The algorithm for calculating the Earth's core runs on the parameters of natural pulsed electromagnetic field of the Earth

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Abstract. This paper presents the argumentation in favor of a hypothesis of the eccentric rotation of the Earth's shell and core. It covers the algorithm and computation of movement path and position of the Earth's core by the Earth's natural pulse electromagnetic field characteristics.

Earth's natural pulse electromagnetic fields (ENPEMF) are generated by Earth's crust heterogeneities, mechanically stressed structures, cracks and microcracks. Mechanical and electric transformations caused by actions of strain waves from the lower mantle, tidal forces, microseismic vibrations, wind and man-caused load generate pulse electromagnetic fields that create a natural electromagnetic background of a lithospheric origin [1]. Many-year observations in various regions of the Northern hemisphere showed that the ENPEMF variations demonstrate a stable diurnal and annual pattern. Spectra of such variations contain all frequencies related to the Earth's rotation around its axis, Earth's revolution about the Sun and changes of Earth's axis tilt. But diurnal and annual rotation of the Earth is not enough for such patterns to occur. Considering that an electromagnetic emission of rocks occurs only if the rocks are exposed to some disturbances, we set a goal to find the source of such disturbances. Among such actions that impact the Earth's surface there are the heat effect of the Sun on the Earth's surface or irradiation of the Earth's surface with an electrojet, but such actions cannot cause significant modulations of mechanical and electromagnetic transformations in rocks and, consequently, cannot cause stable diurnal and annual variation patterns of ENPEMF. Diurnal variations of temperature on the Earth's surface cannot actuate the EM field sources in a certain period of day. It is not average diurnal temperatures but average yearly temperatures that remain unchanged at a depth of few meters. And all the temperature processes affect only loose surface layers and can cause neither deep-seated temperature variations nor deep-seated temperature deformations. Lunar and solar tides that create considerable mechanical stresses in upper layers of the Earth's crust cannot explain a strict diurnal and annual pattern either. The most intensive tides are caused by lunar action. And the period of Moon's revolution around the Earth is not equal to 24 hours. Known frequencies of lunar tidal forces are not seen in ENPEMF spectra. Periodic patterns are also observed in variations of the atmospheric pressure affecting the Earth's crust. However the atmospheric pressure does not have a strict periodicity pattern that is typical of ENPEMF.

Due to the fact that we failed to find sources of one-way impact on the Earth's crust outside it, we assumed a hypothesis of the Earth's core shift relative to the geometric center of the Earth and eccentric rotation of the Earth's core and crust. Eccentric diurnal rotation of the Earth's crust around the Earth's shifted core causes pressure from the core and the melt surrounding it towards the mantle which bulges the shell from outside. In other areas of the planet, on the contrary, forces that draw the Earth's shell inside towards the core will occur. In case if the proposed hypothesis is true, the Earth rotation will inevitably cause the stress from the Earth's core towards the Earth's shell. Due to diurnal rotation of the Earth, the zone of pressure starts moving and, together with it, points on the Earth's crust will also start moving at the moment when disturbance caused by the shifted core is passing below (Figure 1). This leads to occurrence of diurnal rhythms of the Earth's crust. The yearly shift of the core will cause annual rhythms. We considered such a mechanism of occurrence of diurnal and annual variations of ENPEMF and seismicity in our previous publications [1].

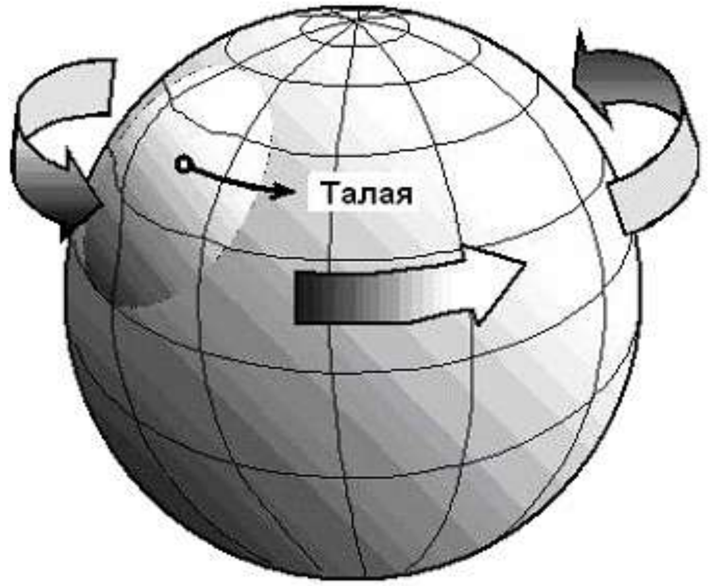

Figure 1. Perturbation produced by eccentric motion of core and lithosphere.

Recently a lot of indirect evidences of the fact, that the metallic core of the Earth is shifted relative to the Earth's geometric center by gravitational fields of the Sun, the Space and the Moon or by other non gravitational mechanisms, have been found [2]. Among methods of depth sounding of the Earth's structure one knows techniques based on three main physical principles, i.e. recording of seismic waves (seismic methods), recording of the gravity (gravimetric methods) and recording of a geomagnetic field of the Earth (magnetometer methods) [3]. However, these techniques have a number of disadvantages. For instance, a seismic technique of studying the Earth's subsurface structure is limited by a fast attenuation of a seismic signal when it propagating inside the Earth. Therefore, seismic methods can be used only when there are available seismic waves generated by extremely great (disastrous) earthquakes or by violent explosions similar to a nuclear explosion by yield.

Considering the fact that currently the moratorium on nuclear weapon testing is in force, it is seen impossible to apply the artificial actuation of the Earth's crust to implement our task. Disastrous earthquakes occur on the Earth no more than one per ten years. Therefore, application of a seismic method to the periodic or continuous monitoring of the Earth's core movement is impossible.

Theoretically gravimetric techniques of monitoring allow recording the gravity variations caused by the Earth's core movement because a specific density of the inner solid core is higher than that of the liquid outer core. However in practice the sensitivity of gravimetric methods is limited by gravity variations caused tidal strains of the earth's surface and by relative strains related to variations of the atmospheric pressure at the observation point (about 10^{-8}). This level of sensitivity is not enough to record processes caused by the core movement.

Due to lack of an exact and proven theory of the Earth's geomagnetic field origin, geomagnetic fields cannot be used to identify the Earth's core position either. In addition to it, there is not any quantitative estimation of the core shift. Theoretical estimations are inconsistent and vary from almost impalpable ones up to values of few hundred meters [2].

A high sensitivity of the method based on recording the ENPEMF to processes occurring deep inside the Earth is achieved by using natural processes of mechanical and electric transformations of energy inside rock massifs in the rock natural environment. Obviously, the more strains in the Earth's crust, the more intensive the processes of energy transformations are, and the higher the energy and amplitude of an electromagnetic pulses flux coming from the lithosphere are. Thus, a unit that records a natural pulse EM field and is placed at a certain geographical point on the Earth's surface can be considered as an Earth's crust strain gauge at the point of this recording unit location.

A vast rock massif, where the natural pulse EM field of the Earth is recorded, ensures stability of such a natural energy transformer and its high sensitivity to global processes occurring deep inside the Earth. The sensitivity of the ENPEMF method to relative strains of the Earth's crust can reach up to 10^{-11} that is three orders higher than the sensitivity of state-of-art gravitational and strain monitoring methods.

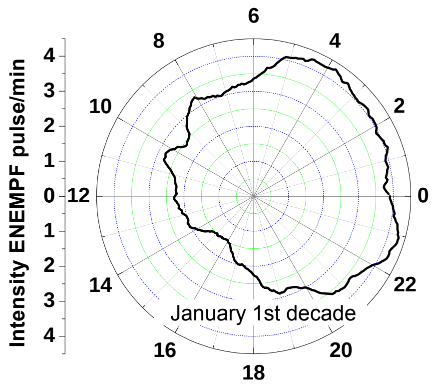

Figure 2. Intensity of ENEMPF in polar coordinates.

In view of the fact that a lithospheric component of ENPEMF is modulated by long-period waves from the lower mantle, units recording such fields can be used as instruments to evaluate the strain waves and calculate the path of the Earth's core which has generated such strain waves. A fixed observation station placed in middle latitudes of the globe will make a full turn above the Earth's core which is close to the Earth's center within 24 hours. Consequently diurnal ENPEMF variations plotted in polar coordinates can be considered as a certain pattern of strains (in relative units) generated by the core at the latitude of the observation station. Because it takes a year for the core to make a full turn, the strain pattern will be altered from month to month. Basing on this assumption the location of the core center inside the Earth was computed. Figure 2 illustrates diurnal ENPEMF variations smoothed by 60 minutes with a sliding window method for the first decade of several-year Januaries plotted in polar coordinates. Values of solar local time and EM field amplitudes at this local time are plotted circumferentially and radially, respectively. A "disturbing" source generating strains in the Earth's core is thought to be located at a point that can be calculated as a center of masses of a planar figure bordered by an obtained curve; the center of the globe is located in the zero point with a zero angle and vector. The vector to the center of masses shows a value (expressed in relative units) and the direction of shift of the disturbance source, i.e. the core, relative to the geometric center of the planet. Then, one should take into consideration that during a year the core moves closer to the latitude of the observation station one day but the other day it moves away from it towards the Southern hemisphere. This is evidenced by increase of diurnal means of ENPEMF intensity in the Northern hemisphere in summer time and their considerable decrease in winter time. Correction for latitudinal shift of the core can be made by normalizing a diurnal pattern for each period and making it equal for each season. After having normalized the diurnal pattern, let us determine the location of the masses center for 36 decades of the year like we did it for the first decade of January. To do this, let us plot the obtained values in polar coordinates (Figure 3). In view of the fact that computations are made as per only one observation station located in the Northern hemisphere, Figure 3 shows a planar figure of a yearly movement of the core as seen from the pole.

It is shown that the inner core is never in the geometric center of the planet but makes oscillating movements next to it along a close orbit. The plane of the core orbit is perpendicular to the plane of equator and is inclined at about 45^0 to the direction to the Sun and to the orbital motion of the Earth around the Sun. An angular velocity of the Earth's core rotation calculated according to frequency characteristics can be an argument in favor of the proposed hypothesis. An average angular velocity of the core rotation is 1.1 degree per year higher than the angular velocity of the Earth rotation. The obtained results of studying the core movement are in line with well-known facts of unstable rotation of the Earth. Estimated values presented in references vary from 0.3 up to 2.8 degrees per year [3, 4].

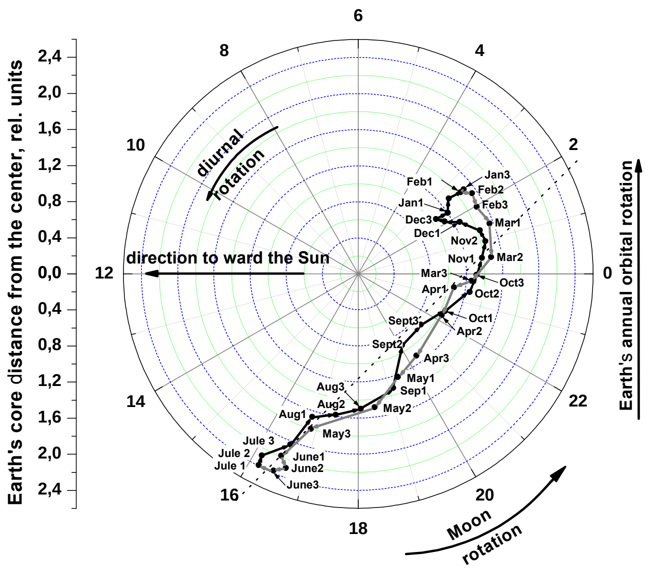

Figure 3. Yearly trace of Earth's core.

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