LOMBARD THEORY OF GRAVITATION

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Abstract. The universe's web-like structure unveils the locations where gravitational plane waves, propagating from all directions are in balance, resulting in the presence of celestial bodies. The mass of matter attenuates gravitational waves as they propagate through matter transferring momentum. The sun, by virtue of its presence, obstructs Earth's view from outer space where gravitational waves are unattenuated, causing an imbalance in momentum transfer, resulting in a force on Earth towards the sun. It is concluded that there is no force of gravitational attraction between masses. The Hubble force that drives celestial bodies apart, is caused by reflecting gravitational waves between the bodies that transfer momentum. The obstruction of gravitational waves of celestial bodies in tandem should be multiplied, resulting in the multiplication of gravitational force on peripheral bodies. The capture of photons between gravitational waves explains the constant vacuum speed of light.

The universe's web-like structure unveils the locations where gravitational plane waves, propagating from all directions are in balance resulting in the presence of celestial bodies. Cosmic objects are ejected from regions characterized by an imbalance in momentum transfer.

The total mass of matter attenuates gravitational waves by reflection and absorption, whereby the amplitude of a wave progressively decreases as it propagates through matter. In a balanced gravitational system, this phenomenon occurs from all directions and the net momentum transferred is nullified.

The sun, by virtue of its presence, obstructs Earth's view from outer space where gravitational waves are unattenuated. Gravitational waves are reflected by the sun, and those that pass through the sun are attenuated. Conversely, the gravitational waves on the dark side of the earth are not attenuated and thus transfer more momentum to the planet than the ones that have passed through the sun. This difference in momentum transfer results in a force on Earth towards the sun.

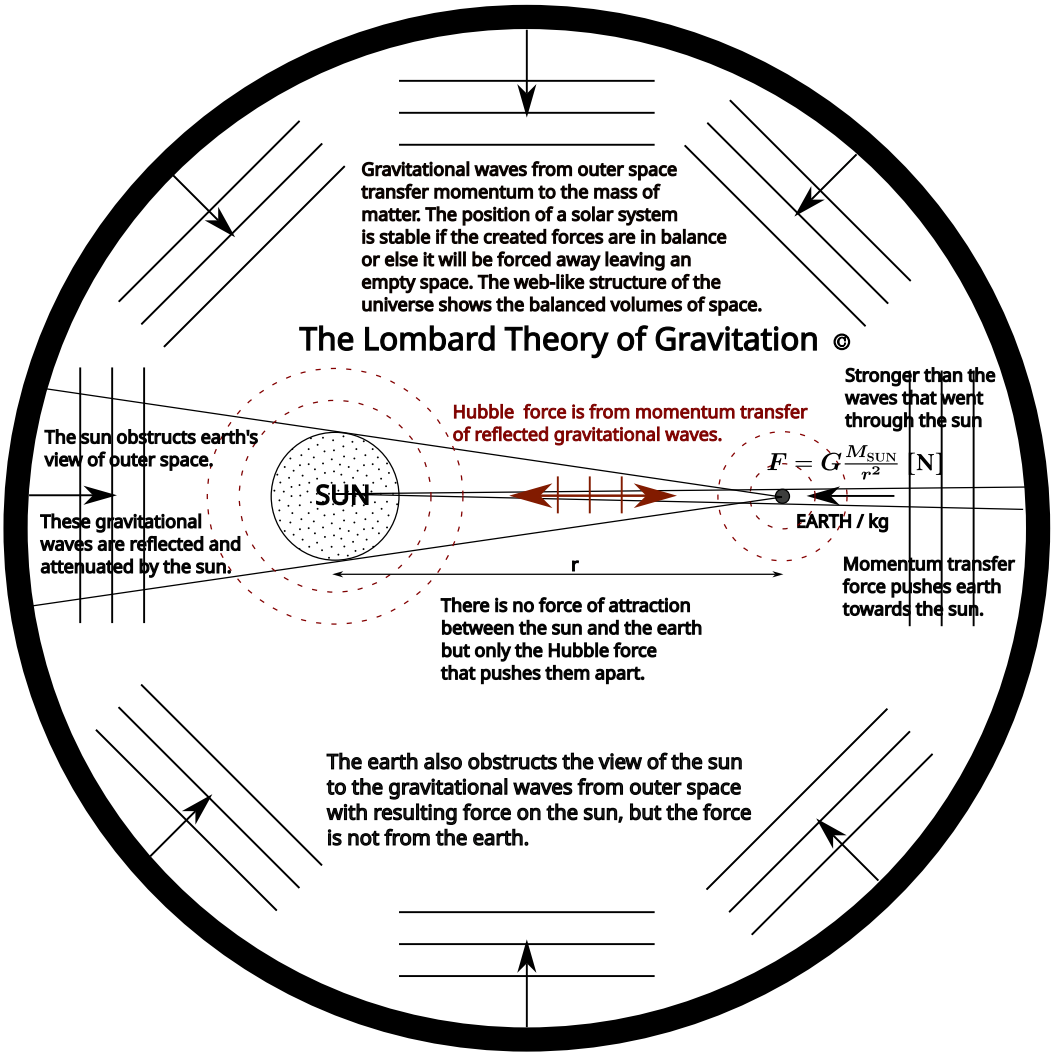

FIGURE 1. *Gravitational Waves* from outer space.

For each kg of Earth's total mass, the obstruction caused by the Sun is given by the modified Newtonian force exerted upon Earth:

$$\boldsymbol{F_{\mathrm{EARTH/kg}} = G\frac{M_{\mathrm{SUN}}}{r^2}} \quad [\boldsymbol{N}] \tag{1}$$

For each kg of the sun's total mass, the earth also obstructs the view of the sun from outer space resulting in a force upon the sun of

$$\boldsymbol{F_{\mathbf{SUN/kg}} = G\frac{M_{\mathbf{EARTH}}}{r^2}} \quad [\boldsymbol{N}] \tag{2}$$

where the total mass includes the mass from kinetic energy.

$$M_{\text{EARTH (/kg)}} = M_{\text{Earth}} + \frac{E_{k_{\text{Earth}}}}{c^2} \tag{3}$$

$$M_{\text{SUN (/kg)}} = M_{\text{Sun}} + \frac{E_{k_{\text{Sun}}}}{c^2} \tag{4}$$

Gravitational waves interact with the total mass of matter. For example, when a planet orbits the Sun in an elliptical path, the total mass it experiences will be greater at the perihelion as it is drawn closer to the sun by the gravitational waves from outer space due to the increase in its kinetic energy and subsequent gain of mass. Conversely, at the aphelion, the total mass experienced will be less due to the decrease in its kinetic energy and subsequent loss of mass.

The earth's obstruction of gravitational waves to the sun causes a gravitational force on the sun, but the force is not from the earth. The sun's obstruction of gravitational waves to the earth causes a gravitational force on the earth, but the force is not from the sun. The force pushing the earth and sun towards each other originates from an imbalanced momentum transfer of gravitational waves behind the objects relative to the attenuated gravitational waves passing through the objects.

There is no gravitational 'Force of Attraction'
between Earth and Sun, (5)
or between any mass.

The beauty of this model of obstruction, when compared to the Newtonian model of attraction, lies in the fact that when an object assumes a

new position in space, the obstruction has already occurred. The attenuated gravitational waves, traveling at the vacuum speed of light relative to the obstructing object, are already present at that specific position in space, permitting the force to act almost instantaneously. This characteristic may potentially be utilized to substantiate this theory.

Newtons equation of gravitation where the forces are equal but in opposite direction applies when the two masses are stationary spheres at a distance from each other:

$$\boldsymbol{F = G\frac{M_1 M_2}{r^2}} \quad [\boldsymbol{N}] \tag{6}$$

The obstruction or attenuation of gravitational waves is amplified when objects are in tandem or closed together such as subatomic particles close to each other. This amplification can be a significant part of the strong nuclear force.

In a spiral galaxy where multiple objects are in tandem, gravitational waves that traverse the galaxy are much more obstructed than simply summing the attenuation of individual objects. This results in an amplification or a higher effective gravitational force on peripheral objects that might incorrectly be attributed to dark matter. Peripheral objects experience unattenuated gravitational waves from outside, whereas objects in tandem are on the inside. The attenuation of gravitational waves when objects are in tandem is not linear. A typical series force attenuation curve can follow the following equation:

$$\boldsymbol{F_{M_0}/\mathrm{kg} = G\left(\frac{M_1}{r_1^2} + 2\frac{M_2}{r_2^2} + 4\frac{M_3}{r_3^2} + 6\frac{M_4}{r_4^2} + ...\right)} \quad [\boldsymbol{N}] \tag{7}$$

The force attenuation curve if the objects are not in series:

$$\boldsymbol{F_{M_0}/\mathrm{kg} = G\left(\frac{M_1}{r_1^2} + \frac{M_2}{r_2^2} + \frac{M_3}{r_3^2} + \frac{M_4}{r_4^2} + ...\right)} \quad [\boldsymbol{N}] \tag{8}$$

The Hubble force that drives celestial bodies apart, is caused by momentum transfer of reflecting gravitational waves between the bodies that are aligned in space and time. Its effect is measured by the speed at which a cosmic object moves away from Earth. Several values have been reported in the literature. Lets assume a Hubble speed of:

$$H_0 = 68300 \ \ [\left(\frac{m}{s}\right) \ / \ \text{Mpc}] \text{ where} \tag{9}$$

$$\text{Mpc} = 3.086E^{+22}[m] \tag{10}$$

$$H_0 = 2.213221E^{-18}\left[\frac{m}{s} \ /\text{m}\right] \tag{11}$$

The mass of celestial bodies are mirrors for gravitational waves that are reflected multiple times between them while accumulating. The gravitational plane waves transfer momentum to the celestial bodies, resulting in a force that push them apart. This force may incorrectly be attributed to dark energy. The reflection between bodies is not constant and is affected by the movement of the bodies and other obstructing bodies. The Hubble force on a celestial body is the vector sum of the Hubble forces from all the reflected gravitational waves from all celestial bodies in its view.

Gravitational waves, propagating through space, are most likely composed of a stochastic ensemble with no fixed wavelength or frequency. This inherent randomness leads to uncertainties and vibrations in atomic structures. The speed of gravitational waves reflected or emitted from a mass particle is constant at the vacuum speed of light relative to the particle's mass. The absolute speed of gravitational waves are not limited. It depends on the speed of the source and the interactions between gravitational waves.

A portion of a gravitational wave interacting with a mass particle will be reflected from the mass particle if the internal energy of the mass particle can supply the required momentum for the reflection to be at the vacuum speed of light or else it will be absorbed in the internal energy of the mass particle. A spherical gravitational wave will be emitted at the vacuum speed of light by a mass particle, if the absorbed energy exceeds its kinetic energy relative to its rest mass, by the quanta required to do so. This will also happen when the particle decelerates.

In a balanced gravitational system, when a mass particle is stationary, reflection will happen from all sides. If the particle is moving at a constant speed, momentum absorbed in front will be used to reflect gravitational waves from behind, at the vacuum speed of light, keeping the particle at its constant speed of movement. Momentum into the particle will be momentum out of the particle.

If a force is applied to a mass particle accelerating it, the momentum of additional gravitational waves will be absorbed maintaining the particle's kinetic energy as its velocity is increased. As the particle accelerates, there are no additional gravitational waves behind the particle to balance the momentum input. This momentum imbalance exerts an inertial force on the particle resisting the applied force of acceleration.

The sources and distribution of gravitational waves still have to be determined and measured either directly or indirectly. In the locations where gravitational waves are in balance resulting in the presence of celestial bodies, the energy, speed and distribution of gravitational waves can't be assumed to be the same as in our solar system. As gravitation is caused by an imbalance in a balanced environment, the absolute values of the energy, speed and distribution of gravitational waves are irrelevant, resulting in the same laws of gravitation.

It is anticipated that the average wavelength of gravitational waves will be smaller than the proton diameter, with a magnitude expected to be in the order of:

$$\lambda = 1E^{-18}[m] \tag{12}$$

with average frequency in the order of

$$f = \frac{c}{\lambda} = \frac{299792458}{10^{-18}} = 3E^{+26}[\text{Hz}] \tag{13}$$

The total mass of an object interacts with the energy of gravitational waves. Albert Einstein connects mass and energy in his famous equation:

$$\boldsymbol{E = mc^2} \tag{14}$$

where mass is a function of the sum of its rest mass and kinetic energy:

$$\boldsymbol{m = m_0 + \frac{E_k}{c^2}} \tag{15}$$

Electromagnetic waves possess energy and the photon can be seen as a mass particle interacting with gravitational waves. The area of vibration or wave function of a gravitational wave is perpendicular to the direction of propagation and its wave function will resist a photon from passing through it when propagating at more or less the same speed. However, in vacuum photons and reflected gravitational waves, propagating in the same direction are doing it at the vacuum speed of light.

The gravitational waves propagating towards a moving photon at the vacuum speed of light from the front and sides of the photon are transferring their momentum to the photon. The photon will be pushed back onto the gravitational wave behind it, propagating at the same speed. The photon has no extra energy to overcome the force that resist it passing through the gravitational wave function. The photon is actually captured by the two gravitational waves in front and behind it, propagating in the same direction.

The capturing of the photon by accompanying gravitational waves, is why the photon always propagates in a vacuum at the constant vacuum speed of light relative to local mass, and if the photon was emitted from a moving source, it will blue- or red-shift its frequency to keep its energy. The interaction of a photon with accompanying gravitational waves, resisting penetration of their wave functions, forces the photon to adjust its speed and wavelength. It can only propagate through the wave functions

of the accompanying gravitational waves if there is enough energy to do so.

If the photon is not propagating in a vacuum, the interaction with mass particles will exert a force resisting its propagation and reducing its speed. The photon will be forced through the gravitational waves behind it that propagate faster at the vacuum speed of light. The gravitational waves overtaking the photon will exert an equal force that balance the force which reduces the photon's speed. The photon will then propagate at its local speed of light.

The waves of quantum particles like photons can be entangled onto the surface of a spherical gravitational wave, keeping the gravitational wave stationary and stretchable, until the quantum particles are measured and the entanglement collapses. The unknown property of the particles at entanglement, knowing they are the same, can be discovered when the gravitational wave is stretched by moving the particles far away.

The weight of a mass object is the outcome of the net gravitational force acting on it, which results from the imbalance of the momentum transfer of gravitational waves acting upon the mass. In the case of gravity on Earth, it attenuates the gravitational waves from below passing through it while the gravitational waves from above are unattenuated, thereby exerting the imbalance force of weight on mass.

If the constructive interference of gravitational waves in space creates standing waves, it can be seen as virtual mass objects with energy (dark matter), attenuating other gravitational waves.

When two large cosmic objects with elliptical orbits merge in space, the acceleration/deceleration of these objects just before merger, radiates an abundance of gravitational waves from their atoms in a short time. The interference of these waves produces a substantial gravitational wave that propagates through space at the speed of light. Upon arrival on Earth, this gravitational wave can be detected with current technology and proofs the existence of gravitational waves. However, the technology is not yet capa-

ble to measure high-frequency random gravitational waves, as required in this theory, but we can measure the effect of their momentum transfer as gravitation.

We only experience the difference in gravitational forces on our bodies and think gravity is a weak force. However, the absolute force is large. It is the very same force that propels matter into a black hole and retains it there.

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