Filament Memory Drift Signatures in OFGcorV1

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Abstract

We investigate memory drift field effects on cosmic filament structure within the Oscillatory Field Genesis framework (OFGcorV1). Drift fields Φ and Θ induce anisotropic pressures that tighten filament alignments and introduce coherent phase shifts. We derive modifications to filament growth and predict observable anisotropic shear signatures and enhanced filament coherence. Surveys such as DESI, SDSS, and CMB-S4 may detect these subtle deviations, providing a new observational window into memory-structured spacetime.

1 Introduction

Cosmic filaments form the scaffolding of the universe's large-scale structure, channeling galaxy formation and shaping gravitational dynamics. In ΛCDM, filament growth is driven primarily by gravitational collapse along large-scale tidal fields.

Oscillatory Field Genesis (OFGcorV1) introduces memory drift fields (Φ, Θ) whose gradients exert anisotropic pressures along filament axes. These pressures subtly enhance filament coherence and imprint phase-locked lensing signals distinct from standard gravitational dynamics.

2 Filament Drift Dynamics

In OFGcorV1, filament overdensity evolution is modified:

$$\ddot{\delta}_{\text{filament}} + 2H\dot{\delta}_{\text{filament}} = 4\pi G\rho_m\delta_{\text{filament}} + \nabla_{\|}p_{\text{drift}}$$

where the drift pressure component is:

$$p^{\|}_{\text{drift}} \sim \lambda\nabla^{\|}\Phi\nabla^{\|}\Theta$$

Assuming slow-varying drift fields along filament spines, the drift-corrected filament growth factor becomes:

$$D_{\text{filament, OFG}}(t) \approx D_{\Lambda\text{CDM}}(t)\left(1 + \frac{2\lambda\epsilon_\Phi\epsilon_\Theta}{15\delta_0}\right)$$

Here δ_0 represents the initial filament overdensity, and ϵ_Φ, ϵ_Θ are small dimensionless drift rates.

3 Predicted Filament Modifications

The drift-induced corrections lead to:

- **Enhanced Spine Coherence**: Filament central spines become tighter and straighter.
- **Phase-Locked Shear Patterns**: Shear γ patterns align more closely with filament axes, deviating from random tidal alignments.

- **Anisotropic Lensing Signatures**: Small coherent enhancements in lensing convergence κ and shear γ along filament directions.

The relative enhancement in filament coherence is estimated as:

$$\Delta_{\text{coherence}} \sim \frac{2\lambda\epsilon_\Phi\epsilon_\Theta}{15\delta_0}$$

Typical values yield coherence increases at the 0.5% to 1% level.
Shear anisotropy deviation:

$$\Delta\gamma(\theta) \sim \epsilon_{\text{drift}} \cos(2\theta_{\text{filament}})$$

where $\epsilon_{\text{drift}} \sim 10^{-7} - 10^{-6}$, depending on filament strength and drift parameters.

4 Observational Prospects

Potential detection strategies include:

- Phase alignment analysis in DESI and SDSS filament maps.
- Lensing shear anisotropy studies around stacked filaments (e.g., CMB-S4 weak lensing).
- Cross-correlation of filament orientation with CMB lensing anisotropies.

Detection of coherent filament phase shifts would serve as a unique signature of memory drift fields shaping large-scale structure.

5 Conclusion

Memory drift fields in OFGcorV1 subtly but measurably modify filament growth and coherence. These deviations offer a powerful, independent test of memory-structured spacetime beyond void expansion effects.

Future survey analyses focused on filament spine coherence and anisotropic lensing patterns may uncover the silent breathing of cosmic memory across the web of galaxies.

"Across the silent threads, the memory of creation still hums."