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Decreasing Universe: The 'Dark Matter' Effect

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Abstract

After a brief review of the Decreasing Universe (D.U.) model, we will derive a formula and the graph for the apparent velocity of stars (of a Messier_33 galaxy) as a function of their radial distance from the galactic center. This formula reproduces the same velocity curve traditionally attributed to dark matter.

Keywords: Dark Matter, Hubble's Law, Dark Energy, Decreasing Universe, Universe Expansion, Messier 33

1. Introduction

The Decreasing Universe (D.U.) theory posits that the gravitational field continuously contracts space and all objects within it. This effect offers an alternative explanation for two key cosmological phenomena.

• The apparent accelerated expansion of galaxies (without invoking dark energy).

• The anomalous orbital velocities of stars (without requiring dark matter).

While counterintuitive, this idea aligns with established relativistic effects.

• Equivalence Principle: In an accelerating elevator, space and objects inside contract in the direction of motion.

• Schwarzschild Metric: Near a massive body, radial distances are compressed. Though D.U. does not directly derive from these effects, they illustrate that gravitational contraction is a plausible mechanism.

2. Dark Energy and Universe Expansion

The D.U. model explains the apparent cosmic acceleration as a consequence of local space contraction. Since Earth-bound measuring instruments also shrink, distant galaxies appear to recede faster than expected—even if their actual motion is unchanged. This contraction-based interpretation reproduces Hubble's Law, eliminating the need for dark energy. For details, see.

• Derivation of Hubble's Law and its relation to dark energy and dark matter [1].

• Decreasing Universe: Distance as a function of redshift [2].

3. Dark Matter and Galactic Rotation Curves

Dark matter is traditionally invoked to explain why stars in galactic outskirts orbit faster than predicted by Newtonian mechanics. The D.U. model offers an alternative: differential gravitational contraction within galaxies.

• Near the galactic center: Higher contraction rates shorten emitted photon wavelengths more severely.

• Farther out: Reduced contraction yields less wavelength compression. Since stellar velocities are measured via redshift (z), this differential mimics the Doppler effect, making outer stars appear faster—without dark matter.

4. Testing D.U. Against ΛCDM

The standard ΛCDM model relies on dark energy and dark matter. D.U. makes a testable prediction.

• D.U: More massive galaxies at the same distance should exhibit lower redshifts due to stronger contraction.

• ΛCDM: Predicts the opposite (gravitational redshift increases with mass). Empirical data support D.U. and contradict ΛCDM [3].

5. The Dark Matter Effect

5.1. Core Hypothesis

The gravitational field (g) contracts space continuously, with the rate depending on g's intensity. From the contraction formula is [1].

$$L(t) = \frac{L_0}{2^{\Delta t/T_j}} \qquad (F1)$$

(Contraction formula from the point of view of a non-shrinking observer).

Where

$L(t)$ = Measure of L_0 (decreasing) by a "Sidereal Observer".

t_0 = Initial time (arbitrary)

L_0 = Length measured in $t = t_0$

T_j = Jocaxian Time (Time to shrink to half)

$\Delta t = t - t_0$ Rewritten using the Jocaxian Factor (Fj)

$$F_j(\Delta t) = 2^{\Delta t/T_j} \qquad (F2)$$

Jocaxian's Factor

We can also rewrite the same Jocaxian Factor (F_j) in a more friendly way.

$$F_j(\Delta t) = e^{\left(\ln(2)*\frac{\Delta t}{T_j}\right)} \qquad (F3)$$

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We can rewrite (F1).

$$L = L_0/F_j(\Delta t) \quad (F4)$$

5.2. Gravitational Dependence

We know that the rate of contraction depends on the gravitational field (g). If the gravitational field increases, the contraction will be faster, that is, the time for space to fall by half decreases.

Therefore, we will include a new hypothesis.

The contraction time is inversely proportional to the intensity of the gravitational field

So, we have:

$$Tj(g)=Tj\cdot\frac{gt}{g} \qquad (F5)$$

Where

Tj = Jocaxian Time (Time to Length contract to half)

gt = GMt/R_t^2 Tj = Jocaxian Time (Time to Length contract to half).

g = GM/R^2 (gravitational field at Earth (Milk Way)). (gravitational field at distance R from galactic center).

This leads to the generalized Jocaxian Factor.

$$Fj(\Delta t,M,R)=e^{\frac{J0M\Delta t}{R^2}} \qquad (F6)$$

Where

$$J_0=\frac{H_0R_t^2}{M_t} \qquad (F7)$$

(*Jocax Constant ≈ 1,37E-18* $m^2 \cdot s^{-1} \cdot kg^{-1}$).

Where

H_0 = Hubble Constant (≈2,2E-18 s^{-1})

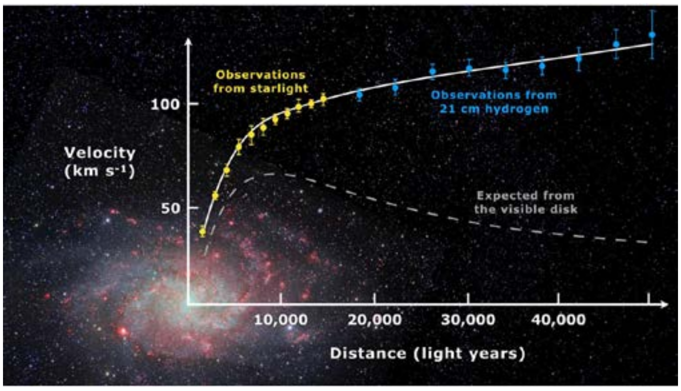
R_t = Distance from Earth to center of Milk Way (≈2,5E20 m)

M_t = Mass of Milk Way (≈1E41 Kg)

6. Galactic Rotation Curves

Dark Matter is a hypothesis created to explain the anomalous speed of stars and gases orbiting galaxies. This speed appears to increase as the orbit gets further away from the center of the galaxy. This apparent increase in speed contradicts Newton's laws, which indicate lower speeds for stars orbiting further away from the center of the galaxy.

The Following Graph-Rotation Curve for the Messier Galaxy_33-(Taken by Observational Measures) Lllustrates this Behavior



Rotation Curve of Spiral Galaxy Messier 33 Plotted by the Observational Measures

6.1. Photon Redshift Calculation

To understand what happens to the Photon until it reaches Earth, we must consider that.

- Both the galaxy from which the photon originated, and the Milky Way have been contracting since their formation. We will consider that both began the contraction at the same time T_0. (We will take T_0 as the time of the formation of the galaxy until the present day: approximately 13 billion years (= 4E16 s).
- The contraction rate, as we have seen, depends on the mass of the galaxy and therefore may have different contraction rates. The Jocaxian Factor will consider these differences.
- It is important to note, as we saw previously, that the contraction rate of the star that emits the photon depends on its distance (R) from the center of the galaxy. Thus, the redshift of the outgoing photon (considering only this factor), will be greater the further away the star is from its origin.
- Of course, part of the redshift will be due to the rotation velocity of the star, which is greater the closer the star is to the center.
- difference in the outgoing redshift as a function of the distance from the center of the galaxy, will define the “dark matter effect” and its peculiar curve.
- Let us consider that T1 is the instant at which the photon is emitted from the source galaxy towards Earth. When it leaves the source galaxy, it ceases to contract, since the gravitational field of the galaxy becomes negligible.
- We will calculate the apparent velocity of the star (in Messier 33 galaxy) (as a function of its distance from the center) considering the redshift up to the moment it leaves the galaxy. (We will not consider the “dark energy” effect, which is the contraction of our galaxy after the photon leaves the emitting galaxy until the Earth) [5].

6.2. Let's Do the Math

To simplify, let's assume that the galaxies formed at the same time. In this case, the photons began to contract differently for each galaxy with different masses. Redshift is the variation in wavelength in relation to a standard on Earth. Initially, shortly after their formation, both galaxies (the emitter (Messier_33,

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with a lower mass) and the receiver (the Milky Way, with a higher mass) emitted photons at the same wavelength λ0. After about 13 billion years (T_0), the contraction rates were different and, therefore, the wavelength decreased differently for both galaxies. In the Milky Way, the photon after T0 will have a shorter wavelength.

$$\lambda^T_0 = \lambda_0/F^TJ(T_0) = \lambda_0/\exp(H_0T_0)$$

Where
λ_0 = Wave length at beginning
λ^T_0 = wave length of photon in Earth after T0
F^T_j = Jocaxian Factor on Earth
T_0 = Time from beginning of Galaxy until Now (13G Years)

In Messier_33 the Contraction Rate is Different, and We Must Use the General F_j.

$$\lambda^M_0 = \lambda_0/F_j(T_0,M,R)$$

Where
λ^M_0 = wave length of photon in Messier_33Earth after T0
$F_j(T_0,M,R)$ = generalized Jocaxian Factor
M = Messier_33 Mass (1,4E39 Kg)
R = Distance of star to center of Messier_33
However, the Messier_33 star that emits the photon, will present a redshift that depends on its rotation speed.

$$V = cz$$

Where c = Speed of light and z = redshift

However

$$V = SQRT(MG/R)$$

$$z = V/c = (\lambda^M_1 / \lambda^M_0 - 1)$$

Where
λ^M_1 = wave length of photon in Messier33 due rotation velocity

$$\lambda^M_1 = \lambda^M 0\ (SQRT(MG/R)/c + 1)$$

The final redshift relative to the Milky Way will be.

$$Z_f = (\lambda^M_1 - \lambda^T_0)/ \lambda^T_0$$

So,

$$Z_f = (\lambda^M_0\ (SQRT(MG/R)/c + 1))/ \lambda^T_0 - 1$$

Replacing we will have.

$$Z_f = (\exp(H_0T_0)/ F_j(T0,M,R))\ (SQRT(MG/R)/c + 1) - 1$$

But **v** = cz, **then the speed measured on Earth** (*without considering the effect of "dark energy" = Our contraction during the photon's journey*), will be.

$$V = c\ \{ (\exp(H_0T_0)/ F_j(T0,M,R))\ (SQRT(MG/R)/c + 1) - 1 \}$$

Substituting $F_j(T_0,M,R)$ we will finally have the galaxy's rotation curve.

$$\mathbf{V_t = c\ \left(\left(\frac{1}{c}\sqrt{\frac{MG}{R}} + 1\right) e^{H0T0 - \frac{J0MT0}{R^2}} - 1\right)}$$

Galaxy Rotation Curve (Apparent Velocity)

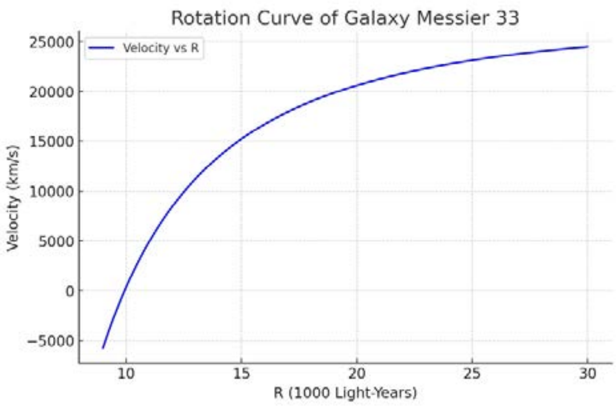
Where
C = Speed of Light (3E8 m/s)
M = Mass of the Emitting Galaxy (1,4E40 Kg)
G = Gravitational Constant (6.7E-11)
R = Distance from the Star to the center of the galaxy
H_0 = Hubble Constant (2.2E-18)
T_0 = Contraction Time (13 billion years = 4E16s)
J_0 = Jocax Constant (1,37E-18)

6.3. For the galaxy Messier 33
Substituting the constant values, we will have the Speed of the Messier Galaxy Star Observed from Earth.

$$\mathbf{V_t = 3E5\ \left(\left(\sqrt{\frac{2{,}4E6}{R}} + 1\right) e^{(0{,}088 - \frac{7{,}7E38}{R^2})} - 1\right)}$$

Star Speed in km/s as a function of distance to the Messier Galaxy_33

"We Can Finally Plot the Rotation Curve for Messier_33 Predicted by the "Decreasing Universe" Theory"



7. Conclusion

The D.U. Model Provides a Unified Framework for.

• Apparent cosmic acceleration (replacing dark energy).
• Anomalous rotation curves (replacing dark matter).

By reinterpreting gravitational contraction, it challenges the need for undetected exotic components in cosmology.

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