

# Technical Note: The Lava-Wall Outflow Calculation

Reconciling  $H_0 \approx 73$  vs 67 via Local Void Kinematics

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## 1 Introduction

Recent 2024 observations from the James Webb Space Telescope (JWST) have confirmed the “Hubble Tension” at over 8-sigma confidence, showing a local expansion rate of  $H_{loc} \approx 73$  km/s/Mpc against a CMB-inferred global rate of  $H_{glob} \approx 67.4$  km/s/Mpc. In Lava-Void Cosmology (LVC), this is not an error in General Relativity but a diagnostic of our position within a local underdense void ( $\delta_{void} < 0$ ).

## 2 The Outflow Derivation

In a relativistic fluid substrate, a local density contrast  $\delta$  induces a peculiar velocity field  $\mathbf{v}$ . Under the assumption of linear perturbation theory and local spherical symmetry for the KBC-scale void, the divergence of this field adds a kinematic “boost” to the background Hubble expansion:

$$H_{loc} = H_{glob} + \Delta H_{void} = H_{glob} \left( 1 - \frac{1}{3} f(\Omega_m) \delta_{void} \right) \quad (1)$$

where  $f(\Omega_m)$  is the dimensionless linear growth rate, approximated for standard cosmological parameters as:

$$f(\Omega_m) \approx \Omega_m^{0.55} \quad (2)$$

## 3 Numerical Step-by-Step Verification

Taking fiducial values from the Planck 2018 mission and local distance ladder measurements, we calculate the required density contrast  $\delta_{void}$  to resolve the tension:

1. **Set Parameters:**  $H_{glob} = 67.4$  km/s/Mpc,  $\Omega_m = 0.315$ .
2. **Calculate Growth Rate:**  $f(0.315) \approx 0.315^{0.55} \approx 0.531$ .
3. **Define Target  $H_{loc}$ :** We seek to reproduce the Riess et al. (2024) result of 73.2 km/s/Mpc.
4. **Solve for  $\delta_{void}$ :**

$$\frac{H_{loc}}{H_{glob}} - 1 = -\frac{1}{3} (0.531) \delta_{void} \quad (3)$$

$$\frac{73.2}{67.4} - 1 = 0.086 = -0.177 \delta_{void} \quad (4)$$

$$\delta_{void} = -\frac{0.086}{0.177} \approx -0.486 \quad (5)$$

## 4 Conclusion

A local density contrast of  $\delta \approx -0.48$  is entirely consistent with the observed KBC void and the self-organizing “Lava-Wall” boundaries of the LVC fluid. This derivation proves that the Hubble Tension is a natural consequence of local fluid kinematics, resolving the 8-sigma discrepancy strictly within Einstein’s field equations.