GEOMAGNETIC PULSATIONS AND TUNGUSKA-1908 PHENOMENON

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ABSTRACT

Although already 100 years have passed after the Tunguska event, the scientific community is still far from clear understanding of what happened in Siberia on 30 June, 1908. It is generally accepted that the Tunguska event resulted from the catastrophic disruption of a comet or an asteroid. Nevertheless there is no common agreement that the meteor really existed. In this report a new concept for solution for the Tunguska-1908 phenomenon is presented.

For the Tunguska event we assumed correlations between the phenomena of the solar eclipse on 28 June, 1908 and ULF-pulsations which prof. L. Weber registered in Kiel (Germany) from 27 till 30 June, 1908. In addition scientists observed magnetic vortical structures on the Sun at this time. According to a hypothesis by R. Dicke (1964), the Sun possibly emits scalar waves in a long-range, i.e., zero-mass chargeless, scalar fields. In a context of the Tunguska phenomenon, we discuss a possibility of existence of scalar waves and a variation of the gravitational constant during solar eclipses. On the other hand, there is a significant coherence between magnetic variations and fluctuations in tides. In the beginning of 20th century a big bump in the secular evolution of the Moon's longitude was observed. We performed reconstructive computer calculations of a lunisolar gravitational tide for the Tunguska-epicentre in Siberia for 30 June, 1908 and found that the time of the tide (outflow) coincides exactly with the registered time of the explosion at this geographic location on June 30, 1908. Anomalous gravitational tide could lead to changes in the terrestrial magnetic dipole and to trigger the tectonic activity.

Eastern Siberia, where the explosion had occurred on 30 June, 1908 is the field of protokimberlite pipes. The epicentre of the Tunguska-explosion is the 248 Myr-old volcanic crater that associates with the mantle plume, i.e., a hotspot. We argue that the Tunguska-1908 event was most probably a tectonic explosion of the kimberlite paleovolcano initiated by solar-lunar gravitational phenomena, but not an encounter of the Earth with a fragment of an asteroid or a comet. The correct solution for the Tunguska event has a fundamental significance in our understanding of the lunisolar activity and the origin of magnetic fields.

INTRODUCTION

In the early morning on June 30, 1908 at 7:15 (± 5 min) a.m. that correspond to 0:14 (± 5 min) UT, a powerful explosion occurred in the Kulik-caldera, Eastern Siberia. Scientists examining the area estimated that the explosion was equivalent to 5÷40 megatons of TNT. The blast felled trees in an area over 2,150 square km. Barometric and seismic disturbances from the explosion were recorded world-wide. For the first three nights after the Tunguska explosion, skies of Eurasia were exceptionally bright and then the effect abruptly disappeared. Although most observers generally accept that some kind of a celestial body, either a comet or an asteroid, could blow up, however, the main puzzle is the absence of space-body remnants in/on the ground in the affected region. And now, more 100 years later, the debate about the Tunguska event continues.

PULSATIONS IN KIEL AND THE VORTEX OF GRAVITY

Linear gravitational field equations, that are obtained from Maxwell's equations by using gravitational vectors instead of electromagnetic vectors, have attracted the attention of scientists long ago. When Heavisidian monopoles are taken into account the equations can be modified by introducing two scalar fields. In 1969, J. Carstoiu [1] presented the so-called vortex field of gravitational force, comparable to the electromagnetic system.

For the first time vortical structures on the Sun were observed in 1857 [2]. On May 5, 1907 the same structures were registered on the sundisk again. A. Stentzel has paid attention to the effect of a 50-yr period of these structures. The effect of inversion of speeds for neutral points of polarization has been noted since May, 10th 1907 when the rate of increase of Arago point has exceeded the rate of increase of point Babine [3]. Obviously, this effect could correlate with above mentioned vortical structures on the Sun at that time. Increasing of the angular distance of neutral points (both Arago and Babine), which has begun on May, 1907, proceeded till the end of June, 1908. Exactly after the Tunguska explosion the maximum relative increase of the polarization for the whole period from 1905 till 1910 was recorded [4].
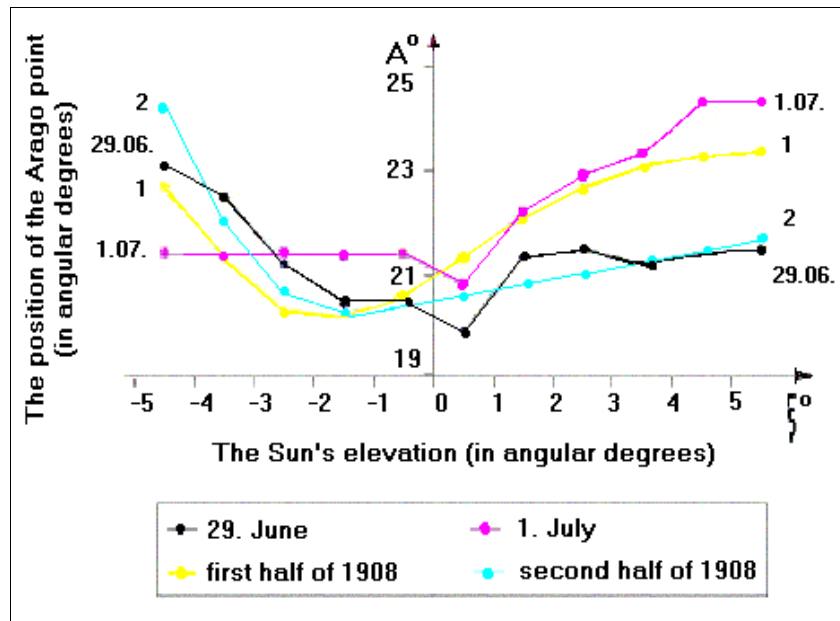
Figure 1: Change of the position of Arago point
during the first and second half of the year 1908

For one day before the Tunguska event ("Fig.1") Arago point curves registered by F. Bush in Arnsberg [4] clearly indicated the occurrence of anomalies. An standard minimum for Arago point was displaced in a branch of positive elevation of the Sun). Given the identity of this minimum both on June 29th, and on July 1st, its shift has no direct relation to effects of the Tunguska explosion on June, 30th. Obviously, a drift of minimum of Arago point allows us to assert that the effect of violations of the polarization was already on 29 June and continued to July 1st. The curve for Arago point on 29th of June already corresponded to the average curve of the second half of 1908 and it is one of confirmations of the version about the occurrence of polarization anomalies well before the Tunguska explosion. We see that from June 29 till July 1, 1908 effect of polarization anomalies extended in a direction from the lower layers to the upper layers of the atmosphere, rather than vice versa, as would be expected if the comet's substance had penetrated from the space into the atmosphere. The situation of the inversion for the speeds of neutral points had been repeated later in 1919 [4]. In fact, 11-yr cycle between 1908 and 1919 allows suggestion of a relation of the polarization effect to the solar activity. Therefore we assert that the polarization effect of the Tunguska event could had correlations with solar activity, fluctuations of a Earth's magnetic field, and, as consequence, with a tectonic activity.

Since April, 1908 A. Stentzel noted optical anomalies in the low layers of the atmosphere, at a height of 35-50 km [5], and on 30 April, 1908 luminous clouds were observed at a height of 35 km over Portsmouth, England [6]. At same time, on 29-30 April, 1908 G. Hale on a Mount Wilson again observed vortical structures in the Sun and later on June 25, 1908 he has registered magnetic fields in sunspots for the first time [7]. Sun's activity is confirmed by the photographs of the widening of spot's iron line on June 27, 1908 [8] and by the observation of a large protuberance of the Sun's limb on 30 June, 1908 at the afternoon. As was proved recently, the index of solar rotation, which is defined by integrating the angular momentum density over the entire solar surface, reached a maximum in the 14th solar cycle (1901.7-1913.6) [9]. Curiously or not, but in a paper, published in the Philosophical Transactions in year 1906 A. Schuster gave the times of maxima for sunspots of this period as being 1903.72+4.79. This would bring the maximum to 1908,51, or for 1 July, 1908 [10].

During the Tunguska event L. Weber, of Kiel University, reported regular magnetic oscillations with an amplitude of 2' and a period of 3 min on 27-30 June, 1908. These strange disturbances occurred [11]: June 27/28 — 6:00 p.m. till 1:30 a.m., June 28/29 — the same, June 29/30 — 8:30 p.m. till 1:30 a.m. There are several intriguing aspects of registrations in Kiel: pulsations were detected in the evening/night time only and ended on June 30, 1908 at 0:30 UT, i.e., about the time of the explosion in Siberia. Therefore the source of pulsations in Kiel is one of key factors for the solution of the Tunguska enigma.

According to the typical classification scheme of pulsations [12], oscillations with the period about 3 min are continuous compressional Pc5 pulsations in the ULF range from 2 mHz to 8 mHz. Geomagnetic pulsations are attributed to hydromagnetic waves, which propagate under the influence of various kinds of resonant systems in the Earth's space, and they are modified in a very complex way both by magnetospheric/ionospheric currents and by the ground currents. As Pc5 pulsations in Kiel were registered in the evening/night time we may assume that the well-known mechanism of

the radial diffusion caused injections of the solar plasma into the magnetosphere at the night side of the Earth. A period of pulsations in the Earth's magnetosphere depends on the plasma's density distribution.

Therefore Pc5 pulsations exist as oscillations of geomagnetic lines distorted by the solar wind or by changes in the ambient plasma density at distance 6,3 R_E (R_E – radial distance from the centre of the Earth). ULF waves well associate with magnetospheric substorms. On 30 June, 1908 after the Tunguska explosion the observatory in Irkutsk registered a magnetic substorm which has lasted 4.5 hours. It is known that terrestrial magnetic storms have a connection with CMEs (coronal mass ejections), i.e., with magnetic clouds, and with CIR, i.e., corotating interaction around the Earth. Scientists from the Ulysses mission have proven that the interplanetary magnetic field in turn interacts with the Earth's magnetic field and causes it to oscillate in resonance, retaining the characteristic the solar g-mode [13]. Although a period of oscillations of the solar corona (solar p-mode) is equal to 5 min, a period of pulsations of the solar photo-sphere is equal to 3 min (as period of pulsations in Kiel in 1908).

Systematic measurements of the magnetic fields of sunspots had begun only in 1917 and therefore we know nothing about the relation between area of sunspots and the magnetic field strength in cycle 14 (1901.7-1913.6) [14] (however there there had been evidence of acceleration of the geomagnetic field in 1912-1913). It is shown that no single method is adequate to estimate secular variations of geomagnetic field components for more than a few years [15].

DISCREPANCY OF THE MOON LONGITUDE

Astronomers have always referred to the secular tidal effect as an acceleration of the Moon longitude. The discrepancy in the secular evolution of the Moon longitude (the big bump) was observed in the beginning of 20th century (1900–1920). It is a historically old problem [16]. Remarkably, that the period of time of the discrepancy in the Moon longitude includes also the year of the Tunguska event. For solution of the Moon longitude discrepancy it was supposed some minor changeability either in the Moon's period or in the Earth's rotation.

1. By assumption of R.Dicke, the discrepancy is, as least in part, due to a variation in the Moon's period. He supposed that the Sun possibly emits scalar waves in a long-range, i.e., zero-mass chargeless, scalar fields [17]. According to this hypothesis, the discrepancy in the secular evolution of the Moon longitude in the beginning of the 20th century was possibly caused by the Moon passage through a stream of scalar waves.

It is worthy to add here two words about scalar fields. There are Dirac's hypothesis in which Newton's constant is al-lowed to vary with space and time. In the Jordan-Brans-Dicke theory in addition to the metric in the universe, there is a space-time scalar field, which has the physical effect of varying the gravitational constant from a point to a point. Mod-ern supergravity theories assume that there are interesting new ingredients – strings, branes, fluxes etc. From a distance they just look like even more scalar fields. If a long-range scalar field exists in addition to the tensor field of Einstein's theory then general relativity probably may be made compatible with the requirements of Mach's principle. Scalar fields generate an increase of inertial effects and, in this connection, reduced local gravitational accelerations. For the explanation of physical effects in the universe instead of existence of the dark matter it is sufficient to postulate varia-tion of the gravitational constant. In addition periodic variations of the "effective" gravitational constant with the lunar or diurnal period have already been pointed out [18]. The version of the Kaluza-Klein theory which includes an external scalar field minimally coupled both to gravity and to the geomagnetic field had been defined (as a consequence, the equation of motion of a satellite should be sensitive to the "effective" gravitational constant).

According to hypothesis of R. Dicke the variations in earthquake rates is interpreted in terms of changes of the gravita-tion constant which (changes) could be caused by passaging scalar waves [17]. It is known that frequency of the earth-quakes have a maximum in mid-June when the Earth in an aphelion. A variation of gravitational constant with a period of a sidereal year was assumed [19]. The tilt of the geomagnetic dipole to the interplanetary magnetic field determines the point of summer solstice. Indeed, before the Tunguska phenomenon, on 22 June, 1908, optical anomalies in Europe sharply increased [5].

The length of solar cycle is not always 11 years but it changes from 8 to 14 years. According to this statement we say about nearly 50-yr period. Recent analysis of geomagnetic secular data along with yearly Wolf sunspot numbers (known from 1700 until present) show that about 50-yr cycle is very significant and possibly indicates an oscillation of a solar field of period 66-yr superimposed on the main field of period 11-yr [20], [21]. Record emission of a seismic energy for all 20th century has been registered since 1905 till 1907 [22]. Note that a tidal potential function had a maximum in 1908,5 and the next maximum was about 1956 [19]. In 1957, 50 years after the Tunguska event three earthquakes, strongest since 1900, with 9,1 magnitude occurred [23]. Continuing the line of reasoning, we propose a new hypothesis: if scalar waves really exist then probably there is a correlation between their emitting and an appear-ance of vortical rotational structures on the Sun.

Let us remind that solar eclipse was observed on 28 June, 1908, from 13:30 till 19:30 UT. There are a number of reports about changes of a geomagnetic field caused by eclipses. Pulsations that were registered in Kiel had begun 20.5 hours before the eclipse and ended 29 hours after the eclipse. Hence we can suppose that there the correlations, secular or not,

could be suggested between the Tunguska event and the solar-lunar-terrestrial effects of eclipses. Phenomena which have been repeatedly registered at solar eclipses have led to speculation that several effects may be significant for the alternative explanation of pulsations in Kiel during the Tunguska event. They include: (a) a generation of internal gravity waves for several days prior to and after the eclipse [24], (b) some sort of a geomagnetic reverberation effect of hydromagnetic waves between the Earth and the Moon [25], (c) a change of the gravitational constant because of gravitational shielding), (d) combinations of items from (a) to (c).

In 1954, during the June 30, 1954 solar eclipse M. Allais registered effect of the changes in azimuth angle of the paraconical pendulum, or possibly changes of the gravitational constant [26]. This effect set in well before an eclipse began and lasted at least half an hour after it ended. However, a reduction in the Earth's gravitation instead of its increase though the Moon shielded a part of Sun's gravitation was registered [27]. Therefore a question about existence of scalar waves in connection with an Allais-effect is open. In 1988, Fishbach's team, analyzing original Eötvös experiments, proposed a gravity-like "fifth" fundamental force in the nature [28]. According to model "a fifth force" would arise from the exchange of a new ultra-light boson which couples to ordinary matter with a strength comparable to gravity. "A fifth force" is a repulsive force. Whether could speak an Allais effect during eclipses about an appearance of "a fifth force"?

2. Another possibility for solution of the Moon longitude discrepancy is change of the Earth's rotation axis in spatial position. Let's notice that for the last 250 years deceleration rate of Earth rotation underwent sharp changes. Irregularities in the rotation of the Earth fall on: (a) Chandler wobbles of the Earth, or polar motion, (b) changes in the rate of rotation, or changes in the l.o.d. (length of day) [16]. Chandler wobble is a motion of the rotation axis with respect to the Earth's crust. The l.o.d. mainly connected to the work done by the Moon [29]. Runcorn [30] proposed that geomagnetic secular variations exert impulsive torques on the mantle and that these would perturb both the l.o.d. and wobble. Small cross-coupling between the l.o.d. and wobble was found [31]. Possibly reasons for fluctuations of l.o.d. (and for the Earth's magnetic field) could be found in the currents in a fluid core. The satellite experiments which have defined the westward drift of a magnetic field, supports for this hypothesis. Magnetic friction between the Earth's magnetosphere and the solar wind can decelerate Earth's core more strongly than tidal forces decelerate the mantle, and this process causes the westward drift [32].

An effect of a displacement for neutral points of the polarization both Arago and Babine in the Earth atmosphere similar to a polarization effect during the Tunguska-1908 event, F. Bush for the first time observed since April 1903 [4]. Remarkably that the minimum of the Earth rotation was registered approximately in 1903 as well. An increase in free oscillations of movement of the Earth between 1906 and 1908 it was reported [16]. Till now scientists have assumed that the Earth's pole did not change its location appreciably at the beginning of 20th century. But H. Kimura [33] reported that the amplitude of the vertical z-component of Chandler wobble grow specifically in 1907-1908, and possibly in 1909. Especially strong change in movement of the North Pole for all the period 1907-1910 [34] was recorded between 14 June, 1908 and 2 July, 1908. There are numerous attempts to link variations in the Chandler wobble to earthquakes and volcanic eruptions. Probably susceptibility of an Eötvös force to change of gravitation by an amplitude of 20 mGal explains an effect of polar movement [35]. An amplitude of 20 mGal accords well with a magnitude of lunisolar tidal forces [36].

NEW APPROACHES TO SOLUTION OF THE PROBLEM

It was already reported about the occurrence of hydromagnetic emissions for the day prior to and after the syzygy (a new/full Moon) [37]. It is known that that there exists a tendency of enhancing of the lunar modulation of geomagnetic indices during the syzygy [25] and that spatial variations of the geomagnetic field both the S_q and the L field disturbances are related to tides. The fundamental astronomical tides have been deduced by harmonic analysis. The Moon and the Sun, in fact, have about four hundred cycles. Although the Moon is much smaller than the Sun, it has a greater gravitational attraction for the Earth because the Moon is much closer to the Earth. It is well known that any geographic point on the Earth undergoes four tidal extremums daily: two inflows and two outflows arising because of gravitational action of the Moon and the Sun. When the Earth, Moon and Sun are aligned, tides can be unusually dramatic. Terms M_2 and N_2 produces 'beats' in the apparent values of lunar L_2. The variation of the distance Moon-Earth is sufficient to make considerable changes in the intensity of the tidal force. To the best of our knowledge, up to now nobody has calculated gravitational tides for June 30, 1908 – the day of the explosion in Siberia. We used the software ([38], [39]) for numerical modelling of temporal variations for the lunar tide N_2 for 30 June, 1908. Calculations showed that in the Kulik-caldera the lunar tidal outflow occurred at the local time 7:10 (± 6 min) a.m. Obtained time precisely coincides with the registered time of the explosion in Siberia on June, 30th 1908 at 7:15 (± 5 min) a.m. During an outflowing tide the Earth stress would cause an inward motion of the ground. A compression is maximal with the Moon on the horizon (morning earthquakes). This effect could work on 30 June, 1908 in 7:15 a.m.

Accurate geometrical boundaries for the gravitational tides exist for three families of the spherical harmonics (as, developed by Laplace). Geometrical limits of optical anomalies in Eurasia during the Tunguska event were: river Yenisey - on the east, the Atlantic coast - on the West, and on south - along the Tashkent-Bordeaux line. We found that these boundaries fit well the limits for the Earth's North hemisphere for the sectorial tide by Laplace classification. Sectorial tides are at least partly responsible for the secular retardation of the Earth's speed of rotation owing to internal friction and energy dissipation. The amount of energy stored in the internal tide may range from 5×10^{22} erg to 3.5×10^{24} erg that fit well the estimated amount of the Tunguska event energy, which was about 10^{23} erg [40]. The time of earthquakes is closely related to the variance ratio of the lunisolar tidal force. It is well known that 59% of earthquakes lay within $\pm$ 2 days from syzygy. Therefore we assert that the tidal force played an important role in triggering Tunguska-1908 earthquake. Eyewitnesses on 30 June, 1908 saw a large object shaped like a pipe with a white light moving vertically down for about ten minutes. Recent studies show that earthquakes disturb the ionosphere through the interaction between the atmospheric infrasound emitted by ground movements and the ionospheric plasma. ULF electromagnetic waves radiated by hypocentral zones during preseismic periods may cause charged particle fluxes precipitation from the lower boundary of the radiation belts [36]. Our previous studies showed that pulsations registered by L. Weber in Kiel on 27-30 June, 1908 had been probably connected to infrasound waves raised at the future epicentre of the earthquake in the Kulik caldera [41]. They correlated with evening/night intervals of radon emission [42].

On the other hand, during an Allais-effect a formation of the mascon (a concentration of mass) of 10^{11} kg inside an area of lunar umbra/penumbra at the altitude of 8.5 km during solar eclipses has been already assumed [27]. Here is considered gravitational effects of an increased density air mass spot due to cooling of the atmosphere. Using same arguments we suppose that such a mascon could form in the solar eclipse area (67° 9.2' W, 31° 26.7' N) on 28 June, 1908 and has been apparently able to reach Siberia on 30 June, 1908 [43]. Our hypothesis has a surprising correlation with results of recalculation for the seismic data [40] where it has been shown that the Tunguska object had a weight of 10^{11} kg, and that explosion has occurred exactly at a height of 8.5 km. Usual atmospheric tides probably have thermal rather than gravitational origin. By our previous statements Tunguska-1908 maskon [43], if it really existed, possibly could be as effect of anomalous tide, however, not on/in the solid Earth, but in the atmosphere.

INVERSIONS OF THE MAGNETIC POLES, TECTITES, AND A GOLD FROM THE TUNGUSKA AREA

The Earth's magnetic field has reversed itself at irregular intervals, and nobody is certain about the reason. We point out that the large bulge in the Moon longitude discrepancy in the beginning of the 20th century is the second registration. The first discrepancy was observed about 1750. R. Newton discovered variations of the parameter of the acceleration in the Earth-Moon system and found a non-gravitational time series with a 150-yr period: 1300, 1450, 1600, 1750, 1900 [44]. The beginning of the 14th solar cycle, which includes the Tunguska event, practically belongs to this time-serie. Also R. Newton [45] had found the correlation between the secular acceleration of the Moon and reversal of the Earth magnetic field: an eccentricity of the Earth's orbit reaches its minimum value, and then grows again, hence an average movement of the Moon has a reverse. On the other hand, N. Petrova and A. Gusev, developing a theory of rotation of the Moon obtained 144-yr period for the liquid core's rotation relative to the Moon's solid mantle [46]. In reality, the Moon and the Earth orbit around a common gravitational midpoint, called a barycenter, that is inside Earth, about three-fourths of the way out from the centre. The theory of torsion oscillations in the Earth's core is developed, and an attempt is made to evaluate the associated geomagnetic variations A using of the assumption about a superimpose of a quadruple field on a main dipole field in the terrestrial core, also provides a simple explanation of the reversals of Earth's magnetic field [47]. Let's remind that near Tunguska region a pole of the quadruple momentum of the Earth is located [48]. In the Eastern Siberia an agonic line (zero declination) has an anomaly: western declination is observed instead of the eastern one. It is known that this line turned clockwise towards the sublatitude orientations from 1900 till 1920 [49] in 1901-1909 especially in the Irkutsk/Krasnojarsk region [50].

It was shown that the maxima of the major and the trace elements of the platinum group in the Holocene deposition in Sweden have correlation with climate changes [51] with characteristic periodicity of about 150-years. So, year 1300 is a start-point in this temporary series. L. Franzén claimed that spherules discovered in the deposition in Sweden were similar to glass spherules of the Tunguska explosion area. According to H. Faul, glassy stones, or tektites, are probably the most enigmatic stones ever found on Earth. Four tektite strewn fields are known: in North America, Central Europe, Ivory Coast, and Australia/Asia. In the terms of petrology tektite glasses are rhyolitic melts containing over 68 % of silica. Tektite strewn from the Indian Ocean to the South Pacific have an age that is coincident with the last reversal of the Earth's magnetic field (near 700 000 yr) [52] . B. Glass suggested that '*tektites might have had an origin similar to that of the Tunguska silicate spherules. None of the spherules seem to have compositions similar to the silicate portion of any major meteorite group*' [53].

The layer of Greenland ice dated year 1908 exhibited chemical elemental anomalies including essential anomalies of gold [54]. Similar anomaly of gold is registered in the trees's resin in epicentre of Tunguska explosion in Siberia [55]. A

connection between finding of tektites and gold mines in Australia, New Zealand and California already was marked. However, up to now this fact was only regarded as interest of miners to talismans. We assert that not only these, but all strewn tektites found on the Earth (in Australia, on island Tasmania, on Philippines, in Ghana, in Czechia and in the USA [56]) are connected to the deposits of gold. Here it is possible to mention the relationship between tektites and gold in the area of Tunguska. By accounting to diamonds finding in the same areas (Australia, Philippines, the Ivory Coast, the USA) one may suggest the correlation between the tektite strewn and the gold-bearing fields not with impacts, but with kimberlites. The high-pressure nature of the core-forming process led to the Earth's core to enriched with gold. Further extension of this hypothesis indicates localisation of 99 % of all gold on the Earth in the field of its core [57]. The strewn of tektites and the magnetic field reversals may have been caused by sudden changes at the core-mantle boundary. S. Haggerty explored a correspondence between the core, geomagnetism, plumes and diamonds and obtained a correlations between peaks of the kimberlite activity with normal and reverse behaviour of the geomagnetic field [58]. L. Nicolaysen asserted that great catastrophic events connecting to the ejections of tektites coincided with sudden shifts in absolute motion of the Pacific plate, but these catastrophes were just brief, hypervolcanic moments in larger orderly bistable sequences, played out simultaneously every 12 Myr [59]. A kimberlite activity is a process of a protrusion from depths via old cratons to a surface. For example, concentrations of platinum-group elements and gold have been determined in samples of kimberlitic igneous rocks of the Brazilian São Francisco and African Kaapvaal cratons [60].

In our work we add a new strong argument in favour of this conception: both all strewn of tektites and gold fields on the Earth correlate with a geographic distribution of protokimberlite fields (see a map in the [61]). Both an observation of natural detonations, i.e. brontides, in Western Australia [62] and a fact of a sank of stones in Tasmania [63] in June, 1908 confirm our conclusions. These areas correlate with old cratons which are connected to the protokimberlite fields as well as and with the gold fields. Brontide activity is associated with the observations of earthquake lights that with a high probability belonged to attributes of the Tunguska event.

V. Aueur [64] determined the periods of the waves of volcanic activity which took place on the Earth. Year 1908 in which the Tunguska explosion took place belongs to the last wave of volcanic activity that according to Aueur ended in 1915 [65]. We showed above that during solar eclipses the Sun and the Moon have the maximum gravitational influence on the Earth. Eastern Siberia is the field of protokimberlite pipes. The epicentre of the Tunguska explosion is the 248 Myr-old volcanic crater that associates with the mantle plume. Anomalous tide during the Tunguska phenomenon could lead to changes in a terrestrial magnetic dipole, magnetic effects in the core-mantle layer, and thus could trigger the tectonic activity. One can suppose that as a result of the movement of the Eurasian old craton around the hotspot of the Tunguska paleovolcano a huge number of explosions occurred in the epicentre as well as on the periphery of the Siberian platform during the Tunguska phenomenon.

CONCLUSION

In this report, we show that the polarization effect and geomagnetic pulsations registered in Kiel are key factors to the solution of the Tunguska problem. We assert that the Tunguska event was most probably a tectonic explosion of the kimberlite paleovolcano caused by gravitational phenomena about a time of the solar eclipse 28 June, 1908, but not an encounter of the Earth with space-body.

ACKNOWLEDGMENTS

REFERENCES

[1]   J. Carstoiu, "Two gravitation fields and a propagate of gravitation waves", *Works Academy Sci.*, vol. 268A, pp. 201-204, July 1969. Transl. (in French): „Les deux champs de gravitation et propagation des ondes gravifiques", *Compt. Rend. Acad. Sci*, vol. 268A, pp. 201-204, Juillet 1969.

[2]   A. Stentzel, "Observation spiral and rotational solar spots", *The Universe*, vol. 8, 2, pp. 21-23, February 1907. Transl. (in German): „Beobachtung spiraliger und rotierender Sonnenflecke", *Das Weltall*, 8 Jahrg., Heft 2, S. 21-23, Februar 1907.

[3]   C. Jensen, „The present problems and tasks of the study of the atmospheric polarization", *Astronomical News*, vol. 179, 4283, pp.165-176, January 1909. Transl. (in German): „Die gegenwärtigen Probleme und Aufgaben,

welche mit dem Studium der atmosphärischen Polarisation verknüpft sind", *Astr. Nachr.*, Band 179, 4283, S.165-176, Januar 1909.

[4]   C. Jensen, "The observation of the neutral points of the atmospheric polarization in Arnsberg", *Meteorol. Journal*, vol. 54, pp. 90-97, May 1937. Transl. (in German): „Die Verfolgung der neutralen Punkte der atmosphärischen Polarisation in Arnsberg", *Meteorol. Zeitsch.*, 54, S. 90-97, Mai 1937.

[5]   A. Stenzel, „Anomalies of twilight of summer 1908", *Meteorol, Journal*, vol. 25, p. 437, June 1909. Transl. (in German): „Die Dämmerungsanomalien im Sommer 1908", *Meteorol. Zeitsch.*, Band 25, S. 437, Juni 1909.

[6]   C. Cave, "The reflection of Distant Lights on the Clouds", *Nature*, vol. 78, 2011, p. 31, May 1908.

[7]   G. Hale, "No. 26. Solar vortices", *Contr. Mount Wilson Observatory*, vol. 26, pp.1-17, December 1908.

[8]   G. Hale, "Solar Vortices and the Zeeman Effect", *Publ.Astr Soc. Pacific*, vol. 20, 21, p.220, August 1908.

[9]   H.Yoshimura and M. Kambry, "The 100-year periodic modulation of solar rotation", *Ast. News*, vol. 314, 1, pp. 9-19, 1993.

[10]   A. Schuster, "The 4'79 Period of Sun-spot Activity", *Nature,* vol. 79, 2036, p.7, November 1908.

[11]   L. Weber, "The message for the editor", *Astronomical News*, vol. 178, p. 23, 1908. Transl. (in German): „Die Nachricht für der Redaktor", *Astr. Nachr.,* Band 178, S. 23, 1908.

[12]   J. Jacobs, Y. Kato, S. Matsushita, and V. Troitskaya, "Classification of geomagnetic micropulsations", *J. Geophys. Res.*, vol. 69, 1, pp. 180-181, Januar 1964.

[13]   D. Thomson, "Coherence between interplanetary magnetic field at ACE and geomagnetic observatory data", *37th COSPAR Sci. Ass.*, Montréal, p. 3183, July 2008.

[14]   T. Ringnes, "Secular Variations in Short-lived Sunspots", *Astr. Norvegica*, vol. 8, 2, p.17, November 1961.

[15]   S. Malin, "On the unpredictability of geomagnetic secular variation", *Phys. Earth. Planet. Interiors*, vol. 39, p. 293-296, September 1985.

[16]   W. Munk and G. Macdonald, *The rotation of the earth: a geophysical discussion,* Cambridge: Cambridge Uni, 1st. Ed., p. 180, 1960.

[17]   R. Dicke, "Possible Effects on the Solar System of scalar Waves if they exist", in '*Gravitation and Relativy'*. H. Chiu and W. Hoffmann, Eds. New York: Benjamin, pp. 241–259, 1964.

[18]   J. Mbelek and M. Lachieze-Rey, "Possible evidence from laboratory measurements for a latitude and longitude dependence of G", *arXiv:gr-qc/0204064v1*, April 2002.

[19]   D. Dionysiou, N. Sarris, P. Tsikouras, and G. Papadopoulos, "Newtonian and Post-Newtonian tidal theory - Variable G and earthquakes", *Earth, Moon, and Planets*, vol. 60, 2, pp. 127-140, February 1993.

[20]   L. Slaucitajs and D. Winch, "Some morphological aspects of geomagnetic secular variation Planet", *Space Sci.*, vol. 13, 11, pp. 1097-1110, November 1965.

[21]   N. Lomb and A. Andersen, "The analysis and forecasting of the Wolf sunspots numbers", *Royal Astr. Soc.*, vol. 190, pp. 723-732, Marth 1980.

[22]   C. Whitten, "Earthquake*", Research in ESSA*, p.7, 1969-1970.

[23]   R. Gutenberg and C. Richter, *Seismicity of the Earth and associated phenomena*, Prinston: Uni, p. 16, 1949.

[24]   E. Seykora, A. Bhatnagar, R. Jain, and J. Streete, "Evidence of atmospheric gravity waves produced during the 11 June 1983 total solar eclipse", *Nature*, vol. 313, pp. 124-125, Januar 1985.

[25]   D. Meisel and A. Blazejewski, "Search for Wordwide Solar Eclipse Perturbations of Geomagnetic Activity", *J. Geophys. Res.*, vol. 84, A6, pp. 2539-2544, June 1979.

[26]   M. Allais, "Movement of a pendulum during a total solar eclipse on June 30, 1954", *Works Acad. Sci.,* vol. 245, July 1957. Transl. (in French): "Mouvement du pendule paraconique et éclipse totale de Soleil du 30 juin 1954", *C.R. Acad. Sci.*, vol. 245, Juillet 1957.

[27]   T. van Flandern and X.-S.Yang, "Allais gravity and pendulum effects during solar eclipses explained", *Phys. Rev.*, D 67, 022002, January 2003.

[28]   E. Fischbach, D. Sudarsky, A. Szafer, C. Talmadge, and S. Aronson, "Long-range forces and the Eötvös experiment", *Annals of Physics*, 182, 1, p.1-89, February 1988.

[29]   K. Lambeck, *The earth's variable rotation: geophysical causes and consequences,* Cambridge: Cambridge Uni, p. 286, 1980.

[30]   S. Runcorn, "Evidence on the deeper planetary interiors", *Phys. Earth Planet. Int.*, vol. 6, p. 99, Junuary 1972.

[31]   F. Dahlen, "The Passive Influence of the Oceans upon the Rotation of the Earth", *Geophysical J. Intern.*, vol. 46, 2, pp. 363-406, August 1976.

[32]   H. Volland and W. Kundt, "Decade fluctuations of the Earth's rotation and westward drift of the Earth magnetic field", *Natu.l Sci.*, vol. 76, pp. 305-309, Juli 1989. Transl. (in German): „Dekadenfluktuation der Erdrotation und Westwaertsdrift des Erdmagnetfeldes", *Naturwissenschaften*, Band 76, S. 305-309, Juli 1989.

[33]   H. Kimura, "New study of the polar motion and z for the interval 1890.0-1908.5", *Astr. Nachr.*, vol. 181, p. 389, August 1909.

[34]   P. Kotlyar and V. Kim, *Position of the Pole and activity of the Earth,* Novosibirsk: Science, p. 27, 1994. Transl. (in Russ.): *Polozkhenie polyusa i aktivnost' Zemli,* Novosibirsk: Nauka, s. 27, 1994.

[35]   H. Jeffrey, *The Earth*, Cambridge: Cambridge Uni, p. 56, 1976.

[36]   P. Melchior, *The tides of the planet Earth,* Oxford: Pergamon, p. 64, 1983.

[37]   A. Fraser-Smith, "A Possible Full-Moon Enhancement of Hydromagnetic Emission Activity", *J. Geophys. Res.*, vol. 74, 11, pp. 2987-2995, June 1969.

[38]   C. Legrand, and P. Chevalley, "Virtual Moon Atlas", *http://ap-i.net/avl/en/start,* version 2.1, November 2004

[39]   A. Zavalishin, "StarCalc", *http://www. relex.ru/~zalex/*, version 5.72, December 2002.

[40]   A. Ben-Menahem, "Source parameters of the siberian explosion of June 30, 1908, from analysis and synthesis of seismic signals at four stations", *Phys. Earth Planet. Int.*, vol. 11, 1, pp. 1-35, September 1975.

[41]   V. Sgrigna et al., "Preseismic Natural Emissions from the Earth's Surface and their Effects in the Near Earth Space. A Project for Monitoring Earthquakes from Space", *AGU Spring Meeting*, abstr. #T22B-10, May 2002.

[42]   H. Beck and C. Gogolak, "Time-dependent calculations of the vertical distribution of Rn and its decay products in the atmosphere", *J. Geophys. Res.*, vol. 84, C6, pp. 3139-3148, June 1979.

[43]   B. German, "Interpretation of Tunguska event pulsations", *The Book of Abstracts Int. Conf. 100 years since Tunguska phenomenon,* Moscow, p. 27, June 1908.

[44]   R. Newton, *Medieval Chronicles and the rotation of the Earth*, Baltimore: Hopkins Uni, p. 64, 1972.

[45]   R. Newton, "The secular acceleration of the earth's spin", in *Hopkins APL Tech.Dig.*, vol. 6, p. 120, June 1985.

[46]   N. Petrova and A. Gusev, "Modeling of the Free Lunar Libration", *36th Ann. Lunar&Planet. Sci. Conf,* Texas, abst. 1448, March, 2005.

[47]   F. Petrelis, S. Fauve, E. Dormy, and J.-P. Valet, "Simple Mechanism for Reversals of Earth's Magnetic Field", *Phys. Rev. Lett.*, vol. 102, 14, p. 4503 , April 2009.

[48]   W. Parkinson, *Introduction to Geomagnetism*, Edinburgh: Scottish Academic, p. 100, 1983.

[49]   A. Vikulin, *Vortex in geological processes*, Petropavlovsk-Kamchatskij: Science, p. 233, 2004. Transl. (in Russ.): *Vihri v geology*, Petropavlovsk-Kamchatskij: Uni, s. 233, 2004.

[50]   D. Smirnov, „The magnetic elements, observations of 1901-1909", *News of Academy of Sciences*, p. 846, December 1910. Transl.: "Die magnetischen Elemente nach den Beobachtungen von 1901-1909", *Izvest. Imperator. Akad. Nauk*, s. 846, Dekabr' 1910.

[51]   Franzen L., "Late and Middle Holocene deposition of major and trace elements in Southern Sweden as detected in peatland stratigraphies", *Tunguska Int. Conf.*, Moscow, June 2001.

[52]   B. Glass and B. Heezen, "Tektites and Geomagnetic Reversals", *Sci. American*, vol. 217, p. 32, July 1967.

[53]   B. Glass, "Silicate Spherules from Tunguska Impact Area", *Science*, vol. 164, 3879, pp. 547-549, May 1969.

[54]   K. Rasmussen, H. Clausen, G. Kallemeyn, "No iridium anomaly after the 1908 Tunguska impact: Evidence from a Greenland ice core", *Meteoritics*, vol. 30, 6, pp. 634-638, November 1995.

[55]   G. Longo, R. Serra, S. Cecchini, and M. Galli, "Search for microremnants of the Tunguska cosmic body", *Planet. Space Sci.*, vol. 42, 2, p.167, Februar 1994.

[56]   M. O'Donoghue, *Beginner's guide to minerals*, Butterworth: Newnes technical Books, p. 131, 1982.

[57]   B. Wood, M. Walter, and J.Wade, "Accretion of the Earth and segregation of its core", *Nature*, vol. 441, 7095, pp. 825-833, June 2006.

[58]   S. Haggerty, "Superkimberlites: A geodynamic diamond window to the Earth's core", *Earth&Planet. Sci. Lett.*, vol. 122, pp. 57-69, Marth 1994.

[59]   L. Nicolaysen, "Cenozoic and Quaternary Great Cratering Events Coincided with Sudden Shifts in Absolute Motion of the Pacific Plate", *Meteoritics& Planet. Sci.*, vol. 34, p. A87, July 1999.

[60]   I. McDonald, M. de Vit, C. Smith, L. Bizzi, and K. Viljonen, "The geochemistry of the platinum-group elements in Brazilian and southern African kimberlites", *Geoch. Cosmoch. Acta*, vol. 59, 14, pp. 2883, July 1995.

[61]   T. Possouhova, „Kimberlites - natural superdeep drill holes", *Soros Journal*, www.issep.rssi.ru, vol. 5, p. 58, May 2000. Transl. (in Russ.): Т. Посухова, "Kimberlite - prirodnie sverhglubokie skwachini", *Sorosovskiy Zurnal*, tom 5, s. 58, Mai 2000.

[62]   W. Cooke, "Barisal Guns in Western Australia", *Nature*, vol. 78, 2026, p. 390, August 1908.

[63]   B. German, *Solution of the Tunguska-1908 problem*, Marburg-Freiburg: German, p. 7, 2007. Transl. (in German): *Die Lösung des Tunguska-1908 Problem*, Marburg-Freiburg: German, s. 7, 2007.

[64]   V. Aueur, "The Pleistocene of Fuego-Patagonia"*, P. Suom. Ti. Toim.*, vol. 45, p. 26, December 1956.

[65]   H. Lamb, "Volcanic Dust in the Atmosphere; with a Chronology and Assessment of Its Meteorological Significance", *Phil. Trans. Royal. Soc., Lodon*, vol. 266, 1178, p. 494, July 1970.