TITLE:

Critical Analysis of Plasma Density Assumptions in Solar Mass Ejection Estimates

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Abstract:

This paper introduces the NMSI model (New Subquantum Informational Mechanics), a novel framework describing the Universe as a coherent subquantum logical network where mass, energy, and time emerge from structured oscillatory interactions. Starting from the analysis of solar filaments and mass discrepancies in coronal mass ejections, the model is extended from the solar and planetary scales to the galactic and universal levels. It is proposed that all cosmic structures are governed by logical oscillatory nodes (CLOs), forming an active network of logical communication and evolution. The final sections explore technological implications, including oscillatory computing (TQC) and planetary logical prediction. This work offers a unified and applicable paradigm linking astrophysical phenomena with emerging computational logic.

Keywords:

NMSI, subquantum oscillations, oscillatory logic network, solar filament, CLO, mass induction, heliosphere, TQC, oscillatory computing, universal resonance, logical matter, planetary prediction, non-expanding physics, informational cosmology

Section 1. Critical Analysis of Plasma Density

1.1 Introduction

In solar physics, the mass and energy of coronal mass ejections (CMEs) and eruptive filaments are usually estimated using remote observations interpreted through a set of assumptions about plasma density. These density values are rarely measured directly. Instead, they are inferred from spectroscopic line intensities, brightness contrasts in EUV and H-alpha, or are directly taken from magnetohydrodynamic (MHD) models calibrated under static coronal conditions.

In this section, we demonstrate that the standard densities used in estimating the mass of eruptive solar structures — typically in the range of 10^{-14} to 10^{-13} g/cm^3 — are subject to critical methodological flaws. These inaccuracies lead to significant underestimations of the actual mass and kinetic energy involved in solar mass ejections.

1.2 Standard Density Estimation Techniques

We briefly list and evaluate the dominant methods used to derive density in solar eruptive events:

(a) Spectroscopic Line Intensity Calibration

Densities are often inferred by matching observed line intensities (e.g., Fe XII, Fe XIV, H-alpha) with simulated radiative emission under local thermodynamic equilibrium (LTE) or coronal approximation conditions:
$I_\lambda \propto n_e^2 \cdot G(T)$
This method requires knowledge of the exact emitting volume, the line-of-sight depth, and the thermal distribution — all highly uncertain in eruptive filaments.

(b) Hydrostatic Corona Model

This model uses the equilibrium equation:
$dP/dr = -\rho(r) \cdot g(r)$
Assuming an isothermal, stratified corona:
$\rho(r) = \rho_0 \cdot \exp(-(r - R_\odot)/\lambda_H)$, with $\lambda_H \sim 50{,}000$ km.

Flaw: The hydrostatic model is invalid during dynamic ejections, where plasma is highly non-equilibrium and subjected to explosive magnetic reconnection forces.

(c) Empirical MHD Code Matching

Numerical codes (e.g., CHIANTI, RADYN, PLUTO) simulate plasma behavior under idealized magnetic and thermal conditions. Densities are adjusted until synthetic observables match satellite images.

Flaw: These simulations are tuned to reproduce average coronal loops — not the extreme mass-loading conditions seen in massive CME cores.

1.3 Mass Discrepancy Calculation: A Concrete Example

Let us consider a typical large-scale eruptive filament:

Observed length: $L = 3 \times 10^5$ km
Cross-sectional diameter: $D = 10^4$ km

Estimated volume: $V \approx 7.85 \times 10^{27}$ cm^3

Standard model density: $\rho = 10^{-14}$ g/cm^3
Estimated mass: $M = \rho \cdot V = 7.85 \times 10^{13}$ g = 78,500 tonnes

This mass yields a kinetic energy (at v = 1000 km/s):
$E\_k = 0.5 \cdot M \cdot v^2 = 3.93 \times 10^{29}$ erg

9This value is at least two orders of magnitude lower than what is observed in X-class solar eruptions. Therefore, the mass is significantly underestimated.

1.4 Revised Density Argument – Energy Consistency

Assume a more realistic density: $\rho = 10^{-12}$ g/cm^3
Mass: $M \approx 7.85 \times 10^{15}$ g
Kinetic energy: $E\_k \approx 3.93 \times 10^{31}$ erg

This result is consistent with observational data for fast, massive CMEs. Hence, the standard density assumption of 10^{-14} g/cm^3 is both theoretically weak and observationally invalid.

Note: This higher density value is not arbitrarily chosen, but aligns with prominence observations from limb geometries and radio occultation studies.

1.5 Conclusion

We conclude that standard solar physics models systematically underestimate filament and CME masses due to unjustified assumptions about coronal plasma density. This leads to severe underreporting of the kinetic and total energetic output of such events.

This discrepancy opens the door for alternative models of energy-mass sourcing, including:
- Mass generation from subquantum vacuum structure (as proposed in NMSI);
- Oscillatory materialization triggered by solar core logic harmonics;
- Non-conservative phase transitions of informational matter.

Section 2. Justification of the Real Density Value of the Solar Filament Core and Introduction to the NMSI Model

2.1 The Need to Revise the Standard Density

As shown in Section 1, the coronal plasma density value currently used in calculations ($\rho = 10^{-14}$ g/cm^3) leads to a clear underestimation of the actual mass involved in solar mass ejections. To move towards a more realistic estimate, we must scientifically justify the use of a value close to:

$\rho = 10^{-12}$ g/cm^3

This value is neither arbitrary nor speculative, but is based on:

- Direct observations of solar prominences at the solar limb, showing dense masses and structures consistent with densities on the order of 10^{-12} g/cm^3 (Labrosse et al., 2010);
- Data from radio occultation studies conducted with radio telescopes during filament crossings over stable radio emission sources (e.g., Very Large Array observations);
- Three-dimensional MHD simulations, starting with the model by Terradas et al. (2005) and recently refined in modernized codes, which converge toward higher density values required for the stabilization of massive filaments.

2.2 Physical Argument: Required Magnetic Cohesion

For a filament to remain stable in the photosphere, it must be supported primarily by a combination of:

- magnetic tension (curvature of field lines);
- dynamic pressure;
- sufficient inertial mass to counteract local turbulence.

Models using densities below 10^{-13} g/cm^3 do not produce stable filaments. Values of 10^{-12} g/cm^3 or even higher are needed to explain:

- the shape of the filament;
- its lifetime (over 24 hours);
- observed H-alpha resonances (oscillations with periods of tens of minutes).

2.3 Opening Toward the NMSI Model: Mass Induction Through Solar Logical Resonance

If we accept a value of $\rho = 10^{-12}$ g/cm^3, then the mass involved in a large eruptive filament can reach:

$M = \rho \cdot V \approx 10^{-12} \cdot 7.85 \times 10^{27} = 7.85 \times 10^{15}$ g

This corresponds to a kinetic energy of:

$E_k = \frac{1}{2} \cdot M \cdot v^2 = 3.93 \times 10^{31}$ erg

The energy approaches the levels detected in major X-class events. At this point, a fundamental question arises:

Where does this mass come from?

The Sun could not lose that much mass through fusion or convection within minutes. Here, the NMSI Model becomes relevant:

- the mass is induced through a phenomenon of logical oscillatory resonance, in which the solar core drives unstable subquantum vacuum zones into temporary materialization;
- the filament is therefore a coherent oscillatory projection of vacuum-based mass, not simply a thermally ejected plasma cloud.

This idea will be developed in Section 3.

2.4 Intermediate Conclusion

The assertion of $\rho = 10^{-12}$ g/cm^3 for the core of solar filaments is not speculative, but based on observational data, consistent simulations, and physical stability requirements. Accepting this value reconciles visible energy with the mass involved and provides a foundation for reinterpreting the origin of mass generation through the lens of the NMSI model.

Section 3. Subquantum Oscillatory Mass Induction Mechanism in the NMSI Model

3.1 Theoretical Basis of Oscillatory Induction

The NMSI model (New Subquantum Informational Mechanics) starts from the hypothesis that the vacuum structure is not passive, but composed of fundamental entities called *infobits* — oscillatory units of potential information.

These exist in a state of coherent fluctuation, and when a region of the Universe (e.g., the solar core) oscillates at a specific resonant frequency, it can perturb the local symmetry of the vacuum, generating temporary materialization in the form of visible mass.

Thus, solar filaments are not merely masses "ejected" from the Sun, but can be interpreted as oscillatory precipitations induced by the Sun's oscillating logic field.

3.2 Stages of Mass Induction from the Subquantum Vacuum

1. Harmonic oscillation of the internal solar core, with frequencies highly correlated to the logical structure of the vacuum;

2. Coherent perturbation of the region around the core, inducing local logical oscillatory instability;

3. Localized oscillatory collapse materializing as mass (plasma filament);

4. Temporary stabilization via solar magnetic fields;

5. CME ejection if mass and energy accumulation exceeds the oscillatory equilibrium threshold.

3.3 Implications for Mass and Energy Conservation

This perspective does not contradict mass conservation, but rather extends it:

Mass is not conserved locally, but through oscillatory equivalence at the level of the universal logical system.

The energy required for mass formation is drawn from the oscillatory phase difference of the vacuum and rebalanced through compensatory radiation (e.g., gravitational waves, soft X-rays, etc.).

3.4 Validation Through Solar Observations and Extrapolation

- Regions where filaments appear coincide with oscillatory nodes of solar activity (e.g., differential rotation centers);

- Filament oscillation frequencies match the periods of the Sun’s p- and g-modes;

- The "excess" mass has no identifiable baryonic source — yet it is fully explainable via oscillatory induction.

This approach provides an alternative framework to explain not only filaments but also the sudden appearance of sunspots, magnetic reconnections, and even coronal waves.

3.5 Conclusion

The NMSI model argues that the masses observed in eruptive filaments can be explained through a subquantum oscillatory induction mechanism, in which the solar core acts as a logical node triggering local materialization.

This offers a coherent, quantifiable, and observation-compatible alternative, forming the energetic foundation of a rigorous yet unconventional solar physics.

Section 4. Oscillatory Correlations Between the Filament, Solar Core, and External Logical Planes (Heliospheric Network)

4.1 Macro-scale Solar Oscillatory Interconnection

According to the NMSI model, solar activity is not isolated but interconnected with an extended oscillatory logical network that includes:
- the central solar core (the main generator of logical harmonics);
- the mid-convective zone (oscillatory phase amplifier);
- the solar corona (medium for oscillation distribution);
- the heliospheric network (a three-dimensional plane of oscillatory reception and reflection).

This network is composed of oscillating nodes (CLOs) distributed spatially, functioning like a solar neural network capable of storing, retransmitting, and modulating infobitic signals.

4.2 Filament Positioning Within the Heliospheric Network

Eruptive filaments frequently appear:
- at the intersection of differential current lines;
- in unstable magnetic interface points;
- in regions where the heliospheric network undergoes logical phase distortions.

These positions are not random but correspond to nodes of oscillatory intensification. Thus, the filament can be considered a logical nodal event.

4.3 Bidirectional Interaction: Core – Filament – Heliosphere

The oscillatory flux is circular and resonant:
- the core emits a logical oscillatory signal;
- it is reflected/amplified in the local heliospheric node;
- the node generates a local reaction (filament);
- the filament's oscillation subtly influences the core phase via feedback (observable in p-mode variations).

This is equivalent to an oscillatory logic feedback loop, by which the Sun monitors and adjusts the activity of its own heliospheric network.

4.4 Systemic Analogies and Extrapolations

The heliospheric network can be compared to:
- the glial network in the brain (subtle control role);
- the cellular internal network (logical endoplasmic reticulum);
- a regulatory layer for inter-structural communication in planetary systems.

This structure does not merely transmit, but constructs logical context for oscillatory materialization. Hence, the eruptive filament is just a local expression of a global oscillatory decision.

4.5 Conclusion

Eruptive filaments represent visible manifestations of a broad oscillatory logic process that links the solar core to external oscillatory planes through spatially distributed CLO nodes.

This approach offers a unified perspective where mass, energy, and information are facets of the same subquantum oscillatory resonance process.

Section 5. Implications of Oscillatory Processes on Planetary Systems and Inter-Nodal Communication

5.1 Solar Resonance and Planetary Activation

The NMSI model proposes that oscillations of the solar core do not remain confined to the Sun, but propagate through the heliospheric network and interact with planetary cores.

Each planet possesses its own "logical node," capable of receiving and transducing these oscillations into forms of internal activity (magnetic, atmospheric, tectonic).

This explains why major solar anomalies (CMEs, filaments) are often correlated with:
- geomagnetic storms on Earth;
- earthquakes;
- sudden climate shifts;
- synchronization effects observed across multiple planets simultaneously.

5.2 Planetary Oscillatory Network

Each planet is part of a solar-synchronized logical oscillatory network. This includes:
- the planetary core as an oscillatory node;
- the mantle as a logical phase filter;
- the crust as a slow signal transducer;
- the atmosphere as an adaptive oscillatory diffuser.

This network may explain the appearance of similar atmospheric or magnetic organizational structures across vastly different planets (e.g., polar vortices on Jupiter and Saturn).

5.3 Inter-Nodal Communication in the Solar System

Solar filaments can be viewed as logical signals sent to planetary nodes, and the responses (including "oscillatory quakes" or magnetic fluctuations) can be interpreted as part of a solar oscillatory communication network.

This provides a new interpretation of seemingly mysterious planetary connections, such as:
- planetary alignments with real physical effects;
- cyclical periods correlated with solar activity;
- synchronization of planetary infrasounds.

5.4 Implications for Geophysical Prediction

By monitoring oscillatory logic loops within the heliospheric network, we can obtain:
- earthquake predictions through analysis of oscillatory interference nodes;
- warnings for geomagnetic storms;
- interplanetary atmospheric correlations;
- logical modeling of climate cycles.

This transforms solar astrophysics into a functional monitoring and prediction system for planetary equilibrium.

5.5 Conclusion

Solar oscillations do not merely radiate energy—they "speak" in a logical language to the entire planetary network. Every filament is a message; every planetary reaction is an interpretation.

Through the NMSI model, solar observation becomes systemic communication, and communication becomes a tool for scientific prediction applicable to geophysical and planetary systems.

Section 6. Cosmological Implications of the NMSI Model and Scaling of Oscillations to the Galactic Level

6.1 Extending Oscillatory Logic to Galactic Structures

According to the NMSI model, subquantum oscillations are not limited to solar systems but propagate across all levels of cosmic structure:
- star clusters;
- galactic arms;
- massive galactic centers;
- cosmic filaments.

Each structural level is dominated by a major oscillatory node (CLO), and their interaction determines:
- the emergence of matter fields in filamentary networks;
- the formation of spiral galaxies;
- the organization of galaxy clusters along the axis of logical resonance.

6.2 Galactic Nuclei as Super-CLOs

Galactic centers are not merely high-density regions, but logical oscillatory nuclei capable of influencing vast spatial volumes through logic-oscillatory dynamics.

Observable effects include:
- synchronized emission of relativistic jets;
- systematic organization of spiral arms;
- gravitational control on large scales, explainable only through an active logical oscillatory network.

6.3 Universal Resonance and the "Excess Mass" of the Universe

The NMSI model naturally explains discrepancies observed in:
- galaxy mass (without postulating undetectable dark matter);
- the organization of cosmic filaments;
- large-scale correlations between quasars, galaxies, jets, and gravitational waves.

All of these may result from a cosmic logical oscillatory network, where mass arises from oscillatory condensation rather than slow gravitational aggregation.

6.4 The Universe as a Self-Resonant Logical Network

In the NMSI view, the Universe is not chaotic space, but a coherent oscillating logical structure, where:
- each node represents a center of oscillatory decision-making;
- matter is the visible stage of local oscillations;
- energy is the module of logical variation;
- time is the oscillatory phase.

This vision eliminates the need for physical expansion of the Universe and replaces it with a continuous logical oscillatory evolution.

6.5 Conclusion

The NMSI model offers a complete cosmological framework where subquantum oscillatory logic governs not only solar and planetary processes but the entire architecture of the Universe.

This opens the path to a new informational cosmology, in which mass, space, and time are emergent logical derivatives from universal coherent oscillation.

Section 7. Technological Implications of the NMSI Model: Oscillatory Computing and Planetary Logical Prediction

7.1 From Observation to Oscillatory Engineering

The NMSI model transforms physical observation into applicable logic. If the Universe operates through coherent oscillatory networks, then we can reproduce these principles in:
- computing architectures;
- logical prediction systems;
- technologies for detecting planetary oscillatory signals.

These applications are no longer fiction, but direct extensions of cosmological logic.

7.2 Oscillatory Computing Systems (TQC)

Artificial oscillatory networks can be built using:
- quantum oscillatory nodes (e.g., EMF);
- propagation substrates with controllable antiphase;
- triadic logic-phase architectures (CLO).

These systems do not use classical digital algorithms but function through spontaneous coherent reorganization under external excitation. This mode of computation is:
- simultaneously distributed;
- logically reversible;
- extremely energy efficient.

7.3 Oscillatory Planetary Prediction Technology

Each planet reacts oscillatory to solar activity. Through the NMSI model, we can:
- construct maps of planetary oscillatory resonance;
- predict seismic or atmospheric risk zones;
- anticipate major earthquakes via oscillatory phase interference;
- determine climate cycles based on heliospheric distortions.

These methods do not require deterministic predictions, but rather detection of emerging logic.

7.4 Infrastructure for Technological Implementation

To apply the NMSI model at a technological scale, the following are needed:
- a global network of oscillatory sensors;
- isolated chambers for stable-phase oscillatory computing;
- logic-phase transducers for interpreting outcomes;
- intercontinental collaboration for calibration.

These technologies can be implemented in advanced physics, geophysics, and informational engineering laboratories.

7.5 Conclusion

The NMSI model is not just a theory but a universal logical foundation for emerging technologies. Oscillatory computing, planetary prediction, and non-digital logical architectures can become reality through the coherent application of universal principles.

The next section will summarize the findings of this work and outline future directions in oscillatory research.

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