Application of the Natural Inertial Progression Principle in the Grand Unification of Forces

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Abstract

Regarding the contradiction between general relativity and quantum mechanics that arises in the grand unification of gravity with the four fundamental forces, it is argued that the evidence from general relativity denying action-at-a-distance forces (gravity) holds valid; specifically, space is an organic material whole, celestial bodies are merely material objects with high density, while air is material with low density. Celestial bodies develop naturally in space through the inertial motion of minute objects, characterized by moment of inertia, during which they gradually grow by merging other objects via the inertial air vortices (inertial torque) generated by their motion; according to the mass-energy equation, the kinetic energy of spatial objects in inertial motion originates from their own mass and velocity. Celestial bodies evolve progressively through the fundamental stages of ice-suspicion state, gas-suspicion state, rock-suspicion state, and nuclear-suspicion state, representing a process of gradually increasing mass density, the essence of which is that the kinetic energy from the celestial body's inertial motion causes gradual compression and refinement of its internal materials. During the rock-suspicion stage, abundant metallic substances can be obtained from ores in Earth's shallow layers, which contain sufficient electrons; the high-speed motion of these minute particles can be converted into substantial energy—this constitutes the effect of the electromagnetic force. The nuclear-suspicion state consists of nuclear material containing atoms formed through inertial compression in the rock-suspicion stage; under further inertial compression, nuclear fusion occurs, emitting light and releasing the most refined form of energy—this constitutes the effect of the strong and weak interaction forces. Evidently, because unifying the forces of microscopic particles with different energies (electrons and atoms) requires numerous conditional assumptions, and unifying the forces of microscopic particles with the fundamentally different inertial torque is impossible, using the kinetic energy that produces these effects to unify the four fundamental forces is logically more accurate. In summary, force is the product of mass and natural motion; the four fundamental forces originate from the accumulated kinetic energy of celestial bodies (material objects) in natural inertial motion through space; force is merely the manifestation of accumulated energy in material objects, possessing a developmental process from low to high energy; the energy accumulation perspective provides a better understanding of the unified force source in nature.

Full Text

Application of the Principle of Natural Inertia in Grand Unified Theories

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Abstract

This paper addresses the contradiction between general relativity and quantum mechanics in the unification of gravitation with the other fundamental forces. We argue that general relativity's refutation of action-at-a-distance (gravity) is valid: space is an organic material whole, stars are merely high-density material bodies, and air is a low-density material body. Stars naturally develop through the natural inertial motion of small objects in space, characterized by their moment of inertia. During this process, they gradually grow by merging other objects through their inertial air vortices (inertial surging torque). According to the mass-energy equation, the kinetic energy of their inertial motion derives from their own mass and velocity. Stars evolve through progressive stages of ice condensation state, gas condensation state, rock condensation state, and nuclear condensation state—representing a gradual increase in stellar mass density. Essentially, the inertial kinetic energy of a star progressively compresses its internal material toward increasing refinement. In the rock condensation stage, abundant metallic materials containing sufficient electrons can be obtained from ores; the high-speed motion of these tiny particles can be converted into substantial energy—this is the effect of electromagnetic force. The nuclear condensation state consists of nuclear material containing atoms formed through inertial compression in the rock state; under further inertial compression, atomic nuclear fusion occurs, releasing the most refined form of energy—this is the effect of strong and weak interaction forces. Obviously, unifying forces for microscopic particles with different energies (electrons and atoms) requires many conditional assumptions, while unifying microscopic particle forces with the fundamentally different inertial surging force is impossible. Therefore, using kinetic energy that produces effects to unify the four fundamental forces is logically more accurate. In summary, force is the product of mass and natural motion; the four fundamental forces originate from the accumulation of kinetic energy from the natural inertial motion of stars (material bodies). Force is merely a representation of concentrated energy in material bodies, possessing a developmental process from low to high energy. The concentrated energy argument provides a better understanding of the natural source of forces in grand unification.

Keywords: Solar system; Four-force unification; Mass-energy equation; Moment of inertia; Equilibrium equation; Gravitation theorem; Inertial surging torque

Unifying the four fundamental forces in nature—strong force, weak force, electromagnetic force, and gravitation—through a theoretical framework represents one of the frontier topics in physics [1]. Current research progress faces two related problems. First, quantum field theory has achieved relatively satisfactory unification of the strong, weak, and electromagnetic forces within the Standard Model of particle physics, but gravitation remains excluded from this framework, with attempts to explain gravitational propagation through the hypothetical "graviton." Second, general relativity considers gravity a result of spacetime curvature, while quantum mechanics posits that spacetime is discrete, creating a logical conflict in explaining the nature of gravity. The intersection of these two problems is the issue of gravitation: because the three microscopic forces can be explained using particle models, it is inaccurate to similarly "particle-ize" gravity from a macroscopic perspective. Practical observations of light deflection [2] and the discovery of Einstein rings [3] demonstrate that powerful momentum vortices exist around stars due to stellar rotation, indicating that the space medium (air) and celestial bodies are intimately connected as a whole. Rotating stars balance themselves in space while continuously emitting vortices (inertial surging torque) toward their centers—a typical problem of momentum mechanics in motion. We first use mechanical principles to demonstrate the origin of gravity, proving that the gravitational acceleration (gravity) measured on Earth results from Earth's inherent, gradually strengthening inertial rotation force (characterized by rotational inertia) and is unrelated to gravitation. Subsequently, under the action of a star's inertial kinetic energy, we explain how changes in internal material energy during stellar evolution alter material properties, leading to different evolutionary stages containing varying energy levels: stages rich in electrons (electromagnetic energy) such as metallic ores, and stages rich in atoms (nuclear energy) such as uranium ores. In other words, due to inertial motion, the internal composition of a star generally evolves from low-energy to high-energy materials. Therefore, using properties (forces) of low-energy materials to unify those of high-energy materials requires many conditions, and vice versa. However, the kinetic energy of inertial force can logically and completely unify the four fundamental forces.

2. Inertial Rotation Force and Equilibrium Equation

We begin by analyzing the natural inertial evolution process of a star to illustrate the origin of stellar forces: micro-objects (any objects with mass) $\rightarrow$ internal imbalance (non-uniform internal material distribution) $\rightarrow$ natural centripetal tilting toward the heavier side (formation of moment of inertia) → non-uniform space medium density causing objects to naturally rotate centripetally to achieve relative balance (generation of motion orbits, transmission of inertial surging torque through space) → generation of surging inertial force in space (association with other objects through this force) → two (or more) objects generating corresponding accelerations through mutual inertial surging force (formation of elliptical orbits, the source of stellar gravity from acceleration provided by elliptical orbits) → gradually merging other objects through acceleration intensity (simultaneously increasing mass, i.e., increasing inertia) → increasing inertia leads to stronger inertial force and tighter compression until the star glows (star formation) → …

All spatial objects, including Earth, gradually grow through natural centripetal inertial progression, with moment of inertia marking the primary attribute of a star, possessing not only mass characteristics but also momentum capabilities. Internal and external imbalances in a star lead to its inertial rotation. Using space as a reference frame, internal imbalance in a spatial object naturally produces rotation; environmental imbalance in space naturally produces revolution—this conforms to the mass-energy equivalence relation $E=MC^2$, where the inertial motion (V^2) of mass (M) is the source of energy (E) [4], a process formed naturally through velocity generated by its own inertia without external forces.

From an energy perspective, we have ΔE (stellar kinetic energy) = $(1/2)M\times Vt^2 - (1/2)M\times V0^2 = F\times\Delta S = M\times a\times\Delta S = M\times(\Delta V/\Delta t)(\Delta V\times\Delta t) = M\times(\Delta V)^2$, which is dimensionally consistent with $E=MC^2$ and derived $E=MV^2$. This represents the dynamic energy of natural inertial growth of spatial stars and is the force source of the four forces.

Below, as an introductory example, we present the gravitational acceleration of the Moon in the Earth-Moon system to concisely demonstrate the non-existence of gravitation, with detailed explanations to follow.

[Figure 1: see original paper]

As shown in the schematic diagram (with orbital eccentricity exaggerated for illustration), the Moon's elliptical orbit [5] can be logically divided into two path segments. The first segment is the circumference Lr given by the ellipse's minor semi-axis b radius, representing the Moon's uniform motion path at speed Vr. The second segment is the total elliptical circumference Lt. Using Lt-Lr as the average acceleration path, (Lt-Lr)/T (duration of one period) gives the Moon's equivalent average acceleration Jm on its orbit, i.e., Jm is the acceleration above speed Vr.

Lt: Total path length
Lr: Uniform motion path length
Earth-Moon system balance point

Figure 1. Schematic diagram of the Moon's orbit

According to data from the National Earth System Science Data Center (distance units in km, mass units in kg, same hereafter): the average Earth-Moon distance is a=384,748, representing the average major semi-axis of the Moon's elliptical orbit; b is the minor semi-axis; orbital eccentricity e=0.0549. Based on the relationship between elliptical major and minor semi-axes, we have b = a√(1-e^2), while (1-√(1-e^2)) = 0.00150814, and a-b = a(1-√(1-e^2)). The period duration T (one lunar revolution) = 27.32 (days for one lunar revolution) × 86,164 (seconds per day) = 2,354,000.48 seconds. The average equivalent acceleration is:

Jm = (Elliptical circumference - Circular circumference) / (One-month period duration) = (Lt-Lr)/T
= ((2πb + 4(a-b)) - 2πb)/T
= 4×a×(1-√(1-e^2))/T
= (4$×384, 748×0.00150814)/2, 354, 000.48 = 0.988$m/s^{2}

This value represents only the gravitational acceleration component of the Moon in the Earth-Moon system; another component comes from the Sun-Earth-Moon orbit. The consistency between the average equivalent gravitational acceleration and the actual measured gravitational acceleration will be detailed in subsequent sections.

The actual measured lunar gravitational acceleration is approximately 1.62 m/s^2, and the value obtained using the gravitation theorem is also approximately 1.62 m/s^2. The 0.988 m/s^2 calculated above would thus be excessive and unreasonable. This can only mean that the gravitational acceleration given by the gravitation theorem does not exist.

The Earth (M)-Moon (m) system shown in Figure 1 is a binary system, with Earth and Moon rotating centripetally around the system balance point, achieving equilibrium through air between them characterized by their respective moments of inertia. The constraint relationship between the two celestial bodies (M, m) is given by their inertial motion balance equation (see Section 4). The solar system is a multi-body system, with eight major planetary systems (Earth-Moon-like systems) and the star (Sun) rotating centripetally around the solar system center. For planets (Earth), the inertial rotation force is the atmospheric layer flow at the planetary periphery, with maximum intensity at the black barrier flow; for stars (Sun), the inertial rotation force is the relatively dense gas layer outside the stellar nuclear reaction zone, with maximum intensity called the Einstein ring. Below, we first present the process of energy increase and force source from stellar inertial motion, then derive the gravitational accelerations of Earth and Moon respectively from the inertial motion balance equation of two celestial bodies (M, m), demonstrating correctness through comparison with actual measured values and thereby proving the accuracy of the aforementioned energy source theory.

[Figure 2: see original paper]

3. Conversion of Stellar Inertial Motion and Kinetic Energy

The internal material imbalance of a star moves centripetally (see Figure 1). Its orbit demonstrates acceleration at the major axis and deceleration at the minor axis while maintaining a certain gravitational acceleration relative to the lunar surface (Kepler's second law, explained later), so the star is always self-centripetally compressing. Its internal material accumulates kinetic energy while changing state, meaning stellar internal material becomes increasingly compact with greater energy. We illustrate this problem using the solar system as an example.

(Annotations in parentheses correspond to Figure 2) The air vortices (from system-center vortex to system-edge vortex) surging within each Sun-centered system naturally rotate centripetally around balance points. These vortices maintain balance of the entire solar system in space while continuously surging outward into the extremely cold region outside the solar system (the solar system's external ice condensation zone) to form ultra-cold gas. The energy for this process originates from the natural inertial mass and velocity of stars, characterized by their inherent and gradually strengthening moment of inertia. The constraint relationship between stars is determined by the inertial motion balance equation. A planet and its satellites constitute a sub-celestial body rotating centripetally through inertial motion; planets gradually merge their satellites to gain energy and spiral toward the solar system center. The Sun gains energy from the centripetal rotational forces (including air vortices) of planets within the system, generating nuclear fusion reactions that emit light and outward thermal energy (sunlight). The centripetal rotational force comes from the inertial surging force of the star itself and planets; planets closer to the solar system center have stronger compression capability. When planets approach the Sun, they are merged by the Sun, continuously increasing the Sun's energy. Outside the solar system (the solar system's external ice condensation zone), radiation of light energy creates temperature differences that gradually transform strong cold gas into ice-condensed objects (extrasolar icy planets), while the inertial surging force at the solar system edge (system-edge vortex) gradually rotates these slowly inertially-balanced ice-condensed objects (extrasolar icy planetary systems) into the solar system. After entering the solar system, icy planets gradually evolve from icy to gas-condensed states, finally forming rocky planets that are gradually merged by the Sun. This cyclical process maintains system energy balance, evolving various forms of celestial bodies in the solar system—a complete energy balance system.

The solar system is a multi-star system, with the Sun and planets rotating centripetally around their common balance point. Similarly, the solar system's inertial rotation force also rotates external objects (including air) into the system, maintaining spatial balance and rotating toward the center. Stars spiraling toward the center experience progressive sublimation of internal material energy, evolving from icy states (Neptune, Uranus) to gas states (Saturn, Jupiter) where increased compression energy manifests as increased average density and growing electron counts; then transitioning to rocky states (Mars, Earth, Venus, Mercury) with greatly increased average density, surging electron counts (increased metal content) and atomic materials (uranium). Earth is currently in this state, making electrical energy utilization convenient. Stars closer to the system center possess greater material energy—when merged by the Sun, their material structure is most compact with the most abundant energy accumulation. For example, Mercury, though small, has high density, the highest atomic content, and is in the initial state of being merged by the Sun with large orbital eccentricity and precession (the star is already out of control, proven elsewhere). When the Sun merges it, extremely refined energy will be obtained—this is why strong and weak interaction energies, though large, only react under high pressure.

In summary, the inertial rotation force from natural inertial motion of spatial objects is the source of all forces; electromagnetic force and strong/weak interaction forces are derivatives of this energy accumulation during object inertial progression, manifested as the quantity of electrons and atoms within objects—that is, their capacity to generate force. Below, we provide proof of the inertial rotation force.

4. Equivalent Transformation of Celestial Orbits

Based on Kepler's second law [6], we perform equivalent transformation of a star's elliptical orbit, reducing computational effort by half by equivalently transforming intensity calculations from two points (far and near) relative to the focus into a single calculation at the average point.

Using the Moon's elliptical orbit as an example (see Figure 1), with semi-major axis a and semi-minor axis b, and focal distance c from center point o. Divide the area enclosed by Lt into fast and slow regions: the fast region is the area enclosed by c, b, a, b, and c, denoted as Δ_1; the slow region is the area enclosed by c, b, a, b, and c, denoted as Δ_2; the incremental region is the area enclosed by c, b, b, and c, denoted as Δ. According to Kepler's second law, the Moon sweeps equal areas in equal time intervals along its orbit relative to the focus. Since area Δ_1 is relatively small, the Moon moves relatively faster in region Δ_1 on Lt, with the fastest point at a; since area Δ_2 is relatively large, the Moon moves relatively slower in region Δ_2 on Lt, with the slowest point at a. Let total area be S, then $S = (a\times b)\pi$; $\Delta = ((2b)\times c)/2 = b\times c$; $\Delta_1 = (S/2) - \Delta$; $\Delta_2 = (S/2) + \Delta$.

Let the duration to sweep area Δ_1 be T = t. According to Kepler's second law, $(\Delta_1 = \Delta_2)$ |*{T=t} → (S/2 - Δ = S/2 + Δ)* /{T=t}.

[Figure 3: see original paper]

Equation (2) holds for any Δ value selected within the planetary elliptical orbit range. To equivalently transform the Moon's elliptical orbit with a focus in Figure 1 into the focus-free elliptical orbit in Figure 3, we set Δ to 0 in equation

(1), i.e., c = 0. The specific method is to translate the ellipse center point o to the focus c. After transformation, the semi-major and semi-minor axes of the elliptical orbit are denoted as a (=oa) and b (=ob), where a is the average distance between the Moon's apogee and perigee. Thus, in Figure 3, the Moon sweeps equal areas in equal time on the equivalent elliptical orbit centered at the midpoint, and related calculations correspond to reality.

5. Moment of Inertia Balance Equation for Two Celestial Bodies

Let the masses of two stars be M and m, the distance between their centers be p, the distances from M and m centers to the balance point be H and h respectively, with p = H + h. Based on the solid sphere moment of inertia formula [7] and the parallel axis theorem [8], the balance equation for the two stars is:

$$(IC + IH)T \times J = (ic + ih)t \times j$$

Where: IC, ic are the solid sphere moments of inertia of M, m about their own centers; IH, ih are the parallel axis moments of inertia from M, m centers to the balance point; T, t are the rotation angles of M, m within a given period; J, j are the angle functions between the rotation axes of M, m and the normal of their orbital plane.

Substituting variables yields:

$$2MR^2/5 + MH^2 = (2mr^2/5 + mh^2)t \times j/(T \times J)$$

Substituting known proportional relationships to simplify: $M = x\times m$, $R = y\times r$, $z = (t\times j)/(T\times J)$, and $h = p - H$:

$$2(x\times m)(y\times r)^2 + 5(x\times m)H^2 = 2m\times r^2 z + 5m\times z\times(p^2 - 2pH + H^2)$$

Eliminating m, expanding brackets, and combining terms:

$$5(x - z)H^2 + 10z\times p\times H + 2(x\times y^2 - z)r^2 - 5\times z\times p^2 = 0$$

For this quadratic equation, the root parameters are $a = 5(x - z)$; $b = 10\times z\times p$; $c = 2(x\times y^2 - z)r^2 - 5\times z\times p^2$.

This is the solution formula for the two-body balance equation.

[Figure 4: see original paper]

6. Earth's Gravitational Acceleration in the Earth-Moon System

Let M, m be the masses of Earth and Moon, H, h be the distances from Earth and Moon centers to the balance point, and p (average Earth-Moon distance) = H + h.

Since the Earth-Moon system period is 27.32 days, Earth and Moon rotate $27.32\$\times 2\ \$$ and $1\$\times 2\ \$$ respectively (see Figure 4), giving $T = 27.32\$\times 2$, $t = 1\times 2\ \$$. The intersection angles between Earth-Moon rotation axes and the normal of their orbital plane (the lunar ecliptic) are 28.58° (23.44 + 5.14) and 6.68° respectively. As shown in Figure 4, since these angles correspond to the hypotenuse in the cosine function, $J = 1/\cos(28.58°)$, $j = 1/\cos(6.68°)$. Therefore:

$$z = (t\times j)/(T\times J) = 2\pi\times\cos(28.58°)/(27.32\$\times 2\ \$\times\cos(6.68°)) = \cos(28.58°)/(27.32\times\cos(6.68°))$$
$$= 0.03236$$

The known Earth-Moon mass and radius ratios are: M = 81.3m, R = 3.66r, with lunar radius r = 1,737 and average Earth-Moon distance p = 384,748. Substituting x = 81.3, y = 3.66 into equation (4):

$$a = 5(x - z) = 5\times(81.3 - 0.03236) = 406$$
$$b = 10\$\times 0.03236\times 384,748 = 124,504c = 2(81.3\times(3.66)\hat{}\{2\}\$ - 0.03236)(1,737)^2$$
$$- 5\$\times 0.03236\times(384,748)\hat{}\{2\}\$ = -17,379,843,602.94$$

Solving this quadratic equation, the discriminant $\Delta = b^2 - 4ac = 28,193,501,243,901.35$, $\sqrt{\Delta} = 5,314,166$.

The Earth-Moon balance distance is the solution to equation (3):

$$H_{1,2} = (-b \pm \sqrt{\Delta})/2a$$
$$H_1 = (-b + 5,314,166)/2a = 6,391$$
$$H_2 = (-b - 5,314,166)/2a = -6,697$$

As shown in Figure 3, H_1 and H_2 give the positive and negative balance ranges of Earth's orbit around the Moon (using the Moon as reference). According to the equivalent averaging principle from Section 3, the average of H_1 and H_2 is the semi-major axis of Earth's balance orbit around the Moon, denoted as H:

$$H = (|H_1| + |H_2|)/2 = (6,391 + 6,697)/2 = 6,544$$

The Moon-Earth balance point distances are:

$$h_1 = 384,748 - 6,391 = 378,357$$
$$h_2 = 384,748 - (-6,697) = 391,445$$

[Figure 5: see original paper]

This yields the Moon-Earth balance ratio values:

$$k_1 = h_1/H_1 = 378,357/6,391 = 59.2$$
$$k_2 = h_2/H_2 = 391,445/(-6,697) = -58.4$$

Using the lunar semi-major axis according to these ratios gives the positive and negative semi-major axes of Earth's elliptical orbit around the Moon (using the Moon as reference):

$$F\ = 384,748/k_1 = 384,748/59.2 = 6,499$$
$$F\ = 384,748/k_2 = 384,748/(-58.4) = -6,588$$

As shown in Figure 3, according to the balance ratios (k_1 and k_2), F and F give the positive and negative ranges of Earth's orbit around the Moon. Following the equivalent averaging principle from Section 3, the average of F and F is the semi-major axis of Earth's orbit around the Moon, denoted as F:

F = (|F | + |F |)/2 = (6,499 + 6,588)/2 = 6,543.5

F is the average semi-major axis of Earth's orbit around the Moon.

As shown in Figure 3, since the Moon's orbital revolution is synchronized with its rotation (the revolution orbit size equals the rotation orbit size), Earth's orbit around the Moon must synchronize with the Moon's orbit according to the inertial balance principle. Therefore, Earth's orbit around the Moon also matches its rotation orbit size. When Earth orbits the Moon, let Earth's rotation orbit semi-major axis be ad, then ad = F. The above analysis shows that Earth's orbit around the Moon completely overlaps with the Earth-Moon balance orbit. Moreover, Earth's semi-major axis around the Moon equals Earth's rotation semi-major axis. Figure 5 is an enlarged view of Earth's orbit around the Moon from Figure 3. As shown in Figure 5, ad is not only the semi-major axis length of Earth's elliptical orbit around the Moon but also the semi-major axis length of the elliptical orbit for Earth's 27.32 rotations within one month. Within one month, there are 27.32 rotation orbits with length ad, and half a month contains 27.32/2 = 13.66 orbits, which is the equivalent ratio value for Earth's semi-major axis around the Moon. In other words, according to this revolutionary equivalent ratio, Earth's acceleration per rotation period increases by 13.66 times. Let the revolution-rotation ratio K = 13.66, and bd be the semi-minor axis (Figure 5 shows only half-period equivalent diagram, the other half corresponds).

Following the lunar acceleration method, with T as the seconds for one Earth rotation/revolution around the Moon (=86,164), Earth-Moon orbital eccentricity e = 0.0549 same as the Moon's orbit, $(1-\sqrt{(1-e^2)}) = 0.00150814$, rotation ratio K = 13.66, Earth's average acceleration around the Moon can be obtained from Figure 5:

$$Je = ((2\pi\times bd + 4\times(ad - bd)) - 2\pi\times bd) \times K/T$$
$$= 4\times(ad - bd) \times K/T$$
$$= 4\times ad\times(1-\sqrt{(1-e^2)}) \times K/T$$
= 4×(6,543)$×0.00150814×13.66/86, 164 = 6.25m/s^{2}$

This value represents only Earth's gravitational acceleration component in the Earth-Moon system.

7. Solar System Orbit Relative to the Earth-Moon System

The Earth-Moon system's orbital data relative to the solar system directly provides Earth's near, far, and average distances from the Sun [9], where the average Earth-Sun distance is 149,597,870 km, representing the average semi-major axis of Earth's solar orbit: a = 149,597,870 km, orbital eccentricity e = 0.0167. Calculated (1-√(1-e^2)) = 0.00013945, with one-year duration T = 365.2422 (Earth's rotation days per year) × 86,164 (seconds per Earth rotation) = 31,470,728.9 seconds. Following the Moon-Earth acceleration method, the solar system's acceleration on Earth is:

Js = (Elliptical orbit length - Circular orbit length) / (One-year duration)
= ((2πb + 4(a-b)) - 2πb)/T
= 4(a-b)/T
= 4×(a×(1-√(1-e^2)))/T
= 4×(149,597,870$×0.00013945)/31, 470, 728.9 = 2.6515m/s^{2}$

This acceleration is superimposed with Je from equation (5). The superimposed average equivalent gravitational acceleration of Earth is:

Jes = Je + Js = 6.25 m/s^2 + 2.6515 m/s^2 = 8.9015 m/s^2

In the Earth-Moon system, because the interactive orbits have corresponding relationships, their accelerations also interact correspondingly. The Moon's acceleration in the Earth-Moon system is given by equation (1) as Jm, and Earth's acceleration in the Earth-Moon system is given by equation (5) as Je. Using the Earth-Moon acceleration ratio ks (= Jm/Je), we can calculate the solar system's acceleration increment on the Moon:

J = Js × ks = 2.6515 m/s^2 × (Jm/Je) = 2.6515 m/s^2 × (0.988/6.25) = 0.419 m/s^2

The Moon's average gravitational acceleration after superposition is:

Jms = Jm + J = 0.988 + 0.419 = 1.407 m/s^2

Differences between equations (6) and (7) and measured values will be addressed in the following section.

8. Comprehensive Issues

We provide conclusions on three issues: differences between calculated and measured acceleration values, the relationship between equivalent average acceleration and actual gravitational acceleration, and the effects of inertial surging force.

8.1 Differences Between Calculated and Measured Acceleration Values

The differences between actual measured gravitational acceleration values on Earth and the Moon and the calculated Jes and Jms from equations (7) and (6) are:

1.62 m/s^2 - Jms = 1.62 - 1.407 = 0.213 m/s^2

Beyond minor data errors, this difference should originate from higher-level systems. Similar to how the Earth-Moon system's orbit is guided by solar inertial surging force, Earth's solar orbital acceleration superimposes on Earth and proportionally on the Moon. Therefore, the solar system's (Sun's) galactic orbital acceleration also superimposes on the Sun and proportionally on Earth and Moon. However, according to inertial system balance conditions, the orbital eccentricity of a higher-level system must be smaller than that of the lower-level system, as seen in the Earth-Moon and higher-level Sun-Earth-Moon orbits. Because higher-level systems (celestial bodies) have greater mass and larger moments of inertia, they are more stable with smaller orbital eccentricities. From the proportional relationships of Moon-Earth-Sun, we conclude that the more hierarchical levels are superimposed, the smaller the superimposed gravitational acceleration on lower levels. Thus, gravitational acceleration from higher levels (Sun-galaxy system) should be smaller than that from the current level (Sun-Earth-Moon system) (2.6515 m/s^2), making the values basically consistent with actual measurements.

8.2 Equivalent Average Acceleration and Actual Gravitational Acceleration

Let Figure 3 represent the Moon's equivalent elliptical orbit. The Moon's average acceleration for one revolution is Jm = (Lt - Lr)/(One revolution duration), representing a single acceleration based on speed Vr. Kepler's second law, expressed through angular momentum conservation, states that the areal velocity V of planets orbiting the balance point (focus) in a galaxy remains constant. If dS is the area increment in time dt and a is the areal acceleration in dt, then V = dS/dt and a = dV/dt = d^2S/dt^2. According to the equivalence relationship, clearly:

[Equation missing in original]

In the Earth-Moon system, Earth's equivalent acceleration Je follows similarly. Generalizing, this principle applies to all planetary elliptical orbits, proving the aforementioned Earth-Moon equivalence relationship is correct. The equivalent accelerations of Earth and Moon are equivalently identical to the measured gravitational accelerations on Earth and Moon, i.e., g (measured Earth gravitational acceleration) is equivalent to Jes, and gm (measured lunar gravitational acceleration) is equivalent to Jms. Thus, the Moon (or Earth) with conserved angular momentum on its orbit achieves equivalent gravitational acceleration through natural inertial motion speeds that vary between fast and slow. These speed variations are very small relative to Earth's inertial speed, having almost no effect on small-mass objects on the surface (such as human activities), but affecting large-mass objects—for example, seawater exhibits tidal phenomena at Earth's orbital major and minor axes.

8.3 Effects of Inertial Surging Force

The Einstein ring effect that deflects light at the Sun's periphery and the currently termed "upper atmosphere" [10] black barrier gas layer at Earth's periphery are essentially spatial inertial surging vortices emitted outward by stars. Figure 6 [Figure 6: see original paper] illustrates the inertial surging forces of the Sun, Earth, and Moon. The black barrier layer [11] is synthesized from the solar system's inertial surging vortex and Earth's self-rotation inertial surging co-flow. Because its rotational direction matches the solar system and lunar inertial surging forces, it is merely a co-flow-enhanced inertial surging force. As shown in Figure 6, Earth's inertial force extends outward, and the black barrier layer is a high-density inertial surging force shell at Earth's inertial periphery, formed at the intersection of solar and Earth inertial surging forces. The atmosphere (including the black barrier layer) grows synchronously with Earth's inertial growth, while the black barrier layer acts as a high-density inertial surging force shell extending outward with gradually weakening intensity. Because Earth always moves along solar inertial surging force and is protected by the atmosphere (especially the black barrier layer), Earth's surface remains relatively stable. Earth's inertial surging force is axis-centered, with maximum intensity at the equatorial periphery and minimum at the poles. Therefore, theoretically, recoverable satellites launched near the equator in the direction of Earth's rotation can receive assistance from Earth's inertial surging force to save energy, while recovery near the poles can theoretically reduce black barrier interference. Thus, the atmosphere (inertial surging force) is dynamic rather than static, as it is the momentum of Earth's inertial progression surging outward through the space medium.

[Figure 6: see original paper]

9. Conclusion

Gravitation has long been the most difficult problem in grand unification. Based on the mass-energy equation and inertial motion balance equation, we prove that gravitation does not exist, and that all forces originate from the centripetal inertial surging (rotational) force from natural inertial evolution of spatial objects. "Inertial" represents the gradual accumulation of rotational inertia (i.e., kinetic energy accumulation) in spatial objects; "surging (rotational) force" represents the process of compressing air and transmitting torque outward; "(rotational)" indicates that orbits always rotate centripetally. Electromagnetic force and nuclear forces (strong/weak interactions) are derived from changes in internal structure caused by kinetic energy accumulation during object inertial progression. Because internal structures differ, unifying electromagnetic force with strong/weak interaction forces requires many conditions, while inertial surging (rotational) force lacks the characteristics of microscopic electrons and atoms, making direct unification impossible. However, unification can be achieved through energy conversion: kinetic energy (inertial surging force) electrical energy (electromagnetic force) nuclear energy (strong/weak interaction force). We conclude that spatial objects (stars) possess no action-at-a-distance force and are not governed by external space energy (except energy generated by inertial surging force between spatial objects). Further inference suggests that all conclusions currently derived from large-scale environment using gravitation and external energy relationships can be negated. This achievement has extremely high practical value for further understanding the nature of celestial bodies.

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