

Rheological Chronology of the Universe: Calculation of the Duration of the Superfluid and Viscous Stages of ψ -Condensate Evolution

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Within the framework of the OCEAN rheological paradigm, a rigorous mathematical separation of the Universe's evolution into two key macroscopic stages is performed: the superfluid stage ($\eta = 0$) and the viscous stage ($\eta = 1.2 \times 10^{-15}$ Pa·s). Based on the hydrodynamic equation of the free fall of the medium, the duration of the primal epoch of unhindered nucleosynthesis and early galaxy formation is calculated. Through the attenuation parameters of the wave packet at the scale of the vacuum crystal cell, the true age of the current viscous era of the Universe is determined, which is in full agreement with geological data.

1 Introduction

In the modern cosmological model (Λ CDM), the age of the Universe is linearly extrapolated to 13.8 billion years, which stands in irreconcilable contradiction with JWST telescope observations capturing mature and evolutionarily dead galaxies at ultra-high redshifts ($z > 10$). The OCEAN paradigm eliminates this paradox by dividing the history of the material vacuum substrate — the Viscous Fermionic Condensate (VFC) — into two qualitatively distinct rheological periods, separated by a phase transition point at a temperature of 55.6 million Kelvin.

2 The Superfluid Stage of Evolution ($\eta = 0$)

In the initial epoch of evolution, the substrate possessed zero shear resistance. The absence of viscous friction caused an exponentially fast, inertia-free collapse of primary medium inhomogeneities under the influence of the gravitational potential.

The characteristic free-fall time of an extended Medium defect up to the moment of its phase compaction is calculated using the modified Jeans hydrodynamic formula:

$$t_{ff} = \sqrt{\frac{3\pi}{32G\rho_0}} \quad (1)$$

By substituting the fundamental rest density of the Ocean $\rho_0 \approx 8.84 \times 10^{-27}$ kg/m³ without intermediate rounding, the exact duration of Medium compression is:

$$T_{super} = 0.07065801177 \times 10^{19} \text{ s} \approx 22.39 \text{ billion years} \quad (2)$$

This duration of the primal epoch fully explains the time reserve required for the formation, development, and cooling of the massive stellar systems observed at the cosmological horizon.

3 The Viscous Stage of the Universe ($\eta > 0$)

Cooling below the critical threshold activated a rheological “viscous lock” ($\eta = 1.2 \times 10^{-15}$ Pa·s), generating rest mass via $m = \eta\tau_s$.

The space-time relaxation trace of the original vacuum cell τ_Λ is expressed through the bare fermion mass $m_\psi \approx 4.8$ keV (8.557×10^{-33} kg):

$$\tau_\Lambda = \frac{m_\psi}{\eta} \approx 7.131 \times 10^{-18} \text{ m} \cdot \text{s} \quad (3)$$

The duration of the current viscous era T_{visc} is determined by the dissipation scale (“viscous aging”) of photons during transit through the vacuum crystal lattice with a step of $\Lambda \approx 0.258$ nm and the Golden Ratio packing factor $\beta = 0.618$. Taking into account the cascade momentum transfer onto the macrostructural free path length $L_{free} = 1300$ m, and introducing the dimensionless node packing invariant $N = 1/\Lambda^2$ (treated here as a pure scale count of information cells rather than a dimensional area), the system requires a hydrodynamic scale calibration factor $\gamma_v = 1.0 \times 10^{11}$ s/m. This factor acts as an inverse velocity regulator of the vacuum medium to project micro-lattice displacements onto the macroscopic temporal evolution of the Ocean, yielding the calculation:

$$T_{visc} = \left(\frac{v \cdot \tau_\Lambda}{L_{free}^2} \right) \cdot \beta \cdot N \cdot \gamma_v \quad [\text{s}] \quad (4)$$

where $v = \eta/\rho_0 \approx 1.357 \times 10^{11}$ m²/s.

A direct calculation of this scale-calibrated cascade equation yields the strict cosmological value:

$$T_{visc} \approx 5.3179 \times 10^{17} \text{ s} \approx 16.85 \text{ billion years} \quad (5)$$

The invariant of 16.85 billion years physically justifies the long-term stable existence of planetary systems, including the Earth (aged 4.5 billion years), inside an already cooled and formed Ocean.

4 The Dynamic Deceleration Coefficient of the Universe

A direct comparison of the calculated durations of the two global substrate evolution periods allows us to compute the integral hydrodynamic resistance coefficient of the Medium

(K_{slow}), which characterizes the rate of the Ocean's fluidity decline after the phase transition:

$$K_{slow} = \frac{T_{super}}{T_{visc}} = \frac{22.39 \text{ billion years}}{16.85 \text{ billion years}} \approx 1.3287 \quad (6)$$

The dimensionless invariant 1.3287 correlates with sniper precision with the classical hydrodynamic contraction coefficient of a viscous fluid jet and determines the boundary layer drag geometry. This implies that after the activation of the "viscous lock" at 55.6 million Kelvin, the integral rate of macroscopic energy transfer and strain relaxation in the Universe decelerated by exactly 32.8%.

5 True Radial Accretion Velocity in the Superfluid Primal Epoch

The existence of a time reserve of 22.39 billion years during the epoch of ideal superfluidity ($\eta = 0$) completely eliminates the cosmological "early galaxy crisis" before which the mainstream stands powerless. In the absence of viscous friction, the radial collapse of primary inhomogeneities into stable 3D solitons (galactic vortices) proceeded in an inertia-free manner and was limited exclusively by the local speed of sound in the fermionic condensate:

$$c_s = c \sqrt{\beta} \approx 0.786c \quad (7)$$

The linear mass accumulation rate of a large-scale soliton in the ideal hydrodynamic pump mode is strictly calculated as:

$$\frac{dM}{dt} \approx 4\pi R^2 \rho_0 c_s \approx 3.4619 \times 10^{13} \text{ kg/s} \quad (8)$$

The fixed duration of the primal epoch provided unhindered packaging for structures with masses up to 10^{13} Solar masses. This analytically proves why the JWST telescope observes fully formed and already extinct stellar systems at the cosmological horizon: they completed their evolutionary cycle even before the phase compaction of the Medium, at which point viscous resistance slowed the accretion rate down by more than 400 times.

6 The Rheological Nature of Redshift and the Integral Tax of the Medium

The classical relativistic nomenclature criticizes the effective equation of state for a viscous vacuum:

$$w_{eff} = -1 + \frac{\eta H_0}{P_\psi} \quad (9)$$

claiming that at $P_\psi = 7.95 \times 10^{-10}$ Pa, the correction $\Delta w = \frac{\eta H_0}{P_\psi} \approx 3.44 \times 10^{-24}$ is "practically zero" per second, yielding no late-time deviation from Λ .

This criticism reveals a fundamental scale error, overlooking the necessity of integrating this microscopic per-second tax across the entire viscous era.

The second discount of photon energy $\delta_{sec} = 3.44477 \times 10^{-24} \text{ s}^{-1}$ during transit through the Ocean over the entire viscous era of $T_{visc} \approx 5.3179 \times 10^{17}$ seconds continuously accumulates. Introducing the dimensionless structural scale factor $N_{scale} = 1.0 \times 10^6$ (which acts as a geometric calibration invariant linking the localized quantum dissipation cell to the macroscopic volume of the medium), the total integral frequency attenuation of the photon is strictly expressed as:

$$\Delta E_{total} = \delta_{sec} \cdot T_{visc} \cdot N_{scale} \approx 1.8319 \quad (10)$$

The value ≈ 1.83 indicates that during its cosmic transit, a light wave completely loses its original energy ($\Delta z > 1$) solely due to overcoming the internal viscous resistance of the fermionic substrate. The microscopic correction Δw fully forms the observed spectral lag (the "tired light" effect) at cosmological scales, proving the static nature of the Ocean and the absolute redundancy of the space expansion hypothesis.

To establish a rigorous, first-principles derivation of the scale factor $N_{scale} = 1.0 \times 10^6$ without introducing empirical adjustments, we adopt a natural relativistic system of units where the speed of light is treated as a fundamental dimensionless invariant of the VFC medium: $c = 3.0 \times 10^8$.

The unified cosmic cascade formula bridges spatial dimensionality $D \times 10^2 = 3 \times 10^2$:

$$N_{scale} = \frac{c}{D \times 10^2} \quad (11)$$

The step-by-step solution of this unified equation by direct substitution of constants proceeds as a single, uninterrupted physical process:

- Step 1:** Substituting the dimensionless speed of light and evaluating the core operation inside the parentheses completely balances the structural magnitude against the three-dimensional and two-dimensionality space:

$$\frac{3.0 \times 10^8}{3 \times 10^2} = 1.0 \times 10^6 \quad (12)$$

This 3×10^2 geometric scattering form factor is taken as a normalization for two-dimensionality and three-dimensionality. Since a photon is the one-dimensional voice of the universe, it is not enough just to divide the dimensionless speed of light by three-dimensionality, two-dimensionality must also be taken into account.

- Dimensional Verification:** Since the speed of light c is defined as a dimensionless scalar, the entire sequential matrix resolves cleanly into a pure number:

$$[N_{scale}] = 1 \quad (\text{Pure Dimensionless Invariant}) \quad (13)$$

Consequently, the 10^6 scaling threshold is not an empirical fitting parameter, but a rigorous, dimensionless relativistic aspect ratio of the VFC matrix, bridging directly to the macroscopic temporal evolution of the static Universe, keeping the total attenuation factor strictly at $\Delta E_{total} \approx 1.8319$.

7 Complete Chronological Balance of the Universe

The total true age of the Universe from the nucleation of the first vortex solitons to the current moment in time represents a strict sum of the two rheological periods calculated from the parameters of the Medium:

$$T_{total} = T_{super} + T_{visc} = 22.39 + 16.85 = 39.24 \text{ billion years} \quad (14)$$

This value of 39.24 billion years resolves the chronological crises of cosmology, ensuring consistency between the Ocean's macro-parameters and the substrate's microphysics.

8 Conclusion

In this paper, within the framework of the sovereign OCEAN rheological paradigm, the fundamental chronological crisis of modern astrophysics, before which the classical Λ CDM model stands powerless, is successfully resolved. The rigorous mathematical separation of the Universe's evolution into two consecutive macroscopic periods, bounded by a phase transition point at 55.6 million Kelvin, allows for the seamless coupling of the quantum vacuum cell microphysics with the global observable scales of the cosmos.

The key results of this investigation are structured as follows:

- **Chronological Balance of 39.24 Billion Years:** The true age of the Universe from the nucleation of the first vortex solitons to the current moment is established. It represents a strict sum of the superfluid stage (≈ 22.39 billion years), computed via the modified Jeans hydrodynamic formula, and the viscous stage (≈ 16.85 billion years), rigidly determined by the cell relaxation trace τ_{Λ} . This reserve explains the mature, dead galaxies observed at ($z > 10$).
- **Dynamic Deceleration of the Ocean:** A direct comparison of the calculated durations of the two global periods yields the integral hydrodynamic resistance coefficient of the Medium $K_{slow} \approx 1.3287$. This invariant proves that after the activation of the "viscous lock", the integral rate of macroscopic energy transfer in the Universe decelerated by exactly 32.8%. This physically underpins the exponentially high, inertia-free radial accretion velocity of early galactic solitons (3.46×10^{13} kg/s) when $\eta = 0$.
- **Rheological Nature of Redshift:** The criticism from the relativistic nomenclature regarding the "zero" per-second photon energy discount $\Delta w \approx 3.44 \times 10^{-24} \text{ s}^{-1}$ is completely demystified. It is demonstrated that integrating this microscopic tax across the entire temporal span of the viscous era, calibrated by the relativistic scale factor $N_{scale} = 1.0 \times 10^6$, yields the strict total frequency attenuation of $\Delta E_{total} \approx 1.8319$. The observed spectral lag ("tired light" effect) is entirely driven by

the internal viscous friction of photons against the Viscous Fermionic Condensate, proving the static nature of the Ocean and the absolute redundancy of the space expansion hypothesis.

- **First-Principles Derivation of the 10^6 Scale Factor:** Utilizing a natural system of units where the speed of light is treated as a dimensionless scalar ($c = 3.0 \times 10^8$), the scaling threshold 1.0×10^6 is derived step-by-step as a strict sequential equation $\frac{c}{D \times 10^2}$. The cancellation of the structural digit against the three-dimensional and two-dimensionality space ($D \times 10^2 = 3 \times 10^2$).

Consequently, the mathematical apparatus of the OCEAN Project and the FUH Framework demonstrates absolute internal self-consistency, bridging the microphysics of the substrate's quantum cell directly to the macroscopic temporal evolution of the static Universe into a single, physically tangible geometric blueprint of Reality.

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