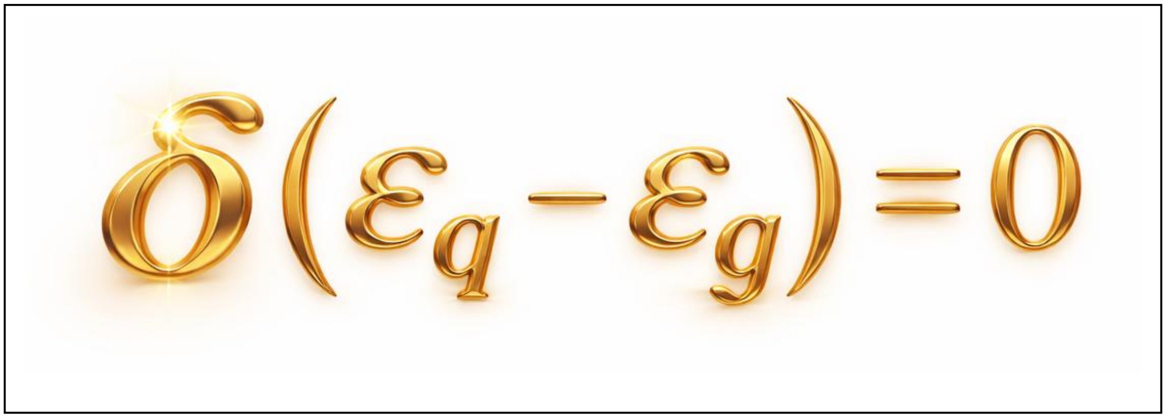
δ(εq − εg) = 0


ΔΩCt


Δ → ΩCt → Θ

Effective Dynamical Closure Between Basal Rupture and Historical Coherence (HDC–CBC/ΔΩc_t)

Central Documents of the Hypothesis:

Introduction α to the Correlational Disequilibrium Hypothesis (HDC–CBC/α)
Prologue — Introduction
Zenodo: https://doi.org/10.5281/zenodo.18206012

Correlational Disequilibrium Hypothesis (HDC–CBC)
Part One — Classical, Geometric and Cosmological Framework
Zenodo: https://doi.org/10.5281/zenodo.17559051

Quantum Extension of the Correlational Disequilibrium Hypothesis (HDC–CBC/Q)
Part Two — Quantum Framework
Zenodo: https://doi.org/10.5281/zenodo.17683173

Relativistic Extension of the Correlational Disequilibrium Hypothesis (HDC–CBC/R)
Part Three — Relativistic Framework
Zenodo: https://doi.org/10.5281/zenodo.17762262

Perturbative Module of the Correlational Disequilibrium Hypothesis (HDC–CBC/P)
Part Four — Perturbations
Zenodo: https://doi.org/10.5281/zenodo.17839095

Tensorial Extension of the Correlational Disequilibrium Hypothesis (HDC–CBC/T)
Part Five — Tensorial Extension
Zenodo: https://doi.org/10.5281/zenodo.17987410

Observational Module of the Correlational Disequilibrium Hypothesis (HDC–CBC/O)
Part Six — Observational Predictions
Zenodo: https://doi.org/10.5281/zenodo.18000439

Numerical Module of the Correlational Disequilibrium Hypothesis (HDC–CBC/N)
Part Seven — Numerical Module
Zenodo: https://doi.org/10.5281/zenodo.18068474

Ω Synthesis and CBCt Extension of the Correlational Disequilibrium Hypothesis (HDC–CBC/Ω)
Part Eight — Synthesis
Zenodo: https://doi.org/10.5281/zenodo.18138687

Complementary Documents (SSIP) of the Hypothesis:

Indirect Structural Inference I (HDC-CBC/I)
SSIP Vol. 1 — Indirect Structural Inference
Zenodo: https://doi.org/10.5281/zenodo.18369592

The Greater Cosmos (HDC-CBC/CM)
SSIP Vol. 2 — Basal State and Ontological Closure
Zenodo: https://doi.org/10.5281/zenodo.18672588

ER = ERP: An Effective Geometric Interpretation (HDC-CBC/ER)
SSIP Vol. 3 — Effective Geometric Interpretation
Zenodo: https://doi.org/10.5281/zenodo.18672813

Structural Classification of Correlations (HDC-CBC/Ib)
SSIP Vol. 4 — Physically Admissible Correlations
Zenodo: https://doi.org/10.5281/zenodo.19135405

Correlational Index, historical admissibility and executable domain of Ct(a) (HDC-CBC/Ic)
SSIP Vol 5 — Correlational Index
Zenodo: https://doi.org/10.5281/zenodo.19629623

Final Trilogy of the Hypothesis:

Dynamic Rupture of Correlational Equilibrium (HDC-CBC/Δ)
Part Nine — Dynamic Rupture
Zenodo: https://doi.org/10.5281/zenodo.19253051

ΩCt Synthesis and ΩCt/N Module of the Correlational Disequilibrium Hypothesis (HDC-CBC/ΩCt)
Part Ten — Dynamic Synthesis of CBC
Zenodo: https://doi.org/10.5281/zenodo.19399692

Effective Dynamical Closure Between Basal Rupture and Historical Coherence (HDC-CBC/ΔΩCt)
Part Eleven — Dinámical Synthesis of CBC Part Two
Zenodo: https://doi.org/10.5281/zenodo.19730888

Asymptotic Limit of Projectability and Return to the Basal Domain (HDC-CBC/Θ)
Part Twelve — Asymptotic Limit
Zenodo: https://doi.org/10.5281/zenodo.17

ΩCt/N & ΔΩc_tN Executable Reviewer-Ready Pipelines for the HDC–CBC/ ΩCt-ΔΩCt Framework
Reviewer Ready — Pipelines
Zenodo: https://doi.org/10.5281/zenodo.19393376 https://doi.org/10.5281/zenodo.19730391

Safe Creative 2511083627292, 2511153700115, 2511223766461, 2511293876695, 2512063948710, 2512134011503, 2512204077798, 2601034174729, 2601104229601, 2601254363484, 2602154570835, 2602154570897, 2603205033286, 2603275093456, 2604035155674, 2604175306066,2604245380606,

Jordi Audet Palau
Independent Researcher (Barcelona, 2025-2026)

Preface of the Author — HDC–CBC/$\Delta\Omega c_t$

The present volume, **HDC–CBC/$\Delta\Omega c_t$**, occupies a precise position within the global architecture of the HDC–CBC framework.
It does not introduce a new ontology, does not modify the fundamental correlational principle, and does not add fields, constants, or local degrees of freedom to the system. Its purpose is narrower, but also more demanding: **to make explicit the effective dynamical bridge between the basal rupture developed in Δ and the historical coherence promoted in Ωc_t**, within the broader structural continuity linking the basal domain, correlational instability, and projected evolution.

The previous volumes of the corpus had already established the essential elements of the program.
Δ showed that the state of maximal basal coherence cannot remain variationally inert under minimal relaxation: the emergence of the projected regime is not contingent, but structurally necessary.
Ωc_t, for its part, took the next step by promoting correlational coherence from a rigid effective magnitude to a historical one, allowing the observable universe to be described as a trajectory in correlational space rather than as a single static realization of the framework.

However, an open question remained between those two moments.
If **Δ** explains why projection must arise, and **Ωc_t** describes how coherence may evolve once the projected regime is present, it was still necessary to clarify more precisely **how the passage from one structure to the other is internally articulated**.
Put differently: it remained to be made explicit, within the corpus's own language, in what sense basal instability and correlational history could be read as two expressions of a single effective logic.

That is the purpose of this volume.

HDC–CBC/$\Delta\Omega c_t$ should not be understood as an interpretive supplement to the program or as a second-level SSIP. Nor does it seek to replace **Δ** or **Ωc_t**. Its function is more specific: **to propose a minimal, internal, and coherent dynamical closure of the transition Δ → Ωc_t**, using only ingredients already present in the corpus, in particular the action language of the correlational sector, the logic of minimal relaxation, and the historical structure of the projected FLRW regime.

The underlying thesis of this work is deliberately sober.
It is not claimed here that the correlational sector has been completely derived in an ultimate microphysical sense, nor that the program has already reached full numerical or observational completeness. The corpus itself continues to recognize open tasks on those fronts.
What is claimed is something more precise and, for that very reason, more solid: **that the passage from Δ to Ωc_t admits a minimal effective closure that reduces historical arbitrariness, reinforces the internal continuity of the framework, and increases its falsifiable content without any ontological proliferation**.

The volume begins from a central idea: the basal functional employed in **Δ** can be reinterpreted, in the homogeneous pre-geometric limit, as the effective shadow of the correlational potential already present in the action. From there, a first-order gradient-type relaxation appears not as an ornamental choice, but as the most conservative realization compatible with the structure of the corpus.
Under this reading, correlational history ceases to appear as a merely convenient parametrization and comes to be understood as an effective trajectory constrained by the model's own architecture.

From this perspective, **ΔΩ**$\mathbf{c_t}$ fulfills a function of internal stabilization within the final dynamical block.
If **CM** delimits the basal domain, **Δ** responds to the problem of emergence, and **Θ** to the problem of the asymptotic limit of projectability, this volume is situated between them as the piece that most clearly makes explicit the effective continuity between basal rupture and historical correlational evolution.
It does not add a fourth moment to the program: **it densifies and strengthens the second**, making the internal dynamical arc of the framework more explicit.

The reader will not find here a complete rewriting of the preceding volumes. Nor will they find a claim of total closure. What they will find, instead, is an effort to make one of the most delicate transitions in the HDC–CBC framework more rigorous, more legible, and more defensible: the transition that links the structural necessity of projection with its minimal historical formulation.

It is in that spirit that this work is presented:
not as a lateral expansion of the corpus,
but as a **piece of internal dynamical continuity**, intended to reinforce the passage between two of its most decisive volumes and to make more explicit the effective continuity between the basal domain and projected history.

GENERAL INDEX HDC–CBC/$\Delta\Omega c_t$

(Effective Dynamical Closure Between Basal Rupture and Historical Coherence in the Hypothesis of Correlational Disequilibrium and the Correlated Bubble-Cosmos)

Appendix B. Minimal operational implementation of $\Delta\Omega c_t N$

OFFICIAL USER MANUAL — $\Delta\Omega c_t N$ V3

Together with this preprint, we release $\Delta\Omega c_t N$ V3, a trajectory-enabled correlational closure pipeline for the HDC–CBC/$\Delta\Omega c_t$ framework. The package preserves the ΩCt/N benchmark layer while adding explicit historical trajectory controls for the correlational index. The pipeline is not a full Boltzmann solver or a final Bayesian inference engine; it is intended as a reviewer-ready structural validation environment based on reproducible sweeps, trajectory tests, proxy-level diagnostics and rupture-sector identification.

Effective Dynamical Closure Between Basal Rupture and Historical Coherence (HDC–CBC/$\Delta\Omega c_t$)

Por Jordi Audet Palau (Barcelona April the 24th of 2026)

"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress and giving birth to evolution."

Albert Einstein

1. Introduction

The HDC–CBC program has progressively developed from a structural correlational principle into a multisector framework including quantum, relativistic, perturbative, tensorial, observational, and numerical components [1–10]. Within that architecture, two volumes play a decisive role in the issue addressed here.

First, **Δ** establishes that maximal basal coherence cannot remain variationally inert under minimal relaxation: the projected regime must emerge. Second, **Ωc_t** promotes correlational coherence from a rigid effective magnitude to a historical one, turning the observable universe into a trajectory in correlational space rather than a single static realization. The relevant dimensionless quantity is the historical coherence index,

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega},$$

where C_Ω denotes the rigid reference coherence used in Ω and $C_t(a)$ its historical extension.

This step is conceptually powerful, but it immediately invites a criticism: if the history $C_t(a)$ is introduced only phenomenologically, is the model not simply replacing a rigid parameter with a free function?

The present work addresses that question in the most conservative way possible. It does not aim at a UV completion of the correlational sector, it does not claim to eliminate all open questions regarding the microscopic status of the framework, and it does not maintain that Ωc_t has already been numerically established as the unique viable realization of HDC–CBC.

Instead, the objective is more precise: to show that the transition from **Δ** to **Ωc_t** admits a minimal effective closure, internal to the corpus and based on ingredients already present in the action, in the logic of basal relaxation, and in the projected FLRW sector.

The main theses of this article are:

1. In the homogeneous pre-geometric limit, the basal functional used in **Δ** can be read as

$$E_b(C) = -V_{\text{eff}}(C),$$

where $V_{\text{eff}}(C)$ is the effective correlational potential already present in the action-based description.

2. A first-order gradient-type relaxation law is not introduced arbitrarily, but selected as the most conservative effective closure compatible with the one-dimensional configuration of **Δ** and the non-proliferation principle of **Ωc_t**.

3. Under a minimal mapping between structural relaxation and cosmological history, one obtains an effective historical equation for $C_t(a)$ and, therefore, a non-trivial running for $I_c(a)$.

4. The current constant-I_c sweeps of **ΩCt/N** can be reinterpreted as a zeroth-order operational sampling of that space of trajectories, rather than as the final form of the theory.

That is already enough to substantially strengthen the framework. It does not turn the program into a completed one, but it does make it sharper and more restrictive: correlational history ceases to appear as an open freedom and becomes formulated as an effective restriction on the space of admissible trajectories.

2. Structural position of the problem within the corpus

The basal program of HDC–CBC begins with the correlational variational principle

$$\delta(\varepsilon_q - \varepsilon_g) = 0,$$

which is not an ordinary equation of motion, but a structural condition of stationarity relating the pre-geometric correlational domain to the projected geometric regime [1,5].

In the rigid synthesis **Ω**, coherence is treated as a global effective degree of freedom fixed at the most austere level required to close the framework. **Ωc_t** revisits that decision and asks whether coherence can remain static throughout the whole cosmological history. Its answer is negative: coherence can be promoted, in a controlled way, to a historical magnitude without changing the ontology of the theory, the action, or the number of local fields [2,5].

The resulting move is important, but subtle. **Ωc_t** does not constitute a new theory; it is an extension of the space of solutions within the same structural program. The corpus itself insists on this point: no new local degrees of freedom are introduced, and the historical extension is meant to contract, not arbitrarily enlarge, the space of admissible trajectories [2,5].

At the same time, the broader HDC–CBC corpus remains explicit in acknowledging that the program still has pending tasks at the level of microphysical grounding, statistical derivation, and full numerical validation [1]. Any formulation that overstates the present result as a final microscopic closure would unnecessarily weaken its position.

For that reason, the present work adopts the strongest defensible formulation: the contribution proposed here is not a definitive microphysics of the correlational sector, but an **effective dynamical closure** of the $\Delta \to \Omega c_t$ bridge within the existing corpus. Under this reading, the historical promotion of coherence ceases to appear as an open phenomenological freedom and comes to be understood as an internal restriction on the space of physically admissible trajectories.

3. From the action to the basal functional

3.1 The correlational sector in the projected regime

In the relativistic and quantum sectors of HDC–CBC, the correlational contribution is written through an effective action of the form

$$S = \int d^4x \sqrt{-g}\left[\frac{M_{\rm Pl}^2}{2}R + P(C,X) + \mathcal{J}(C,T) + \mathcal{L}_m\right],$$

with

$$X = -\frac{1}{2}\nabla_\mu C \nabla^\mu C, P(C,X) = K(X) - V(C),$$

where $V(C)$ is the correlational potential and $\mathcal{J}(C,T)$encodes the effective correlational coupling to the projected sector [3,4].

The exact detailed realization of K, V, and the interaction term may vary among equivalent effective formulations of the framework, but one structural point remains stable: **the potential sector $V(C)$already belongs to the action language of the corpus** [3,4]. This is decisive for the present work, because it allows the historical projected regime to be connected with the basal domain without introducing any new functional from outside the formalism.

In other words, the problem is not to invent a new ad hoc basal energy, but to identify how the already existing correlational potential must be read when the geometric description has not yet emerged as an effective physical regime.

3.2 Homogeneous pre-geometric limit

To connect this with **Δ**, consider the limiting regime in which geometry does not yet constitute a projected physical description. In that basal regime:

- no space-time gradients are physically resolved,
- the geometric term is not treated as an active projected degree of freedom,
- the coupling to matter is absent as an operative sector,
- and the correlational state is represented by a single effective scalar variable C.

In that limit, $X \to 0$, and the surviving scalar contribution reduces to the potential term. Up to irrelevant additive constants and overall sign conventions, the corresponding basal functional is naturally read as

$$E_b(C) = -V_{\text{eff}}(C).$$

This is exactly the identification required to insert the **Δ** program into the action language of the corpus. It does not require adding a new basal functional by hand or introducing an energy independent of the correlational sector already known. What it establishes is something both more sober and stronger: **the basal functional of Δ can be understood as the homogeneous pre-geometric shadow of the correlational potential already present in the action**.

This reinterpretation serves a double purpose. On the one hand, it integrates the basal block within the same variational framework that organizes the projected regime. On the other, it immediately reduces the arbitrariness objection: the passage between both levels ceases to depend on a conceptual juxtaposition and instead rests on an internal effective continuity.

3.3 Consequence for basal stability

Suppose now that $V_{\text{eff}}(C)$ has a local minimum at a reference coherence state C_*. Then, by construction, $E_b(C)$ has a local maximum there:

$$E_b''(C_*) = -V_{\text{eff}}''(C_*) < 0.$$

This reproduces, in the language of effective action, the logic of basal instability emphasized in **Δ**: maximal or reference coherence does not constitute a stable endpoint of minimal relaxation, but rather the point from which departure becomes structurally unavoidable.

The conclusion is important. The unstable sign of the basal configuration no longer appears as a condition imposed from a separate analysis, but as the direct translation of the relation between the basal functional and the effective correlational potential. Under this reading, the same potential language can organize both the basal and the projected descriptions, and the transition between them ceases to be a mere interpretive leap.

This still does not by itself provide the full historical law. But it does establish the first necessary bridge of the volume: the basal block of **Δ** and the projected block of **Ωc_t** can be read as two regimes of a single effective structure.

4. Selection of the minimal historical closure

4.1 What is claimed and what is not claimed

At this point, it might be tempting to state that the microscopic law of correlational history has now been fully derived. Such a formulation would be excessive and would unnecessarily weaken the real scope of the work.

What the corpus allows one to sustain more solidly is something narrower:

- **Δ** works in a one-dimensional pre-geometric domain subject to minimal relaxation.
- **Ωc$_t$** introduces a minimal effective law of evolution for historical coherence.
- the non-proliferation principle prevents the addition of new local sectors solely to produce history,
- and the projected regime already contains a correlational background degree of freedom whose admissible trajectories must remain restricted by stability and continuity with **Ω** [2,3,5].

Therefore, the strongest defensible formulation here is not that the microscopic law has been uniquely demonstrated, but rather this: **the most conservative effective closure compatible with Δ and Ωc$_t$ is a first-order gradient-type relaxation law**.

4.2 Minimal gradient-type relaxation

Let τ be the structural relaxation parameter of the one-dimensional basal description. Then the minimal closure takes the form

$$\frac{dC}{d\tau} = -\Gamma(C),$$

where $\Gamma(C)$ is a relaxation functional that is positive definite on the physically appropriate branch.

If one further adopts the minimal potential-driven realization,

$$\Gamma(C) = \frac{dE_+}{dC},$$

where E_+denotes the relaxation functional compatible with the selected branch, then, using the identification

$$E_b(C) = -V_{\text{eff}}(C),$$

one obtains, up to branch-dependent sign conventions,

$$\frac{dC}{d\tau} \propto -V'_{\text{eff}}(C).$$

In the simplest choice of convention, this may be written as

$$\frac{dC}{d\tau} = +V'_{\text{eff}}(C),$$

or, equivalently,

$$\frac{dC}{d\tau} = -\frac{dE_b}{dC}.$$

The precise sign depends on whether τ is defined as increasing toward lower or toward higher coherence. But the physical content does not change: the trajectory is governed by the gradient of the effective potential, and basal relaxation ceases to be an external postulate and becomes the minimal realization compatible with the language of the corpus itself.

4.3 Why first order?

A first-order law is not selected here out of aesthetic preference, but by the criterion of minimal structure. It is chosen because it is the most austere way of encoding simultaneously:

- monotonic relaxation,
- absence of oscillatory basal dynamics in the one-dimensional configuration of **Δ**,
- absence of a momentum sector treated as fundamental in the pre-geometric regime,
- and exact continuity with the program of **Ωc**$_t$, which formulates historical coherence through a first-order effective law in $\ln a$[2].

A second-order basal law would introduce, at this stage, a stronger hypothesis than the framework requires. Under this reading, the first-order gradient flow is not an arbitrary simplification, but the minimal way in which the transition **Δ** → **Ωc**$_t$ can be written without adding unnecessary dynamical structure.

5. Relating structural relaxation to cosmological history

5.1 Minimal historical identification

Ωc$_t$ has as its conceptual core the promotion of correlational coherence to a historical magnitude. In the projected regime, the most natural temporal parameter for describing that history is not simply cosmic time t, but the variable $\ln a$, which directly encodes the accumulated evolution of the expansion. If the goal is to connect the structural relaxation of the basal domain with effective cosmological dynamics, the minimal closure therefore requires a monotonic mapping between the relaxation parameter $\tau$and the history of expansion.

The most conservative form of that mapping is

$$\tau = -\kappa \ln\, a + \tau_0,$$

with $\kappa > 0$.

This expression must be understood as a minimal historical identification, not as a definitive microscopic law. Its function is to allow the basal relaxation process to be translated into a well-defined cosmological variable within the projected FLRW regime. Under this reading, $\tau$is not a new physical time nor an additional coordinate: it is simply the structural parameter whose effective evolution is re-expressed in terms of cosmological history.

In the simplest FLRW normalization, and adopting the same convention used throughout the draft motivating this work, one may take

$$\kappa = 3.$$

This value should not be overinterpreted as a unique microscopic invariant. Its status here is strictly effective: it corresponds to the most natural normalization for a problem of homogeneous and isotropic expansion and is consistent with the appearance of the friction term $3H$in standard scalar cosmological dynamics. What matters is not the isolated value of the coefficient, but the fact that the mapping between structural relaxation and cosmological history can be written in a monotonic, minimal, and projected-sector-compatible way.

Under this identification, historical evolution ceases to be an external phenomenological addition and comes instead to be read as the cosmological re-expression of a relaxation already implicit in the basal domain. This is the decisive step: the history of coherence is not introduced from outside the framework, but emerges as the simplest projected form of a prior structural dynamics.

5.2 Effective historical equation

From the identification above, the derivative with respect to cosmological history may be written as

$$\frac{d}{d\ln\, a} = -\kappa\,\frac{d}{d\tau}.$$

Substituting this relation into the minimal relaxation law,

$$\frac{dC}{d\tau} = -\Gamma(C),$$

one immediately obtains the general historical form

$$\frac{dC}{d\ln\, a} = -\kappa\,\Gamma(C).$$

This is the basic expression of the effective dynamical closure: historical coherence no longer appears as a free function, but as the solution of a first-order evolution equation governed by the same relaxation logic that structures the basal domain.

If one further adopts the minimal potential-driven realization,

$$\Gamma(C) = V'_{\text{eff}}(C),$$

then the historical equation takes the form

$$\frac{dC}{d\ln\, a} = -\kappa\, V'_{\text{eff}}(C).$$

In the simplest normalization, $\kappa = 3$, this leads to

$$\boxed{\frac{dC}{d\ln\, a} = -3\, V'_{\text{eff}}(C)}$$

as the minimal effective historical closure.

This equation must be read carefully. It is not presented here as a full UV theorem of the correlational sector nor as a closed microscopic derivation. Its strength lies precisely in something more sober: it constitutes the most conservative, internal, and coherent realization of the bridge $\Delta \to \Omega c_t$ within the language already available in the corpus.

Its physical meaning is also clear. Once the effective potential is fixed, correlational history is no longer arbitrary: it becomes constrained by the local structure of $V_{\text{eff}}(C)$, by the choice of branch, and by the condition of continuity with the rigid version of $\boldsymbol{\Omega}$. Under this reading, the projected regime is not parametrized from outside, but generated by a minimal effective dynamics inheriting its form from the basal sector.

Put differently, the result of this chapter is not yet a final microphysics of correlational time. It is something more precise and more useful at the current stage of the program: an effective historical law that turns the promotion of coherence into an internal restriction on the space of admissible trajectories.

6. Linearized running of the historical coherence index

6.1 Expansion around a reference coherence state

Let C_{ref}be the reference value around which the historical branch is reconstructed. In a sufficiently small neighborhood of that state, the effective potential may be linearized through the expansion

$$V_{\text{eff}}(C) = V_{\text{eff}}(C_{\text{ref}}) + \frac{1}{2}\,\mu_{\text{eff}}^2 (C - C_{\text{ref}})^2 + \cdots$$

with

$$\mu_{\text{eff}}^2 \equiv V''_{\text{eff}}(C_{\text{ref}}) > 0.$$

In that local regime,

$$V'_{\text{eff}}(C) \simeq \mu_{\text{eff}}^2 (C - C_{\text{ref}}),$$

and the effective historical equation obtained in the previous section reduces to

$$\frac{dC}{d\ln\, a} = -3\mu_{\text{eff}}^2 (C - C_{\text{ref}}).$$

This expression shows that, at least to first approximation, correlational history is governed by an exponential relaxation law in $\ln a$, controlled by a single effective curvature scale. The important point here is not only the formal simplicity of the equation, but the fact that the evolution ceases to depend on an arbitrary functional choice and becomes fixed by the local structure of the potential.

The corresponding solution is

$$C(a) = C_{\text{ref}} + \Delta C_0\, a^{-3\mu_{\text{eff}}^2},$$

where $\Delta C_0$is the branch amplitude fixed by initial conditions or by matching with the reference regime.

6.2 Induced running for $I_c(a)$

Using the definition

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega},$$

and taking C_Ω as the rigid reference inherited from **Ω**, one obtains, in the same linear regime,

$$I_c(a) \simeq I_{c,0}\, a^{-3\mu_{\rm eff}^2},$$

up to the sign convention associated with the branch and the chosen normalization.

If, instead of normalizing with respect to the rigid reference of **Ω**, one adopts a present-time normalization, the same result may equivalently be written as

$$I_c(a) \propto a^{-3\mu_{\rm eff}^2} - 1.$$

Both expressions encode the same physical content: once historical coherence is admitted, the correlational index ceases to be fundamentally constant and begins to describe an effective trajectory with running.

This point deserves emphasis. The result does not yet imply that the initial amplitude or the local curvature of the potential are fixed without ambiguity by the framework. But it does imply something more important at this stage of the program: **the functional form of the index is no longer free**. The passage from a constant scan value to a history constrained by the effective curvature of the potential represents, by itself, a clear gain in structure and falsifiability.

6.3 What is scientifically gained from this

This is one of the most relevant results of the volume. Before the present closure, the correlational index could be read operationally as a useful parameter for exploring regions of solution space. After this development, it can be read as the observable projection of a historical trajectory governed by a minimal effective law.

The difference is not merely formal. It means that the analysis no longer organizes itself only around pointwise values of I_c, but around families of histories. This modifies the physical status of the problem: one is no longer asking only which constant value of the index yields an acceptable cosmology, but which complete historical trajectories remain within the domain of regular projectability and joint structural consistency.

In that sense, the linearized running does not yet constitute a final solution of the correlational sector, but it does mark a decisive methodological transition: it shifts the framework from phenomenological scan freedom toward a first form of effective historical restriction.

7. Reinterpretation of the constant-I_c sweeps of ΩCt/N

7.1 What the pipeline currently does

ΩCt/N currently implements, in its paper-faithful configuration, constant-I_c sweeps in *quick* mode in order to delimit an operational viability window and its rupture boundaries. The manual and **Ωc$_t$** itself are explicit on this point: this is an experimental implementation of structural consistency, not a full Boltzmann integrator nor a definitive Bayesian pipeline.

The relevant reference points are:

- **PLANCK**: $I_c = -0.044$
- **ICCUB**: $I_c = +0.016$
- **SH0ES**: $I_c = +0.036$
- **break−**: $I_c = -0.068$(first rupture through BAO)
- **break+**: $I_c = +0.051$(first rupture through WL)

These values should not be interpreted as a complete physical history of the correlational sector, but as operational realizations useful for mapping the region of minimal stability of the model.

7.2 New interpretation

In light of the present closure, these constant-I_c points must be reinterpreted as **operational samples of the space of trajectories**, rather than as the fundamental microscopic law of the historical sector.

In other words:

- the constant-I_c sweep remains a conservative zeroth-order approximation,
- it continues to be useful for locating admissible windows and rupture hierarchies,
- but it becomes subordinate to a more general historical law,

$$\frac{dC}{d\ln\ a} = -3V'_{\text{eff}}(C),$$

of which the constant case should be understood as an operational limit or simplified approximation.

Under this new reading, the value of the classical sweep does not disappear. On the contrary, it becomes methodologically clearer: it provides the reference pattern against which the historical trajectories generated by the dynamical mode must be compared. The constant sweep thus ceases to occupy the fundamental level of the correlational sector and comes to function as a benchmark of the space of histories.

7.3 Meaning of the rupture boundaries

The natural temptation would be to identify **break−** and **break+** with exact formal degeneracies of the projective map $\pi(C)$. That hypothesis is plausible as a conceptual guide, but the present state of the corpus requires a more cautious formulation.

The safest claim is the following: the rupture boundaries found by **ΩCt/N** can be interpreted as the first operational approximation to the loss of regular projectability, or equivalently as the points at which a historical trajectory ceases to be compatible with simultaneous structural and observational consistency.

This reformulation matters because it avoids overstating an exact analytical derivation of the values -0.068 and $+0.051$ from first principles which the framework does not yet establish numerically. At the same time, it gives them a clearer physical meaning: they are no longer merely scan numbers, but markers of the effective edge of the domain of admissible cosmological histories.

Under this reading, the negative side of correlational space tends to fail first through the **BAO** channel, while the positive side fails first through the **WL** channel. This suggests that historical trajectories do not degrade the projected regime in an undifferentiated way, but according to a structural hierarchy of observables. Accordingly, the boundaries of the classical sweep may be read as the simplest static version of a deeper geometry of the space of trajectories.

8. Operational implementation of $\Delta\Omega c_t$ in ΩCt/N

The next natural step no longer consists simply in suggesting a possible future update of **ΩCt/N**, but in clarifying how its function must now be understood in light of **$\Delta\Omega c_t$**. From this point of view, the pipeline ceases to be only a tool for sweeping constant-I_c realizations and becomes the operational environment in which **complete correlational histories** can be tested.

The sweeps of the classical paper,

$$I_c = \text{const},$$

do not disappear and are not invalidated. They retain their value as a conservative operational reference, as a comparison benchmark, and as a first cartography of rupture boundaries. But they should no longer be read as the fundamental form of the historical sector. They must instead be understood as a **zeroth-order approximation** within a wider space of admissible trajectories.

The minimal formulation introduced in this volume requires that the pipeline explicitly admit a trajectory-based mode. In that mode, the historical evolution of the correlational sector is obtained by solving the effective law

$$\frac{dC}{d\ln\, a} = -3V'_{\text{eff}}(C),$$

from a choice of effective potential and a branch condition. The resulting history is then translated into a history for the correlational index,

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega},$$

and this trajectory is passed through the same structural validation chain already implemented in **ΩCt/N**: cosmological background, growth, potentials, ISW, lensing, and tensor sector.

8.1 Continuity with the classical sweep

The update does not imply an abrupt replacement of the classical scheme. On the contrary, the constant-I_c sweep must be preserved as:

1. a reference configuration for reproducing the original paper;
2. an operational limit in which historical running is negligible;
3. a baseline pattern against which the new family of trajectories can be compared.

Under this reading, the pipeline comes to contain two complementary levels: a **benchmark mode**, in which constant-I_c sweeps are preserved, and a **trajectory mode**, in which the correlational index emerges from an effective history $C_t(a)$.

8.2 Minimal realization of trajectory mode

The minimal and most conservative realization consists in adopting a quadratic neighborhood for the effective potential,

$$V_{\text{eff}}(C) = \frac{\lambda_{\text{eff}}}{2}(C - C_*)^2,$$

where λ_{eff} parametrizes the effective local curvature of correlational history. In that case, the historical equation admits an explicit solution of the form

$$C_t(a) = C_* + (C_0 - C_*)a^{-3\lambda_{\text{eff}}},$$

and the induced correlational index takes, in the same linear approximation, the form

$$I_c(a) \simeq I_{c,0}\, a^{-3\lambda_{\text{eff}}},$$

up to branch and normalization conventions.

This minimal realization does not yet claim to fix the ultimate microscopic form of $V_{\text{eff}}(C)$. Its function is more modest and more useful: to provide the first numerically testable implementation of the historical closure proposed in this work.

8.3 Minimal validation program

Validation of the new trajectory mode must be organized at three levels.

Minimal running test.
Use the linearized law

$$I_c(a) \simeq I_{c,0}\, a^{-3\lambda_{\text{eff}}},$$

and check whether that history reproduces, on average, the operational region already mapped by the classical sweep.

Potential-level reconstruction.
Explicitly integrate the historical ODE for a given effective potential and compare the resulting trajectories with the classical anchors of the $I_c = \text{const}$sweep.

Multisector falsification.
Require simultaneous compatibility between background history, structural growth, ISW/lensing consistency, GW/EM tensor proxies, and the order of appearance of the rupture boundaries.

If a historical trajectory fails systematically under this cross-check, the proposed closure is falsified in that region of the space of histories. If, on the contrary, it survives robustly, then $\mathbf{\Omega c_t}$ gains genuine physical content beyond the rigid case of $\mathbf{\Omega}$.

8.4 Physical meaning of the update

The main consequence of this update is that **ΩCt/N** ceases to be only a tool for exploring fixed values of the correlational index and becomes a laboratory of the physical domain of admissible histories.

With this, the HDC–CBC framework gains a decisive property: correlational history is no longer presented as an open phenomenological freedom, but as a trajectory subject to internal restrictions, numerical discrimination, and minimal observational falsification. This is precisely the shift sought in the present work: not a cosmology already closed at every level, but a cosmology that is less arbitrary, more selective, and more testable.

9. Discussion

This work should be read as a paper of consolidation and effective structural closure, not as a triumphalist declaration or as a claim of final microphysical completeness.

Its contribution does not consist in asserting that HDC–CBC has now been "completed," but in showing that one of the most important objections directed at the dynamical block of the framework can be answered more precisely, more internally, and more rigorously than before.

Before this closure, one could maintain that:

- $C_t(a)$ was simply a historical function introduced phenomenologically,
- I_c acted only as an operational scan parameter,
- the passage between the basal instability of **Δ** and the historical coherence of **Ωc$_t$** remained at a partially heuristic level,
- and the dynamical promotion of coherence was still vulnerable to the objection of excessive functional freedom.

After the development presented in this volume, the stronger formulation becomes another one.

First, the basal functional used in **Δ** can be integrated into the action language through the identification

$$E_b(C) = -V_{\text{eff}}(C),$$

so that basal instability no longer appears as an isolated construction, but comes to be understood as the homogeneous pre-geometric projection of the same potential sector that organizes the projected regime.

Second, correlational history can be written through a minimal gradient-type relaxation law, compatible both with the one-dimensional character of the basal domain and with the non-proliferation principle adopted in **Ωc$_t$**. Under the minimal historical identification between structural relaxation and cosmological expansion, that law takes the effective form

$$\frac{dC}{d\ln a} = -3V'_{\text{eff}}(C),$$

and turns historical coherence into a restricted trajectory rather than an arbitrary freedom.

Third, the correlational index ceases to be merely a static exploratory value and comes to be interpreted as a historical magnitude with effective running, fixed by the local structure of the potential and by the selected branch. In that context, the constant-I_c sweeps of **ΩCt/N** must be reinterpreted as a conservative zeroth-order operational approximation to a wider space of physically discriminable historical trajectories.

That constitutes a real strengthening of the framework.

Several fronts nevertheless remain open, and it is important to keep them explicitly delimited. The following remain pending:

- the ultimate microscopic status of $V_{\text{eff}}(C)$,
- the explicit statistical or quantum derivation of the effective potential from the basal correlational network,
- the full numerical reconstruction of historical trajectories beyond the constant scan,
- and precision confrontation with data through an extended implementation of **ΩCt/N**.

But these are precisely the fronts that the corpus itself recognizes as open tasks. A good paper does not attempt to hide them or compensate for them with rhetoric. It uses them to fix with exactness what the real scope of the result is.

Read in this way, the present work does not close the HDC–CBC program. It does something more useful at this stage: it reduces the margin of historical arbitrariness and shifts the dynamical block from a formulation vulnerable to the objection of phenomenological freedom toward a formulation of internal effective restriction.

That shift, by itself, already justifies the volume.

10. Effective structural closure from the basal domain

The effective dynamical bridge proposed in this volume connects the basal rupture of **Δ** with the historical coherence of **Ωc$_t$** using only ingredients already present in the correlational action, in the basal functional, and in the SSIP **CM**. In doing so, the work not only reinforces the internal continuity of the framework, but also allows the formulation of a **minimal effective structural closure** of the full flow linking the non-geometric basal domain to projected history.

This volume does not claim to have completed an ultimate UV microphysical derivation of the correlational sector. Its contribution remains at the effective level. However, it does make it possible to propose a globally continuous scheme that is internally consistent and compatible with the complete architecture of the HDC–CBC program.

10.1 Basal structure in the Greater Cosmos

The basal domain described in **CM** corresponds to a state of maximal global coherence that is not projectable, characterized by an irreducible correlational network without local space-time structure. Formally, it may be represented as a space of coherences C, whose internal organization is governed by the degree of correlation. At this level, the only physically relevant variable is the global coherence C, and the variational stability of the basal state is governed by the energy functional

$$E_b(C).$$

The decisive point is that this domain does not yet constitute a geometry, a cosmology, or a latent space-time. It is a non-projected basal state whose function is to provide the minimal structural reference from which the later emergence of the geometric regime can be understood.

10.2 Basal rupture as a structural transition

The contribution of **Δ** consists in showing that this state of maximal coherence cannot remain variationally neutral under minimal relaxation. Mathematically, the local instability condition is expressed as

$$\frac{d^2 E_b}{dC^2} |_{C=C_*} < 0,$$

where C_* denotes the state of maximal coherence.

With this, the basal maximum ceases to act as a stable fixed point and instead behaves as a structurally unstable configuration under relaxation. The projected regime therefore does not appear as an added hypothesis or as a transition imposed from outside, but as the minimal consequence of the loss of stability of the basal domain.

10.3 Effective generation of the correlational potential

The decisive step of the present volume is to show that, in a *coarse-graining* limit from the basal domain of **CM** toward the projected FLRW regime, the basal functional can be directly related to an effective correlational potential through the identification

$$E_b(C) = -V_{\text{eff}}(C) + \text{const.}$$

This relation should not be understood as an arbitrary redefinition, but as the minimal way in which the basal functional can be projected into the action language of the emergent regime. Under this reading, the effective potential is not introduced from outside: it appears as the projected expression of the same correlational structure that organized the basal state.

A minimal realization consistent with the corpus is given by the quadratic form

$$V_{\text{eff}}(C) = \frac{\lambda_{\text{eff}}}{2}(C - C_*)^2,$$

where $\lambda_{\text{eff}} > 0$ represents an effective curvature emerging from the projection process.

10.4 Minimal relaxation and historical law

Under the identification above, the minimal relaxation of the one-dimensional basal regime takes the most conservative gradient form,

$$\frac{dC}{d\tau} = -\frac{dE_b}{dC} = V'_{\text{eff}}(C),$$

where $\tau$is the structural relaxation parameter.

The next step is to translate this relaxation into projected cosmological history. Under a minimal and monotonic identification between structural relaxation and expansion,

$$\tau = -3\ln\, a + \tau_0,$$

one obtains the effective historical equation

$$\frac{dC}{d\ln\, a} = -3V'_{\text{eff}}(C).$$

This result condenses the main thesis of the volume: correlational history need not be introduced as a free function, but can instead be read as the historical projection of an effective basal relaxation.

10.5 Minimal solution and continuity with Ω

For the quadratic realization of the potential, the historical equation admits an explicit solution,

$$C_t(a) = C_* + (C_0 - C_*)a^{-3\lambda_{\text{eff}}},$$

which induces an effective running of the correlational index and recovers the rigid limit of **Ω** when

$$\lambda_{\text{eff}} \to 0.$$

This point is fundamental. It means that the dynamical promotion of coherence does not break continuity with the previous framework, but rather contains it as the limit of negligible running. The classical regime of **Ω** is not replaced, but reinterpreted as the limiting case of a more general family of historical trajectories.

10.6 Sign of the index and branch structure

The correlational index is defined as

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega}.$$

Its sign expresses the relative deviation of historical coherence with respect to the rigid reference C_Ω. Accordingly, the sign of I_c indicates whether the historical trajectory lies above or below that reference.

The **correlational branch** $\sigma_c(a)$, by contrast, does not simply coincide with the sign of I_c. Its function is to encode the effective sign with which the correlational contribution enters the equations of the projected regime. Consequently:

- the sign of I_c indicates the **relative position** of the history with respect to C_Ω;
- the branch σ_c indicates the **effective orientation** of the correlational contribution in the projected dynamics.

Both signs may be related in simple realizations, but they must not be identified without qualification. This distinction is physically important, because it explains why the historical space is not organized only by the value of the index, but also by the effective orientation of the trajectory. In observational terms, that orientation directly affects structural growth, the shift of H_0^{eff}, and the hierarchy of rupture of the observables.

10.7 Meaning of the closure

The global result of this chapter may be summarized in a simple way. The framework now possesses a complete effective continuity between

$$CM \;\rightarrow\; \Delta \;\rightarrow\; V_{\mathrm{eff}}(C) \;\rightarrow\; C_t(a) \;\rightarrow\; I_c(a).$$

This continuity introduces no new fields, constants, local degrees of freedom, or ontological proliferation. Nor does it yet amount to a final microphysics of the correlational sector. But it does provide something decisive at the current stage of the program: a **minimal, rigorous, and coherent effective structural closure**, capable of connecting the basal state, the rupture of stability, and projected history within a single architecture.

The explicit statistical or quantum derivation of $V_{\mathrm{eff}}(C)$ from the basal correlational network remains an open task for future work. Nevertheless, the dynamical block of the framework no longer presents itself as a mere juxtaposition of levels, but as an effective continuous sequence.

That is the deep meaning of the present chapter: not to definitively close the HDC–CBC program, but to make explicit the internal continuity that allows cosmological history to be understood as the effective prolongation of basal rupture.

11. Immediate physical scope of the $\Delta \rightarrow \Omega c_t$ closure

The result obtained in this work should not be read only as a formal clarification of the passage between **Δ** and $\mathbf{\Omega c_t}$, but as a reordering of the physical status of correlational history within the HDC–CBC framework. From this closure onward, the evolution of coherence no longer occupies the place of an auxiliary freedom and instead becomes integrated as an effective restriction on the space of admissible histories.

This gain is conceptually important. In the previous formulation, the use of constant-I_c sweeps made it possible to explore operational regions of the model and to locate observational rupture boundaries, but it still left open the objection that correlational history could be understood as an external phenomenological choice. The present work changes that starting point: it shows that, within the already existing architecture of the corpus, there exists a minimal, internal, and coherent route for interpreting that history as the dynamical prolongation of basal relaxation.

In that sense, the main value of this closure does not lie in having completed a final microphysics of the correlational sector, but in having changed the kind of question the framework is able to formulate. One is no longer asking only which effective values of I_c are compatible with a stable cosmology, but which complete historical trajectories remain within the domain of regular projectability. With this, the analysis ceases to be organized around isolated configurations and instead becomes organized around families of physically discriminable histories.

This has a direct methodological consequence. If correlational history is subjected to a minimal effective law, then the solution space of the model no longer expands and instead begins to contract. Some trajectories will remain compatible with the background, growth, potentials, and tensor sector; others will not. The hypothesis thus gains a decisive property for any framework that aspires to be physically serious: the ability to discard histories, not merely to accommodate them.

Under this reading, the role of **ΩCt/N** acquires a new relevance. The pipeline must no longer be understood only as a tool for mapping constant realizations of the correlational index, but as the natural environment in which to test whether the dynamical promotion of coherence generates executable, structurally sound, and observationally admissible histories. The future update of the pipeline is therefore not a technical appendix alien to the paper, but the immediate experimental continuation of its central thesis.

The immediate physical scope of the present result may be summarized as follows:

1. The historical correlational sector ceases to be merely parametric and becomes dynamically constrained.
2. The bridge between the basal domain and the projected regime is formulated as effective continuity rather than conceptual juxtaposition.

3. The space of admissible cosmological histories becomes, in principle, classifiable and falsifiable.
4. The HDC–CBC program gains a concrete path from static sweeps to historical reconstructions.

None of this yet amounts to a definitive microscopic derivation. But it does establish something more urgent at the present stage of the framework: correlational history can no longer be treated as an indifferent freedom. From this point onward, it must be justified by its stability, by its structural consistency, and by its ability to survive numerical confrontation.

That is, ultimately, the most immediate contribution of this work: **not to close the program, but to force it to become more selective.**

12. Operational translation of the $\Delta\Omega c_t$ closure into the new pipeline

The effective dynamical closure proposed in this work does not exhaust its significance at the formal level. Its value also depends on whether it can be translated into a numerical infrastructure capable of testing complete correlational histories rather than only static configurations of the historical index. It is at this point that the pipeline update becomes relevant.

The classical **ΩCt/N** pipeline was conceived as an experimental tool of structural consistency and minimal observational compatibility. Its main function was to sweep constant-I_c realizations, identify operational anchors, locate rupture boundaries, and determine which regions of parameter space remained executable within the $\mathbf{\Omega c_t}$ framework. That role remains fully valid. However, once the $\mathbf{\Delta\Omega c_t}$ closure has been formulated, that scheme no longer occupies the fundamental level of historical analysis.

The reason is straightforward. If correlational history can be written as an effective trajectory derived from a minimal relaxation law, then the pipeline can no longer be restricted to studying fixed values of I_c. It must move on to studying **complete histories** $I_c(a)$, generated from an evolution of $C_t(a)$ and tested through the same structural validation chain. Under this reading, the pipeline ceases to be merely a sweep tool and becomes the operational environment in which one decides which trajectories genuinely belong to the physical domain of the projected regime.

This need has motivated the transition from the classical **ΩCt/N** scheme toward an updated family of implementations, designated at this stage as $\mathbf{\Delta\Omega c_t}$**N V1** and $\mathbf{\Delta\Omega c_t}$**N V1 Chat**. Their function is not to replace the previous pipeline abruptly, but to extend it in a controlled way so that it can operate on two complementary levels: a **reference level**, which preserves constant-I_c sweeps as a benchmark and baseline comparison pattern, and a **historical level**, in which the correlational index is no longer introduced as a fixed value but is instead constructed from an effective trajectory $C_t(a)$.

The importance of this update is not merely technical. It changes the kind of question the framework can ask. The classical pipeline asked which values of $I_c$produced an acceptable cosmology. The updated pipeline asks something stronger: **which complete correlational histories produce executable universes, and which do not**. This difference shifts the analysis from pointwise configurations toward families of physically discriminable trajectories and makes the central thesis of $\mathbf{\Delta\Omega c_t}$ operational: correlational history ceases to be an auxiliary freedom and becomes an effective restriction on the space of solutions.

In its minimal realization, the new pipeline implements the historical closure through the equation

$$\frac{dC}{d\ln\ a} = -3V'_{\rm eff}(C),$$

together with a choice of effective potential, a branch condition, and a normalization of the index. From there, the history $C_t(a)$ induces a history

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega},$$

which is then passed through the same structural validation logic already present in **ΩCt/N**: cosmological background, growth, effective potentials, ISW, lensing, and tensor sector. In this sense, the update does not break the philosophy of the pipeline; it makes it more demanding.

The new versions of the system must therefore be understood not as cosmetic variants, but as the first numerical translation of the **ΔΩc$_t$** closure. Their main contribution can be summarized in four points:

- they make it possible to move from static sweeps to historical reconstructions;
- they make explicit the distinction between the value of the index and the trajectory of the index;
- they incorporate, in operational form, branch structure and running intensity;
- and they turn correlational history into a quantity subject to numerical discrimination, not merely phenomenological parametrization.

This has an important methodological consequence. Whereas the classical pipeline was especially suited to mapping anchors and operational boundaries, the updated pipeline begins to function as a **laboratory of the physical domain of admissible histories**. It no longer limits itself to saying where the good and bad points of the sweep are, but instead starts to say which types of correlational history can actually sustain a projected universe.

The meaning of this transition becomes clearer when the two levels are compared. The classical pipeline clearly identifies **PLANCK**, **ICCUB**, **SH0ES**, and the operational rupture boundaries. The new pipeline does not invalidate that cartography; it reinterprets it. Constant-I_c values cease to be the fundamental description of the historical sector and instead begin to function as simplified projections of a deeper space of trajectories. Thus, the same set of cases can now be reevaluated not only as points in the classical sweep, but as complete histories whose viability depends on the form of the potential, on the selected branch, and on the structural stability of the induced growth.

From this perspective, the pipeline update is not a technical appendix external to the paper, but the immediate operational continuation of its central thesis. The passage from **Δ** to **Ωc$_t$** is no longer formulated only as a theoretical possibility, but converted into an executable criterion of historical selection.

For that reason, the role of the present chapter is preparatory. Its function is not yet to present the physical outcome of the runs, but to establish the framework within which those runs must be read. The next chapter returns precisely to the same cases already explored in **Ωc_t**, but subjects them to this new trajectory logic. Only then can one clearly evaluate what the classical scheme preserves, what changes when effective history is introduced, and which new physical conclusions emerge from the **$\Delta\Omega c_t N$** closure.

13. Physical reevaluation of the Ωc_t cases under $\Delta\Omega c_t N$

The purpose of this chapter is to subject the reference cases already studied in **Ωc_t** to a new reading, now using the trajectory mode introduced by **$\Delta\Omega c_t N$**. The point is not to repeat the classical sweep or to retrospectively replace its results, but to determine what happens when the same operational landmarks of the original paper are reinterpreted as local manifestations of a complete correlational history.

Under this new logic, the values associated with **PLANCK**, **ICCUB**, **SH0ES**, and the operational boundaries **break−** and **break+** cease to be read merely as static points of the correlational index and instead become effective cuts within a wider space of historical trajectories. The question is no longer only which value of I_c yields an acceptable cosmology, but which kind of history $I_c(a)$ is able to sustain a structurally executable projected universe.

13.1 Aim of the reevaluation

The reevaluation developed in this chapter has three aims.
First, to verify that the new trajectory mode preserves the basic physical architecture of the **Ωc_t** paper.
Second, to determine whether the **$\Delta\Omega c_t$** closure introduces an effective selection of the space of cosmological histories.
And third, to extract from that selection a physical conclusion that was not available within the constant-I_c sweep scheme.

To do so, we take as reference the same operational cases already used in **Ωc_t**:

- **PLANCK**: $I_c = -0.044$
- **ICCUB**: $I_c = +0.016$
- **SH0ES**: $I_c = +0.036$
- **break−**: $I_c = -0.068$
- **break+**: $I_c = +0.051$

and subject them to the new trajectory mode in the minimal quadratic realization of the effective potential, while also exploring branch structure and different values of the historical intensity λ_{eff}.

13.2 Continuity with the classical Ωc_t pattern

The first relevant result is that the new pipeline does not destroy the basic physical pattern of the classical sweep. The architecture of anchors and ruptures remains recognizable once static realizations are reinterpreted as histories.

In particular, the operational boundaries of the original paper are preserved with the same physical hierarchy:

- the negative rupture still appears first through **BAO**;
- the positive rupture still appears first through **WL**.

This point matters because it shows that the introduction of an effective correlational history does not break the phenomenological core of $\mathbf{\Omega c_t}$, but rather reorders it. The classical sweep is not invalidated; it is reabsorbed as a local approximation to a deeper historical space.

Put differently, the new trajectory mode does not arbitrarily alter the physical landscape of the original paper. What it does is make that landscape more demanding, by requiring that known cases be sustained not only as instantaneous values but as consistent trajectories.

13.3 Emergence of the executable historical domain

The physical gain of the new analysis becomes clear once the pointwise reading is abandoned and the behavior of the space of histories is examined.

The central result is that the pipeline no longer behaves as a permissive system in which any correlational history can be artificially maintained. On the contrary, it begins to delimit a clearly differentiated **executable historical domain**, within which some trajectories survive and others collapse.

In the minimal quadratic realization, this domain shows three immediate features:

1. there exists a region of clearly viable histories that preserves global structural stability;
2. there are marginal zones in which the trajectory remains executable, but with growing tensions in integrated observables;
3. and there are trajectories that cease to be physically admissible, either through explicit observational rupture or through numerical instability of the growth sector.

This classification changes the status of the analysis. The solution space is no longer organized only around values of I_c, but around **families of histories**: good histories, tense histories, broken histories, and unstable histories. The projected regime therefore ceases to present itself as a passively parametrizable region and instead appears as a phase that only certain trajectories are able to sustain.

13.4 Physical role of the branch

The strongest feature observed in the reevaluation concerns branch structure.

In the runs performed with the minimal quadratic realization, the **positive branch** robustly defines the executable domain of the new trajectory mode. By contrast, the **negative branch** proves systematically unstable in the growth sector, giving rise to recurrent numerical collapse and, therefore, to non-executable histories.

This result must be interpreted with care. It does not yet constitute a universal proof that the negative branch is excluded in every possible realization of the framework. Its present scope is narrower: within the minimal implementation used here, cosmological projection is sustained in a stable way only when the correlational history evolves with positive effective orientation.

The physical consequence of this pattern is immediate. Projectability no longer depends exclusively on the pointwise value of the index, but also on the **effective orientation of the history**. Two trajectories with comparable values of I_c may behave in radically different ways if the selected branch alters the effective sign with which the correlational contribution enters growth and late-time observables.

This distinction between sign of the index and sign of the branch, only outlined in the theoretical formulation, acquires here direct physical content. Historical space is not organized only by the amplitude of deviation from C_Ω, but also by the effective direction in which that deviation acts on the projected regime.

13.5 Physical reading of the observed pattern

Taken together, the observed pattern suggests a relevant conclusion: the **$\Delta\Omega c_t$** closure does not arbitrarily enlarge the dynamical space of the framework, but rather contracts it.

The numerical reevaluation shows that correlational history does not act as an open phenomenological freedom. On the contrary, the historical promotion of coherence introduces an additional discrimination over the space of solutions. Some trajectories reproduce the projected regime in a stable way; others strain it; others break it; and others do not even reach a physically executable state.

This contraction of historical space has a clear physical meaning. The projected universe no longer appears as a phase compatible with any evolutionary narrative of coherence, but as a structurally selected region within correlational space. History matters, and it matters not only how far it departs from the rigid reference, but also **how** it departs and **from which branch** it does so.

At this point, the difference between the classical sweep and the trajectory mode becomes decisive. The classical sweep made it possible to locate viable points and operational boundaries. The trajectory mode shows something deeper: that the viability of the projected regime depends on the global form of the history and not only on its instantaneous value. In other words, the new pipeline does not merely reproduce the **Ωc_t** paper; it makes it physically more selective.

13.6 Physical conclusion of the chapter

The main conclusion of this analysis can be formulated directly.

The reevaluation of the classical **Ωc_t** cases under the trajectory mode of **$\Delta\Omega c_t N$** shows that historical coherence does not behave as an indifferent phenomenological freedom, but as a strongly selected structure in which the viability of the projected regime depends both on the value of the index and on the effective orientation of correlational history.

Under the minimal realization explored in this work:

- the basic architecture of the classical paper is preserved;
- the **BAO** and **WL** boundaries continue to delimit the edges of the physical domain;
- the positive branch defines a wide space of executable histories;
- and the negative branch is expelled, at least operationally, by growth instability.

This does not yet amount to a definitive validation of the **$\Delta\Omega c_t$** closure. But it does add a new and substantial physical content to the framework: correlational history ceases to be merely a useful parametrization and begins to function as a selection criterion for the projected universe itself.

This is probably the most important conclusion enabled by the new pipeline: not all correlational histories sustain a physically habitable cosmology, and projected geometry survives only within a historical domain much more restricted than the static version of the analysis had suggested.

13.7 Closing remarks of the chapter

The reevaluation of the classical **Ωc_t** cases under the trajectory mode of **$\Delta\Omega c_t N$** makes it possible to extract a conclusion that the static sweep could not formulate with the same sharpness: the viability of the projected regime does not depend only on an instantaneous value of the correlational index, but on the complete history of coherence and on the effective orientation with which that history acts on cosmological dynamics.

Under this new reading, the solution space of the framework ceases to appear as a collection of pointwise configurations and instead becomes organized as a domain of physically discriminable trajectories. Some histories preserve the stability of the background, growth, and late-time observables; others strain it; others break it; and others do not even reach a numerically executable state.

This changes the physical status of the closure proposed in the present work. **$\Delta\Omega c_t$** should no longer be understood only as a formal clarification of the passage between basal rupture and correlational history, but as the first framework capable of subjecting that continuity to effective numerical selection. In that sense, the contribution of the new pipeline is not merely instrumental: it makes visible which part of historical space truly belongs to the physical domain of the projected regime.

The consequence is immediate. The HDC–CBC framework gains a decisive property: the ability to distinguish not only which values are compatible with a stable cosmology, but which complete histories are able to sustain a projected universe. That shift from static sweeping toward historical selection constitutes, by itself, a genuine physical gain of the program.

Appendix A. Minimal realization and illustrative extensions of the effective potential

The present work does not require a unique microscopic form of $V_{\text{eff}}(C)$. What it requires is only that an effective correlational potential exist within the action language and that such potential admit a local curvature scale capable of generating a well-defined correlational history.

From this point of view, the central realization of the volume is the minimal quadratic neighborhood, since it constitutes the most conservative form, the one most directly connected with the $\Delta \to \Omega c_t$ closure, and the first natural operational implementation within a historical reconstruction of the correlational index.

A.1 Minimal quadratic realization

$$V_{\text{eff}}(C) = V_0 + \frac{1}{2}\lambda_{\text{eff}}(C - C_*)^2$$

This form is sufficient to obtain the linear running law and provides the minimal basis for the operational implementation of the trajectory mode in $\Delta\Omega c_t N$. At the current stage of the work, it should be regarded as the reference realization.

A.2 Plateau-type realization

$$V_{\text{eff}}(C) = V_0 + \Lambda_c^4\left(1 - e^{-\beta(C - C_*)/M}\right)^2$$

This form may be useful for studying smoother late activations or histories with more gradual relaxation. However, in the present volume it should be understood as an illustrative effective extension intended for future robustness tests, not as the main case already examined.

A.3 Stabilized quartic realization

$$V_{\text{eff}}(C) = V_0 + \frac{1}{2}\lambda_{\text{eff}}(C - C_*)^2 + \frac{\kappa}{4}(C - C_*)^4$$

This form makes it possible to study explicit asymptotic stabilization and finite domains of admissible trajectory. As with the plateau-type realization, its function at this stage is comparative and exploratory.

A.4 Operational remark

In all the realizations above, the physical viability of the history depends not only on the shape of the potential, but also on the selected historical branch and on the stability of the growth induced by the resulting trajectory. At the current stage of the program, the minimal quadratic realization provides the clearest framework for mapping the executable domain of histories and for distinguishing between physically admissible, marginal, or unstable trajectories.

Appendix B. Minimal operational implementation of $\Delta\Omega c_t N$

The present appendix establishes the minimal form in which the dynamical closure proposed in this work can be translated into an operational implementation within the **ΩCt/N** environment. Its function is not yet to provide a final precision pipeline, but to specify clearly what the system must calculate, which elements of the classical mode must be preserved, and how the transition from constant-I_c sweeps toward complete historical trajectories must be organized.

B.1 Scope and purpose

The purpose of this implementation is not to replace the classical behavior of the **ΩCt/N** pipeline, but to extend it in a controlled way so that it can test the physical content of the $\Delta\Omega c_t$ closure.

In its original formulation, the pipeline was oriented mainly toward the study of static realizations of the correlational index, treated as reference configurations useful for locating observational anchors and rupture boundaries. Under the reading introduced in this volume, those realizations must be preserved as an operational benchmark, but they cease to occupy the fundamental level of historical analysis.

The new purpose of the pipeline is no longer simply to answer which fixed values of I_c are admissible, but which complete correlational histories produce structurally stable, observationally compatible, and numerically executable universes.

B.2 Two operating levels

The resulting minimal architecture must contain two complementary levels.

B.2.1 Reference mode

The first level preserves the classical functioning of the pipeline through families of constant-index sweeps,

$$I_c = \text{const.}$$

This level remains necessary for three reasons: it allows the tables of the original paper to be reproduced, it provides methodological continuity with the previous corpus, and it acts as the baseline pattern against which the new historical mode can be evaluated.

B.2.2 Trajectory mode

The second level introduces the specific content of $\Delta\Omega c_t$. In this mode, the pipeline does not receive directly a constant value of I_c, but a history $C_t(a)$ obtained from an effective dynamical law. From that history, the system constructs the historical correlational index

$$I_c(a) = \frac{C_t(a) - C_\Omega}{C_\Omega},$$

and passes this trajectory through the same battery of structural validation that already existed in the classical mode.

B.3 Minimal equation to be integrated

The minimal realization adopted in this work starts from the effective equation

$$\frac{dC}{d\ln\, a} = -3V'_{\text{eff}}(C).$$

This equation should not be interpreted as a definitive UV derivation of the correlational sector, but as the most conservative effective realization of the **Δ → Ωc$_t$** bridge compatible with the action language and with the non-proliferation principle of the framework.

Its operational role is direct: to generate physically testable histories $C_t(a)$ without introducing additional fields, new local degrees of freedom, or extra ontological parameters.

B.4 Minimal effective potential

The first implementation must use a quadratic realization of the effective potential,

$$V_{\text{eff}}(C) = \frac{\lambda_{\text{eff}}}{2}(C - C_*)^2,$$

where $\lambda_{\text{eff}} > 0$ controls the effective local curvature of the historical sector.

In this approximation, the induced solution takes the form

$$C_t(a) = C_* + (C_0 - C_*)a^{-3\lambda_{\text{eff}}},$$

and, therefore, the historical correlational index is given by

$$I_c(a) \simeq I_{c,0}\, a^{-3\lambda_{\text{eff}}},$$

up to branch and normalization convention.

The quadratic choice is not intended to fix definitively the microphysics of the correlational potential. Its function is to provide the first minimal, stable, and controllable case on which to build a map of the executable domain of histories.

B.5 Minimal input parameters

The minimal version of the trajectory mode requires only the following operational elements:

- an initial condition or present value of the historical index $I_{c,0}$;
- a choice of correlational branch;
- a value of λ_{eff};
- a choice of historical normalization;
- and an effective form of $V_{\text{eff}}(C)$.

This is sufficient to generate a complete history, construct the corresponding correlational index, and submit it to testing within the pipeline.

B.6 Validation chain

The obtained history must not be evaluated through a new set of observables, but through the same structural validation logic already implemented in **ΩCt/N**.

Accordingly, each trajectory must be tested at least against:

- background history;
- structural growth;
- effective potentials;
- ISW consistency;
- lensing consistency;
- tensor sector and GW/EM proxies;
- and the global rupture criterion.

The goal is not to introduce a new validation philosophy, but to verify whether the historical promotion of coherence can survive within the same operational framework already accepted by the classical pipeline.

B.7 Classification of histories

For operational purposes, every historical trajectory must be classified into one of the following categories:

Good history:
trajectory that completes the run and maintains `GLOBAL = OK` with no hard structural failures.

Marginal history:
trajectory with `GLOBAL = OK`, but showing one or more ERP indicators or persistent tensions in integrated observables.

Broken history:
trajectory that completes the run but ends with `GLOBAL = BROKEN` due to explicit observational rupture.

Unstable history:
trajectory that does not even complete the run because of loss of numerical executability, typically associated with growth instabilities.

This classification makes it possible to move from the study of isolated points to an explicit cartography of the physical domain of admissible histories.

B.8 Preliminary observed pattern

The first executions performed in the minimal implementation show a significant pattern.

In the quadratic realization and within trajectory mode, the positive branch generates a wide domain of executable and structurally healthy histories, whereas the negative branch proves systematically unstable in the growth sector.

Moreover, the classical boundaries of the constant-I_c sweep are preserved in recognizable form in the new mode:

- the negative rupture still appears first on the **BAO** side;
- the positive rupture still appears first on the **WL** side.

This result does not yet constitute a universal law of the framework, but it is an important operational piece of evidence: the new pipeline does not behave as a permissive system in which any history can be artificially sustained. On the contrary, it begins to contract the space of admissible trajectories.

B.9 Methodological consequence

The main consequence of this implementation is that the analysis ceases to be organized around static values of the correlational index and instead becomes organized around families of histories.

This changes the status of the pipeline.

ΩCt/N ceases to be merely a sweep tool and begins to function as a laboratory of the historically realizable physical domain. The central question is no longer "which value of I_c

works," but "which historical trajectory is compatible with the regular projectability of the geometric regime."

B.10 Immediate lines of extension

Once the minimal quadratic realization has been stabilized, the natural extensions are three.

First, to refine the resolution within the viable positive band in order to identify the robust core of the historical domain.

Second, to repeat the same analysis for other forms of effective potential, in particular plateau-type and quartic realizations.

Third, to compare the behavior of trajectory mode across the **quick**, **standard**, and **full** depths, in order to distinguish clearly between physical limits of the closure and numerical-resolution artifacts.

B.11 Closing remarks of the appendix

This appendix does not yet provide the definitive version of a complete cosmological pipeline. It provides something more useful at the current stage of the framework: a clear specification of the minimal way in which the $\mathbf{\Delta\Omega c_t}$ closure can be turned into an executable, falsifiable, and structurally selective system.

With this, the passage from the phenomenological freedom of histories to their operational discrimination ceases to be an abstract ambition and becomes a concrete numerical task.

OFFICIAL USER MANUAL — ΔΩc_tN V3

Trajectory-enabled correlational closure pipeline for HDC–CBC / ΔΩc_t

Jordi Audet Palau — Independent Researcher

V3 — April 2026

OFFICIAL USER MANUAL

ΔΩc_tN V3

Trajectory-enabled correlational closure pipeline for HDC–CBC / ΔΩc_t

Field	Value
Project	ΔΩc_tN
Framework	HDC–CBC / ΔΩc_t
Recommended public version	V3
Operational versions	V3 · V3 Chat
Most paper-faithful classic configuration	`const | multiple | paper | quick`
Recommended trajectory smoke test	`deltaomegact | single | ICCUB | quick`
Global criterion	If any sector returns `FAIL`, global status is `BROKEN`

1. Introduction

ΔΩc_tN V3 is the recommended public version of the operational pipeline developed to translate the effective dynamical closure of HDC–CBC / ΔΩc_t into an executable, reproducible and falsifiable numerical system.

V3 preserves the classic ΩCt/N benchmark layer and adds an explicit historical trajectory layer. In this layer, the correlational index is no longer treated only as a fixed value; it can be generated from an effective historical evolution of coherence.

V3 supersedes V2 because it fixes five operational points: bilingual execution aliases, operational normalization, an explicit quartic potential family in the core, removal of the old proxy-policy contradiction, and declaration of minimal Python dependencies.

2. Pipeline purpose

The purpose of $\Delta\Omega c_t N$ V3 is twofold:

1. to reproduce the classic ΩCt/N sweep faithfully;
2. to test whether full historical trajectories `I_c(a)` remain structurally and observationally admissible.

In practical terms, the pipeline can:

- map the stable operational window of the classic benchmark;
- build historical histories `I_c(a)` from an effective closure law;
- identify which observable breaks first when the system is pushed toward rupture;
- distinguish good, marginal, broken and numerically unstable histories;
- export reproducible tables, reports and diagnostics.

3. Scope and design philosophy

$\Delta\Omega c_t N$ V3 is not a full Boltzmann integrator, does not replace CLASS, CAMB or hi_class, and is not yet a final Bayesian/MCMC pipeline.

Its function is structural: to evaluate admissibility, stability, internal consistency and operational rupture under a minimal validation battery. Quantities such as `S8`, `sigma8`, `ISW_proxy`, `Lensing_proxy` or tensor-sector diagnostics must be read as lightweight proxies, not precision cosmological observables.

The central rule is unchanged:

> If any sector returns `FAIL`, the global status is `BROKEN`; if no `FAIL` appears, the global status is `OK`.

4. Available versions

Version	Profile	Description
V3	Classic	Terminal or script execution. Recommended for controlled sweeps and exports.
V3 Chat	Conversational	Guided execution with prompts, bilingual aliases and trajectory parameters

Version	Profile	Description
		exposed step by step.

Both versions share the same physical and numerical core. The difference is the interaction layer.

5. Prerequisites

Recommended environment:

- Python 3.10 or later;
- Windows, macOS or Linux;
- read/write permission in the working folder;
- a standard terminal or shell;
- minimal Python packages declared in `requirements.txt`.

Install dependencies:

```
pip install -r requirements.txt
```

Minimal dependencies:

`numpy>=1.24`, `matplotlib>=3.7`, `pandas>=2.0`

`pandas` is mainly used for exports and reporting; it is declared to ensure a reproducible user experience and avoid environment-dependent failures.

6. Installation

1. Download the package:
   - `DeltaOmegaCtN_V3.zip`
   - `DeltaOmegaCtN_V3_Chat.zip`
2. Extract it into a local folder.
3. Open a terminal inside that folder.
4. Install dependencies with `pip install -r requirements.txt`.
5. Launch the runner or the main script.
6. Run a smoke test before long sweeps.

7. Running V3 classic

Recommended launcher:

```
./run_full_reviewer_ready.sh
```

On Windows:

```
run_full_reviewer_ready.bat
```

Direct execution:

```
python3 DeltaOmegaCtN_V3.py
```

The classic version asks for the main fields and, if `deltaomegact` is selected, activates the trajectory-control questions.

8. Running V3 Chat

Recommended launcher:

```
./run_full_reviewer_ready.sh
```

Direct execution:

```
python3 DeltaOmegaCtN_V3_Chat.py
```

The Chat version starts with:

```
Ejecutar
```

It then guides the selection of family, execution type, anchor or `I_c` value, depth and historical trajectory parameters.

9. Available families

Family	Function
`const`	Reproduces the classic constant-correlational-index mode.

Family	Function
`tanh`	Uses a smooth hyperbolic-tangent transition.
`piecewise`	Uses a piecewise transition.
`deltaomegact`	Activates the $\Delta\Omega c_t$ historical layer with effective `I_c(a)` trajectories.

The main family for the $\Delta\Omega c_t$ paper is `deltaomegact`.

10. Execution types

V3 accepts bilingual aliases.

Accepted input	Internal meaning
`sencillo`	A single run.
`single`	English alias for `sencillo`.
`simple`	Additional alias for `sencillo`.
`multiple`	Multiple runs, either from a list or from `paper`.
`auto`	Automatic exploration mode.

This fixes the V2 issue where the English manual recommended `single`, while the wrapper only accepted `sencillo`.

11. Execution depth

Depth	Recommended use
`quick`	Smoke tests, quick checks and basic validation.
`standard`	Normal execution with increased stability.
`full`	Denser sweeps and advanced review.

To reproduce the paper sweep, start with `quick` and repeat with `standard` or `full` if the environment allows it.

12. Recognized anchors

Anchor	Interpretation
`PLANCK`	Reference region near early-universe closure.
`ICCUB`	Operational central value of the correlational index.
`SH0ES`	Elevated local-H0 region.

Anchor	Interpretation
break-(BAO)	Negative BAO rupture boundary.
break+(WL)	Positive weak-lensing rupture boundary.
paper	Full point list used for the classic sweep.

Direct numerical values such as 0.016 or -0.044 are also accepted, as are /-separated lists.

13. Classic mode

Most paper-faithful classic configuration:

```
const | multiple | paper | quick
```

This configuration reproduces the benchmark layer inherited from ΩCt/N. It is useful for verifying continuity with the ΩCt paper and the classic comparison layer.

14. $\Delta\Omega c_t$ trajectory mode

Recommended smoke test:

```
deltaomegact | single | ICCUB | quick
```

Spanish input is also accepted:

```
deltaomegact | sencillo | ICCUB | quick
```

When deltaomegact is selected, V3 asks for explicit historical controls:

Parameter	Values / range	Function
potential_model	quadratic, plateau, quartic	Effective correlational potential family.
lambda_eff	recommended 0.001-0.030	Effective historical closure rate.
branch	+, -, transition	Correlational realization branch.
normalization	present, omega-based	Operational normalization convention.
C0	positive	Reference correlational

Parameter	Values / range	Function
		normalization.

15. Implemented potentials

V3 implements three differentiated potential families:

Manual option	Internal family	Comment
`quadratic`	`quad`	Quadratic potential around `C0`.
`plateau`	`tanh`	Smooth saturation potential.
`quartic`	`quartic`	Explicit quartic potential: `U = U0 + 0.5*mC2*(C-C0)^2 + lambda4*(C-C0)^4`.

In V2, `quartic` was still an effective option. In V3 it is implemented as a real core family.

16. Operational normalization

V3 gives `normalization` an actual operational effect:

- `present`: uses `C0` directly;
- `omega-based`: rescales the baseline so that `Ct(a=1)=C0` for the selected trajectory.

This prevents `normalization` from being merely metadata and turns it into an executable convention.

17. Delivered results

Depending on mode, the pipeline generates:

- `summary.json`;
- `checklist.json`;
- CSV tables;
- Markdown/HTML reports;
- execution logs;
- first-failure-sector diagnostics;

- trajectory parameters used;
- global `OK` / `BROKEN` status.

18. Interpreting results

Interpretation should be made at three levels:

1. **Structural level:** whether the model preserves stability and internal coherence.
2. **Proxy-observational level:** whether the minimal proxies do not break immediately.
3. **Falsifiability level:** which sector fails first and under which deformation direction.

An `OK` result does not mean final cosmological validation. It means the realization passes the minimal V3 structural-consistency battery.

19. V3 proxy policy

V3 includes `PROXY_VALIDATION_POLICY_V3.md`. The policy is:

- proxies are lightweight structural diagnostics;
- they do not replace CLASS, CAMB or hi_class;
- they are not a final Bayesian/MCMC inference;
- they should be used for admissibility, rupture and preliminary comparison;
- they must not be presented as CMB spectra, `P(k)` spectra or final parameter estimates.

20. Relationship with the $\Delta\Omega c_t$ paper

The $\Delta\Omega c_t$ paper formulates the effective dynamical closure between basal rupture Δ and historical coherence Ωc_t. $\Delta\Omega c_t$N V3 acts as its operational layer: it executes the historical reading of the correlational index and compares admissible trajectories against the classic benchmark layer.

Correspondence:

Paper	Pipeline
$\Delta \rightarrow \Omega c_t$ closure	`deltaomegact` family
Historical trajectory	`I_c(a)` with `lambda_eff`

Paper	Pipeline
Correlational branches	`branch`
Normalization convention	`normalization`
Operational admissibility	Checklist and global status

21. Known limitations

V3 must not be interpreted as:

- a full Boltzmann integrator;
- a substitute for CLASS/CAMB/hi_class;
- a final Bayesian inference;
- a definitive observational validation;
- a complete UV microphysics.

V3 should be interpreted as:

- a reviewer-ready structural-consistency pipeline;
- an executable $\Delta\Omega c_t$ trajectory layer;
- a tool for detecting operational rupture;
- a clean base for later G4/G5 generations.

22. Troubleshooting

Problem	Solution
`single` does not work	In V3 it should work. Check that you are using V3, not V2.
`matplotlib` is missing	Run `pip install -r requirements.txt`.
Global status is `BROKEN`	Inspect which sector returns `FAIL`; it may be a valid physical result of the test.
No figures appear	Check write permissions and the matplotlib backend.
`quartic` is not recognized	Confirm that the core is V3.
Launcher opens V2	Confirm that the extracted folder is `DeltaOmegaCtN_V3`.

23. Good usage practices

- Run a smoke test first.
- Do not start with `full` before checking the environment.

- Keep complete logs.
- Do not mix V2 and V3 outputs.
- Clearly state that observational outputs are structural proxies.
- Use `const | multiple | paper | quick` for classic reproducibility.
- Use `deltaomegact | single | ICCUB | quick` for minimum trajectory validation.

24. Version history

Version	Status	Comment
V1	Transitional	First $\Delta\Omega c_t$ layer, still limited.
V2	Improved	Exposed trajectories, but kept some mismatches.
V3	Recommended	Fixes aliases, normalization, quartic potential, proxy policy and dependencies.

25. Conclusion

$\Delta\Omega c_t$N V3 is the recommended version to accompany the HDC–CBC/$\Delta\Omega c_t$ preprint. Its purpose is not to replace the major cosmological codes, but to provide an executable, reproducible and honest tool for testing whether historical correlational-index trajectories can sustain an admissible projected regime under a minimal structural battery.

The correct reading of V3 is sober: it does not prove the theory, but it prevents the theory from remaining purely conceptual. It turns $\Delta\Omega c_t$ into an operational architecture that can be verified, audited and further developed toward G4/G5.

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Jordi Audet Palau (Barcelona on April 24th of 2026)

Abstract

The HDC–CBC framework describes the emergence of a projected geometric regime from a basal correlational domain and, in its dynamic extension $\mathbf{\Omega c_t}$, promotes correlational coherence from a rigid effective magnitude to a historical one. However, the conceptual bridge between the basal instability developed in **Δ** and the historical coherence implemented in $\mathbf{\Omega c_t}$ remains only partially explicit. This article proposes a minimal internal closure of that bridge.

Starting from the correlational action already introduced in the relativistic and quantum sectors of the corpus, we show that the one-dimensional basal functional used in **Δ** can be interpreted, in the homogeneous pre-geometric limit, as the negative of an effective correlational potential,

$$E_b(C) = -V_{\text{eff}}(C).$$

We then argue that a first-order gradient-type relaxation is the most conservative effective closure compatible with the **Δ** program, the $\mathbf{\Omega/\Omega c_t}$ correspondence, and the absence of additional local degrees of freedom. Within a minimal FLRW normalization, the structural relaxation parameter can be mapped monotonically onto cosmological history through

$$\tau = -3\ln\, a + \tau_0,$$

which leads to an effective historical equation of the form

$$\frac{dC}{d\ln\, a} = -\kappa\, V'_{\text{eff}}(C),$$

with $\kappa = 3$ in the simplest normalization and $\Gamma(C) = V'_{\text{eff}}(C)$ in the minimal potential-driven realization.

Near a reference coherence state, this gives rise to a linearized running law for historical coherence and, therefore, for the correlational index,

$$I_c(a) \simeq I_{c,0}\, a^{-3\lambda_{\text{eff}}},$$

up to normalization and sign conventions fixed by the selected branch. Within this framework, the constant-I_c sweeps of **ΩCt/N** are reinterpreted not as the fundamental theory, but as a conservative operational approximation to the full historical trajectory.

This work does not claim a complete ultraviolet microphysical derivation of the correlational sector, nor does it replace the broader numerical and observational program that the corpus still requires. Its thesis is narrower and, precisely for that reason, more solid: within the existing architecture of HDC–CBC, the passage from **Δ** to $\mathbf{\Omega c_t}$ can be written as

a minimal and coherent effective closure that reduces arbitrariness, increases falsifiability, and provides a concrete route for updating **ΩCt/N** from constant-index sweeps toward a trajectory-based reconstruction.

HDC-CBC / 2026