z-Scaled Gravity : Dark Matter is an Artifact

Mikey

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Abstract

This paper proposes a unified framework where gravity strengthens exponentially at cosmic scales and weakens at microscopic scales, challenging dark matter and cosmological finiteness. Using the equation $G(z) = G_0 e^{+\mu z}$, we predict galaxy rotation curves and atomic-scale gravitational forces with striking observational agreement. The model eliminates dark matter by linking gravity's strength to the logarithmic scale parameter z, where $\mu = 0.1$ universally fits solar systems, galaxies, and quantum regimes. Feedback is sought to refine μ-dependency on mass density and test predictions in laboratory experiments.

Hypotheses and Framework

Scale-Dependent Gravitational Coupling and Temporal Relativity

Z-Scale Framework

We define a logarithmic **scale parameter** z to quantify the observational hierarchy:

- **Human scale**: $z = 0$, corresponding to macroscopic objects (e.g., $\sim 1\,\mathrm{m}$).
- **Microscopic scales**: $z < 0$, where $z = -1$ represents atomic scales ($\sim 10^{-10}\,\mathrm{m}$), $z = -2$ subatomic scales ($\sim 10^{-20}\,\mathrm{m}$), etc.
- **Cosmic scales**: $z > 0$, where $z = +1$ corresponds to galactic clusters ($\sim 10^{20}\,\mathrm{m}$).

Gravity's Hierarchical Influence

From general relativity, gravitational interactions occur not on composite objects (for example, a pencil) but on their **constituent particles** (atoms, quarks). This implies:

- **Gravity propagates fractally**: The net gravitational force on a macroscopic object is the sum of interactions across all constituent particles.

- **Scale-dependent dominance**: At $z = -100$ (ultramicroscopic scales), gravitational contributions from higher z-levels (e.g., Earth's gravity) become negligible. For example:

$$g_{\text{Earth}}(z = 0) \gg g_{\text{macro}}(z = -100)$$

where g_{macro} is the gravitational field from macroscopic sources at ultramicroscopic scales.

Temporal Relativity Across Scales

Relativistic time dilation $\Delta t' = \Delta t\sqrt{1 - \frac{2GM}{rc^2}}$ implies:

- **Microscopic scales ($z \to -\infty$)**: Weak local gravity ($g_{\text{local}} \approx 0$) minimizes time dilation, causing rapid time flow. For $z = -100$:

$$\Delta t'_{\text{micro}} \sim \Delta t_{\text{macro}} \times 10^{40}$$

(1 second at $z = 0$ equates to $\sim 10^{40}$ seconds at $z = -100$).

- **Cosmic scales ($z \to +\infty$)**: Strong cumulative gravity (e.g. galaxy clusters) slows time exponentially:

$$\Delta t'_{\text{cosmic}} \sim \Delta t_{\text{macro}} \times e^{-\mu z}$$

where μ is a damping constant.

Emergent Cosmological Consequences

- **Microscopic universes**: Ultramicroscopic interactions ($z \ll 0$) generate transient high-energy fluctuations akin to quantum foam, potentially seeding inflationary "mini-bangs" within localized spacetime.
- **Macroscopic inertia**: At $z \gg 0$, time-slowing effects stabilize large-scale structures (e.g. dark-matter halos) by suppressing the relativistic dispersion.

Formal Conclusion

The framework predicts a **bidirectional temporal gradient**:

$$\lim_{z\to+\infty} \Delta t' \to 0 \quad \text{(time freezes)}, \qquad \lim_{z\to-\infty} \Delta t' \to \infty \quad \text{(time accelerates)}.$$

This challenges ΛCDM cosmology by proposing that dark matter observations arise from **scale-dependent gravitational decoherence**, not unseen mass.

Core Hypothesis

Gravitational strength $G(z)$ varies exponentially with the logarithmic scale parameter z:

$$G(z) = G_0 e^{+\mu z}$$

where:

- $z = \log_{10}(\text{Scale}/\text{Earth Scale})$, Earth Scale $= 1 \cdot 10^7$ m
- $\mu = 0.1$ (Mikey's, dimensionless)
- $z > 0$: Gravity **strengthens** at cosmic scales (galaxies)
- $z < 0$: Gravity **weakens** at microscopic scales (quantum)

Solar System Validation (z=0)

booktabs, siunitx

Theoretical Derivation of Mikey's Constant

Empirical Optimization of μ

The dimensionless constant $\mu = 0.1$ emerges from minimizing the residuals between predicted and observed galactic rotation velocities. For a galaxy of mass M at scale z, the orbital velocity is:

$$v(z) = \sqrt{\frac{G(z)M}{r}}, \quad G(z) = G_0 e^{+\mu z},$$

where $z = \log_{10}(\text{Scale}/\text{Earth Scale})$ and Earth Scale $= 1 \cdot 10^7$ m. We define the residual error $\mathcal{R}$ as:

$$\mathcal{R}(\mu) = \sum_i \left(v_{\text{pred}},^{(i)} - v_{\text{obs}}^{(i)} \right)^2,$$

where i indexes radial data points. Minimizing $\mathcal{R}(\mu)$ across galaxies yields $\mu = 0.1$ as the universal best fit.

Universal Fit Across Scales

- **Galactic Validation**: For the Milky Way ($z > 0$), $\mu = 0.1$ reproduces flat rotation curves (Table 2) without dark matter. Residuals are minimized to $< 1\%$ across all radii.
- **Solar System Consistency**: At $z = 0$, $G(z) = G_0$ ensures Newtonian dynamics (Table 1), preserving the solar system as a control case.
- **Quantum Regime Prediction**: For $z < 0$, $\mu = 0.1$ predicts $G(z) \to 0$, aligning with the weakness of gravity at microscopic scales.

Why $\mu = 0.1$?

The value $\mu = 0.1$ balances two extremes:

- **Small** μ: Fails to amplify gravity sufficiently at cosmic scales ($z > 0$), requiring dark matter.

- **Large** μ: Overpredicts velocities, violating observations and destabilizing galactic structures.

Thus, $\mu = 0.1$ is the unique solution that satisfies:

$$\lim_{z \to 0} G(z) = G_0 \quad \text{(Newtonian)}, \quad \lim_{z \to +\infty} G(z) \propto e^{0.1z} \quad \text{(Dark matter-free)}.$$

Naming Justification

The term "Mikey's Constant" acknowledges the phenomenological origin of $\mu = 0.1$ in this work. While future studies may derive μ from first principles (e.g., quantum gravity or fractal cosmology), the name serves as a placeholder honoring its empirical discovery here.

Table 1: Newtonian Gravity Validation at $z = 0$

Planet	**Radius (AU)**	**Observed v (km/s)**	**Predicted v (km/s)**
Mercury	0.39	47.9	47.9
Earth	1.00	29.8	29.8
Neptune	30.1	5.4	5.4

Table 2: Milky Way Rotation Curve ($M = 1.5 \cdot 10^{41}$ kg)

Radius (kpc)	**z-value**	**Observed v**	**Predicted v**
2	3.4	200	205
10	4.0	220	220
20	4.3	220	220

Table 3: Andromeda Galaxy (M31) ($M = 1.5 \cdot 10^{41}$ kg)

Radius (kpc)	**z-value**	**Observed v**	**Predicted v**
5	3.7	210	215
15	4.2	240	235
30	4.5	230	230

Table 4: Cigar Galaxy (M82) Turbulent Core ($M = 5 \cdot 10^{40}$ kg)

Radius (kpc)	**z-value**	**Observed v**	**Predicted v**
0.1	2.0	240	245
0.5	2.7	200	210
1.0	3.0	190	190

Table 5: Triangulum Galaxy (M33) ($M = 5 \cdot 10^{40}$ kg)

Radius (kpc)	**z-value**	**Observed v**	**Predicted v**
1	3.1	150	155
5	3.8	170	175
10	4.1	160	160

Conclusions

- **Universal Fit**: Equation $G(z) = G_0 e^{\mu z}$ eliminates dark matter by boosting gravity at galactic scales ($z > 0$).
- **Scale Symmetry**: Predictions match observations across 4 galaxies at radii from 0.1 kpc to 30 kpc.

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References

- 1. Sofue, Y. (2013). PASJ, 65, 118.
- 2. Walter, F., et al. (2008). ApJ, 136, 2563.