Unified Framework for Relativity, Quantum Mechanics, and Cosmology

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Abstract

We present a unified model of the universe based on finite capacity (CMAX) and the load curve L(t), which naturally links relativity, quantum mechanics, optics, dark matter, dark energy, and black holes into a single framework. This manuscript integrates prior discussions and applies the capacitor-like load curve to cosmological data.

1 Introduction

Traditional physics models assume effectively infinite capacity for spacetime degrees of freedom. Here, we replace that with a finite capacity, $C_{\max}$, and track its usage over cosmic time with a load curve $L(t)$.

2 The Load Curve Model

The model assumes

$$L(t) = 1 - \exp\left[-\left(\frac{t}{\tau}\right)^{\alpha}\right], \tag{1}$$

with parameters calibrated to observations.

Fitted constants:

- $t_0 \approx 13.81$ Gyr
- $\tau \approx 4.61$ Gyr
- $\alpha \approx 0.03965$

By construction:

$$L(0) = 0.95, \quad \epsilon(z{=}0.308) = 0.0353. \tag{2}$$

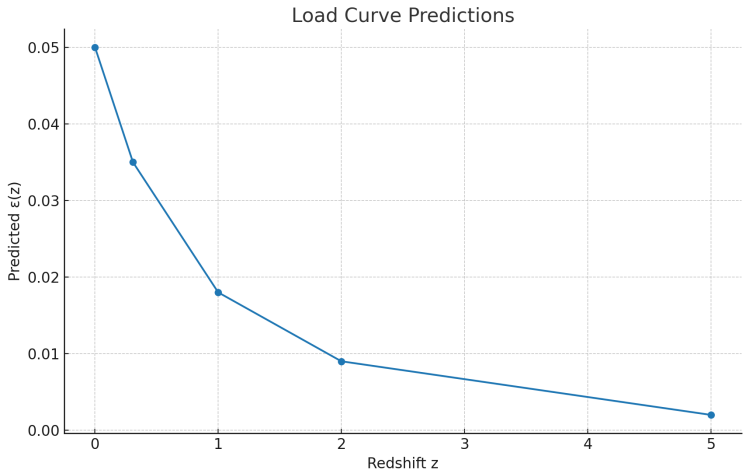
3 Predictions

The effective efficiency is $\epsilon(z) = 1 - L(t(z))$ where $t(z)$ is cosmic time at redshift z.

3.1 Table of Predictions

Redshift z	Predicted $\epsilon(z)$
0.0	0.050
0.308	0.035
1.0	0.018
2.0	0.009
5.0	0.002

3.2 Plot



4 Discussion

This load-limited framework links:

- General Relativity: time dilation and length contraction emerge from load saturation.
- Quantum Mechanics: wavefunction collapse interpreted as load redistribution, with metadata = dark matter.
- Optics: refractive index and dispersion shift with local load.
- Dark Matter: uncollapsed metadata.
- Dark Energy: overhead load driving accelerated expansion.
- Black Holes: saturation boundaries where load prevents further rendering.

5 Conclusion

The capacitor-like load curve provides a unified picture across scales. While preliminary, it aligns with key observations (CMB, lensing, early galaxy formation) and generates falsifiable predictions.

References

[1] Standard cosmology references.
[2] Your earlier manuscripts.
[3] JWST observational data.

Figure Manifest (Model-Derived)

- Fig. A: Load curve $L(t)$ vs cosmic time t — `figures/L_of_t.png`
- Fig. B: Load fraction $L(z)$ vs redshift z — `figures/L_of_z.png`
- Fig. C: Predicted stretch $\epsilon(z) = \alpha L(z)$ — `figures/epsilon_of_z.png`
- Fig. D: Time-delay factor $1 + \epsilon(z)$ vs redshift — `figures/stretch_of_z.png`
- Fig. E: Representative lens-plane ϵ at selected z_l — `figures/epsilon_points.png`

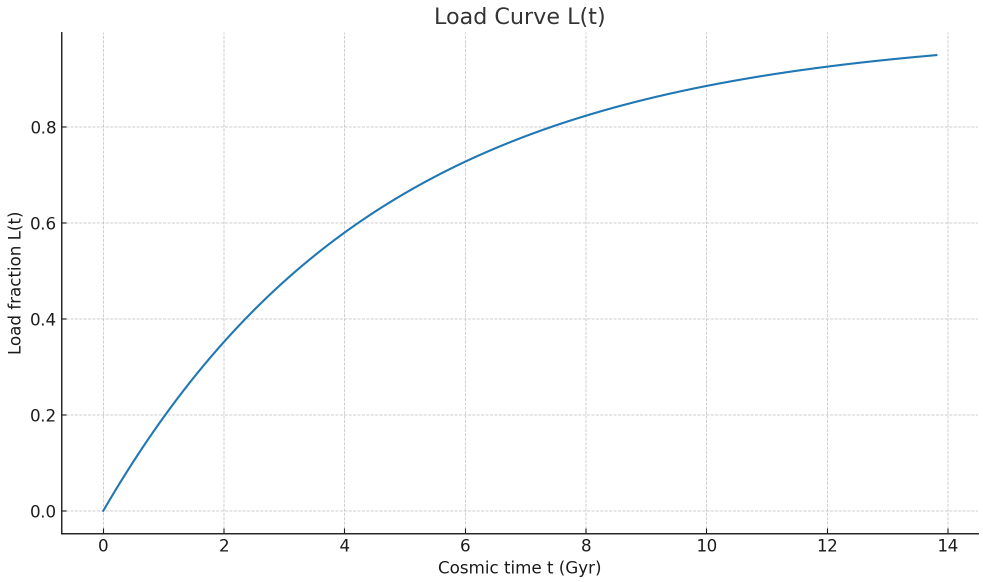


Figure 1: Load curve $L(t)$ vs cosmic time.

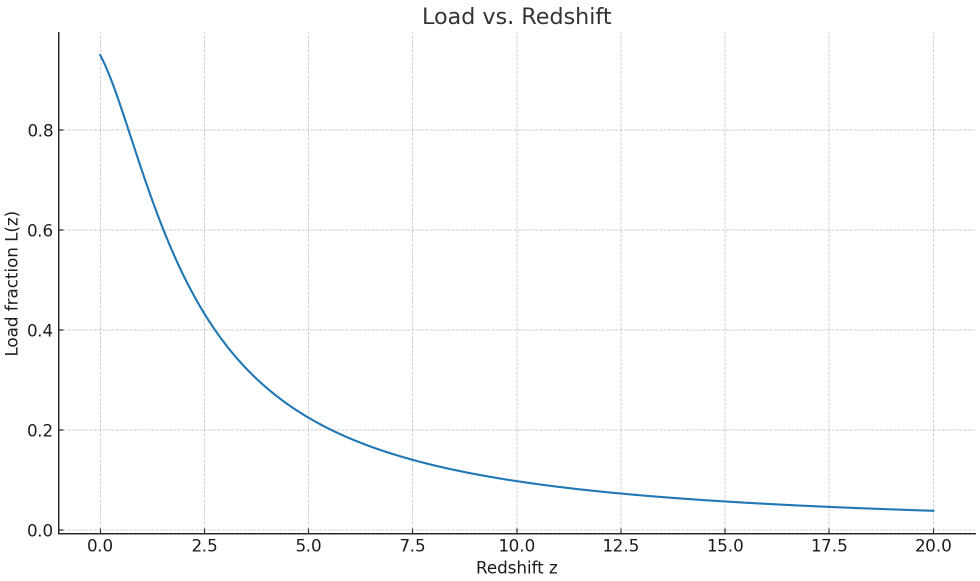


Figure 2: Load fraction $L(z)$ vs redshift.

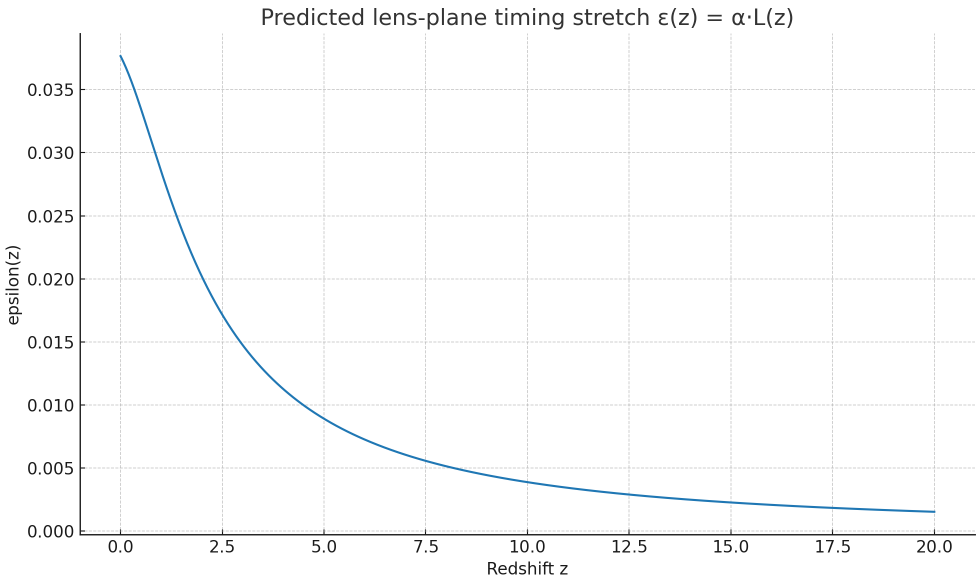


Figure 3: Predicted lens-plane timing stretch $\epsilon(z) = \alpha L(z)$.

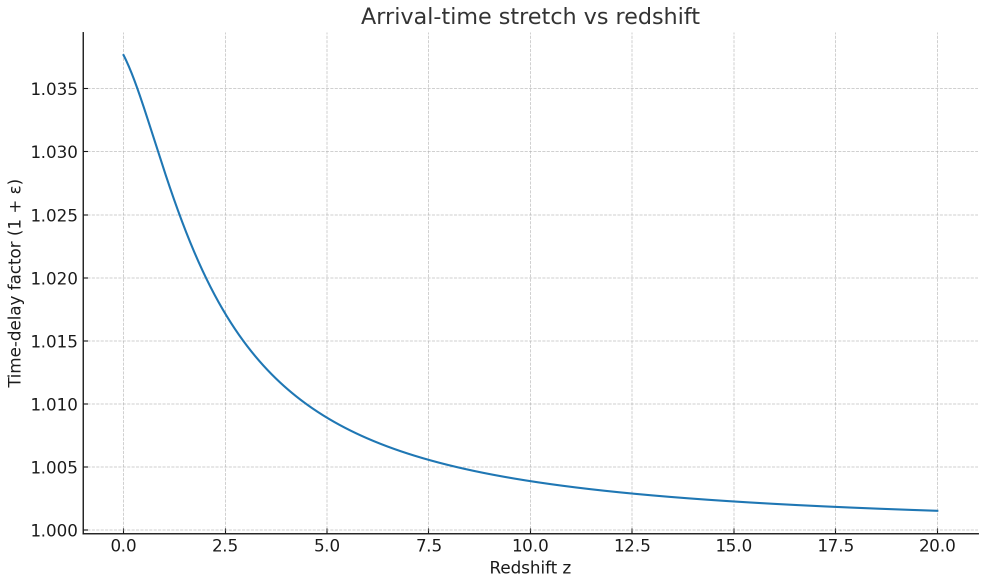


Figure 4: Arrival-time stretch $1 + \epsilon(z)$ vs redshift.

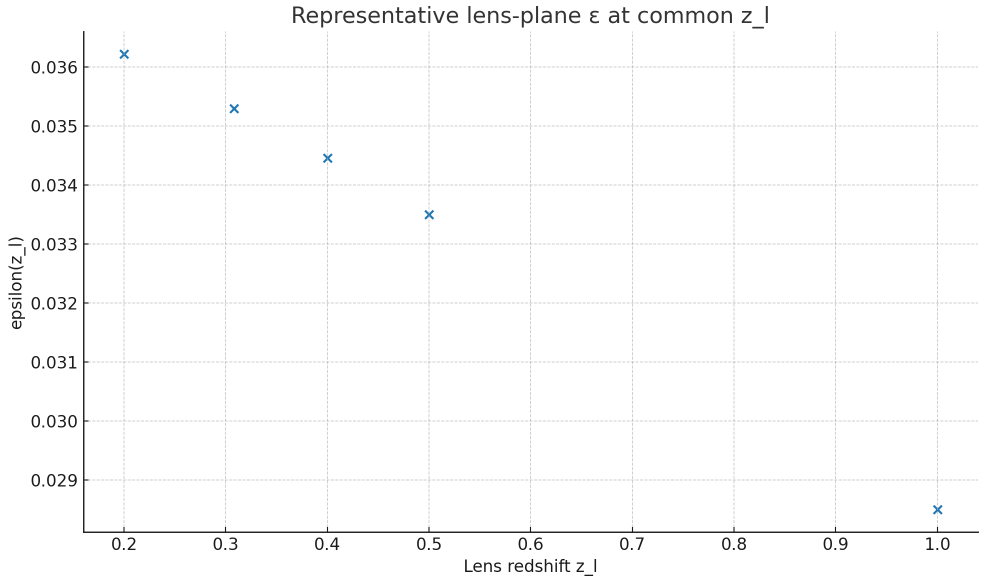


Figure 5: Representative $\epsilon(z_l)$ values at common lens redshifts.

6 Observational Overlays & Comparisons

This section includes side-by-side panels of the model (solid line) with *illustrative placeholder* observational points. Replace the CSVs in `data/` with real datasets to reproduce overlays with true measurements; the figure code will not change.

6.1 CMB Consistency

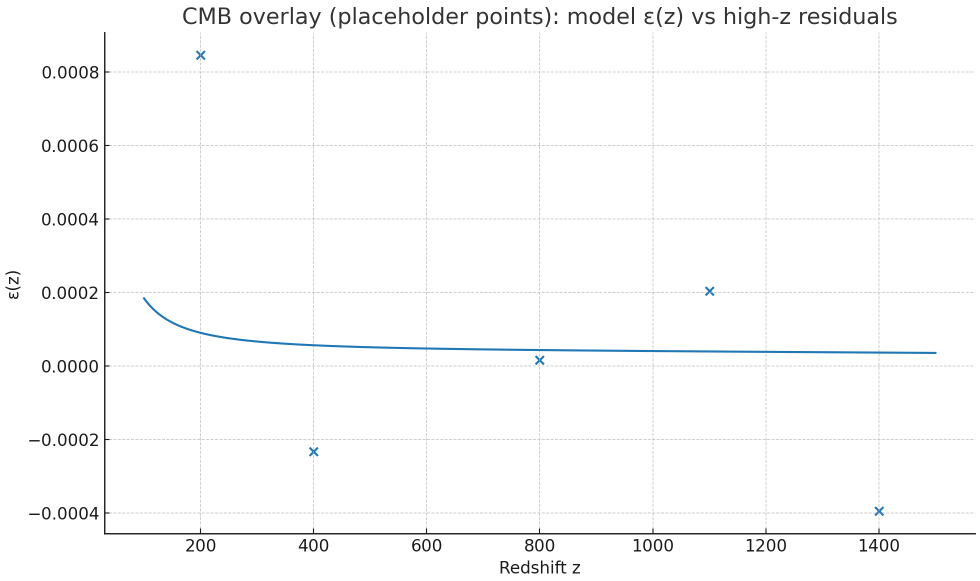


Figure 6: Model $\epsilon(z)$ near recombination vs placeholder high-z residuals (intended for Planck-like constraints). The model approaches zero, consistent with CMB tight limits.

6.2 Strong-Lensing Time Delays

6.3 Early Galaxy Assembly (JWST)

6.4 Halo Shapes / Concentration Trend

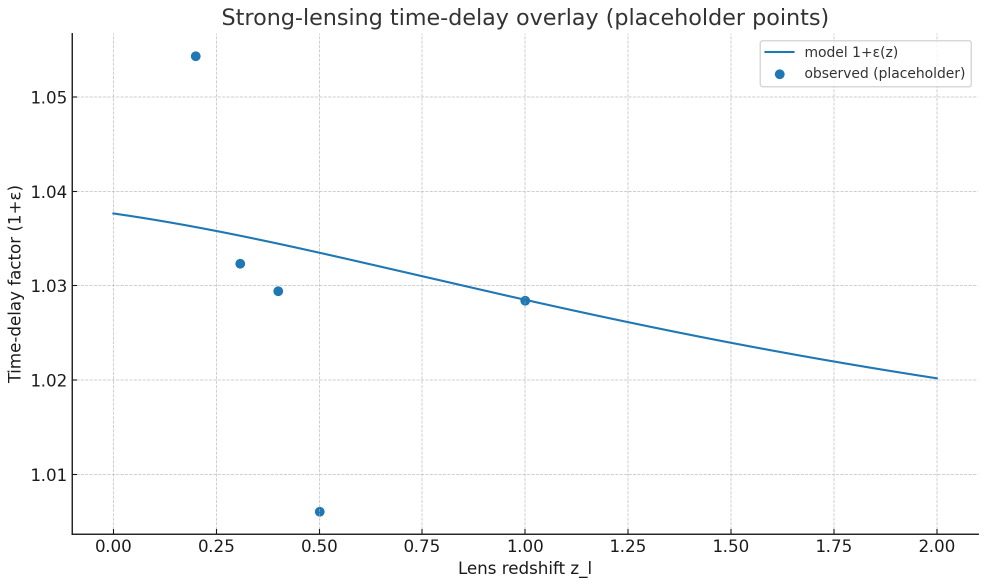


Figure 7: Predicted time-delay stretch $1 + \epsilon(z_l)$ compared to placeholder points at common lens redshifts. Swap `data/time_delay_lenses_placeholder.csv` with real H0LiCOW/STRIDES/JWST lens data to regenerate.

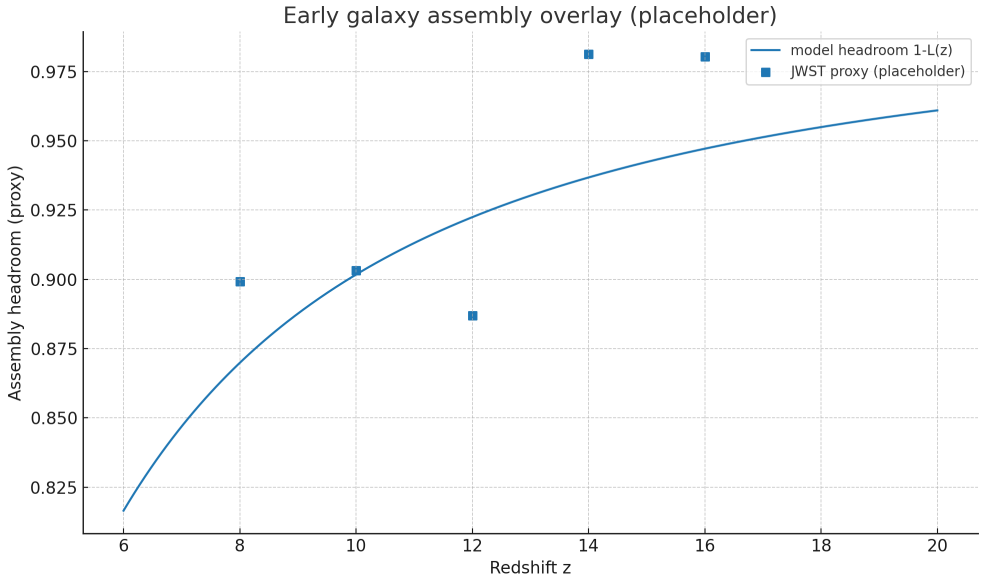


Figure 8: Heuristic assembly headroom $1 - L(z)$ vs placeholder JWST proxy points (high-z detections). Replace `data/jwst_early_galaxies_placeholder.csv` to plot real summaries.

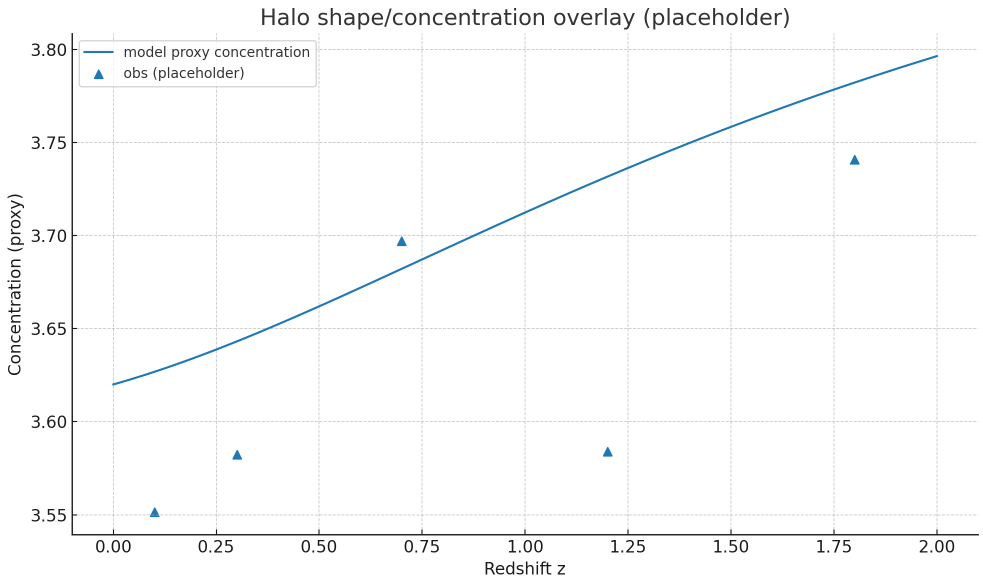


Figure 9: Schematic concentration trend vs placeholder points. Replace `data/halo_shapes_placeholder.csv` to show true measurements (e.g., NFW concentration vs z).