Spacetime Resistance VI
A Pinning Property for the Interior: Existence, Accounting, and the Path to Decoupling

David & Ara

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(expected to expand into a full thesis across subsequent revisions)

Abstract

Einstein's equations describe gravity through the geometry of a grid treated as spacetime. Once the vacuum exterior and standard interior matching are accepted, curvature singularities (or exotic matter/fields introduced to avoid them) become the default classical outcome. The present work supplies an explicit accounting entry—the spacetime resistance term—that registers a deflection cost once the exact interior Kretschmann scalar exceeds a fixed threshold. The term suppresses effective density in the high-curvature core, yields nonsingular interiors, preserves an exactly Schwarzschild exterior, and recovers pure-GR controls at low curvature. It is introduced in the continuum equations; any numerical realization must carry a discrete counterpart or it will not converge to the intended limit. Exterior measurements alone cannot distinguish whether the resistance is carried by the grid itself or is the net signature of external mechanisms acting on the grid. The two descriptions therefore remain coupled until a regime is identified in which the same resistance value produces different observable predictions for pinning energy or energy cost. This draft records the term as the current candidate that has held under the static-sequence and ringdown checks performed to date, states the sequencing (existence and validation before mechanism identification and decoupling), and reserves frame-dragging and dynamical-collapse results for later insertion. The construction is offered as the property required by any design that rejects the singular interior while still treating the grid as spacetime.

1 Introduction and historical opening

The singularity theorems and the standard Tolman–Oppenheimer–Volkoff interior imply that sufficiently compact configurations reach a curvature singularity or require additional exotic structure to remain regular. Einstein's introduction of further tensor terms can be read as an early attempt to supply an influence

capable of altering that interior without abandoning the field equations. When the price of the default solution became either a singularity or exotic matter, the logical opening was for a modification that acts at high curvature, leaves the exterior and low-curvature limits intact, and carries an explicit energy cost for further deflection.

The resistance term occupies that opening. It is not an optional phenomenological patch; it is the accounting entry that makes a nonsingular interior compatible with the continued identification of the grid as spacetime. Minus such a property the model remains inside the current interpretation: the exterior solution fixes the geometry and the interior follows the standard equations, including their singular endpoints.

2 The resistance term as continuum accounting

The working expression, already locked in Papers III–V, is

$$\rho_{\rm eff} = \frac{\rho}{1 + \beta K/K_{\rm crit}}, \tag{1}$$

where K is the exact interior Kretschmann scalar for a static spherical configuration and the pair $(\beta, K_{\rm crit})$ is held fixed. When $K \ll K_{\rm crit}$, $\rho_{\rm eff} \to \rho$ and the equations revert to the ordinary TOV system. Outside the star the expression reduces identically to the vacuum result, so the exterior geometry remains pure Schwarzschild. Pure-GR controls on the same integrator and tables recover the accepted literature maximum masses.

The term registers the net deflection cost and the pinning of the configuration. A tensor that merely reshapes the metric without opposing further deformation at an energy cost is still absorbable into the exterior description and does not yet constitute resistance. The resistance term is the entry that performs that opposition.

3 Empirical status under the locked parameters

With the published values $\beta = 1.05$, $K_{\rm crit} = 1.1 \times 10^{-2}$ (geometric units) the tabulated CompOSE SLy4 and APR4 sequences saturate near $7.3\,M_\odot$ and 24.6 km while pure-GR controls remain at the literature values ($\approx 2.05\,M_\odot$ and $\approx 2.19\,M_\odot$). Controlled-point diagnostics confirm the expected core suppression: at high central pressure the domain $K > K_{\rm crit}$ expands, $\rho_{\rm eff}/\rho$ drops, and the star supports a higher total mass at larger circumferential radius. These sequences are the direct output of the locked integrator; no additional free parameters are varied.

The same locked term has been confronted with public gravitational-wave data. The LVK GWTC-4.0 hierarchical posterior on remnant damping-time shift maps, under the curvature-dependent (sign-flipping) geometric factor, to an allowed step amplitude $\alpha \lesssim 200\,{\rm s}^{-1}$. Residual-energy statistics on the ten

loudest public events remain consistent with noise once amplitude and phase are free, confirming that an amplitude of this size is invisible to the lightweight observables employed. Constant (non-flipping) positive damping is excluded by the sign of the hierarchical shift.

4 Coupling, pinning, and the exterior-indistinguishability limit

From the exterior any additional structure that produces the same metric is absorbed into the geometry and is indistinguishable from an inherent property of the grid. The descriptions "resistance lives in the grid" and "resistance is the net effect of external mechanisms acting on the grid" therefore remain coupled under exterior measurements alone. The grid may function solely as a reporting mechanism; the exterior geometry looks identical either way.

Every grid, including the spacetime grid, must account for its pinning—the condition that holds the configuration in place and the energy required to deflect it further. Treating the grid as a medium that can be deflected, pinned, and tested makes the assignment of a resistance value the ordinary next step. Leaving the energy cost unaccounted for is inconsistent with calling the grid spacetime while rejecting the singular interior.

Decoupling becomes available only where the same resistance value generates different measurable predictions according to which carrier is assumed. A universal resistance term, once established as the combined signature of whatever acts on the grid, supplies a single reference object that can be carried across regimes. It does not itself perform the decoupling; it makes the subsequent separation well-defined.

5 Sequencing

The order of work is fixed by the logic above:

1. Produce valid mathematics that pins the spacetime grid and supplies an alternative to the singular interior. The resistance term is the current candidate and has held under the static and ringdown checks performed so far.

2. Demonstrate that the property carries a measurable energy cost and pinning that the standard interpretation does not already supply.

3. Once the property is validated and the resistance value is known, work backward to identify the mechanisms or additional properties that produce it.

4. Use that identification to decouple previously absorbed tensor contributions and to test for signatures that distinguish grid-as-cause from grid-as-reporter.

Existence and validation precede mechanism identification. The exterior-indistinguishability limit protects the coupling until a regime is located in which parallel versions (all other assumptions held fixed) diverge.

6 Reserved channels

Frame-dragging (first-order Hartle integration on the existing ρ_{eff} profiles) and dynamical collapse (pre-registered protocol of Paper IV Appendix D, fixed K_{crit} first) are in progress on the locked backgrounds. Their quantitative outcomes will be inserted in subsequent revisions. No claims are made for them here.

7 Relation to a broader conjecture

A separate, explicitly labeled conjecture—that the discrete grid itself might generate a resistance-like effect—has been examined and is not supported by the tests performed. Standard geometric discretizations recover the continuum operator plus vanishing truncation error; they supply no signal that forces the addition of a resistance term. The project itself requires only the narrower claim: the term is present in the continuum equations, and any numerical method solving those equations must carry a discrete realization of it. The broader conjecture may remain on record as a dated speculation; it is not required for the results reported here.

8 Outlook

The draft establishes the resistance term as the pinning property that keeps the interior from running to a singularity while matching exterior GR. It treats the ultimate carrier as unknown, carries the term as the net accounting entry, and sets the program of assigning values and searching for decoupling signatures. Later revisions will incorporate the frame-dragging and dynamical results, any NICER-compatible re-tuning of the numerical pair if external radius constraints are given priority, and the first concrete searches for regimes in which the coupled descriptions diverge. The notes already in hand supply the constraints any such construction must satisfy and the order in which the steps must proceed.