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The Validity of the Thermohydrogravidynamic Theory Concerning the Predicted Dates of the Maximal Temporal Intensifications of the Global Seismotectonic Processes of the Earth during the Range 2020 - 2023 AD

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Abstract

We present (on the 13th International Conference on Geology and Geophysics) the convincing evidence that the strongest earthquakes (according to the U.S. Geological Survey) of the Earth (during the range 2020 - 2023 AD) occurred near the predicted (calculated in advance based on the global prediction thermohydrogravidynamic principles determining the maximal temporal intensifications of the global seismotectonic, volcanic, climatic and magnetic processes of the Earth) dates 2020.016666667 AD (Simonenko, 2020), 2021.1 AD (Simonenko, 2019, 2020), 2022.18333333 AD (Simonenko, 2021), 2023.26666666 AD (Simonenko, 2022) and 2020.55 AD, 2021.65 AD (Simonenko, 2019, 2021), 2022.716666666 AD (Simonenko, 2022), respectively, corresponding to the local maximal and to the local minimal, respectively, combined planetary and solar integral energy gravitational influences on the internal rigid core of the Earth. We present the short-term thermohydrogravidynamic technology (based on the generalized differential formulation of the first law of thermodynamics and the first global prediction thermohydrogravidynamic principle) for evaluation of the maximal magnitude of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD (according to the U.S. Geological Survey).

Keywords

Thermohydrogravidynamic Theory, Non-Stationary Cosmic Gravitation, Generalized First Law of Thermodynamics, Cosmic Geology, Cosmic Geophysics, Cosmic Seismology, Global Seismotectonic Processes, Global

Prediction Thermohydrogravidynamic Principles, The Short-Term Thermohydrogravidynamic Technology

1. Introduction

The problem of the long-term and short-term predictions of the strong earthquakes is the significant problem (Richter, 1958) of the modern geophysics (Simonenko, 2012, 2013, 2016) related with the founded (Simonenko, 2012, 2014a) increased intensifications of the global natural (seismotectonic, volcanic, climatic and magnetic) processes of the Earth during the established ranges 2020 - 2026 AD, 2037.38 - 2043.38 AD and 2055 - 2064 AD (Simonenko, 2012, 2014a). The evaluation (in advance based on the global prediction thermohydrogravidynamic principles (Simonenko, 2012, 2014a)) of the forthcoming ranges of the maximal temporal intensifications of the global seismotectonic processes of the Earth is the significant first step to solve the problem of the long-term deterministic predictions of the strongest earthquakes of the Earth. We calculated in advance (based on the global prediction thermohydrogravidynamic principles (3) and (4) determining the maximal temporal intensifications of the global seismotectonic processes of the Earth) the dates $t^*(\tau_{c,r}, 2020) = 2020.016666667$ AD (Simonenko, 2020), $t^*(\tau_{c,r}, 2021) = 2021.1$ AD (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022) = 2022.18333333$ AD (Simonenko, 2021), $t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD (Simonenko, 2022) and $t_*(\tau_{c,r}, 2020) = 2020.55$ AD, $t_*(\tau_{c,r}, 2021) = 2021.65$ AD (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022) = 2022.716666666$ AD (Simonenko, 2022) corresponding, respectively, to the local maximal combined planetary and solar integral energy gravitational influences (3) and to the local minimal combined planetary and solar integral energy gravitational influences (4) on the internal rigid core $\tau_{c,r}$ of the Earth.

The first aim of this article is to present the convincing evidence that the strongest earthquakes (according to the U.S. Geological Survey) of the Earth (during the range 2020 - 2023 AD) occurred near the calculated (in advance based on the global prediction thermohydrogravidynamic principles (3) and (4) used in the first approximation of the circular orbits of the planets around the Sun) dates $t^*(\tau_{c,r}, 2020)$ (Simonenko, 2020), $t^*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022)$ (Simonenko, 2021), $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) and $t_*(\tau_{c,r}, 2020) = 2020.55$ AD, $t_*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022)$ (Simonenko, 2022).

The second aim of this article is to present the short-term thermohydrogravidynamic technology (based on the global prediction thermohydrogravidynamic principle (3)) for evaluation of the maximal magnitude of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD (according to the U.S. Geological Survey).

In Section 2 we present the fundamentals of the developed thermohydrogra-

vidynamic theory (Simonenko, 2007a, 2007b, 2012, 2013, 2014a, 2014b, 2015, 2016, 2018, 2019). In Section 2.1 we present the established (Simonenko, 2007a, 2007b, 2012, 2013, 2014a, 2019) generalized differential formulation (1) of the first law of thermodynamics. In Section 2.2 we present the established (Simonenko, 2012, 2014a) global prediction thermohydrogravidynamic principles (3) and (4) determining the maximal temporal intensifications of the global seismotectonic, volcanic, climatic and magnetic processes of the Earth near the corresponding time moments (dates) $t^*(\tau_{c,r}, i)$ and $t_*(\tau_{c,r}, i)$.

In Section 3.1 we present the convincing evidence that the strongest earthquakes (according to the U.S. Geological Survey) of the Earth (during the range 2020 - 2023 AD) occurred near the calculated (in advance based on the global prediction thermohydrogravidynamic principles (3) and (4) used in the first approximation of the circular orbits of the planets around the Sun) dates $t^*(\tau_{c,r}, 2020)$ (Simonenko, 2020), $t^*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022)$ (Simonenko, 2021), $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) and $t_*(\tau_{c,r}, 2020) = 2020.55$ AD, $t_*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022)$ (Simonenko, 2022) corresponding, respectively, to the local maximal combined planetary and solar integral energy gravitational influences (3) and to the local minimal combined planetary and solar integral energy gravitational influences (4) on the internal rigid core $\tau_{c,r}$ of the Earth.

In Section 3.2 we present the application of the short-term thermohydrogravidynamic technology for evaluation of the maximal magnitude $M_{up,th}(2023, \text{loc. max.}, \text{March})$ of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD (according to the U.S. Geological Survey).

In Section 4 we present conclusions.

2. Fundamentals of the Thermohydrogravidynamic Theory

2.1. The Generalized First Law of Thermodynamics

The long-term thermohydrogravidynamic technology (Simonenko, 2020, 2021, 2022) is based on the established (Simonenko, 2006, 2007a, 2007b, 2012, 2013) generalized differential formulation of the first law of thermodynamics (for an individual finite continuum region τ subjected to the non-stationary combined (cosmic and terrestrial) Newtonian gravitational field and non-potential terrestrial stress forces):

$$dU_\tau + dK_\tau + d\pi_\tau = \delta Q + \delta A_{np,\partial\tau} + dG, \tag{1}$$

where U_τ is the classical (Gibbs, 1873; De Groot & Mazur, 1962) internal thermal energy of the continuum region τ, K_τ is the established (Simonenko, 2006, 2007a, 2007b) macroscopic kinetic energy of the continuum region τ, π_τ is the established (Simonenko, 2006, 2007a, 2007b) macroscopic potential gravitational energy (of the continuum region τ) related with the non-stationary potential ψ of the gravitational field, δQ is the classical (Gibbs, 1873; De Groot & Mazur, 1962) differential total heat flux to (for $\delta Q > 0$) or from (for $\delta Q < 0$)

the continuum region τ, $\delta A_{np,\partial\tau}$ is the established (Simonenko, 2006, 2007a, 2007b) generalized differential work done by non-potential stress forces acting on the boundary surface $\partial\tau$ of the continuum region τ,

$$dG = dt\iiint_{\tau}\frac{\partial\psi}{\partial t}\rho dV, \tag{2}$$

is the established (Simonenko, 2007a, 2007b, 2012, 2013, 2014a, 2016) differential (during the differential time interval dt) energy gravitational influence (as the result of the Newtonian non-stationary gravitation) on the continuum region τ characterized by the local density ρ of mass distribution.

2.2. The Global Prediction Thermohydrogravidynamic Principles

The first and the second global prediction thermohydrogravidynamic principles (determining the maximal temporal intensifications of the global seismotectonic, volcanic, climatic and magnetic processes of the Earth near the corresponding dates $t^*(\tau_{c,r},i)$ and $t_*(\tau_{c,r},i)$) are formulated (based on the term (2) of the generalized differential formulation (1) of the first law of thermodynamics) for the internal rigid core $\tau_{c,r}$ of the Earth (Simonenko, 2012, 2014a):

$$\begin{aligned}&\Delta G(\tau_{c,r},t^*(\tau_{c,r},i))\\&=\max_{t}\int_{t_0}^{t}dt'\iiint_{\tau_{c,r}}\frac{\partial\psi_{comb}}{\partial t'}\rho_{c,r}dV-\text{local maximum for time } t^*(\tau_{c,r},i),\end{aligned} \tag{3}$$

and

$$\begin{aligned}&\Delta G(\tau_{c,r},t_*(\tau_{c,r},i))\\&=\min_{t}\int_{t_0}^{t}dt'\iiint_{\tau_{c,r}}\frac{\partial\psi_{comb}}{\partial t'}\rho_{c,r}dV-\text{local minimum for time } t_*(\tau_{c,r},i),\end{aligned} \tag{4}$$

where $\rho_{c,r}$ is the mass density of the internal rigid core $\tau_{c,r}$, $\psi_{comb}\equiv\psi_{comb}(\tau_{c,r},t)$ is the combined planetary and solar gravitational potential (Simonenko, 2012, 2013, 2014a, 2019) in the internal rigid core $\tau_{c,r}$ of the Earth.

3. Results and Discussions

3.1. The Application of the Global Prediction Thermohydrogravidynamic Principles for Evidence of the Cosmic Energy Gravitational Genesis of the Strongest Earthquakes Occurred near the Predicted Dates of the Range 2020 - 2023 AD

To confirm the cosmic energy gravitational genesis of the strongest (according to the U.S. Geological Survey) earthquakes of the Earth (during the range 2020 - 2023 AD) occurred near the calculated (in advance based on the global prediction thermohydrogravidynamic principle (3) used for the first approximation of the circular orbits of the planets around the Sun) dates $t^*(\tau_{c,r},2020)$ (Simonenko, 2020), $t^*(\tau_{c,r},2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r},2022)$ (Simonenko, 2021) and $t^*(\tau_{c,r},2023)$ (Simonenko, 2022) (corresponding to the local

maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth), we present **Table 1** of the strongest earthquakes of the Earth (during the range 2020 - 2023 AD) occurred near the predicted dates $t^*(\tau_{c,r}, i)$ (i = 2020, 2021, 2022, 2023) of the local maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth.

We see (based on **Table 1**) that the strongest (characterized by the magnitudes $M_{up}(i, \text{loc. max.})$ according to the U.S. Geological Survey) earthquakes of the Earth (during the range 2020 - 2023 AD) occurred on the dates $t_e(i,\text{loc. max.})$ (i = 2020, 2021, 2022, 2023) near the calculated (in advance based on the global prediction thermohydrogravidynamic principle (3)) dates $t^*(\tau_{c,r}, 2020)$ (Simonenko, 2020), $t^*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022)$ (Simonenko, 2021) and $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) corresponding to the local maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth. The closeness (as it is evident from the column for the difference $\Delta^*(i) = \left|t_e(i,\text{loc. max.}) - t^*(\tau_{c,r}, i)\right|$ in **Table 1**) of the dates $t_e(i,\text{loc. max.})$ and $t^*(\tau_{c,r}, i)$ (for i = 2020, 2021, 2022, 2023) gives the first convincing evidence of the cosmic energy gravitational genesis of the strongest (according to the U.S. Geological Survey) earthquakes of the Earth (during the range 2020 - 2023 AD) occurred near the predicted

Table 1. The analysis of the previous strongest earthquakes (characterized by the magnitudes $M_{up}(i, \text{loc. max.})$ according to the U.S. Geological Survey) of the Earth occurred on the dates $t_e(i,\text{loc. max.})$ (i = 2020, 2021, 2022, 2023) near the calculated dates $t^*(\tau_{c,r}, 2020)$ (Simonenko, 2020), $t^*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022)$ (Simonenko, 2021), $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) of the local maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth.

Year i AD	Date $t_e(i,\text{loc. max.})$ of the strongest earthquake	Magnitude $M_{up}(i, \text{loc. max.})$ of the strongest earthquake	Region of the strongest earthquake	$\Delta^*(i) = \left\|t_e(i,\text{loc. max.}) - t^*(\tau_{c,r}, i)\right\|$, in days
2020 AD	January 28, 2020	7.7	123 km NNW of Lucea, Jamaica	21.91 days after the date $t^*(\tau_{c,r}, 2020) = 2020.016666667$ AD
2021 AD	March 4, 2021	8.1	Kermadec Islands, New Zealand	26.47 days after the date $t^*(\tau_{c,r}, 2021) = 2021.1$ AD
2022 AD	December 14, 2021	7.3	112 km N of Maumere, Indonesia	84.21 days before the date $t^*(\tau_{c,r}, 2022) = 2022.18333333$ AD
2022 AD	December 29, 2021	7.3	125 km NNE of Lospalos, Timor, Leste	69.21 days before the date $t^*(\tau_{c,r}, 2022) = 2022.18333333$ AD
2022 AD	March 16, 2022	7.3	57 km ENE of Namie, Japan	8.03 days after the date $t^*(\tau_{c,r}, 2022) = 2022.18333333$ AD
2023 AD	February 6, 2023	7.8	Turkey and Syria	60.39 days before the date $t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD

(Simonenko, 2019, 2020, 2021, 2022) dates $t^*(\tau_{c,r}, 2020)$, $t^*(\tau_{c,r}, 2021)$, $t^*(\tau_{c,r}, 2022)$ and $t^*(\tau_{c,r}, 2023)$ corresponding to the local maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth.

The strongest (during the last 6 years) magnetic anomaly observed on March 23, 2023 AD (according to the US Space Weather Prediction Center and National Oceanic and Atmospheric Administration) near the predicted (Simonenko, 2022) date $t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD (corresponding approximately to April 7, 2023 AD) is the additional real evidence of the cosmic energy gravitational genesis of the maximal intensifications of the global magnetic processes of the Earth.

We presented on the 11th International Conference on Geology and Geophysics (Simonenko, 2021) the satisfactory explanation (based on the established long-term thermohydrogravidynamic technology) of the maximal (during the considered range from December 7, 2019 to April 18, 2020 AD) magnitude $M_{up}(2020, \text{loc. max.}) = 7.7$ (given in **Table 1**) of the strongest earthquake occurred on January 28, 2020 AD near 21.91 days after the previously calculated (Simonenko, 2021) date $t^*(\tau_{c,r}, 2020)$. We presented on the 12th International Conference on Geology and Geophysics (Simonenko, 2022) the satisfactory explanation (in the frame of the long-term thermohydrogravidynamic technology) of the maximal magnitude $M_{up}(2021, \text{loc. max.}) = 8.1$ (given in **Table 1**) of the strongest (during the considered range from October 27, 2020 to May 17, 2021 AD) earthquake of the Earth occurred on March 4, 2021 AD near 26.47 days after the previously calculated (Simonenko, 2020) date $t^*(\tau_{c,r}, 2021)$. The possibility to explain (based on the long-term thermohydrogravidynamic technology (Simonenko, 2020, 2021, 2022) the maximal magnitudes $M_{up}(2020, \text{loc. max.}) = 7.7$ and $M_{up}(2021, \text{loc. max.}) = 8.1$ (according to the U.S. Geological Survey) of the strongest earthquake of the Earth occurred on January 28, 2020 AD and on March 4, 2021 AD, respectively, gives the second convincing evidence of the cosmic energy gravitational genesis of the strongest earthquakes of the Earth occurred near the predicted (Simonenko, 2019, 2020, 2021) dates $t^*(\tau_{c,r}, 2020)$ and $t^*(\tau_{c,r}, 2021)$.

We see (based on **Table 2**) that the strongest (characterized by the magnitudes $M_{up}(i, \text{loc. min.})$ according to the U.S. Geological Survey) earthquakes of the Earth (during the range 2020 - 2022 AD) occurred on the dates $t_e(i,\text{loc. min.})$ (i = 2020, 2021, 2022) near the predicted (calculated in advance based on the global prediction thermohydrogravidynamic principle (4) used for the first approximation of the circular orbits of the planets around the Sun) dates $t_*(\tau_{c,r}, 2020)$, $t_*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022)$ (Simonenko, 2022) corresponding to the local minimal combined planetary and solar integral energy gravitational influences (4) on the internal rigid core $\tau_{c,r}$ of the Earth.

The closeness (as it is evident from the column for the difference $\Delta_*(i) = \left|t_e(i,\text{loc. min.}) - t_*(\tau_{c,r}, i)\right|$ in **Table 2**) of the dates $t_e(i,\text{loc. min.})$ and

Table 2. The analysis of the previous strongest earthquakes (characterized by the magnitudes $M_{up}(i, \text{loc. min.})$ according to the U.S. Geological Survey) of the Earth occurred on the dates $t_e(i,\text{loc. min.})$ (i = 2020, 2021, 2022) near the calculated dates $t_*(\tau_{c,r}, 2020)$, $t_*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022)$ (Simonenko, 2022) of the local minimal combined planetary and solar integral energy gravitational influences (4) on the internal rigid core $\tau_{c,r}$ of the Earth.

Year i AD	Date $t_e(i,\text{loc. min.})$ of the strongest earthquake	Magnitude $M_{up}(i, \text{loc. min.})$ of the strongest earthquake	Region of the strongest earthquake	$\Delta_*(i) = \lvert t_e(i,\text{loc. min.}) - t_*(\tau_{c,r}, i)\rvert$, in days
2020 AD	July 22, 2020	7.8	99 km SSE of Perryville, Alaska	3.11 days after the date $t_*(\tau_{c,r}, 2020) = 2020.55$ AD
2021 AD	July 29, 2021	8.2	99 km SE of Perryville, Alaska	27.41 days before the date $t_*(\tau_{c,r}, 2021) = 2021.65$ AD
2022 AD	September 10, 2022	7.6	70 km E of Kainantu, Papua New Guinea	8.76 days before the date $t_*(\tau_{c,r}, 2022) = 2022.716666666$ AD
2022 AD	September 19, 2022	7.6	35 km SSW of Aguililla, Mexico	0.23 days after the date $t_*(\tau_{c,r}, 2022) = 2022.716666666$ AD

$t_*(\tau_{c,r}, i)$ (for i = 2020, 2021, 2022) gives the third convincing evidence of the cosmic energy gravitational genesis of the strongest (according to the U.S. Geological Survey) earthquakes of the Earth (during the range 2020 - 2022 AD) occurred near the predicted (Simonenko, 2019, 2021, 2022) dates $t_*(\tau_{c,r}, 2020)$, $t_*(\tau_{c,r}, 2021)$ and $t_*(\tau_{c,r}, 2022)$ corresponding to the local minimal combined planetary and solar integral energy gravitational influences (4) on the internal rigid core $\tau_{c,r}$ of the Earth.

We have calculated the forthcoming date $t_*(\tau_{c,r}, 2023) = 2023.8$ AD (corresponding to the local minimal combined planetary and solar integral energy gravitational influence (4) on the internal rigid core $\tau_{c,r}$ of the Earth) and the next forthcoming date $t^*(\tau_{c,r}, 2024) = 2024.35$ AD corresponding to the local maximal combined planetary and solar integral energy gravitational influence (3) on the internal rigid core $\tau_{c,r}$ of the Earth.

3.2. The Short-Term Thermohydrogravidynamic Technology for Evaluation of the Maximal Magnitude of the Strongest Earthquake of the Earth during the March, 2023 AD

The second aim of the article is related with the fact (according to the related presentation on the 13th International Conference on Geology and Geophysics) that the magnitude 7.0 of the strongest (during the March, 2023 AD) earthquake of the Earth (occurred on March 16, 2023 AD) may be evaluated in advance based on the analysis (in the frame of the developed short-term thermohydrogravidynamic technology) of the previous strongest (according to the U.S. Geological Survey) earthquakes of the Earth.

We introduce the five independent variables (characterizing the strongest earthquakes of the Earth for the year i AD): $x_i \equiv x(i) = t_e(i, \text{loc. max.}) - t^*(\tau_{c,r}, i)$, $y_i \equiv y(i) = t^*(\tau_{c,r}, i) - \text{March 17, i AD}$, $z_i \equiv z(i) = t^*(\tau_{c,r}, i) - t_M(i, \text{loc. max.})$,

$w_i \equiv w(i)$, $M_i \equiv M(i) \equiv M_{up}(i, \text{loc. max.})$, where $t_i \equiv t_e(i, \text{loc. max.})$ is the date of the strongest earthquake of the Earth occurred near the date $t^*(\tau_{c,r}, i) = t^*(\tau_3, i)$ (for the year i AD) of the local maximal combined planetary and solar integral energy gravitational influence (3) on the internal rigid core $\tau_{c,r}$ of the Earth and on the Earth as a whole, $t_i(M) \equiv t_M(i, \text{loc. max.})$ is the date of the Full Moon, which is nearest to the date $t_e(i, \text{loc. max.})$, $w_i \equiv w(i)$ is the calculated non-dimensional value (for the year i AD) of the local maximal combined planetary and solar integral energy gravitational influence $\Delta G(\tau_3, t^*(\tau_3, i))$ (Simonenko, 2014a) on the Earth, $M_i \equiv M_{up}(i, \text{loc. max.})$ is the maximal magnitude of the more strongest earthquake of the Earth occurred on the date $t_i \equiv t_e(i, \text{loc. max.})$ near the date $t^*(\tau_{c,r}, i)$ (for the year i AD) of the local maximal combined planetary and solar integral energy gravitational influence (3). We have the following calculated in advance dates:

$t^*(\tau_{c,r}, 1964) = 1964.28333333$ AD (Simonenko, 2021),

$t^*(\tau_{c,r}, 2011) = 2011.26666666$ AD (Simonenko, 2021) and

$t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD (Simonenko, 2022). We assume that the maximal theoretical magnitude $M_i(th) \equiv M_{up,th}(i, \text{loc. max.})$ of the strongest earthquake of the Earth (occurred on the date $t_i \equiv t_e(i, \text{loc. max.})$ near the date $t^*(\tau_{c,r}, i) = t^*(\tau_3, i)$ (for the year i AD) is given by the relation

$$M_i(th) \equiv M_{up,th}(i, \text{loc. max.}) = q_1 + q_2 x_i + q_3 y_i + q_4 z_i + q_5 w_i. \quad (5)$$

The five unknown coefficients q_1, q_2, q_3, q_4, q_5 can be calculated (based on the method of the least squares generalized for the five independent variables x_i, y_i, z_i, w_i, M_i) from the solution of the system of the five linear equations

$$q_1 a_{k1} + q_2 a_{k2} + q_3 a_{k3} + q_4 a_{k4} + q_5 a_{k5} = b_k, (k = 1, 2, 3, 4, 5) \quad (6)$$

where the empirical coefficients $a_{kj}(k, j = 1, 2, 3, 4, 5)$ and $b_k(k = 1, 2, 3, 4, 5)$ are given by the following relations

$$a_{12} = a_{21} = \sum_{i=1}^{N} x_i, a_{13} = a_{31} = \sum_{i=1}^{N} y_i, a_{14} = a_{41} = \sum_{i=1}^{N} z_i, a_{15} = a_{51} = \sum_{i=1}^{N} w_i, \quad (7)$$

$$a_{22} = \sum_{i=1}^{N} x_i x_i, a_{33} = \sum_{i=1}^{N} y_i y_i, a_{44} = \sum_{i=1}^{N} z_i z_i, a_{55} = \sum_{i=1}^{N} w_i w_i, \quad (8)$$

$$a_{23} = a_{32} = \sum_{i=1}^{N} x_i y_i, a_{24} = a_{42} = \sum_{i=1}^{N} x_i z_i, a_{25} = a_{52} = \sum_{i=1}^{N} x_i w_i, \quad (9)$$

$$a_{34} = a_{43} = \sum_{i=1}^{N} y_i z_i, a_{35} = a_{53} = \sum_{i=1}^{N} y_i w_i, a_{45} = a_{54} = \sum_{i=1}^{N} z_i w_i, \quad (10)$$

$$b_1 = \sum_{i=1}^{N} M_i, b_2 = \sum_{i=1}^{N} x_i M_i, b_3 = \sum_{i=1}^{N} y_i M_i, b_4 = \sum_{i=1}^{N} z_i M_i, b_5 = \sum_{i=1}^{N} w_i M_i, \quad (11)$$

Considering the more strongest two earthquake given in the **Table 1** (Simonenko, 2021: p. 190), we calculated the four independent variables x_i, y_i, z_i, w_i (given for i = 1, 2 in **Table 3**) presented with the corresponding real maximal magnitudes M_i. Based on the five independent variables x_i, y_i, z_i, w_i, M_i (given for i = 1, 2 in **Table 3**), we calculated (for N = 2) the empirical

coefficients $a_{kj}(k, j = 1,2,3,4,5)$ and $b_k(k = 1,2,3,4,5)$ given by the relations (7)-(11). We calculated (for N = 2) the numerical coefficients $q_1 = 1.04289456$, $q_2 = -0.672124107$, $q_3 = 0.12243217$, $q_4 = -0.55283081$ and $q_5 = 0.00925187$ from the numerical solution (with the double precision) of the system (6) of five linear equations. Using the calculated (for N = 2) numerical coefficients q_1, q_2, q_3, q_4, q_5, we calculated based on the formula (5) (for the calculated independent variables x_i, y_i, z_i corresponding to March 16, 2023 AD and presented in **Table 3**) the theoretical magnitude 6.45, which is near the real magnitude 7.0 of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD. **Table 3** and **Table 4** present the calculated theoretical magnitudes $M_i(th)$ based on the formula (5) for the presented calculated (for i = 1964, 2011, 1975, 1988 and 2023) non-dimensional values w_i:

$$w_i = \Delta G(\tau_3, t^*(\tau_3, i)) / \Delta_g E(\tau_3, \tau_1) \quad (12)$$

of the local maximal combined planetary and solar integral energy gravitational influences $\Delta G(\tau_3, t^*(\tau_3, i))$ on the Earth (Simonenko, 2014a) normalized on the maximal integral energy gravitational influence $\Delta_g E(\tau_3, \tau_1)$ of the Mercury on the Earth (Simonenko, 2007b, 2013).

Table 3 presents the real maximal magnitudes M_i of the occurred strongest two (i = 1, 2) earthquakes of the Earth (Simonenko, 2021, p. 190, **Table 1**) and the real maximal magnitude 7.0 of the strongest (during the March 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD. **Table 3** presents also the differences $\Delta M_i = M_i(th) - M_i$ between the theoretical calculated magnitudes $M_i(th)$ and the real maximal magnitudes M_i.

Table 4 presents the four (i = 1, 2, 3, 4) strongest earthquakes of the Earth. We calculated the following dates: $t^*(\tau_{c,r}, 1975) = 1975.266666666$AD and $t^*(\tau_{c,r}, 1988) = 1988.283333333$AD along with the dates $t^*(\tau_{c,r}, 1964)$ (Simo-

Table 3. The theoretical magnitudes $M_i(th)$ (calculated based on the formula (5) used for the numerical coefficients q_1, q_2, q_3, q_4, q_5 calculated for N = 2) corresponding to March 28, 1964 AD (i = 1), March 11, 2011 AD (i = 2) and to March 16, 2023 AD characterized by the corresponding calculated variables x_i, y_i, z_i for March 28, 1964 AD (i = 1), March 11, 2011 AD (i = 2) and for March 16, 2023 AD.

Number i	Date t_i of the more strongest earthquake of the Earth	Region of the more strongest earthquake of the Earth	Real magnitude M_i	Calculated magnitude $M_i(th)$	ΔM_i	x_i, in days	y_i, in days	z_i, in days	w_i	Date $t_i(M)$
1	March 28, 1964	Southern Alaska	9.2	$9.2 - 10^{-15}$	-10^{-15}	−15.48	26.48	15.48	331.6562	March 28, 1964
2	March 11, 2011	near the east coast of Honshu, Japan	9.0	9.0	0.0	−27.39	21.39	19.39	−254.1981	March 19, 2011
	March 16, 2023	Kermadec Islands region	7.0	6.45	−0.55	− 22.39	21.39	31.39	550.5151	March 7, 2023

Table 4. The calculated magnitudes (based on the formula (5) used for the numerical coefficients q_1, q_2, q_3, q_4, q_5 calculated for N = 4) corresponding to March 28, 1964 AD (i = 1), May 26, 1975 AD (i = 2), March 6, 1988 AD (i = 3), March 11, 2011 AD (i = 4) and to March 16, 2023 AD characterized by the calculated independent variables x_i, y_i, z_i corresponding to March 28, 1964 AD (i = 1), May 26, 1975 AD (i = 2), March 6, 1988 AD (i = 3), March 11, 2011 AD (i = 4) and to March 16, 2023 AD.

Number i	Date t_i of the more strongest earthquake of the Earth	Region of the more strongest earthquake of the Earth	Real magnitude M_i	Calculated magnitude $M_i(th)$	ΔM_i	x_i, in days	y_i, in days	z_i, in days	w_i	Date $t_i(M)$
1	March 28, 1964	Southern Alaska	9.2	$9.2 - 1.7 \times 10^{-14}$	-1.7×10^{-14}	−15.48	26.48	15.48	331.6562	March 28, 1964
2	May 26, 1975	Azores-Cape St. Vincent Ridge	7.9	$7.9 + 4.5 \times 10^{-15}$	4.5×10^{-15}	48.61	21.39	− 47.61	−90.9267	May 25, 1975
3	March 6, 1988	Gulf of Alaska	7.8	$7.8 + 2.3 \times 10^{-15}$	2.3×10^{-15}	−37.48	26.48	40.48	−158.6773	March 3, 1988
4	March 11, 2011	near the east coast of Honshu, Japan	9.0	$9.0 + 7.3 \times 10^{-15}$	7.3×10^{-15}	−27.39	21.39	19.39	−254.1981	March 19, 2011
	March 16, 2023	Kermadec Islands region	7.0	7.69	0.69	−22.39	21.39	31.39	550.5151	March 7, 2023

nenko, 2021), $t^*(\tau_{c,r}, 2011)$ (Simonenko, 2021), and $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) calculated in advance. Considering (for N = 4) the four $(i = 1, 2, 3, 4)$ strongest earthquakes presented in **Table 4**, we calculated (for the corresponding calculated empirical coefficients $a_{kj}(k, j = 1, 2, 3, 4, 5)$ and b_k $(k = 1, 2, 3, 4, 5)$ given by the relations (7)-(11) for N = 4) the following numerical coefficients: $q_1 = 6.37255263$, $q_2 = -0.16218322$, $q_3 = 0.08460082$, $q_4 = -0.163128903$ and $q_5 = 0.0018147003$ from the numerical solution (with the double precision) of the system (6) of the five linear equations.

Table 4 presents the theoretical calculated magnitudes $M_i(th)$ based on the formula (5) for the presented calculated non-dimensional values w_i (for 1964 AD, 1975 AD, 1988 AD, 2011 AD and 2023 AD) of the local maximal combined planetary and solar integral energy gravitational influences (Simonenko, 2020, 2021, 2022) on the Earth. **Table 4** presents also the differences $\Delta M_i = M_i(th) - M_i$ between the theoretical calculated magnitudes $M_i(th)$ and the real maximal magnitudes M_i. Using the calculated numerical coefficients q_1, q_2, q_3, q_4, q_5 for N = 4, we calculated based on the formula (5) (for the calculated independent variables x_i, y_i, z_i, w_i corresponding to March 16, 2023 AD and presented in **Table 4**) the theoretical magnitude 7.69, which is near the real magnitude 7.0 of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD. The theoretical calculated mean magnitude $M_{up,th}(2023, \text{loc. max.}, \text{March}) = (6.45 + 7.69)/2 = 7.07$ (based on the corresponding theoretical calculated magnitudes 6.45 and 7.69 given in **Table 3** and in

Table 4, respectively, for March 16, 2023 AD) is very close to the real magnitude 7.0 of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD.

The relation (5) for the maximal theoretical magnitude $M_{up,th}(i, \text{loc. max.})$ (of the possible strongest earthquake of the Earth, which can occur on the date $t_i \equiv t_e(i, \text{loc. max.})$ near the date $t^*(\tau_{c,r}, i)$ (for the year i AD) of the local maximal combined planetary and solar integral energy gravitational influence (3) on the internal rigid core $\tau_{c,r}$ of the Earth) is not the universal formula with the numerical coefficients q_1, q_2, q_3, q_4, q_5 calculated for N = 2 and for N = 4. The relation (5) (with the numerical coefficients q_1, q_2, q_3, q_4, q_5 calculated for N = 2 and for N = 4) can be considered (according to the thermohydrogravidynamic theory (Simonenko, 2007-2022) and according to the developed short-term thermohydrogravidynamic technology) for evaluation of the maximal magnitude $M_{up,th}(i, \text{loc. max., March})$ of the possible strongest (during the March of the year i AD) earthquake of the Earth, which can occur on the date $t_i \equiv t_e(i, \text{loc. max.})$ of the March of the year i AD characterized by the condition $\beta(i) = t^*(\tau_{c,r}, i) - i = 0.26666666$.

4. Conclusion

We have presented in Section 3.1 the convincing evidence that the strongest earthquakes (according to the U.S. Geological Survey) of the Earth (during the range 2020 - 2023 AD) occurred near the predicted (calculated in advance based on the global prediction thermohydrogravidynamic principles (3) and (4) used for the first approximation of the circular orbits of the planets around the Sun) dates $t^*(\tau_{c,r}, 2020)$ (Simonenko, 2020), $t^*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2020), $t^*(\tau_{c,r}, 2022)$ (Simonenko, 2021), $t^*(\tau_{c,r}, 2023)$ (Simonenko, 2022) and $t_*(\tau_{c,r}, 2020) = 2020.55$ AD, $t_*(\tau_{c,r}, 2021)$ (Simonenko, 2019, 2021), $t_*(\tau_{c,r}, 2022)$ (Simonenko, 2022). It means that the established (Simonenko, 2012, 2014a) global prediction thermohydrogravidynamic principles (3) and (4) (used for the first approximation of the circular orbits of the planets around the Sun) represent the significant theoretical basis of the established long-term thermohydrogravidynamic technology (Simonenko, 2020, 2021, 2022).

We have demonstrated the short-term thermohydrogravidynamic technology (presented on the 13th International Conference on Geology and Geophysics) for evaluation of the maximal theoretical magnitude $M_{up,th}(2023, \text{loc. max., March})$ of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD near the previously calculated (Simonenko, 2022) date $t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD of the local maximal combined planetary and solar integral energy gravitational influence (3) on the internal rigid core $\tau_{c,r}$ of the Earth. We have shown the good agreement between the evaluated (based on the developed short-term thermohydrogravidynamic technology) theoretical calculated mean magnitude $M_{up,th}(2023, \text{loc. max., March}) = 7.07$ (of the possible strong earthquake of the Earth, which can occur on March 16, 2023

AD) and the real maximal magnitude M = 7.0 (according to the U.S. Geological Survey) of the strongest (during the March, 2023 AD) earthquake of the Earth occurred on March 16, 2023 AD near the previously calculated (Simonenko, 2022) date $t^*(\tau_{c,r}, 2023) = 2023.26666666$ AD . The good agreement between the theoretical calculated mean magnitude $M_{up,th}(2023, \text{loc. max., March}) = 7.07$ and the real maximal magnitude M = 7.0 (during the March, 2023 AD) confirms the cosmic energy gravitational genesis of this earthquake occurred on March 16, 2023 AD. This good agreement is the confirmation that the strongest earthquakes of the Earth (occurred near the calculated dates $t^*(\tau_{c,r}, i)$ of the maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth) have the founded (Simonenko, 2012, 2013, 2018, 2021, 2022) cosmic energy gravitational genesis. We have concluded (as the main conclusion made on the 13th International Conference on Geology and Geophysics) that the maximal magnitudes of the strongest earthquakes of the Earth (occurred near the calculated (in advance) dates $t^*(\tau_{c,r}, i)$ of the maximal combined planetary and solar integral energy gravitational influences (3) on the internal rigid core $\tau_{c,r}$ of the Earth) can be predicted (in advance) based on the presented short-term thermohydrogravidynamic technology.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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