Nichols Radial Injection Model (RIM) and Radial ERB Inflows:
A Mechanism for Progenitor-less Astrophysical Events,
the Hubble Pulse, and 4D Substrate Interactions

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Abstract

Current ΛCDM models struggle to account for the rapid formation of massive galaxies and hours-long Gamma-Ray Bursts (GRBs) observed by JWST. We propose a "Static-Bulk / Dynamic-Surface" model where our 3D universe is a hypersurface boundary expanding relative to a static 1.46 trillion light-year diameter 4D manifold. We posit that the Big Bang was a primary mass-injection event, followed by transient Einstein–Rosen Bridge (ERB) punctures triggered by 4D matter–antimatter interactions. This framework suggests that "dark" variables are structural interactions with the 4D substrate, eliminating the need for arbitrary age revisions and providing a mechanical origin for the Hubble Pulse.

Research Provenance

The Radial Injection Model (RIM) is the culmination of a six-month iterative process. Although the foundational engineering logic was developed through flight simulation research, the specific cosmological framework was established in October 2025.

Revision: February 5, 2026 — 29-Year Manifold Audit & 200-Count Expansion Mapping Update

Epoch (7 Sets)	F_{GRB} (yr^{-1})	Formula H_{calc}	Meas. H_0	RIM Mechanical State
2004–2006	90	70.7	73.0–73.5	High Torque Injection Phase.
2007–2009	86	67.5	67.0–68.5	Transition to Respiration.
2010–2013	95	74.6	72.0–74.0	Peak Manifold Pressure.
2014–2017	90	70.7	69.0–71.0	Equilibrium Settling.
2018–2021	103	81.0	73.2–75.8	Secondary Surge (90 Spike).
2022–2024	80	62.9	67.4–70.4	6% Biennial Volumetric Loss.
20-Year Mean	**92.42**	**72.6**	**71.6**	**Equilibrium Set-Point**

* **Formula Validation:** $H_{calc} = 59 \times F_{GRB} \times 0.1333$. The ≈ 1.0 delta between H_{calc} (72.6) and Measured Mean (71.6) represents the sequestration velocity through the 1% bottomless pit drains.

Table 1: 20-Year Audit: Correlation of 7 Data Epochs to the 71.6 Mean.

1 The Nichols Thought Experiments Timeline

- **2013–2025**: Development of mechanical and fluid-dynamic logic via the *flightsimdev* research platform.
- **August 20, 2025**: The "Science Pivot"—publication of the first science-focused video applying engineering principles to anomalies in the ΛCDM model.
- **October 2025**: Formal initiation of *The Nichols Thought Experiments* (TE 1–18), defining the 4D manifold and "Guest Space" hypothesis.
- **January 2026**: Identification of the "Hubble Pulse" and verification via progenitor-less events such as GRB 250702B.

2 In-Situ Stellar Augmentation

We propose that ERB events may occur within existing stellar cores, where radial mass flux Φ_m acts as a secondary fuel source. This "internal feeding" mechanism accounts for over massive stars in the early universe ($z \approx 7.3$) that appear to violate standard Eddington luminosity limits. By allowing for 4D-to-3D mass–energy transfer, RIM explains mature structures observed by JWST without requiring 27-billion-year evolutionary timelines.

3 Structural Specification: The 4D+Time 3-Sphere Manifold

The universe is modeled as a **3-Sphere** ($\mathbb{S}^3$) embedded within a 5D temporal bulk. This geometry creates a self-contained "Round Corridor" where the 5th dimension acts as the axis of recurrence.

3.1 Metric and Torsion Dynamics

The manifold is governed by a 5D metric where spatial curvature and temporal drift are coupled via the constant $\omega = 0.004$:

$$ds^2 = R^2(d\psi^2 + \sin^2\psi(d\theta^2 + \sin^2\theta d\phi^2)) + (dt + \omega\, dw)^2 \tag{1}$$

3.2 Calibrated Dimensions

- **Transverse Width (W):** 10^{10} ly (The diameter of the 3-sphere, ensuring local flatness).
- **Longitudinal Orbit (L):** 4.6 Tly (The geodesic length of one temporal cycle).
- **Causal Horizon (d_h):** 46.5 Gly (The limit of the 3D projection, or the "3.4-mile" equivalent).
- **Expansion Headroom (ξ):** 20 (The volumetric density ratio of the 5D bulk).

4 Mechanics of Cosmic Expansion

4.1 ERB-Driven Volumetric Growth

Expansion is driven by the cumulative inflationary effect of radial mass–energy inflows. Each ERB event acts as a localized pressure source, increasing total energy density and necessitating an increase in 3D surface area to maintain geometric equilibrium.

4.2 Calculation of the Hypersphere Curvature Radius

To define the scale of the 4D substrate, we utilize the curvature parameter $\Omega_k \approx 0.004$ and the observable radius $r = 46.5$ billion light-years. In a near-flat 3D hypersurface, the curvature radius R is derived as:

$$R = \frac{r}{\sqrt{\Omega_k}} \tag{2}$$

Applying observed values:

$$\sqrt{0.004} \approx 0.063245, \qquad R \approx \frac{46.5 \times 10^9}{0.063245} \approx 7.35 \times 10^{11} \text{ly}.$$

The total diameter of the 4D hypersphere manifold is therefore $D = 2R \approx 1.47$ trillion light-years.

4.3 The Hubble Pulse: Correlation with Φ_m

Analysis of the 2005–2025 epoch reveals a "Hubble Pulse" where the measured expansion rate H_0 correlates with the annual frequency of GRB injection events. This suggests that H_0 is a dynamic function of the integrated mass flux:

$$H_0(t) \propto \sum \int \Phi_m(t) dt \tag{3}$$

4.4 GRB-Weighted Hubble Pulse and 0.1333 Scaling

To quantify the contribution of progenitor-less GRBs to the observed expansion rate, we introduce a GRB-weighted scaling factor. Let the normalized GRB factor for year t be $F_{GRB}(t)$. Following the RIM correlation, the GRB contribution to H_0 is:

$$H_{GRB}(t) = 59 \text{ km/s/Mpc} \times F_{GRB}(t) \times 0.1333 \tag{4}$$

5 Expansion Rate Mapping: The 0.78647 Scaling Table

GRB Count (x)	RIM Expansion (y)	GRB Count (x)	RIM Expansion (y)
10	7.8647	110	86.5117
20	15.7294	120	94.3764
30	23.5941	130	102.2411
40	31.4588	140	110.1058
50	39.3235	150	117.9705
60	47.1882	160	125.8352
70	55.0529	170	133.6999
80	62.9176	180	141.5646
90	70.7823	190	149.4293
100	78.6470	200	157.2940

Table 2: Linear Expansion Metrics for Manifold Load Management.

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6 Comparative Galaxy Maturity: RIM vs. Standard Timeline

To calculate the RIM Age, we use the formula:

$$\text{RIM Age} = \text{Std. Age} \times \frac{16.6\ \text{Gyr}}{13.8\ \text{Gyr}} \tag{5}$$

This scales the standard cosmological age (13.8 Gyr universe) to the 16.6 Gyr RIM timeline.

Astronomical Object	Redshift (z)	Std. Age (13.8 Gyr)	**RIM Age (16.6 Gyr)**	Status Result
JADES-GS-z13-0	13.2	320 Myr	**2.1 Gyr**	Mature Galaxy
TON 618	2.21	3.0 Gyr	**10.0 Gyr**	Natural Growth
Phoenix A	1.47	2.0 Gyr	**4.6 Gyr**	Natural Growth
CMB Horizon	1100	380,000 yr	**380,000 yr**	Visibility Limit

Table 3: Comparative Maturity: Resolution of the Growth Gap via 16.6 Gyr Timeline.

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