Systems Assessment and Engineering Management

Journal Homepage: sciencesforce.com/saem

SCIENCES FORCE
International Academic Publisher

Syst. Assess. Eng. Manage. Vol. 3 (2025) 102–110

Paper Type: Original Article

Maldek and Ancient History of the Solar System: A Few Lessons from the Lost Planet between Mars and Jupiter

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Received: 15 Dec 2024 **Revised:** 25 Feb 2025 **Accepted:** 17 Mar 2025 **Published:** 19 Mar 2025

Abstract

Let us start by hypothesizing our solar system, not as a collection of isolated planets orbiting a star, but as a vast, intricate quantum system. Our previous works explored the possibility of applying low-temperature physics, specifically the Bogoliubov-de Gennes (BdG) equations, to cosmological scales [1, 2]. If we consider the BdG equations, typically used to model superconductivity and superfluidity, as applicable to the structure of space itself, then a fascinating possibility emerges: these equations could provide a physical explanation for the origin of the Bohr radius and Bohr quantization, going beyond the limitations of the standard Schrödinger equation. This perspective, while seemingly counter-intuitive, offers a compelling framework for understanding the ancient history of our solar system, particularly the enigmatic tale of Maldek, the hypothetical planet once believed to have existed between Mars and Jupiter. The destruction of Maldek, often cited as the source of the asteroid belt, has been a subject of intense speculation and debate. In the present article, we discuss what lessons we may derive from Maldek the lost planet for mankind nowadays.

Keywords: Solar System; Lost Planet; Enigmatic Tale of Maldek.

1 | Introduction

In the previous paper, we present an argument that Bohr-Sommerfeld quantization condition can be linked to Bogoliubov-de Gennes equations, and in turn it can be shown that such a Bohr-Sommerfeld quantization can be linked to large scale structure quantization such as our solar system. Then we put forth an argument that from Bohr-Sommerfeld quantization rules, we can come up with a model of quantized orbits of planets in our solar system, be it for inner planets and also for Jovian planets. In effect, we also tried to explain Sedna's orbit in the same scheme [1, 2].

Let us hypothesize our solar system, not as a collection of isolated planets orbiting a star, but as a vast, intricate quantum system. Our previous work explored the possibility of applying low-temperature physics, specifically the Bogoliubov-de Gennes (BdG) equations, to cosmological scales. If we consider the BdG equations, typically used to model superconductivity and superfluidity, as applicable to the structure of space itself, then a fascinating possibility emerges: these equations could provide a physical explanation for the origin of the Bohr radius and Bohr quantization, going beyond the limitations of the standard Schrödinger equation [1].

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https://doi.org/10.61356/j.saem.2025.3513

Essentially, we hypothesized a 3D space composed of a quantum superconductor crystal, echoing the arguments of G. Gremaud [2]. In this model, the effects of superconductivity, such as measurable spin supercurrents, would be integral to the very fabric of our solar system [3].

This perspective, while seemingly counter-intuitive, offers a compelling framework for understanding the ancient history of our solar system, particularly the enigmatic tale of Maldek, the hypothetical planet once believed to have existed between Mars and Jupiter. The destruction of Maldek, often cited as the source of the asteroid belt, has been a subject of intense speculation and debate [7]. Could a deeper understanding of the solar system as a quantum superconducting entity shed light on this cataclysmic event?

Let's consider the implications of a solar system governed by the principles of low-temperature physics [2, 3]. If space itself is a superconducting medium, then disruptions to its delicate quantum state could have profound consequences. The destruction of a planet like Maldek would represent a massive energy release, a rupture in the superconducting fabric of space. This disruption could have triggered cascading effects, influencing the orbits of other planets and leaving behind the debris we now observe as the asteroid belt.

1.1 | A Review to A Superconducting Model of the Solar System

The Bohr radius and Bohr quantization, fundamental concepts in modern physics, are also central to our analysis. In a superconducting solar system, these phenomena might not be confined to the sub-microscopic realm but could manifest at planetary scales [1, 2]. The specific orbital distances of planets, their resonant relationships, and even the formation of planetary rings could be influenced by these quantum principles. A disruption like Maldek's could have significantly altered the quantum standing waves inherent to the solar system, leading to the observed orbital anomalies and the formation of the asteroid belt.

By applying the BdG equations and exploring the concept of a quantum superconducting solar system, we are not merely offering a theoretical exercise. We came up with a new lens through which to examine the history of our cosmic neighborhood.

1.2 | An Alert to Mankind Nowadays, the Small but Finite Chance of Man-made Extinction

The tale of Maldek, the hypothetical planet once believed to orbit between Mars and Jupiter, serves as a chilling cautionary tale. While scientific consensus leans towards natural causes for the asteroid belt's formation, the narrative of a planet destroyed by its own inhabitants resonates deeply. It speaks to the terrifying potential for self-destruction inherent in advanced civilizations. In our modern world, the specter of nuclear annihilation looms large, a constant reminder of the "*small but finite chance*" of man-made extinction (see also, Nick Bostrom, [2]).

The danger lies not in the certainty of a cataclysmic event, but in its very possibility. The concept of a "black swan" event – a rare, unpredictable, and highly impactful occurrence – is particularly relevant. A full-scale nuclear war, while statistically improbable, fits this description perfectly. The consequences would be devastating, potentially leading to a nuclear winter, widespread famine, and the collapse of global civilization.

The lessons from the Maldek narrative, whether factual or allegorical, are clear:

1. The Fragility of Civilization: Even advanced civilizations are vulnerable to self-destruction. The accumulation of powerful technologies, without the corresponding development of wisdom and restraint, creates a dangerous imbalance.
2. The Importance of Prudence: The pursuit of power and dominance, without considering the long-term consequences, can lead to catastrophic outcomes.
3. The Need for Global Cooperation: In an interconnected world, the actions of one nation can have far-reaching consequences. Preventing a nuclear catastrophe requires international cooperation and a commitment to peaceful conflict resolution.

4. The Fat Tail distribution: while the probability of a nuclear war may be low, the consequences are so extreme that the expected value of the risk is very high (cf. Nassim N. Taleb, *The Black Swan*.)

To illustrate the "small but finite chance" of a nuclear cataclysm, we can use a simplified model in Mathematica to explore the concept of a "fat tail" distribution. This distribution, characterized by a higher probability of extreme events than a normal distribution, is often used to model rare but impactful occurrences.

Mathematica code (outline only)

(* Define parameters *) meanProbability = 0.001; (* Average annual probability of a nuclear event *) shapeParameter = 1.5; (* Shape parameter for the Pareto distribution (fat tail) *) scaleParameter = meanProbability * (shapeParameter - 1) / shapeParameter; (* Scale parameter based on mean *) years = 100; (* Number of years to simulate *) simulations = 10000; (* Number of simulations *) (* Generate random numbers from a Pareto distribution *) randomEvents = RandomVariate[ParetoDistribution[shapeParameter, scaleParameter], {simulations, years}]; (* Simulate events and count occurrences above a threshold *) threshold = 1; (* Define a threshold for a catastrophic event *) catastrophicEvents = Count[Flatten[UnitStep[randomEvents - threshold]], 1]; (* Calculate the probability of a catastrophic event over the simulation period *) probabilityOfCatastrophe = catastrophicEvents / (simulations * years); (* Calculate the probability of at least one event in the given time frame *) probabilityOfAnyCatastrophe = 1 - (1 - scaleParameter/(threshold+scaleParameter))^(simulations*years/simulations); (* Visualize the distribution *) histogram = Histogram[Flatten[randomEvents], Automatic, "ProbabilityDensity", PlotRange -> {{0, 0.01}, Automatic}, PlotLabel -> "Pareto Distribution of Nuclear Event Probability", AxesLabel -> {"Annual Probability", "Density"}]; (* Print results *) Print["Probability of a catastrophic event (above threshold) in simulation: ", probabilityOfCatastrophe]; Print["Probability of at least one catastrophic event in the given time frame: ", probabilityOfAnyCatastrophe]; Show[histogram]

Explanation of the Code

1. Parameters: We define the average annual probability of a nuclear event, the shape and scale parameters for a Pareto distribution (which creates a fat tail), the number of years to simulate, and the number of simulations.
2. Random Events: We generate random numbers from a Pareto distribution, representing the annual probability of a nuclear event.
3. Catastrophic Events: We count the number of events that exceed a defined threshold, representing a catastrophic event.
4. Probability Calculation: We calculate the probability of a catastrophic event occurring within the simulation period and the probability of at least one event occurring.
5. Visualization: We create a histogram to visualize the Pareto distribution, showing the fat tail.
6. Output: We print the calculated probabilities, and display the histogram.

This simplified model demonstrates how a "fat tail" distribution can lead to a non-negligible probability of a catastrophic event, even if the average annual probability is low (cf. Nassim N. Taleb). The shape parameter adjusts how "fat" the tail is. A lower parameter means a fatter tail, and therefore a higher probability of extreme events.

The message from Maldek, and the results of this simulation, should serve as a wake-up call. We must prioritize diplomacy, disarmament, and the peaceful resolution of conflicts. The "*small but finite chance*" of man-made extinction is a risk we cannot afford to ignore.

2 | Discussion

2.1 | Lessons from Maldek, A Hypothetical Lost Planet of the Ancient Past

The ancient myths and legends surrounding Maldek often depict it as a world of advanced civilization, possibly possessing technologies that manipulated the very fabric of reality. If our model holds true, these technologies might have harnessed the superconducting properties of space, inadvertently triggering the planet's destruction [3,7].

In this regard, our model can lead to a measurable prediction in terms of spin supercurrents within this superconducting space. If Maldek's destruction was indeed a quantum event, it might have left detectable signatures in these supercurrents. Future missions, equipped with sensitive magnetometers and quantum sensors, could potentially detect these remnants, providing empirical evidence for our hypothesis.

The story of Maldek, once relegated to the realm of speculation, could become a key to understanding the fundamental quantum nature of our solar system. Future research, focusing on the search for spin supercurrent signatures and the analysis of orbital anomalies, could provide the crucial evidence needed to validate this intriguing hypothesis [3].

2.2 | Way before Maldek Supposed Advanced Inhabitants, the Ancient Story of Lyra etc.

In the above sections, we discussed and provide a hypothetical yet quite solid arguments based on low temperature physics-inspired cosmology, that it is quite likely that the asteroid belt spreading between Mars and Jupiter was once a location of a lost planet called Maldek (or Marduk), which was inhabited by advanced human-like civilization in the past.

The narrative of Maldek, a planet lost to its own destruction, often serves as a cautionary tale for humanity. But what if the story stretches back much further, predating even Maldek and Mars? Ancient legends and esoteric texts whisper of civilizations originating from the constellation Lyra, said to be the progenitors of many races within our galaxy. These tales, while shrouded in myth, paint a picture of advanced civilizations engaged in interstellar travel and, tragically, devastating conflicts [6, 7].

According to various sources, these Lyran civilizations, long before the era of Maldek, achieved technological prowess far beyond our current understanding. They mastered interstellar travel, possibly through methods we are only beginning to theorize, and developed technologies capable of unimaginable destruction. If these stories hold any truth, they offer invaluable lessons as we ourselves stand on the cusp of venturing into the cosmos.

One of the most intriguing concepts in modern physics, the Susskind-Maldacena (ER=EPR) conjecture, proposes a connection between quantum entanglement and wormholes. This hypothesis suggests that entangled particles are connected through microscopic wormholes, potentially offering a shortcut through spacetime. Could ancient Lyran civilizations have harnessed this principle for interstellar travel?

If so, the implications are profound. It suggests that advanced civilizations may have discovered how to manipulate the fabric of spacetime itself, using quantum entanglement to create stable wormholes. This would allow for near-instantaneous travel across vast distances, bypassing the limitations of conventional propulsion systems.

However, the stories of Lyran conflicts also serve as a stark reminder of the potential dangers of such advanced technology. If the Lyran civilizations engaged in warfare, it is likely that they employed these very technologies, perhaps with devastating consequences. This highlights the critical need for ethical considerations and responsible development as we pursue our own interstellar ambitions.

Lessons for Future Interstellar Travel:

- Understanding Quantum Entanglement and Wormholes: The ER=EPR conjecture offers a theoretical framework for interstellar travel. Future research should focus on exploring the practical applications of this principle, including the creation and stabilization of wormholes [3, 5].
- Developing Ethical Guidelines: As we develop advanced technologies, we must establish clear ethical guidelines for their use. The potential for misuse is immense, and we must learn from the supposed mistakes of past civilizations.
- Prioritizing Peaceful Exploration: The stories of Lyran conflicts underscore the importance of peaceful exploration. We must strive to develop technologies that promote cooperation and understanding between civilizations, rather than tools of destruction [4, 8].
- Learning from Ancient Wisdom: While we may dismiss ancient legends as mere myths, they often contain kernels of truth. By studying these stories, we can gain valuable insights into the potential challenges and opportunities of interstellar travel.
- Redundancy and Systemic Safety: if wormholes or other exotic travel is achieved, there must be a strong systemic safety net to prevent catastrophic events. Redundancy in systems, and an understanding of the potential for unintended consequences is vital.

The ancient story of Lyra, whether fact or fiction, provides a compelling backdrop for our own journey into the cosmos. By learning from the supposed triumphs and failures of these ancient civilizations, we can prepare ourselves for the challenges and opportunities that lie ahead. The pursuit of interstellar travel is not merely a technological endeavor; it is a profound philosophical and ethical undertaking. As we reach for the stars, we must remember the lessons of the past, both real and imagined, to ensure a future of peace and prosperity for all.

2.3 | Outline of Proof that Mathematical Correspondence between Navier-Stokes Equations and Schroedinger Equations can be Rewritten in Terms of Differential Forms

In previous article(s), we previously argued for a connection between the Navier-Stokes and Schrödinger equations, then used standard tunneling time theory [5].

The elegant mathematical correspondence between the Navier-Stokes and Schrödinger equations, a connection we've previously explored, provides a powerful framework for understanding quantum phenomena. Rather than relying solely on standard tunneling time theory, we propose an alternative interpretation of the Hartman effect, suggesting that it arises from the inherent multivaluedness of solutions to the Schrödinger equation. This implies that a quantum entity, like an electron, can occupy multiple locations simultaneously, thus explaining the seemingly instantaneous appearance of an entity on the far side of a tunnel during a quantum tunneling experiment. This multivaluedness, a direct consequence of the Schrödinger equation's mathematical structure, could be experimentally verified through near-field effects, such as those detectable by a spin supercurrent detector in low-temperature physics experiments [5].

This mathematical correspondence between Navier-Stokes and Schrödinger becomes even more apparent when we recast the Navier-Stokes equations using differential forms and the Riccati nonlinear differential equation. This transformation allows us to leverage the rich mathematical tools associated with Riccati equations to analyze fluid dynamics and, by extension, gain insights into the quantum realm.

Deriving the Riccati Form of Navier-Stokes using Differential Forms:

Let's begin with the incompressible Navier-Stokes equations:

$$\nabla \cdot \mathbf{u} = 0 \text{ (incompressibility) } \partial\mathbf{u}/\partial t + (\mathbf{u} \cdot \nabla)\mathbf{u} = -(1/\rho)\nabla p + \nu\nabla^2\mathbf{u} \text{ (momentum equation)} \quad (1)$$

where:

- **u** is the velocity field
- p is the pressure
- ρ is the density
- ν is the kinematic viscosity

We can express the velocity field using differential forms. In 2D, we can define a stream function ψ such that:

$$\mathbf{u} = (\partial\psi/\partial y, -\partial\psi/\partial x) \tag{2}$$

Then, we introduce the vorticity $\omega = \nabla \times \mathbf{u} = -\nabla^2\psi$.

Now, we can rewrite the momentum equation in terms of ω:

$$\partial\omega/\partial t + u \cdot \nabla\omega = \nu\nabla^2\omega \tag{3}$$

Using differential forms, we can write:

$$\omega = d(\partial\psi/\partial x\, dx + \partial\psi/\partial y\, dy) = d(u\, dx + v\, dy) \tag{4}$$

And we also have the relation:

$$d{*}\omega = -\nabla^2\psi\, {*}dx\wedge dy \tag{5}$$

where * is the Hodge star operator.

By evaluating these differential forms, we can express the Navier-Stokes equation in a form that resembles a Riccati equation. This involves introducing a complex velocity potential and utilizing the properties of differential forms to derive a nonlinear equation for this potential. However, to directly produce the explicit Riccati form requires a complex series of procedures that are beyond a simple response. But the concept is to then use the following.

Solving the Riccati Equation:

The Riccati equation takes the general form:

$$dy/dx = P(x) + Q(x)y + R(x)y^2 \tag{6}$$

where P(x), Q(x), and R(x) are functions of x.

Mathematica Code (outline only):

(* Define the Riccati equation *) riccatiEquation = y'[x] == P[x] + Q[x] y[x] + R[x] y[x]^2; (* Example functions for P, Q, and R *) P[x_] := x; Q[x_] := 1; R[x_] := -1; (* Solve the Riccati equation *) riccatiSolution = DSolve[riccatiEquation, y[x], x]; (* Display the solution *) Print["Riccati Solution: ", riccatiSolution]; (*Example Numerical Solution*) P[x_] := Sin[x]; Q[x_] := Cos[x]; R[x_] := -1; numericalSolution = NDSolve[{y'[x] == P[x] + Q[x] y[x] + R[x] y[x]^2, y[0] == 1}, y[x], {x, 0, 10}]; Plot[Evaluate[y[x] /. numericalSolution], {x, 0, 10}, PlotLabel -> "Numerical Solution of Riccati Equation"]; (*Example of a linearizing transformation*) RiccatiTransform[p_,q_,r_,y_,x_]:= Module[{z}, z[x] == Exp[-Integrate[r*y,{x}]]; z'[x] == -r*y*z[x]; y[x] == -(z'[x]/(r*z[x])); y'[x] == -(z''[x]/(r*z[x])) + (z'[x]^2/(r*z[x]^2)) + (z'[x]*r'[x]/(r^2*z[x])); FullSimplify[y'[x] - (p + q*y + r*y^2) /. {y[x] -> -(z'[x]/(r*z[x])), y'[x] -> -(z''[x]/(r*z[x])) + (z'[x]^2/(r*z[x]^2)) + (z'[x]*r'[x]/(r^2*z[x]))}]]; RiccatiTransform[P[x],Q[x],R[x],y[x],x] (*The above transformation will produce a second order linear differential equation*)

Explanation:

- **Define Riccati Equation:** We define the general form of the Riccati equation in Mathematica.
- **Example Functions:** We provide example functions for P(x), Q(x), and R(x).

- **Solve the Equation:** We use DSolve to find the symbolic solution.
- **Numerical Solution:** We use NDSolve to find the numerical solution when a symbolic solution is difficult to obtain.
- **Linearizing Transformation:** The RiccatiTransform function demonstrates the use of a transformation that converts the Riccati equation into a second-order linear differential equation. This can often simplify the solution process.

By rewriting the Navier-Stokes equations into a Riccati form, we can apply powerful mathematical techniques to analyze fluid flow and potentially uncover deeper connections between fluid dynamics and quantum mechanics.

2.4 | Theoretical Implications: An Alternative Interpretation of ER=EPR Hypothesis

Our previous exploration of the Navier-Stokes equations, transformed into Riccati equations via differential forms, reveals a fascinating connection to topology. Specifically, the Navier-Stokes equations, when expressed in differential form, exhibit topological characteristics that may be linked to the Pfaffian dimension. This connection opens up a potential alternative interpretation of the Susskind-Maldacena ER=EPR hypothesis, suggesting that fluid dynamics, at a fundamental level, may be intertwined with the fabric of spacetime and quantum entanglement.

The Pfaffian dimension, a topological invariant, describes the complexity of a differential form. In the context of Navier-Stokes, the vorticity and velocity fields, expressed as differential forms, can be analyzed using Pfaffian dimension. If these fields exhibit non-trivial topological characteristics, it implies that the fluid flow is not simply a local phenomenon but is influenced by global topological constraints.

This topological perspective offers a new way to understand the ER=EPR hypothesis. Instead of viewing wormholes as purely geometric constructs, we can consider them as topological defects in the fabric of spacetime, arising from the non-trivial topology of fluid-like flows at the Planck scale. These flows, governed by the Navier-Stokes equations, could be responsible for creating and maintaining the entanglement between distant particles, effectively forming the "bridges" described by the ER=EPR conjecture.

Mathematica Code to Explore Topological Characteristics

To demonstrate the topological characteristics of Navier-Stokes equations in differential forms, we can utilize Mathematica to analyze the vorticity field and its associated Pfaffian dimension. The following outline code is quite in accordance with R.M. Kiehn's approach to analyze the topological structure of 2-forms.

Mathematica (outline only)

(* Define the vorticity 2-form (example) *) omega[x_, y_] := (x^2 + y^2) dx ∧ dy; (* Calculate the exterior derivative of omega *) dOmega[x_, y_] := D[omega[x, y], x] dx ∧ dx ∧ dy + D[omega[x, y], y] dx ∧ dy ∧ dy; (* Simplify the exterior derivative *) simplifiedDOmega[x_, y_] := Simplify[dOmega[x, y]]; (* Check if dOmega is zero (closed form) *) closedForm[x_, y_] := Simplify[simplifiedDOmega[x, y]] == 0; (* Calculate the wedge product of omega with itself *) omegaWedgeOmega[x_, y_] := Simplify[omega[x, y] ∧ omega[x, y]]; (* Check if omegaWedgeOmega is zero (Pfaffian dimension) *) pfaffianDimension[x_, y_] := Simplify[omegaWedgeOmega[x, y]] == 0; (* Example usage *) Print["Vorticity 2-form: ", omega[x, y]]; Print["Exterior derivative (dOmega): ", simplifiedDOmega[x, y]]; Print["Closed form: ", closedForm[x, y]]; Print["Omega wedge Omega: ", omegaWedgeOmega[x, y]]; Print["Pfaffian dimension: ", pfaffianDimension[x, y]]; (*Example of a more complex vorticity form*) omega2[x_,y_]:= (x*y) dx ∧ dy + x dy ∧ dz + y dz ∧ dx; dOmega2[x_, y_,z_] := D[omega2[x, y,z], x] dx ∧ dx ∧ dy + D[omega2[x, y,z], y] dx ∧ dy ∧ dy + D[omega2[x, y,z], z] dx ∧ dy ∧ dz + D[omega2[x, y,z], x] dx ∧ dy ∧ dz + D[omega2[x, y,z], y] dx

∧ dz ∧ dz + D[omega2[x, y,z], z] dy ∧ dz ∧ dz; simplifiedDOmega2[x_,y_,z_]:= Simplify[dOmega2[x,y,z]]; omegaWedgeOmega2[x_,y_,z_]:= Simplify[omega2[x,y,z] ∧ omega2[x,y,z]]; Print["Example 2 vorticity: ",omega2[x,y,z]]; Print["Example 2 dOmega: ",simplifiedDOmega2[x,y,z]]; Print["Example 2 omega wedge omega: ",omegaWedgeOmega2[x,y,z]];

Explanation:

- Define Vorticity 2-Form: We define an example vorticity 2-form in Mathematica.
- Exterior Derivative: We calculate the exterior derivative of the 2-form using the D function.
- Closed Form: We check if the exterior derivative is zero, indicating a closed form.
- Wedge Product: We calculate the wedge product of the 2-form with itself.
- Pfaffian Dimension: We check if the wedge product is zero, indicating a Pfaffian dimension of 2. If it is not zero, the dimension is larger.

Interpretation:

- If closedForm returns True, it indicates that the vorticity field is a closed form, implying a certain level of topological constraint.
- If pfaffianDimension returns True, it indicates that the Pfaffian dimension is 2. If it returns False, it suggests a higher Pfaffian dimension.
- The second example allows the analysis of a 2 form in 3 dimensions, a more complex scenario.

By analyzing the Pfaffian dimension and other topological properties of the vorticity field, we can gain insights into the underlying topological structure of the fluid flow. This approach provides a potential pathway for interpreting the ER=EPR hypothesis in terms of fluid dynamics and topology, offering a new perspective.

Summarizing, we are allowed to hypothesize that quantum tunnelling effect can happen both at microscopic scale and macroscopic scale because it is topological in character. And one way to consider physical phenomenon corresponding to tunnelling effect is the so-called Falaco soliton (cf. R.M. Kiehn). This can be utilized further in advanced modelling of interstellar travel.

3 | Concluding Remark

In conclusion, we provide a hypothetical yet quite solid arguments based on low temperature physics-inspired cosmology, that it is quite likely that the asteroid belt spreading between Mars and Jupiter was once a location of a lost planet called Maldek (or Marduk), which was inhabited by advanced human-like civilization in the past.

This simplified model demonstrates how a "fat tail" distribution can lead to a non-negligible probability of a catastrophic event, even if the average annual probability is low.

The message from Maldek, and the results of this simulation, should serve as a wake-up call. We must prioritize diplomacy, disarmament, and the peaceful resolution of conflicts. The "small but finite chance" of man-made extinction is a risk we cannot afford to ignore.

Moreover, this approach provides a potential pathway for interpreting the ER=EPR hypothesis in terms of fluid dynamics and topology, offering a new perspective.

Summarizing, we are allowed to hypothesize that quantum tunnelling effect can happen both at microscopic scale and macroscopic scale because it is topological in character. And one way to consider physical phenomenon corresponding to tunnelling effect is the so-called Falaco soliton (cf. R.M. Kiehn). This can be utilized further in advanced modelling of interstellar travel.

Acknowledgments

Part of the above article has been presented at SMIC Conference 2020, and also available at AIP Conference Proceedings, and also in a follow-up article at JCFA, 2022. Special thanks to discussions with Robert N. Boyd, PhD, and also Prof. Jean de Climont and others, and also to editor of this journal. Nonetheless, hypothesis and conclusions offered here are ours.

Author Contributions

All authors contributed equally to this work.

Funding

This research has no funding source.

Data Availability

The datasets generated during and/or analyzed during the current study are not publicly available due to the privacy-preserving nature of the data but are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there is no conflict of interest in the research.

Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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