Variable Light Speed and the s_0 / s_1 Entropic States

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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.

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 due to minimal entropic drag.

3 The s_1 State: Active Entropic Flow

The s_1 state is characterized by increased entropy, active energy flow, structure formation, curvature, and local increases in information density. Effective light-speed decreases due to entropic resistance.

4 Variable Light Speed as an Entropic Phenomenon

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

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

High-s_1 regions reduce c_{eff}; high-s_0 regions increase it. This produces a natural emergent model without exotic physics.

5 Implications for Cosmology

This framework predicts:

- Light-speed anisotropy across large-scale structure.
- Redshift deviations without expansion-only metrics.
- Natural alternatives to dark energy.
- Modified lensing time-delays.
- Predictable light-speed variation across entropic gradients.

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, shaping the maximum information propagation rate.