Decreasing Universe: The Distance from the Galaxy as a Function of its Redshift

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Summary: Using the "Decreasing Universe" model [01] we will show evidence that this new model of the dynamics of the Universe is less disruptive and more adequate than the traditional Λ-CDM model that postulates the existence of Dark Energy.

We will also develop, from this new theory, a simple and straightforward mathematical formula that provides the distance of the galaxy as a function of its redshift.

Keywords: Decreasing Universe, λ-CDM, Redshift, Expansion of the Universe, Galaxies, Hubble.

Introduction

The " Decreasing Universe"[01][02] model proposes that the gravitational field shrinks space and everything else inside. In this way, if we are under a gravitational field, we will also be decreasing in size as well as all our rulers and measuring instruments.

The rate of contraction is quite slow (7% every 1 billion years, here on Earth), but it is enough to give us the ***false impression*** that galaxies are moving away at an accelerated rate (if my distance pattern is decreasing, the distances will seem further and further apart).

Thus, to explain the mysterious accelerated separation of galaxies, through this erroneous interpretation, the existence of "Dark Energy" was postulated.

The problem with "Dark Energy" is its origin: It has never been explained or detected in any way other than the accelerated detachment effect itself, and therefore violates the main law of thermodynamics: the Law of Conservation of Energy.

In addition, it also violates the theory of relativity, as it allows galaxies to move away at a speed faster than light.

Decreasing Universe

The " Decreasing Universe" is a new model, which introduces a single hypothesis: that *the gravitational field shrinks space and everything else inside*. This would rule out the need to postulate the existence of Dark Energy and would otherwise explain the apparent accelerated remoteness of galaxies.

In this model, based on this premise, a formula was developed that provides the Apparent Distance (D) (also called "*Proper Distance*" or "***Luminosity Distance***") as a function of time and the Non-Apparent Distance (D_0) (also called "***Comoving Distance***").

We will talk a little more about these two important concepts of cosmology.

Comoving Distance (D_0) and Proper Distance (D)

The Comoving distance (D_0) and the Proper distance (D) are concepts used in cosmology to measure the distance to objects, particularly galaxies.

In the 'Λ-CDM' model :

-The comoving distance excludes the expansion of space and considers only the peculiar motions of the galaxy itself (or other object).
-The proper distance (or Luminosity distance), considers the expansion of space due to Dark Energy and, therefore, this distance increases as time increases.

In the 'Decreasing Universe' model :

-The Comoving distance (D_0) is the distance measured by an observer in outer space where the gravitational influence can be considered negligible. In this case, it and its measuring instruments do not change over time.
-The Proper distance (D) is the measured distance from the Earth, where there are multiple gravitational fields that makes space and everything else bathed by this field, contract. In this case the distances measured beyond our galaxy, as we have seen, also *appear to be increasing*.

The Original Formula

From the referenced article[01][02] we copy the formula of the distance proper:

$$D(\Delta t) = D_0 * \exp(H_0 * \Delta t) \quad [F01]$$

Distance (proper) measured as a function of time and comoving distance'.

Where:
D = Distance measured by an observer from Earth ('Proper distance')
D_0 = Distance seen by an observer outside the gravitational field ('Comoving distance')
H_0 = Hubble Constant
Δt = Time Interval ($t-t_0$) until measurement is made

From the above formula, in the case of the distance of a galaxy, the Hubble Equation was also derived [01]:

$$V = H_0 * D \quad [F02]$$

Hubble Equation

Where:
V = Apparent Velocity
D = Proper distance
H_0 = Hubble Constant

Redshift

It is interesting to note that we can use the formula [F01] to measure the relationship of wavelengths coming from galaxies. Thus, we will have:

$$\lambda = \lambda_0 * \exp(H_0 * \Delta t) \text{ [F03]}$$

Wavelength Measured Within a Gravitational Field

Where:

λ = Wavelength measured when the photon *reaches* Earth.
λ_0 = Wavelength when the photon *leaves* the galaxy, at T_0.

We'll also use the redshift (Z) setting:

$$Z = (\lambda - \lambda_0) / \lambda_0 \text{ [F04]}$$

Redshift Definition

From [F03] we can see that λ increases in size, (and also its redshift) the longer (Δt) it takes the wave to travel in space until it reaches Earth.

The Mass of Galaxies

We should note that in our theory, redshift depends on 3 main factors:

-*The time* for the photon to cross space and reach Earth (*it is the main factor*)
The longer the time for the photon to reach the Earth, the greater the shrinkage time of our planet and our galaxy and, therefore, the greater the length that we will measure of something outside our galaxy, in this case, the size of the wave (causing a redshift), that is, it will increase the redshift.

-*The Mass* of the Origin Galaxy
The galaxy from which the photon is emitted, like every galaxy, is also shrinking. In this case, the greater its mass, the greater the shrinkage speed and the more energetic (shorter the wavelength) the photon will have. This will contribute to the redshift being lower in more massive galaxies.

On the other hand, counterbalancing this factor, there is also the *loss of energy from the photon* to exit the gravitational field of the galaxy. Since we do not have the formula for the contraction of the galaxy as a function of its mass, it is difficult to estimate which of these two factors affects the photon's wavelength more.

-The Mass of the Target Galaxy
The greater the mass of our galaxy, the higher the rate of contraction (we estimate the rate of contraction of 7% for every 1 billion years *here on Earth*)[02]. Thus, the greater the mass of the target galaxy, the greater the calculated redshift. On the other hand,

there will also be a gain in energy from the photon when it enters the gravitational field of our galaxy.

As a conclusion, we can say that if the energy loss to leave the source galaxy field is similar to the energy gain to enter the destination galaxy (ours), then *the redshift will have a greater dependence on the* ***contraction rate*** *of the photon-generating galaxy*.

In this case, the greater the mass of the galaxy in which the photon escapes, the shorter its outgoing wavelength, and therefore the lower the redshift measured here on Earth. So, *more massive galaxies will tend to have lower redshifts* and therefore should appear a little closer in the Λ-CDM model

Some Evidence

Based on this new paradigm, we can make a comparison with the Λ-CDM model (model of the Accelerated Expansion of the Universe by Dark Energy).

We must remember that, in our model, our galaxy, as well as all the others, are continually shrinking and that the photons coming from these galaxies do not suffer this shrinkage while they are traversing the immense interstellar space between the galaxies. And that can last for billions of years.

In this way, we can summarize what we studied and condense the results in the following table:

Comparison Table : **"λ-CDM" x "Decreasing Universe"**

Topic	**Dark Energy**	**Decreasing Universe**
First Law of Thermodynamics (Conservation of Energy)	Contrary to 1. Law by accelerating galaxies without a detectable energy source.	It does not contradict.
Theory of Relativity and Speed of Light	It contradicts T. Relativity by accelerating galaxies to a speed faster than the speed of light.	It does not contradict.
Hubble's Law	They come from the graphic interpolation of observations.	It is derived from Theory.
Redshift as a function of the Mass of the Galaxy	It does not provide.	It predicts lower redshift for more massive galaxies. ('Cause they're contracting faster)
Average Heating of Galaxies (in the Universe)	It does not provide.	It predicts the galaxies will heat up over time. (Continuous contraction causes warming).
Comoving distance($_{D0}$) and Proper distance(D)	'Magically' it is assumed that a part of space does not expand.	It **arises naturally** from the theory: $D_0 = D/(1+Z)$

Comparative Table of the "Decreasing Universe" model in relation to the Λ-CDM model

Distance from Galaxy as a Function of your RedShift (Z)

We will now develop the formula that produces the distance (comoving) of a galaxy as a function of its redshift. (The formula, strictly speaking, would be valid for galaxies with masses similar to those of our Milky Way. For galaxies with very different masses from the Milky Way, the result may be impaired (massive galaxies will appear a little closer).

For simplicity, we will take $T_0 = 0$ (the instant the photon leaves your galaxy)

From the equations [F03] and [F04] we derive:

$$Z+1 = \exp(H_0*T) \quad [F05]$$

Redshift as a function of the Time traveled to Earth

Where T is the time required for the photon, from the galaxy, to reach Earth that can be calculated as:

$$T = D_0 /c \quad [F06]$$

Photon Travel Time as a Function of Comoving Distance

Where c = speed of light in a vacuum.

From [F06] and [F01] we will have:

$$D = cT*\exp(H_0T) \quad [F07]$$

Proper distance as a function of Time Traveled

It provides the appropriate distance as a function of the Time T that it took the photon to reach the Earth.

But from [F05] we isolate T:

$$T = \ln(Z+1) / H_0 \quad [F08]$$

Time as a function of Redshift

Now using [F06], [F05] and [F01] we will produce:

$$D = [\ c*(Z+1)*\ln(Z+1)\ ] /H_0 \quad [F09]$$

Proper Distance as a Function of Redshift

It is the distance itself as a function of Redshift

However, from [F01] and [F05] we can write:

$$D_0 = D/(Z+1) \quad [F10]$$

Comoving Distance (as a function *of Luminosity Distance*)

This equation [F10] is also known (in the Λ-CDM model) as the "*Luminosity Distance*" which relates the moving distance (D_0) to the apparent distance (D).

Finally we can use [F09] and F[10] and we will finally have:

$$\mathbf{D_0 = c\ \ln(\ Z+1\ )\ /\ H_0\ [F11]}$$

Comoving distance as a function of redshift

Which provides the comoving distance as a function of the Redshift of the galaxy.

(For redshift **z<<1** we can further simplify the equation and we get $D_0=(c/H_0)\ z$ [F12])

Some Numerical Values

If we take :

c/H_0 = 14.3 Billion years

We can set up the following table:

Redshift (Z)	**Decreasing Universe Distance (Comoving) (in billions of light-years)**	**Standard Model (Λ-CDM) Distance (via ChatGPT) (in billions of light-years)**	**Difference**
1	9.9	10.6	7%
2	15.7	16.9	7%
3	19.8	20.4	3%
4	23.0	26.2	13%
10	34.2	35.8	4%

Comoving Distance Comparison for Decreasing Universe and λ-CDM

Implications and Observational Consistency

The derived distance-redshift relationship offers a new perspective on cosmic observations. Notably:

1. Direct Relationship: The direct equation between distance and redshift contrasts with the more complex relationships predicted by the Λ-CDM model, simplifying the interpretation of astronomical data.

2. Absence of Dark Energy: By attributing the observed redshift to the shrinking of space and matter rather than an expanding universe, this model eliminates the need for dark energy, addressing one of the most enigmatic components of the standard cosmological model.

3. Consistency with Observations: The Decresing Universe model aligns with current observational data, providing an alternative explanation for phenomena traditionally attributed to cosmic expansion.

Next, *as an example*, we will show how Copilot calculates these distances using the Λ-CDM model, See how the calculation is extremely more complicated:

Copilot calculates distance using the Λ-CDM model

To calculate the comoving distance from a redshift, we use the cosmological model. Here's the basic idea:

1. **Redshift** (z): This represents how much the wavelength of light from a distant object has been stretched due to the expansion of the universe.
2. **Comoving Distance** (DCD_C): This is the distance between two points in the universe measured along a path defined at the present time, ignoring the expansion of the universe.

The equation to calculate the comoving distance is:

$$D_C = \frac{c}{H_0} \int_0^z \frac{dz'}{\sqrt{\Omega_m (1+z')^3 + \Omega_\Lambda}}$$

Where:

- c is the speed of light ($\approx 3 \times 10^5$ km/s),
- H_0 is the Hubble constant (≈ 70 km/s/Mpc),
- Ω_m is the matter density parameter (typically around 0.3),
- Ω_Λ is the dark energy density parameter (typically around 0.7).

Discussion

We must keep in mind that this model does not prevent galaxies from moving away from each other but, if this occurs, this movement away from each other, if it exists, should not be accelerated as in the Λ-CDM model.

In addition, if the galaxy is near of us, the peculiar movements of each one can cause their redshifts, due to these peculiar movements, to overlap with that calculated by our contraction, since the distances are relatively small from our galaxy and the time to light travel too.

Conclusion

We can conclude that the "Decreasing Universe" model is a much simpler model and, above all, with fewer theoretical anomalies than the Λ-CDM model.

It provides a convincing alternative to the Λ-CDM model, avoiding theoretical anomalies such as the violation of thermodynamic laws or the requirement of undetected "Dark Energy" and conflict with the Theory of Relativity. By proposing that gravitational fields shrink space and objects, he explains the observed accelerated recession of galaxies in a more natural way.

References

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