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TIDES

(According to "*Hypothesis on* MATTER")

Nainan K. Varghese, matterdoc@gmail.com

Abstract: Present explanations on the mechanism of tides are based either on centrifugal action or on gravitational attraction. Centrifugal force (due to motion of a body in circular path), used in analytical solutions, is an imaginary force. Explanations, based on actions by an imaginary force, cannot be factually correct. One of the fundamental assumptions used for deriving equation for the attraction due to gravitation between two bodies is that all matter content (mass) of each body is concentrated at its centre. This makes it illogical to assume that different parts of a body have different magnitudes of attraction due to gravitation towards another body. Therefore, the explanations, based on differences in gravitational attractions on different parts of bodies, are perversions of present theory on attraction due to gravitation. Apparent orbital motion of a body about an epicentre is also used in some of the explanations. In nature, no free body can orbit **around** another moving body [2]. Orbital path of earth about the sun (or that of the moon about earth) is not circular or elliptical around a central body but it zigzags about sun's (earth's) path in space. Hence, an explanation based on rotation of earth around an epicentre is pure imagination. According to current rules of dynamics, more than one external linear force, acting on a rigid body can produce only one resultant linear motion. Yet, the earth experiences distinctly separate tides from central forces towards the moon and the sun. Magnitudes of lunar tides are greater than solar tides. Only logical reason is that the central force between earth and moon is greater than that between earth and sun. This article attempts to give a simple and logical explanation to tidal mechanism, based on a radically different dynamics put forward in "Hypothesis on MATTER" [1]. Tides are caused by (accelerating) actions of external forces on a linearly moving spinning-body. Each force alters the shape of the spinning body, separately, to produce its own tides. Change in the shape of a spinning body, rather than displacement of its parts, cause tides. Absolute linear motion of the spinning body shifts the zenith points of tides from the local meridians facing the sun (or the moon). Orbital motion of the spinning body enhances the deflection of tides from local meridian. Displacement of ocean water is superficial and it cannot produce tidal drag on earth's solid body.

Keywords: Rotation, Tides, Tidal mechanism, Solar system, Celestial mechanism, Apparent orbits, Cosmology, Hypothesis on MATTER.

Introduction:

"*Hypothesis on* MATTER" describes an alternative concept. In it**:** a body's matter content and the energy about the body are distinctly separate. Matter content is the total sum of three-dimensional matter particles in a body. Energy is the strain developed due to 'distortions' in the natural arrangements of basic matter particles in and about a body, constituting the universal medium. Matter content and energy content of a body cause and support each other for their existence and stability. They are not convertible into each other. Entire space is filled with universal medium of two dimensional latticework formations (called '2D energy fields') by basic 1D matter particles (quanta of matter). 2D energy fields, in various directions and planes, passing through a point, co-exist. Since the latticework is formed by quanta of matter, arranging themselves as the sides of rectangles in a plane, each section with four sides is called a square. Although, the 2D energy fields are made of (apparently) rigid matter particles, it has all properties of an ideal fluid. Parts of 2D energy fields, within and about the dimensions of a macro body, contain sufficient distortions to sustain the body's integrity and stability in their current state. This part of 2D energy fields is the 'matter field' of the macro body. Distortions in the matter field are the 'work', existing in a macro body and it determines the state of the macro body. Force is the rate of work being stored in a macro body, with respect to its displacement in space due to the invested work. Action of an inertial force (a force that invokes inertia) is simple structural reshaping of matter field and the resulting motion of any matter particles, present in the region. State of a body depends on the work (energy stored) in its matter field rather than on the magnitude of force applied on it. All apparent interactions between matter particles take place through the medium of 2D energy fields. This avoids the assumption of 'actions at a distance'. There are no 'pull forces' or 'rigid bodies' in this concept. All forces, classified into various types, are different manifestations of 'only one type of force' and it is of 'push nature'. Work (distortions in 2D energy fields) is transmitted only in straight lines and separately in each plane. Forces in different planes do not form a resultant. Forces in the same plane in different directions interfere to reduce each other's efficiency to produce motion of associated matter particle. Sum of independent displacements of a body, produced by external forces in different directions or in different planes, is the resultant motion of the body in 3D space.

Tendency of a 2D energy field, to attain serene state, does not allow static distortions in it. Transfer of distortions in the matter field of a body carries body's matter particles and thus produces body's motion. This inertial action about a body maintains body's state of motion. A change in the inertial actions about a body produces its acceleration. If certain work is invested into a body, the body will attain a stable state only after an inertial delay, during which time, the work within the matter field of the body distributes and attain stable state of transfer. This is true even after the application of force is terminated. Matter is inert; it has no ability to move or act. Associated matter field-distortions produce all apparent actions presently assigned to the matter bodies. Presence of 3D matter particles breaks the continuity of a matter field in its plane. That is, the matter field does not extend into the 3D matter particles but remain outside and touch their perimeters. This helps to maintain their shape, size and matter density. Matter field distortions in a macro body, in its steady state, are distributed within the body-dimensions. As the distortions in a matter field are transferred, it carries body's matter particles along with the distortions. Steady transfer of matter field distortions contributes to steady motion of matter particles and hence that of the macro body. Action of an external force on a macro body invests fresh distortions (work) into its matter field. These distortions are distributed in a macro body during the inertial delay. When such distribution is completed, after the cessation of external force, the body reaches a steady state. During accelerating stage, existing distortions in the matter field are modified and the change in the state of body, with respect to its position in space (or steady state of motion), is exhibited as its acceleration.

Presence of 3D matter particles in a 2D energy field breaks its continuity. Discontinuity causes imbalance in the state of 2D energy field. Pressures, applied by the 2D energy field latticework from the sides, compress a matter particle. [Primary 3D matter particles are of uniform radial size and they constitute (in various mutual arrangements) all other superior matter bodies]. If the extents of 2D energy field on opposite sides of a matter particle are unequal, the matter particle experiences a resultant force, which tends to move it towards the side of lower pressure. Extent of 2D energy fields between two matter particles is less than the extent of 2D energy fields on their outer sides. As a result, matter particles are pushed towards each other. Motion of constituent particles of a macro body moves the whole body. This action gives rise to the apparent gravitational attraction between macro bodies. Apparent gravitational attraction between two bodies is, relatively, a minor by-product of gravitational actions on them. It takes place between (spinning and disc shaped) basic 3D matter particles of both the macro bodies, which are in the same plane at a given instant. At any instant, apparent gravitational attraction between two macro bodies is produced between extremely small numbers of basic 3D matter particles in the bodies. An average apparent attraction is derived from sporadic actions between various 3D matter particles, which happen to be in the same plane at the instant. Contrary to present belief, gravitational force is enormously stronger compared to other manifestations of force.

This article deals with 3D macro bodies. Hence, in order to describe actions on a matter field, equations currently used for 3D space system are used with modifications, corresponding to 2D planes. Concepts expressed in this article are taken from the "*Hypothesis on* MATTER" [1]. All movements are with respect to an absolute reference as given in the same concept. For details, kindly refer to the same. No figures, in this article, are drawn to scale. They are greatly enlarged to make the actions/phenomena distinct and clear. Only those matter field-distortions that are required to produce whole body-motion in a plane, mentioned in the article, are represented in the figures. Matter field-distortions, maintaining steady state and integrity of matter particles and the macro body as whole are ignored. Directions of latticework squares of 2D energy fields, shown in figures, are chosen for ease of representing them. They are intended to show the nature of distortions rather than their shape or orientation in the 2D energy field. They may be understood as the resultant shape of all matter field distortions in the macro body with respect to the actions considered. Present orientations of the matter field squares are chosen to reflect the described actions clearly. The term 'force' is used in its general meaning to represent an effort or a cause of an action.

Action of a rotating force:

Inertial forces (forces which invoke the phenomenon of inertia in a body) can act only in straight lines and within the plane of their application. Uneven action of a linear force about a point in a body produces a couple of force and body's resulting rotary motion, in addition to any linear motion of the body. Rotating motion of a body is nothing but sum of linear motions of its matter particles, moving at different linear speeds (and in different directions) about a centre point. With respect to a radial line of the body, linear speeds of matter particles of the body increase in proportion to their distances from the centre of rotation. Transfer of distortions in the matter field latticework at unequal linear speeds move matter particles in the region at corresponding linear speeds. With respect to rotary motion of a body, that has no linear motion, (linear) matter field distortions producing body's rotary motion remain steady in space and the body itself acts as a moving body of unlimited length, in all directions in each plane of rotation. Matter field squares at the centre of rotation (of a static macro body) have no distortions and hence matter particles in that region do not move. Matter particles whose distances from the centre are in opposite directions, move in opposite linear directions.

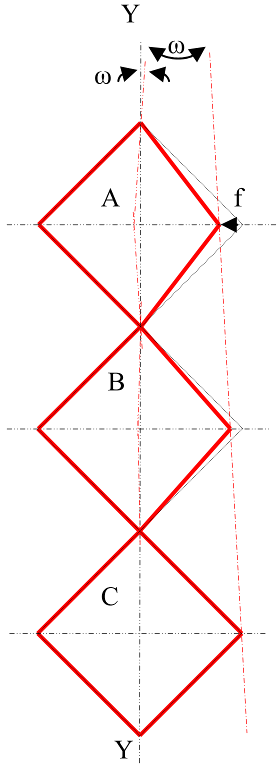

Figure 1

Figure 1 shows representations of three matter field squares 'A', 'B' and 'C' of a (rotating) body, in a radial line. Black dotted lines show their original shape, when the body has no motion at all. [Distortions, maintaining the steady state of rest and integrity of the macro body are ignored]. 'A' is near the perimeter, 'C' is at the centre and 'B' is somewhere in between the centre and perimeter of the rotating macro body. In their original shapes, arms of all squares are symmetrical about a reference line (vertical centre line shown passing through the centers of the squares). Due to this symmetry, force acting along the reference line is evenly distributed in the arms of the latticework squares and the resultant action of the force is linear along the reference line,YY.

A linear force, 'f', acting on the body away from its centre of rotation and perpendicular to the reference line, distorts the matter field squares in the region of its action. Matter field squares are distorted as shown by the bold (red) lines. Matter field square ‘C’ being at the centre of rotation of the body is not affected by the force. Due to integrity of the body, distortion in matter field square ‘B’ achieves magnitude corresponding to its location. As the location of matter field squares approach the perimeter, magnitude of distortion in them approach highest value, corresponding to force ‘f.’ Speeds of transfers of distortions are proportional to their magnitudes. Outer most matter field square will transfer the distortion fastest and speed of transfer in other squares will gradually diminish as their location nears the centre of rotation. Matter particles near the perimeter of the body will have highest linear (tangential) speed and linear speeds of matter particles nearer to the centre are lower. Due to different linear speeds of the particles, the macro body as a whole rotates about its centre of rotation. Distortions in the matter field squares of the rotating body create asymmetry in their arms with respect to the reference line YY. Magnitude of this asymmetry is the angular speed of the rotating macro body, shown in figure 1 as the angle ‘ω’. When the force is withdrawn, the macro body will attain steady state of rotation after the inertial period. Macro body will maintain this state of rotation until another torque is applied to modify its angular speed.

Due to asymmetry of the arms of matter field squares, action of an external force along the reference line, YY, towards the centre of rotation is bifurcated. A component of action produces an angular deflection to turn the body and the other part imparts linear motion to the body. Direction of action of the force is deflected from the direction of its application by an angle whose magnitude is equal to the angular speed of the rotation. After the inertial period, the body will settle down to steady state of combined motion of linear and original spin motions. Due to linear speed, attained by the macro body, matter field distortions on one side of the centre of rotation increase their transfer speeds while matter field distortions on the opposite side lose their transfer speeds. Location of the matter field square that produces no angular deflection is shifted towards the side that was moving in opposite direction to the newly introduced linear motion. This shifts the centre of rotation of the macro body.

Let an external linear force act on a spinning macro body, along a radial line, where the arms of the squares are symmetrical about the direction of force. Since the external force produces no angular component, it cannot affect body particles’ tangential motion. Macro body has to develop pure linear motion in addition to its original rotary motion. All matter particles of a spinning macro body move in curved paths about body’s centre of rotation. On one side of the centre of rotation, particles of the rotating macro body have newly introduced linear motion assisting their tangential motion in the curved paths and on the other side, particles of the rotating macro body have newly introduced linear motion opposing their tangential motion in the curved paths. Centre of rotation of the body shifts without affecting the angular speed of the body. As the additional linear motion increases, centre of rotation of the body can move even outside the body. Angular and linear motions of the macro body remain independent of each other irrespective of changes in any of them. Newly introduced linear motion cannot affect macro body’s rotary motion. In order to satisfy this requirement, curvatures of the body particle’s path are varied by appropriate changes in their paths. Changes in the curvature of paths, with the tangential speed remaining constant, requires shift in the centers of their curved paths. During linear accelerating stage of a rotating body, its radii in various planes perpendicular to the spin axis vary all around the centre of rotation. Cross sections of the spinning body (perpendicular to spin axis) attains elliptical shape. The body bulges outwards along the line of external force’s action. Body’s shape will revert to original as the body attains a steady state.

Figure 2 shows the equatorial plane of a rotating macro body – circle in black dotted line. ‘A,B,C,D,E,F,G and H’ show distorted shapes of few of the matter field squares in different locations in the macro body. They represent the spin-part of resultant distortions in the matter field, rather than the actual matter field squares in the macro body. Curved black arrows in dotted line show the direction of spin motion – as shown in the figure, anticlockwise – of the macro body. Let the spin speed of the body is equal to ‘+ω’. Small arrows show parts of an external linear force applied evenly on the macro body. This force is applied equally on every matter field square in the macro body. All junction points of matter field squares experience equal resultant forces in the direction of the applied force. Although the actions of the force is to introduce identical linear distortions in every matter field squares of the macro body, orientation of matter field squares at different locations cause slight differences in the distortions introduced. At ‘A, D, E and H’, arms of matter field squares are symmetrical to the direction of action of the external force. Force experienced at all junction points and the distances between junction points, in perpendicular direction to the external force, are equal. Distortions introduced by the external force are purely linear and the work introduced is used solely for linear motion of the macro body in the direction of the external force.

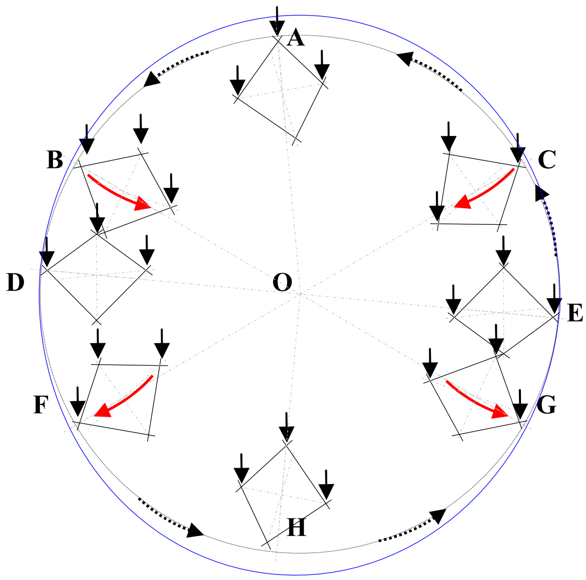

Figure 2

At ‘C and F’, orientation of the matter field square (distortion) is deflected anticlockwise. Distances between middle junction point and junction points on either side are different. Junction point to the right is farther than the junction to the left. Although the magnitudes of vertical forces are same, difference in the distances to the junction points on the sides, produce a turning movement of the matter field square in clockwise direction, ‘-α’, as shown by curved arrow in bold line (red). Direction of this deflection is in opposition to the matter field distortions producing macro body’s spin motion and thus it tends to reduce the spin speed of the macro body in these locations.

At ‘B and G’, orientation of the matter field square (distortion) is deflected clockwise. Distances between middle junction point and junction points on either side are different. Junction point to the left is farther than the junction to the right. Although the magnitudes of vertical forces are same, difference in the distances to the junction points on the sides, produce a turning movement of the matter field square in anti-clockwise direction, ‘+α’, as shown by curved arrow in bold line (red). Direction of this deflection is in the same direction of the matter field distortions producing macro body’s spin motion and thus it tends to enhance the spin speed of the macro body in these locations.

Spin motion of a macro body can be modified only be another torque. External force acting on the macro body is purely linear in nature. Hence, it is unable to change the spin speed of the macro body. Spin speed of a macro body depends on the relative differences between the tangential speeds of macro body’s matter particles in different locations in it. Spin motion of a macro body is measured in terms of angular displacement of its matter particles with respect to a reference line passing through its centre of rotation. Turning movement of matter field distortions, explained above also causes angular displacement of macro body’s particles. Therefore, effect of the turning motion of matter field squares is also measured in terms angular displacement of matter particles. However, its action on the macro body is without affecting tangential speeds of body particles, producing macro body’s spin motion. For this, the curvatures of the paths of matter particles of the macro body are modified without altering their tangential speeds. A matter particle, in the macro body, moves outward from ‘O’ (the centre of rotation) during its travel from ‘E’ to ‘A’; moves inward towards ‘O’ during its travel from ‘A’ to ‘D’; moves outward from ‘O’ during its travel from ‘D’ to ‘H’ and moves inward towards ‘O’ during its travel from ‘H’ to ‘E’. Path of the particle is shown in bold (blue) ellipse, in the figure 2. Changes in the paths of the macro body’s matter particles alter its shape during the action of the external force. Change in the shape of the body will last only during macro body’s accelerating stage (during the action of the external force). Once the external force is terminated and accelerating stage is over, the macro body will reach a

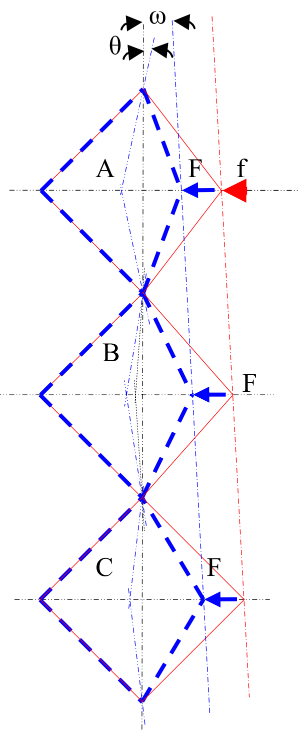

Figure 3

steady state of combined motions of spin and linear motions and it will revert to its original shape. During linear acceleration stage of a spinning body, it elongates, as a whole, along the direction of the external force.

Let another external force ‘F’, as shown in figure 3, act evenly on a macro body in steady state of rotation and the macro body attain a steady state of linear motion in addition to its spin motion. All matter field squares in the macro body are distorted identically as shown by ‘A, B and C’. Squares in thin lines (red) show the distortions causing steady rotary motion of the body. Additional linear motion of the body, produced by force ‘F’, has its own linear distortions in the matter field. These additional distortions are shown by dashed (blue) lines. Since whole of the matter field is distorted identically, the body maintains the linear motion without affecting angular speed of its rotary motion. Asymmetry of arms of the matter field squares, ‘θ’, is amplified in proportion to body’s linear speed. Correspondingly, angular deflection of matter field distortions from the reference line is enhanced. Action of an external linear force on a spinning body depends not only on its magnitude but also on the symmetry of matter field squares to the direction of force. This phenomenon causes shifts in the direction of tides from local meridian of a planet.

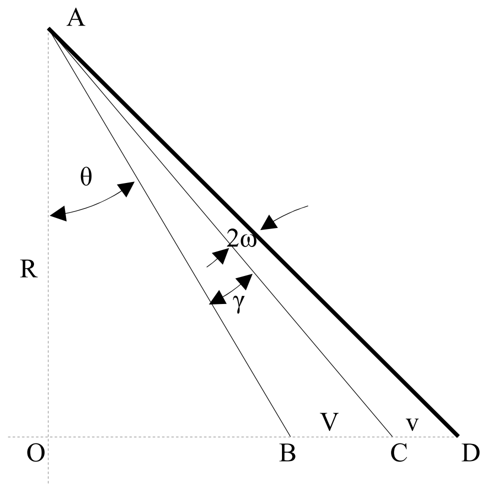

Figure 4

Figure 4 shows one quarter part of a 2D energy field square situated at the zenith point ‘A’ on the equatorial perimeter of a spherical macro body. AD is one of the quanta of matter forming the matter field square. Work (distortion), causing body’s rotary motion, displaces point ‘D’ towards ‘O’. End ‘D’ of the quantum is displaced to ‘C’ through a distance proportional to tangential speed, ‘v’, of a matter particle in that region. As and when the spinning macro body develops additional linear speed equal to ‘V’, point ‘C’ is displaced by additional distance, CB, proportional to ‘V’. Speed, ‘V’, considered here is of absolute nature. It is with respect to the 2D energy fields in space.

In the figure 4; $\angle OAD = \pi/4$, OA = R, BC = V,

CD = v, where v is the tangential speed of surface particle with respect to the spinning macro body and V is macro body’s absolute linear speed.

Let the spin speed of the macro body is equal to ‘ω’. Spin speed of the macro body is the angular deflection of median between side AD and opposite side of the square. Distortion for spin motion deflects only the arm AD. The opposite arm is not deflected. Therefore, in order to produce a deflection of angle ‘ω’ of the median, side AD has to have a deflection of 2ω.

$$\angle CAD = 2\omega, \qquad \angle OAC = \pi/4 - 2\omega$$

$$\text{Tan}\,\angle OAC = \text{Tan}\left(\pi/4 - 2\omega\right) = \frac{R - v}{R}, \qquad R = \frac{v}{1 - \text{Tan}\left(\pi/4 - 2\omega\right)}$$

$$\text{Tan}\,\theta = \frac{R - V - v}{R} = \frac{\dfrac{v}{1 - \text{Tan}\left(\pi/4 - 2\omega\right)} - V - v}{\dfrac{v}{1 - \text{Tan}\left(\pi/4 - 2\omega\right)}} = 1 - \frac{(V + v)\left(1 - \text{Tan}\left(\pi/4 - 2\omega\right)\right)}{v}$$

$$\theta = \text{Tan}^{-1}\left\{1 - \frac{(V+v)\left(1-\text{Tan}\left(\pi/4 - 2\omega\right)\right)}{v}\right\} \tag{1}$$

Total deflection of the arm due to linear speed and spin motion,

$$\gamma + 2\omega = \angle OAD - \angle OAB = \frac{\pi}{4} - \text{Tan}^{-1}\left\{1 - \frac{(V+v)\left(1-\text{Tan}\left(\pi/4 - 2\omega\right)\right)}{v}\right\}$$

Since there is no deflecting motion on the opposite arm, it is not deflected. Hence, deflection of the median line between AD and the opposite arm is half of deflection of AD.

$$\begin{Bmatrix}\text{Deflection of} \\ \text{Symmetry of} \\ \text{matterfield} \\ \text{square}\end{Bmatrix} = \frac{\angle BAD}{2} = \frac{\gamma + 2\omega}{2} = \frac{\frac{\pi}{4} - \text{Tan}^{-1}\left\{1 - \frac{(V+v)\left[1-\text{Tan}\left(\frac{\pi}{4} - 2\omega\right)\right]}{v}\right\}}{2} \tag{2}$$

Apparent attraction due to gravitation:

Let G be the constant of proportion for apparent attraction due to gravitation in 3D space system between two (spherical) bodies of mass, 'M' each, situated at a distance, 'd', between their centers of gravity. In determining the apparent gravitational attraction in 3D space system, all matter content in each of the macro bodies is assumed to be concentrated at their centres of gravity. This centre point is a geometrical point of zero dimensions.

Thus; the apparent gravitational attraction, $F = M^2G / d^2$ and $G = Fd^2 / M^2$.

When 'M' and 'd' are equal to unit measures, gravitational constant, G = F.

For this reason, the size or shape of the concerned 3D macro bodies do not come into consideration to determine gravitational constant, G, in 3D space system. For the current gravitational equations to be true, there can be only one centre of gravity in a macro body. Assuming a single macro body to have different centres of gravity for different parts of the macro body is distorting the theory. This is not scientific thinking.

According to the concept, given in the "Hypothesis on MATTER", magnitude of a disturbance is the extent of its contact with the 2D energy fields. All 3D matter particles are disturbances in the 2D energy fields. Matter content in each plane is in contact with 2D energy field of the same plane. For a 3D particle, extent of its contact with 2D energy fields equals its surface area. A larger 3D macro body is a union of numerous 3D particles. In a 3D macro body, basic matter particles are situated far apart and held together by inter-particle field forces and apparent attraction due to gravitation. This makes the matter-density of a 3D composite macro body lesser than the matter-density of a matter particle. Matter-densities of all 3D matter particles are same. It is their distribution in a macro body that makes the matter-density of a composite macro body lesser. A composite 3D macro body may be considered as single 3D disturbance of lower matter-density.

Matter-density of a 3D macro body, considered as a 3D disturbance

= Total matter content of the 3D macro body ÷ Surface area of the macro body.

Magnitude of a 3D disturbance = Matter-density of the disturbance × surface area of its matter body

= (Total matter content of the 3D macro body ÷ Surface area of the macro body) × surface area of the macro body

= Total matter content of the 3D macro body = Rest mass of the macro body.

Matter content of a 3D disturbance, equivalent to a 3D macro body, is the total matter content of the

3D macro body. Total matter content of a macro body is represented by its rest mass. Rest mass of a macro body is used to evaluate the apparent gravitational attraction between 3D macro bodies. Assumption that whole of the matter content is concentrated at the centre of gravity is required to have a common point to represent the matter content of a macro body. However, a 3D disturbance has to have a continuous surface area. Same body cannot be considered as number of smaller parts and have different or fractional gravitational actions.

For us, the 3D beings, matter bodies have real existence only when they exist in all three spatial dimensions. Since a plane has no thickness, a 2D body in three-dimensional system has no existence (volume) and its matter content and mass becomes zero in calculations. However, it may be understood that a 3D body has its existence in every 2D plane passing through it. Matter content of such a body is distributed in each of these planes proportionately. Since, at present, we have no two-dimensional system, we may use the present value of the gravitational constant for 3D bodies with corresponding modifications to the units involved. A plane of unit thickness that can be used by present equation is a meter (being one unit of distance) thick. This may not influence calculations of apparent gravitational attraction, in 2D space system, between very large bodies at great distances. However, if the thickness of a plane in 3D space system is reduced to a smaller unit, corresponding changes in the gravitational constant is also required. If the unit measure of distance is reduced to 0.5 meter, corresponding change in the value of gravitational constant is four times enhancement. Calculations used in this article correspond to 2D space system as described in the “Hypothesis on MATTER”.

Apparent attraction due to gravitation between two 2D bodies, $F = (m_1 m_2 G)/d$, where m_1 and m_2 are masses of the 2D bodies, ‘d’ is the distance between them and G is the gravitational constant used in three-dimensional system. We shall estimate the apparent gravitational attraction between a 2D matter particle of unit mass in the equatorial plane of a spherical body and the matter content of the body in the same plane as follows;

Let R be the radius of the spherical body, ‘M’ is its mass and ‘d’ is the distance between the 2D matter particle and the spherical body.

Volume of a spherical macro body $= \frac{4}{3}\pi R^3$ Matter density of the macro body $= \dfrac{M}{\frac{4}{3}\pi R^3}$

Area of equatorial plane $= \pi R^2$

Mass of equatorial plane of unit thickness = Matter density × Area $= \dfrac{M}{\frac{4}{3}\pi R^3} \times \pi R^2 = \dfrac{3M}{4R}$

Matter-density of equatorial plane, considered as a 2D disturbance

= Mass of equatorial plane ÷ Surface area of equatorial plane.

Matter-density of 2D disturbance = Mass of equatorial plane ÷ Surface area

$$= \frac{3M}{4R} \div \pi R^2 = \frac{3M}{\pi\, 4R^3} \text{ kg/m}^2 \qquad (3)$$

Equatorial plane has its contact with 2D energy field at its perimeter.

Perimeter of equatorial plane forming the 2D disturbance = 2 π R

Magnitude of 2D disturbance = Matter-density of 2D disturbance × Perimeter of the disturbance

$$= \frac{3M}{\pi\, 4R^3} \times 2\pi \times R = \frac{3M}{2R^2} \qquad (4)$$

Apparent attraction due to gravitation between matter content in the equatorial plane of the spherical body and a 2D body of unit mass,

$$F = \frac{3M}{2R^2} \times \frac{G}{d} = \frac{3MG}{2dR^2} \qquad \text{(by equation } F = (m_1 m_2 G)/d\text{)} \qquad (5)$$

Where ‘d’ is the distance between nearest points on their perimeters.

This apparent attraction acts between the equatorial 2D plane of the body and a 2D body of unit mass in the same plane. Similar apparent attractions in every plane of 3D space, containing two bodies, subscribe to the total apparent gravitational attraction between them in 3D space system. Calculating the central forces between earth – sun (or moon – earth) pairs, in 2D space system, magnitude of central force between earth and moon is much higher than the central force between earth and sun. This accounts for higher angular deflection of lunar orbital path compared to earth's orbital path about the sun and larger lunar tides compared to solar tides.

Tides:

Matter particles of a macro body are held together by the gravitational actions and inter-particle field forces. Apparent attraction due to gravitation between matter particles tends to move them towards the centre of the macro body. This action aids the field forces to integrate the matter particles into a single composite macro body. With respect to a macro body, its linear and rotating motions are distinctly separate. Linear motion of a macro body can be modified only by an external linear force, applied evenly on the macro body and its rotary motion can be modified only by another torque (linear force applied unevenly). Although an external force may simultaneously invoke linear and rotary motion of a macro body, work invested in macro body's matter field is distinct for each of these motions. For linear motion, work is of linear nature and of even magnitude. For spin motion, work is of linear nature but varying in magnitude and direction about the centre of rotation. In macro body's steady state, each nature of distortions produces respective motions independently. Even at very high linear speed of a spinning macro body, the work corresponding to its spin motion remains latent within macro body's matter field and rotates the macro body about its centre. Transition period between one steady state to another is macro body's acceleration stage. During acceleration stage, external linear force (or torque) modifies the matter field distortions in the macro body. Reshaping of matter field latticework squares during this period, to modify one type of motion, take place without interfering with the other type of motion of the macro body. Change in linear speed does not affect the spin speed and a change in spin speed does not affect the linear speed of a macro body.

Tides are distortions induced by an external linear force (or torque) in the shape of a spinning macro body, moving or not moving in linear direction. Sources of the external force (or torque) or consistency of rotating macro body are immaterial. All forces are of push nature. Tides are produced by linear forces on rotating macro bodies or by rotating forces on linearly moving macro bodies. Both types of motions, linear and rotary motions, are involved. Otherwise, the external linear force simply produces linear acceleration of the macro body and external torque produces spin acceleration of the macro body. If a spinning body is under constant action of an external linear force, cross sectional planes (planes perpendicular to the spin axis) of the macro body will maintain their elliptical shapes. This makes the rotating body bulge outwards in both directions, towards and away from the direction of the incoming external linear force. Increase in the diameter of the rotating macro body (in cross sectional planes perpendicular to spin axis) due to the bulges in the direction of external linear force creates the phenomenon of 'tide'. In a macro body of uniform consistency, there is no displacement of body-particles other than that the curved path of each body-particle is modified to suite the present requirements. Body-particles are not attracted towards (or displaced in) any direction to create this phenomenon of tide. Similar action takes place also during the action of a torque on a macro body under linear motion. Once the accelerating stage is over, the macro body will settle down to its steady states in both linear and rotary motions. The tidal effects are no more.

Phenomenon of tide takes place only during accelerating stages of a macro body, either rotary or linear. Since this is not related to macro body's steady state of motions, each of the external forces acting on the macro body produces its own tides on the macro body, separately. According to current theories, two external forces, acting on a body, produce only one resultant motion of the body. Yet, in case of terrestrial tides, we come across two separate external forces acting on a rotating macro body to produce two sets of tides at different points on the macro body. This clearly contradicts any explanation of tide related to the displacement of parts of the macro body in the direction of external force. Further, the "Hypothesis on MATTER" does not recognize pull forces that acts through empty space to pull at parts of a rotating macro body to create tides.

No free body in space can remain static. They move, mostly in curved paths about some other body.

Let us consider a spherical spinning macro body in space, moving in a linear path. A particle on the equator of the body traces a circular path about the spin axis. Simultaneously, the particle is carried with the macro body in its linear motion. Circles in figure 5 show the representations of the equatorial plane of a spinning macro body, moving in linear direction. The macro body moves linearly in the direction of linear arrows while spinning in the direction of curved arrows. A 2D matter particle (plane section of a 3D matter particle) at 'A', on the equatorial surface of the macro body, is carried along the curved path GA'DFCAE. This particle has a constant angular speed, 'ω', about the spin axis of the macro body, over and above its linear speed. As shown, the angular speed is anticlockwise (+ ω).

Let a constant external force, 'f', shown by the block arrows, act on the macro body continuously. Directions of tides depend on the direction of the external force, 'f'. All particles in the macro body are affected identically. They are linearly accelerated/decelerated in the direction of the external force. Work, introduced by the external force in the matter field, has to accommodate itself within the work already existing in the macro body and producing macro body's linear and rotary motions. Newly introduced distortions modify the existing distortions during the accelerating stage. Since the external force is continuous, this modification is of constant magnitude. Part of the linear distortions, due to force 'f', (that attained stability) causes the particle to move (at constant speed) in the direction of external force and the distortions in transition-stage accelerates the particle. Component of linear acceleration (taken about the centre of rotation), aiding/opposing the tangential motion of a particle, acts to modify the angular displacement of the particle along the curved path. Direction of angular acceleration depends on the relative position of the particle about the centre of the curved path. Resultant angular speed of the particle

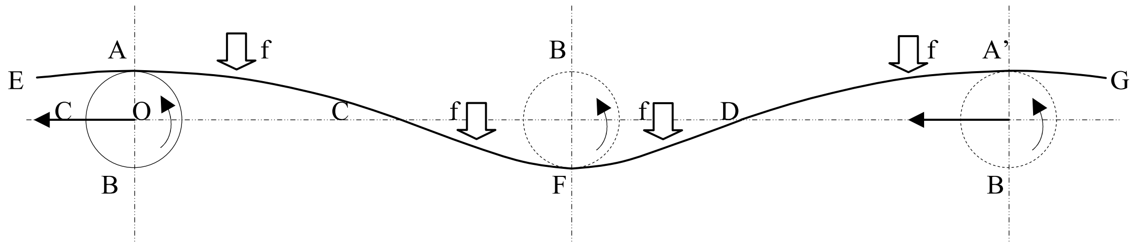

Figure 5

along the curved path is modified accordingly, without affecting particle's tangential speed.

With reference to the figure 5; consider a 2D matter particle situated at A';

From A' to D, the particle is on the left side of the centre of rotation and hence causes anticlockwise angular acceleration (+ α). Total angular speed of the particle in its curved path is increased. The particle tends to move towards the center of the curved path.

From D to F, the particle is on the right side of the centre or rotation and hence causes clockwise angular acceleration (− α). Total angular speed of the particle in its curved path is reduced. The particle tends to move away from the center of curved path.

From F to C, the particle is on the left side of the centre of rotation and hence causes anticlockwise angular acceleration (+ α). Total angular speed of the particle in its curved path is increased. The particle tends to move towards the center of curved path.

From C to A, the particle is on the right side of the centre of rotation and hence causes clockwise angular acceleration (− α). Total angular speed of the particle in its curved path is reduced. The particle tends to move away from the center of curved path.

Every particle in the macro body travels along similar paths. As a result, the macro body bulges outwards in both directions along the line of action of the external force. Macro body's equatorial plane changes its shape from a circle to an ellipse.

Figure 6 shows the transformation of the equatorial plane of a linearly moving spinning macro body, ACBDA, under the action of an external force, ‘f’, shown by the thick arrow, evenly applied on the whole of the macro body. Curved arrow shows the direction of spin of the macro body.

Spin speed of the macro body = ω rad/sec   Rotational time period of the macro body = T sec

Radius of the macro body = r meters   Tangential speed of the particle = v m/sec

Magnitude of external force = f kg-m/sec^2

Mass of a 2D particle of the macro body situated on its equatorial plane at D = one unit.

Linear acceleration of 2D particles in the macro body due to external force = a m/sec^2

Displacement of 2D particle in unit time = a/2 m   (displacement = $at^2/2$)

Additional angular speed of the particle in its curved path at D, ω_a = a/2r rad/sec (6)

Relative direction of external force with respect to the path of the particle changes as the particle moves along the curved path. Angular acceleration of the particle, produced by the external force, varies relative to direction of action of the force. Magnitude of angular acceleration is highest when the particle is at ‘D’ or at ‘C’ and it is lowest when the particle is at ‘A’ or at ‘B’. Magnitude of angular acceleration with respect to spin axis of the macro body varies in proportion to the cosine of the angular displacement from ‘D’. Therefore, the mean magnitude of angular acceleration in any quadrant is equal to 2/π times of the highest magnitude (produced at C or D).

$$\text{Mean magnitude of additional angular speed } \omega_{\text{a mean}} = \frac{a}{2r} \times \frac{2}{\pi} = \frac{a}{\pi r} \quad (7)$$

Additional angular speed attained by the particle during its travel from D to A

$$= \omega_{\text{a mean}} \times \text{time to move through one quadrant} = \frac{a}{\pi r} \times \frac{T}{4} = \frac{aT}{4\pi \times r} \quad (8)$$

From D to A, additional angular speed is in opposition to particle’s original angular speed.

From A to C, additional angular speed is in the direction of particle’s original angular speed.

From C to B, additional angular speed is in opposition to particle’s original angular speed.

From B to D, additional angular speed is in the direction to particle’s original angular speed.

$$\text{Resultant angular speed of the particle at A and B} = \omega - \text{additional angular speed} = \omega - \frac{aT}{4\pi \times r} \quad (9)$$

$$\text{Resultant angular speed of the particle at C and D} = \omega - \frac{aT}{4\pi \times r} + \frac{aT}{4\pi \times r} = \omega$$

Angular speeds of the particle are lowest at A and B.

Radii of circular path at A and B = Tangential speed ÷ resultant angular speed

$$= \frac{v}{\omega - \frac{aT}{4\pi \times r}} = \frac{4\pi \times rv}{4\pi \times r\omega - aT} = \frac{rv}{v - \frac{aT}{4\pi}} \quad (10)$$

Increase in the radii of curved path at A and B = Radius of circular path at A or B − Original radius

$$= \frac{rv}{v - \frac{aT}{4\pi}} - r = \frac{rv - rv + \frac{raT}{4\pi}}{v - \frac{aT}{4\pi}} = \frac{raT}{4\pi \times v - aT} \quad (11)$$

Increase in the length of diameter of the macro body, in the direction of external force, varies in proportion to the magnitude of action of the external force and to the tangential speed of matter particles (spin speed) of the macro body. Magnitude of external force being constant, higher rotational speed tend to increase the magnitudes of tides. Higher rotational speed increases the tangential speed of matter particles and reduces their rotational period. As the denominator of equation (10) approaches zero, magnitudes of tides increase considerably and may affect the integrity of a spinning body.

In figure 6, ACBDA in dotted red line is the original shape of the equatorial plane of the spinning macro body. Elliptical path (in dashed black line), D'A'C'B', shows the path of a surface particle. Changes in the circular paths of the constituent particles of the macro body (due to the action of linear force, f)

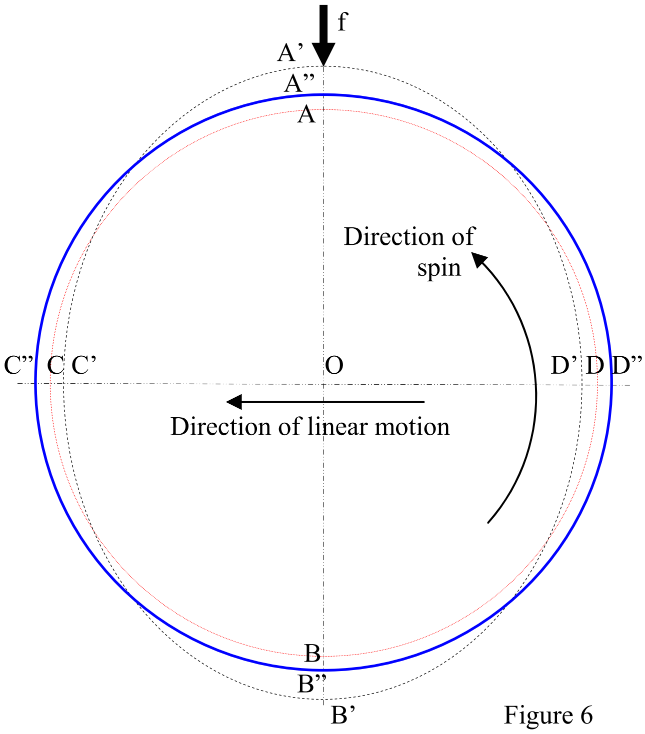

Figure 6

change the shape macro body's equatorial plane. Similar actions take place in all planes perpendicular to the spin axis. Spinning macro body elongates along the direction of action of the external linear force. Blue circle A"C"B"D"A" is the mean assumed shape of the body. A"A' and B"B' show the heights of high tides and CC' and DD' show the depth of low tides from the assumed mean equatorial surface of the macro body.

From the above explanation, it can be seen that the changes in the macro body's matter field change its shape in correspondence with the external force on the macro body. Magnitude of change depends on the magnitude of the external force. Change in shape of the macro body is simply due to the rearrangement of its matter field during acceleration period rather than any motion of the macro body or displacement of its parts. Paths of body-particles are rearranged by the matter field to reflect the modified shape. Hence, any number of forces acting on the macro body will introduce as many sets of distortions in the macro body as there are external forces. Even while the body is moving linearly, it is able to have tide effects simultaneously in many directions.

External force in 3D space system, producing the tidal effects on the spinning macro body, simultaneously acts in all the planes containing the line of its action. This external force is usually distributed in all the planes, in the direction of the force, passing through the whole area of the macro body. It is not a point force. Matter field distortion, causing its spin motion, is not present in the planes, which are not perpendicular to the direction of linear motion of the macro body. Hence, the external forces in these planes do not have imbalances in their actions to cause body-distortion of the macro body in other directions. External forces in these planes cause linear motion of the macro body in the directions of the forces, without tidal effects. Tidal effect of point forces on a spinning body is confined to local region around the line of application of the force through (on opposite sides of) the macro body. Such effects may appear as small bulges on the surface of the body, rather than as tides about the whole macro body.

Terrestrial tides:

Earth is a spinning macro body, moving linearly along its orbital path about the sun. Central force between the sun and the earth guides the earth along its curved orbital path. It is also under another central force from the orbiting moon. These two external forces are independent of each other. Central forces, from both the sun and the moon, due to apparent gravitational attraction act evenly and continuously on the earth to provide the external linear forces, acting on the spinning macro body of earth. Each of these forces, independently, transforms the shape of earth to increase its diameter along their directions of actions, each in its own direction. Since the centre of earth's orbital path is far out of its body, for the following calculations, small part of earth's orbital path is assumed to be a straight line. Hence, tides on both sides of earth are assumed to be of the same height. Small differences in their heights due to curvature of orbital path are ignored. Variations in parameters due to eccentricity or inclination of orbital paths are also not considered.

Taking the following parameters from the data books:

Radius of earth, r = 6378100 m Earth's rotational period, T = 86164.2 sec

Tangential speed of a particle on the surface of earth at the equator, v = 465.09785 m/sec

Gravitational constant in 3D space system, $G = 6.67259 \times 10^{-11}\ m^3/ kg\ sec^2$

Solar tides:

Taking the following parameters from data books:

Mass of the sun, $M = 1989100 \times 10^{24}$ Kg

Radius of the sun, R = 696000000 m

Distance between centers of earth and the sun = 147090000000 m

Distance between equatorial planes of the sun and the earth,

d = 147090000000 – 696000000 – 6378100 = 146387621900 m

Apparent gravitational attraction between equatorial plane of the sun and a 2D body of unit mass in the same plane at the surface of earth, (by equation (5):

$$F = \frac{3MG}{2dR^2} = 2.8074981701006873180145250705546 \times 10^{-9}\ kg\_m / sec^2$$

Linear acceleration of the particle, $a = F \div 1 = F = 2.8074981701006873180145250705546 \times 10^{-9}\ m/sec^2$

Increase in radii of earth towards or away from sun, H_{solar}, by equation (11) :

$$H_{solar} = \frac{raT}{4\pi \times v - aT} = 0.2639875756766571\ m$$

Lunar Tides:

Taking the following parameters from data books:

Mass of moon = 0.07349 × 10 24 Kg Radius of moon = 1738100 m

Distance between centers of earth and moon = 384400000 m

Distance between equatorial planes of earth and moon,

d = 384400000 − 6378100 − 1738100 = 376283800 m

Apparent gravitational attraction between equatorial plane of sun and a 2D body of unit mass in the same plane at the surface of earth, by equation (5)

$$F = \frac{3MG}{2dR^2} = 6.4706648554084731732072680052814 \times 10^{-9}\ kg\_m / sec^2$$

Linear acceleration of the particle, $a = F \div 1 = F = 6.4706648554084731732072680052814 \times 10^{-9}\ m/sec^2$

Increase in radii of earth towards or away from the moon, H_{lunar}, by equation (11)

$$H_{lunar} = \frac{raT}{4\pi \times v - aT} = 0.6084332444581 \text{ m}$$

For convenience, we regard earth as a spheroid or a sphere. All cross sections of earth, perpendicular to its spin axis, are considered as perfect circles. In order to account for the differences in diameters of earth's cross sections due to tides, length of earth's diameter is assumed to be of a mean length and a datum shape is set as a sphere. Water levels are then related to this datum. Mean radius of earth is determined as 6378100 meters.

Increase in diameter due to solar tides = $H_{solar} \times 2 = 0.52797515$ m

This is divided in to four parts to give two solar high tides and two solar low tides from the datum.

Increase in diameter ÷ 4 = 0.13199379 m

When measured from datum, solar tides give two high tides of heights 0.13199379 m each and two low tides of depths 0.13199379 m each.

Similarly, increase in diameter due to lunar tides = $H_{lunar} \times 2 = 1.21686649$ m

This is divided in to four parts to give two lunar high tides and two lunar low tides from the datum determined.

Increase in diameter ÷ 4 = 0.30421662 m

When measured from datum, lunar tides give two high tides of heights 0.30421662 m each and two low tides of depths 0.30421662 m each.

Comments:

Apparent attraction due to gravitation, calculated according to equations for 3D space system, is not valid for calculations in 2D space system. Calculations involving central forces in planetary system, calculated for 2D space system (as given above) shows that the central force between earth and moon is much higher than the central force between earth and sun. This accounts for greater lunar tide compared to solar tide on earth. Discrepancies in the values obtained in above calculations, if any, are due to insufficient accuracies of parameters used. Above given calculations are true for a body of earth's parameters and covered evenly with fluid matter. But, earth in its nature, has an uneven surface of land masses and oceans. Tidal effects felt by rigid land mass and fluid oceans are slightly different. Ocean water conforms to tidal effects freely, whereas the landmass does it reluctantly. This tends to create level differences. Gravitational actions due to earth's mass try to overcome the level differences and create superficial flow of water-bodies from one place to another, locally. However, there is no overall displacement of water bodies along with the tides. If water body was to move to create tides, there would have been a constant westward flow of ocean water (at least, in cases of bodies with no land masses to break the flow). Tendency of such flow is not observed on earth. When the earth as a whole is considered, it may appear that the crests and troughs of a large-scale traveling wave system, comprising the tides, strives to sweep continuously around the earth, following the relative position of the moon (and the sun). This is mere appearance due to the motion of the observer in the opposite direction. While the earth spins, its shape remains steady in space. An observer, static with respect to earth's surface, moves through high and low tide regions in easterly direction and experience the feeling of tides traversing him in opposite direction. Changes, the observer experiences, are not caused by lateral displacement of the water body but due to vertical changes in the shape of the planet. As there is no flow of ocean water from one part of earth to another, laws of fluid dynamics do not apply to tides. Since there is no relative linear motion between the water body and the land mass at the ocean floor, there is no frictional effect at the ocean floor. The assumption that the earth's spin speed slows down due to such friction is baseless. In fact, earth's orbital motion has an accelerating effect on its spin motion [2]. All natural phenomena, which cause temporary rise or fall of water level in the ocean cannot be interpreted as tidal effects. Tides are the rise and fall of a point on the surface of a spinning macro body, with respect to a datum, in the direction of or away from an external (linear or spin) force acting on it.

Since the tides are formed due to acceleration of the spinning body, rather than due to change of its state (change in speed), no work is expended for their creation. Only the shape of the body is changed.

Mere (temporary) changes in shape or direction of motion do not constitute work. To change the shape of the body, original work existing within the body is re-deployed during the process of investment of work (acceleration) by the external force. No energy is used from any source to produce tidal effects on a spinning body and hence, tidal effects cannot do any work. Energy from other sources (like gravity, during changes in levels of water bodies) may be derived to do other works during tides. Work invested by external force in a planetary body is used solely to change the state of the body by modifying its linear or spin speeds in its orbital path. Central force on a planet produces the orbital motion and spin motion of the planet. Action-stage (acceleration period) of the central force causes the tide. Since the tides are not changes in the state of a body, they do not consume work.

Effects due to eccentricity of orbital paths, inclination of orbital planes, topography on the ocean floor, flow of water into confining channels or nearly closed oceanic basins, dynamic considerations during local flow of water due to level difference and contiguous current in the oceans are not taken into account, here. All of the above (and other less important influences) can combine to create a considerable variety (many times) in the observed magnitudes and phase sequence of the tides - as well as variations in the times of their arrival at any location. Of a more local and sporadic nature, important meteorological contributions to the tides know as "storm surges", caused by a continuous strong flow of winds either onshore or offshore, may superimpose their effects upon normal tidal actions to cause variations in the magnitudes of tides. High-pressure atmospheric systems may depress the tides and deep low-pressure systems may cause them to increase in height. Higher inclination of lunar orbit makes large variety between tides at the equatorial region and higher latitudes.

Direction of tides:

Magnitude of angular shift from local meridian:

It is observed that zenith points of tides on earth do not coincide with the local meridian where the sun or moon is present. This is usually attributed to friction between water and land masses of earth. This is not so. Even if the planet is wholly fluid, this change in the direction of tides will appear. Change in the direction of tides is caused by the fact that the direction of action of a force need not always be wholly in the direction of its application, as explained above in the paragraph on ‘action of a rotating force’. Changes in the direction of tides are local phenomenon related only to the parameters of the spinning body. Hence, magnitudes or sources of external forces or the parameters of the ‘source bodies’ do not affect the changes in the apparent deflections of tides.

We shall take the absolute linear speed of the sun is equal to 250000 m/sec. Accordingly, depending upon the position of earth on its orbital path with respect to the sun, earth’s absolute linear speed vary between 220000 m/sec and 280000 m/sec. This will make corresponding changes in the magnitude of angular shift of the zenith point of the tide from the local meridian. Angular shift of the tidal zenith point on earth depends only on the parameters of earth. Hence, irrespective of the source of external force acting on the earth, all terrestrial tides will be shifted identically. [External forces on earth are applied by the 2D energy fields in the direction of (central) bodies, which provide the shadow in the 2D energy field for the development of the apparent attraction due to gravitation. The sun or moon do not directly apply any force on the earth, instead, they cause the central forces on earth being applied by the 2D energy fields]. Magnitudes of deflection depend on earth’s location on its orbital path. Differences due to change of earth’s location in its orbit is not considered in the calculation below.

From equation (2);

$$\text{Deflection of tides from the local meridian} = \frac{\frac{\pi}{4} - \text{Tan}^{-1}\left\{1 - \frac{(V+v)\left(1-\text{Tan}\left(\pi/4 - 2\omega\right)\right)}{v}\right\}}{2} \qquad (2)$$

Putting;

V = Average absolute linear speed of earth = 250000 m/sec

v = Tangential speed of a particle on earth’s equator = 465.097851 m/sec

ω = Angular speed of earth's rotation = 7.29210659088 × 10^{-5} rad / sec

Putting these values in equation (2), deflection of terrestrial tides from local meridian = 2.76°

Zenith points of terrestrial tides are shifted from local meridian (facing the central body) at any point on earth's equator by an angle of 2.76°. Since the shift is a function of earth's parameters, magnitude of shift is identical for both lunar and solar tides. This value is with respect to earth's centre of rotation. An observer on earth views the tides with respect to earth. The observer is also moving with the earth at its absolute linear speed. Hence, displacement of tide from the local meridian with respect to earth's spin axis is also of the same magnitude.

Magnitude of tidal deflection is related to the absolute linear speed of the planet and the relative direction of the central force to the direction of planet's absolute linear motion. All bodies in the solar system move with average linear speeds equal to the sun's linear speed in its orbital path about the centre of galaxy. Linear speed of the galaxy, if any, is not accounted in the above calculation. Linear speed of the sun, in its orbital path, is taken as earth's average absolute linear speed. Any discrepancy in the value of angular deflection of tides, calculated above and corrected for angular deflection of earth's orbit, as shown below, from the observed magnitude is due to the discrepancy in earth's absolute speed, taken for the calculation. If the deflection of tides from local meridian in a place (of uniform ocean depth and far away from land masses) can be accurately measured, absolute speed of earth in space can be determined.

Direction of angular shift from local meridian:

In figure 7, rectangles in red dashed lines, 'A' and 'C', represent distorted matter field squares at the local meridian in a linearly moving spinning body. Since the body has only one combined motion (linear motion along a curved path about the centre of rotation of the body) shown by the thick curved arrow, all matter field squares in the body are, more or less, distorted identically. Shorter arrows represent two sets of external linear forces, applied on the body in two directions, upward and downward. Other two matter field squares, 'B' and 'D', displaced from the local meridians, 'D' displaced in the same direction of body's spin motion from 'C' and 'B' displaced in opposite direction to body's spin motion from 'A'. Central force, acting on a planet, is towards the central body. Matter fields-distortions need not be symmetrical about the direction of the external force. Maximum tides occur at the point where the distortions are symmetrical about the direction of external force. At these points, arms of the matter field latticework squares are symmetrical about the line of action of the external force. Therefore, an observer standing on a planet sees the tide; either leads or lags the local meridian. This is mere appearance. Zenith points of tides always take place, where matter field squares are symmetrical about the line of external force. When the observer is on the line, joining centers of planet and the central body, matter field squares of local meridian are not symmetrical with the line of central force. Matter field squares become symmetrical about the line of force only when the observer is away from the meridian facing the central body. This is seen by the observer as an angular shift in the place of occurrence of tide from the local meridian occupied by him and facing (or directly opposite) the corresponding central body.

Let us consider the action of downward external force on the matter field square 'A'. At its position at 'A', action of external force is asymmetrical on its arms. Matter particles in contact with this matter field square experience anti-clockwise deflection in addition to downward linear motion. Maximum tidal effect occurs where no part of the external force is used for angular deflection of particles' paths. Since the external force is not fully effective at 'A' in downward direction, high tide cannot occur at this position (local meridian). As the body rotates, observer at 'A' is carried forward. After some time, matter field square situated at 'B' comes to occupy

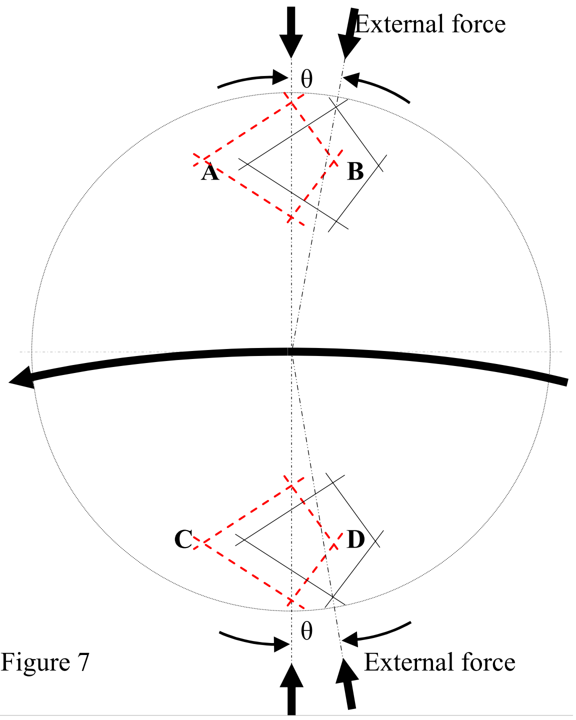

Figure 7

position in line with the external force. This is shown in the figure by a shift in the direction of external force. Here, the arms of matter field square ‘B’ are symmetrical about the direction of external force. Whole of the external force acts along its direction of its application. No part of the force is used to deflect matter particles angularly. Hence, the high tide occurs at this point. By the time matter field-square ‘B’ comes in line with the external force, local meridian of the observer has moved ahead in the direction of spin of the body. Therefore, the observer notices that the high tide lags behind the local meridian occupied by him, when the external force is applied towards the centre of resultant motion (curved mean path) of the spinning body.

Consider action of external force in the opposite direction, away from the centre of resultant motion (curved mean path) of the body. At local meridian occupied by the observer, as shown by matter field square ‘C’, its arms are asymmetrical to the external force. Hence, the high tide cannot occur at this point. Matter field square at position ‘D’ has its arms symmetrical about the external force. Tide is highest when the meridian at position ‘D’ is facing the central body. Local meridian, occupied by the observer, is behind the meridian, where high tide takes place. To the observer the tides appear to lead the local meridian (where the central body appears to him) when the external force is applied in the direction away from the centre of resultant motion (curved mean path) of the spinning body.

Figure 8 shows the orbital path, GA’CBDAE, of earth about the sun’s path, X”X. Thick arrow T_1R_1 shows the resultant direction of earth’s motion (linear motion + spin motion). Block arrows show the direction of central force between earth and the sun. Central force on a planet is a push force, applied from the side away from the central body towards the central body. Small circles show earth’s spin direction and arrows across the circles shows the direction of solar tides with respect to local meridian in each quarter of the orbital path. Arrows, along X”X, in dotted line show the direction of earth’s mean absolute linear motion with respect to sun’s path. In real sense, deflection of solar tides with respect to meridian is always as shown in this figure and as explained above. In positions ‘P’ and ‘R’, solar tides are deflected westward from local meridian and in positions ‘S’ and ‘T’, solar tides are deflected eastward from local meridian. Directions of lunar tides are also similar. In case of lunar tides, the earth moves in the linear path X”X and the moon moves along the orbital path GA’CBDAE. Relative directions of central force on earth reverse. Therefore, in positions ‘P’ and ‘R’, lunar tides are deflected eastward from local meridian and in positions ‘S’ and ‘T’, lunar tides are deflected westward from local meridian. (Deflections of lunar tides are not shown in the figure).

During the half-yearly period when the earth is nearer to the outer datum point in its orbit (it is outside its median path − with respect to sun) the earth is farther than the sun from the centre of sun’s curved path. The central force is applied from the side away from the sun towards the centre of earth’s combined motion. [Central force is a push-force applied on earth’s farther side towards the sun]. During this six month period, solar tides tend to lag behind the local meridian of the observer. Tides will appear to the west of local meridian (they appear earlier than the sun itself reaches the local meridian).

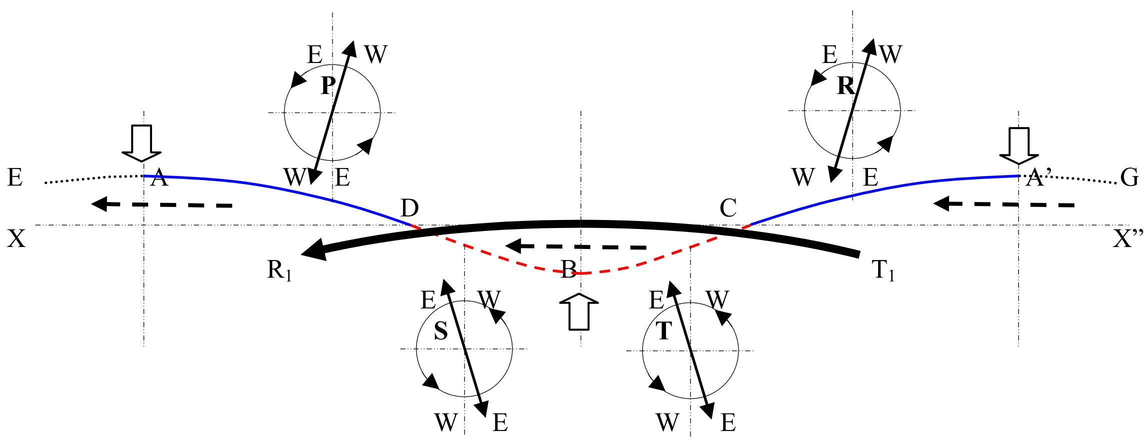

Figure 8

During the half-yearly period when the earth is nearer to its inner datum point in the orbit (it is inside its median path − with respect to sun) the earth is nearer to the centre of sun’s path. During this time the central force is applied away from the centre of earth’s resultant motion. [Central force is a push-force applied on earth’s farther side towards the sun]. During this six month period, terrestrial tides tend to lead the local meridian of the observer. Tides will appear to the east of local meridian (they appear later than the sun itself has crossed the local meridian).

During the half-monthly period when the moon is near the inner datum point in its orbit about the earth (it is within earth’s orbital path − with respect to earth) the moon is nearer to the centre of earth’s combined motion. The central force on earth is applied towards the centre of earth’s combined motion. [Central force is a push-force applied on earth’s side away from the moon towards the moon]. During this half-monthly period, lunar tides tend to lag behind the local meridian. Tides will appear to the west of local meridian of the observer (they appear earlier than the sun itself reaches the local meridian).

During the half-monthly period when the moon is near the outer datum point in its orbit about the earth (it is outside earth’s orbital path − with respect to earth) the moon is farther from the centre of earth’s combined motion. The central force is applied in a direction away from the centre of earth’s combined motion. [Central force is a push-force applied on earth’s side away from the moon towards the moon]. During this half-monthly period, lunar tides tend to lead the local meridian. Tides will appear to the east of local meridian of the observer (they appear later than the moon itself has crossed the local meridian).

If there are more than one central force acting on a planet, each force produces its own set of tides, independently. If the directions of these tides are near, they will create resultant tides which are arithmetical sum of independent tides on the body. This summation gives rise to ‘spring tides’ and ‘neap tides’ on earth. The effect is the greatest when the Moon and Sun are in a straight line with the Earth (called "syzygy"), which occurs during Lunar and a Solar Eclipses (Full Moon and New Moon), while both the sun and moon are on the same side of earth’s orbital path. To an observer of earth, earth’s orbital path does not appear as a wavy line but it is observed as circular/elliptical path around the central body. This appearance (different from real condition) changes the directions how the tides appear to an observer.

Apparent direction of Solar tides:

An observer on earth judges the orbital motion of the earth about the sun as he sees it. Originally, in early times in history, the sun appeared to move around the earth in westerly direction. This notion was later changed to the motion of the earth around the sun in easterly direction. Although, no free body can orbit around another moving body, the notion of earth orbiting around the sun in easterly direction is still maintained. This incorrect belief is the cause of many misunderstandings in celestial mechanism [3]. In order to satisfy this belief, we arbitrarily change directions of certain motions.

In the figure 9, X”X shows small part of sun’s curved path. Earth’s orbital path is shown by wavy line

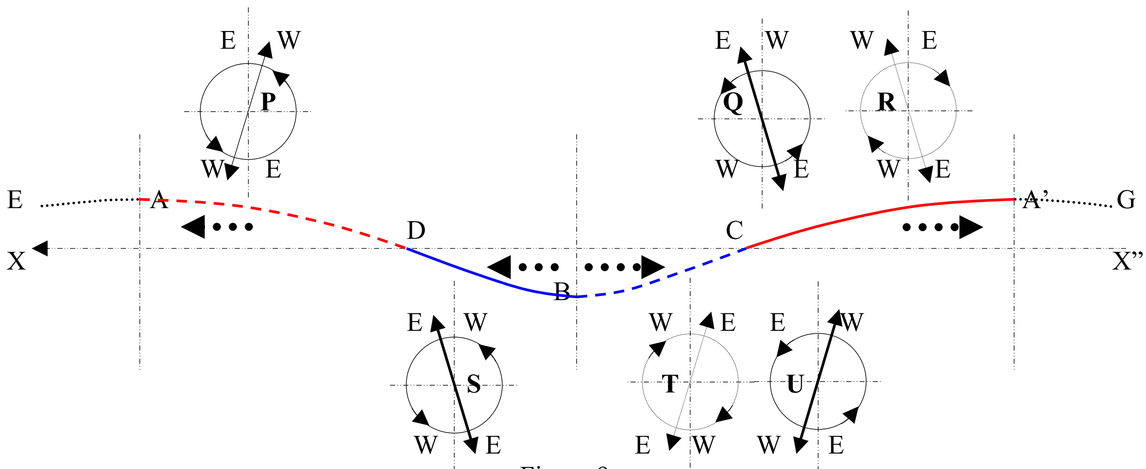

Figure 9

GA’CBDAE. ‘A’ and A’ are outer datum points (points in the orbital path, where absolute linear speed of earth is highest) and ‘B’ is the inner datum point (points in the orbital path, where absolute linear speed of earth is lowest). For the time being, it is assumed that the central force acting on earth is always (nearly) perpendicular to its orbital path. Relative directions of linear motion of earth with respect to sun are shown by arrows in dotted lines. As the earth moves in its orbital path, from ‘B’ to ‘A’, it is behind the sun. Central force between the two accelerates the earth in forward direction towards ‘X’. Relative direction of earth’s linear motion is in the same direction as that of the sun. Directions of earth’s spin and the deflection of tide from local meridian, as shown by ‘P’ and ‘S’, are same as derived above. During earth’s travel from ‘D’ to ‘A’, solar tides are deflected westward from local meridian and during earth’s travel from ‘B’ to ‘D’, solar tides are deflected eastward from local meridian.

North-south directions in space are oriented with respect to earth’s spin axis and this orientation is considered true throughout the space. Unlike north-south directions, east-west directions have no definite orientation in space. These are indicated by the direction of motion of a surface-particle on earth. Since the earth has a spin motion, relative to space, east-west directions depend on the location of surface point on earth.

From A’ to B, in figure 9, earth is in front of sun and hence it is retarded in its linear motion. Sun appears to advance towards ‘X’ while earth appears to move (relatively) in the opposite direction, shown by arrows in dotted line. This assumption is able to change the shape of orbit from a wavy line to an elliptical path around the sun. By this consideration, earth appears to move from B to A’. Earth’s motions are reversed by the supposition as shown by ‘T’ and ‘R’. By doing so, not only earth’s linear motion but its spin motion is also reversed. Change in the spin direction is against what is observed. Here, again, we resort to one more change (Or undo part of the change of direction attempted earlier). East-west directions are changed back to suit the observation, related to earth’s spin motion. This is shown in ‘Q’ and ‘U’. By doing so; in ‘Q’, relative direction of solar tides have changed easterly and in ‘U’, relative direction of solar tides have changed westerly with respect to local meridians. Although the reality is different, this is what we observe and believe to be true.

Summarizing the above points;

From (A’) to (C), solar high tides occur before the sun itself reaches the local meridian of the place. Solar tides are deflected in easterly direction as shown in ‘Q’.

From (C) to (B), solar high tides occur after the sun itself crossed the local meridian of the place. Solar tides are deflected in westerly direction as shown in ‘U’.

From (B) to (D), solar high tides occur before the sun itself reaches the local meridian of the place. Solar tides are deflected in easterly direction as shown in ‘S’.

From (D) to (A), solar high tides occur after the sun itself crossed the local meridian of the place. Solar tides are deflected in westerly direction as shown in ‘P’.

High tides on the opposite side of earth also appear correspondingly.

Apparent direction of lunar tides:

Figure 10 shows the relative orbital motion of moon with respect to earth when earth is at outer datum point in its orbital path. Moon travels in the wavy path, GA’CBDAE, while the earth moves along X”X in its curved orbital path about the sun. To an observer on earth, the moon appears to move around the earth. Earth’s motion relative to the moon appears in directions as indicated by dotted arrows. From A’ (full moon) to ‘B’ (new moon), the moon is in front of earth and the earth accelerates due to the central force in the direction of moon’s motion. Earth appears to move towards the moon which is in front. Both bodies appear to move in the same direction. Directions of deflections of the tides are as explained above, with respect to figure 8.

Between ‘B’ (new moon) and ‘A’ (full moon), the moon is behind the earth and the earth is decelerated due to the central force in opposite direction to moon’s motion. Earth appears to move towards the moon (in opposite direction to moon’s motion), which is behind the earth. They appear to move in opposite directions. This appearance creates the apparent orbital motion of moon around earth. Directions of earth’s real motions are reversed to suit observation as shown by circles, ‘T’ and ‘R’, in dotted lines. Further, direction of earth’s spin motion is reversed to suit the observation as shown in circles ‘P’ and ‘S’. Resulting appearances of deflections of lunar tides are shown by arrows across circles ‘P’, ‘S’, ‘U’ and ‘Q’.

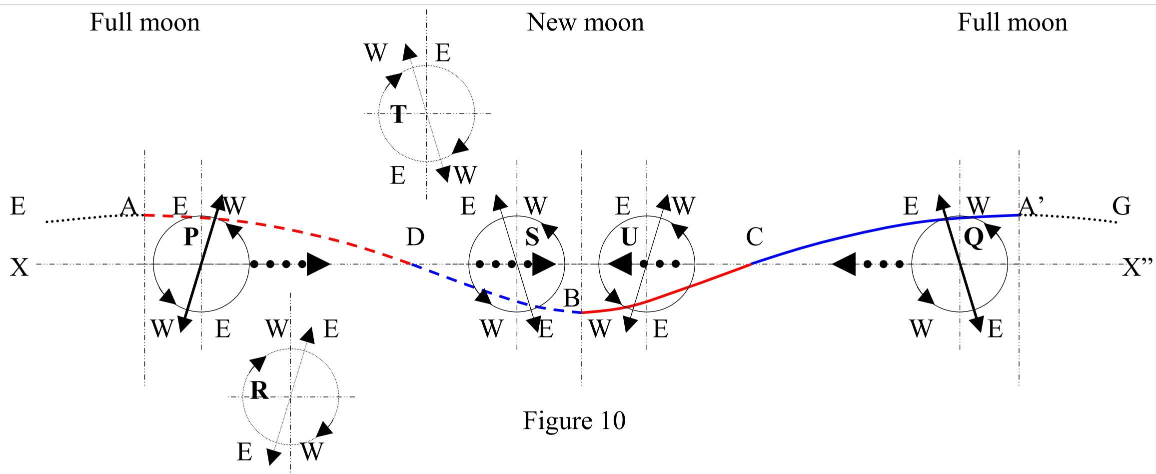

Figure 10

Summarizing the above;

Between new moon (B) and first-quarter phase (D), lunar high tides occur before the moon itself reaches the local meridian of the place. Lunar tides are deflected in easterly direction as shown in 'S'.

Between first-quarter phase (D) and full moon (A), lunar high tides occur after the moon has reached the local meridian of the place. Lunar tides are deflected in westerly direction as shown in 'P'.

Between full moon (A') and third-quarter phase (C), lunar high tides occur before the moon itself reaches the local meridian of the place. Lunar tides are deflected in easterly direction as shown in 'Q'.

Between third-quarter (C) phase and new moon (B), lunar high tides occur after the moon has reached the local meridian of the place. Lunar tides are deflected in westerly direction as shown in 'U'.

Effect of orbital motion on deflections of tides:

Magnitudes and directions of shift of tides as explained above are satisfied only when the central force is perpendicular to earth's orbital path. This can be so only under the condition that earth's orbital path is circular around the sun. From the above figures, it can be seen that earth's orbital path zigzags about sun's path and the direction of central force with respect to orbital path changes through a full circle during every orbital period. Central force is perpendicular to the orbital path only at two points (at outer and inner datum points) in an orbit. At all other points in the orbit, angles between orbital path and the central force vary between 0° and 90°.

Direction of earth's path deflects to a maximum of about 6° from its median path, on either side. Earth's median path happens to be the sun's curved path. Earth's matter field squares deflect through a maximum of 6° on either side about median path. Deflection in earth's matter field squares due to its orbital motion enhances deflection of high tides from local meridian occupied by an observer. Accordingly, depending upon the location of earth in its orbit, deflection of solar high tides from local meridian of an observer increases up to about 8.76°, where angular deflection of orbital path from median path is highest (At the point where earth crosses sun's path in space). At this point, only one-third of deflection is caused by the matter field of the earth and the rest is caused by curvature of earth's orbital path. Magnitudes and directions of shift of lunar tides also vary between a minimum to a maximum, during one solar year. Magnitude of angular shift of lunar tides varies from one lunar month to another lunar month, completing one cycle in one solar year. Magnitude of deflection of terrestrial tides varies within an angular sector of about 17.52°. Magnitude of deflection, at any time, depends on the locations of earth and moon in their respective orbital paths.

Conclusion:

Tidal effects on a spinning macro body take place separately in each plane, perpendicular to its spin axis. Acceleration (linear or rotational) due to an external source causes tides on a spinning macro body. Change in the shape of the macro body causes the tide on it. There are neither displacements of body-parts or flow of ocean water during tidal formation. Superficial flow of ocean water during tides is caused by effective level differences of earth's surface due to presence of land masses and their distribution. Since there is no relative motion between earth's core and ocean water, tidal drag on earth's solid body is a fallacy. Absolute linear motion of a spinning body produces angular shift of tides from local meridian, facing the central bodies. Directions of apparent shift of tides do not conform to their real deflections. Curvature of earth's orbital path about sun's median curved path has greater effect on displacement of tide from local meridian than earth's absolute linear speed. Phenomenon of tides on planets should be interpreted on facts rather than on their appearances.

References:

[1] Nainan K. Varghese, *Hypothesis on MATTER* (second edition), (2008). http://www.booksurge.com/Hypothesis-on-MATTER-Second-Edition/A/1419689789.htm

[2] Nainan. K. Varghese, ARTICLES, http://wbabin.net/papers.htm#Varghese

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