10^{16}	10^{5}	$0.1 mev$	**Big Star** epoch. Nuclei formed.
10^{10}	10^{22}	10^{-15}	$1 ev$	**Big Galaxy** epoch. Atom formed.

All the conditions calculated by System Field Theory in table7-1 are fit for the events in every period of cosmos. It enables us to study the early cosmos with quantitative analyses.

8. Black Hole

The Schwarzschild’s exterior solution of the gravitation equation for a spherical symmetry field under System Field Theory has the same form as that under the general relativity, **[1][2]**

$$ds^2 = -\left(1-\frac{2GM}{r}\right)dt^2 + \left(1-\frac{2GM}{r}\right)^{-1} dr^2 + r^2\left(d\theta^2 + \sin^2\theta . d\varphi^2\right) \quad . \qquad (8.1)$$

In the general units system for a local heavenly system, 2GM in formula (8.1) is

$$\frac{2GM}{{C_g}^2} = \frac{2ZM}{C_0 + C} < \frac{2ZM}{C_0} = r \quad . \qquad (8.2)$$

Then we get the following relation in formula (8.1),

$$1-\frac{2GM}{r} > 0 \quad . \qquad (8.3)$$

From this we can see that, in any space-time area inside a high-density star, the coordinates are normal. There is no any special area. Black holes cannot be possible in cosmos.

9. Curvature of Cosmos

The basic space-time equation under the general relativity has one form as the following.

$$\rho = \rho_c + \frac{3}{8\pi G}\frac{k}{R^2} \quad . \qquad (9.1)$$

Here *k* is the curvature of the space.

From equation (4.4) we can see that, the critical density is exactly the average density.

$$\rho_c = \frac{3H^2}{8\pi G} \equiv \rho \quad . \qquad (9.2)$$

From equation (9.1) and (9.2), we get

$$k \equiv 0 \quad . \qquad (9.3)$$

So, the space is always smooth in any time of the history of universe. This has been proved by observations and analyzes about the total entropy of the cosmos. So, Einstein’s idea is wrong to think that the space with gravitations is curving.

10. Event Horizon of Cosmos

The event horizon of the cosmos can be derived from the Robertson-Walker metric as **[1][2]**

$$l_{H(t)} \equiv R(t)\int_0^{r(H)} \frac{dr}{\sqrt{1-kr^2}} = R(t)\int_0^t \frac{dt'}{R(t')} \quad . \qquad (10.1)$$

Equation (3.2) shows that *R* is in direct proportion to square root of *t*. So, from equation (10.1), we get the event horizon of the cosmos as (in nature unit system)

$$l_{H(t)} = 2t \quad . \qquad (10.2)$$

Now, let’s calculate the event horizon of cosmos at the time of $10^{-20}s$ when the temperature of the cosmos is 10^5 Gev (see table 7.1). Equation (3.3) gives the light speed at that time is about $10^{28} ms^{-1}$, so the horizon of the cosmos at that time is about $10^8 m$. Equation (5.6) gives the following relation,

$$TR = T_0 R_0 = const. \tag{10.3}$$

Now, let's calculate the scale of our 2.8k and 200 billion light year ($2 \times 10^{26} m$)-cosmos in the early universe at $10^{-20} s$ with a temperature of $10^5 Gev$. It's about $10^8 m$. It's exactly the event horizon of the cosmos at that time. So there is no any abnormality in the whole history of universe. All the cosmological results and physical results are natural and reasonable.

11. Conclusions

The only hypothesis in this paper is the light velocity formula (1.1). The big success is that it can calculate accurately most of the important constants in cosmology with light velocity C, gravitation constant G, and age of cosmos t. All the results are consistency to the observations. Coincidently, the conclusions from System Field Theory shown in formula (2.2), (3.2), (3.6), (4.4), (4.5), (5.3), (5.4), (5.5) and (5.6) are all the same as those from general relativity in forms. **[1][2]** The main difference between them is that, the light velocity C and gravitation constant G are variables. The conclusions from relativity are special ones from System Field Theory while C and G get their values of nowadays cosmos. But System Field Theory uses a completely different yet very simple method while general relativity uses a very complicated metric tensor analyses method. All the difficulties in cosmology under general relativity are solved. The System Field Theory finds a unified way for the Newtonian dynamics and the relativity.

References

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