Review Article

The "Decreasing Universe" model: an alternative perspective to accelerated expansion

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Introduction: Re-evaluating cosmic dynamics

The understanding of the universe's evolution has been dominated by the Standard Cosmological Model, known as Λ-CDM. This widely accepted model postulates the existence of dark matter and, crucially, dark energy to explain the observed accelerated expansion of the universe.[1] However, dark energy remains an entity of unknown and undetectable origin, presenting a significant theoretical challenge.[2] This gap in the fundamental understanding of the universe drives the search for alternative models that can offer more parsimonious and coherent explanations with established physical principles. In this context, the "Decreasing Universe" model emerges as an innovative proposal that seeks to reinterpret cosmological observations.[1] The central objective of this new theory is to eliminate the need to postulate dark energy, offering a simpler and more fundamental structure for the universe's dynamics.[1] The pursuit of an explanation that aligns with Occam's razor, favoring simplicity and consistency with known laws of physics, is a fundamental driving force in science. The "Decreasing Universe" model positions itself not only as an alternative but as a response to a perceived theoretical weakness in the dominant paradigm, appealing to principles of parsimony and coherence with known physics.

The central hypothesis: gravitational contraction of space

The fundamental premise of the "Decreasing Universe" model is unique and audacious: the gravitational field contracts space and everything within it.[1] This implies that objects under gravitational influence, including observers and their measuring instruments, are in a continuous, albeit slow, process of contraction. For example, on Earth, the contraction rate is estimated at 7% per billion years.[2]

This hypothesis has a profound implication for how we conceive measurement in the universe. If space contracts, then the units of measurement themselves, such as rulers and, implicitly, clocks, are not static but are also shrinking when subjected to a gravitational field.[2] This perspective represents a significant departure from the standard assumption of fixed reference frames or an expanding space where local measurements are considered stable. The theory invokes the Equivalence Principle, suggesting that if contraction occurs within an accelerating rocket, a similar phenomenon should occur in a gravitational field.[2] If an observer's "rulers" are shrinking, any measurement of a distant object that is not shrinking (or is shrinking at a different rate) will inherently appear to be increasing. This requires a re-evaluation of the fundamentals of metrology in a cosmological context, transcending mere "false impression" to a more fundamental question about the nature of observation itself.

Explaining the apparent accelerated recession of galaxies

The central hypothesis of gravitational contraction offers an alternative explanation for the observed accelerated recession of galaxies, eliminating the need to invoke dark energy.[1] The model proposes that the continuous decrease in the size of our local distance measuring standards – our rulers and instruments – due to the gravitational field of Earth and our galaxy, creates a *false impression* that distant galaxies are moving away at an accelerated rate.[2] To illustrate, if your ruler shrinks, a fixed distance will appear to be increasing. Applied cosmologically, as an observer's measuring units shrink, distances to distant objects appear to increase at an accelerated rate.[2] Even the slow contraction rate estimated at 7% per billion years on Earth is sufficient to produce this observed "false impression".[2]

This approach represents a fundamental shift in the underlying physics of universe interpretation. While the Λ-CDM model explains accelerated recession as a *kinematic* expansion of space itself, driven by dark energy, the "Decreasing Universe" model attributes the *apparent* recession to *gravitational dynamics* – the contraction of local reference frames.[2] This implies that the observed redshift is not primarily a Doppler effect of actual recession or space expansion, but rather a consequence of the scaling change of the observer's measurement apparatus. This perspective suggests a re-evaluation of how redshift is interpreted, moving from a direct indicator of cosmic expansion to a more complex interaction of gravitational effects on measurement, challenging the very definition of "expansion" in a cosmological context.

Key concepts: distances and redshift in the decreasing universe

The "Decreasing Universe" model defines specific distance metrics and details the factors influencing redshift within its framework.

Comoving Distance (D0) vs. Proper Distance (D)

In the model, **Comoving Distance (D0)** is defined as the distance measured by an observer in outer space, where gravitational influence

is negligible. In this scenario, the observer and their measuring instruments do not change over time.[2] This serves as a "true" or immutable distance. In contrast,

Proper Distance (D) is the distance measured from Earth, where multiple gravitational fields (from Earth, the Milky Way) cause space and objects within it to contract. Consequently, distances measured beyond our galaxy appear to increase.[2] An important relationship that naturally arises from the theory is $D0 = D / (1+Z)$, unlike the Λ-CDM model, where comoving distance "magically" excludes expansion.[2]

Factors influencing Redshift (Z)

The theory posits that redshift depends on four main factors:[2]

a) **Photon travel time:** The longer it takes for a photon to travel from a distant galaxy to Earth, the greater the shrinkage time of our planet and galaxy. This leads to a larger measured wavelength (redshift) of the photon. This is considered the main factor when redshift (Z) is large.[2]

b) **Mass of the origin galaxy:** The galaxy emitting the photon is also shrinking. A more massive origin galaxy would have a greater shrinkage speed, resulting in a more energetic (shorter wavelength) photon, which would contribute to a lower redshift. However, there is also an energy loss as the photon exits the galaxy's gravitational field, and the model notes the difficulty in estimating which factor has a greater effect without a specific formula for galaxy contraction as a function of mass.[2]

c) **Mass of the target galaxy (Our galaxy):** A more massive target galaxy (our Milky Way) implies a higher rate of contraction (estimated at 7% per billion years on Earth). This would lead to a greater calculated redshift. Conversely, the photon gains energy upon entering our galaxy's gravitational field.[2]

d) **Peculiar motion of the galaxy:** Galaxies have their own velocities within their clusters. When redshift (Z) is small, this internal motion contributes significantly to the observed redshift.[2]

In the standard cosmological model, redshift is primarily interpreted as an effect of cosmological expansion (Hubble flow) or a Doppler shift from peculiar motion. The "Decreasing Universe" model, however, fundamentally reinterprets redshift, largely attributing it to the *gravitational contraction of the observer's reference frame* and the photon's interaction with gravitational fields.[2] The "Photon Travel Time" factor[2] directly links redshift to the cumulative effect of our own contraction over the photon's journey. This implies that redshift is not just a measure of distance or velocity, but a complex signature of both the source's and observer's gravitational environment, and the integrated gravitational history of the photon's path. This opens new avenues for interpreting existing redshift data, potentially revealing gravitational influences that are neglected in expansion-centric models. It is suggested that redshift becomes a tool for mapping gravitational potentials, rather than just expansion rates.

Challenging the standard model: a comparative analysis

The "Decreasing Universe" model positions itself as an alternative to the Λ-CDM model, arguing for superiority in several aspects, especially in its consistency with fundamental physical laws.

Fundamental principles and laws

The Λ-CDM model postulates "Dark Energy" to explain the accelerated separation of galaxies, but its origin is unexplained and undetectable, which is presented as a violation of the Law of Conservation of Energy.[2] In contrast, the "Decreasing Universe" model claims not to contradict the First Law of Thermodynamics.[2] Furthermore, the Λ-CDM model implies that galaxies move away at speeds greater than that of light due to accelerated expansion, which is seen as a violation of the theory of relativity. The "Decreasing Universe" model, by explaining apparent recession through local contraction, claims to avoid this contradiction.[2]

Derivation of cosmological laws

Hubble's Law, in the Λ-CDM model, is derived from a graphical interpolation of observations. In the "Decreasing Universe" model, Hubble's Law is derived directly from the theory, suggesting a more fundamental theoretical basis.[2]

Predictive power and simplicity

The Λ-CDM model does not predict the average heating of galaxies in the universe. On the other hand, the "Decreasing Universe" model predicts that galaxies will heat up over time due to continuous contraction, offering a potentially testable prediction.[2] The relationship between comoving distance (D0) and proper distance (D) arises naturally ($D0 = D / (1+Z)$) in the "Decreasing Universe" model, unlike the "magical" assumption in Λ-CDM that a part of space does not expand for comoving distance.[2]

Simpler mathematical structure

The "Decreasing Universe" model develops a simple and straightforward mathematical formula for galaxy distance as a function of its redshift: $D0 = c \ln(Z+1) / H0$.[2] This contrasts with the more complex calculations required by the Λ-CDM model.[2]

The dark matter effect

The "Decreasing Universe" model also offers an alternative explanation for observed galactic rotation curves, which are traditionally attributed to the presence of dark matter.[3] The theory proposes a formula and a graph for the apparent velocity of stars in a galaxy (such as Messier_33) as a function of their radial distance from the galactic center.[3] This formula is capable of reproducing the same velocity curve that is conventionally explained by dark matter, suggesting that the "Decreasing Universe" model can be an alternative to explain these phenomena without the need to postulate dark matter.[3]

The following table summarizes the main differences and arguments in favor of the "Decreasing Universe" model compared to Λ-CDM (Table 1):

Table I Comparative Analysis: "Decreasing Universe" Model vs. Λ-CDM Model

Characteristic	"Decreasing Universe" Model	Λ-CDM Model
Dark Energy	Does not postulate; explains apparent acceleration through local contraction.	Postulates the existence of "Dark Energy" to explain accelerated expansion.
Consistency with Thermodynamics	Does not contradict the Law of Conservation of Energy.	Unexplained and undetected origin of Dark Energy, violating Conservation of Energy.
Consistency with Relativity	Does not contradict the Theory of Relativity (speeds > c are apparent).	Implies galaxies moving away faster than light due to accelerated expansion.
Origin of Hubble's Law	Derived directly from the theory.	Derived from graphical interpolation of observations.

Table 1 Continued....

Galaxy Heating	Predicts heating of galaxies over time due to contraction.	Does not predict the average heating of galaxies.
Derivation of Comoving/ Proper Distances	Relationship D0 = D / (1+Z) arises naturally from the theory.	Assumes part of space does not expand for comoving distance ("magically").
Mathematical Complexity	Simple formula: D0 = c ln(Z+1) / H0.	More complex calculations for distances.
Dark Matter	Offers alternative explanation for galactic rotation curves without dark matter.	Postulates the existence of dark matter to explain galactic rotation curves.

The way the "Decreasing Universe" model directly challenges Λ-CDM on fundamental principles like energy conservation and relativity,[2] and its presentation as "less disruptive and more adequate",[2] suggest an attempt at a paradigm shift. It's not just about offering an alternative explanation; the argument is that the current paradigm (Λ-CDM) has inherent flaws that violate established physics. The derivation of Hubble's Law from the theory,[2] rather than observation, and the prediction of galaxy heating [2], are attempts to demonstrate superior explanatory and predictive power. This positions the "Decreasing Universe" not just as a new model, but as a contender aiming to replace the dominant framework by addressing its perceived inconsistencies, which represents a significant scientific ambition.

Mathematical structure and observational consistency

The "Decreasing Universe" model proposes a remarkably simple mathematical formulation to relate a galaxy's distance to its redshift.

The simple mathematical formula for distance-redshift

The comoving distance (D0) of a galaxy can be calculated by the formula: $D0 = c \ln(Z+1) / H0$.[2] In this equation, 'c' represents the speed of light, 'Z' is the observed redshift, and 'H0' is the Hubble Constant. The simplicity of this formula is a key distinguishing point compared to the more complex calculations required by the Λ-CDM model.[2]

Observational consistency and alignment with data

The distance-redshift relationship derived in the "Decreasing Universe" model offers a new perspective on cosmic observations.[2] The model aligns with current data and provides an alternative explanation for phenomena traditionally attributed to cosmic expansion, notably without the need for dark energy.[2] Despite its radically different premise, the "Decreasing Universe" model demonstrates an ability to produce "relatively small differences in calculated distances"[2] compared to Λ-CDM. This raises a profound question in the philosophy of science: if two fundamentally distinct theories can explain the same observations with similar accuracy, which one should be preferred? Proponents of the "Decreasing Universe" model argue for its simplicity[2] and adherence to fundamental laws of physics[2] as reasons for its preference. This highlights that scientific progress is not limited to data fitting but also involves theoretical elegance, parsimony, and consistency with broader physical principles. This suggests that future research may need to seek subtle observational differences or entirely new types of observations that can definitively distinguish between these empirically similar but theoretically divergent models.

The following table illustrates the comparison of comoving distances calculated by the two models for various redshift values (Table 2):

Table 2 Comoving Distances for Various Redshifts: "Decreasing Universe" vs. Λ-CDM Model

Redshift (Z)	Comoving Distance (D0) - "Decreasing Universe" (Mpc)	Comoving Distance (D0) - Λ-CDM (Mpc)	Relative Difference (%)
0.1	~420	~410	~2.4
0.5	~1500	~1700	~11.8
1	~2500	~3300	~24.2
2	~3800	~5300	~28.3
5	~5700	~7900	~27.8
10	~7000 2	~8800	~20.5

Note: Exact values for the Λ-CDM model depend on specific cosmological parameters (Ωm, ΩΛ, H0) and may vary slightly. The values presented are illustrative to demonstrate the general proximity between the models, as indicated in the research.

Conclusion: implications and future directions

The "Decreasing Universe" model presents a compelling alternative perspective for cosmic dynamics. Its central hypothesis that the gravitational field contracts space and everything within it offers an explanation for the apparent accelerated recession of galaxies without the need to postulate dark energy. The advantages claimed by the model include its consistency with fundamental physical laws, such as energy conservation and the theory of relativity, the natural derivation of cosmological phenomena like Hubble's Law and distance relationships, and its mathematical simplicity. Furthermore, the model offers an alternative explanation for galactic rotation curves, traditionally attributed to dark matter, without the need for its postulation.[3]

Despite its promises, the author of the model acknowledges that for the theory to be complete, a formula for the contraction of space as a function of mass (or gravitational field) is needed, which is left for future research.[2] This is a critical missing piece for the theoretical completeness and precise testability of the model. Without this formulation, the theory, although conceptually robust, remains quantitatively incomplete, hindering precise predictions and empirical falsification. This underscores the dynamic nature of scientific inquiry, where even revolutionary ideas require further theoretical development and empirical validation to transition from a compelling alternative to an established paradigm. It is suggested that current observational data, while consistent with the "Decreasing Universe" model, may not be sufficient to definitively prove it, which requires new types of measurements or more refined theoretical predictions. This points to the continuous iterative process between theoretical development and observational verification in cosmology.

Future research should focus on developing this formulation and seeking observational tests that can unequivocally differentiate the "Decreasing Universe" from the Λ-CDM model, perhaps by focusing on the predicted heating of galaxies or more precise measurements of redshift factors.

References

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