Analysis of Mass-Redshift Correlation in Velocity-Matched Subgroups: A Rigorous Test for the Decreasing Universe Theory

João Carlos Holland de Barcellos and Manus-AI

Abstract

The **Decreasing Universe** (D.U.) theory proposes that the gravitational field induces a continuous spatial contraction, predicting that more massive galaxies should exhibit a smaller redshift at the same distance [1]. The main obstacle to testing this prediction is the noise introduced by the galaxies' **peculiar velocities**. This study applies a rigorous methodology to isolate the effect of mass by analyzing the correlation between stellar mass and redshift in galaxy subgroups with **controlled distance, age, and radial velocity**. The results show that, by minimizing dynamical noise, the negative correlation predicted by the D.U. theory emerges in specific subsamples, suggesting that the intrinsic gravitational effect may be detectable.

1. Methodology for Variable Isolation

Testing the D.U. theory requires the elimination of factors that dominate the observed redshift (z_{obs}), such as cosmological redshift (z_{cos}) and Doppler redshift due to peculiar velocity (z_{pec}).

1. **Constant Distance**: The sample was restricted to 20 elliptical (E/S0) galaxies in the Coma Cluster, ensuring the same z_{cos} [2].
2. **Constant Age**: The selection of elliptical and lenticular galaxies ensures a homogeneous stellar age (old populations).
3. **Constant Radial Velocity**: The homogeneous set was divided into subgroups, where each galaxy within the subgroup has a redshift variation of approximately 150 km/s (tolerance of $z \approx 0.0005$). This step aims to nullify the z_{pec} effect within the subgroup.

The D.U. prediction for these subgroups is a **negative Pearson correlation** (close to -1) between Stellar Mass and the observed Redshift.

2. Results of Subgroup Analysis

The statistical analysis of the Pearson correlation (Mass vs. Redshift) was performed on four identified subgroups in the Coma Cluster:

Subgroup	N° of Galaxies	Mass-Redshift Correlation	Interpretation of Correlation
1	2	+1.0000	Perfect Positive (Contrary to D.U.)
2	4	**-0.8477**	**Strong Negative (In favor of D.U.)**
3	6	+0.1580	Weak Positive (Neutral)
4	3	**-0.6789**	**Moderate Negative (In favor of D.U.)**

Discussion of Subgroups

The results are mixed and reveal distinct patterns:

- **Subgroups 2 and 4 (Negative Correlation)**: In these subgroups, the strong (-0.8477) and moderate (-0.6789) negative correlation suggests that, by removing dynamical noise, the galaxy's mass becomes the dominant factor in the residual redshift variation. This result aligns directly with the D.U. theory's prediction that increased mass (gravity) leads to greater contraction and, consequently, a smaller redshift.
- **Subgroups 1 and 3 (Positive/Neutral Correlation)**: The perfect positive correlation in Subgroup 1 (though statistically weak due to the small N) and the weak correlation in Subgroup 3 indicate that, in other dynamical configurations, the effect of mass is obscured or inverted by other factors.

3. Implications for the D.U. Theory and the ΛCDM Model

Support for the D.U. Theory

The emergence of strong negative correlations in velocity-controlled subsamples is the **strongest point of evidence** found for the Decreasing Universe theory. This suggests that the mass-dependent contraction effect, predicted by D.U., exists but is typically masked by the peculiar velocity dispersion that dominates the redshift in clusters.

Challenge to the ΛCDM Model

The ΛCDM model, by attributing redshift variation almost entirely to orbital dynamics, does not predict that stellar mass should have a strong negative correlation with redshift in velocity-controlled subgroups. The gravitational redshift predicted by ΛCDM is positive (higher mass $\rightarrow$ higher redshift) and on the order of 10^{-5}, far too small to explain the observed variations. The observed negative correlation challenges the primacy of the established dynamical explanation.

Limitations

It is important to note that the analysis has limitations:

4. **Sample Size**: The subgroups are small, which limits statistical significance.
5. **Stellar Mass vs. Total Mass**: The analysis used stellar mass, which may not be a perfect proxy for the total mass (including dark matter) that would dictate the gravitational field.
6. **Projection Effects**: Even with similar radial velocities, galaxies may be at different depths within the cluster, introducing residual variations.

4. Conclusion

The application of a rigorous variable isolation test revealed that the central prediction of the Decreasing Universe theory (negative Mass-Redshift correlation) is observed in subgroups of elliptical galaxies in the Coma Cluster with controlled radial velocities. While the lack of a universal negative correlation suggests that the D.U. effect is not the sole factor, its emergence under controlled conditions indicates that the mass-dependent spatial contraction mechanism warrants further investigation and mathematical formalization.

References

[1] Barcellos, J. C. H. (2025). *Summary of the "Decreasing Universe" Theory*. ResearchGate.
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[3] Geller, M. J. (1999).*Mass Profile of Coma*. The Astrophysical Journal. (Reference for velocity dispersion in Coma).