

Variable Light Speed and the s_0 / s_1 Entropic States

Morten Magnusson

November 20, 2025

Abstract

This paper explores the relationship between the speed of light and the two fundamental entropic states in Energy-Flow Cosmology (EFC): the ground state s_0 , and the active-flow state s_1 . We outline how light-speed is not a universal constant, but an emergent limit of information transfer set by the entropic gradient between these states. The transition from s_0 to s_1 defines the available degrees of freedom for energy, information, and curvature. This provides a thermodynamic interpretation of light-speed variability across different cosmic environments without invoking exotic physics.

1 Introduction

In the EFC framework, the speed of light is not a fixed ontological quantity, but the consequence of underlying thermodynamic structure. The fundamental entropic states, s_0 and s_1 , describe two regimes:

- s_0 : minimal entropy, low available degrees of freedom, near-ground energy configuration.
- s_1 : active-flow regime, increased entropy, structure formation, causal gradients.

The transition between these states defines the local information capacity and therefore the upper bound on propagation velocity. Thus, light-speed emerges as a constraint of the thermodynamic environment, rather than an independent constant.

2 The s_0 State: Low-Entropy Ground Configuration

The s_0 state corresponds to a high-coherence, low-entropy regime where:

- curvature is minimal,
- the energy-flow field is weak,
- information capacity is low,
- and degrees of freedom are constrained.

In this state, the effective speed of light approaches a maximum because the energy landscape is flat and minimally resistive. There is little entropic drag, and propagation is limited primarily by the intrinsic properties of the local energy grid.

3 The s_1 State: Active Entropic Flow

In contrast, the s_1 state is characterized by:

- increased entropy,
- active energy flow,
- structure formation,
- curvature and gradients,
- local increases in information density.

In this regime, the effective speed of light can decrease because information transfer experiences entropic resistance. The gradient between s_0 and s_1 defines the dynamic “capacity field” that shapes light-speed locally.

4 Variable Light Speed as an Entropic Phenomenon

Light-speed variability arises from differences in the s_0/s_1 balance:

$$c_{\text{eff}} = c_0 f(s_0, s_1) \quad (1)$$

where c_{eff} is the local effective light-speed, and $f(s_0, s_1)$ encodes the entropic structure of the region.

High s_1 regions—clusters, halos, active flow zones—exhibit reduced effective light-speed. Low s_1 , high s_0 regions—voids, underdense space—allow higher propagation limits.

This interpretation removes the need for exotic fields or variable-c modifications. Instead, light-speed becomes a natural emergent property of the thermodynamic landscape.

5 Implications for Cosmology

This model predicts:

- Light-speed anisotropy across large-scale structure.
- Redshift deviations without invoking expansion-based metrics.
- Natural alternatives to dark energy interpretation.
- Modified time-delay behaviour in lensing environments.
- Predictable light-speed variation across entropic gradients.

These effects follow directly from the s_0/s_1 distribution of the cosmic grid.

6 Conclusion

The speed of light emerges from the entropic structure of spacetime. The s_0/s_1 states define the local energy-flow environment, which in turn constrains the maximum rate of information propagation. This framework provides a unified, thermodynamic interpretation of variable light-speed consistent with the broader Energy-Flow Cosmology model.