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Research Article

Gravitational Tension - a Live Sustainable Thread upon the Pushing Between Two Partners

Charles Edward Ng'hwaya Masule*

Department of Chemical and Process Engineering, College of Engineering and Technology, University of Dar-es-salaam, Dar-es-salaam, United Republic of Tanzania

Abstract

This study pursued to derive a mathematical expression for gravitational tension existing between two gravitational partners upon the model of a sustainable thread of radiant heat existing between the two partners by first exploiting the only clue that Mercury and the Moon is under the state of being tidally locked in order to get intermediate mathematical models for radiant heat flow from Earth and from the Sun as functions of increasing distances away from these sources of radiant heat. The study had consequential pursuits to unearth the essence of tidal locking as well as to draw the limitations of the Newton's law of gravitation out of the sought mathematical expression for gravitational tension. Last but not least, the study pursued to evaluate the mode of transmission under which the gravitational-wave signal dated September 14, 2015 at 09:50:45 UTC reached the LIGO (for Laser Interferometer Gravitational-Wave Observatory) labs from the Cosmos out of a collision of two massive black holes. The study found the following:- gravitational tension is a multiplication product in W^2/m^4 out of two opposing streams of radiant heat exercised by two gravitational partners along their line of gravitational relationship. Mercury and the Moon is tidally locked because the strength of the Sun's radiant heat reaching the Mercury's surface is equal to the strength of the Mercury's escaping total radiant heat on the Mercury's surface and the same effect holds for the Earth-Moon relationship. Tidal waves are a result of the push from the gravitational partner. Gravitational tension gives the hint that gravity is a perishable result of a push. The Newton's law of gravitation can be derived out of the mathematical expression for gravitational tension upon the fragile assumption that the less-massive partner's push be elevated in that expression to unreasonably cause the less-massive partner's distance to the synchronization orbit to be assumed to shrink far below the distance to the radiant heat decay pause. The consequence out of those assumptions is that whereas the mathematical expression for gravitational tension produces a value in W^2/m^4 to signify a sustainable quantity, the value out of the Newton's law of gravitation produces a value in Newton without any information as to the sustainability thereof. Without a fuel, without a medium and without a sustainable gravitational tension between Earth and a black hole, the Wave cannot travel from a black hole to reach the LIGO's labs.

Keywords

Black Hole, LIGO, Laser Interferometry, Gravitational Wave, Earth, Moon, Tanzania, Climate Change

*Corresponding author: nghwaya@yahoo.co.uk (Charles Edward Ng'hwaya Masule)

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1. Introduction

The well-established gravitational relationship between the Sun and its planet as well as between a planet and its moon is governed by the Newton's law of gravitation under which there exists a force of attraction between the two gravitational partners which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers [11, 12, 16-19]. Einstein's general relativity describes gravitation as geometry [17] whereas under the theory of gravitation in flat space-time, GFST, it is the gravitational field which provides the attraction of the bodies not the mass of the bodies [17].

Earth and the Moon (as well as the Sun) are said to be exerting gravitational attraction on each other under which the attraction is slightly of a greater extent on the sides closest to each other to result in tidal forces [11, 12, 16, 18, 19]. Ocean tides are the most widely experienced result of this phenomenon [13, 18, 19].

On September 14, 2015 at 09:50:45 UTC, LIGO announced to have detected a transient gravitational-wave signal, the Wave, simultaneously at LIGO Hanford and at LIGO Livingston respectively in the US states of Washington and Louisiana [1, 2]. The Wave is reported to originate out of a binary black hole merger out of a collision [1, 2].

This study was conceived primarily to derive a mathematical expression for gravitational tension existing between two gravitational partners. The go-between therefor is a model of a sustainable thread of radiant heat existing between the two gravitational partners [3-8, 10, 14, 15, 18]. The pivotal stepping stone to reach the model is the fact that Mercury and the Moon is under the state of being tidally locked [16]. This study has the consequential obligation to pursue the essence of tidal locking. The study will also pursue to draw the limitations of the Newton's law of gravitation out of the model of gravitational tension for significant conclusions also as a consequential pursuit. Last but not least, the study pursues to draw a conclusion as to the Wave's possibility to reach Earth from the Cosmos without a fuel.

2. Sun's Push out of Radiant Heat

Both Mercury as well as the Moon orbits the Sun as well as Earth respectively in the innermost orbit and they are tidally locked respectively at a 3:2 and 1:1 spin-orbit resonance [16].

By assuming that the strength of the Sun's radiant heat reaching Mercury is equal to the strength of Mercury's total emissive power on the surface of Mercury, the Sun's radiant heat can be shown to be decaying with increasing distance from the Sun as follows:

$$E_{Sun}\left(S_{\text{Planet}}\right)=\bar{M}_{Sun}\lambda_{Sun}\left(\frac{Q_{\text{Sun}}}{S_{Planet}}\right)^{1.535} \quad (1)$$

Where $E_{Sun}(S_{Planet})$ is the Sun's radiant heat in W/m^2 as a function of planet's distance from the Sun,

$\bar{M}_{Sun}$ is the Sun's surface gravity on the Sun's surface in kg/m^2 - it is equal to 326,942,760,026 kg/m^2 [11, 12, 16, 18],

Q_{Sun} is the Sun's radiant heat decay pause in km - it is equal to 3,504,372 km [18],

S_{Planet} is planet's mean distance from the Sun in km,

λ_{Sun} is the Sun's emissive heat escape factor in W/kg, equals to $1\,W/kg$ [3-8, 10, 14, 15, 18].

In order to lend merit to equation (1), the next step is to apply it in the determination of the orbital period in equation (2) for the results in table 1, so:

$$\omega(S_{Planet})=\left(\bar{M}_{Sun}\lambda_{Sun}\left(\frac{3,504,372}{S_{Planet}}\right)^{1.515}\right)^{-1}*404,708,090,392 \quad (2)$$

Where ω is the planet's orbital period in Earth days.

Table 1. *Orbital period for the planets of the Solar system [16].*

Planet	Orbital Period in Earth Days/Years (given)	Orbital Period in Earth Days/Years (calculated)
Mercury	87.97	86.73
Venus	224.70	223.61
Earth	365.26	365.26
Mars	686.98	691.32
Jupiter	11.86 (EY)	4,443.98 (12.16 EY)
Saturn	29.46 (EY)	11,127.96 (30.46 EY)
Uranus	30,685.00 (84.00 EY)	32,099.92 (87.88 EY)
Neptune	60,190.00 (164.80 EY)	63,379.89 (173.51 EY)

Planet	Orbital Period in Earth Days/Years (given)	Orbital Period in Earth Days/Years (calculated)
Pluto	247.92 (EY)	95,750.60 (262.14 EY)

Upon the Sun's sidereal rotation period of 25.05 Earth days [16], by virtual of equation (2), the Sun's synchronization orbit stands at 25,511,990 km away from the Sun. Upon the distance of 57,909,175 km between Mercury and the Sun [16], by virtual of equation (1), the Sun's radiant heat reaching the surface of Mercury is equal to 4,411,955,863 W/m^2. Upon the Mercury's surface gravity of 4,411,956,516 kg/m^2 [11, 12, 16], upon the Mercury's heat escape factor of 1 W/kg [3-8, 10, 14, 15, 18], Mercury's total emissive power on its surface is 4,411,956,516 W/m^2. Therefore, it can conclusively be said that Mercury is tidally locked because the Sun's radiant heat reaching the surface of Mercury is equal to the Mercury's total emissive power on the Mercury's surface.

3. Earth's Push out of Radiant Heat

In analogy to equation (1), the Earth's radiant heat can be shown to be decaying outwards with increasing distance from Earth as follows:

$$E_{Earth}\left(S_{\text{Moon}}\right)=\bar{M}_{Earth}\lambda_{Earth}\left(\frac{Q_{\text{Earth}}}{S_{Moon}}\right)^{4.8825} \quad (3)$$

Where $E_{Earth}(S_{Moon})$ is Earth's radiant heat in W/m^2 as a function of moon's distance from Earth,

$\bar{M}_{Earth}$ is the Earth's surface gravity on the Earth's surface in kg/m^2 - it is equal to 11,698,287,490 kg/m^2 [11, 12, 16],

Q_{Earth} is the Earth's radiant heat decay pause in km - it is equal to 152,729 km,

S_{Moon} is moon's mean distance from Earth in km,

λ_{Earth} is the Earth's emissive heat escape factor in W/kg, it is equal to 15 W/kg [3-8, 10, 14, 15].

In analogy to equation (2), the equation to calculate the orbital period for a terrestrial moon can be derived out of equation (3) for the results in table 2, so:

$$\omega 2(S_{Moon})=\left(\bar{M}_{Earth}\lambda_{Earth}\left(\frac{152,729}{S_{Moon}}\right)^{4.8825}\right)^{-1}*57,184,400,721 \quad (4)$$

Where $\omega 2$ is terrestrial moon's orbital period in Earth days.

Table 2. Orbital period for the Earth's moons [16].

Orbit	Orbital Period in Earth Days (given)	Orbital Period in Earth Days (calculated)	Mean Distance from Earth in km
Synchronization orbit	1	0.999992	192,155 (calculated)
Moon's orbit	29.530589	29.530589	384,400 (given)

The Earth's emissive heat escape factor fits to be 15 W/kg in equation (3) and (4) for the simple reason that the distance to reach the Earth's synchronization orbit from Earth must be greater than the distance to reach the Earth's radiant heat decay pause.

Upon the distance of 384,400 km between the Moon and Earth [16], by virtual of equation (3) the Earth's radiant heat reaching the surface of the Moon is equal to 1,936,446,331 W/m^2. Upon the Moon's surface gravity of 1,936,443,720 kg/m^2 [11, 12, 16], upon the Moon's heat escape factor of 1 W/kg [3-8, 10, 14, 15, 18], the Moon's total emissive power on the Moon's surface is equal to 1,936,443,720 W/m^2. Therefore, it can conclusively be said that the Moon is tidally locked because the Earth's radiant heat reaching the Moon is equal to the Moon's total radiant heat on the Moon's surface.

4. Gravitational Tension

To start with: it is a settled principle of mathematics that a vector product out of two vectors shall produce a third vector

that is perpendicular to both of the original vectors whereas a dot product out of two vectors shall produce a scalar product (a non-vector product) [7, 9]. So:

$$\vec{A}\times\vec{B}=\left|\vec{A}\right|\left|\vec{B}\right|Sin(\theta)\vec{z} \quad (5)$$

Where $\vec{A}$ is a dimensionless arbitrary vector.

$\vec{B}$ is a dimensionless arbitrary vector.

θ is the angle in radians between the two vectors $\vec{A}$ and $\vec{B}$.

$\vec{z}$ is a unit vector in the direction perpendicular to the plane of $\vec{A}$ and $\vec{B}$.

$$\vec{A}\bullet\vec{B}=\left|\vec{A}\right|\left|\vec{B}\right|Cos(\theta) \quad (6)$$

Out of intuition: it makes sense to derive the gravitational tension out of the scalar product on the basis of equation (6) since the underlying gravitational relationship is assumed to act along a straight line to the effect that the result out of equation (6) shall be non-zero scalar quantity, whereas the result out of equation (5) shall be zero, so:

$$\kappa=E_{Sun}\bullet E_{Earth} \quad (7)$$

Where κ is the gravitational tension in W^2/m^4.

Therefore: gravitational tension is the multiplication product in W^2/m^4 out of two opposing radiant heat-based pushes exercised by two gravitational partners.

5. Limitations of the Newton's Law of Gravitation

Out of equation (1), (3) and (7), the gravitational tension acting between the Sun and Earth is given by:

$$\kappa=\bar{M}_{Sun}\lambda_{Sun}\left(\frac{Q_{Sun}}{S_{Planet}}\right)^{1.535}*\bar{M}_{Earth}\lambda_{Earth}\left(\frac{Q_{Earth}}{S_{Moon}}\right)^{4.8825} \quad (8)$$

S_{Planet} and S_{Moon} can be replaced by R in equation (8) because they are equal, so:

$$\kappa=\bar{M}_{Sun}\lambda_{Sun}\left(\frac{Q_{Sun}}{R}\right)^{1.535}*\bar{M}_{Earth}\lambda_{Sun}\left(\frac{Q_{Earth}}{R}\right)^{4.8825} \quad (9)$$

The weakness of the Newton's law of gravitation is exactly here because it assumes Q_{Sun} is equal to Q_{Earth} in equation (9) and that the sum of the powers is 2 in equation (9) which is not true. There are two thinkable reasons for these assumptions: the 1st reason is to simplify equation (9). The 2nd reason is to increase the numerical value of the gravitational tension by increasing the Earth's component thereto.

An attempt to modify equation (3) and (4) to fit the Newton's assumption for meaningful results in table 2 fails on the ground that the distance between Earth and the Earth's synchronization orbit falls far below the distance between Earth and the Earth's radiant heat decay pause.

By pursuing the Newton's assumptions, equation (9) gets modified as follows:

$$\kappa=\bar{M}_{Sun}\bar{M}_{Earth}\lambda_{Sun}\lambda_{Earth}\left(\frac{Q_{Sun}}{R}\right)^2 \quad (10)$$

By multiplying by the surface area of the Sun and that of Earth as well as by the Newton's gravitational constant on both sides of equation (10) the result is as follows:

$$\kappa A_{Sun}A_{Earth}G=G\frac{M_{Sun}M_{Earth}}{R^2}\left(\lambda_{Sun}\lambda_{Earth}\right)\left(Q_{Sun}\right)^2 \quad (11)$$

Where G is the Newton's gravitational constant in $N(km^2/kg^2)$ - it is equal to $6.67x10^{-17}\ N(km^2/kg^2)$ [11, 12, 16].

Upon rearranging equation (11) it follows that:

$$G\frac{\kappa A_{Sun}A_{Earth}}{\left(\lambda_{Sun}\lambda_{Earth}\right)\left(Q_{Sun}\right)^2}=G\frac{M_{Sun}M_{Earth}}{R^2} \quad (12)$$

Now, because the left and right hand side of equation (12) has the unit of a force, because the gravitational tension appears on the left hand side as a sought parameter, it follows that:

$$F=G\frac{M_{Sun}M_{Earth}}{R^2} \quad (13)$$

6. Results, Discussion and Conclusion

There exists gravitational tension in W^2/m^4 between the Sun and Earth in the line of the gravitational relationship in the line reaching the Earth's dayside and the same thing holds for the Earth-Moon gravitational relationship and the same thing holds for any other gravitational relationship in the Solar system and perhaps in any other star system in the Cosmos. Gravitational tension is a result of the radiant heat based opposite pushing between two gravitational partners and mathematically it is a multiplication product out of the two. The tidal effects on the two partners are indeed a result out of gravitational tension. Gravitational tension is a live thread. Gravitational tension gives the hint that gravity is a perishable result of a push.

Mercury and the Moon is said to be tidally locked because the strength of the Sun's radiant heat reaching the Mercury's

surface is equal to the strength of the Mercury's escaping total radiant heat on the Mercury's surface and the same effect holds to the Earth-Moon relationship. Tidal waves are essentially a result upon the push from the Earth's gravitational partners, The Sun and the Moon.

The Newton's law of gravitation can be derived out of the mathematical expression for gravitational tension upon the fragile assumption that the less-massive partner's push be elevated in that expression to unreasonably cause the less-massive partner's distance to the synchronization orbit to be assumed to shrink far below the distance to the radiant heat decay pause. The consequence out of this assumption is that whereas the mathematical expression for gravitational tension produces a value in W^2/m^4 to signify a sustainable quantity, the value out of the Newton's law of gravitation produces a value in Newton without any information as to the sustainability thereof.

Without a fuel, without a medium and without a sustainable gravitational tension between Earth and a black hole, the Wave cannot travel from a black hole to reach the LIGO's labs.

Abbreviations

GFSP	Gravitation in Flat Space Time, Dimensionless
LIGO	Laser Interferometer Gravitational-wave Observatory, Dimensionless
Wave	A Transient Gravitational-wave Signal, Dimensionless
$\vec{A}$	Arbitrary Vector, Dimensionless
$\vec{B}$	Arbitrary Vector, Dimensionless
E	Radiant Heat, W/m^2
G	Newton's Gravitational Constant, $N(km^2/kg^2)$
M	Mass, Kg
$\bar{M}$	Surface Gravity on the Originating Surface, kg/m^2
Q	Radiant Heat Decay Pause, Km
R	Distance Between Two Gravitational Partners, km
S	Mean Distance from the Sun, km
λ	Emissive Heat Escape Factor in W/kg
ω	Planet's Orbital Period, Earth Days
$\omega 2$	Terrestrial Moon'S Orbital Period, Earth Days
θ	Angle Between Two Vectors A and B, Radians
κ	Gravitational Tension, W^2/m^4
$\vec{z}$	Unit Vector in the Direction Perpendicular to the Plane of the Two Vectors $\vec{A}$ and $\vec{B}$, Dimensionless
Earth	The 3rd Planet from the Sun
Moon	The Only Earth's Moon
Planet	An Object in the Astronomical Meaning of a Planet of the Solar System
Sun	The Sun in the Astronomical Meaning of the Center of the Solar System

Author Contributions

Charles Edward Ng'hwaya Masule is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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