The Gravitational Field and the Dark Energy

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I herein write on a new idea about cosmology that seeks to solve the dark energy and dark matter problem by eliminating the need to postulate its existence.

Introduction

The dark energy is a "Ad-Hoc" hypothesis postulated with the only purpose of explaining the apparent fast separation of distant galaxies. The effect observed which indicates a rapid separation is known as "Redshift". The Redshift of galaxies is currently considered as a Doppler effect of separation.

The new theory I will expose explains the Redshift effect with another hypothesis other than the rapid separation of galaxies. With this new hypothesis, the existence of dark energy and dark matter is no longer necessary. In case this theory is confirmed, these "dark" entities may be abandoned permanently.

How the idea came to me

I was thinking to myself, trying to find a way for the Jocaxian Nothingness (JN) [1] to generate the Aristotelian logic that could explain the apparent 'logic' of our universe. I was thinking about what kind of thing the JN would be able to generate in the beginning, but the possibilities were endless… Suppose the JN generates SOMETHING, I thought. This something may or may not have crazy properties, but suppose one of the properties was a restriction to the generation of things inside or outside its limits… While I was day dreaming, all of the SUDDEN I had the idea that the things that are inside the first generated something could decrease in size and the original SOMETHING would remain untouched.

If the thing in its interior could decrease in size, the impression given would be that the initial something would be increasing! An expansion! I therefore abandoned my original problem and began to refine this new idea.

Refining the idea

In this model of "Decreasing Universe" the atoms and other particles would be decreasing in size in the same proportion space dimensions also decreased.

As the size of our "ruler" would also decrease together with the local space dimensions, we would not notice this decrease locally. The apparent size would be the same since our patterns of measure would decrease in the same proportion of the space dimensions.

We know through general theory of relativity (GTR) that time in a system submitted to a gravitational field passes more slowly than within another system that has no field, or that has a weaker gravitational field. The idea is that the decrease in local space dimensions is caused by the effect of the gravitational field the system is submitted to. That is, black holes would not be special cases of systems in internal collapse. Furthermore, the contraction of the space should also depend on the intensity of the gravitational force.

Theory of Relativity– Equivalence Principle

It is interesting to notice that this idea is very similar, but expanded to 3 dimensions with special relativity, when it claims that the dimension of the system that moves in the direction of the movement suffers a contraction. The faster an object moves the more it will contract itself in the direction of the movement. In the decreasing universe this contraction would be due to gravity and would occur in the 3 space dimensions.

We can intuit the Decreasing Universe from the following premises of the theory of relativity:

1-A person inside a closed box under acceleration or gravitational field cannot know by any internal measurement that the box is being accelerated or that it is under the influence of a gravitational field.

2- An object under acceleration increases its velocity. But we know that the highest the speed is the strongest the contraction of this object in the direction of the movement.

Putting 1 and 2 together we can intuit that an object in a gravitational field could suffer contraction as an object inside a box being accelerated does!

In a more formal way we have:

Lorentz Contraction

If we suppose that gravitational field contracts the space around it (including everything within), we can explain the accelerated separation from galaxy through this contraction without postulating 'dark energy'.

The contraction of space made by gravity would cause a kind of 'illusion of optic', seem like, as presented below, that galaxies depart fastly.

The contraction of space would be equivalent to relativistic effect which occurs in a special nave in high-speed L.M.: With regard to an observer in an inertial referential stopped compared to a nave, the observer and everything is on it, including own nave, has its dimension contracted towards to movement of nave compared to a stopped observer (Lorentz Contraction).

This means that the ‘rule’ (measuring instruments) within the nave is smaller than the observer outside of moving nave.

The consequence is, with this ‘reduced rule’, this moving observer would measure things bigger than the observer would measure out of nave.

An accelerated rocket and its continuous contraction

In the same way, if we think of an accelerated increasing speed rocket, its length towards movement – compared to an inertial reference - will be smaller, and 'rule' within the nave will decrease continuously compared to this observer.

We would think of 'equivalence principle' to justify that gravitational field would have the same effect on 'rules' (measuring instruments) as an accelerated rocket would do within the nave, but, now, towards all gravitational field and not, in the case of rocket, only at acceleration speed.

I.e., the gravitational field would make that all rules within this field would be continuously smaller regarded to an observer outside of gravitational field and this would make, as we can see, these observers see things out of field be away fastly.

Anyway, even if “equivalence principle” can’t be applied into a gravitational field to show that the space is contracting around it, we can take it as a new effect on gravitational fields and this would explain the 'dark energy effect'.

Light through space

Now, let us think about what would happen to a light emitted by a distant galaxy until it reaches our planet:

Our galaxy, as other distant galaxies, would be in constant contraction. A photon of light emitted by a star of this distant galaxy, after leaving its galaxy, would travel through a long “empty” space, without much gravitational influence, until it finally reaches our galaxy and our planet.

During this long course (sometimes billions of years), this photon would suffer little gravitational effect and its frequency would be little affected. However, during this time, our system would continue to decrease and, when the photon finally reached here, we would measure its wavelength with a “ruler” rather diminished in relation to what we had at the time the photon was emitted. So in our measure we would verify that this photon had suffered a Redshift, because we would measure a longest wavelength, and the traditional explanation would be that the redshift was due to the Doppler Effect relative to the speed of separation of the galaxy.

End of the Dark Energy

The more distant a galaxy is from the observation point, the longer it takes for its light to reach us and the more shrunken our “ruler” would be to measure the photon and then, its wavelength would seem to be longer, what would lead us to think that the speed of separation of the galaxy would be faster. This apparent acceleration of distant galaxies led astronomers to postulate the existence of a “Dark Energy” that would have a repulsive effect, making them stray each time faster. But if the acceleration is due to our own reduction of scale, this dark energy would no longer be necessary, since what makes us notice its accelerated separation is in fact our own space contraction.

End of the dark Matter

Suppose we observe a distant galaxy in a rotation movement.

The rotation period of the edge of the galaxy is proportional to the square root of the cube of the radius divided by its mass. Mathematically:

$$T = k * [(R^3)/M]^(1/2)$$

Where: T is the period of time to complete a turn, k is a constant, R is the radius, that is, the distance of the centre of the galaxy to its edge, and M is the mass of the galaxy.

When the light of the galaxy reaches us, we will observe the same rotation period; however, we will observe also an apparent increase of the radius R due to the time the image took to reach us, who are in contraction. If the observed radius of the galaxy seems to be increased and the period is the same, it seems that the mass M of the galaxy should be larger. That is, in order to maintain the period T constant, the mass M must seem larger than the observed [3]. For that reason, scientists also postulated the existence of the “dark matter”. This “extra” mass could correct the observation to maintain the rotation period according to the radius of the galaxy. However, with this new hypothesis of the “Decreasing Universe”, the dark matter would not be necessary, since we can correct the radius of the galaxy back to its real value at the time the light was emitted by it.

Summarizing

Summarizing the Theory of the “Decreasing Universe”, we have:

-The universe is not expanding apace. The radius of the universe, however, may be expanding, may be fixed, or may be decreasing. The important is that it is not expanding apace.

- The objects in its interior, as well as its space dimensions, are contracting due to the presence of the gravitational field.

- In our local referential, the apparent expansion of the universe could be explained (at least partially) as due to the contraction of our own referential and its measure patterns.

-The theory of the Decreasing Universe would also explain the redshift: a galaxy at a certain distance from us would emit its light at a certain average frequency F. Another more distant galaxy would emit its light, for instance, with the same frequency, but that light would take longer than the first one galaxy to reach us. However, when this more distant light finally reached us, our measure patter would be smaller and, therefore, we would see this light with a longer wavelength (a smaller frequency) than the first galaxy. That is, we would observe a bigger redshift in the most distant galaxies than in the closest ones, and that would happen even if the galaxies were not straying.

Falsifiability

A fast way to refute the theory is to verify whether the redshift is according to the observed dark mass, that is, if the relaxation of the radius of the galaxies, in the calculation of the period, is compatible with the observed redshift.

Some Numerical Estimation

We will do um rough calculation, *and non-relativistic,* of the contraction rate of our Earth system depending on the “Redshift” [4] observed.

If F0 is the light frequency of a star that strays with speed V from an observer, then the frequency F the observer perceives is given by the following formula non-relativistic (c=speed of light):

$$F = F0 * (1 - V/c) \qquad (1)$$

But if L is the wavelength, F its frequency and c its speed, we have:

$$L * F = c \qquad (2)$$

If L is the wave frequency observed and L0 is the wave frequency at the source, from (1) and (2) we have:

$$L = L0 / (1 - V/c) \qquad (3)$$

Now, suppose the speed of separation of the galaxy follows the formula of Hubble (where d is the distance between us and the galaxy):

$V = H * d$ (4)

Then, from (3) and (4) we have:

$L = L0 / (1-H*d/c)$ (5)

Now, in case we detect two wavelengths L1 and L2 from two galaxies separated from Earth in d1 and d2, (d2>d1) that emit light at the same wavelength L0, we can estimate the reduction rate of the dimensions Fx", by unit of time, at the date in which the measures were taken:

$Tx = (L2 - L1)/L1/ T$ (6)

Tx is the reduction rate by unit of time, L2 and L1 the wavelengths observed and T the extra time light takes from the second galaxy in relation to the first one to reach our planet.

The letter Z (redshift) [4] is usually assigned to the factor (L2-L1)/L1:

$Z = (L2-L1)/L1$ (7)

$T = (d2-d1) / c$ (8)

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$Tx = Z*c/(d2-d1)$ (9)

But using (4) and taking the "redshifts" from each galaxy separately:

$Z1 = (L1-L)/L$ e $Z2 = (L2-L)/L$ (10)

We have:

$Tx = [(Z2-Z1)/(Z1+1)]*H*c/(V2-V1)$ (11)

We can take our own galaxy as a pattern and simplify the formula above, since the "redshift" of our own galaxy is zero:

$\mathbf{Tx = Z * H * c/V}$ (12)

In distances:

$\mathbf{Tx = Z * c / d}$ (13)

Where :
Z is the"redshift" of the galaxy
H is the Hubble Constant
d is the distance of the galaxy
V is the speed of separation of the galaxy
c is the speed of light

We will use the formula (13) and the data from the cosmologic chart [5] for galaxy NGC3034 and calculate the current compression rate. For this galaxy:

It is important to notice that Z/d must be the constant that reflects the current compression rate of our coordinate system!!

Tx = 0,000677 * 3E05 / (2,72 * 3E19) = 2,5E-18/s

At this reduction per second rate, in one million years the compression would be:

Tx * 1 milllion years = 2,5E-18 * 3E13 = 0,007%

If I did not make any mistakes, that is a number too small to be observed.

Correlation between dark Matter and Redshift

We will calculate the increase of dark matter needed according to the RedShift (*).

This calculation would be useful to refute this theory in case the dark mass expected is not compatible with the redshift of the galaxy.

From the equation of the T period (the first one), supposing that the rotation period of the galaxy is the same (T=T'), we have:

$R^3/M = R'^3 / M'$ (14)

Where: R is the radius of the real galaxy and M its real mass

R' is its radius observed on Earth (larger) and M' its total mass observed.

From (14), we can derive:

$M' = M (R'/R)^3$ (15)

If Z is the RedShift of the galaxy, we have:

$Z = (R' - R) / R$ (*) (16)

From (15) and (16) we obtain:

$M' = M (1 + Z)^3$ (17)

If the Dark Matter (Me) is given from

$Me = M' - M$ (18)

From (17) e (18), we have:

$Me = M [(1+Z)^3 - 1]$ (19)

That is the Dark Matter (Me) according to the RedShift of the galaxy (for distant galaxies).

Now, using (5) we have the dark matter in terms of distance from our galaxy:

Me = M [1/(1 - H d / c) ^3 -1] (20)

Where :
Me = Mass of the Dark Matter
M = Mass expected
H = Hubble constant (70 km/s/Mparsec)
c = Speed of light (300 000 Km/s)
d = distance from Earth to the galaxy

This value must be confronted with the observation and then corroborate or refute the theory.

(*) We must take the RedShift of galaxies that are very distant, since when it comes to near galaxies, the redshift can be distorted by the gravitational force of our galaxy.

This is the case of the Andromeda galaxy, which is coming closer to our galaxy in a faster way than the separation effect caused by the "dark energy", and that causes its light to present a shift to the blue. Therefore, that galaxy would not be useful to calculate the dark matter.

Portuguese version: http://stoa.usp.br/mod/forum/forum_view_thread.php?post=41

References

[1] O Nada Jocaxiano: [The Jocaxian Nothingness]
http://www.genismo.com/logicatexto23.htm

[2] Criação Ex Nihilo [Ex Nihilo Creation]
http://www.str.com.br/Scientia/criacao.htm

[3] A elusiva matéria escura [The elusive dark matter]
http://www.herbario.com.br/data05/2811matesc.htm

[4]O Deslocamento para o Vermelho [The Red Shif]
http://www.on.br/site_edu_dist_2006/pdf/modulo2/o_deslocamento.pdf

[5] O RedShift E a Lei de Hubble [The RedShift and Hubble's Law]
http://www.telescopiosnaescola.pro.br/hubble.pdf