QGMF Cosmology: A Curvature-Based Model with Parity-Gated Dynamics

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Abstract

We present the Quantum Gravity Model Framework (QGMF), a curvature-resolved cosmological model that replaces ΛCDM's inflationary scaffolding and dark sector placeholders with gravitational geometry and parity-gated dynamics. The framework generates full-sky microwave anisotropies via shell projection through the Milky Way's curvature zone, reproduces solar motion asymmetries, and resolves binary evolution anomalies using minimal inserts. Predictions include BB-mode parity asymmetry, TE sign cadence, latitude-dependent amplitude scaling, and orbital period shifts in IMXBs. The model is falsifiable, reproducible, and cross-domain consistent.

1 Gravitational Geometry and Shell Projection

We define a metric–affine spacetime $(\mathcal{M}, g_{\mu\nu}, \Gamma^{\lambda}{}_{\mu\nu})$ with torsion

$$T^{\lambda}{}_{\mu\nu} = \Gamma^{\lambda}{}_{\mu\nu} - \Gamma^{\lambda}{}_{\nu\mu}, \tag{1}$$

and a shell Σ with radius R_s and angular thickness σ. The generator field is

$$M(x) = M_0 \exp\left[-\frac{d_\perp(x,\Sigma)^2}{2\sigma^2}\right]\left[1 + \alpha K(x) + \beta \mathcal{T}(x)\right], \tag{2}$$

where K is curvature, $\mathcal{T}$ is torsion, and $d_\perp$ is geodesic distance.

2 Line-of-Sight Projection

Temperature and polarization are computed via:

$$\Delta T(\hat{n}) = \int W_T(\lambda, \hat{n}) M(x(\lambda))\, d\lambda, \tag{3}$$

$$(Q \pm iU)(\hat{n}) = \int W_P(\lambda, \hat{n}) \Pi_\pm(x(\lambda))\, d\lambda. \tag{4}$$

3 Parity Metric

Define BB-mode parity asymmetry:

$$P_{B/E} = \frac{\sum_{\ell \le \ell_{\max}} (C_\ell^{BB} - C_\ell^{EE}|_{\text{odd}})}{\sum_{\ell \le \ell_{\max}} C_\ell^{BB}}. \tag{5}$$

4 Solar Analemma Modulation

The QGMF overlay reproduces the observed 80–20 lobe ratio and non-centered crossing:

$$x(t) = k\,\mathrm{EOT}(t) + A_0[1 + \beta_1 \sin M + \beta_2 \sin 2M] \sin(\lambda + \Delta t), \tag{6}$$

$$y(t) = \delta(t) + \lambda_1 \sin M + \lambda_2 \sin 2M - \gamma_1\, \mathrm{sgn}(\delta). \tag{7}$$

5 Binary Evolution Inserts

For an IMXB:

$$\frac{\dot{a}}{a} = 2\frac{\dot{J}_{\text{orb}}}{J_{\text{orb}}} - 2\frac{\dot{M}_1}{M_1} - 2\frac{\dot{M}_2}{M_2} + \frac{\dot{M}_1 + \dot{M}_2}{M_1 + M_2}, \tag{8}$$

with QGMF inserts:

$$\dot{J}_{\mathcal{P}} = \eta_{\mathcal{P}} \left(\frac{M_1 - M_2}{M_1 + M_2}\right) \Omega a^2 \Xi(q, e), \tag{9}$$

$$\dot{M}_2 \to \dot{M}_2 \exp(\kappa_1 \sin\Phi + \kappa_2 \sin 2\Phi), \tag{10}$$

$$\frac{dR_2}{dt} \to \frac{dR_2}{dt} - \gamma_{\mathcal{E}}\, \mathrm{sgn}(L_{\text{He}}). \tag{11}$$

6 Terminology: Parity-Gated Dynamics

Parity-Gated (adj.) — A system or interaction protocol in which physical outcomes are conditionally modulated by parity state, typically spatial inversion or phase asymmetry. In QGMF, parity-gated dynamics refer to evolution pathways where the system's configuration—such as mass asymmetry, orbital phase, or curvature orientation—acts as a gate that permits or suppresses specific outcomes.

Formally, if a system evolves under a dynamic operator $\mathcal{D}$, parity-gating modifies the evolution as:

$$\mathcal{D}_{\text{eff}} = \mathcal{D}_0 + \mathcal{P} \cdot \Delta\mathcal{D}$$

where $\mathcal{P} \in \{-1, +1\}$ is the parity state, $\mathcal{D}_0$ is the baseline evolution, and $\Delta\mathcal{D}$ is the parity-sensitive modulation.

Applications include:

- Angular momentum loss in binaries (e.g., PSR J1640+2224)
- Solar motion asymmetry (analemma lobe ratio and offset)
- BB-mode parity asymmetry in microwave shell projection
- Fifth-image anomalies in gravitational lensing

7 Predictions

- Latitude scaling: $A(|b|) \sim A_0 \sec(|b|/b_0) \exp[-(|b|/b_1)^2/2]$
- Peak spacing: $\Delta\ell \simeq \pi/(\sigma/R_s)$
- TE cadence: $\mathrm{sgn}(C_\ell^{TE})$ fixed by shell orientation
- BB parity: $P_{B/E} \neq 0$ aligned with shell axis
- Analemma: 80–20 lobe ratio, non-centered crossing
- Binary: Shift in P_{orb}–M_{WD} locus; eccentricity floor; systemic velocity imprint

8 Conclusion

QGMF replaces inflation and dark sector placeholders with gravitational geometry and field-synced dynamics. It matches observational traces across domains using minimal inserts and yields falsifiable predictions. The model is reproducible and ready for audit.