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The Big Bang Explosion as an Icequake: A Novel Model for the Origin of the Universe within a Rotating Tectonic Iceball

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Abstract: While the Big Bang theory remains foundational to cosmology, critical questions persist regarding the initial singularity and pre-Bang conditions.

We propose a novel high-energy cosmological mechanism for the origin of the observable universe, modeled as a catastrophic *icequake* within the crust of a rotating tectonic iceball of cosmological scale, termed *Feluc*, embedded in a vast, cold medium we refer to as the Old-Water. In this framework, mechanical stress accumulation and sudden fracture in Feluc's crystalline outer shell release a burst of energy sufficient to initiate sublimation, dissociation, and ionization of H_2O ice, giving rise to a rapidly expanding, rotating plasma cloud: the nascent B-universe. The model preserves energy conservation by linking cosmic expansion to ongoing progressive sublimation of the Last Scattering Surface (LSS), the spherical icy boundary of Feluc's cavity preserving the B-universe.

The Cosmic Microwave Background (CMB) is recast as thermal radiation emitted from the LSS. Observed temperature anisotropies in the CMB are interpreted as projections of density variations within Feluc's crust, offering a physically grounded mechanism for primordial fluctuations.

By bridging glaciology, thermodynamics, and high-energy astrophysics, the model generates testable predictions that both challenge conventional cosmological theories and provide innovative solutions to persistent cosmological problems, while establishing new observational constraints for probing the universe's formation through verifiable physical mechanisms rather than abstract mathematical singularities.

The unification of planetary-scale physics with high-energy astrophysical phenomena creates a robust, observationally constrained alternative to traditional creation paradigms.

Keywords: high-energy icequake, tectonics, ices, Cosmic background radiation, non-singular Big Bang, Planetary Physics.

I. Introduction

The Big Bang theory stands as one of the most widely accepted explanations for the origin and evolution of the universe. The standard cosmological model posits that the universe originated from a hot, dense singularity approximately 13.8 billion years ago. While this theory has provided a robust framework for understanding the formation of cosmic structures, the distribution of matter and energy, and the evolution of the universe, it leaves several fundamental questions unanswered, particularly regarding the nature of the initial singularity, the pre- Bang conditions, the mechanism triggering the event, and the physical origin of early anisotropies.

Traditional cosmological models often invoke singularities or exotic physics to explain the Big Bang explosion, raising questions about the conservation of energy and the physical plausibility of such scenarios.

This research aims to explore an alternative perspective on the first creation of the universe, proposing that the Big Bang explosion was not an isolated, singular event but rather a natural consequence of the dynamics within a massive, rotating tectonic iceball.

We propose an alternative high-energy model that recasts the Big Bang explosion as a catastrophic phase transition event—specifically, a high-energy icequake—within the crust of a massive, rotating, stratified cryogenic structure, designated *Feluc*. This body exists within an extensive low-temperature aqueous medium ("Old-Water") and possesses a layered internal structure composed of dense, amorphous, and crystalline phases of H_2O ice. Under rotational and internal stress, Feluc's rigid outer crust undergoes fracture, releasing immense energy, sufficient to sublimate and ionize the surrounding ice and thereby generate a hot, expanding plasma sphere—the B-universe, embedded within the larger structure of the Feluc.

By reimagining the Big Bang explosion as an icequake within the crust of Feluc, we offer a model that aligns with the principles of classical physics and avoids the need for exotic explanations.

The proposed model integrates insights from cosmology, geology, and the unique properties of water ice to provide a comprehensive framework for understanding the origins of the universe.

This reinterpretation yields a new perspective on early-universe physics grounded in classical mechanics and thermodynamics.

The Cosmic Microwave Background (CMB), a faint glow of microwave radiation that permeates the B-universe, is interpreted as

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a snapshot of the surrounding spherical icy boundary, part of the Feluc's crust, which we identify as the Last Scattering Surface (LSS). The hollow icy boundary LSS holds the B-universe, but is not a part of the B-universe.

Within this framework, the CMB represents thermal emission from the spherical LSS, with temperature anisotropies arising from pre-existing density gradients in Feluc's crust. Furthermore, the model introduces a natural origin for cosmic time and expansion as emergent properties of rotational dynamics and slow sublimation at the LSS boundary.

This work challenges conventional cosmological paradigms by situating the Big Bang within the context of a larger, dynamic cosmological structure. It provides a fresh perspective on the origins of the universe, reconciling cosmological observations with a physically consistent model that avoids the need for exotic physics. By exploring the interplay between geological processes and cosmic evolution, we open new avenues for understanding the universe's creation, evolution, and its place within the broader cosmic framework. This exploration not only addresses unresolved questions in cosmology but also opens new avenues for understanding the fundamental nature of our universe.

The Classical Big Bang Theory: Foundations and Unanswered Questions

Overview of the classical Big Bang theory

The Big Bang theory is the most widely accepted explanation for the outcomes of the explosion that marked the origin of the universe, rather than an explanation of the explosion itself [Silk, 1994]. Immediately following the Big Bang, the universe was dark and composed of primordial gas clouds. Since then, it has been expanding rapidly while maintaining a consistent composition, with roughly 75% hydrogen and 15% helium. The theory suggests that the universe had a definite origin approximately 13.7 billion years ago and did not simply exist eternally in some form. However, what existed before the Big Bang, if anything, remains an open question. What caused the explosion, and what mechanism triggered such a cataclysmic event, are central to understanding the origin of the present universe. Was there truly no time or matter before the Big Bang, or is this merely a limitation of our current understanding?

In this research, we aim to construct a more rigorous history of the universe, exploring these fundamental questions. Guided by the principle that "nothing is created, nothing is lost, and everything is transformed," we will investigate the origins of the universe and its continuous transformation through time. Although the present universe is vast and constantly growing, the fact that it had a definite beginning—originating from a singularity or a finite volume with a finite accelerating rate of expansion—suggests that its total spatial extent remains finite, even as it continues to expand over time.

Before the Big Bang explosion, what existed, if anything, is a question that remains open to interpretation. What caused the explosion, and what mechanism triggered such a cataclysmic event, are central to understanding the origin of the present universe. Was there truly no time or matter before the Big Bang, or is this just a limitation of our current understanding?

Star formation

The formation of a star is a complex and dynamic process that begins within a swirling, ball-shaped molecular cloud. This process is often initiated by gravitational instability, which can be triggered by external factors such as shock waves from nearby stellar explosions. When a region within the cloud reaches a sufficient density of matter, it begins to collapse under its own gravitational force, forming a ball of plasma. This marks the "prestellar" phase, during which the object continues to contract until it forms a dense, hot core capable of initiating nuclear fusion. The core's temperature and pressure eventually become high enough to fuse hydrogen into helium, marking the birth of a star. As fusion progresses, the star enters a stable phase, shining brightly due to the energy released by thermonuclear reactions in its core. Over time, the star's core grows hotter and denser, enabling the fusion of heavier elements, such as carbon into oxygen, through a runaway process. However, stars have a finite supply of hydrogen fuel in their cores, which limits their lifetimes. Once the hydrogen is exhausted, the star no longer has a source of energy to counteract the inward pull of gravity.

At this point, the star's core collapses, leading to a catastrophic explosion known as a supernova. This explosion disperses the star's outer layers into space, enriching the surrounding interstellar medium with heavy elements. For a significant portion of its life, a star shines due to the thermonuclear fusion of hydrogen in its core, releasing energy that radiates into outer space and sustains the star's luminosity. This life cycle of stars—from their formation in molecular clouds to their eventual demise in supernovae—plays a crucial role in the evolution of galaxies and the distribution of elements throughout the universe.

Some water properties

Water (H_2O) is one of the most abundant molecular ices in the dense interstellar medium (ISM), where temperatures are extremely low (typically around 10-20 K) and pressures are minimal. Under these conditions, H_2O ice can exist in both amorphous and crystalline forms, making it a significant component of the ISM's icy inventory [Fraser et al. 2001]. The prevalence of H_2O ice in such environments is due to its stability at low temperatures and its ability to form through various chemical processes, including surface reactions on dust grains and gas-phase chemistry.

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The presence of H_2O ice in the ISM is not only important for understanding the chemical composition of interstellar clouds but also for studying the processes that lead to the formation of stars and planetary systems. Water ice acts as a reservoir for volatile molecules and can contribute to the formation of more complex organic compounds, which are essential building blocks for life. Additionally, the behavior of H_2O ice under extreme conditions, such as those found in the ISM, provides valuable insights into the physical and chemical processes that govern the evolution of cosmic environments.

In summary, H_2O ice is a key component of the dense ISM, existing in both amorphous and crystalline forms under the cold, low-pressure conditions typical of these regions. Its abundance and chemical properties make it a critical factor in the formation of stars, planets, and potentially life itself. Understanding the behavior of H_2O ice in the ISM is therefore essential for unraveling the complex processes that shape the universe.

Water structure

Water is a chemical substance with the chemical formula H_2O. Its molecule consists of one oxygen atom covalently bonded to two hydrogen atoms. At ambient conditions, water is typically found in its liquid form, but it can also exist as a solid (ice) or a gas (water vapor or stream). Even slight changes in temperature or pressure can cause water to undergo phase transitions, resulting in different structural arrangements that vary in symmetry, density, proton ordering, and other physical properties. Depending on the cooling rate and pressure, “ice” can exist in several different forms, with the most common being three different phases: **Crystalline ice:** We know about 15 crystalline phases of water [Praveen & Velumurgan, 2000]. Ice I, less dense than water. Ice II, ice III …ice XV, denser than water. With careful control of temperature, all these different types of ice can be recovered at ambient pressure. For the purposes of this discussion, I will refer to any crystalline form of ice that is denser than liquid water as "crystal ice"**.**

Applying high pressure can indeed be helpful in suppressing crystallization. We obtain then:

Glassy water: also called amorphous ice, is more commonly found in outer space, where extreme conditions—such as low temperatures and low pressures—prevail, and can be obtained from Crystal ice. There are three distinct amorphous forms of ice:

i. LDA: Low density amorphous ice, which is more viscous than regular water, has a density of approximately ~0,94g/cm^3 when recovered at ambient pressure [Martoňák et al., 2005]. It is less dense than the densest form of water, but denser than ordinary ice (ice I_h). This makes it likely the most abundant form of solid water in the universe [Jenniskens et al., 1995].

Ice VIII , when decompressed to 1 bar at 80 K and then heated to 125, undergoes a direct transformation into low-density amorphous ice (LDA) [Yoshimura et al., 2006a,b].
ii. HDA: High density amorphous ice, when recovered at ambient pressure, has a density of approximately 1,17g/cm^3 [Martoňák et al., 2005].

If low-density amorphous ice (LDA) is isothermically compressed at 77°K, it transforms into high-density amorphous ice (HDA) at a pressure of approximately 600 MPa [Poole et al., 1993]. So, HDA can be prepared by isothermal compression of LDA. The pressure required for the LDA→HDA transition decreases as the temperature increases [Poole et al.1993]. HDA states can also be prepared by decompression of VHDA at 140 K to a selected pressure [McClure, 2006].
iii. VHDA: Very high density amorphous ice, when recovered at ambient pressure, has a density of approximately 1,25g/cm^3. VHDA can be viewed as the limiting amorphous structure of highest density. VHDA can be produced by isobarically heating HDA at a pressure of approximately 1.1 GPa to a temperature around 160°K [Christie et al., 2005; Yoshimura et al., 2007]. On isothermal compression of HDA at 125°K, the material transforms into VHDA at a pressure of approximately 1,2 GPa [Loerting et al., 2006].

Dense ice. At the high pressure end, VHDA transform into a new form of crystalline ice, which I will refer to as “Dense ice” [Martoňák et al., 2005; Yoshimura et al., 2011]. While heating amorphous ice at constant pressure, researchers observed its transformation into a denser form of amorphous ice: “Dense ice” (Loerting et al., 2011).We can now conclude that as pressure increases, crystalline forms transform into amorphous ice, which undergoes a significant structural change, from LDA to HDA , and then to VHDA at pressures greater than10kbar. Finally, the amorphous ice transforms under pressure into Dense ice. On the lower pressure end, LDA crystallizes back into a crystalline form [Loerting et al., 2011].
Chemical reactions

Water dissociation: How Light and Heat Break Down Ice

Under extremely high temperatures—around 4500℃—or intense ultraviolet (UV) radiation, water molecules (H_2O) can be broken down into their elemental components: hydrogen (H_2) and oxygen (O_2). This process is called thermal decomposition or photo-dissociation:

$2H_2O + \text{energy} \rightarrow 2H_2 + O_2$

In space environments or icy planetary surfaces exposed to UV light, such as those on Europa or Enceladus, this reaction can occur even at much lower temperatures.

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The UV irradiation of ice (H_2O) can cause the evaporation of the ice and triggers the breakdown of water, forming highly reactive radicals, including H atoms (Hydrogen), OH (hydroxyl radical), HO_2 (hydroperoxyl radical) and H_2O_2 (hydrogen peroxide) [Arasa et al., 2010].

These species play critical roles in planetary atmospheres. For instance, hydroxyl radicals contribute to the breakdown of methane and other greenhouse gases, while hydrogen peroxide acts as a short-lived oxidizing agent.

When oxygen molecules (O_2) break down, they produce oxygen free radicals, which are highly reactive.

Additionally, oxygen molecules (O_2) exposed to UV light can form ozone (O_3) [Miles et al., 1990]:

$3O_2 \rightarrow 2\ O_3$

Ozone is important in Earth's stratosphere for absorbing harmful UV radiation, but it is also a potent air pollutant in the lower atmosphere, contributing to photochemical smog**.**

Ionization: When Water Molecules Gain or Lose Electrons

Ionization is a more extreme chemical process than dissociation, requiring even higher energy input. It results in the formation of charged species called ions. For water and its related compounds, some key ionization reactions include:

* Water molecule splitting into a hydronium ion and a hydroxide ion:

$H_2O + \text{energy} \leftrightarrow H_3O^+ + OH^-$

* Further breakdown of water vapor or hydrogen peroxide can produce:

$H_2O + \text{energy} \leftrightarrow H^+ + OH^-$

$H_2O_2 + \text{energy} \leftrightarrow H^+ + O_2H^-$

These reactions may also release free electrons, contributing to plasma formation—an essential state of matter in high-energy astrophysical environments, such as those envisioned in the aftermath of the Feluc icequake.

Broader Environmental Relevance

These reactions (paragraph 3.2.1 & 3.2.2) are crucial for understanding surface chemistry on icy moons and comets, as well as the chemical evolution of interstellar ices. On bodies like Europa and Enceladus, dissociation and ionization driven by solar radiation and charged particle bombardment contribute to the formation of thin atmospheres, auroral emissions, and potentially prebiotic chemical cycles within subsurface oceans [Paganini et al., 2020; Filacchione et al., 2016]. Similar interactions in dense interstellar clouds lead to the formation of complex organic molecules on icy dust grains, playing a foundational role in the chemistry of star-forming regions and planetary system development [Herbst & van Dishoeck, 2009].

On Earth and other planets, these same mechanisms influence atmospheric composition and climate. For instance, the production of hydroxyl radicals (OH) through water dissociation is central to Earth's atmospheric self-cleansing processes, influencing the lifetime of greenhouse gases like methane [Levy, 1971; Monks, 2005]. Ozone (O_3), produced through the photolysis of O_2, protects the biosphere by absorbing harmful ultraviolet light, playing a major role in regulating surface UV levels, but in the lower atmosphere, it also contributes to air pollution and photochemical smog [Miles et al., 1990; Seinfeld & Pandis, 2016].

Understanding these chemical pathways in both terrestrial and extraterrestrial contexts improves our models of planetary habitability, atmospheric dynamics, and climate evolution but also enhances our interpretation of remote sensing data from icy bodies. In the framework of the Feluc model, they provide a physically grounded mechanism for the transformation of solid H_2O ice into vapor, radicals, and plasma—fueling the birth and continued expansion of the B-universe.

Remote Sensing

Given the key role of sublimation, dissociation, and ionization of H_2O ice in the Feluc model, remote sensing provides a critical observational pathway to validate the model's predictions through non-invasive detection of these processes.

By capturing and analyzing electromagnetic signals from distant surfaces, remote sensing techniques enable scientists to detect not only the presence of H_2O ice but also the chemical transformations it undergoes—providing indirect access to the physical processes occurring at the Last Scattering Surface (LSS) and beyond.

Electromagnetic waves are crucial in remote sensing because they enable the collection of information about objects, areas, and phenomena without physical contact. These waves interact with surfaces, materials, and atmospheres, providing essential data about the target. Electromagnetic waves span a broad spectrum, from very short wavelengths (gamma rays, X-rays) to very long wavelengths (radio waves). Each type of wave is sensitive to specific features. The way electromagnetic waves are reflected, absorbed, or transmitted by objects helps create images and data about the target's surface, without any need for direct contact.

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Remote Sensing of Water Ice

Remote sensing is a powerful and non-invasive tool for detecting and analyzing the presence and properties of H_2O ice on planetary surfaces, even in environments where direct exploration is challenging, such as the Moon, Mars, and the icy moons of outer planets [Schmitt et al., 1998]. This technique relies on capturing and interpreting electromagnetic radiation—reflected or emitted from a surface—to infer the composition, physical state, and thermal properties of materials like water ice and liquid water, even at great distances from the receiver.

Thermal and spectral remote sensing techniques play a crucial role in detecting water ice, monitoring its phase transitions, and analyzing the chemical byproducts of its transformation under cosmic conditions. These methods provide the observational foundation for understanding the role of H_2O in planetary systems—and, in the context of the Feluc model, they offer the possibility of probing cosmological structures such as the Last Scattering Surface (LSS).

One of the key factors in thermal remote sensing is emissivity, which measures how effectively a surface emits thermal radiation. High-emissivity surfaces, such as those covered by liquid water or rough ice, are particularly well-suited for thermal infrared observations. In the thermal infrared range (8–14 µm), liquid water and rough ice exhibit emissivity values close to 98–99%, making them nearly perfect blackbody emitters [Warren, 2019]. This high emissivity allows thermal infrared sensors to detect subtle temperature variations and heat signatures, which are critical for identifying active regions such as sublimation zones or venting fractures on icy bodies.

The spectral behavior of ice and water across the electromagnetic spectrum further supports their remote identification. While the absorption spectra of ice and liquid water are relatively similar in the ultraviolet to mid-infrared regions, they diverge at longer wavelengths—particularly in the microwave range. This divergence enables scientists to distinguish between solid and liquid states and to detect dynamic transitions such as melting or freezing [Warren, 2019].

By leveraging the unique spectral signatures of water ice and liquid water, scientists can infer not only their presence but also their physical properties, such as grain size, purity, and temperature.

In summary, remote sensing is a vital tool for studying H_2O ice and liquid water in planetary environments. Its ability to detect high-emissivity surfaces and analyze spectral differences across the electromagnetic spectrum allows scientists to explore the distribution, state, and behavior of water without direct contact. This capability is essential for understanding the role of water in the evolution of planetary bodies and for identifying potentially habitable environments beyond Earth.

Some Useful Techniques

Beyond identifying the presence of H_2O ice, advanced remote sensing techniques can directly detect chemical reactions such as dissociation, ionization, and sublimation. These processes alter spectral signatures in measurable ways:

* Ultraviolet (UV) Spectroscopy is particularly effective in identifying dissociation products of water ice, such as hydroxyl radicals (OH), hydroperoxyl (HO_2), hydrogen peroxide (H_2O_2), and ozone (O_3),. These compounds are direct indicators of photodissociation processes triggered by solar UV or cosmic energy sources [Arasa et al., 2010]. UV spectroscopy was instrumental in confirming plumes of water vapor escaping from Europa's surface [Paganini et al., 2020], a phenomenon comparable to the proposed icequake-driven events.

We can mention, for the optical spectral range and the near-UV spectroscopy, the TRAnsiting Planets and PlanetesImals Small Telescope–South – TRAPPIST-South [Lippi et al., 2023].

* Infrared (IR), Near-Infrared, and Thermal Infrared Sensing are used to detect vibrational transitions of water molecules and their dissociation products [Paganini et al., 2020], identify water ice grain size, crystallinity, and thermal evolution on planetary bodies like Europa, Mars, and Enceladus [Warren, 2019], and provide a direct and independent assessment of water vapour in planet's atmosphere [Paganini et al., 2020].

The Visual InfraRed Thermal Imaging Spectrometer (VIRTIS) provides remote sensing hyperspectral data from the near-ultraviolet (UV) through the near-infrared (IR) wavelengths [Fougere et al. 2016]. The CRyogenic high-resolution cross-dispersed InfraRed Echelle Spectrograph – CRIRES+ is a high-resolution IR spectrograph [Lippi et al. 2023].

* Microwave Remote Sensing is sensitive to changes in dielectric properties, enabling discrimination between solid and liquid states of water. This allows for the detection of phase transitions and mapping of subsurface water distributions, as demonstrated on Mars and Mercury [Lawrence et al., 2013], important not only for planetary geology but also for interpreting potential impact signatures or thermal features on the LSS.

* Neutron and gamma-ray spectrometry are powerful tools for determining the chemical composition of a planet's surface and near-subsurface layers [Reedy, 1978]. The MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft, equipped with a Gamma-Ray and Neutron Spectrometer, has been instrumental in detecting hydrogen-rich areas indicative of water ice deposits on and even beneath planetary surfaces [Sori et al. 2019; Evans et al. 2012; Lawrence et al., 2013].

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Permanently shadowed lunar craters studied via infrared and neutron spectroscopy have revealed stable water ice deposits in regions where sublimation rates are minimal, providing a baseline for understanding long-term volatile retention [Hayne et al., 2021].

From space, the James Webb Space Telescope (JWST) might permit even more sensitive observations of water release at infrared wavelengths that could help to better understand the outer space moon's activity.

Real-World spectroscopy and Cosmological Extensions

Remote spectroscopies—such as ultraviolet (UV), visible (Vis), and infrared (IR)—play a central role in exploring planetary surfaces and atmospheres. These techniques help identify minerals, map their distribution, and detect signs of past or present water. On Mars, they have revealed hydrated minerals that suggest a history of liquid water. On Titan, spectroscopy has helped characterize the complex organic haze, offering clues about chemical processes that may resemble early Earth.

In Venus's thick atmosphere, UV and IR observations have revealed key components like hydroxyl (OH) radicals, improving our understanding of atmospheric chemistry and greenhouse effects on rocky planets [Seaton et al., 2022]. On Saturn, thermal infrared data from the night-side have shown variations in atmospheric composition and aerosols, helping scientists understand its climate and chemical cycles.

Enceladus, one of Saturn's moons, has been found to have a surface made almost entirely of pure water ice, with minimal hydrogen peroxide. Spectroscopic data confirmed the presence of active jets from the south pole, feeding a large water vapor plume [Seaton et al. 2022; Benedikter et al., 2024]. The heat driving these jets likely comes from a global subsurface ocean beneath the icy crust [Seaton et al., 2022].

Venus's atmosphere was also studied by the VIRTIS instrument, which detected OH and provided new data on atmospheric composition and temperature [Seaton et al. 2022]. Similarly, the Juno mission is using the UVS (Ultraviolet Spectrograph) and JIRAM (Jovian Infrared Auroral Mapper) instruments to study Jupiter's auroras and atmospheric dynamics [Connerney et al. 2017; Gladstone et al. 2017]. UVS captures far-UV auroral emissions caused by energetic electrons [Connerney et al. 2017; Seaton et al. 2022], while JIRAM maps thermal emissions, revealing cloud structure, humidity, and chemical cycles in Jupiter's upper atmosphere [Seaton et al., 2022].

Low-frequency radar sounders, penetrate below surface layers to identify hidden ice and stratigraphy, offer unique measurement capabilities for exploring the subsurface of planetary bodies. Variations in the dielectric properties of subsurface materials cause partial reflections of radar signals. Analyzing these echoes enables researchers to reconstruct the physical layering, density, and composition of planetary bodies [Lawrence et al., 2013; Benedikter et al., 2024]. Low-frequency radar sounders like the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) radar and The Shallow Radar (SHARAD) instrument aboard the Mars Reconnaissance Orbiter (MRO) [Holmstrom et al. 2025; Campbell et al. 2024] have provided valuable insights into the internal structure, composition, and geological history of Mars' polar regions. In addition to advancing our understanding of Martian ices and subsurface deposits to depths of several kilometers, MARSIS and SHARAD have also revealed new information about the planet's deeper interior and the behavior of its ionosphere [Putzig et al. 2024; Holmstrom et al. 2025].

In the near future, the Radar for Icy Moon Exploration (RIME) [Bruzzone et al. 2015] and the Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON) [Blankenship et al. 2024] will explore the icy crust of the Galilean satellites of Jupiter.

Remote sensing has already been used to map and analyze volatile chemistry on planetary bodies that bear physical resemblance to the layered structure proposed for Feluc. For instance, thermal emission and UV reflection studies on Enceladus have confirmed the presence of tectonically fractured ice crusts and eruptive activity [Porco et al., 2006; Filacchione et al., 2016], offering strong parallels to the dynamics hypothesized within Feluc's crust and the concept of icequakes that drive the Feluc-based Big Bang scenario.

In the Feluc model, these real-world examples serve as analogues for processes occurring at vastly larger scales on the LSS, including slow sublimation, photochemical transformations, and impact-cratering.

Remote Sensing of the LSS and the CMB

Perhaps the most significant application of remote sensing in this context is the interpretation of the Cosmic Microwave Background (CMB) itself. In the Feluc framework, the CMB is recast as thermal radiation passively emitted from the concave icy surface of the LSS. Thus, CMB mapping becomes a form of remote sensing, where tiny fluctuations in microwave intensity and spectrum correspond to physical variations—such as density inhomogeneities—on the LSS.

Anisotropies observed by COsmic Background Explorer (COBE), Wilkinson Microwave Anisotropy Probe (WMAP), and Planck missions [Smoot et al. 1992; Jarosik et al. 2011; Clements, 2017] may thus represent subtle surface features of a vast, spherical ice boundary, not merely relic quantum fluctuations. This reinterpretation invites new methods for analyzing the CMB, such as spectral decomposition and polarization analysis, to infer the chemical and thermal history of the LSS surface.

Remote sensing is therefore not just a tool for planetary exploration—it is a bridge between observation and theory, grounding the

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Feluc model in testable, measurable phenomena. By applying established techniques from space science to cosmological scales, we open the door to a new, ice-centered view of the universe, where electromagnetic observations illuminate the hidden processes shaping cosmic birth and evolution.

The Tectonic Iceball. A New Framework for the Big Bang

Tectonic iceball

A tectonic iceball is a snowball made up of three main layers: core, mantle, and crust. This structure is analogous to the Earth's layers, where the core is the innermost layer, the mantle lies above it, and the crust is the outermost layer. “Travel through the earth and observe how He began creation”

The crust (Outermost Layer): is the solid outer shell. It is much thinner than the other layers and is composed of crystalline ice (lighter material), which can fracture in blocks. The fractures between these blocks are called faults, which allow the blocks to move relative to one another.

The mantle is the middle layer, situated between the crust and the core. It is composed of glassy water and consists of three parts: the innermost section made of VHDA ice, the middle part formed by HDA ice, and the outer section made of LDA ice. The mantle can slowly deform in a plastic manner.

The core is the central part located beneath the mantle. Due to the extreme pressure, it remains solid and is composed of dense ice.

The physical structure

The mantle and crust together can be divided into three parts:

The Lithosphere: consists of the crust (crystal ice) and the upper mantle formed by LDA ice. This layer can be divided into pieces called tectonic plates. The crust, being under less pressure, is more rigid and can fracture, and moves as a single unit, over the plastic-like flow of the lower mantle section of the lithosphere.

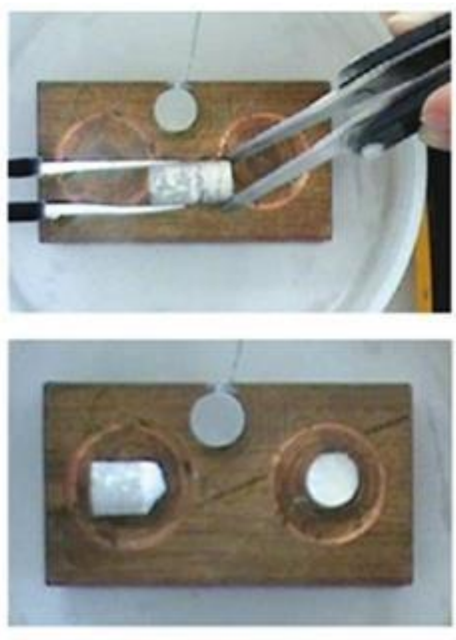

Fig. 1 The two pieces upon heating at ambient pressure, demonstrating the spatial segregation between LDA and HDA and a phase boundary in between (Winkel et al., 2011) (Reprinted by permission).

LDA films are known to fracture during crystallization (fig.1). This fracturing creates pathways that allow vapor phase transport of desorbing molecules within the film [McClure, 2006].

The Asthenosphere: is the part of the mantle on which the tectonic plates move. It is composed of HDA ice, which is a more plastic-like material that can slowly deform, allowing the lithospheric plates to move over it.

The Mesosphere: is the lower part of the mantle, located beneath the asthenosphere, formed by VHDA ice.

Tectonic plates

A tectonic plate is a block of the lithosphere. Each tectonic plate fits together with the surrounding plates like pieces of a puzzle.

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Tectonic plates cover the surface of the asthenosphere. There is a spatial segregation between LDA and HDA, with a phase boundary between them [Winkel et al. 2011]. This boundary separates the more rigid LDA portion of the mantle from the more plastic-like HDA region of the asthenosphere.

The lithosphere is mechanically detached from the layer below (fig.1), allowing it to move independently of the asthenosphere. Mechanically, the lithosphere is more rigid, while the asthenosphere flows more easily due to its plastic-like properties. As the tectonic plates move continuously and slowly past each other, they exert forces on themselves and on one other. When these forces become large enough, the crust is forced to break. When the break occurs, the stress is released as energy [McClure, 2006], which propagates through the iceball in the form of waves, resulting in what is known as an icequake.

Example

To gain insight into the tectonic plates of ice, we can look at Saturn's icy moon Enceladus (NASA , 2011, http://science.nasa.gov/). Enceladus's surface is covered with three layers of water ice (H_2O).

Fig.2 Fractures at the south pole of Enceladus (Tiger Stripe) (NASA , 2011, http://science.nasa.gov/)

The fractured south polar region of Endceladus reveals remarkable details of tectonic deformation (fig.2), showcasing how ice plates can fracture and move, similar to Earth's tectonic activity. These fractures spray jets of water vapor and ice particles outward, forming a cloud over the south pole of Endceladus (fig.3). From my perspective, this activity could be a clear indication of an icequake.

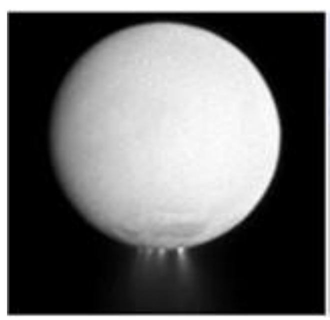

Fig.3 Plume of icy material streaming from Enceladus' south pole (NASA , 2011, http://science.nasa.gov/)

The Big Bang explosion. "We made from water every living thing"

The space occupied by an electron is negligible compared to the size of an atom. Similarly, the space occupied by an atom is negligible compared to the size of the Earth, and the space taken up by the Earth is negligible compared to the vastness of the universe. Any finite space seems negligible when compared to an even "vaster" one. Since our universe is finite, it would also be negligible in comparison to an even greater "immense" space.

Let us denote by R_W and R_F two real number such that $R_W \gg R_F$ and $\varepsilon = 13{,}8$ billon years light is negligible compared to R_F.

The Old –Water and the Feluc

The *Old-Water* is sufficiently cold water (H_2O) occupying an extremely large spherical volume with a vast radius R_W, subjected to appropriate pressure, and with temperature rising progressively as depth increases.

Since R_W is extremely large, low temperature and pressure will be a key factor in forming a tectonic Old-Iceball with a radius $R_F \gg \varepsilon$ at the center of the Old-Water. I will refer to this Old-Iceball as "*Feluc*". The crust of the "Feluc" is assumed to be composed of

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crystal ice that sublimates when heated. Additionally, we assume that Feluc is rotating around a central axis.

The Birth of the B-Universe "Roam the earth, then behold how He originated creation"

When an Old-Icequake occurs near, but not at, the equator of the Feluc (so the Coriolis effect is not zero), the energy released at the focal point of the crust will be immense—unprecedented in scale. This energy will cause the crystal ice to sublimate, dissociate, and ionize (as detailed in section 3), resulting in the formation of a gigantic sphere of smoggy cloud. The center of this sphere will be extremely hot, reaching billions of degrees, while the outer edges will be incredibly cold.

Enough instability is present in this new atmosphere. Due to the Feluc's rotation, the Coriolis Effect will generate a powerful cyclone. I will refer to this phenomenon as the "*Old-cyclone*".

The catastrophic explosion resulting from the Old-Icequake is proposed to be the event that initiated the Big Bang, marking the origin of our universe. According to this model, the explosion transformed a small portion of the crust of an immense iceball, referred to as Feluc, into a spherical smog. This smog immediately began to spin, generating time, with its flow dependent on the angular velocity of the newly born B-universe (Kallel-Jallouli, 2021a-d). In the absence of friction, this spherical universe would continue to spin indefinitely, sustaining the flow of time within its framework.

Our B-universe, in this model, exists within the crust of Feluc, an immense iceball swimming within the Old-Water. Compared to the vastness of Feluc, our universe is negligible in size. This perspective suggests that "all celestial bodies within our universe are swimming within Feluc". The Old-Water, which surrounds Feluc, serves as the primordial medium from which the iceball and, by extension, our universe, emerged.

This model provides a novel framework that challenges conventional cosmological theories by proposing that the Big Bang was not an isolated event but rather a consequence of geological and physical processes occurring within a much larger structure.

In summary, the catastrophic explosion from the Old-Icequake is posited to be the Big Bang, transforming a portion of Feluc's crust into a spinning spherical smog that constitutes the beginning of the birth of our universe. This model situates our universe within the crust of an immense iceball, Feluc, which is swimming in the Old-Water.

The Feluc-day

One *Feluc-day* corresponds to the rotation period of the Feluc (Kallel-Jallouli, 2024b). This suggests that time existed prior to the Big Bang explosion. In a future study, we will attempt to show that the duration of one Feluc-day is approximately 2.3 billion years. By the time Feluc completes its sixth day after the Big Bang explosion, our B-universe will be approximately 13.8 billion years old.

The secret of the first star

Researchers, by using the Subaru telescope in Hawaii, have found a star that has the form of an eye in the center of the circumstellar disk, with spiral arms (NASA, 2011, http://science.nasa.gov/).

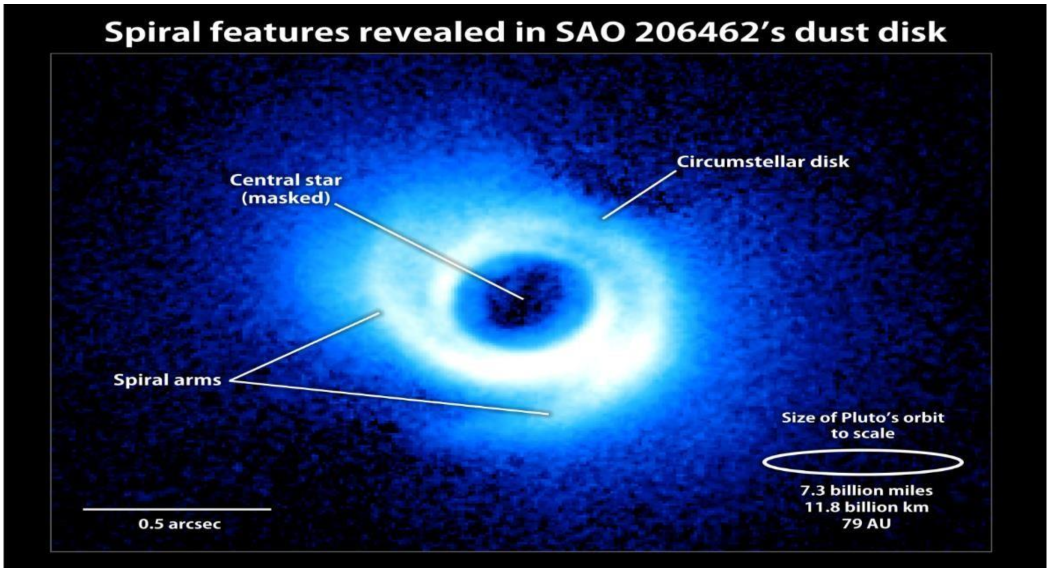

Fig. 4. SAO 206462, a young star in the constellation Lupus (NASA, 2011, http://science.nasa.gov/).

The first star forms inside the eye of the Old-cyclone (compare fig.4 to a tropical cyclone). Since the eyewall spirals with a total velocity greater than the surrounding velocity, the rotational speed at the star's boundary would surpass that of the surrounding

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regions. Given that time is influenced by the rate of rotation [Kallel-Jallouli, 2023, 2024b], the passage of time for the star could differ from that experienced by the rest of the universe. As a result, it is not surprising to find that some stars can seem to be older than the universe itself [VandenBerg, 2000; Kallel-Jallouli, 2024b]. This explains the existence of "Methuselah Star" (HD 140283), which was estimated to be 14.8 billion years old (Nasa, 2011, http://science.nasa.gov/), even though our universe is only 13.8 billion years old.

Further explanation about time and its relationship with motion can be found in previous works [Kallel-Jallouli, 2021a-d; 2024a)]. These studies investigate how spin is linked to the passage of time, suggesting that time may not be experienced uniformly across different regions of space, especially in systems with varying rotational speeds. Additionally, they explore how spin gradients influence motion, potentially contributing to phenomena such as *Dark Matter* and *Dark Energy* [Kallel-Jallouli, 2024c,d]. Without the Coriolis effect, a star cannot form. This helps explain the presence of blue-colored turnoff stars along the celestial equator [Newberg et al., 2002], and leads to the conclusion that the (spherical) universe's equator is close to the classical celestial equator (fig.5). Since Earth is positioned at the center in fig.5, we can infer that Earth is located about the center of the B-universe.

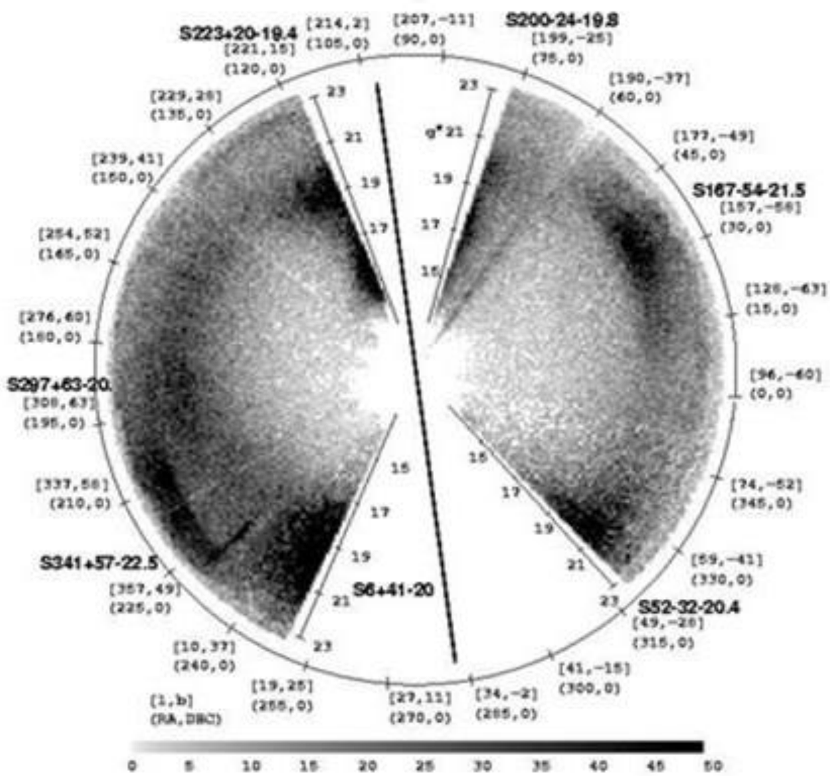

Fig.5 Blue-colored turnoff stars along celestial equator. The nearly vertical line is the celestial equator [Newberg et al. 2002]. (Reprinted by permission).

Some consequences of the new Feluc-model

Our B-universe

Our B-universe is the universe that emerged from the Big Bang explosion, which occurred within the crust of a vast tectonic iceball (Feluc). It takes the shape of a swirling, spherical mass within Feluc's crust, enclosed by a spherical surface of crystalline ice, referred to as the Last Scattering Surface (LSS), a component of the old Feluc's crust. The LSS is not a part of our newly born B-universe. Our Earth is located about the center of the B-universe.

The B-universe –time and space.

Typically, assuming that the newborn B-universe retains the same mass and is embedded in a smooth ice surface with no friction, it would continue to rotate at the same speed. Initially, the angular velocity of the young spherical B-universe was exceptionally high. The emission of energetic radiation from the B-universe (such as from stars, galaxies, supernovas, gamma-ray bursts, etc.) causes part of the surrounding ice—originating from the crust of its precursor, Feluc—to transform into hydrogen and other elements (as detailed in section 3). This process allows the B-universe to expand without being stretched. As the B-universe grows, its mass increases while its rotational speed decreases, leading to the lengthening of the B-universe period of rotation. In reality, the

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B-universe does not have a solid body rotation; instead, it rotates differentially.

Since our universe is an outer Keplerian universe [Kallel-Jallouli, 2024c], inside the outer Keplerian zone, the length T(R) is known to be related to R via [Kallel-Jallouli, 2024c]:

$$(R) = 2\pi\sqrt{\frac{R^3}{GM}} \qquad (1)$$

Which means, the length of the day increases as the distance R from the Earth (universe center) increases. Any test particle P, at a given distance R from earth, will recede with a velocity given almost everywhere by [Kallel-Jallouli, 2024c]:

$$V_r = H(t_U).R \qquad (2a)$$

With

$$H(t_U) = \frac{2}{3}(t_U)^{-1} \qquad (2b)$$

Where t_U is the age of our universe. This high receding velocity is driven by "Zaman spinning down" [Kallel-Jallouli, 2024c] and can be parameterized as a function of redshift.

With ice sublimation, the radius (t_U) of LSS sphere gets a little bit bigger. Then, the growth rate H_{LSS} satisfies [Kallel-Jallouli, 2024d]:

$$H_{LS}(t) = \frac{a'(t)}{a(t)} \qquad (3)$$

There is no evident relation between the LSS radius growth rate $H_{LS}(t)$ related to ice sublimation, and the Hubble constant $H(t_U)$ (2), related to Kepler's relation (1) [Kallel-Jallouli, 2024d]. So, there is no Hubble constant crisis.

On icy bodies, like Europa or comets, infrared absorption drives sublimation. At Europa's maximum surface temperature of ~132 K, the sublimation rate of water ice is very slow, but it is still significant over long timescales. Over geological timescales, sublimation can lead to significant ice loss. For example, over 1 billion years, more than 1 kilometer of ice could sublimate (thickness of the ice layer being removed) from Europa's surface [Vasavada et al. 1999]. Over billions of years, sublimation can significantly alter Europa's surface, smoothing out features or exposing older layers of ice. Since 1 km/Ga corresponds to 1 millimeter per thousand years, we see how slow the process is on human timescales but how significant it becomes over geological timescales.

Even within the framework of the Last Scattering Surface (LSS), the rate of ice sublimation must be exceedingly slow by human standards. Over time, as ice sublimates, our universe grows, but this expansion occurs so gradually that the universe appears almost static. As particles move toward the boundary of the universe, they would attain radial velocities significantly exceeding the speed of light (see relation (2)), appearing to be drawn by the gravitational influence of the LSS. In truth, however, they are propelled outward by the differential rotation of "Zaman" [Kallel-Jallouli, 2024d]. Upon reaching the LSS, these particles would collide with it at superluminal speeds. Since the LSS is composed of ice, such high-velocity impacts would generate craters (concave depressions) on its surface, similar to the impact craters on the moon surface formed by the collision of hypervelocity impacts. When these objects strike a surface, they explode and release an enormous amount of energy, causing deformation of the surface, creating a crater that can vary in size, shape, and depth, depending on both, the projectile characteristics (size, speed, density) and the properties of the target surface [Melosh,1989].

But how can we determine whether craters exist on the LSS? The answer to this question will be explored in future works.

The Cosmic Microwave Background (CMB): A Snapshot of the LSS

Definition

In cosmology, the Cosmic Microwave Background Radiations (CMB) is a faint glow of microwave radiation that fills the universe, falling on earth from every direction, coming from era of decoupling when neutral hydrogen atoms first formed. Either it was discovered only on 1965 by Penzias and Wilson, but it is the oldest light we can see from our earth.

Asymmetric fluctuations

The CMB radiations have nearly the same temperature in all directions, but contains tiny asymmetric fluctuations, which were first detected by COBE experiment in 1992 [Smoot et al. 1992]. These temperature anisotropies were generated during the era of formation and indicate a spherical asymmetry (fig.6). The temperature reaches a maximum of 2.729 Kelvin in the direction of Leo and a minimum of 2.721 Kelvin, 180 degrees away, in the direction of Aquarius [Muller, 1978]. An asymmetry between the north and south ecliptic hemispheres [Eriksen et al. 2004]. The exclusively kinematic interpretation of this CMB dipole, classically

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interpreted as due to our motion with respect to the rest frame in which the CMB is isotropic, was rejected [Secrest, 2021]. The CMB dipole may need to be interpreted in terms of new physics [Turner, M. S. 1991].

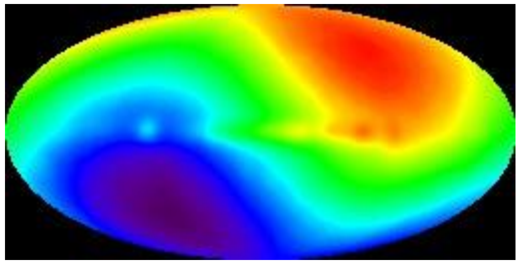

Fig.6 Warmer (red) and cooler (blue) region seen by COBE. (NASA/JPL-Caltech)

Can we guess a logical physical mechanism for the primordial asymmetric temperature fluctuations observed in the CMBR?

II. Discussion. Asymmetric fluctuations and their connection to Feluc's density variations

The concave surface of LSS ice can absorb a wide range of the incoming radiation in certain frequencies, especially in the infrared and microwave regions, make it behave in a way that's close to ideal blackbody. Its emission spectrum can reveal its presence and even provide information about its physical state.

The CMB provides a snapshot of the LSS approximately 13.8 billion years ago, offering a wealth of information about the surface and its evolution and helping to answer fundamental questions about Feluc's composition and evolution, 13.8 billion years ago.

Since the temperature of the Feluc is uniform within each spherical shell centered around its core and increases as one moves closer to the center, the spherical hollow crust bounded by the Last Scattering Surface (LSS), where our universe resides, would not maintain a uniform temperature, due to a radial temperature gradient that increases toward the Feluc's center.

The temperature reaches its highest point at the location closest to Feluc's center, creating the hottest spot L with temperature $T_L = 2.729\,°K$, and its lowest point at the location farthest from the center, forming the coldest spot A with temperature $T_A = 2.721\,°K$. Consequently, we can deduce that the straight line passing through Aquarius and Leo intersects Feluc's center (Fig.7) and acts as the axis of symmetry for the hollow spherical shell of ice surrounding our universe.

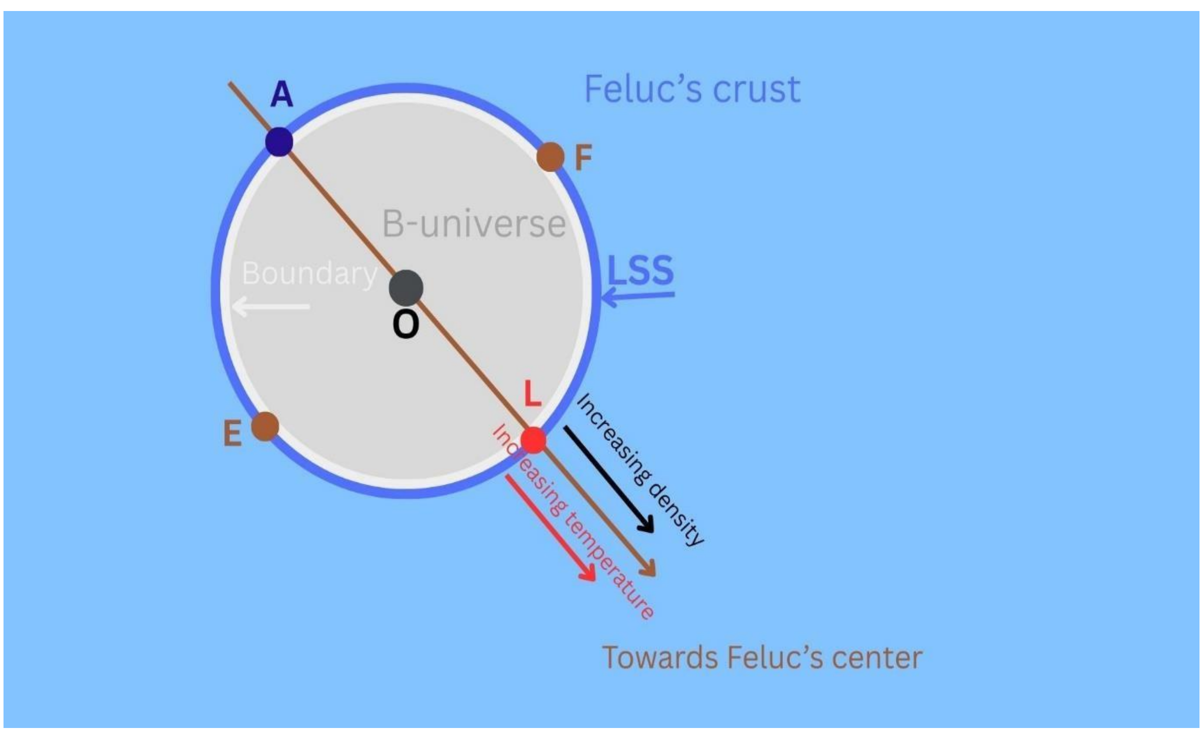

Fig.7 Position of our universe inside Feluc's crust

The closer the hot spot is to Feluc's center, the hotter it becomes, and the farther the cold spot is from Feluc's center, the colder it becomes. As our B-universe gets bigger, the diameter *AL* (fig.7) of the B-universe increases, causing point *A* to become colder and point *L* to become hotter. The mean rate of change in temperature (as observed), when moving radially toward Feluc's center is

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simply given by the temperature gradient along this radial direction:

$$\delta T = \frac{T_L - T_A}{AL} \quad (4)$$

Since Feluc's density increases radially as one approaches its center, the small asymmetric temperature fluctuations observed in the CMB correspond to variations in Feluc's density.

The asymmetric temperature fluctuations δT observed in the CMB radiation are directly linked to density variations within Feluc's crust ρ_t:

$$\delta T \propto \delta\rho \quad (5)$$

The asymmetric temperature fluctuations in the CMB directly mirror the density fluctuations in Feluc's crust. Areas of higher density in the LSS of the Feluc's crust appear as warmer regions in the CMB, while lower density regions show up as cooler spots.

III. Conclusion

While the traditional Big Bang theory has provided a foundational framework for cosmology, it leaves critical questions unanswered. In this work, we have proposed a novel and physically consistent high-energy cosmological model wherein the Big Bang explosion is reinterpreted not as a singularity, but as a phase-transition-driven icequake within the crust of a massive, rotating tectonic iceball (Feluc). By leveraging the unique thermo-physical properties of water ice under extreme conditions, this framework offers a fresh perspective on the universe's origins, suggesting that our B-universe, though immense, is but a small region within Feluc, which governs its expansion and stability, all while preserving fundamental conservation laws. The resulting B-universe inherits angular momentum and structure from its parent body, with its expansion governed by sublimation at the Last Scattering Surface. This reinterpretation yields novel explanations for several long-standing puzzles, including the physical origin of the CMB and the emergence of anisotropies.

Our findings necessitate a fundamental reassessment of the Big Bang paradigm, particularly concerning the universe's center and rotational axis, which may evolve dynamically. Identifying these features is crucial for refining our understanding of cosmic evolution. Moreover, this framework provides profound insights into the nature of time, revealing its dualistic origin: pre-Big Bang time is tied to Feluc's spin, while post-Big Bang time emerges from our B-universe's spin [Kallel-Jallouli, 2024b]. This distinction resolves long-standing cosmological puzzles, including the nature of dark matter and dark energy [Kallel-Jallouli, 2024c] and the observed phase shifts of orbiting astronomical objects [Kallel-Jallouli, 2024d].

The CMB serves as a crucial observational tool, offering a glimpse into the Large-Scale Structure of the concave icy Last scattering surface (LSS) and the Feluc. Future cosmological probes could refine this model within the CMB that suggest ongoing photochemistry. Transient anomalies in the CMB can reveal the LSS's properties at extreme distances, particularly through the detection of high-energy collisions between ejected particles from our B-universe and the LSS, which should imprint distinct signatures on the CMB. Additionally, we can investigate the presence and properties of H_2O ice at the LSS [Schmitt et al., 1998] and anomalous hydrogen concentrations above it [Lawrence et al., 2013], which could further validate our Feluc-model.

Remote sensing instruments aboard upcoming missions (e.g., the Large UV/Optical/Infrared Surveyor (LUVOIR), the far-infrared surveyor Origins Space Telescope (OST))[Hylan et al., 2019] or advanced Earth-based observatories (e.g., Atacama Large Millimeter/submillimeter Array (ALMA), JWST) [Goddi et al. 2019; Gupta, 2023] could play a role in detecting these signatures. Such observations would provide independent, physically measurable support for the Feluc model's reinterpretation of the Big Bang and the observable B-universe.

Scientific progress demands more than technological advancement—it requires intellectual courage and a willingness to challenge long-held assumptions. Rigid adherence to outdated theories, based on limited early evidence, risks stagnation. True discovery emerges from embracing new ideas supported by robust evidence, even when they disrupt conventional wisdom. The future of cosmology depends on our ability to remain open to paradigm shifts, fostering curiosity and bold inquiry. By doing so, we can unlock deeper truths about the universe's structure, origins, and ultimate fate, ensuring that our understanding of the cosmos continues to evolve.

The path forward lies not in defending old frameworks but in pursuing truth—wherever it may lead. Only through such intellectual daring can we transcend current limitations and usher in a new era of cosmological discovery.

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Availability of data and material

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Code availability

Not applicable.

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