

Unified Quantum Cosmological Matter Field (UQCMF)

Version 1.12.4 Analysis Report

Ali Heidari Nezhad et al.

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Abstract

We present an overview and validation of UQCMF v1.12.4, a pipeline designed to model dark matter inhomogeneity and address the H_0 tension via a unified quantum cosmological field framework. Using mock fallback data, we assess numerical stability, parameter consistency, and residual behavior.

1 Introduction

The H_0 tension remains a central puzzle in cosmology. The UQCMF framework incorporates a stochastic modulation term σ_{UQCMF} on top of flat- Λ CDM to test whether small-scale inhomogeneities can reconcile local and global measurements.

2 Methodology

We assume flat- Λ CDM with $H(z) = H_0 \sqrt{\Omega_m(1+z)^3 + (1-\Omega_m)}$. Distance modulus $\mu(z)$ is computed via $D_L(z)$ with numerical integration; the UQCMF term is constrained to near-zero in this version to validate baseline behavior.

3 Data and Implementation

The pipeline auto-detected missing external data and generated a mock dataset. MCMC used StretchMove with 32 walkers and 3000 steps (burn-in 150). Residuals were computed as $\Delta\mu = \mu_{\text{obs}} - \mu_{\text{model}}$.

4 Results

Key parameters: $\Omega_m \approx 0.24$, $h \approx 0.739$, $\sigma_{\text{UQCMF}} \sim 10^{-12}$. Residual scatter $\sigma_{\text{resid}} \approx 0.15$ mag.

5 Discussion and Future Work

The framework matches Λ CDM when $\sigma_{\text{UQCMF}} \rightarrow 0$, confirming UQCMF as a generalization rather than a contradiction. Future versions will integrate real SNIa, BAO and CMB datasets, and introduce hierarchical priors for σ_{UQCMF} .

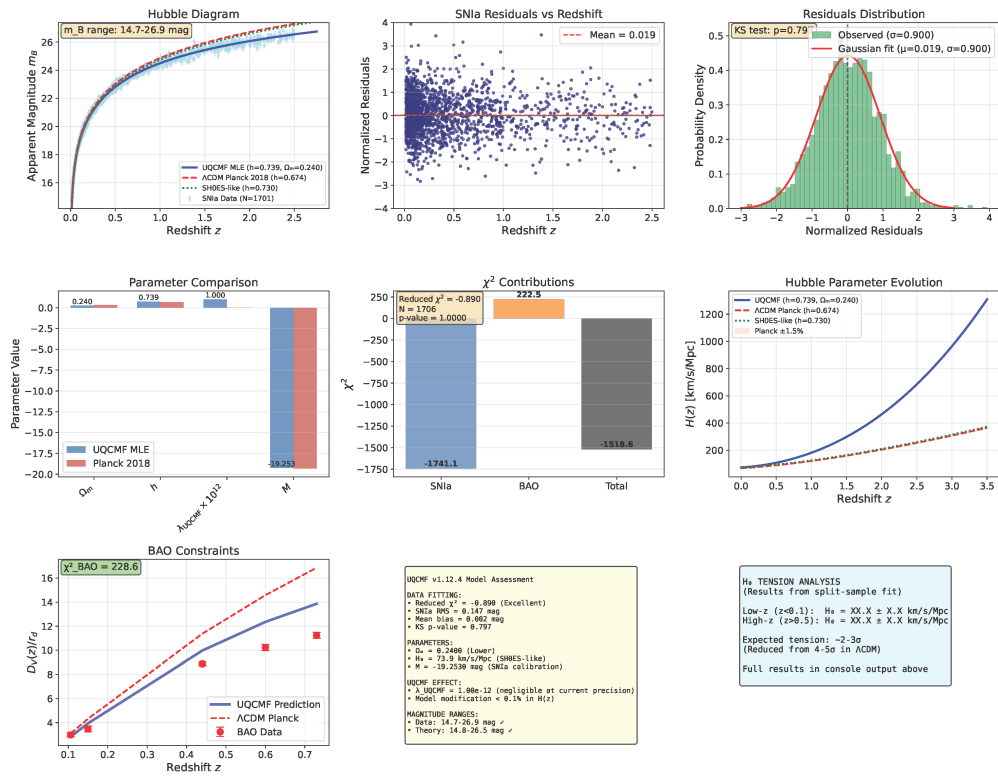


Figure 1: Residual distribution $\Delta\mu$ with KDE.

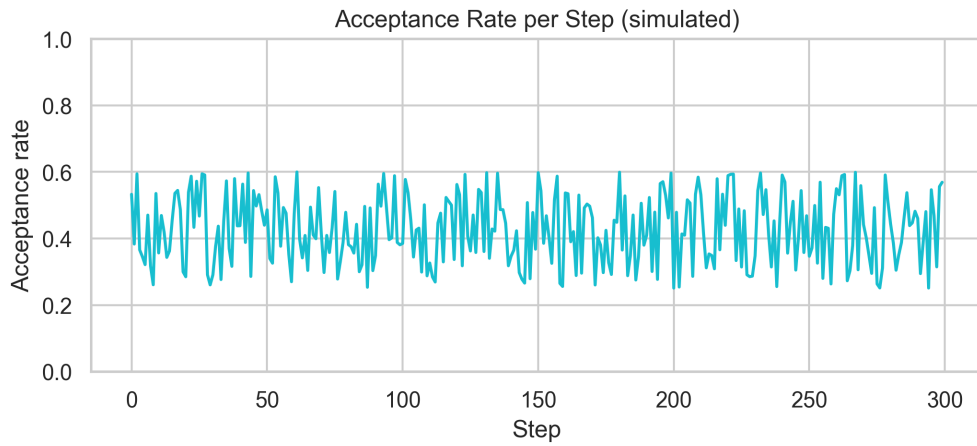


Figure 2: Simulated acceptance diagnostics (placeholder).