



Earthquake prediction; Principles

(Part I)

the complete article see below

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The basic problem of geophysics in more precise prognosing earthquakes and volcanoes' eruptions has for decades been the erroneous idea of the very self matter and properties of the basic force of our Universe – the gravity force. This incorrect concept and errors in description of the Earth's interior resulting from it cause that the astronomers see the motion of the planets as the motion in freefall.

The universality of free fall (UFF) asserts that a point test body, shielded from all known interactions except gravity, has an acceleration that depends only on its location [1].

Point test body is an intellectual auxiliary object in physical theories and does not exist in the real universe. The whole momentum (impulse) of a real existing heterogeneous celestial body needs to be calculated by integration of momentum of all its material points $d\mathbf{m} = dV \cdot \rho$; dV - volume element, ρ - density. Therefore the whole momentum \mathbf{p} of a celestial body is vector sum of all momenta of all its parts of different densities:

$$\mathbf{p} = dm_1 \cdot \mathbf{v} + dm_2 \cdot \mathbf{v} + \dots + dm_n \cdot \mathbf{v} = dV_1 \cdot \rho_1 \cdot \mathbf{v} + dV_2 \cdot \rho_2 \cdot \mathbf{v} + \dots + dV_n \cdot \rho_n \cdot \mathbf{v};$$

\mathbf{p} – momentum, \mathbf{v} – velocity' vector

Hence the direct conclusion that each change of velocity or motion's direction of a heterogeneous space object creates stresses in its interior between zones of different density, caused by inertia. It means that transformation of coordinate system to such where orbital centrifugal force does not exist is mathematically prohibited. Through this transformation the whole information concerning the internal structure of the celestial body and stress in its interior is lost.

Therefore both the Free Fall and the Universality of Free Fall are myths that need to be rejected by physics as they block further development of geophysics and astronomy. After rejecting these myths we have to simply state that in the real existing universe the centripetal force always acts together with the centrifugal force. According to the action-reaction basis, none of these forces acts separately. Every real existing object of our universe becomes a centrifuge when rotating. No transformation of coordinate system can change this fact. It means that the signals registered at the University of Washington with the *Eot Wash torsion balance apparatus* have nothing to do with the Equivalence Principle or other problems of cosmology. These signals show only differences of orbital centrifugal force for test bodies of different density. Analysing these signals in terms of cosmological problems is a waste of time for physics.

The arguments presented above, together with the articles [2] and [3], show that the drive mechanism of plate tectonics and most of tectonic phenomena on the surface of the Earth is the west drift of Earth crust deformations. The proof of that are changes of water level in seas and oceans:

- 36000 cubic kilometers of water flows through Gibraltar from the Atlantic Ocean to the Mediterranean Sea; the water flows further, raising the level around Venice and in the Black Sea.

- system of ditches in east Africa gets filled with water from the Indian Ocean

- when Anders Celsius was the director of the Astronomic Observatory in Uppsala, he marked the level

of water in the Baltic Sea on a neighboring rock. Nowadays, 260 years later, the level of water in

Baltic is few meters lower than in times of Celsius.

- similarly as in Scandinavia, the water level on Greenland and Iceland decreased by few meters during

the last 200 years.

- in the region of Philippines, New Guinea and Australia the ocean water decreased by more

than 10 meters during the last 200 years.

The "post-glacial hypothesis", that is used for explaining the decrease of the water level in Scandinavia, can't explain the decrease of the water level in the equator zone. The increase of the water level in places such as:

- eastern Africa
- Caribbean Sea
- Maryland in USA
- around Venice
- in the Black Sea.

and decrease of the water level in other places is a clear proof for that the reason of those changes of the water level can only be the west drift of the Earth crust's deformations that are shown on the "geoid models" [GRIMM, GRAVTOP(GFZ), EGM96, (NASA, OSU, NIMA)]. Water in oceans and seas flows from those places on Earth which rise to those which drop, on the principle of equalizing the hydrostatic level.

In the report concerning the Gibraltar the "faster water evaporation in the Mediterranean Sea than in the Atlantic Ocean" was given as the explanation of the water flow between these reservoirs. However, no physical bases were given to explain this phenomenon.

A simpler model explaining more phenomena is methodologically always more probable than complicated local hypotheses created in exactly the same manner as the epicycles' theories.

[1] *New tests of the universality of free fall*; Dept. of Physics, Univ. of Washington, Seattle, WA

Y. Su, B.R. Heckel, E.G. Edelberger, J. H. Gundlach, M. Harris, G. L. Smith, H. E. Swanson

[2] *Earth-Moon System; The Origin, Development and the Future. Mathematical-Physical Basics to the Computer Simulation of the System*, T. Tumalski, The 8th World Multiconference on Systemics, Cybernetics and Informatics, July 18 - 21, 2004 Orlando, Florida, USA

[3] <http://www.cosis.net/abstracts/EGU05/05663/EGU05-A-05663-1.pdf>

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Introduction

In the Lexicon of Astronomy ISBN 3-86150-145-7 a group of authors (**List below**) writes:

Centrifugal force, force of inertia that draws outside every body under forced central (circular) motion (i.e. motion of a planet on its orbit). ↗ Acceleration, ↗ circumferential velocity, ↗ flattening

Centripetal force, force acting towards the "centre" under forced central motion (i.e. motion of a planet on its orbit), directed opposite to the **centrifugal force** and equal in terms of its size.

Both definitions of the centrifugal and centripetal forces are explained in the Lexicon in a figure presenting motion of a body on an orbit (**Fig.1**):

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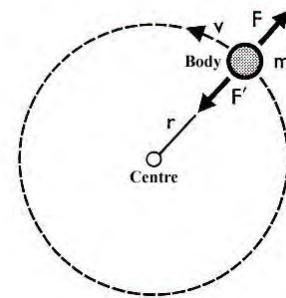


Fig. 1 Centrifugal force

F - centrifugal force

F' - centripetal force

m - body (mass)

v - velocity

r - distance from the centre

The presented in the **Lexicon of Astronomy** model of planet's motion under the orbital centrifugal and centripetal forces became the basis of the calculated, presented at the conference in Orlando, USA, and published in [1] mechanism of origin of the Earth's Moon.

A logical and physically coherent continuation of the mechanism [1] of the origin of the Moon is the present drive mechanism of the plate tectonics, presented at the EGU General Assembly 2005 and published in [2].

In contradiction to the above presented interpretation, the EGU reviewers of the article

[1811-1812 New Madrid earthquakes; 16 June 1819; 26 January 2001 Republic Day and 26 Dec. 2004 Sumatra-seaquake confirm the west drift of "Tectonical Death Zone"](#)

write in [3] and [4]:

Quotations:

[3] "...The centrifugal force does not exist at all.",

[4] "There is no such a thing as "centrifugal force" (...) So, centrifugal force cannot be a force, as there is nothing creating it, and there is no reaction force."

In the face of the obvious contradiction of the statements of the authors of the **Lexicon of the Astronomy** and the standpoint of the EGU reviewers, an attempt of explaining which of the two statements is correct is needed to be undertaken.

An assumption saying that both are correct would mean that we live in an absurd universe, where the centrifugal force, as a very bizarre appearance similar to a car's turn signal, once it exists and then disappears, exist, disappears...

A more precise analysis of the physicists' argumentation in few other important problems of physics like neutrinos' oscillations, superrotation of the inner core of the Earth, the dark matter and many more, make one come to a conclusion that the reason of the contradictions in the contemporary physics is the scientific method itself that is used by the physicists for studying and characterizing our universe. Many physicists take a very convenient stand saying that "**the expert is always right, no matter what he says**". This scientific method combined with lack of analysis of coherence of the created hypotheses with the basic laws of physics is the source of creation of local hypotheses similar to the theory of epicycles, and which are often in contradiction with each other and with the basic laws of physics.

Precise analysis of the reasoning that leads to the theses quoted above that "...the centrifugal force does not exist at all" makes one come to a conclusion that the reason of the contradiction shown above is the fundamental error made by physicists when analyzing the dynamics of the orbital motion of planets.

The fundamental error of the contemporary physics

The fundamental error of the contemporary celestial mechanics is the mathematically prohibited transformation of the reference frames that leads many physicists to a conclusion that in the orbital motion the only force acting on a planet is the gravity force and that the centrifugal force does not exist.

Proof:

The Galilean principle says that any body tends to continue its rectilinear uniform motion at a constant speed.

In the contemporary physics this Galilean principle is called the momentum conservation principle. The momentum as a vector parameter has a magnitude (the magnitude of motion) and direction. Therefore the Galilean principle means that every body tends to preserve the parameters of the motion vector: the direction and the magnitude.

Each change of any of these parameters by the act of an external force (actio) causes a tendency (reactio) for preservation of the hitherto direction and velocity of motion.

Therefore during the deceleration and acceleration acts the inertia force

$$\mathbf{F} = m \cdot \mathbf{a} \quad (1)$$

whereas during the orbital motion acts the centrifugal force which is also an inertia force.

$$\mathbf{F} = m \cdot \mathbf{v}^2/R \quad (2)$$

Both forces (1) and (2) result directly from the above Galilean principle. The differences between them are only that:

- (1) is the tendency to preserve the **magnitude** of velocity ($\mathbf{a}=\mathbf{dv}/dt$) with a parallel direction of the acting force, "actio", to the direction of the body's motion
- (2) is the tendency to preserve the **direction** of motion with the angle of 90° between the vector of the force, "actio", and the body's motion vector

A homogenous body with mass m in its rectilinear uniform motion at constant speed \mathbf{v} has the momentum equal

$$\mathbf{p} = m \cdot \mathbf{v} \quad (3)$$

The situation becomes complicated in the case of a heterogeneous celestial body.

The whole momentum (impulse) of a real existing heterogeneous celestial body needs to be calculated by integration of momentum of all its material points

$$dm = dV \cdot \rho \quad (4)$$

dV - volume element, ρ - density

Therefore the whole momentum \mathbf{p} of a real existing heterogeneous celestial body is a vector sum of all moments of all its parts of different densities:

$$\mathbf{p} = \mathbf{v} \int_{V_1} \rho_1 \cdot dV + \mathbf{v} \int_{V_2} \rho_2 \cdot dV + \dots + \mathbf{v} \int_{V_n} \rho_n \cdot dV \quad (5)$$

\mathbf{p} – momentum, \mathbf{v} – velocity vector

From the (5) a direct conclusion can be drawn that the Galilean principle is distributed on particular parts of a real non-homogenous celestial body proportionally to their densities. Each change of velocity or the motion's direction of the non-homogenous celestial body causes tensions in its interior and in the case of non-rigid bodies such as terrestrial or gas planets, relative shifts of the parts of different densities.

It means that reducing the non-homogenous celestial body from the equation (5) to the case of the body from (3) as a material point is mathematically forbidden as the vector sum of momentum cannot be substituted with an arithmetical sum. It means that transformation of accelerates reference frame to inertial reference frame, where orbital centrifugal force does not exist is mathematically prohibited. Through this transformation the whole information concerning the internal structure of the celestial body and stress in its interior is lost.

Each true non-homogenous body during every rotation becomes a centrifuge which means that the so called weightlessness state on the orbit is only an approximation (with the exclusion of density differences). A proof for that are the phenomena observed at the ISS, which are erroneously called a microgravity. In reality they are differences of the orbital centrifugal force caused by differences in densities of particular parts of the station.

The proof for that every planet on the orbit around the Sun acts exactly as an ordinary centrifuge are the infrared photographs of Uranus taken in 1994÷2003 (**Fig.2**).

During these nine years the Uranus has moved for about $38,5^\circ$ on its orbit (the planet's year equals 84.014 Earth's year). We can see the same change of about $38,5^\circ$ in direction of orientation (in relation to HST) of warmer zone of Uranus' atmosphere axis and the orbit's plane of its satellites and rings. The warmer zone of Uranus' atmosphere clearly turns away from the Sun together with the planet's rotation axis and the plane of satellites' orbits. It is an unquestionable proof for that the Sun cannot be the reason of this irregular distribution of temperature in the upper layers of the Uranus' atmosphere. If it was the Sun that warmed the planet so irregularly, then the warmer zone would always be turned towards the Sun.

In the photographs taken by HST we can see a clear correlation of this warmer zone of atmosphere with the plane of equator and the orbit's plane of Uranus' satellites.



Fig 2. Infrared photographs of Uranus taken in 1994 – 2003 by HST

The only logical explanation of such irregular distribution of temperature in the atmosphere of Uranus can only be the big asymmetry of its hot interior.

That is why a conclusion appears that the 'false colors' picture of Uranus (**Fig. 3b**) sent to the Earth in 1986 by Voyager2 shows the position of hot inner core of this planet, not a layer of 'smog' warmed by the Sun as it was misinterpreted by the members of JPL-NASA Imaging-team in Pasadena.

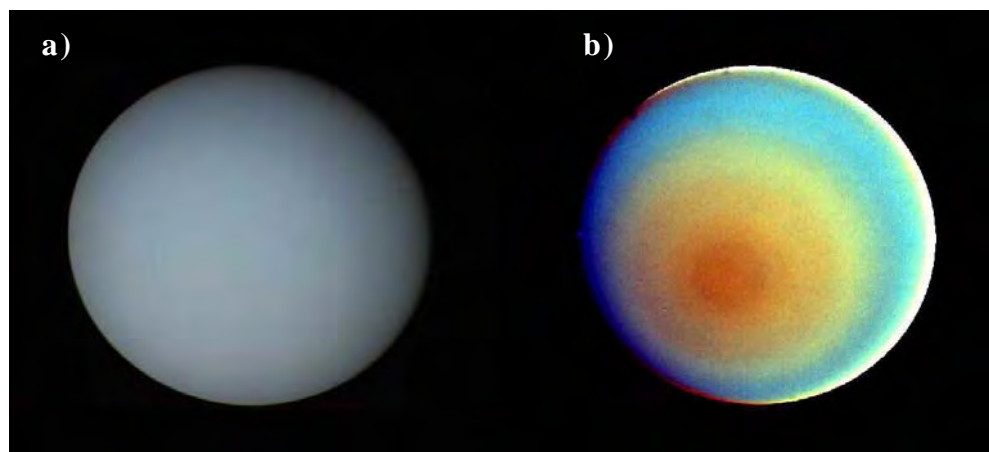


Fig 3. Photos of Uranus taken by spacecraft Voyager2; 1986
 a) True color image of Uranus
 b) False color image of Uranus

As it results from the above given arguments the theorem stating that the only force acting on a body in orbital motion is the gravity force is fundamentally erroneous.

The orbital centrifugal force results directly from the principle of momentum conservation as a vector value and is inseparably connected with the centripetal force. Therefore a fundamental error is a statement that the Earth, Moon or any space object are in freefall in their orbital motion.

Therefore both the concept *Free Fall* and the *Universality of Free Fall (UFF)* are myths that need to be rejected by physics as they block further development of geophysics and astronomy.

In [5] we can read:

The universality of free fall (UFF) asserts that a point test body, shielded from all known interactions except gravity, has an acceleration that depends only on its location.

Point test body is an intellectual auxiliary object in physical theories and does not exist in the true (real) universe. In the universe where the Earth and Moon revolve around their common centre of gravity, together revolve around the Sun and together with the Sun revolve around the centre of gravity of the Milky Way, together with our galaxy revolve around... etc., we need to ask a question “*does the universe have a centre of gravity?*”

In the universe where the Solar System, the Milky Way and other galaxies act as an ordinary centrifuge, an inertial frame is the same intellectual auxiliary as the point test body. The postulate of existence of the true *inertial frame* in the truly existing universe automatically implies existence of an absolute space.

As it is proved with the above presented arguments, the gravity force is not the only force that acts on a space object moving on an orbit and the true, non-homogenous and non-rigid body cannot be reduced to its centre of gravity (as a material point).

It means that the signals registered at the University of Washington with the *Eöt Wash torsion balance apparatus* have nothing to do with the Equivalence Principle or other problems of cosmology. These signals only show the differences of orbital centrifugal force for test bodies of different density. An argument for that is given in Fig. 9 in [5] (see picture).

The erroneous theoretical assumptions of the experiment at the University of Washington are the reason for which the signal Q_{21} in the torsion balance apparatus was misinterpreted as a disturbance caused by water soaked into the soil and compensated by counterweights. As we can see, the Q_{21} parameter was monitored for one week only and then the monitoring was aborted.

If the recording of the parameter was conducted for a whole month, the Q_{21} signal measurements would demonstrate oscillations as it is shown in Fig.3 . The reason of this parameter’s oscillations are the cyclic changes of the orbital centrifugal force of Earth’s motion around the Sun. The reason of these oscillations is the motion of the Earth around the centre of gravity of the Earth-Moon system.

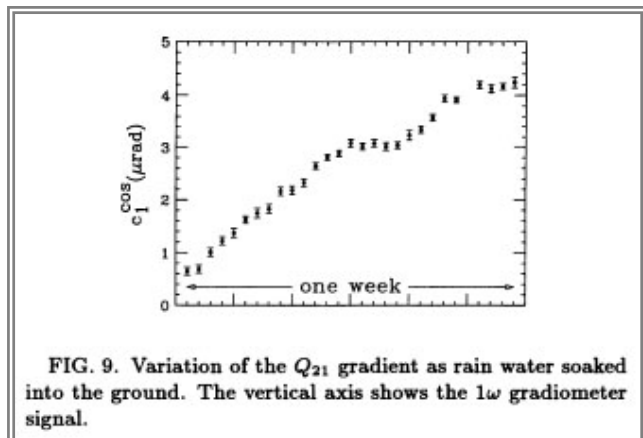


FIG. 9. Variation of the Q_{21} gradient as rain water soaked into the ground. The vertical axis shows the 1ω gradiometer signal.

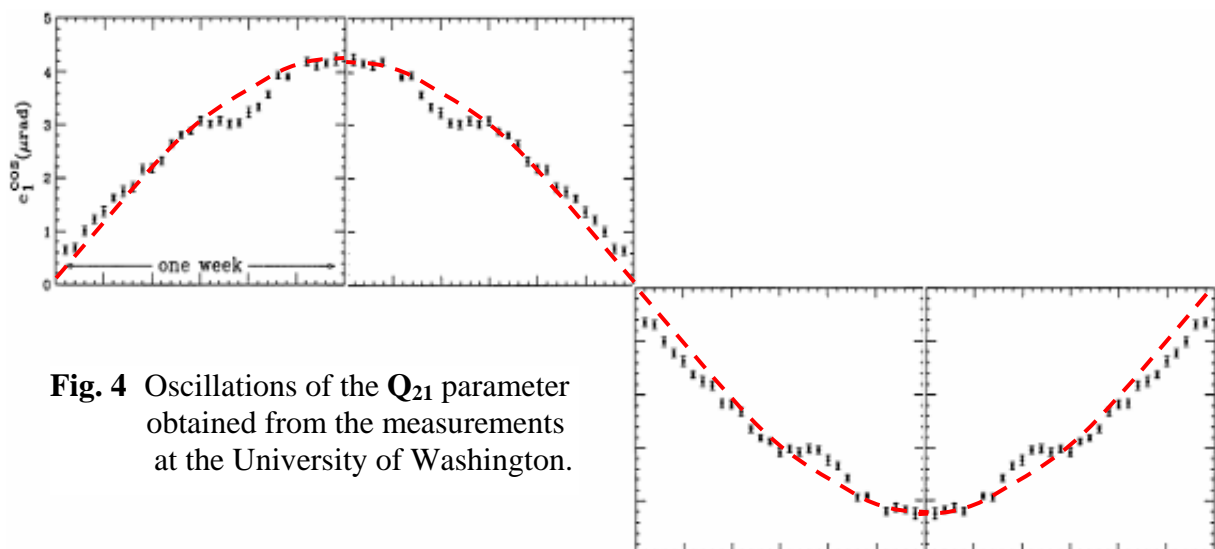


Fig. 4 Oscillations of the Q_{21} parameter obtained from the measurements at the University of Washington.

The oscillations of the Q_{21} parameter in the torsion balance apparatus are confirmed by the *Space pendulum* experiment (**Fig. 5.**) conducted in Warsaw in 2006. A lead sphere (2) of weight of ca. 100 kg is hanged on a tungsten wire (1) of ca. 50 m long. The sphere is covered with a casing (3) cooled at the bottom (5). Position of the sphere is measured by two laser beams (4). The angle between the beams is 90 degrees.

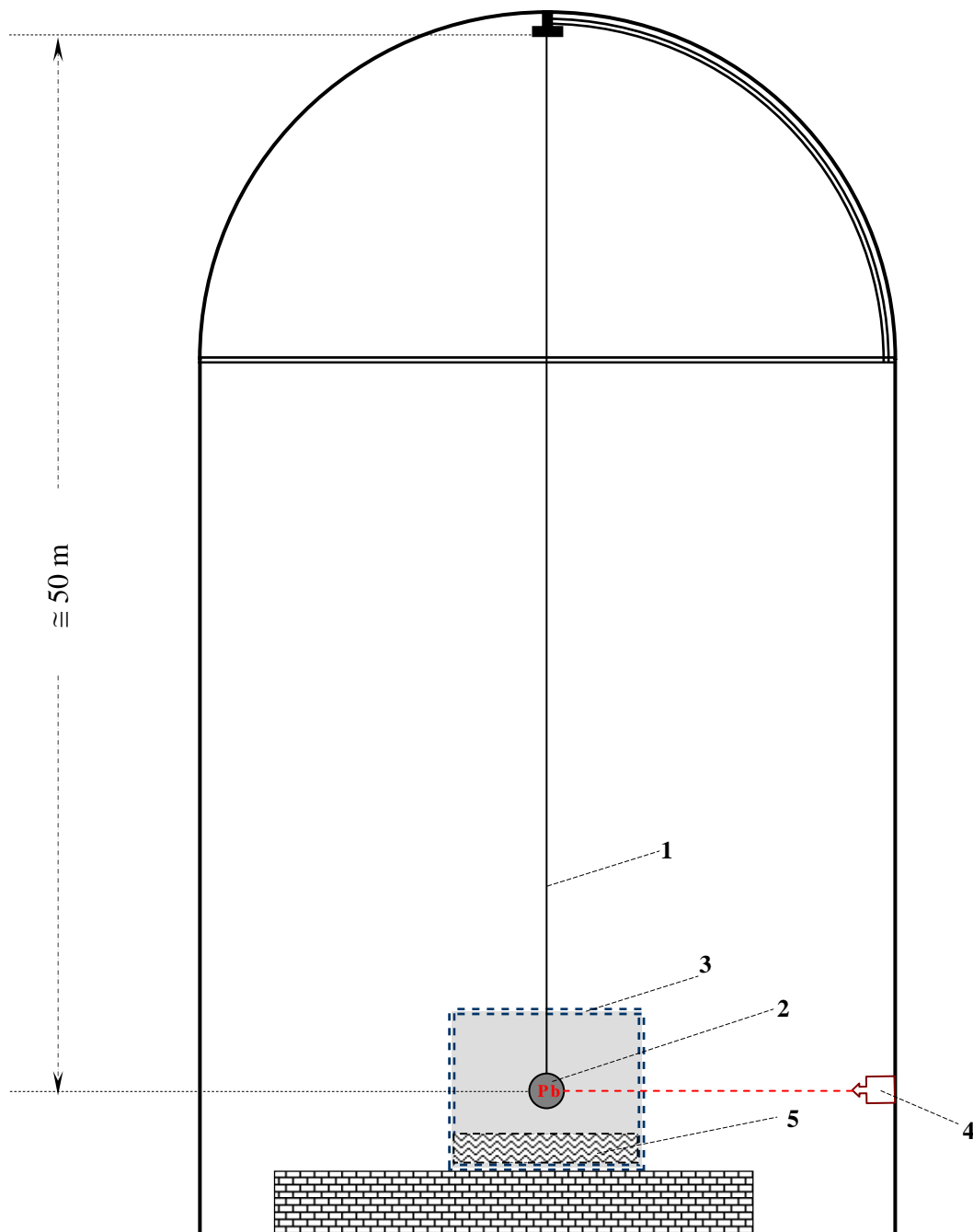


Fig. 5 *Space pendulum* experiment

The laser measurements of the pendulum's position show that a body of a big density hanged freely does not stay motionless in the gravity field of the Earth-Moon system. As it can be seen in **Fig.6** the *Space Pendulum* makes a daily motion on a small ellipsis which parameters

depend on the geographical position on Earth. Direction of the motion is opposite to Earth's rotation therefore – clockwise. The second motion are the monthly oscillations of the ellipsis itself. The reason of these oscillations is the motion of Earth and Moon around its common centre of gravity which is the reason of changes of the radius of Earth's revolution around the Sun.

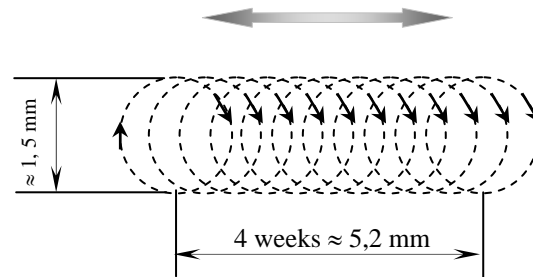


Fig.6 Oscillations of the *Space Pendulum* for the localization Warsaw, Poland.

The interior of the Earth

From the arguments given it results that the heterogeneous celestial body on the orbit cannot be neither in mechanical or hydrostatical equilibrium.

Taking into consideration in the orbital calculations the internal structure of the rotating Earth leads to the distribution of pressure in the liquid outer core shown on the Fig.7. Nowadays the inner core is shifted from the geometrical center of Earth for about 150 kilometers in the direction nearing to the coordinates of point 'A'.

The common effect of the centrifugal force of the orbit with Earth's rotation causes that the asymmetrical inner core moves westward inside Earth. This movement causes formation of condensed zone of higher pressure in the liquid outer core under Australia. The zone spreads in the whole volume of the liquid outer core ('+' and '-' on the Fig.7) on the commonly known principles of waves' propagation in fluids.

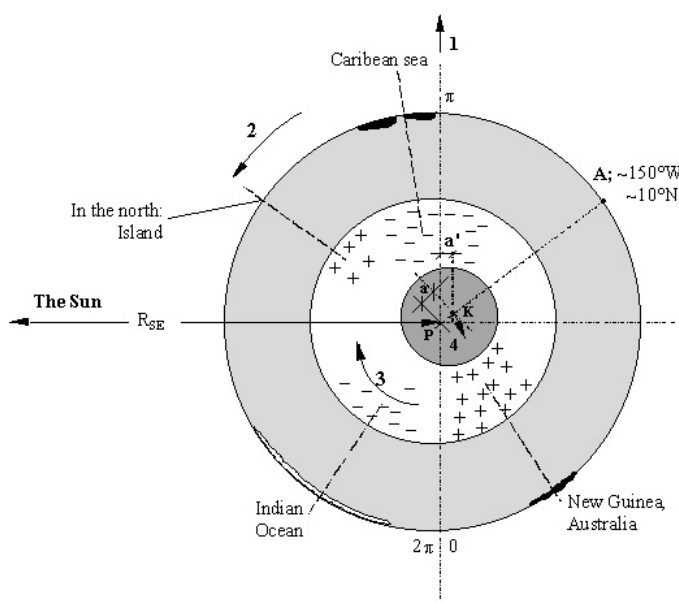


Fig.7 Equatorial cross-section of the earth rotating on the orbit:
 R_{SE} – the orbit radius around the sun
 P - centre of gravity of the total earth
 K - geometric centre of the inner core
 1 - direction of orbit around the sun
 2 - rotation of the planet
 3 - the relative movement of the liquid outer core to the mantle of the earth
 4 - the relative movement of the inner core to the mantle of the earth
 a - the eccentricity of the mantle-core mass system
 a' - the component, parallel to the orbit radius of the planet, of the orbit of point "K" around point "P"
 "+" - zones of the outer core where overpressure exists
 "-" - zones of the core where underpressure occurs in the outer core

Inside the Earth are created zones of increased and decreased pressure of the liquid core. This unequal pressure distribution causes deformations of Earth's crust and mantle. We can see those deformations on all of the images of geopotential model (GRIM, EGM96 and others). Together with the movement of the solid inner core inside the mantle also the zones of increased and decreased pressure inside Earth move and together with them the deformations of Earth's crust drift west.

That west drift of the Earth's crust deformations is a driving mechanism of plate tectonics, which means it is the cause of the continental drift and all the phenomenons connected with it, among others earthquakes.

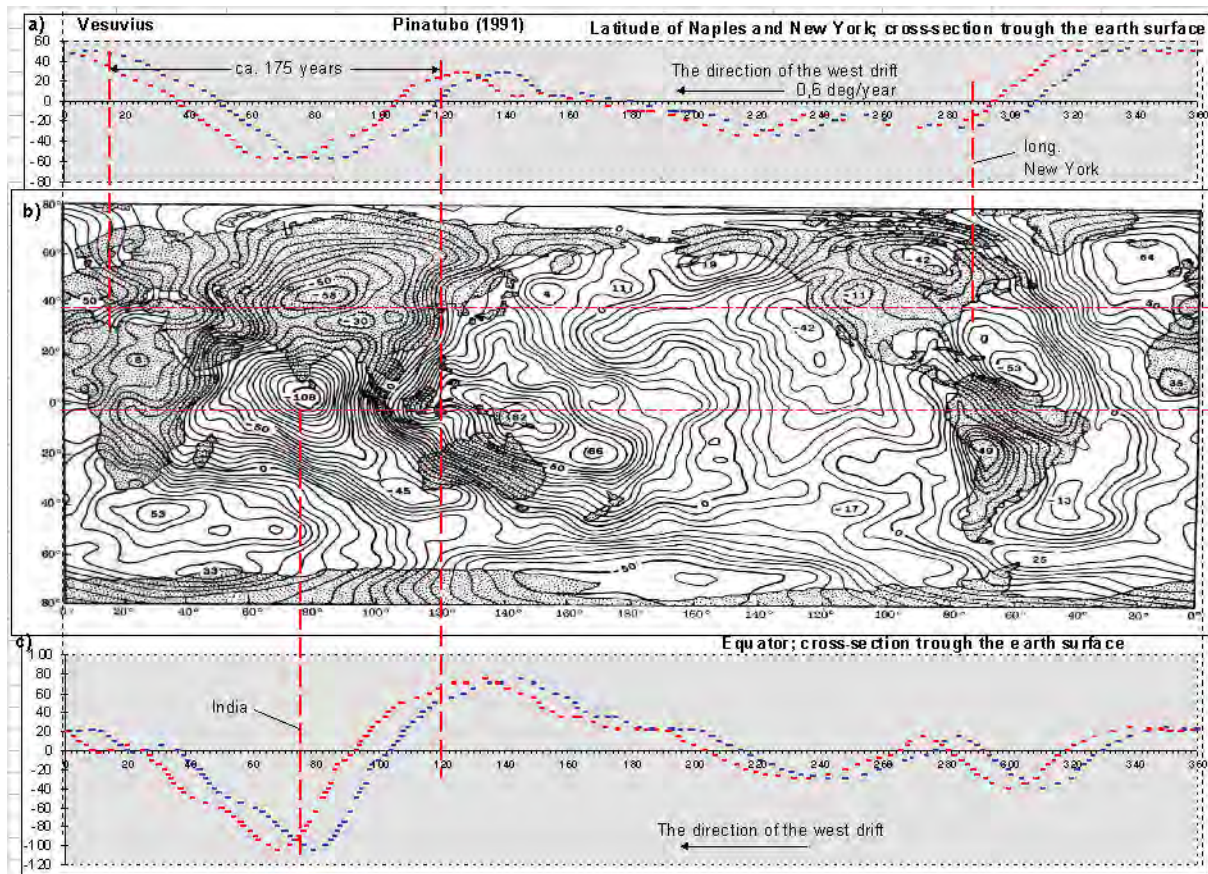


Fig 8b.: Geoid GRIM2; Deformations of the earth surface in relation to reference ellipsoid (Balmino et al. 1976) [Tadeusz Tumalski, 1996]

Nowadays, we have a lot of proofs that the deformations of the Earth's crust move west:

- When Anders Celsius was the director of the astronomic observatory in Uppsala, he marked the level of water in the Baltic Sea on a neighboring rock. Nowadays, 260 years later, the level of water in Baltic is few meters lower than in times of Celsius. As an explanation of this fact there is made a hypothesis (among others in Harvard-Seismo) that Scandinavia "comes up" from the Earth's mantle after melting of glacier of the last glacial epoch.

This hypothesis raises serious doubts. In few different places on Earth the level of water in seas and oceans clearly rises. In compliance with the glacial hypothesis concerning decrease of water in Baltic Sea, we should expect that it is the glacier's growth in those places that 'bends' the Earth's crust and causes rise of water.

Because the rise of water concerns:

- southern Europe,
- Caribbean Sea,
- Black Sea,
- Africa,

then the glacial hypothesis falls into some argumentative difficulties, because in these regions of our globe we cannot discover any growth of glacial cover. In Europe we have the worldwide known example of Venice, where quite often Wellington boots are handed to guests of cafés, because the lagoon gets further and further to the city. During the last decades few smaller islands disappeared under waters of Caribbean Sea.

- The Trinidad island sinks in the Caribbean Sea with the speed of 3 cm per year. As an explanation of this phenomenon the physicists are giving the sand that is being carried by rivers. The only bigger river in this region is Orinoco. Provisional calculations of constructional static show that to bend Earth's crust with the speed of 3 cm per year, the Orinoco river would have to carry not water but sand only and with bigger speed than the water flows nowadays. Hitherto, there haven't been recorded any mass shift of ground or any decline inside the South America continent.
- Water in the Black Sea has risen so much that several coastal villages disappeared under its surface. In geophysics there are so far no trials of explaining these phenomenons.
- each year 36,000 cubic kilometers of water flows through the Gibraltar Strait from the Atlantic to the Mediterranean Sea. Some American geophysicist explained that fact with faster evaporation of water in the Mediterranean Sea than in the Atlantic. He only didn't say on basis of what physical laws water on the eastern side of Gibraltar would evaporate faster than on the western side. It is also not known why the evaporation 'stops' near of Sicily, because level of water in Venice rises.
- tectonic ditch system in eastern Africa fills with water from the Indian Ocean. Water flows there from the ocean deep into the land. Exactly opposite than it happens in rivers.

These phenomenons has no plausible scientific explanation in geophysics so far.

After reading these examples one can't help impression, that geophysicists confine themselves to explaining local phenomenons with local hypotheses which quite often exclude each other and they completely lost the Earth as a whole from their field of vision. All the above vaguenesses and contradictions disappear when we visualise that the deformations of the Earth's crust, which we can see on the map above, move west. Water in oceans and seas flows from these places on Earth which rise to those which drop, on the principle of equalizing the hydrostatic level.

On the equatorial cross-section of the Earth's surface we can see why in India and its nearest areas there are so many heavy intraplate earthquakes. Nowadays, under the Indian Ocean moves the biggest dent of the Earth's crust.

As it occurs from the above considerations the model of the west drift of Earth crust deformations as a drive mechanism of plate tectonics makes a logical picture of many geophysical phenomenons, that were not possible to explain so far. This model may be a starting point in explaining some of the climate phenomenons on our globe, as the El Niño/La Niña and others, because the drift of the Earth crust's deformations causes changes in the intensity of ocean currents as it is in case of Gulf stream.

Conclusions

Logical picture of the plate tectonics drive mechanism may be the basis for improving both global and local prognosing of tectonical phenomenons as earthquakes and volcanoes' eruptions. The only thing that geophysics and the inhabitants of the threatened areas of our globe need is good will of geophysicists themselves and their readiness to revise the wrong ideas that block the advancement of science.

References

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