TIDES

(According to "*Hypothesis on* MATTER")

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Abstract: Present explanations on 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 effort. Explanations, based on actions by an imaginary effort, cannot be factually correct. One of the fundamental assumptions used to derive the equation for gravitational attraction is that whole matter content (mass) of each body is concentrated at its centre. This makes it illogical to assume that different parts of same body have different magnitudes of gravitational attraction towards another body. Therefore, explanations on tides, based on differences in gravitational attractions on different parts of bodies, are perversions of present theory on gravitational attraction. Apparent orbital motion of a body about epicentre of a system is also used in some explanations. In nature, no free body can orbit around another moving body [3] in geometrically closed path. Orbital path of earth about the sun (or that of moon about earth) is not circular or elliptical around a central body but it zigzags about sun's (earth's) median path in space. Hence, an explanation based on revolution of earth around an epicentre is pure imagination. According to current rules of dynamics, more than one external linear effort on a rigid body can produce only one resultant linear motion. Yet, earth experiences distinctly separate sets of tides from central forces towards moon and sun. Only logical reason for lunar tides to be greater than solar tides is that the central force between earth and moon is greater than that between earth and sun. This cannot be substantiated by current gravitational laws.

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 efforts on a linearly moving spinning-body. Each external effort alters shape of the spinning body, separately, to produce its own set of 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 zenith points of tides from local meridians facing the sun (or moon) and on opposite side. Orbital motion of a spinning body enhances deflection of tides from local meridian. Displacement of ocean water in the direction of moving tide is superficial and it cannot produce tidal drag on earth's solid core body.

Keywords: Rotation, tides, tidal mechanism, solar system, celestial mechanism, apparent orbits, Hypothesis on MATTER.

Introduction:

'Hypothesis on MATTER' describes an alternative concept. In it**:** a three-dimensional body's matter content and the energy about it are distinctly separate. Matter content is the total sum of three-dimensional matter particles in the body. Energy is the stress developed due to 'distortions' in natural arrangements of basic 3D matter particles in and about a body, constituting an all-encompassing 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 quanta of matter. 2D energy fields, in various directions and planes, passing through a point, co-exist. Universal medium is formed by quanta of matter, arranging themselves as the sides of continuous rectangles in a plane. Each section with four quanta of matter as its sides is called a latticework square. Although, 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 spatial dimensions of a macro body, contain sufficient distortions to sustain macro body's integrity and stability in its current states. This part of 2D energy fields is 'matter field' of the macro body. Distortions in a matter field are 'work' about a macro body and it determines the state of the body. Force is the rate of work being stored about a macro body, with respect to body's acceleration in space due to invested work. Action of an inertial effort (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 work (energy stored) in its matter field rather than on magnitude of effort applied on it. All apparent interactions between 3D 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 efforts, classified into various types of natural forces, are different manifestations of 'only one type of effort' and it is of 'push nature'. Work (distortions in 2D energy fields) is transmitted only in straight lines and separately in each plane. Efforts in different planes do not form a resultant. Efforts in 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 macro body, produced by external efforts 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 serenity, does not allow static distortions in it. Transfer of distortions in the matter field of a macro body carries body's 3D matter particles and thus produces its motion. This inertial action of 2D energy fields about a body maintains body's state of motion at constant velocity. A change in inertial actions about a body produces its acceleration. If certain work is invested into matter field of a body, the body will attain stable state only after an inertial delay, during which time, work within its matter field distributes and attain stable state of transfer. This is true even after the application of effort is terminated. Matter is inert; it has no ability to move or act. Associated matter field-distortions produce all apparent actions presently assigned to matter bodies.

Presence of 3D matter particles breaks continuity of a 2D energy field in its plane. That is, 2D energy field does not extend into 3D matter particles but remain outside and touch their perimeters. This helps to maintain 3D matter particles' shape, size and matter density. Matter field-distortions about a macro body, in its steady state, are distributed within body's spatial dimensions. As distortions in a matter field are transferred, it carries body's 3D 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 effort on a macro body invests additional distortions (work) into its matter field. These distortions are distributed in macro body's matter field during inertial delay. When such distribution is completed, after the cessation of external effort, the macro body reaches a steady state (of motion). During accelerating stage, existing distortions in matter field are modified and change in macro body's shape and state of motion, with respect to its position in space (or steady state of motion), is exhibited as its acceleration.

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

This article deals with 3D macro bodies. Hence, in order to describe actions in 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 '*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 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 (of motion) 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 2D energy field. They may be understood as resultant shape of all matter field-distortions about the macro body, with respect to the actions considered. Orientations of the matter field squares, used in figures, are chosen to reflect 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 effort:

For mechanism of an external effort's action on a macro body, kindly refer to [1]. Inertial efforts (forces which invoke phenomenon of inertia about a body) can act only in straight lines and within the plane of their application. Uneven action of a linear effort about centre of mass in a macro body produces a couple of effort and macro body's resulting rotary motion, in addition to any linear motion. Rotating motion of a macro body is nothing but sum of linear motions of its 3D matter particles, moving at different linear speeds (and in different directions) about a centre point. With respect to a radial line of the macro body, linear speeds of macro body's matter particles increase in proportion to their distances from centre of rotation. Transfer of distortions in matter field latticework at unequal linear speeds move 3D matter particles in the region at corresponding linear speeds. With respect to rotary motion of a static macro body, (linear) matter field distortions producing macro body's rotary motion remain steady in space and the macro 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 3D matter particles in that region do not move. 3D matter particles, whose distances from the centre of rotation are in opposite directions, move in opposite linear directions.

Figure 1 shows representations of three matter field (latticework) squares 'A', 'B' and 'C' of a (rotating) macro body, in a radial line. Thin blue lines show their original shape, when the body has no motion at all. [Distortions, maintaining steady state of rest and integrity of macro body are ignored]. Latticework squares 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 latticework squares are symmetrical about a reference line (vertical centre line, YY, shown passing through the centers of the squares). Let us consider an external effort, acting along macro body's radial line, YY, and towards its centre. Due to symmetry of matter field-latticework squares A, B and C effort acting along reference line, YY, is evenly distributed through arms of the latticework squares and resultant action of the effort is linear along the reference line, YY. This external effort tends to move the macro body in the direction of the external effort.

Let us consider another linear effort, 'f', acting on static macro body, away from its centre of mass and in a direction perpendicular to the reference line, YY, as shown in figure 1 by small arrow, f. Due to integrity of macro body, applied external effort will gradually distribute invested work about the point of its application. Work, invested in body's matter field at various points will be proportional to its distance

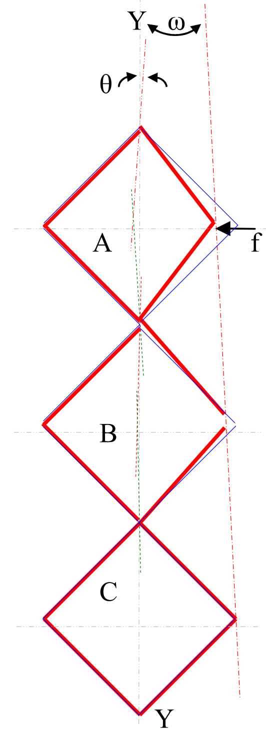

Figure 1

from body's centre of rotation. Work is in the form of distortions of matter field-latticework squares. Average distortions of matter field-latticework squares are shown by the thick (red) lines. Matter field-latticework square 'C', being at body's centre of rotation, is not affected by the effort. Due to integrity of the macro body, distortion in matter field-latticework square 'B' achieves magnitude corresponding to its location, away from the centre of body. As the location of matter field-latticework squares approach body's perimeter, magnitude of distortion in them approach highest value, corresponding to effort, f. Speeds of transfers of distortions in the matter field are proportional to their magnitudes. Outer most matter field-latticework square will transfer distortion fastest and speed of transfer in other latticework squares will gradually diminish as their location nears body's centre of rotation. Constituent 3D matter particles of macro body are carried along with moving distortions. 3D matter particles near perimeter of the macro body will have highest tangential linear speed and linear speeds of 3D matter particles nearer to body's centre of rotation are lower. Due to different linear speeds of 3D matter particles, macro body as a whole rotates about its centre of rotation. Distortions in matter field-latticework squares of the rotating macro body create asymmetry in the arrangement of arms of latticework squares with respect to reference radial line YY. Magnitude of this asymmetry is proportional to angular speed of rotating macro body. Angular deflection due to asymmetry is shown in figure 1 as the angle 'ω'. Angle ω is proportional to angular speed of the rotating macro body. When effort is withdrawn, macro body will attain steady state of rotation after inertial period, with steady distortions in all its matter field-latticework squares. Macro body will maintain this state of rotation until another torque is applied to modify its angular speed.

Every matter particle in the macro body moves at constant angular speed ω. In order to facilitate this, matter particles at different locations in the macro body needs different linear displacement (in unit time) along their curved paths. Speed of linear displacement of a 3D matter particle is proportional to average latticework distortions in surrounding matter field. Magnitudes of distortions in matter field-latticework squares, in different locations in a rotating macro body, are different and depend on their locations relative to centre of rotation of the macro body. Matter field-latticework squares nearer to macro body's periphery will have greater distortions and matter field-latticework squares towards centre of rotation will have lesser distortions. Angle θ, in figure 1, shows magnitude of distortion in matter field-latticework square, A, in the macro body, considered. Line of symmetry between upper arms of matter field-latticework square A is deflected from reference line YY by an angle θ. Magnitude of this deflection varies and depends on the location of matter field-latticework square in the macro body.

Let an external effort act on a rotating macro body along radial line YY, as shown in figure 1. Due to asymmetry of arms of matter field-latticework squares (shown by thick red lines), magnitude of action of external effort through each arm of latticework square is different. Each arm has different angular deflection from reference line, YY. Action of the effort along the reference line, YY, towards the centre of rotation is no more in balance. With respect to reference line, YY, action in each arm produce different couples. Equal magnitudes of couples on either side add together to produce resultant linear effort to be transmitted further. Unequal part of a couple through one arm produces angular deflection to turn matter field-latticework square (whole of macro body) and the other part imparts linear motion to macro body. Resultant direction of action of the effort is deflected from direction of its application by an angle whose magnitude is equal to the angular speed of the rotation. After inertial period, the macro body will settle down to a 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 magnitudes and transfer speeds while matter field distortions on the opposite side of centre of rotation lose their magnitudes and transfer speeds. Location of matter field-latticework 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.

Figure 2 shows representation of three matter field-latticework squares, A, B and C, situated at different locations in a spinning macro body, along a radial line on one side of centre of rotation of the macro body and perpendicular to direction of action of an external effort, F. Matter field-latticework square A is situated near macro body's periphery, matter field-latticework square C is situated near centre of macro body's rotation and matter field-latticework square B is situated somewhere in the middle. Thin red lines represent matter field-latticework squares with sufficient distortions to sustain macro body's spin motion at constant angular speed, ω.

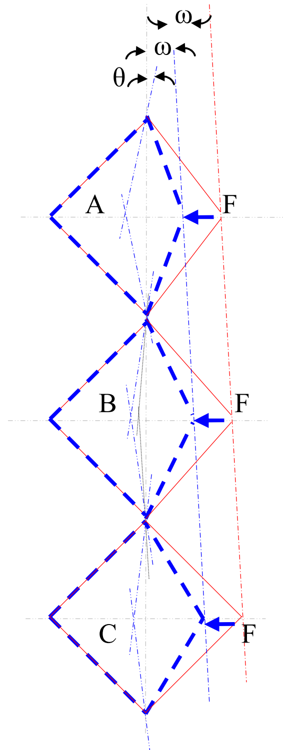

Figure 2

Squares in thin lines (red) show the distortions causing steady rotary motion of the body. Let another external effort 'F', as shown in figure 2, act evenly on the macro body, which is in steady state of rotation at an angular speed ω. All matter field-latticework squares in the macro body are distorted identically by external effort, as shown by small arrows, F. Additional linear motion of the macro body, produced by effort 'F', has its own linear distortions in the matter field. These additional distortions are shown by matter field-latticework squares shown in dashed (blue) lines. Angular deflection between radial reference line and line joining right corners of matter field-latticework squares dies not change by action of external effort, F. External effort, F, acting evenly on the macro body does not alter macro body's rotary speed. Matter field-latticework squares on the opposite side of centre of rotation of macro body are also distorted in similar fashion. Since whole of the matter field is distorted identically, the macro body gains and maintains linear motion without affecting angular speed of its rotary motion, which remains steady at magnitude of ω. and let the macro body attain a steady state of linear motion in addition to its spin motion.

However, asymmetry of arms of the matter field squares, 'θ', is affected. As shown in matter field-latticework square, A, angular deflection θ between median line between arms of latticework square and reference radial line, YY, is amplified in proportion to linear speed gained by macro body. Correspondingly, angular deflection of matter field distortions in each latticework square from reference radial line, YY, is enhanced in proportion to linear speed, gained by the macro body. Change in asymmetry of arms of latticework square is bound to affect actions of external linear effort along radial reference line (as explained above). Magnitude of variation in the action of external effort (along radial line passing through centres of latticework squares) depends on the magnitude of macro body's linear speed. Action of an external linear effort on a spinning body depends not only on its magnitude but also on the symmetry of matter field squares to the direction of external linear effort. This phenomenon causes shifts in the direction of tides from local meridian of a planet.

Actions of an external effort on constituent 3D matter particles of a spinning macro body depend not only on parameters of external effort and macro body but also on locations of individual 3D matter particles in the macro body. Those matter particles, moving (or has a component of their motion) along the direction of action of external effort, suffer only linear accelerations. Magnitude of their linear acceleration is proportional to component of their motion along the direction of external effort. Those matter particles, moving (or has a component of their motion) across the direction of action of external effort, suffer not only linear accelerations but also angular accelerations. Magnitude of their linear acceleration is proportional to component of their motion along direction of external effort. Magnitude of their angular acceleration is proportional to component of their motion across the direction of external effort.

Let an external linear effort act on a spinning macro body, along a radial line. Let us also assume that arms of matter field-latticework squares are symmetrical about the direction of external effort (macro body's non-spinning state), as shown by blue squares in figure 1. Since external effort acts through centre of mass of the body, it produces no angular component of motion. Macro body has to develop pure linear motion in addition to its original rotary motion. However, all matter particles, of a spinning macro body, move in curved paths about body's centre of rotation. On one side of centre of rotation, 3D matter particles of rotating macro body have newly introduced linear motion assisting their tangential motion in the curved paths and on opposite side of centre of rotation, 3D matter particles of rotating macro body have newly introduced linear motion opposing their tangential motion in curved paths. Macro body's centre of rotation shifts without affecting rotational speed of the body. As magnitude of linear motion of macro body increases, macro body's centre of rotation can move even outside the limits of its body. Angular and linear motions of macro body remain independent of each other, irrespective of changes in any of them. However, for all purposes of observations, a linearly moving-spinning macro body or its constituent 3D matter particles appear to have resultant motions in space.

Newly introduced linear motion cannot affect a spinning-macro body's rotary motion. In order to satisfy this requirement, curvatures of constituent 3D matter particle's paths are varied only by appropriate changes in their paths about centre of rotation of the body. Changes in curvature of paths of body-particles, while keeping their tangential linear speed constant, requires shift in centers of their curved paths. During linear accelerating stage of a rotating body (in perpendicular direction to body's spin axis), its radii in different directions in various planes (perpendicular to spin axis) differ all around body's centre of rotation. Cross sections of a spinning spherical macro body (perpendicular to spin axis) attains elliptical shapes. The macro body bulges outwards (in both directions) along the line of external effort's action. Spinning-macro body's shape will revert to original spherical shape as the body attains a steady state (of motion).

In addition to distortions, required to sustain a macro body's integrity and current state (of motion), matter field of a macro body accommodates all additional distortions required for macro body's motions. Hence, matter field-latticework squares of a moving macro body accommodate additional distortions corresponding to magnitudes of macro body's motions. Magnitude and direction of additional distortions of any matter field-latticework square, at any instant and at any location, is resultant of all additional distortions required for independent motions of 3D matter particles at that location. Linear and rotary motions of a macro body are independent of each other.

Figure 3 shows equatorial plane of a rotating macro body – circle in black dotted line. A, B, C, D, E, F, G and H show representations of distorted shapes of few of the matter field squares in different locations in the macro body, near its periphery. Their distortions represent spin-part of resultant distortions in latticework squares of matter field, rather than actual (distortions of) matter field-latticework 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 spin speed of the macro body is equal to '+ω'. Small arrows show parts of an external linear effort (in magnitude and direction) applied evenly on the macro body. This external effort is applied equally on every matter field-latticework square in the macro body. All junction points of matter field-latticework squares experience equal resultant efforts in the direction of applied external effort. Although, actions of an evenly applied external effort is to introduce identical linear distortions in every matter field-latticework squares of the macro body, orientation of matter field-latticework squares at different locations in the macro body cause slight differences in the magnitude and direction of additional distortions introduced into them.

At locations, A, D, E and H, arms of matter field-latticework squares are symmetrical to direction of action of external effort. Magnitudes of effort experienced at all junction points and distances between junction points, in perpendicular direction to the external effort, are equal. No couples are formed. Additional distortions, introduced by external effort at these locations, are purely

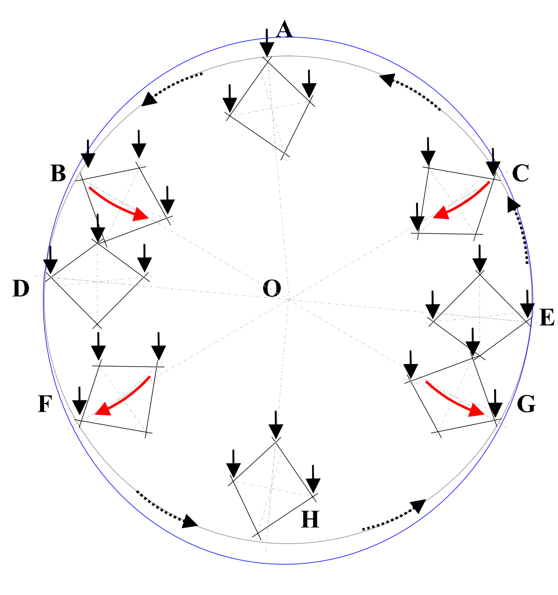

Figure 3

linear and work (additional distortions) introduced is used solely for linear motion of macro body in the direction of external effort.

At locations, C and F, orientations of matter field-latticework squares are deflected anticlockwise due to existing distortions, required for body's spin motion. In each latticework square, distances between middle junction point towards incoming external effort and junction points on either side are different. Junction point to the right is farther than the junction to the left. Although magnitudes of components of external efforts (shown in vertical direction, in the figure) are same, difference in distances to junction points on either sides, produce turning movement of the matter field-latticework square in clockwise direction, '-α', as shown by curved arrow in bold line (red). Direction of this deflection is in opposition to matter field-latticework distortions producing macro body's spin motion. Hence, these additional distortions tend to reduce spin speed of the macro body (tangential linear speeds of 3D matter particles) at these locations.

At locations, B and G, orientation of the matter field-latticework square (distortion) is deflected clockwise. In each latticework square, distances between middle junction point towards incoming external effort and junction points on either side are different. Junction point to the left is farther than junction to the right. Although the magnitudes of components of external efforts (shown in vertical direction, in the figure) are same, difference in distances to junction points on either sides, produce a turning movement of matter field-latticework 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 matter field-latticework distortions producing macro body's spin motion. Hence, these additional distortions tend to enhance spin speed of the macro body (tangential linear speeds of matter particles) at these locations.

Spin motion of a macro body can be modified only by another torque. External linear effort, considered above (central force between a planetary body and its central body), acting on macro body is purely linear in nature. Hence, it is unable to change spin speed of the macro body. Spin speed of a macro body depends on the relative differences between tangential speeds of macro body's 3D matter particles at different locations in it. Spin motion of a macro body is measured in terms of angular displacement of its 3D matter particles with respect to a reference line passing through body's centre of rotation. Turning movement of matter field distortions, explained above also causes angular displacement of macro body's 3D particles. Therefore, effect of turning motion of 3D matter field-latticework squares is also measured in terms angular displacement of 3D matter particles. However, its action on the macro body is without affecting tangential speeds of body's matter particles, producing macro body's spin motion. To satisfy these conditions, angular speeds of constituent 3D matter particles of the macro body should vary without altering angular speed of macro body, constituted by them. This is achieved by modifying curvatures of constituent 3D matter particles' paths without altering their tangential speeds.

As shown in figure 3, a 3D matter particle, in a spinning macro body;

Moves outward from 'O' (the centre of rotation) during its travel from location E to location A;

Moves inward towards 'O' during its travel from location A to location D;

Moves outward from 'O' during its travel from location D to location H and

Moves inward towards 'O' during its travel from location H to location E.

Path of 3D matter particle is shown in bold (blue) ellipse, in the figure 3. Changes in paths of constituent matter particles, during action of the external effort, alter macro body's shape. Change in the shape of macro body will last only during macro body's accelerating stage (during action of the external effort). Once the external effort is terminated and accelerating stage is over, the macro body will reach a 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 macro body, as a whole, it elongates in both directions along the direction of external effort.

Figure 4 shows one quarter part of a 2D energy field-latticework square situated at zenith point A on the equatorial perimeter of a spherical macro body. AD is one of the four quanta of matter forming the matter field square. Work (distortion), causing body's rotary motion at an angular speed of ω, displaces end point D of quantum of matter AD towards centre point O. Magnitude of this displacement is proportional to tangential speed, v, of a 3D matter particle in that region. Present position of quantum of matter AD is shifted to AC. As and when the spinning macro body develops additional linear speed equal to V, end point C of quantum of matter, AC, is displaced by additional distance, CB, proportional to linear speed V. Linear speed, V, considered here is of absolute nature. It is with respect to the 2D energy fields in space, the absolute reference in nature.

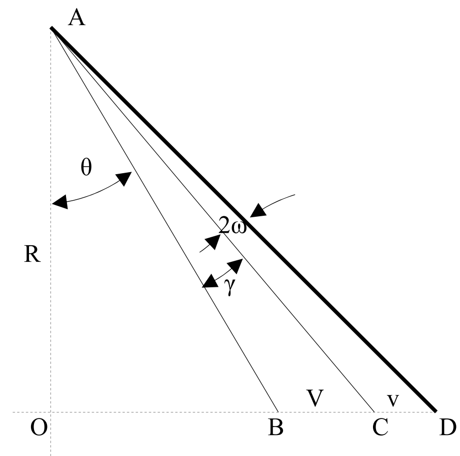

Figure 4

In the figure 4;

$$\angle OAD = \pi/4, \quad OA = R, BC = V, \quad CD = v,$$

where v is tangential speed of a surface 3D matter particle with respect to spinning macro body's centre of rotation and V is macro body's absolute linear speed in space. In order to move macro body at constant linear speed, V, every latticework square in its matter field needs to be distorted identically. Let the displacement, required to produce the required distortion move end point C of quantum of matter AC to position B. Now the quantum of matter occupies the location AB. Let the angle BAC, between AC and AB is equal to γ, which is proportional to absolute linear speed of the macro body.

Let spin speed of macro body is equal to ω rad/sec. Spin speed of the macro body is the angular deflection of median between side AD and opposite side of matter field-latticework square. Distortion, required for spin motion of the macro body, deflects only the arm AD of the latticework square towards O. Opposite arm of the latticework square is not deflected. Therefore, in order to produce a deflection of angle ω of median line between (upper) arms of latticework square, side AD has to have a deflection of 2ω. Angle between AD and AC is equal to 2ω. This deflection will sustain spin motion of the macro body at constant magnitude of ω rad/sec.

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

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

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

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

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

Total deflection of arm AD due to linear and spin speeds of macro body,

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

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

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

Apparent gravitational attraction:

Let G be the constant of proportion for gravitational (apparent) attraction in 3D spatial system between two (spherical) bodies of mass, ‘M’ each, situated at a distance, ‘d’, between their centers of gravity. To determine gravitational attraction in 3D spatial system, all matter content in each of the macro bodies is assumed to be concentrated at their centres of gravity. Centre of gravity is a geometrical point of zero dimensions.

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

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

For this reason, size or shape of concerned 3D macro bodies do not come into consideration while determining gravitational attraction, F, in 3D space system. For 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. [In some theories, it is assumed that different magnitudes of gravitational attractions act between nearer and farther ends of two macro bodies and this difference cause tides on member bodies].

According to concept, proposed in ‘Hypothesis on MATTER’, magnitude of a disturbance is the extent of its contact with 2D energy fields. All 3D matter particles are disturbances in the 2D energy fields. Matter content of a 3D matter particle, in each plane, is in contact with 2D energy field of the same plane. For a 3D matter 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 3D matter particles are situated far apart and held together by inter-particle field forces and gravitational attraction. This makes the matter-density of a 3D composite macro body lesser than the matter-density of a 3D matter particle. Matter-densities of all 3D matter particles are same. It is their distribution in a macro body that makes matter-density of a composite macro body lesser and different. A composite 3D macro body may be considered as single 3D disturbance of lower matter-density.

$$\left\{\begin{matrix}\text{Matter - density of a 3D macro body,}\\ \text{considered as a 3D disturbance}\end{matrix}\right\} = \frac{\text{Total matter content of 3D macro body}}{\text{Surface area of macro body}}$$

$$\text{Magnitude of a 3D disturbance} = \text{Matter - density of disturbance} \times \text{Surface area of its matter body}$$

$$\left\{\begin{matrix}\text{Magnitude of a 3D disturbance,}\\ \text{equavalent to a macro body}\end{matrix}\right\} = \frac{\text{Total matter content of 3D macro body} \times \text{surface area of macro body}}{\text{Surface area of macro body}}$$

$$= \text{Total matter content of 3D macro body} = \text{Rest mass of 3D macro body.}$$

Matter content of a 3D disturbance, equivalent to a 3D macro body, is 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 gravitational attraction between 3D macro bodies. Assumption that whole of matter content of a 3D macro body is concentrated at its centre of gravity is required to have a common point to represent 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 attractions.

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 acknowledged 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 measurement system, we may use present value of gravitational constant for 3D bodies with corresponding modifications to units involved. A plane of unit thickness that can be used by present equation is a meter (being one unit of distance) thick. For approximate calculations, this may not influence results for magnitudes of 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 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 'Hypothesis on MATTER'.

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

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

$$\text{Volume of a spherical macro body} = \tfrac{4}{3}\pi R^3$$

$$\text{Matter-density of the macro body} = \frac{M}{\tfrac{4}{3}\pi R^3}$$

$$\text{Area of equatorial plane} = \pi R^2$$

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

$$\left\{\begin{matrix}\text{Matter - density of equatorial plane,} \\ \text{considered as a 2D disturbance}\end{matrix}\right\} = \frac{\text{Mass of equatorial plane}}{\text{Surface area of equatorial plane}}$$

$$\text{Matter-density of 2D disturbance} = \text{Mass of equatorial plane} \div \text{Surface area}$$

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

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

$$\text{Perimeter of equatorial plane forming the 2D disturbance} = 2\,\pi\,R$$

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

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

Gravitational attraction between matter content in equatorial plane of 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 equatorial 2D plane of spherical macro body and a 2D matter body of unit mass in same plane. Similar apparent attractions in every plane of 3D space, containing two matter bodies, subscribe to total gravitational attraction between them in 3D space system. Calculating central forces between earth and sun (or moon and earth), in 2D space system; magnitude of central force between earth and moon is much higher (by about 2.3 times) than central force between earth and sun. This accounts for higher angular deflection (curvature) of lunar orbital path compared to earth's orbital path about the sun and larger lunar tides compared to solar tides on earth.

Tides:

3D matter particles of a macro body are held together by gravitational actions and inter-particle field forces. Apparent gravitational attraction between matter particles tends to move them towards centre of the macro body. This action aids field forces to integrate 3D 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 effort, applied evenly on the macro body and its rotary motion can be modified only by another torque (linear effort applied unevenly). Although an external effort may simultaneously invoke linear and rotary motion of a macro body, work invested into 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 a macro body's steady state (of motion), each nature of matter field-distortions produces respective motions independently. Even at very high linear speed of a spinning macro body, work corresponding to its spin motion remains latent within macro body's matter field and spins the macro body about its centre of rotation. Transition period between one steady state (of motion) to another is macro body's acceleration stage. During acceleration stage, external linear effort (or torque) modifies matter field-distortions in the macro body, by adding or removing distortions. Reshaping of matter field-latticework squares during this period, to modify any one type of motion, take place without interfering with other type of motion of the macro body. Change in linear speed does not affect spin speed and a change in spin speed does not affect linear speed of a macro body.

Tides are distortions induced by an external linear effort (or torque) in the shape of a spinning macro body, moving or not moving in linear direction. Sources of external effort (or torque) or consistency of rotating macro body are immaterial. All efforts are of push nature. Tides are produced by linear efforts on rotating macro bodies or by rotating efforts on linearly moving macro bodies. Both types of motions, linear and rotary motions, are involved. Otherwise, an external linear effort simply produces linear acceleration of the macro body and an external torque produces spin acceleration of the macro body. If a spinning macro body is under constant action of an external linear effort, perpendicular to its spin axis, macro body's cross sectional planes (planes perpendicular to the spin axis) will maintain their elliptical shapes. This makes the rotating body bulge outwards in both directions, towards and away from the direction of incoming external linear effort. Enlargement in diameter of the rotating macro body (in cross sectional planes perpendicular to spin axis) due to bulges in the direction of external linear effort creates the phenomenon of 'tide'. In a macro body of uniform consistency and shape, there is no displacement of body-matter particles other than that the curved path of each body-matter particle is modified to suite present requirements. Body-matter particles are not attracted towards (or displaced in) any direction to create phenomenon of tide. Similar action takes place also during action of a torque on a macro body under linear motion. Once the accelerating stage is over, 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 efforts acting on macro body produces its own tides on the macro body, separately. [According to current theories, two external efforts, acting on a body, produce only one resultant motion of the body. Yet, in case of terrestrial tides, we come across two separate external efforts 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 effort. 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 matter particle on the equator of the macro body traces a circular path about macro body's spin axis. Simultaneously, the matter particle is carried with macro body in its linear motion. Circles in figure 5 show the representations of equatorial plane of a spinning macro body, moving in linear direction (perpendicular to its spin axis). 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 equatorial surface of the macro body, is carried along the curved path GA'DFCAE. This matter particle has a constant angular speed, ω rad/sec, about the spin axis of the macro body, over and above its linear speed. As shown in figure 5, angular speed is anticlockwise (+ ω).

Let a constant external effort, 'f', shown by block arrows, act on the macro body continuously. Directions of tides on the macro body depend on the direction of external effort, 'f'. All 3D matter particles in macro body are affected identically. They are linearly accelerated or decelerated in the direction of the external effort. Additional work, introduced by external effort into macro body's matter field, has to accommodate itself within the work already existing in macro body's matter field and producing macro body's linear and rotary motions. Newly introduced additional distortions modify existing distortions during accelerating stage of the macro body. Since external effort is continuous, this modification is of constant magnitude. Part of additional linear distortions, due to external effort f, which attained stability causes macro body's 3D matter particles to move (at constant speed) in the direction of external effort and additional linear distortions in their transition-stage accelerates 3D matter particles of the body. Component of linear acceleration (taken about the centre of rotation), aiding or opposing tangential motion of a 3D matter particle, acts to modify angular displacement of the 3D matter particle along its curved path. Direction of its angular acceleration depends on relative position of 3D matter particle about centre of its curved path. Resultant angular speed of 3D matter particle along its curved path is modified accordingly, without affecting 3D matter particle's tangential speed.

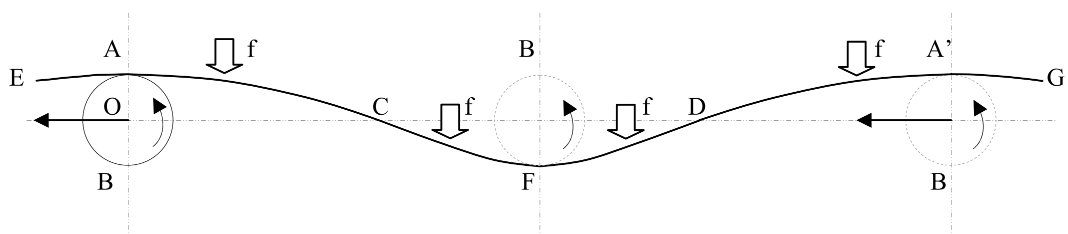

Figure 5

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

From A' to D, the 2D matter particle is on the left side of centre of rotation of the macro body. Hence, it causes anticlockwise angular acceleration (+ α) of the 2D matter particle. Total angular speed of 2D matter particle in its curved path is increased. The 2D matter particle tends to move towards the center of its curved path.

From D to F, the 2D matter particle is on the right side of centre or rotation of the macro body. Hence it causes clockwise angular acceleration (− α) of the 2D matter particle. Total angular speed of 2D matter particle in its curved path is reduced. The 2D matter particle tends to move away from the center of its curved path.

From F to C, the 2D matter particle is on the left side of centre of rotation of the macro body. Hence it causes anticlockwise angular acceleration (+ α) of the 2D matter particle. Total angular speed of 2D matter particle in its curved path is increased. The 2D matter particle tends to move towards the center of its curved path.

From C to A, the 2D matter particle is on the right side of centre of rotation of the macro body. Hence it causes clockwise angular acceleration (− α) of the 2D matter particle. Total angular speed of 2D matter particle in its curved path is reduced. The 2D matter particle tends to move away from the center of its curved path.

Every 3D matter 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 effort. Spherical macro body's equatorial plane changes its shape from a circle to an ellipse. Similar actions take place in all planes (of macro body), which are parallel to its equatorial plane.

Figure 6 shows the transformation of equatorial plane of a linearly moving spinning macro body, red circle ACBDA, under action of an external effort, f, shown by thick arrow, applied evenly on the whole of the macro body. Curved arrow shows 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 2D matter particle = v m/sec

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

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

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

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

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

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

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

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

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

From position D to position A, additional angular speed is in opposition to matter particle's original angular speed.

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

From position C to position B, additional angular speed is in opposition to matter particle's original angular speed.

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

Resultant angular speed of matter particle at position A and position B = ω − additional angular speed

$$= \omega - \frac{aT}{4\pi \times r} \quad (9)$$

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

Angular speeds of matter particle are lowest at position A and position B.

$$\text{Radii of circular path at A and B} = \frac{\text{Tangential speed of matter particle}}{\text{Resultant angular speed of matter particle}}$$

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

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

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

Increase in length of diameter of the macro body, in the direction of external effort, varies in proportion to magnitude of action of external effort and to tangential speed of 3D matter particles (spin speed) of the macro body. Magnitude of external effort being constant (in this case), higher rotational speed tends to increase 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 integrity of a spinning body. Macro bodies in all planetary systems constantly accelerate in their spin motions [6]. In the long run, increasing spin speed causes their disintegration due to tidal stress. This phenomenon ensures eventual destruction of planetary systems and subscribe towards recycling of 3D matter in universe, so that entropy in universe is maintained within limits.

In figure 6, ACBDA in dotted red line is the original shape of the equatorial plane of a spinning macro body. Elliptical path (in dashed black line), D’A’C’B’, shows path of all surface 3D matter particles. Changes in circular paths of constituent 3D matter particles of macro body (due to action of linear effort, f) change the shape macro body’s equatorial plane. Similar actions take place in all planes perpendicular to its spin axis. Spinning macro body elongates along the direction of action of external linear effort. Blue circle A”C”B”D”A” is the mean assumed shape of the macro body. A”A’ and B”B’ show heights of high tides and CC’ and DD’ show depth of low tides from the assumed mean equatorial surface (blue circle) of the macro body.

From the above explanation, it can be seen that alterations in a macro body’s matter field change its body-shape in correspondence with external effort on the macro body. Magnitude of change depends on

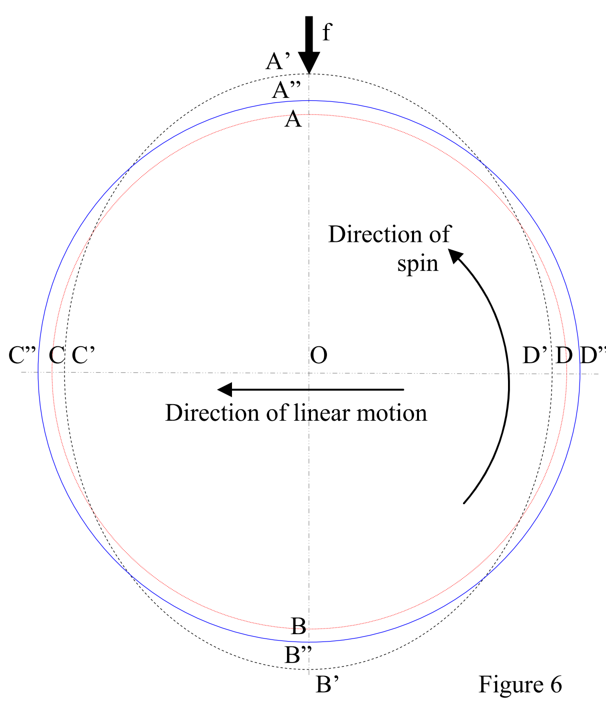

Figure 6

magnitude of external effort. 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 macro body or displacement of its parts. Paths of body-matter particles are rearranged by macro body's matter field to reflect modified shape. Hence, any number of external efforts, acting on a macro body, will introduce as many sets of tides in the macro body as there are external efforts. Even while the macro body is moving linearly, it is able to have tides, simultaneously in many directions.

External effort in 3D space system, producing the tidal effects on a spinning macro body, simultaneously acts in all planes containing line of its action. This external effort is usually distributed in all planes, in the direction of external effort, passing through whole area of the macro body. It is not a point effort (force). Matter field-distortions, causing macro body's spin motion, are not present in planes, which are not perpendicular to the direction of linear motion of the macro body. Hence, external efforts in these planes do not have imbalances in their actions to cause body-distortion of the macro body in other directions. External efforts in these planes cause linear motion of the macro body in the directions of external efforts, without tidal effects. Tidal effect of point efforts (forces) on a spinning body is confined to local region (on opposite sides of macro body) around the line of application of external effort through the macro body. Such effects may appear as small bulges on the surface of a macro 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 sun and earth guides earth along its curved (wavy) orbital path. Earth is also under another central force from orbiting moon. These two external efforts are independent of each other. Central forces, from both the sun and the moon, due to apparent gravitational attraction act evenly and continuously on earth to provide external linear efforts, acting on the spinning macro body of earth. Each of these efforts, independently, transforms shape of earth to increase its diameter along their directions of actions, each in its own direction. Since centre of earth's curved (wavy) 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 earth's orbital path are ignored. Variations in parameters of tides due to eccentricity or inclination of earth's orbital paths are also not considered.

Taking the following parameters from data books, available on www:

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

Tangential speed of a matter particle on the surface of earth at its 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, available on www:

Mass of sun (representing its total matter content), $M = 1989100 \times 10^{24}$ Kg

Radius of sun, $R = 696000000$ m

Distance between centers of earth and sun = 147090000000 m

Distance between equatorial planes of sun and earth,

$d = 147090000000 - 696000000 - 6378100 = 146387621900$ m

Apparent gravitational attraction between equatorial plane of the sun and a 2D matter particle 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 matter particle of unit mass, on equatorial surface of earth; $a = F \div 1 = F$

$= 2.8074981701006873180145250705546 \times 10^{-9}$ m/sec^2

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

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

Lunar Tides:

Taking the following parameters from data books, available on www:

Mass of moon (representing its total matter content); M = 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 moon and a 2D matter particle of unit mass in the same plane at the surface of earth, by equation (5)

$$F = \frac{3MG}{2dR^2} = 6.470664855408473173207268005281 4 \times 10^{-9} \text{ kg\_m / sec}^2$$

Linear acceleration of a matter particle of unit mass, on equatorial surface of earth; $a = F \div 1 = F$

$= 6.4706648554084731732072680052814 \times 10^{-9}$ 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, (in earth's non-spinning state) are considered as perfect circles. In order to account for 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 earth's 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 earth's 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 earth's 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.

Increase in earth's 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 gravitational attraction, calculated according to equations for 3D space system, is not valid for calculations in 2D spatial system. Calculations involving central forces in planetary system, calculated for 2D space system (as given above) [5] shows that central force between earth and moon is much higher (by about 2.3 times) than central force between earth and sun. This accounts for greater magnitude of lunar tides compared to solar tides on earth. Discrepancies in the values obtained in above calculations, if any, are due to insufficient accuracies of various parameters used. Above given calculations are true for a body of earth's parameters and covered evenly with (low-density) 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 matter content try to overcome 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 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 crests and troughs of a large-scale traveling wave system, comprising the tides, strives to sweep continuously around earth, following relative position of moon (and sun). This is mere appearance due to motion of the observer in opposite direction. While earth spins, its shape remains steady in space with respect to sun and moon. Cross sectional planes of earth, perpendicular to earth's spin axis remain in elliptical shapes with their major axes in the directions of both sun and moon, independently. 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 water-body but due to vertical changes in the shape of planet earth.

As there is no flow of ocean water from one part of earth to another (around the earth), laws of fluid dynamics do not apply to tides. Since there is no relative linear motion between water-body on earth's surface and land mass at its ocean floor, there is no frictional effect at the ocean floor. Assumption that 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 ocean, cannot be interpreted as tidal effects. Tides are rise and fall of surface points of a spinning macro body, with respect to a datum, in the direction of or away from external (linear or spin) effort acting on it.

Since tides are formed due to acceleration of a spinning body, rather than due to change of its state of motion (change in speed), no work is expended for their creation. Only the shape of spinning macro body is changed. Mere (temporary) changes in shape or direction of motion do not constitute work. To change shape of the body, original work existing within body's matter field is re-deployed during the process of investment of work (acceleration) by external effort. No energy is used from any source to produce tidal effects on a spinning body. Hence, tidal effects cannot do any work. Energy from other sources related to tides (like gravity, during changes in levels of water bodies) may be derived to do other works during tides. Work invested by external effort 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 orbital motion and spin motion of a planet. Action-stage (acceleration period) of central force causes the tide. Since tides are not changes in the state (of motion) of a body, they do not consume work.

Effects due to eccentricity of orbital paths, inclination of orbital planes, topography on 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 oceans are not taken into account, here. All of the above (and other less important influences) can combine to create considerable variety (many times) in observed magnitudes and phase sequence of 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 tides known 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 magnitudes of tides. High-pressure atmospheric systems may depress 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:

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

Magnitude of angular shift from local meridian:

We shall take the absolute linear speed of sun is equal to 250000 m/sec. Accordingly, depending upon the position of earth on its orbital path with respect to sun, earth's absolute linear speed vary between 220000 m/sec and 280000 m/sec. This will make corresponding changes in magnitude of angular shift of zenith point of tide from the local meridian. Angular shift of tidal zenith point on earth depends only on parameters of earth. Hence, irrespective of source of external effort acting on earth, all terrestrial tides will be shifted identically. [External efforts on earth are applied by 2D energy fields in the direction of (central) bodies, which provide shadow in the 2D energy field for development of apparent gravitational attraction. Sun or moon do not directly apply any effort on earth, instead, they cause central forces on earth being applied by 2D energy fields]. Magnitudes of deflection of tides from local meridian 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 matter particle on earth's equator = 465.097851 m/sec

ω = Angular speed of earth's rotation = $7.29210659088 \times 10^{-5}$ 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 this 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 tides with respect to earth. The observer is also moving with earth at its absolute linear speed. Hence, displacement of tide from local meridian with respect to earth's spin axis is also of the same magnitude.

Magnitude of tidal deflection is related to absolute linear speed of planet and relative direction of central force to the direction of planet's absolute linear motion. All bodies in solar system move with average linear speeds equal to sun's linear speed in its orbital path about galactic centre. [A stable galaxy has no translational motion in space]. Linear speed of galaxy, if any, is not accounted in the above calculation. Linear speed of 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 observed magnitude is due to discrepancy in earth's absolute speed, taken for the calculation. If 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 shift of tides from local meridian:

In figure 7, rectangles in red dashed lines, 'A' and 'C', represent distorted matter field-latticework squares at local meridian (latticework square A, facing a central body, when planetary body is on one side of median orbital path and latticework square C, facing a central body, when planetary body is on other side of median orbital path) in a linearly moving spinning macro body. Since the macro body has only one combined motion (linear motion along a curved path about centre of rotation of macro body) shown by thick curved arrow, all matter field-latticework squares in the macro body are, more or less, distorted identically. Shorter arrows in figure 6 represent two sets of external linear efforts, applied on the macro body in two directions, upward and downward. [Two sets of external efforts in same figure make it convenient to explain deflection of tides from local meridian, when macro body is on either side of its median orbital path]. Other two matter field-latticework squares, 'B' and 'D', shown in the figure are displaced from local meridian (latticework square B, towards the central body, when planetary body is on one side of median orbital path and latticework square D, towards the central body, when planetary body is on other side of median orbital path). Latticework square D is displaced in the same direction of body's spin motion from latticework square C. Latticework square B is displaced in opposite direction to body's spin motion from latticework square A.

Central force, acting on a planet, is towards its central body. Matter field-distortions of a macro body need not be symmetrical about the direction of external effort on the macro body. Greatest tides occur at points, where distortions in matter field-latticework square are symmetrical about the direction of external effort. At these points, arms of matter field-latticework squares are symmetrical about line of action of external effort. In the matter field of a linearly moving spinning macro body, matter field-latticework squares are not symmetrical about macro body's radial lines. External effort by central force can act only along radial line of the macro body. In other words, although an observer is placed at a meridian facing the central body, arms of matter field-latticework squares at this meridian are not symmetrical about the direction of external effort. Therefore, an observer standing on a planet sees the tide; either leads or lags local meridian. This is mere appearance. Zenith points of tides always take place, where arms of matter field-latticework squares are symmetrical about the line of action of external effort. When observer is on a line, joining centers of planet and central body, arms of matter field-latticework squares at local meridian are not symmetrical with the line of central force. Matter field squares become symmetrical about the line of central force only when observer is away from local meridian facing central body. This is seen by observer as an angular shift in the place of occurrence of tide from local meridian occupied by him and facing (or directly opposite) corresponding central body.

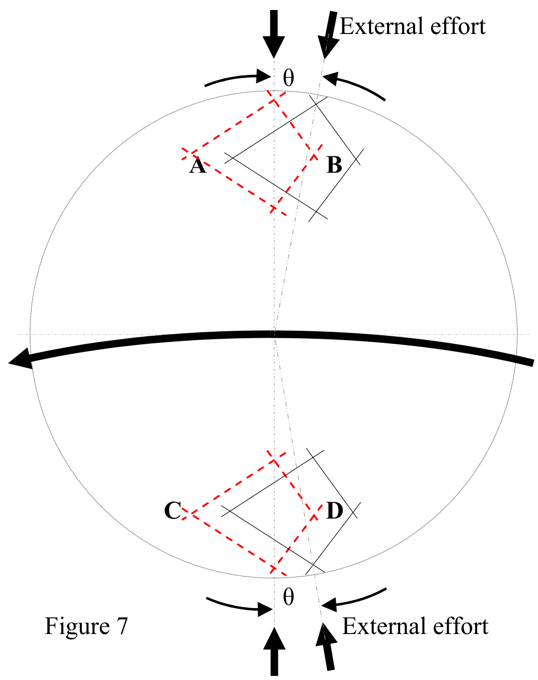

Figure 7

Let us consider the action of downward external effort on the matter field-latticework square A. At its position at A, action of external effort is asymmetrical on its arms. Matter particles in contact with this matter field-latticework square experience anti-clockwise deflection in addition to downward linear motion. Maximum tidal effect occurs, where no part of external effort is used for angular deflection of matter particles' paths. Since external effort is not fully effective at position A, in downward direction, high tide cannot occur at this position (local meridian). As the body rotates, observer at position A is carried forward. After some time, matter field-latticework square situated at position B, comes to occupy position in line with external effort. This is shown in figure by a shift in the direction of external effort. Here, arms of matter field-latticework square B are symmetrical about the direction of external effort. [Displacement of matter field-latticework square B is shown in the figure by displacing central force in opposite angular direction, as shown by the second arrow to the right]. Whole of external effort acts along its direction of its application. No part of external effort is used to deflect matter particles' path angularly. Hence, high tide occurs at this point. By the time matter field-latticework square B comes in line with external effort, local meridian of observer has moved ahead in the direction of spin of macro body. Therefore, observer notices that high tide lags behind local meridian occupied by him. This happens, when external effort is applied towards centre of resultant motion (curved mean path) of linearly moving spinning body.

Consider action of external effort in 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-latticework square C, its arms are asymmetrical to direction of external effort. Hence, high tide cannot occur at this point, C. Matter field-latticework square at position D has its arms symmetrical about external effort. [Displacement of matter field-latticework square D is shown in the figure by displacing central force in opposite angular direction, as shown by the second arrow to the right]. Tide is greatest when meridian at position D is facing the central body. Local meridian, occupied by observer, is behind meridian facing central body, where high tide takes place. To the observer tides appear to lead local meridian (where central body appears to him), when external effort is applied in the direction away from the centre of resultant motion (curved mean path) of linearly moving spinning body.

Angular shift of terrestrial tides:

Figure 8 shows part of earth's real orbital path (during one apparent orbit), GA'CBDAE, about the sun's median path, X"X. Thick arrow T_1R_1 shows resultant direction of motion (linear motion + spin motion) of matter particles on earth's equatorial surface. Block arrows show direction of central force between earth and sun. Central force on a planet is a push effort, applied from the side away from central body towards central body. Small circles show direction of earth's spin motion and arrows across the circles show direction of solar tides with respect to local meridian in each quarter of earth's apparent orbital path. Arrows, along side X"X, in dotted line show direction of earth's mean absolute linear motion with respect to sun's path. In real sense, deflection of solar tides with respect to local meridian is always as shown in this figure and as explained above. Earth in positions 'P' and 'R', solar tides are deflected westward from local meridian. Earth in positions 'S' and 'T', solar tides are deflected eastward from local meridian.

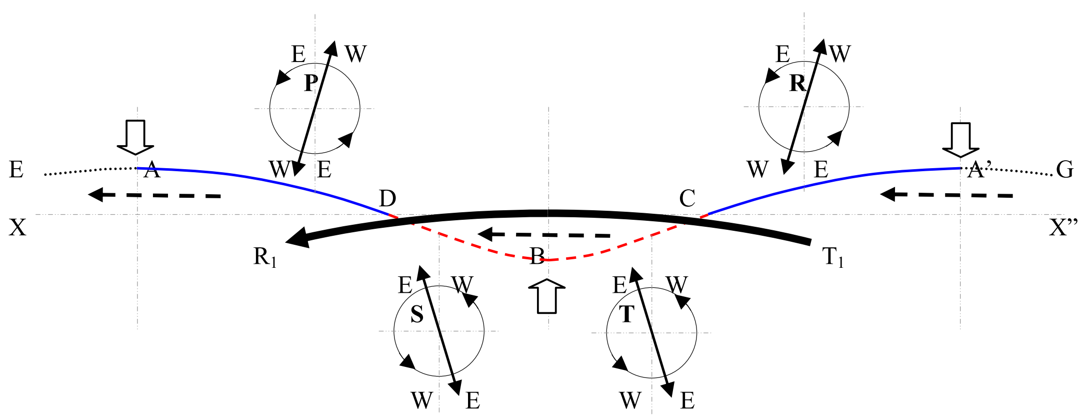

Figure 8

During half-yearly period, when earth is nearer to outer datum point in its orbit (it is outside its median path − with respect to sun) earth is farther than sun from the centre of sun's curved path [3]. Orbital path is marked by blue curved line. Central force is applied from the side away from sun towards centre of earth's combined motion. [Central force is a push-effort applied on earth's farther side towards sun]. During this six month period, solar tides tend to lag behind the local meridian of observer. Tides will appear to west of local meridian (they appear earlier than the sun itself reaches local meridian).

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

Directions of lunar tides are also similar. Figure 9 shows moon's real orbital path (during one apparent orbit), GA'CBDAE, about earth's median path, X"X. Thick arrow T_1R_1 shows resultant direction of motion (linear motion + spin motion) of matter particles on earth's equatorial surface. Block arrows show direction of central force between earth and moon. Central force on a planet is a push effort, applied from the side away from central body towards central body. Small circles show direction of earth's spin motion and arrows across the circles show direction of lunar tides with respect to local meridian in each quarter of moon's orbital path. Arrows, along side X"X, in dotted line show direction of moon's mean absolute linear motion with respect to earth's path. In real sense, deflection of lunar tides with respect to local meridian is always as shown in this figure and as explained above. Earth in positions 'P' and 'R', lunar tides are deflected eastward from local meridian. Earth in positions 'S' and 'T', lunar tides are deflected westward from local meridian.

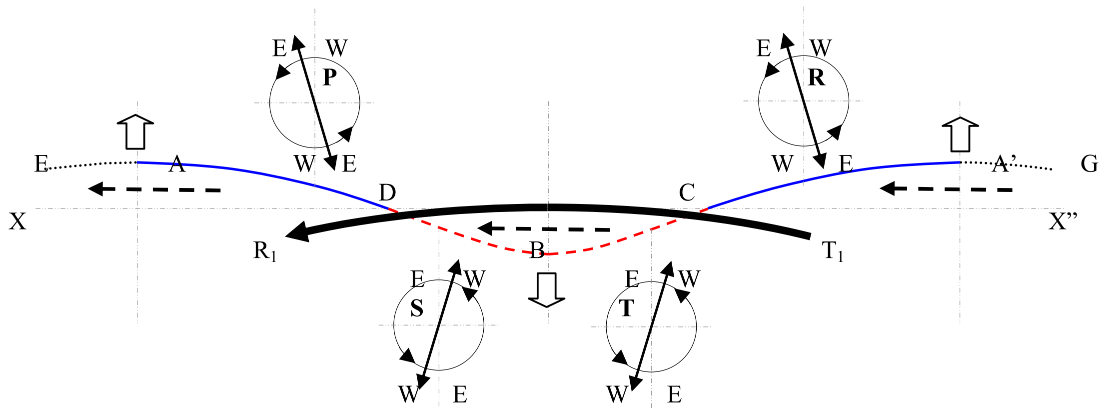

Figure 9

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

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

If there are more than one central force acting on a planet, each effort produces its own set of tides, independently. If directions of these tides are near, they will combine to create resultant tides which are arithmetical sum of independent tides on the macro body. This summation gives rise to 'spring tides' and 'neap tides' on earth. This effect is the greatest when Moon and Sun are in a straight line with Earth (called 'syzygy'), which occurs during Lunar and Solar Eclipses (during Full Moon and New Moon), while both 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 a central body. This appearance (different from real condition) changes the directions how tides appear to an observer.

Apparent direction of Solar tides:

An observer on earth judges orbital motion of earth about sun as he sees it. Originally, in early times in history, sun appeared to move around earth in westerly direction. This notion was later changed to motion of earth around sun in easterly direction. Although, no free body can orbit around another moving body, in closed geometrical path, notion of earth orbiting in elliptical path around the sun in easterly direction (or moon orbiting earth in westerly 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 of concerned bodies.

In figure 10, X"X shows small part of sun's curved path. Earth's real orbital path is shown by wavy line GA'CBDAE. Points A and A' are outer datum points (points in real orbital path, where absolute linear speed of earth is highest) and point B is inner datum point (points in real orbital path, where absolute linear speed of earth is lowest). For time being, we shall consider deflection of tides, when earth is located near datum points on its real orbital path. At these places 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 earth moves in its real orbital path, from point B to point A, it is behind the sun. Central force between the two accelerates 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 deflection of tide from local meridian, as shown by circles P and S, are same as derived above. During earth's travel

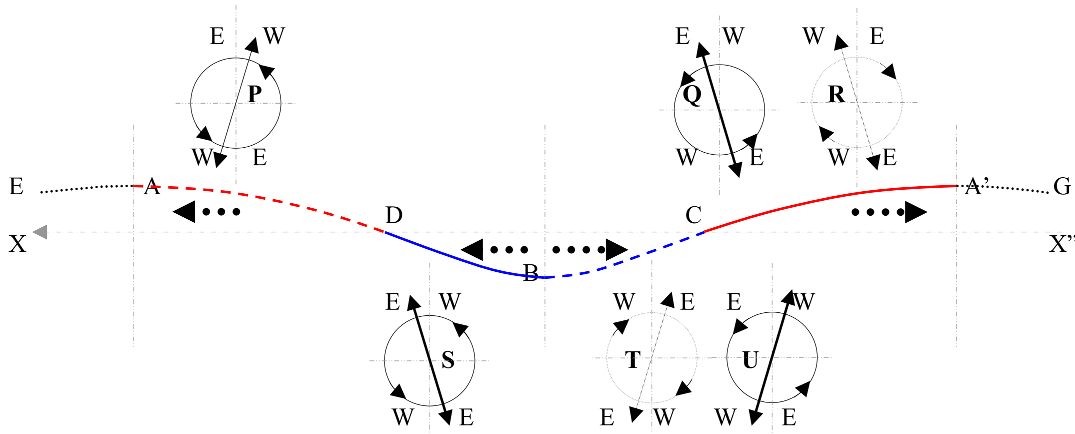

Figure 10

from point D to point A, solar tides are deflected westward from local meridian as shown in circle P and during earth's travel from point B to point D, solar tides are deflected eastward from local meridian as shown in circle S.

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

From point A' to point B, in figure 10, 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 opposite direction, as shown by arrows in dotted line. This assumption enables us to change the shape of earth's orbital path from a wavy line about sun's path to an elliptical path around the sun. By this consideration, earth appears to move from point B to point A'. Directions of earth's motions are reversed by this supposition as shown by circles T and R in dotted lines. By doing so, not only direction of earth's linear motion but direction of its spin motion is also reversed. Change in the direction of earth's spin is against what is observed. Here, again, we resort to one more change (Or undo part of change of direction attempted earlier). East-west directions are changed back to suit our observation, related to earth's spin motion. This is shown in circles Q and U. By doing so; in circle Q, relative direction of deflection of solar tides have changed easterly and in circle U, relative direction of deflection 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; During earth's travel -

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

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

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

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

High tides on opposite side of earth also appear correspondingly.

Apparent direction of lunar tides:

Figure 11 shows relative orbital motion of moon with respect to earth when earth is at outer datum point in its real orbital path. Moon travels in the wavy path, GA'CBDAE, while earth moves along X"X in its curved orbital path about the sun. To an observer on earth, moon appears to move around earth. Earth's motion relative to the moon appears in directions as indicated by dotted arrows on line XX". From full moon to new moon, moon is in front of earth and earth accelerates in the direction of moon's motion due to central force. Earth appears to move towards moon which is in front. Both moon and earth appear to move in same direction, from point X" towards point X. Directions of deflections of tides are as explained above, with respect to figure 9. They are shown in circles U and Q.

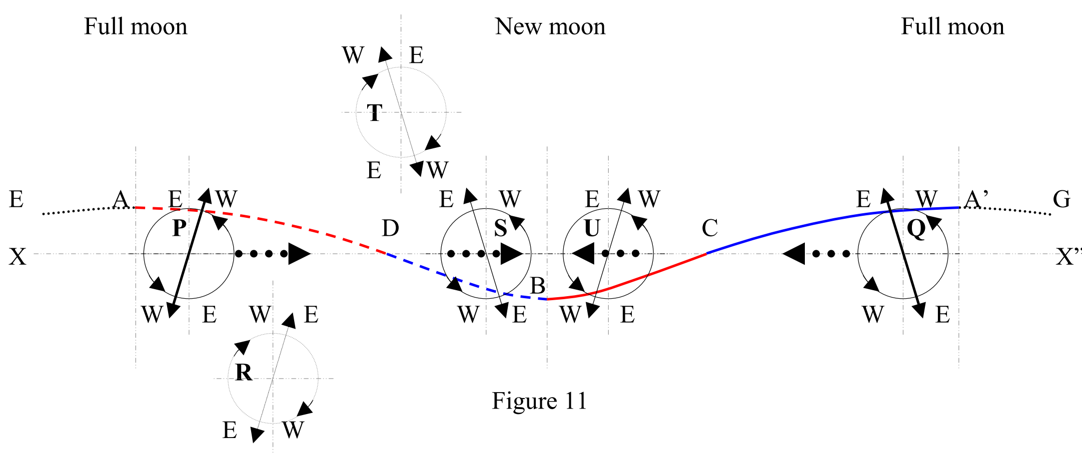

Figure 11

Between new moon and full moon, moon is behind earth and earth is decelerated in opposite direction to moon's motion due to central force. Earth appears to move towards moon (in opposite direction to moon's motion), which is behind earth. Both, moon and earth, appear to move in opposite directions. Moon moves in the direction from point X" towards point X, while earth appears to move in the direction from point X towards point X". This appearance enables us to create apparent orbital motion of moon around earth. Directions of earth's real motions are reversed to suit our 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.

Summarizing the above points;

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

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

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

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

Effect of orbital motion on deflections of tides:

Magnitudes and directions of deflection 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 above figures, it can be seen that earth's orbital path zigzags about sun's path and direction of central force with respect to orbital path changes through a full circle during every apparent orbital period. Central force is perpendicular to orbital path only at two points (at outer and inner datum points) in orbit. At all other points in orbit, angles between orbital path and 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 sun's curved path. Earth's matter field-latticework squares deflect through a maximum of 6° on either side about its median path. Deflection in earth's matter field-latticework 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 distortions in the matter field of 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. Considering ideal orbital conditions, magnitude of deflection of terrestrial tides varies within an angular sector of about 17.52°. Magnitude of deflection, at any time, depends on the location 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 external efforts produces tides on a spinning macro body. Change in the shape of a macro body causes tides 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 and curvature of its orbital path produce angular shift of tides from local meridian, facing 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.

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