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# THE EVIDENCE OF THE COSMIC ENERGY GRAVITATIONAL GENESIS OF THE FORTHCOMING INTENSIFICATION OF THE GLOBAL SEISMOTECTONIC, VOLCANIC, CLIMATIC AND MAGNETIC ACTIVITY OF THE EARTH, AND THE PROBLEM OF THE CONTROLLED THERMONUCLEAR REACTIONS

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*Abstract- The article presents the fundamentals of the thermohydrogravidynamic theory of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth based on the author's generalized differential formulation of the first law of thermodynamics extending the classical Gibbs' formulation by taking into account the infinitesimal increment  $dK_\tau$  of the macroscopic kinetic energy  $K_\tau$ , the infinitesimal increment  $d\Pi_\tau$  of the gravitational potential energy  $\Pi_\tau$ , the generalized expression for the infinitesimal work  $\delta A_{np,\partial\tau}$  done by the non-potential stress forces acting on the boundary surface  $\partial\tau$  of the continuum region  $\tau$ , the infinitesimal increment  $dG$  of energy due to the cosmic and terrestrial non-stationary energy gravitational influence on the continuum region  $\tau$ , the differential change  $dE_{e,m,\tau}$  of the electromagnetic energy  $E_{e,m,\tau}$  inside the continuum region  $\tau$ , the energy flux  $\delta\Phi_{e,m}$  of the electromagnetic energy radiated from the individual region  $\tau$  across the boundary surface  $\partial\tau$  of the continuum region  $\tau$ , the differential heating  $\delta Q_{e,m}$  due to the differential work of electrodynamic forces (resulted to the Joule heating owing to the electrical currents inside the continuum region  $\tau$ ). Based on the established fundamental global seismotectonic, volcanic, climatic and magnetic time periodicities  $T_{tec,vol,clim,m,f} = (702 \pm 6)$  years and  $T_{tec,vol,clim,m,sf} = (6321 \pm 3)$  years (determined by the combined predominant non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter and the Saturn), the author presents the evidence of the cosmic energy gravitational genesis of the forthcoming intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth in the 21<sup>st</sup> century AD related causally with the revealed (by Kleiven et al. in 2008 AD) outstanding climate anomaly during (6372-6192) BC in the North Atlantic.*

**Keywords** - Cosmic Geophysics; Thermohydrogravidynamic Theory; Generalized Differential Formulations of the First Law of Thermodynamics; Non-stationary Cosmic Gravitation; Global Seismotectonic, Volcanic, Climatic and Magnetic Activity of the Earth; Natural Disasters; the Problem of the Controlled Thermonuclear Reactions

## I. INTRODUCTION

The problems of the long-term predictions of the strong earthquakes [1-4], the volcanic eruptions [4, 5], the global climatic processes of the Earth [4, 6, 7] and the variations of the Earth's magnetic field [8, 9] are the significant problems of the modern geophysics. We present in this article the development of the thermohydrogravidynamic theory [2-4, 7,

10-12] intended for combined consideration of the global seismotectonic, volcanic, climatic and magnetic processes of the Earth. The thermohydrodynamic theory of the global seismotectonic, volcanic, climatic and magnetic processes is based on the author's generalized differential formulations [2-4, 7, 10-12] of the first law of thermodynamics.

In Subsection 2.1 we present the generalized differential formulation (1) of the first law of thermodynamics [10] for non-equilibrium shear-rotational states of the deformed one-component individual finite continuum region  $\tau$  subjected to the non-stationary Newtonian gravitational field. In Subsection 2.2 we present the subsequent generalization (7) [11] of the generalized differential formulation (1) of the first law of thermodynamics. The subsequent generalization (7) of the first law of thermodynamics is suggested for description of moving rotating deformed compressible heat-conducting stratified individual macroscopic region  $\tau$  of turbulent electromagnetic plasma subjected to the non-stationary Newtonian gravitational and electromagnetic fields. Under the absence of the thermonuclear reactions, in Subsection 2.2 we present also the generalized differential formulation (11) of the first law of thermodynamics for the individual finite continuum region  $\tau$  (considered in the Galilean frame of reference) subjected to the combined non-stationary cosmic and terrestrial Newtonian gravitational field and electromagnetic field.

In Section 3 we present the fundamental time periodicities (12) and (13) of the periodic global seismotectonic, volcanic, climatic and magnetic activity of the Earth determined by the non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter, the Saturn, the Uranus and the Neptune. In Section 3 we present the founded [12] synchronic fundamental seismotectonic, volcanic and climatic time periodicity  $T_{\text{tec, vol, clim, sf}} = (6321 \pm 3)$  years characterizing the time synchronization of the mean periodicities 702 years and 1581 years of the fundamental global seismotectonic, volcanic and climatic time periodicities  $T_{\text{tec, vol, clim, f}} = (702 \pm 6)$  years [3, 4, 11] and  $T_{\text{tec, vol, clim, cf}} = (1581 \pm 189)$  years [12].

In Section 4 we give the explanation of the forthcoming subsequent intensifications of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth in the 21<sup>st</sup> century. To do this, in Subsection 4.1 we present the evidence of the causal link between the beginning (6372 BC) of the outstanding climate anomaly during (6372÷6192) BC in the North Atlantic [13] and the established range (50±30) BC [14] of the strong global volcanic activity of the Earth. In Subsection 4.2 we present the explanation of the intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth in the beginning of the 21<sup>st</sup> century AD. In Subsection 4.3 we present the evidence of the subsequent forthcoming intensifications of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth in the 21<sup>st</sup> century AD.

In Section 5 we present the conclusions.

## II. THE GENERALIZED DIFFERENTIAL FORMULATIONS OF THE FIRST LAW OF THERMODYNAMICS

### 2.1. The Generalized Differential Formulation of the First Law of Thermodynamics for the Individual Finite Continuum Region (Considered in the Galilean Frame of Reference) Subjected to the Combined Non-stationary Cosmic and Terrestrial Newtonian Gravitational Field

We shall consider the continuum region  $\tau$  (characterized by the symmetric stress tensor  $\mathbf{T}$ ) in a Galilean frame of reference with respect to a Cartesian coordinate system  $K$  centred at the origin  $O$  and determined by the axes  $X_1, X_2, X_3$  (see Fig. 1). Using the general equation of continuum movement [15], the differential formulation of the first law of thermodynamics [16] for the one-component deformed macrodifferential continuum element with no chemical reactions, the heat equation [16], the decomposition  $\mathbf{P} = p\delta + \mathbf{\Pi}$  [16] for the pressure tensor  $\mathbf{P} = -\mathbf{T}$  [15] related with the viscous-stress tensor  $\mathbf{\Pi}$  [16] (where  $\delta$  is the Kronecker delta-tensor and  $p$  is the thermodynamic pressure), we derived [2-4, 10] the generalized differential formulation (for the Galilean frame of reference) of the first law of thermodynamics (for moving rotating deforming compressible heat-conducting stratified macroscopic continuum region  $\tau$  presented on Fig. 1):

$$dU_\tau + dK_\tau + d\pi_\tau = \delta Q + \delta A_{\text{np}, \partial\tau} + dG, \quad (1)$$

where  $U_\tau$  is the classical microscopic internal thermal energy of the macroscopic individual continuum region  $\tau$ ,  $K_\tau$  is the instantaneous macroscopic kinetic energy of the macroscopic individual continuum region  $\tau$ ,  $\pi_\tau$  is the macroscopic potential energy (of the macroscopic individual continuum region  $\tau$ ) related with the non-stationary potential  $\Psi$  of the gravitational field,  $\delta Q$  is the classical [15, 17] differential change of heat related with the thermal molecular conductivity of heat across the boundary  $\partial\tau$  of the continuum region  $\tau$ ,  $\delta A_{\text{np}, \partial\tau}$  is the generalized infinitesimal work [10, 18] done during the infinitesimal time interval  $dt$  by non-potential stress forces acting on the boundary surface  $\partial\tau$  of the continuum region  $\tau$ ,

$$dG = dt \iiint_\tau \frac{\partial \Psi}{\partial t} \rho dV \quad (2)$$

is the infinitesimal non-stationary gravitational energy influence [2-4, 10] on the continuum region  $\tau$  during the infinitesimal time interval  $dt$ . The relation for  $dG$  takes into account the partial derivative of the potential  $\Psi$  of the combined non-stationary cosmic and terrestrial gravitational field inside the macroscopic individual continuum region  $\tau$  characterized by the local mass density  $\rho$  in the differential volume  $dV$  of the continuum region  $\tau$ . Under the partial conditions  $dK_\tau = 0$ ,  $d\pi_\tau = 0$ ,  $dG = 0$  and under the

classical [17, 19] approximation  $\delta A_{np,\partial\tau} = -p dV_\tau$  (where  $dV_\tau$  is the differential change of volume  $V_\tau$  of the small macroscopic continuum region  $\tau$  characterized by the thermodynamic pressure  $p$ ), the generalized differential formulation (1) gives the equivalent classical differential formulations [17, 19] of the first law of thermodynamics, which gave the basis of the past technological revolution of the humankind related with the engines of internal combustion.

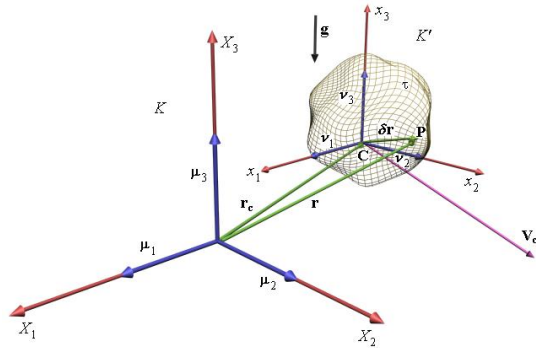


Fig. 1 Cartesian Coordinate System  $K$  of a Galilean Frame of Reference and the Lagrangian Coordinate System  $K'$  Related with the Mass Center  $C$  of an Individual Finite Continuum Region  $\tau$  Subjected to the Non-stationary Newtonian Gravitation and Electromagnetic Field

The generalized differential formulation (1) of the first law of thermodynamics and the expression (2) for  $dG$  demonstrate that the positive partial derivative ( $\partial\psi/\partial t > 0$ ) inside the continuum region  $\tau$  is related [2-4, 10, 11] with the positive gravitational energy flux  $dG$  into the continuum region  $\tau$ . The generalized differential formulation (1) of the first law of thermodynamics gave the theoretical foundation of the detected [1] non-relativistic classical “gravitational” waves [3, 4, 11] from the moving material bodies (continuum regions) such as the focal regions of earthquakes. The theoretical foundation of the non-relativistic classical “gravitational” waves was made [3, 4, 11] based on the following relation for the gravitational energy power  $W_{gr}(\tau)$ :

$$W_{gr}(\tau) = \frac{dG}{dt} = \iiint_{\tau} \frac{\partial\psi}{\partial t} \rho dV = -\iint_{\partial\tau} (\mathbf{J}_g \cdot \mathbf{n}) d\Omega_n, \quad (3)$$

where  $\mathbf{J}_g$  is the energy flux of the gravitational energy (per unit time and per unit area) across the surface element  $d\Omega_n$  (of the continuum boundary surface  $\partial\tau$ ) characterized by the external normal unit vector  $\mathbf{n}$ . The energy flux  $\mathbf{J}_g$  is determined by the divergence [4, 5, 11]

$$\text{div} \mathbf{J}_g = -\rho \frac{\partial\psi}{\partial t} \quad (4)$$

of the gravitational energy flux across the boundary  $\partial\tau$  of the continuum region  $\tau$ . Analyzing the historical development of the Aether (ether) concept, it was pointed out [20] that “Descartes, Newton, Huygens, Le Sage and Laplace explained gravity from Aether”. The relations (3) and (4) give the physical basis to support this explanation by associating the energy flux  $\mathbf{J}_g$  of the gravitational energy (represented in relation (3)) with the energy flux of the gravitational ether, which is responsible for (according to relation (3)) the gravitational interaction of the continuum region  $\tau$  with the surrounding material objects. Considering the Earth as a whole subjected to the periodic recurrences (characterized by the time periodicity  $T_{energy}$ ) of the maximal (integral and instantaneous) energy gravitational influences of the Sun (owing to the gravitational interaction of the Sun with the Jupiter, or with the Saturn, or with the Uranus, or with the Neptune), or of the Moon, or of an arbitrary planet of the Solar System, we founded (based on the generalized differential formulation (1) of the first law of thermodynamics) the global seismotectonic, volcanic and climatic time periodicities [3-4, 10, 11]:

$$T_{tec} = T_{vol1} = T_{clim1} = T_{energy}, \quad (5)$$

$$T_{tec-endog} = T_{vol2} = T_{clim2} = T_{endog} = T_{energy} / 2 \quad (6)$$

of the periodic global seismotectonic, volcanic and climatic activity of the Earth.

## 2.2. The Generalized Differential Formulations of the First Law of Thermodynamics for the Individual Finite Continuum Region (Considered in the Galilean Frame of Reference) Subjected to the Combined Non-stationary Cosmic and Terrestrial Newtonian Gravitational Field and Electromagnetic Field

Based on the founded Non-equilibrium Statistical Thermohydrodynamics of Turbulence [18] and the Thermohydrogravodynamics of the Solar System [10], we deduced [11] the subsequent generalization of the first law of thermodynamics (for moving rotating deformed compressible heat-conducting stratified individual macroscopic region  $\tau$  (see Fig. 1) of turbulent electromagnetic plasma subjected to the non-stationary Newtonian gravity and the non-stationary electromagnetic field):

$$P(t)dt + dU_\tau + dK_\tau + d\pi_\tau + dE_{e,m,\tau} = \delta Q_{e,m} + \delta Q + \delta A_{np,\partial\tau} + \delta\Phi_{e,m} + dG + c^2 dm_\tau \quad (7)$$

extending the established generalized differential formulation (1) by taking into account the infinitesimal change  $dU_\tau$  of the internal energy  $U_\tau$  of the turbulent plasma without the emitted fast neutrons in the individual region  $\tau$ , the increment  $dK_\tau$  of the macroscopic kinetic energy  $K_\tau$  of the turbulent plasma in the individual region  $\tau$ , and the following additional terms: the useful energy production

$P(t)dt$  of fast neutrons (emitted during time interval  $dt$  due to the thermonuclear reaction between two nuclei of deuterium or between nuclei of deuterium and tritium in a high temperature plasma) characterized by the positive released energy power  $P(t)$  (which should be directed from the individual region  $\tau$  to sustain the controlled thermonuclear process), the differential change  $dE_{e,m,\tau}$  of electromagnetic energy  $E_{e,m,\tau}$  inside the individual region  $\tau$  of plasma, the energy flux  $\delta\Phi_{e,m} = -\delta F_{e,m}$  of the electromagnetic energy radiated from the individual region  $\tau$  across the boundary surface  $\partial\tau$  of the region  $\tau$ , the differential heating  $\delta Q_{e,m}$  due to the differential work of electrodynamic forces (resulted to the Joule heating owing to the plasma current) and due to the dissipated electromagnetic waves inside the individual region  $\tau$ , and the differential amount of energy  $c^2 dm_\tau > 0$  released (as a consequence of the thermonuclear burning mechanism proposed by Dr. Hans Bethe in 1939 for the Sun) due to the thermonuclear reaction related to the conversion of the differential amount of mass  $dm_\tau$  (a small difference between the initial and final reactive components of the thermonuclear reaction inside the individual region  $\tau$ ) into energy ( $c$  is the speed of light). The subsequent generalization (7) (of the first law of thermodynamics (1)) is the basis of the non-equilibrium statistical thermohydrogravidynamics of turbulent plasma subjected to the non-stationary gravitational and electromagnetic fields.

The problem of the controlled thermonuclear reactions (analyzed by Academician P.L. Kapitza in 1978 in his Nobel Lecture [21]) has not yet been solved by the world national and international research centers. It is clear that the general generalized differential formulation (7) represents the thermodynamic key for the final solution of this problem. The general generalized differential formulation (7) of the first law of thermodynamics is deduced [11] to describe the combined thermohydrogravidynamics of the controlled thermonuclear reactions inside the individual region  $\tau$  of turbulent electromagnetic plasma subjected to the non-stationary Newtonian gravity and the non-stationary electromagnetic field.

In particular, the reduced differential formulation (taking into account the differential change  $dV_\tau$  of volume  $V_\tau$  of the small macroscopic continuum region  $\tau$  characterized by the thermodynamic pressure  $p$ )

$$dE_{e,m,\tau} = \delta A_{np,\partial\tau} = -pdV_\tau \quad (8)$$

(with zero others terms in the formulation (7)) leads to the classical Stefan-Boltzman law [19]

$$E_{e,m,\tau} / V_\tau \sim T^4 \quad (9)$$

and to the classical [19] relation

$$pV_\tau^{4/3} = \text{const} \quad (10)$$

for the adiabatic process related with the equilibrium electromagnetic black-body radiation (the gas of photons)

contained in the individual region  $\tau$  characterized by the volume  $V_\tau$  and the absolute temperature  $T$ .

Under the absence of the thermonuclear reactions, i.e. under the partial conditions  $dm_\tau = 0$  and  $P(t) = 0$ , the generalized differential formulation (7) gives the generalized differential formulation of the first law of thermodynamics

$$dU_\tau + dK_\tau + d\pi_\tau + dE_{e,m,\tau} = \delta Q_{e,m} + \delta Q + \delta A_{np,\partial\tau} + \delta\Phi_{e,m} + dG \quad (11)$$

for the individual finite continuum region  $\tau$  (considered in the Galilean frame of reference, see Fig. 1) subjected to the combined non-stationary cosmic and terrestrial Newtonian gravitational field and electromagnetic field. Considering the generalized differential formulation (11) for the Earth as a whole subjected to the periodic recurrences (characterized by the time periodicity  $T_{\text{energy}}$ ) of the maximal (integral and instantaneous) energy gravitational influences of the Sun (owing to the gravitational interaction of the Sun with the Jupiter, or with the Saturn, or with the Uranus, or with the Neptune), or of the Moon, or of an arbitrary planet of the Solar System, we can conclude that the time periodicities (5) and (6) characterize also the periodic global variations of the Earth's magnetic field determined by the cosmic non-stationary energy gravitational influences on the Earth.

### III. THE FUNDAMENTAL GLOBAL TIME PERIODICITIES OF THE PERIODIC GLOBAL SEISMOTECTONIC, VOLCANIC, CLIMATIC AND MAGNETIC ACTIVITY OF THE EARTH

We established the successive approximations for the different time periodicities  $T_{\text{energy}}$  of recurrence of the maximal (instantaneous and integral) energy gravitational influences on the Earth:  $\{(T_{S-MOON,3})_i\} = 3$  years ( $i=1$ ), 8 years ( $i=2$ ), 19 years ( $i=3$ ), 27 years ( $i=4$ ) for the system Sun-Moon [2-4, 10] including 11 years ( $i=2$ ) [3-4, 11];  $\{(T_{V,3})_j\} = 3$  years ( $j=1$ ), 8 years ( $j=2$ ) for the Venus [2-4, 10] including 11 years ( $j=3$ ) [3-4, 11];  $\{(T_{MARS,3})_k\} = 15$  years ( $k=1$ ), 32 years ( $k=2$ ), 47 years ( $k=3$ ) for the Mars [2-4, 10];  $\{(T_{J,3})_n\} = 11$  years ( $n=1$ ), 12 years ( $n=2$ ), 83 years ( $n=3$ ) for the Jupiter [2-4, 10] and for the Sun owing to the gravitational interaction of the Sun with the Jupiter [3, 4, 11];  $\{(T_{SAT,3})_m\} = 29$  years ( $m=1$ ), 59 years ( $m=2$ ), 265 years ( $m=3$ ) for the Saturn [3, 4, 11] and for the Sun owing to the gravitational interaction of the Sun with the Saturn [3, 4, 11];  $\{(T_{U,3})_q\} = 84$  years ( $q=1$ ) for the Uranus [3, 4, 11] and for the Sun owing to the gravitational interaction of the Sun with the Uranus [3, 4, 11];  $\{(T_{N,3})_r\} = 165$  years ( $r=1$ ), 659 years ( $r=2$ ), 2142 years ( $r=3$ ) for the Neptune [3, 4, 11] and for the Sun owing to

the gravitational interaction of the Sun with the Neptune [3, 4, 11].

Based on the generalized differential formulation (1) of the first law of thermodynamics used for the Earth as a whole, we founded [3, 4, 11] the fundamental sets of the fundamental global seismotectonic and volcanic time periodicities  $T_{tec,f}$  and the fundamental global climatic time periodicities  $T_{clim1,f}$  :

$$T_{tec,f} = T_{clim1,f} = T_{energy,f} = L.C.M. \cdot \{(T_{S-MOON,3})_i^{l_6}, (T_{V,3})_j^{l_2}, (T_{MARS,3})_k^{l_4}, (T_{J,3})_n^{l_5}, (T_{SAT,3})_m^{l_6}, (T_{U,3})_q^{l_7}, (T_{N,3})_r^{l_8}\} \quad (12)$$

determined by the successive global fundamental periodicities  $T_{energy,f}$  (defined by the least common multiples

*L.C.M.* of various successive time periodicities related to the different combinations of the following integer numbers:  $i = 1, 2, 3, 4$ ;  $j = 1, 2$ ;  $k = 1, 2, 3$ ;  $n = 1, 2, 3$ ;  $m = 1, 2, 3$ ;  $q = 1$ ;  $r = 1, 2, 3$ ;  $l_0 = 0,1$ ;  $l_2 = 0,1$ ;  $l_4 = 0,1$ ;  $l_5 = 0,1$ ;  $l_6 = 0,1$ ;  $l_7 = 0,1$ ;  $l_8 = 0,1$ ) of recurrence of the maximal combined energy gravitational influences on the Earth of the different combined combinations of the cosmic non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter, the Saturn, the Uranus and the Neptune.

Based on the generalized differential formulation (1) of the first law of thermodynamics used for the Earth as a whole, we deduced [3, 4, 11] the fundamental set of the fundamental global seismotectonic and volcanic time periodicities  $T_{tec-endog,f}$  and the fundamental global climatic time periodicities  $T_{clim2,f}$  :

$$T_{tec-endog,f} = T_{clim2,f} = T_{endog,f} = T_{energy,f} / 2 = \frac{1}{2} L.C.M. \cdot \{(T_{S-MOON,3})_i^{l_6}, (T_{V,3})_j^{l_2}, (T_{MARS,3})_k^{l_4}, (T_{J,3})_n^{l_5}, (T_{SAT,3})_m^{l_6}, (T_{U,3})_q^{l_7}, (T_{N,3})_r^{l_8}\} \quad (13)$$

determined by the successive global fundamental periodicities  $T_{energy,f}$  (defined by the least common multiples

*L.C.M.* of various successive time periodicities related to the different combinations of the following integer numbers:  $i = 1, 2, 3, 4$ ;  $j = 1, 2$ ;  $k = 1, 2, 3$ ;  $n = 1, 2, 3$ ;  $m = 1, 2, 3$ ;  $q = 1$ ;  $r = 1, 2, 3$ ;  $l_0 = 0,1$ ;  $l_2 = 0,1$ ;  $l_4 = 0,1$ ;  $l_5 = 0,1$ ;  $l_6 = 0,1$ ;  $l_7 = 0,1$ ;  $l_8 = 0,1$ ) of recurrence of the maximal combined energy gravitational influences on the Earth of the different combined combinations of the cosmic non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter, the Saturn, the Uranus and the Neptune.

Considering the generalized differential formulation (11) for the Earth as a whole, we can conclude that the fundamental global time periodicities (12) and (13) characterize also the periodic global variations of the Earth's magnetic field determined by the cosmic non-stationary energy gravitational influences on the Earth. Thus, they have the fundamental time periodicities (12) and (13) of the

periodic global seismotectonic, volcanic, climatic and magnetic activity of the Earth determined by the non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter, the Saturn, the Uranus and the Neptune.

Based on the formulas (12) and (13), we founded [3-4, 11, 12] the following ranges of the following fundamental global seismotectonic, volcanic and climatic time periodicities (determined by the combined predominant non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter and the Saturn):

$$T_{tec, vol, clim, f} = T_{tec, f} = T_{clim1, f} = 696 \div 708 \text{ years} = (702 \pm 6) \text{ years}, \quad (14)$$

$$T_{tec, vol, clim, cf} = T_{tec, tec-endog, f} = T_{clim1, clim2, f} = 1392 \div 1770 \text{ years} = (1581 \pm 189) \text{ years}. \quad (15)$$

Based on the ranges (14) and (15), we founded [12] the synchronic fundamental seismotectonic, volcanic and climatic time periodicities

$$T_{tec, vol, clim, sf} = (6321 \pm 3) \text{ years} \quad (16)$$

characterizing the time synchronization of the mean periodicities 702 years and 1581 years of the fundamental global seismotectonic, volcanic and climatic time periodicities (14) [3, 4, 11] and (15) [12]. Taking into account the made conclusion in the end of the Section 2, we can state that the established time periodicities (14), (15) and (16) characterize also the periodic global variations of the Earth's magnetic field (characterized by the same time periodicities  $T_{tec, vol, clim, m, f} = (702 \pm 6) \text{ years}$ ,  $T_{tec, vol, clim, m, cf} = (1581 \pm 189) \text{ years}$  and  $T_{tec, vol, clim, m, sf} = (6321 \pm 3) \text{ years}$ )

determined by the cosmic non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter and the Saturn. This statement is in partial agreement with the archaeomagnetic and palaeomagnetic study of the magnetic field of the Earth [8]. It was revealed [8] that the time variations of the Earth's magnetic field "have an almost periodical character" characterized (as it follows from the Fig. 1 of the article [8]) by the period, which is in good agreement with the founded [12] synchronic fundamental seismotectonic, volcanic and climatic time periodicities (16). Thus, the synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities

$$T_{tec, vol, clim, m, sf} = (6321 \pm 3) \text{ years} \quad (17)$$

explain the revealed [8] periodic global variations of the Earth's magnetic field related with the global geomagnetic reversals [9].

#### IV. THE EXPLANATION OF THE PRVIOUS AND FORTHCOMING INTENSIFICATIONS OF THE GLOBAL SEISMOTECTONIC, VOLCANIC, CLIMATIC AND MAGNETIC ACTIVITY OF THE EARTH

#### 4.1. The Evidence of the Causal Link Between the Beginning (6372 BC) of the Outstanding Climate Anomaly During (6372÷6192) BC in the North Atlantic and the Established Range (50±30) BC of the Strong Global Volcanic Activity of the Earth

It was revealed the outstanding climate anomaly (8380÷8200) years before the present (B.P.) in the North Atlantic [13] as the result of weakened overturning circulation (which “begins at ~ 8.38 thousand years B.P.” [13]) triggered by the freshwater outburst related with catastrophic drainage of Lake Agassiz. We established [12] that the outstanding climate anomaly in the North Atlantic is related with the possible catastrophic seismotectonic event (related with catastrophic drainage of Lake Agassiz) near Lake Agassiz during the range [13] (8380÷8200) B.P. = (8290±90) BP. Taking into account the date 2008 of publication of the article [13], the range (8290±90) BP [13] gives the corresponding range of the possible catastrophic seismotectonic event near Lake Agassiz (8290±90) – 2008 = (6282±90) BC = (6372÷6192) BC. (18)

We proved [12] that the catastrophic seismotectonic event near Lake Agassiz was realized more probably (to all appearances) near the lower date 6372 BC [13] of the range (18).

Using the lower date 6372 BC (of the range (18) [13]) as the possible date of the catastrophic seismotectonic event near Lake Agassiz and using the synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities (17), we can evaluate the range of the dates of the possible strong seismotectonic, volcanic, climatic and magnetic activity worldwide (after 1 cycle of the time periodicities  $T_{\text{tec, vol, clim, m, sf}} = (6321 \pm 3)$  years):

$$-6372 + 1 \times (6321 \pm 3) = -51 \pm 3 = (51 \pm 3) \text{ BC}, \quad (19)$$

which represents very well the center of the established range [14]

$$(50 \pm 30) \text{ BC} = (80 \div 20) \text{ BC} \quad (20)$$

of the strong global volcanic activity of the Earth. The mean value of 51 BC of the range (19) is in very good agreement with the mean value of 50 BC of the established range (20). It gives the additional evidence that the lower date 6372 BC of the range (18) is the more probable date of the catastrophic seismotectonic event near Lake Agassiz related with the outstanding climate anomaly during (6372÷6192) BC in the North Atlantic [13]. By assuming that the intensification of the seismotectonic, volcanic and climatic activity worldwide (including near Lake Agassiz) occurred during the slightly more wider (than the range (19)) possible range

$$(6372 \pm 28) \text{ BC}, \quad (21)$$

we can evaluate the range of the dates of the possible strong seismotectonic, volcanic and climatic activity worldwide (after 1 cycle of the synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities (17)):

$$\begin{aligned} -6372 \pm 28 + 1 \times (6321 \pm 3) &= -51 \pm 31 = \\ &= (51 \pm 31) \text{ BC} = (82 \div 20) \text{ BC}, \end{aligned} \quad (22)$$

which is slightly more wider than the range (20) but the range (22) contains completely the range (20). The range (22) represents very well the time of the maximal magnetic field of the Earth as it is shown on the Fig. 1 of the article [8]. Consequently, the range (21) can be considered as the range

representing the real intensification of the seismotectonic, volcanic, climatic and magnetic activity worldwide including the Lake Agassiz [13]. This conclusion is in agreement with the fact that the narrow range (21) represents very well the time of the maximal magnetic field of the Earth as it is shown on the Fig. 1 of the article [8].

#### 4.2. The Explanation of the Intensification of the Global Seismotectonic, Volcanic, Climatic and Magnetic Activity of the Earth in the 21<sup>st</sup> Century

We find the additional explanation of the intensification of the global seismotectonic, volcanic, climatic and magnetic activity (in the beginning of the 21<sup>st</sup> century AD) based on the founded range (6372±28) BC (given by (21)) of the strong intensification of the seismotectonic, volcanic and climatic activity worldwide (including near Lake Agassiz [13]) and using the founded synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities (17) together with the fundamental global seismotectonic, volcanic and climatic periodicities (14) [3-4, 11]. Considering the founded range (21) of the intensification of the seismotectonic, volcanic, climatic and magnetic activity worldwide (including near Lake Agassiz), we can evaluate the range of the dates of the next possible intensification of the global seismotectonic, volcanic, climatic and magnetic activity (after 1 cycle of the fundamental global periodicities (17) and 3 cycles of the fundamental global periodicities (14))

$$\begin{aligned} -6372 \pm 28 + 1 \times (6321 \pm 3) + 3 \times (702 \pm 6) &= (2055 \pm 49) \text{ AD} = \\ &= (2006 \div 2104) \text{ AD} \end{aligned} \quad (23)$$

in the beginning of the 21<sup>st</sup> century AD. We have shown [12] that the intensification of the global seismotectonic, volcanic and climatic activity of the Earth in the beginning of the 21<sup>st</sup> century AD is closely related with the intensification of the amplitude of oscillation of the inner rigid core of the Earth (relative to fluid core of the Earth) and related intensification of the amplitude of the gravitational disturbances radiating from the heterogeneous regions (especially, between the rigid core of the Earth and the fluid core of the Earth).

Considering the established range (50±30) BC of the strong global seismotectonic, volcanic [14] and magnetic [8] activity of the Earth, we can evaluate the range of the dates of the next possible intensification of the global seismotectonic, volcanic, climatic and magnetic activity (after 3 cycles of the fundamental global periodicities (14)):

$$\begin{aligned} -50 \pm 30 + 3 \times (702 \pm 6) &= (2056 \pm 48) \text{ AD} = \\ &= (2008 \div 2104) \text{ AD}, \end{aligned} \quad (24)$$

which includes the dates 2008 AD and 2011 AD of the realized strong Chinese 2008 (predicted in advance [10]) earthquakes and the realized strong 2011 Japanese earthquakes (predicted in advance [7], see [2, 3]). The mean date 2056 AD (of the obtained range (24)) is in perfect agreement with the obtained date 2056 AD [12] corresponding to the maximal combined synchronization of the mean periodicities 702 years and 1581 years in the ranges (14) and (15).

#### 4.3. The Evidence of the Subsequent Forthcoming Intensifications of the Global Seismotectonic, Volcanic,

## Climatic and Magnetic Activity of the Earth in the 21<sup>st</sup> Century

Considering the range of the established dates (1450±14) BC [4, 12] of the possible last major eruption of Thera, we evaluated [4, 12] the range of the dates of the possible intensification of the global seismotectonic, volcanic and climatic activity (after 5 cycles of the fundamental global periodicities (14)):

$$-(1450 \pm 14) + 5 \times (702 \pm 6) = (2060 \pm 44) \text{ AD} = (2016 \div 2104) \text{ AD.} \quad (25)$$

The ranges (23), (24) and (25) contain the evaluated subsequent three subranges (2023±3) AD [11],

(2040.38 ± 3) AD [11] and (2059.5 ± 4.5) AD [12] of the increased intensification of the global seismotectonic, volcanic and climatic activity of the Earth in the 21<sup>st</sup> century AD. Considering the date 1318 AD of the strong earthquake in England [4, 11] and using the range of the fundamental global periodicities (14), we evaluated [4, 11, 12] the following range (of the forthcoming intensification of the global seismotectonic, volcanic and climatic activity worldwide)

$$(1318 + 696 \div 1318 + 708) = (2014 \div 2026) \text{ AD,} \quad (26)$$

which contains the established subrange (2023±3) AD [11] of the increased intensification of the global seismotectonic, volcanic and climatic activity of the Earth in the 21<sup>st</sup> century AD.

Taking into account that the possible catastrophic seismotectonic event near Lake Agassiz [13] was realized more probably (to all appearances, as it is shown above) near the lower date 6372 BC of the range (18), we can evaluate the range of the dates of the next possible intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth (after 1 cycle of the fundamental global periodicities (16) and 3 cycles of the fundamental global periodicities (14))

$$-6372 + 1 \times (6321 \pm 3) + 3 \times (702 \pm 6) = (2055 \pm 21) \text{ AD} = (2034 \div 2076) \text{ AD} \quad (27)$$

containing the previous two evaluated subsequent subranges (2040.38 ± 3) AD [11, 12] and (2059.5 ± 4.5) AD [12] of the increased intensification of the global seismotectonic, volcanic and climatic activity of the Earth in the 21<sup>st</sup> century AD. The mean date 2055 AD (of the obtained ranges (23) and (27)) is very close to the established date 2056 AD [12] corresponding to the maximal combined synchronization of the mean periodicities 702 years and 1581 years of the fundamental global seismotectonic, volcanic and climatic time periodicities (14) [3-4, 11] and (15) [12]. Based on the date 63 BC (which belongs to the range (22) representing the time of the maximal magnetic field of the Earth [8]) of the greatest earthquakes in the ancient Pontus [22], we can present the additional independent evidence of the validity of the established subrange (2040.38 ± 3) AD [11, 12] of the increased global seismotectonic, volcanic and climatic activity of the Earth. Considering the founded decomposition [3] for the initial date 63 BC of the greatest earthquakes in the ancient Pontus [22], we estimate the date of the next increased intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth (including the seismotectonic intensification near the region

of the ancient Pontus) based on the following decomposition (using the established [3] mean fundamental global seismotectonic and volcanic periodicity  $T_f(1) = 702$  years, which is equal to the mean value in the range (14)) relative to the initial date  $t_0 = 63$  BC:

$$-63 + 3 \times (702) = 2043 = 2043 \text{ AD,} \quad (28)$$

which belongs to the established subrange (2040.38 ± 3) AD [11, 12] of the increased global seismotectonic, volcanic and climatic activity of the Earth. Considering the founded decomposition [3] for the initial date 63 BC of the greatest earthquakes in the ancient Pontus [22], we estimate the date of the next increased intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth (including the seismotectonic intensification near the region of the ancient Pontus) based on the following decomposition (using the established [3] mean fundamental global seismotectonic and volcanic periodicities  $T_f(1) = 702$  years and

$$T_f(8) = 16.5 \text{ years}) \text{ relative to the initial date } t_0 = 63 \text{ BC:}$$

$$-63 + 3 \times (702) + 16.5 = 2059.5 = 2059.5 \text{ AD,} \quad (29)$$

which is perfectly consistent with the mean date 2059.5 AD of the established subrange (2059.5 ± 4.5) AD [12] of the increased intensification of the global seismotectonic, volcanic and climatic activity of the Earth in the 21<sup>st</sup> century AD.

## V. CONCLUSIONS

We have presented the fundamentals of the thermohydrogravodynamic theory of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth based on the generalized differential formulation (11) of the first law of thermodynamics, which extends the previous generalized differential formulation (given by (1) [2-4, 10]) by taking into account the differential change  $dE_{e,m,\tau}$  of electromagnetic energy  $E_{e,m,\tau}$  inside the continuum region  $\tau$ , the energy flux  $\delta\Phi_{e,m}$  of the electromagnetic energy radiated from the individual region  $\tau$  across the boundary surface  $\partial\tau$  of the continuum region  $\tau$ , the differential heating  $\delta Q_{e,m}$  due to the differential work of electrodynamic forces (resulted to the Joule heating owing to the electrical currents inside the continuum region  $\tau$ ) along with the classical [15, 17] differential change  $\delta Q$  of heat across the boundary  $\partial\tau$  of the continuum region  $\tau$ , the differential change  $dU_\tau$  of the classical [15, 17] microscopic internal thermal energy  $U_\tau$  of the macroscopic continuum region  $\tau$ , the established [2-4, 10] infinitesimal increment  $dK_\tau$  of the macroscopic kinetic energy  $K_\tau$ , the established [2-4, 10] infinitesimal increment  $d\Pi_\tau$  of the gravitational potential energy  $\Pi_\tau$ , the established [2-4, 10] generalized expression for the infinitesimal work  $\delta A_{np,\partial\tau}$  done by the non-potential stress forces acting on the boundary surface  $\partial\tau$  of the continuum region  $\tau$ , the established [2-4, 10]



infinitesimal increment  $dG$  of the combined (cosmic and terrestrial) non-stationary energy gravitational influence on the continuum region  $\tau$  (considered in the Galilean frame of reference). The generalized differential formulation (11) of the first law of thermodynamics is intended for the individual finite continuum region  $\tau$  (without the thermonuclear reactions) subjected to the combined (cosmic and terrestrial) non-stationary Newtonian gravitational field and electromagnetic field. Based on the fact that the established [2-4, 10] infinitesimal increment  $dG$  (of the combined non-stationary energy gravitational influence on the continuum region  $\tau$ ) is the general term of the formulations (1), (7) and (11), we have concluded that the previously established fundamental global seismotectonic, volcanic and climatic periodicities (14) [2-4, 11], (15) [12] and (16) [12] should characterize also the periodic global variations of the Earth's magnetic field (characterized by the same time periodicities  $T_{\text{tec, vol, clim, m, f}} = (702 \pm 6)$  years,  $T_{\text{tec, vol, clim, m, cf}} = (1581 \pm 189)$  years and  $T_{\text{tec, vol, clim, m, sf}} = (6321 \pm 3)$  years) determined by the cosmic non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter and the Saturn. This conclusion is confirmed partially by the agreement with the archaeomagnetic and palaeomagnetic study of the magnetic field of the Earth [8] since the revealed [8] time variations of the Earth's magnetic field (shown on Fig. 1 of the article [8]) have the period, which is in good agreement with the founded synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities  $T_{\text{tec, vol, clim, m, sf}} = (6321 \pm 3)$  years.

Based on the time periodicities (16) and (17), we have presented (in Subsection 4.1) the evidence of the causal link between the beginning (6372 BC) of the outstanding climate anomaly in the North Atlantic [13], the established range (50±30) BC [14] of the strong global volcanic activity of the Earth and the maximal magnetic field of the Earth [8] during the obtained range (22), which is consistent with the established range (50±30) BC [14] of the strong global volcanic activity of the Earth. Based on the time periodicities (14), (16) and (17), we have presented (in Subsection 4.2) the explanation of the intensification of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth in the 21<sup>st</sup> century AD.

Based on the date 63 BC of the greatest earthquakes in the ancient Pontus [22], we have presented (in Subsection 4.3) the additional evidence of the forthcoming increased intensifications of the global seismotectonic, volcanic, climatic and magnetic activity of the Earth during the established [12] subranges (2040.38 ± 3) AD [11, 12] and (2059.5 ± 4.5) AD [12].

The generalized differential formulation (7) of the first law of thermodynamics (intended for moving rotating deformed compressible heat-conducting stratified individual macroscopic region  $\tau$  of turbulent electromagnetic plasma subjected to the non-stationary Newtonian gravity and the non-stationary electromagnetic field) can be used for the urgent nearest practical realization of the controlled thermonuclear reactions to enhance the energy power of humankind before the subsequent forthcoming

intensifications [3-4, 11, 12] of the seismotectonic, volcanic, climatic and magnetic activity of the Earth in the 21<sup>st</sup> century.

It was stated [11] without any doubt that the sustainable controlled thermonuclear reactions can be realized under the reliable controlled synchronization of the different differential terms in the general generalized formulation (7), which takes into account the combined thermohydrogravi-electromagnetic dynamics related with the sustainable thermonuclear process characterized by the useful energy power  $P(t) > 0$  released from the individual region  $\tau$  of turbulent electromagnetic plasma subjected to thermonuclear reaction. The consideration of the generalized differential formulation (used for the Earth as a whole) of the first law of thermodynamics (11) (which is obtained from the established [11] formulation (7) under the partial conditions  $dm_{\tau} = 0$  and  $P(t) = 0$  denoting the absence of the thermonuclear reactions) demonstrates the significant synchronization (related with the good agreement of the synchronic fundamental seismotectonic, volcanic, climatic and magnetic time periodicities (17) and the period of the revealed [8] variations of the Earth's magnetic field presented on Fig. 1 of the article [8]) between the time variations of the magnetic field of the Earth and the combined predominant non-stationary energy gravitational influences on the Earth of the system Sun-Moon, the Venus, the Mars, the Jupiter and the Sun owing to the gravitational interactions of the Sun with the Jupiter and the Saturn.

The established fact that the reduced differential formulation (8) (under zero others terms in the general generalized formulation (7)) leads to the classical results (the Stefan-Boltzman law (9) [19] and the classical [19] relation (10) for the adiabatic process related with the equilibrium electromagnetic black-body radiation) gives the significant argument in favour of the generalized formulation (7) [11] of the first law of thermodynamics (for moving rotating deformed compressible heat-conducting stratified individual macroscopic region  $\tau$  of turbulent electromagnetic plasma subjected to the thermonuclear reaction under the non-stationary Newtonian gravity and the non-stationary electromagnetic field).

The revealed synchronization (based on the generalized differential formulation (11) of the first law of thermodynamics for the individual finite continuum region  $\tau$  subjected to the combined non-stationary cosmic and terrestrial Newtonian gravitational field and electromagnetic field) between the time variations of the magnetic field of the Earth and the combined predominant non-stationary energy gravitational influences on the Earth presents the second argument in favour of the generalized formulation (7) [11] of the first law of thermodynamics.

The revealed synchronization (between the time variations of the magnetic field of the Earth [8] and the combined predominant non-stationary energy gravitational influences on the Earth [12]) presents the additional evidence of the statement [11] that the sustainable controlled thermonuclear reactions can be realized under the reliable controlled synchronization of the different terms in the general generalized formulation (7), which takes into account the combined thermohydrogravi-electromagnetic dynamics related with sustainable thermonuclear process.

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