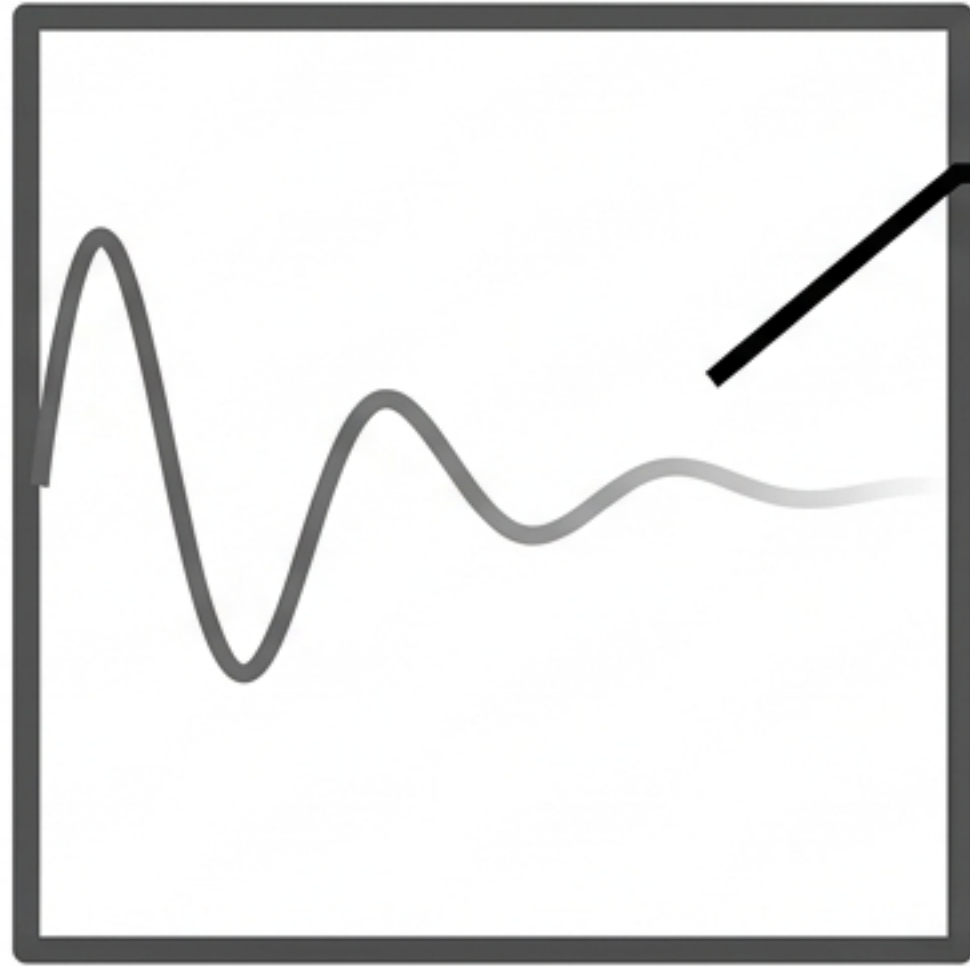
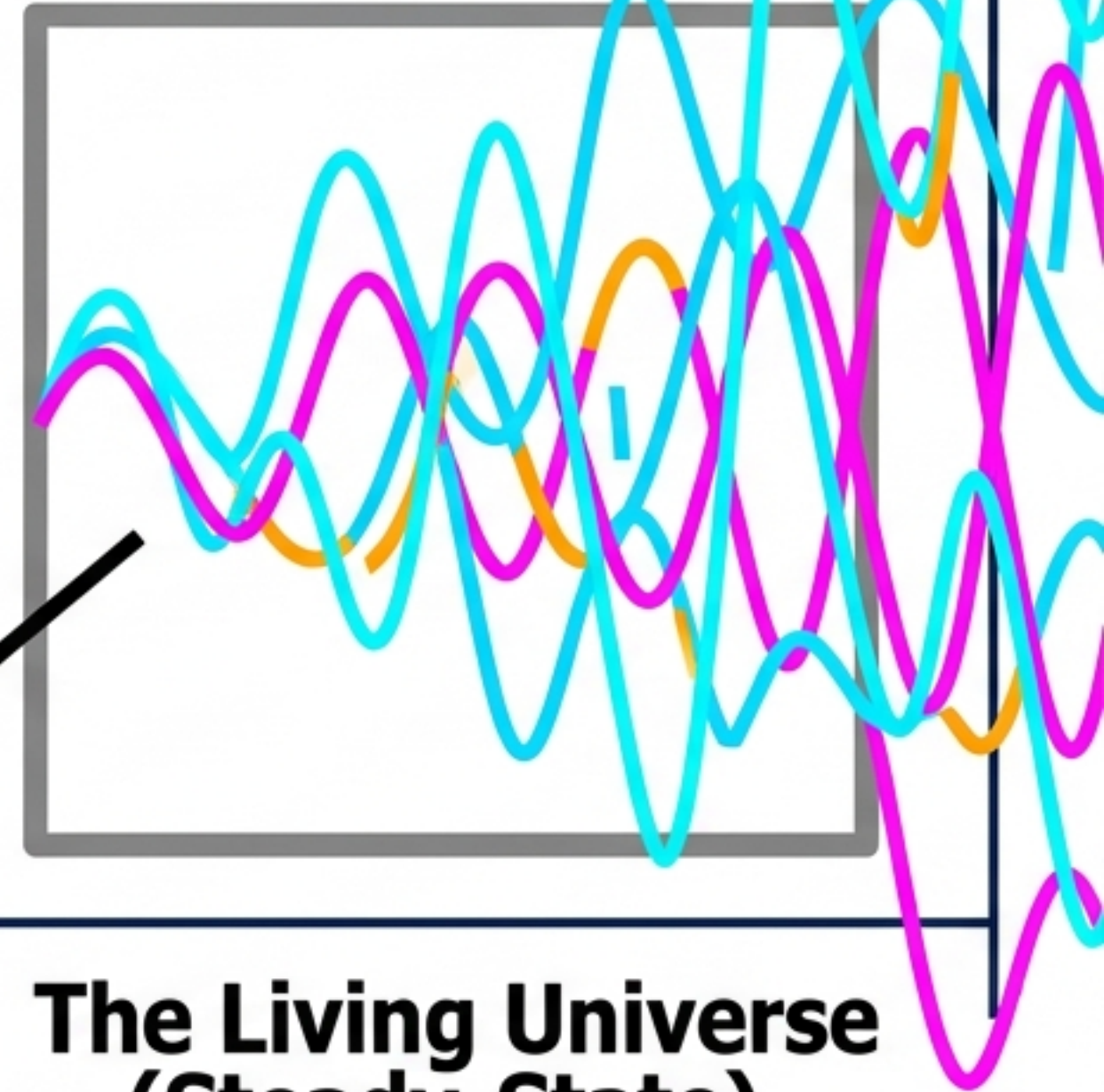


Dynamic thermal equilibrium as an alternative origin for the Cosmic Microwave Background acoustic peak structure.



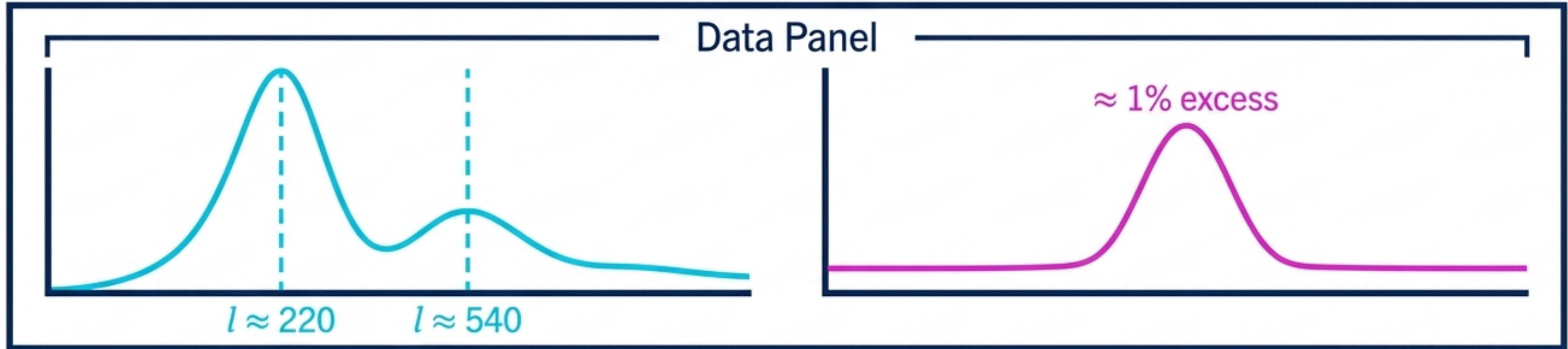
**The Frozen Fossil
(Standard Model)**

The Cosmic Microwave Background (CMB) acoustic peak hierarchy and Baryon Acoustic Oscillation (BAO) features are not unique fossil signatures of a singular primordial recombination epoch. They are steady-state statistical outcomes of ongoing shell-like structure generation and scale-dependent damping in the present ionised universe. A dynamically maintained background requires no inflationary mechanism to explain its large-scale thermal uniformity.



**The Living Universe
(Steady-State)**

Separating empirical observables from ontological inferences in cosmological structure.



The Raw Observations.

The CMB blackbody background of 2.725 K, the acoustic peak hierarchy at multipoles $l \approx 220, 540$, and the BAO 1% galaxy pair-count excess are real, confirmed physical measurements.

The Ontological Inference.

The standard model interprets these features as uniquely requiring a singular Big Bang origin and a privileged primordial plasma epoch. This leap conflates a robust observation with a non-unique historical narrative.

Falsifying the uniqueness claim through present-epoch microphysics

The standard model claims acoustic oscillations are unique to a pre-recombination plasma. However, the exact same microphysical operate today in HII regions, quasar broad-line regions, and the diffuse ionised intergalactic medium.

Thomson Scattering

The coupling of photons and baryons persists in the ongoing universe.

$$\sigma_T = 6.6524 \times 10^{-29} \text{ m}^2$$

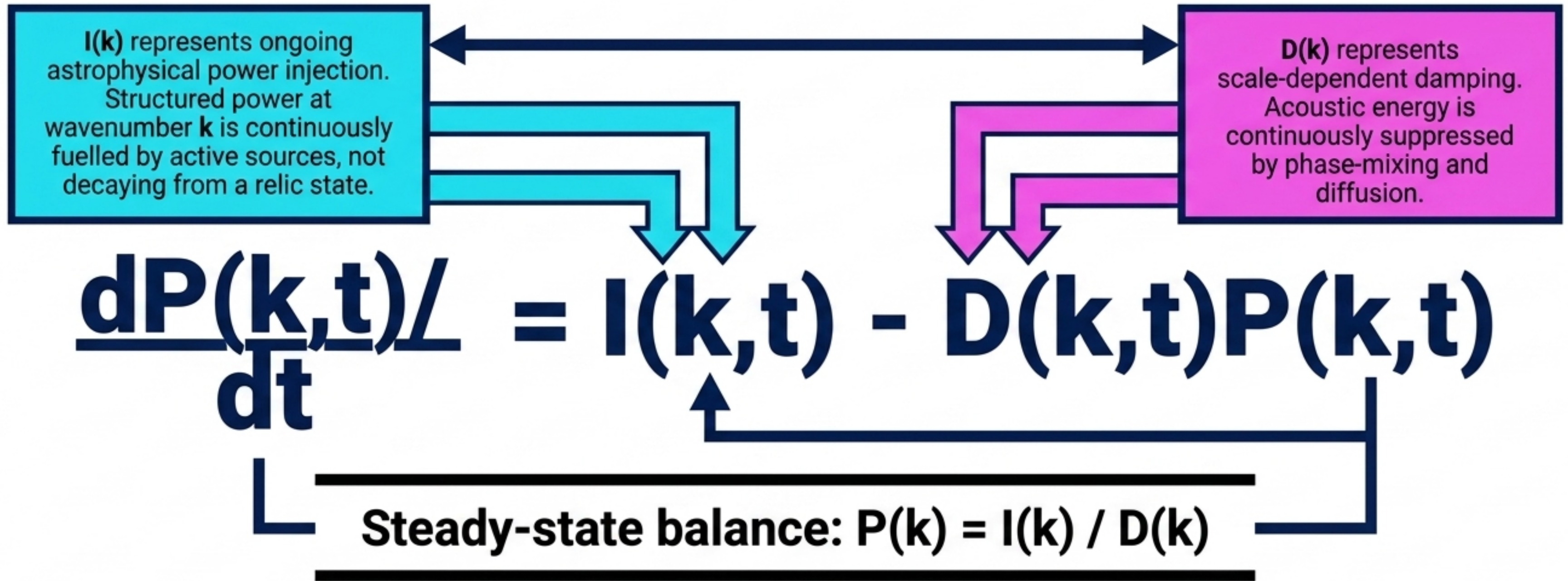
Silk-Type Diffusion Damping

Photon diffusion across oscillation scales smooths out density perturbations today.

$$D_{\text{diff}} = \frac{c}{3 n_e \sigma_T}$$

Because this microphysics is active in the ongoing universe, the standard claim of absolute uniqueness to a one-time primordial event is physically invalid.

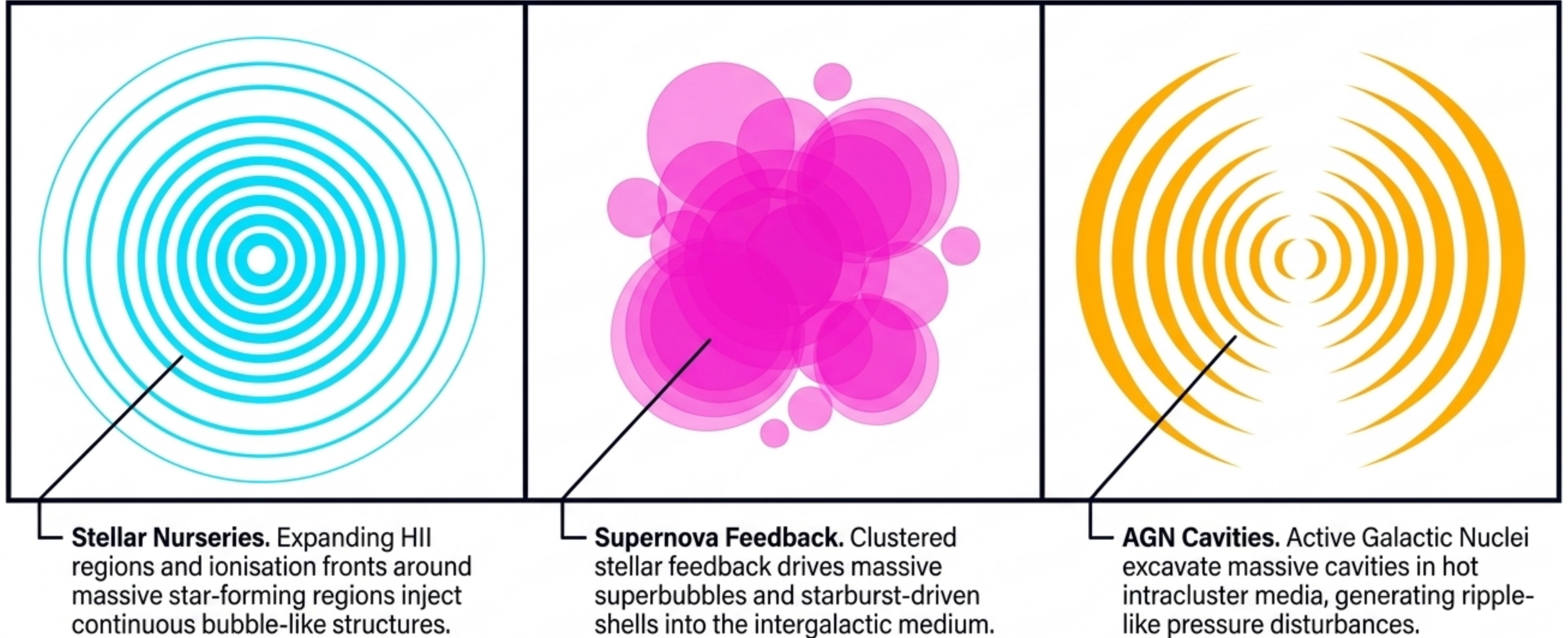
The power-balance master equation for dynamic equilibrium.



In an infinite, dynamically active universe, the observed CMB and large-scale structures represent the statistical equilibrium state of this continuous thermodynamic and mechanical balancing act.

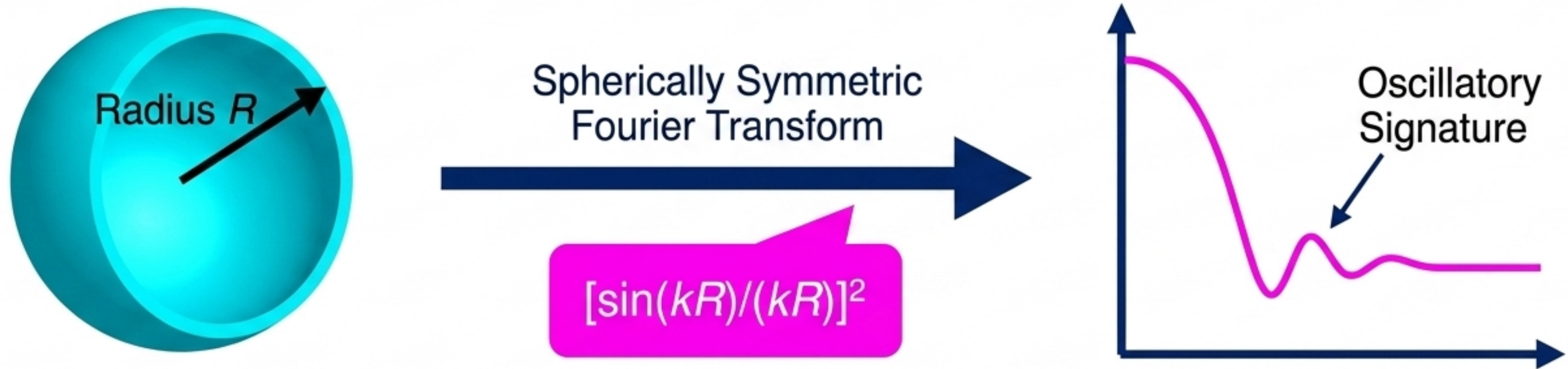
Cosmological power injection through ongoing shell and ripple generation

The injection term $I(k)$ is fuelled by observable, present-universe source classes that continuously pump acoustic energy into the cosmic plasma.



The geometric origin of oscillatory Fourier structure in **Baryon Acoustic Oscillations**

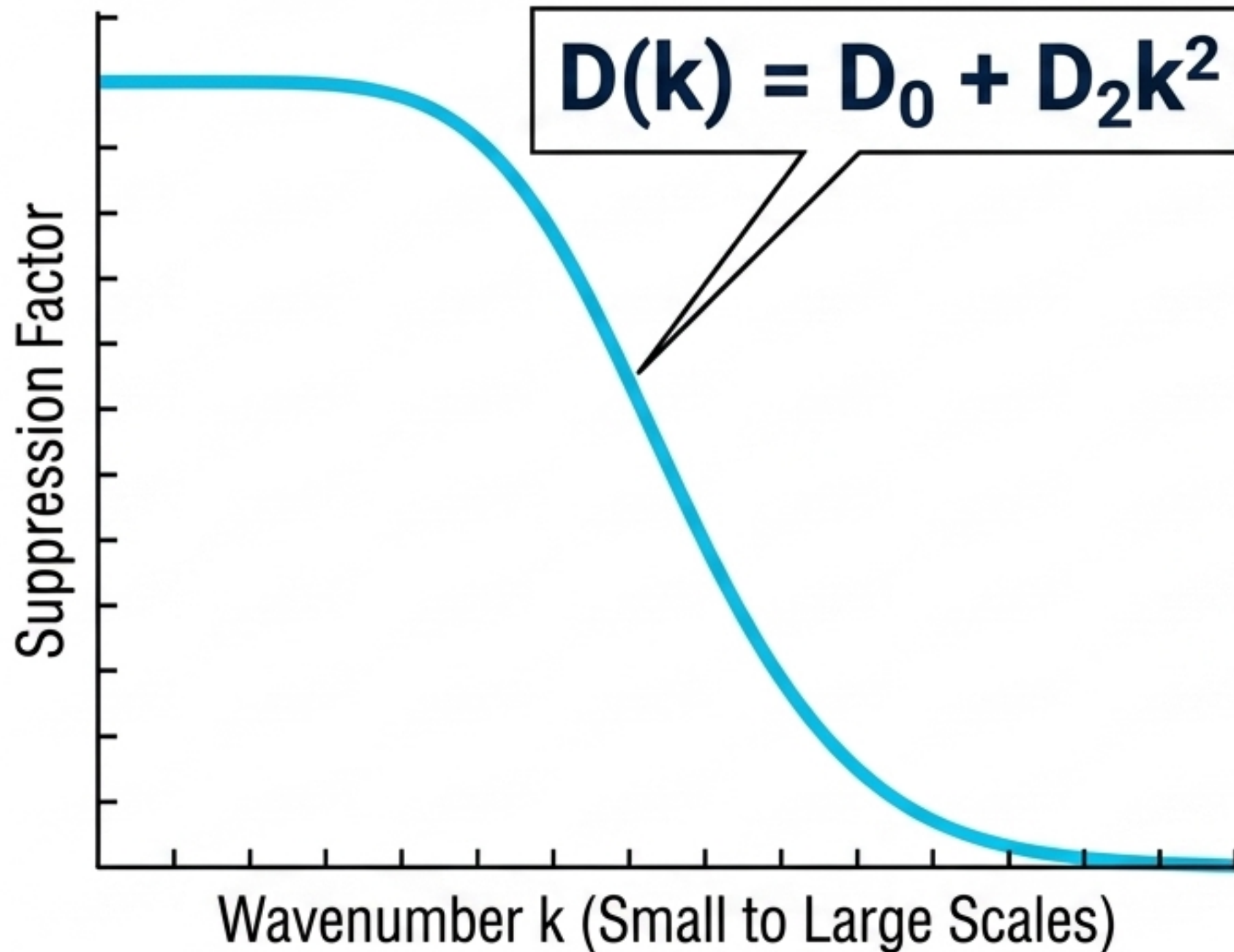
Oscillatory structure in Fourier space is not exclusive to a Big Bang acoustic plasma; it is a natural geometric consequence of shell structures.



A population of ongoing shell-like events inherently generates the broad BAO correlation scale and the oscillatory wiggles in the matter power spectrum.

No primordial sound horizon is required.

Scale-dependent suppression and Silk-type diffusion damping in the present IGM.



The damping term $D(k)$ balances the ongoing power injection. It follows a form directly reflecting current-universe diffusion-like damping, where the $D_2 k^2$ term is physically motivated by the Thomson scattering coefficient D_{diff} .

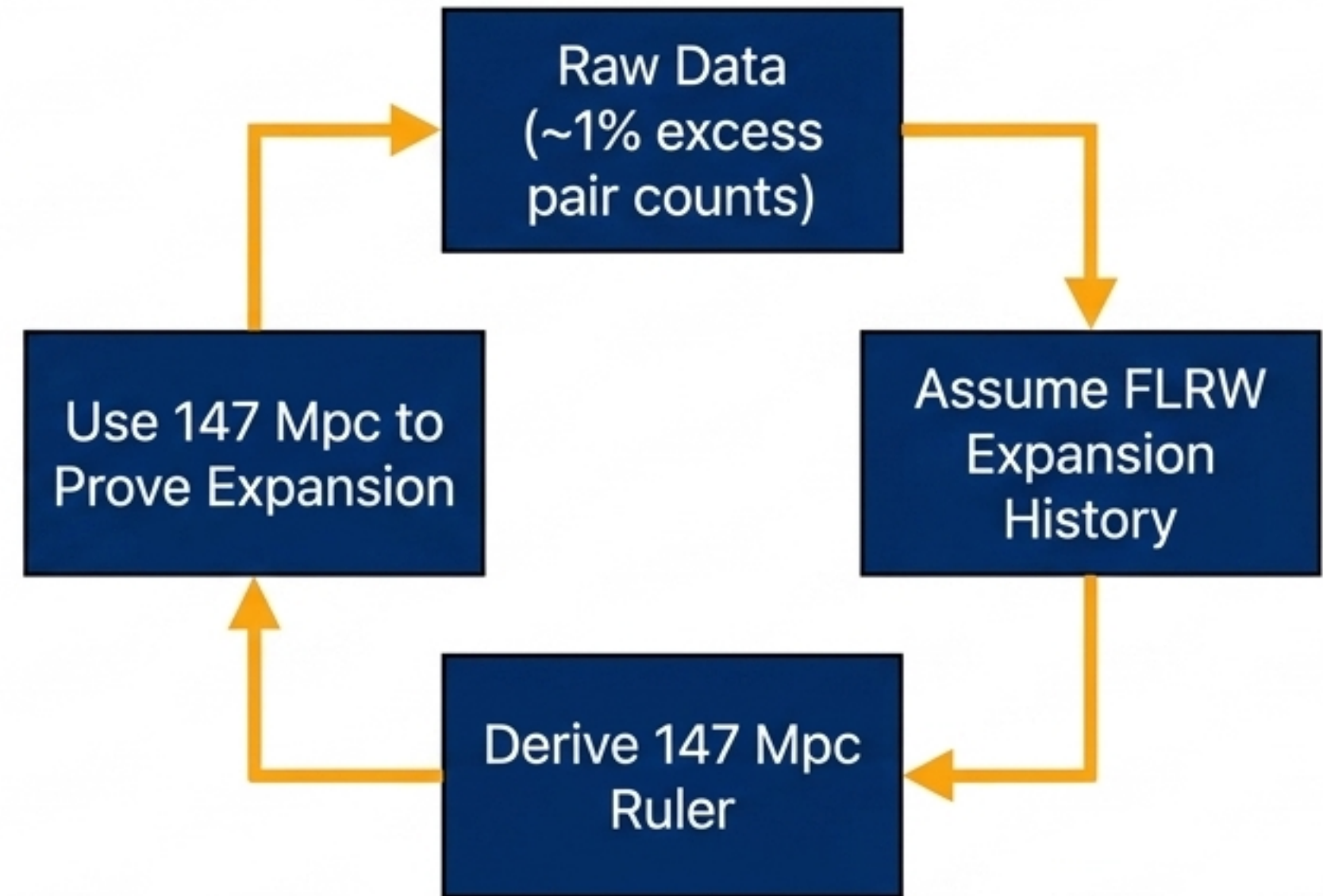
Just as in the standard model, photon diffusion across oscillation scales smooths out density perturbations. In a steady state, high-frequency (high- k) power is rapidly suppressed.

This ongoing mechanism naturally shapes the descending tail of the acoustic peak hierarchy without requiring a primordial decoupling event.

The circularity of the 147 Mpc standard ruler interpretation.

The BAO scale is frequently presented as a raw observation proving universal expansion. In reality, the raw observation is merely a statistical $\approx 1\%$ excess in galaxy pair counts at a specific angular separation.

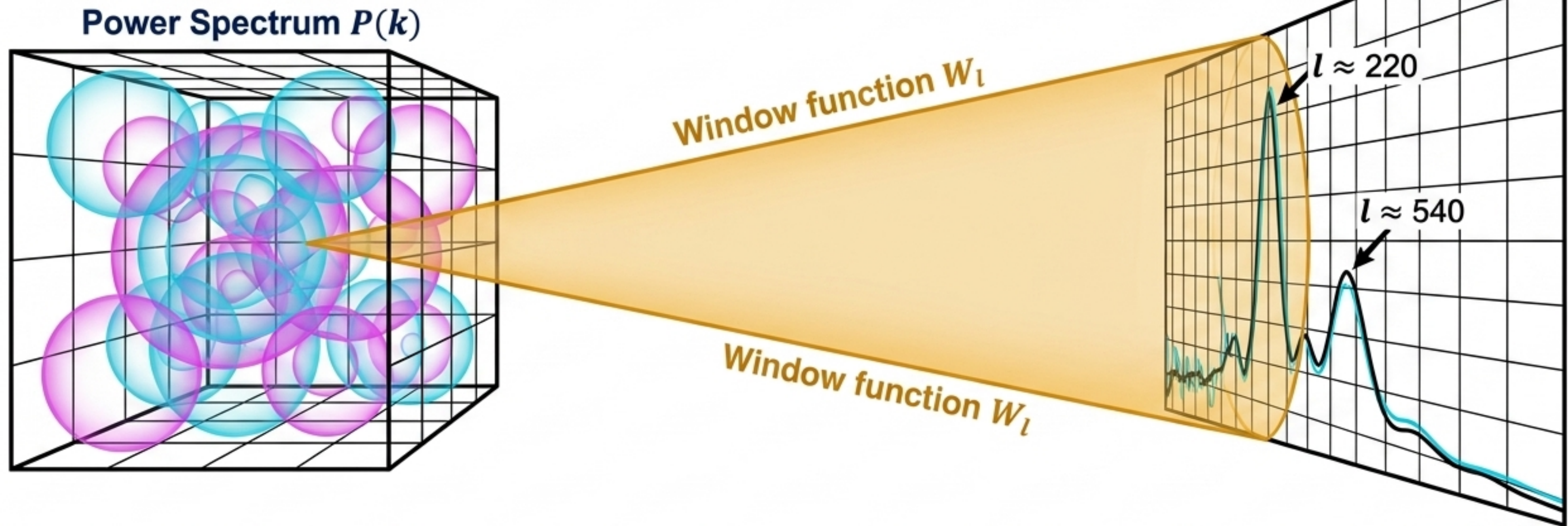
Converting this angle into a 147 Mpc "standard ruler" explicitly requires assuming the FLRW metric expansion history.



In an infinite, non-expanding universe, a current-universe Jeans-length estimate yields a preferred scale within $\approx 7\%$ of the observed feature using only present measured quantities and ongoing physics.

Reinterpreting the Cosmic Microwave Background acoustic peak hierarchy.

$$C_l \approx P(l/D_{\text{eff}}) \times W_l$$



The observed CMB acoustic hierarchy is the angular projection of the ongoing-equilibrium shell-induced power spectrum. Applying a visibility window W_l naturally yields a dominant first peak and subsequent harmonic secondary peaks.

The peak hierarchy emerges purely from the oscillatory shell kernel and current-universe damping, bypassing the need for a singular recombination epoch.

Comparative diagnostic of acoustic structure generation mechanisms

	Standard Model (Relic Interpretation)	Steady-State (Living Interpretation)
Timeframe	Frozen 380k yrs post-origin	Ongoing eternal present
Microphysics	Primordial plasma	Current ionised IGM
BAO Origin	Stalled primordial sound horizon	Statistical $[\sin(kR)/(kR)]^2$ shell geometry
Mathematical Core	Initial conditions tracking	$P(k) = I(k)/D(k)$ steady state
Both frameworks utilize Thomson scattering and Silk damping. However, the steady-state model relies strictly on verifiable, current-universe conditions rather than untestable primordial assumptions.		

Falsifiable prediction: CMB and star-formation-rate cross-correlation.

$$C_l^{\text{CMB} \times \text{SFR}} = \frac{3n_e^2 \sigma_T^2}{k^2} \times b_{\text{SFR}} \times P_{\text{matter}}(k)$$

If CMB structured anisotropy is generated by ongoing astrophysical processes rather than a frozen primordial relic, a measurable residual cross-correlation must exist between selected CMB anisotropy components and independent tracers of current cosmic star-formation activity.

After standard foreground cleaning, a robust null result at sufficient sensitivity (e.g., via CMB-S4) would count as a direct, empirical falsification of the steady-state dynamic equilibrium framework.

