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Research Article

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Geodynamic Features of Planet Earth at the Current Stage of Development

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Abstract

The subduction hypothesis, based on the constancy of the planet's diameter, is disappearing from the scene as untenable and speculative. Recently, many new hypotheses have appeared about the origin and development of the Earth, and the expansion of the planet is an established fact. Various sources of endogenous and geodynamic activity are proposed (hydrogen degassing; generation of free neutrons in the core and their transformation into hydrogen and other elements; influx of matter from a vacuum; displacement of the Earth's center of mass under the influence of gravity of the bodies of the Solar System and the Galaxy, and others). The increase in geodynamic activity over time and the acceleration of geological development can be explained by the influx of additional energy from space. The heating of the planet's core has a long-term character. The current increase in geodynamic activity and the catastrophic nature of climate events is a consequence of the superposition of number cosmic cycles on each other. The concept of natural homeostasis is introduced. The mechanism of acceleration of development of celestial bodies is explained.

Keywords: Geodynamics, Plate Tectonics, Subduction, Eduction, Earth's Expansion, Folding, Cyclicity, Natural Homeostasis

1. Introduction

The plate tectonics hypothesis, originating from Fischer and Wegener, developed in the works of Le Pichon and other researchers [1-3], and which dominated for several decades, is currently disappearing from the scene. This is due both to the speculative nature of the constructions during its creation, and to the fact that many geological facts cannot be explained within the framework of this paradigm. In connection with the new data, new hypotheses about the nature of the Earth's core and the scenario of geological development appeared.

There are several key issues that affect the understanding or interpretation of Earth's evolution and its current state as a result of this development:

1 – expansion of the Earth;
2 – explanation of the causes of folding;
3 – geological significance of tectonic structures known as seismic focal zones;
4 – sources of endogenous activity;
5 – influence of cosmic factors.

Below, attention will be paid to each of these problems. The purpose of the work is not to analyze the enormous amount of information on geodynamics (including plate tectonics) accumulated to date. But acquaintance with new and still little-known data may be of interest to a wide range of researchers.

2. Methods

When writing the work, we used the logical-analytical method, based on the analysis of a large number of facts in order to build not contradictory logical constructions. The author's own long-term experience in study of the evolution of living and non-living matter allows him to critically evaluate analyzed data.

3. Expansion of the Earth

The expansion of the planet in the ocean area (spreading) is also recognized by supporters of plate tectonics, but given the constancy of the planet's diameter, they had to provide for a compensatory mechanism – the convergence and thrusting of plates on each other, or subduction. The Earth with an iron core and silicate mantle is not capable to change its volume significantly, but the "iron core and silicate mantle" version has never been proven [4]. Recognition of seafloor spreading inevitably leads to recognition of the expansion of the Earth, but if we recognize the expansion of the planet, subduction is not needed in principle [5].

The expansion of the Earth is evidenced by both the data of a number of researchers and space geodetic surveys. Reteum indicates that over the past 200 million years, a grandiose process of expansion of the Earth has unfolded, and since the Paleozoic, the radius of the planet has increased more than 2 times, and its volume and mass have increased accordingly by approximately an order of magnitude. According to the calculations of Cherepovsky, the total surface area of the planet has increased over the past 150

million years from about 250 to 500 million square kilometers, that is, twice. According to Larin [4], the volume of the Earth has increased since its origin 5 times. Other researchers allow for an increase in the volume of the Earth over a geological period of time by 8 times. It is possible that the size of the Earth in the Archean was smaller than the Moon [6-10].

The process of expansion implies the rise of huge masses of earthly matter from the depths to the surface. The continental lithosphere prevents the influx of deep masses due to its significant thickness on ancient platforms, where individual blocks were consolidated for many hundreds of kilometers, and the increase in area occurred mainly due to the thin oceanic lithosphere, which has a different genesis [11]. If the Earth did not experience expansion, any area of the earth's surface could have a complete geological history from the origin of the Earth to the present day. But in the course of development, as the size increased, new areas of the earth's surface inevitably arose on the Earth, mainly in the seas and oceans. Chudinov divides the history of the Earth into two periods: an older and longer initial period, when expansion was small or absent, and the shorter late period, corresponding to the Upper Proterozoic and Phanerozoic, a time of intense destruction of the platform lithosphere and the formation of oceanic and folded supra-oceanic crust. Larin believes that the expansion of the planet began in the Early Proterozoic, and the main reason for the expansion is hydrogen degassing. According to Belozerov, both the Sun and all stars emitting electromagnetic and corpuscular radiation are exclusively the heirs of decompressing and expanding neutron-baryonic stars. One of the drops of "neutron-hypersonic broth" measuring only 0.25-0.5 km could have acted as the Proto-Earth. The diameter of this "drop", which has long since become the planet, has increased (assuming its absolutely spherical shape) by 40-80 thousand times and continues to increase [4,8].

According to the concept of an expanding and pulsating Earth, the epochs of stable expansion of the Earth are replaced by epochs of stable compression [12]. Rotating around the center of the Galaxy, our Earth and our Solar System successively go through different seasons of the conventional galactic year, and now we are entering a galactic "winter" and a period of maximum expansion of the planet. The authors note that pulsations in the size of the Earth are secondary phenomena in relation to its overall expansion. An indicator of the planet's expansion can be a slowdown in rotation and a decrease in the number of days per year. The cyclic nature of the planet's expansion and hydrogen outgassing is also emphasized by Larin [4]. Each cycle begins with the process of expansion and long-term outgassing and ends with the period of rest, during which radiogenic heat accumulates in the bowels of the planet, which is necessary to launch the next cycle.

Modern continents continue to be subject to fragmentation as a result of stretching, which is observed in the Great African Rift zone, in the Amazon River basin, in the Mediterranean, the Baikal region, as well as in many lowlands, such as the West Siberian, Pechora and others [11]. The increase in the distance between all geodetic stations without exception, located on opposite sides of the Atlantic and Pacific Oceans, clearly indicates the process of Earth expansion [6].

4. Folding

Folding and mountain building are not always synonyms, since folding is not necessarily accompanied by uplift, and long-term uplifts of sections of the earth's crust can occur without folding [13]. Below we use both terms depending on the situation. Despite numerous explanations of the mechanism of these processes, the question of the formation of folding and mountains has not been finally resolved, which can be seen from the diversity of opinions on this matter.

Contrary to popular belief, tectonic concepts that postulate the constancy of the Earth's size cause great difficulties precisely in explaining the process of folding [11]. The expansion of the Earth is another matter, against its background, the collision of rock masses is inevitable: folded deformations, including in the largest folded belts, act as secondary side effects of the general process of expansion. The main cause of folding is lateral tectonic compression. Ancient continental blocks could easily crush the plastic oceanic crust, and any deviation from the diverging trajectories along their path of movement ultimately led to folding. The Earth's rotation could contribute to additional horizontal displacements of continental and oceanic masses [11].

According to Belozerov, the cooling of the Proto-Earth, exothermic self-decomposition and decompaction led to the fact that the remnants of the once super-dense matter turned into another, significantly less dense neutron-containing substance ("broth"), which is currently the "G"-core layer (sub-core) of the planet and has a radius of about 1300 km. The process of self-decomposition of free neutrons is accompanied by the formation of hydrogen, the synthesis of helium and all sorts of isotopes of all possible chemical elements and continues to this day. In the weakest places of the growing crust, cracks formed, through which the outflow of molten magma from the bowels of the Earth has occurred and continues to occur, while in stronger places of the growing crust, its "swelling" has been and is still occurring, resulting in the formation of hills, mountains and mountain systems. Thus, according to Belozerov, the formation of mountains is simply the swelling of the solid crust of the Earth that occurs during the cooling of the neutron-hyperonic broth. "On the surface of the red-hot sphere that was still glowing with heat yesterday, first the liquid surface of melts begins to form, covered by a powerful heat-insulating vapor-gas shell, later – the growing crust of solid matter, etc." [8, p. 43].

According to Larin, the cause of tectonomagmatic activity leading to the formation of folded belts is one, it is the hydrogen degassing. The specificity of hydrogen degassing is the ability to collect in flows, since it is a heat carrier, and hot flows can attach to themselves smaller, less heated streams. As a result, so-called tectonogens can arise, which are understood as a certain volume of rocks under the lithosphere in the upper part of the metal sphere and in which the concentrated flow of hydrogen collects (Figure

1). The metallosphere is a layer between the lithosphere and the outer core, with a thickness of 150 to 2900 km, 90% composed of magnesium, iron and metallic silicon silicides (with additions of potassium, aluminum, sodium and other metals). It is formed due to the reduction of the mass of the core during the degassing of hydrogen, which is retained in metals in the form of a solution, while it must be largely degassed from the outer shells [4].

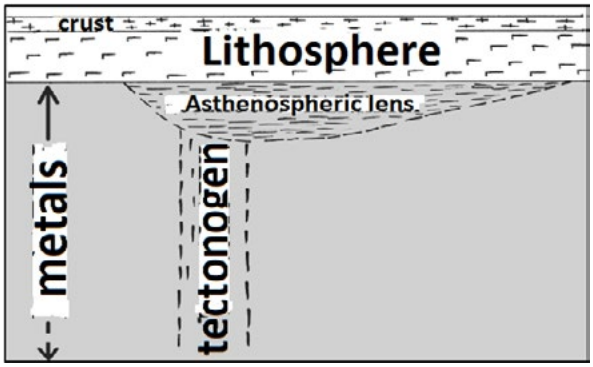

Figure 1: Scheme of the Structure of the Tectonogen According to Larin

Larin explains the simultaneous orogenesis in all folded belts of the same tectonomagmatic cycle, regardless of the distance of their location, by the fact that the cessation of hydrogen degassing from the core is a global phenomenon. There should be two mountain-building cycles in folded belts: the first due to folding and the second as a result of decompaction of the tectonogen. Initially, metals in the volume of the tectonogen are compacted, and the upper boundary drops downwards. Everything located above it is sucked into the resulting depression (the "swallowing zone"). A natural consequence of this process is the formation of a vast sea basin and the accumulation of sediments in it (Figure 2).

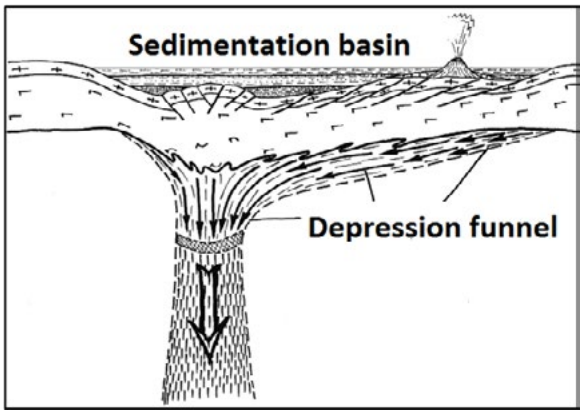

Figure 2: Stage of Submersion and Sedimentation

In the inner parts of the basin, the compression regime will prevail, so the sediments begin to crumple into folds. After increasing their thick and rising above sea level, sedimentation ceases. Over time, the area of the cordillera increases, the basins shrink, and a young folded belt is formed (Figure 3). But in the marginal parts, from under which the asthenosphere is drained, the regime of extension and long-term stable subsidence dominates; the marginal zones are formed into marginal troughs, in which subsidence and sedimentation continue.

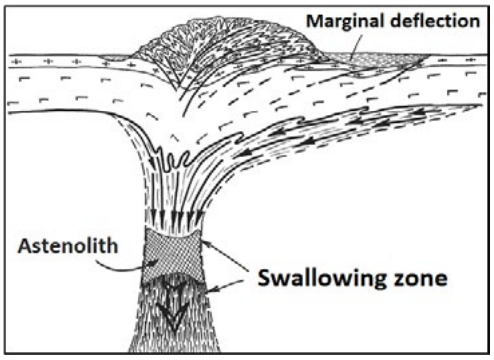

Figure 3: Stage of Complete Folding (Astenolith – a Block of Silicates Formed as a Result of the Transformation of Intermetallic Silicides Into Oxides)

With the end of hydrogen degassing from the core, proton gas flows out of the tectonogen fairly quickly. As a result, the tectonogen returns to its original volume, i.e. expands, and the depression funnel is transformed into an asthenosphere bulge; an orogenic arch is formed (Figure 4).

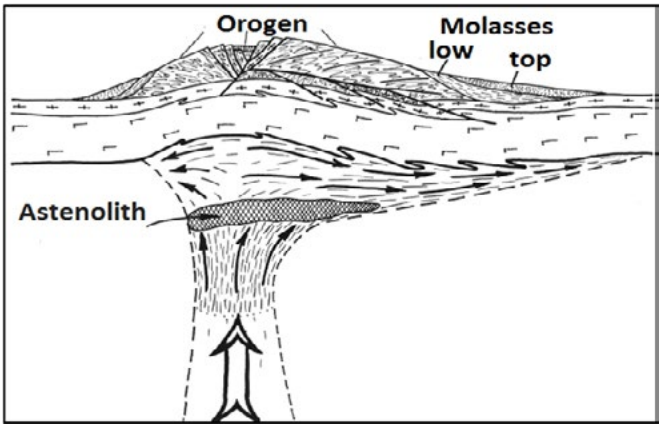

Figure 4: Orogenic Stage. Stage of Uplift of the Orogenic Arch

In some cases, extended mountain systems are formed without preliminary subsidence and sedimentation (epiplatform orogenesis). The relief uplift here is associated with the disintegration of metastable garnet in the lithosphere from the action of hot fluids (the isomorphic capacity of the garnet crystal lattice is tens of times greater than that of olivine, pyroxenes and plagioclase, into which it disintegrates when pressure decreases), whereas in folded belts, orogenesis is caused by the decompaction of tectonogens. That is, tectonogens in the areas of epiplatform orogenesis had small amplitude of compaction and decompaction and were located under areas that had been in a state of tectonic rest for a long time.

According to the concept of mass overthrust-thrust tectonics of the lithosphere, the modern structure of the lithosphere is formed by powerful tangential compression and represents a complex of allochthons of different ages and scales, successively thrust from the center of the eugeosyncline toward the neighboring craton. Platform folding, according to the listed authors, is formed as a result of regional compression directed from folded orogens. With regard to the source of the forces determining these tectonic processes, only the vaguest ideas are expressed about the decompaction of foundation rocks under the influence of processes of their transformation that are not specified by the authors. According to Suslikov, this concept only thoroughly fixes the existing structure of the earth's crust, without considering in detail the mechanism and patterns of the processes that formed it. Thus, tangential compression cannot be transmitted over any significant distances. The cause of tectonic processes also cannot be explained from the standpoint of fixism, since this concept denies significant horizontal movements of the earth's crust masses and explains the formation of orogens by vertical uplifts of basement blocks. The same applies to mobilism, which moves rigid plates of continental and oceanic crust over significant distances without any vertical differentiation: convection, as a source of continental drift forces with soldered oceanic crust, is impossible in a heterogeneous mantle [14-17]. Therefore, an alternative model of the earth's crust geodynamics was proposed – the glacial model, based on the similarity of the processes occurring in the body of the glacier and in the earth's crust.

The similarity between the orographic pattern of mountain ranges and glacial relief became obvious after the appearance of the first space images in the early 80s. This is clearly visible below in several figures (Figures 5-15), taken from Suslikov's work [17].

Figure 5: Morphology of the right tributary of the Fedchenko Glacier, Pamir

Figure 6: Orography of the Yana River basin

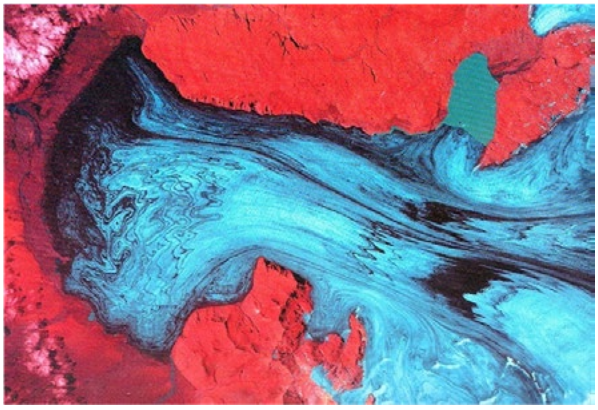

Figure 7: Vatnajokull Glacier (Iceland). Fold patterns are the Result of Plastic Ice Flow

Figure 8: Hamersley Range (Australia). Orographic pattern (Compare with Figure 7)

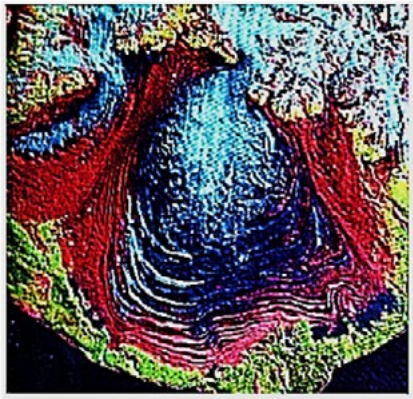

Figure 9: Morphology of the Malaspina Glacier (Alaska)

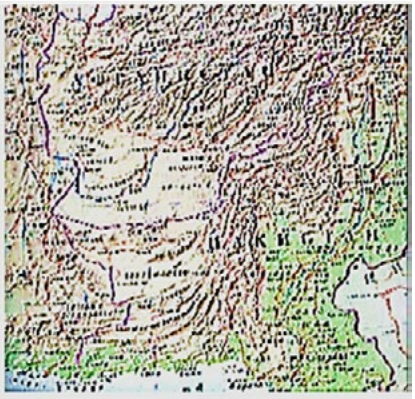

Figure 10: Orography of Central Makransky Range and Suleimenov Mountains (C. Asia)

Figure 11: Southeastern North America. Appalachian fold system. Sharp-Angled Folds (Compare with Figure 12)

Figure 12: Glacier. Hindu Kush. Sharp-Angled Folds

Figure 13: Bivachny Glacier. Pamir. Similarity of Rock and Ice Rock Structures

Figure 14: South Sandwich Islands. South Atlantic. Similarity of Rock and ice Rock Structures

Figure 15: Hindu Kush. Similarity of Rock and Ice Rock Structures

The fractal nature of the world structure allowed the author to assume that the external similarity of tectonic and ice structures formed by rocks of different densities is the result of the similarity of the processes occurring in them. In his work, he showed that the dynamics of the glacial model (the evolutionary complementary series "glaciers – moraine-containing ice – main moraines") is applicable to the geodynamics of both individual structures and the geodynamics of the earth's crust as a whole. Primacy in all these processes is given to gravitational forces: any tectonic flow of rocks occurs as the result of the action of gravity and no force of horizontal compression or extension directly participates in the occurrence of tectonic faults, but is, in essence, only its derivative. Ascending stresses of deep origin also have a gravitational nature. Gravitational flow of rocks ("gravitational tectogenesis") covers any phenomena in which gravity takes part – from simple sliding of newly deposited sediments to processes of isostatic alignment on a continental scale, including the theory of the deep structure of mountain ranges. The cause of this movement is the gradual uplift of the foundation, increasing over time and expanding as the result of numerous, successive and different-rank tectonic phases. Small basement tilt angles do not prevents sliding. The thicker the rock mass, the easier it is: when the pore fluid pressure approaches the pressure of the overlying sediments, the stress experienced by the solid part of the rock becomes very small, and the tangential friction resistance decreases accordingly [17]. It should be added that the drilling of deep and ultra-deep wells (more than 350) confirmed the exceptional influence of water on the rheology of rocks, and, consequently, on tectonics.

5. Seismic Focal Zones

Seismic focal zones (or Benioff zones) are active boundaries of oceans and continents, characterized by the largest tectonic movements and seismic activity, where up to 80% of the Earth's total seismic energy is released. Seismic focal zones (SFZ) extend in accordance with the continent-ocean boundaries and dip obliquely toward the continent, so the deepest earthquakes (up to 700 km) occur near the margins of the continent or under it. The influence of the SFZ is manifested in significant horizontal and vertical tectonic deformations, mainly in the form of block or folded-block structures, accompanied by large-scale magmatic and ore-forming processes [11].

Most subduction zones are associated with SFZs. Supporters of plate tectonics believe that continental crust is formed in subduction zones due to the remelting of the oceanic crust and sediments pushed under it. The tilt of the SFZ towards the continent was incorrectly interpreted by Le Pichon as the pushing of the oceanic plate under the continental plate, which is opposed by many scientists. The pushing of lighter oceanic crust under heavier continental crust contradicts the laws of physics, Archimedes' principle [11,19]. For 50 years, not a single fact has been published that indicates the actual immersion of the crust into the mantle [6]. It is unclear how the plates are heated to the melting temperatures of rocks, why there are no deformations of the bottom sediments, and how the material balance between long two-sided spreading zones and short one-sided subduction zones is maintained over millions of years, etc. Le Pichon's mistake was that the expansion of the ocean floor occurs not only in the direction transverse to the spreading ridges, but also in other directions, including longitudinal [11]. If we accept mid-ocean ridges as traces of continental splitting, then we cannot fail to recognize the significant longitudinal expansion of these ridges. Objections also concern the term "lithospheric plate" itself. The purpose of distinguishing plates was to ensure the constant size of the Earth, but this tectonic division united the most heterogeneous parts of the lithosphere – the continents and oceans, and the latter, since their area is much larger, were divided into pieces belonging to different plates. Chudinov points out that geophysical or geological arguments in favor of such a unification of heterogeneous or separation of homogeneous parts of the lithosphere have never been given. The unnaturalness of the distinguished structures can also be seen from the fact that the same areas can be classified by different researchers as different "lithospheric plates"

In the subduction model, many features of the structure of the SFZ and the fact of the removal of huge masses of matter of deep origin to the earth's surface remain unexplained, so an alternative concept was proposed – Eduction.

Eduction is the extrusion and outflow of mantle material onto the Earth's surface in the area of active connection of continents and oceans where plate tectonics suggests subduction [11]. The outflow of lower mantle material to the Earth's surface is carried out from under the blocks of the ancient lithosphere, which is understood as the platform lithosphere formed in the first and longest stages of the Earth's development and initially covered the entire Earth of a smaller size, it is the most powerful and most rigid. The movement of deep material begins from depths of hundreds of kilometers at temperatures 2000-2300°C and higher, resulting in the introduction of large reserves of deep heat into the upper levels of the lithosphere. The process of eduction is opposite to subduction in the direction of tectonic movements; it is characterized by the presence of deep-water SFZs of the ocean margin, volcanic, intrusive and supra-seismic ore belts above them, and characteristic forms of mega-relief in the form of deep-water trenches, island arcs or, in other cases, marginal continental rises. Eduction leads to additional growth of the oceanic basement from the side of the basins.

The eduction concept is consistent with the theory of Earth expansion, as the outflow of deep mantle material is thought to occur as a result of pressure from below the expanding parts of the Earth. It also solves the problem of the lack of high-energy sources, which is one of the problems with the subduction concept. The sinking of a cold plate into the mantle stops the supply of heat from the mantle and causes the rock masses to cool near the surface. Plate friction cannot create the necessary amount of heat to explain the significantly increased heat flow in the supraseismofocal region [11]. Eduction excludes the requirement of equality of the sides of the spreading zones and subduction zones, since it can occur simultaneously with spreading or at different times. The eduction model forces us to look for the origin of earthquake-generating

movements not near the Earth's surface, as the subduction model does, but at great depths in seismic focal zones. The main material observed in these areas was not brought from the ocean, but was raised from the depths.

A generalized section along the SFZ as interpreted by Chudinov [11] is presented in Figure 16.

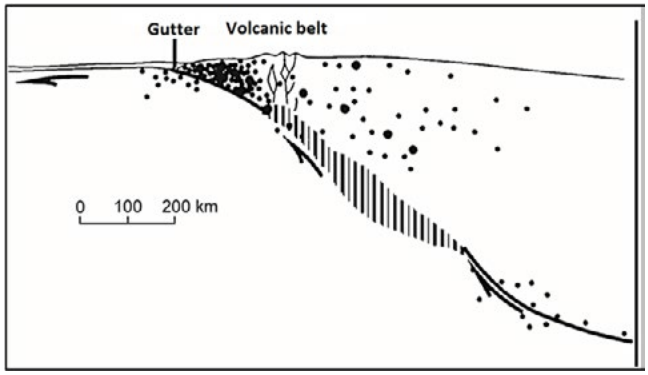

Figure 16: Generalized section along the active continental margin. Arrows show the direction of mantle material outflow along the deep edge of the continental lithosphere. Circles are sources of earthquakes of varying strength; the shaded strip is the interval of magma formation

Chudinov points out that the tilt of the SFZ towards the continent, which serves as the main argument in favor of subduction, does not have a satisfactory explanation from its standpoint. He explains the tilt of the seismic focal plane away from the sea by the protrusion of the oceanic crust, and not by its absorption [20]. This interpretation of the tilt of the SFZ is not the only one. Larin believes that the inclined part of the seismic focal zone (above 250 km) is associated with the formation of the swallowing zone in tectonogen and the overflow of a depression funnel in the asthenosphere. In the lower part (in the depth range from approximately 250 km to 650 km), the plane of the seismic zone is located vertically (or close to it), and seismicity in it is caused by changes in the volume of metals during their saturation with hydrogen (and during its degassing). The tectonogen itself is fixed by deep-focus earthquakes (Figure 17).

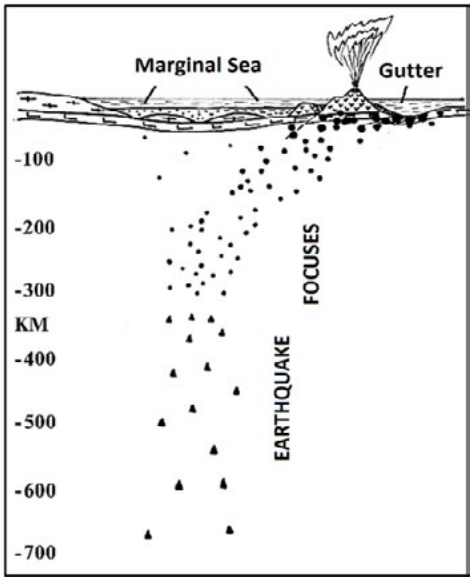

Figure 17: Character of Seismicity as a Consequence of the Laying of a Tectonogen (Generalized Section of the Triad – Deep-Sea Trench, Island Arc, Marginal Sea)

Suslikov regards the rise and expansion of the bottom of rear pool to be the main cause of seismicity of island arcs and considers the Benioff-Zavaritsky zone as focal zone of stress relaxation in the lithosphere created by the mass of the advancing continental crust of the Asian continent onto the oceanic crust (not to be confused with the underthrust of the oceanic crust under the continental crust, i.e., with subduction). A similar mechanism is also characteristic of the margins of the American continents, which creep with a broad front onto the oceanic crust.

6. Endogenous Heat Sources

Among the energy sources that determine internal geodynamic processes, preference was given to the gravitational differentiation of matter by density, the decay of radioactive elements, and tidal interactions of the Earth with the Moon. Different weights were given to different processes. For example, Sorokhtin and co-authors believe that during the formation of the Earth, the gravitational energy of the planet's accretion almost completely dominated; in the young Earth, the release of tidal energy prevailed, and starting

from the Archean, that is, from the moment of the emergence of endogenous tectonic activity of the Earth and up to now, the release of energy of gravitational differentiation of the Earth's matter has dominated. The release of energy from the decay of radioactive elements in the depths of the Earth, in their opinion, has never played a leading role. At present, energy is distributed as follows. The main planetary process that controls the evolution of the Earth is the process of chemical-density differentiation of the earth's matter, leading to the release and growth of a dense iron oxide core in the central regions of the Earth and to the emergence of chemical-density convection in its silicate shell, that is, in the earth's mantle; this process currently releases about 90% of endogenous energy. In second place in terms of power is the process of decay of radioactive elements – less than 10% of the energy, and, finally, tidal deformations in the body of the Earth release yet approximately 1% of endogenous energy [18].

The authors whose views are presented above are supporters of plate tectonics, and here it is appropriate to cite the statement of Reteum [6]: over the past 40 years, the world geological literature has been replenished with tens of thousands of books and articles on plate tectonics, but among them there is not a single special work (!) that would consider (even hypothetical) options for generating energy in the hot core and transferring it to the outer shells. This is probably due to the fact that plate tectonics do not require the expansion of the Earth. Below are some alternative points of view.

According to Larin [4], the author of the hydride hypothesis of the Earth's origin, the newborn planet was relatively cold. But radiogenic heating of the bowels was not the main source of energy determining the planet's evolution, but only warmed it to temperatures at which the decomposition of hydrides began. Radioactive elements, the amount of which was greater than now, were distributed evenly throughout the entire volume of the Earth, so the heating also occurred evenly. The stability of hydrides increases with increasing pressure (with depth), but decreases with increasing temperature, so the heating of the initially hydride Earth was accompanied by its stratification into a number of shells. Naturally, hydrides should have been preserved for a longer time in the center of the planet, that is, in the zones of maximum pressures; here a hydrogen-containing core with a hydride central zone was formed, surrounded by a metallic shell, the volume of which increased over time due to the reduction in the mass of the core and which was blown through by hydrogen released due to heating. In this case, oxygen atoms were displaced by hydrogen, resulting in the formation of a silicate-oxide crust – the lithosphere. In its predominant volume, it was formed by the end of the Archean [4]. The main energy source of the tectonic activity of the planet was the energy stored in hydrides at the stage of formation of a solid body: the potential energy released during its gravitational compaction did not lead to heating, but was spent mainly on the transformation of chemical compounds.

In contrast to the recognition of the initially hydride composition of the Earth, Reteum believes that hydrogen is synthesized in the Earth's core due to the continuous influx of etheric newtonium from space; the oxidation of hydrogen serves as a common source of energy for all geodynamic processes accompanied by the formation of water, the release of heat and electromagnetic radiation. Getting into the super-dense core of our planet, newtonium is converted into neutrons and then into hydrogen atoms and other chemical elements [6]. The conversion of neutrons into hydrogen atoms leads to an increase in volume by a trillion times, which is the main cause of earthquakes and slow tectonic deformations [20].

The simplest way to solve the problem of finding sources of endogenous energy is probably from the standpoint of the concept of development of neutron-baryon stars proposed by Belozerov [8]. In the process of continuous exothermic self-decomposition of the initial "drop" from the "neutron-hyperonic broth", the remainder of which, according to this concept, currently represents the sub-core (layer "G", or kernel) of the planet, free neutrons appear, "evaporating" in countless quantities from the surface of the "G" layer into the intermediate (transitional) layer "F" and further from this surface. During the electron β-decay of radioactive free neutrons (half-life ~ 16 minutes), hydrogen (protons plus electrons) and helium are formed, synthesized from neutrons and hydrogen atoms in the multi-stage exothermic process under extreme conditions of the transition layer "F". These processes are accompanied by the release of a large amount of energy, which eventually turns into heat. Without going into the details of these processes, we will only recall that the β-decay of every 8 free neutrons leads to the appearance in nature of 4 hydrogen atoms and 1 helium atom, as well as to the release of energy more than 5 times greater than the energy of the exothermic β-decay of 8 neutrons [8]. These reactions are very indicative in relation to explaining the appearance of free energy in the body of the planet.

Barkin believes that all observed planetary phenomena (tectonic activity, formation of cracks and faults, rise of plumes, degassing, sharp jumps in activity of polar regions, etc.) can be explained by the mechanism of forced oscillations of the core and mantle of the planet, which is capable of providing energy for all observed planetary phenomena. The constant displacement of the Earth's center of mass relative to its geometric center is 1.1 km. The centers of mass of the shells (including the core) do not coincide with the center of mass of the planet and interact with each other, performing complex movements under the action of gravitational forces of the surrounding celestial bodies of the Solar System and the Galaxy. Deformation of the shells and changes in the geometry of their masses cause tectonic processes and other transformations. The process of gravitational differentiation of the earth's matter is the most powerful source of endogenous energy on Earth. At the same time, the contribution of lunar-solar tides to the endogenous activity of the planet and to planetary natural processes is no more than 1% [21].

7. The Influence of Space Factors

The influence of space on the Earth is multifaceted and often unpredictable, and it is studied by humanity. Within the framework of the article, we will touch upon only some aspects of this vast topic that are related to recent events.

Life on Earth, the geodynamic features of the planet and weather conditions depend on both permanent and non-periodic, random factors. The fall of cosmic bodies to Earth is a random phenomenon, but it happens regularly. In this regard, Zeilik formulated the problem of the cosmic threat to humanity in 1988 [22]. At that time, it was not taken seriously, but became obvious in connection with the development of the satellite system, which made it possible to discover a significant number of asteroids in the solar system, and in connection with subsequent events (for example, the fall of the Chelyabinsk meteorite on February 15, 2013; the appearance in the Solar System of the interstellar object Oumuamua, about 400 meters long, in 2017). Aerial photography revealed a wide development of ring structures. Of the 5,000 ring structures, about half received a standard geological interpretation (plutonic, volcanic, tectonic), and the rest remained in the rank of structures of "unknown origin" [23]. It is quite obvious that a significant part of them are astroblemes.

Another example concerns the explosion of the magnetar SGR 1806-20, which caused the 2004 Sumatra earthquake; the resulting tsunami killed 300,000 people. Its explosion is considered the most powerful in space in the history of astronomical observations [19].

Everyone knows the influence of the Sun on terrestrial processes. It is believed that the 11-year cycle has a much weaker effect on internal processes than the cycle of total solar activity, equal to 179 years and associated with the movement of the Sun and Earth around the barycenter of the solar system; it affects geodynamics, which is manifested in increased seismicity and volcanic eruptions [24]. The barycenter is the center of gravity of the solar system, where the masses of the Sun itself, all planets, moons and asteroids are balanced. Scientists believe that the barycentric motion of the Sun, controlled by gravity, affects the processes occurring on the Sun, Earth and other planets of the solar system [25]. The end of the later cycle of solar activity falls on 1990 [19]. This cycle is superimposed on the 1430-year, 11440-year and other cycles, as well as the 12- and 24-thousand-year cycles, which should be discussed in more detail.

The mechanism of forced oscillations of the planet's core and mantle proposed by Barkin [21] does not explain the increase in the intensity of tectonic processes over time, as well as the increase in volcanic and seismic activity and the increasing catastrophic nature of climate change that is currently occurring. From the standpoint of the concept he outlined, the total endogenous energy of the planet should remain relatively constant, but the events of recent decades clearly indicate the increase in endogenous energy in the body of the planet.

Obvious changes began at the end of the last century. Thus, the drift velocity of the north magnetic pole increased by more than 500% from 1980 to 2010, which is regarded as the beginning of a significant increase in the Earth's geodynamic activity [26]. Since 1998, after the jump of the earth's core under Taimyr, there has been the sharp increase in the number of strong earthquakes and the number of people killed as a result according to an exponential law, an abrupt change in solar radiation and the abnormal increase in the global temperature of the troposphere, the "jump" in the annual number of tsunamis, described by exponential trends. There is also the sharp increase in the number of tornadoes, North Atlantic tropical storms, the total number of hurricanes in the Atlantic basin; the stable increase in the number of floods; the abrupt increase in the number of forest fires and the number of other events.

Synchronous jumps in natural processes are observed not only on Earth, but also on the Sun, Moon, Mars and other bodies of the Solar System. Separate, even powerful solar events are not capable of causing jump-like deviations, and therefore they cannot be the cause of sporadic changes in the nature of the trend of geodynamic and geophysical processes that occurred in 1997-1998. A significant increase in the level of evolutionary trends after jumps can only occur by adding energy to the planet or the Solar System as a whole [26]. Therefore, scientists believe that the cause of sharp climatic and geodynamic changes is cyclicity: once every 12-13 thousand years, the Solar System comes under galactic radiation of unknown origin or under galactic shock waves, which is confirmed by the data of the geological record. Every 24-26 thousand years, the impact is stronger due to a closer passage to the radiation source, and at the present time, a 24-thousand-year cycle is superimposed on the 12-thousand-year cycle [27, 28]. Receiving additional energy, the cores of the planets heat up, causing the activation of geodynamic and climatic processes. Reteum [6] considers the invasion of ultrafine particle flows into the Earth's space to be proven: it is obvious that radiation from the center of the Galaxy arrives at the Earth and is retained by its core, but the interaction of flows of this type with matter of unique density has yet to be studied.

Analysis of the facts shows that the earth's core is subject to heating not only during cyclic periods, but experiences stable heating over a long period of time [29], evidence of which is given below. Each stage of geological development is characterized by its own features that distinguish it from other stages, which is associated, among other things, with the direction of the planet's evolution. With the passage of geological time, an increase in the intensity of tectonic processes is noted. It is believed [4] that in the Archean there was no hydrosphere as a global phenomenon, although individual shallow basins were present. This is evidenced by the finds of fossil bacteria aged 3.5 or even 3.8 billion years [30, etc.]. Their first blossoming is confined to the early Proterozoic, which may indicate the broader development of sea basins from that time. Larin [4] explains the absence of the hydrosphere in the Archean by the fact that oxygen forms more stable bonds with metals than with hydrogen, therefore in the Archean, when metals were oxidized and the lithosphere was formed, there was no water in the deep fluid. After this process was completed, oxygen began to react with hydrogen, and water appeared in the deep fluid. The Precambrian seas were relatively shallow, with a narrow photic zone, since multi-kilometer tides stirred up the sediment [31-33]. Rozanov points out that in the Precambrian and Paleozoic, there were widespread epicontinental shallow seas,

which have no analogues at present [34]. Since the Cambrian, the number of stromatolites, the distribution of which was initially associated with shallow water, has sharply decreased. Also, since the Cambrian, upwellings have been widely developed, which is due to the differentiation of the seabed by depth [35]. These facts clearly indicate the deepening of the seabed since the beginning of the Paleozoic, which could have been facilitated by the Vendian transgression. The height of the photic zone column increased, and anoxic conditions (hydrogen sulfide contamination) could have been created in sediment traps. The deposition of rifts and the beginning of the formation of oceans are associated with the end of the Permian – the beginning of the Triassic [17]. Since the Mesozoic, the intensity of tectonic movements has increased, and a powerful tectonic stage (Cimmerian or Pacific) has emerged. Differentiation between deep-sea basins and mountain elevations has reached its maximum for the entire period of the Earth's existence. Even greater intensity is characteristic of neotectonics movements associated with the Alpine phase of folding (Late Paleogene-Anthropogenic), which continues to this day. Compared to the previous stage, their intensity has increased almost threefold [17]. For example, the increase in the height of the Andes peaks by 5–6 km occurred in the Pliocene and Quaternary in just 7–8 million years [11].

The acceleration of geological development, expressed in the acceleration of the expansion of the earth's crust, may also indicate an increase in the planet's energy as a whole. Since the Mesozoic, the curve of acceleration of development has acquired an exponential character (Figure 18). For the Baikal phase of folding (end of the Precambrian – beginning of the Cambrian), the calculated rate of crust generation is 0.05 km2/year, for the beginning of the Cretaceous era – 1.3, and for the present – 3.12.

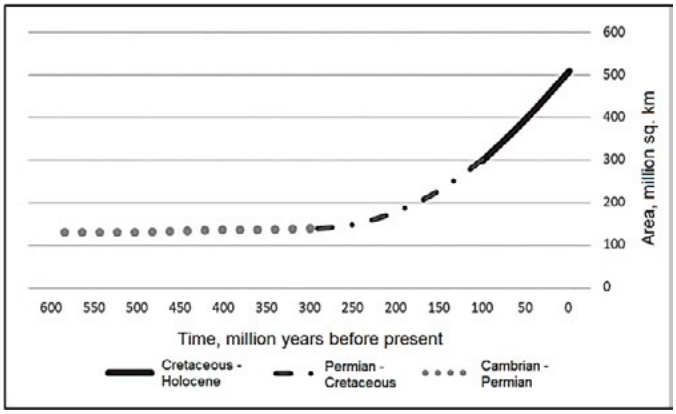

Figure 18: The Growth of the Earth's Crust Over Time (According to Blinov [10])

Another proof of long-term heating of the core can be a change in the intensity of the magnetic field, which in the Precambrian was approximately 6-8 times higher than the current value [9]. According to geological data, the field intensity decreased by 8-10 times during periods of cycles, which is still observed today. Flocks of birds go astray, in conditions of the weakened field the number of mutants and the number of oncological and cardiovascular diseases increases.

Based on data on the development of the ice sheet in Tajikistan, warming has been going on for at least 200 thousand years [29]. An indirect indicator of the heating of the core can be the fact that the climate changes that are observed now, according to scientists' calculations, should have begun on Earth much later – in 100 or more years.

On the scale of the Earth's existence, a time of 12-13 thousand years is very insignificant, so the Earth receives additional energy almost constantly. In such conditions, a cumulative effect should manifest itself. For clarity, we will give the following calculations. If we equate the time of the Earth's existence (4.8 billion years) to one Earth day (24 hours) and assume that the periodicity of cycles is 12 thousand years, then it is easy to calculate that hard radiation will act (over the course of a conventional day) every 0.216 seconds. If a body with sufficiently high thermal conductivity (what is the earth's core like) is exposed to sufficiently strong thermal pulses (analogs of high-energy radiation) every 0.216 seconds for 24 hours, it should heat up [29].

According to scientists, the density of the core is not 12.46, but 25 or even 35 g/cm3 [4,8]. Its formation required a certain amount of time, and not only radiogenic heat, but also periodic energy inputs from cycles could have contributed to the heating of the initially cold Earth. According to some scientists, the ancient atmosphere could have consisted of greenhouse gases (carbon dioxide with an admixture of methane), which should have protected the Earth from freezing [30]. The processes of differentiation and degassing of hydrogen could begin only after reaching the temperature limit of hydride stability. The same applies to expansion, it began at the end of the Archean – the beginning of the Proterozoic or in the late Proterozoic [4, 11]. That is, at first, the energy supplied by the cycles did not play a big role due to the low temperature of the planet as a whole. The lower temperature was facilitated by the smaller size and weaker luminosity of the Sun, which increased by 30% over these several billion years. During the Archean period, the Sun shone dimmer and heated the Earth less [30], and dimensions of the Sun were also smaller. It took the fairly long time for the cumulative effect of heating of the core, formed during the formation and development of the planet, to take effect. The acceleration of geological development and the

increase in the intensity of tectonic processes became especially noticeable from the Mesozoic (Figure 18), which may indicate a clear manifestation of the cumulative effect from this time.

It should be remembered that in order to increase the intensity of any process, there is no need to increase the dose of incoming energy consistently; the duration of its intake is more important. To speed up the process, it is enough to meet the condition: Epart = const, where Epart is portions of energy that supply the system over a long period of time. This can be observed in various examples. The temperature of heating water to the boiling point remains constant throughout the entire heating time, but the water in the pan will boil sooner or later. In physics, there is a well-known rule: when a constant force acts on a body, uniformly accelerated motion occurs. In the case of cyclicity, the same must be observed: the amount of incoming energy may not change significantly, but the geodynamic processes will intensify and accelerate as can be clearly seen on the graph (Figure 18). The same applies to the Sun: if the luminosity of the Sun increased by 7% for every 500-600 million years, as was established for the Phanerozoic [36], then by now it should have increased not by 30%, but by at least 60%, that is, by two times. This means that acceleration of development is inherent not only to the Earth, but also to the Sun.

8. Natural Homeostasis

Another fact indicating long-term heating of the core is the abnormally large amount of water on the planet. Water occupies 72-73% of the Earth's surface, and our planet could well be called the Ocean Planet. The heat capacity of water is 1000 times greater than that of air, and endogenous heat, passing through the thickness of the ocean and dissipating into the atmosphere, loses its initial temperature. The volume of the underground ocean is three times larger, and it is believed that the enormous underground ocean also plays a role in regulating the Earth's temperature [37]. This reservoir probably acts as a giant sponge, absorbing excess heat and carbon dioxide from the mantle and then transferring it to cooler areas of the crust. In this way, a stable climate on the planet can be maintained throughout geological eras, the authors believe. Therefore, an increase in the amount of water over time, along with long-term heating of the core, can be considered a compensatory mechanism, that is, as one of the manifestations of natural homeostasis.

The expression "natural homeostasis" was mentioned by us in one of the articles [38], but no definition was given (due to a different topic). The following definition can be given: natural homeostasis is the action of Le Chatelier's principle at the planetary or sufficiently large-scale level, with or without the participation of the biosphere. The principles of self-maintenance of systems are also inherent in the Earth. Let us give several examples.

In the work of Svatkov, the following fact is indicated: the luminosity of the Sun has increased by almost 7% since the beginning of the Paleozoic; the Earth responded by increasing cloudiness. Based on the study of solar energy absorption by the Earth in the Paleozoic, he came to the conclusion that purely terrestrial processes are capable of reducing the planetary temperature near the liquid-solid surface of the planet despite increasing insolation. Due to feedback and its own low-energy but directed processes in a complicated natural system, its behavior can be directly opposite to the external influence [36].

It is known that a significant amount of sand and dust from the Sahara Desert is carried away by the winds, but they do not cause much harm, since they are the main source of nutrients for the lush forests of the Amazon. Phosphorus, potassium and other substances are washed out of the soil by rain and rivers, but are brought from the Sahara along with sand by subequatorial winds. Ecologists have calculated that out of 182 million tons of sand and dust, 15% settles in the ocean, but 130 million tons end up in the Amazon forests. They contain 22 thousand tons of phosphorus – about the same amount as is washed out by rains and rivers [39]. This mechanism maintains the stability and diversity of a unique biocenosis.

It is probably no coincidence that after biosphere crises, when a large amount of dead organic matter accumulates on land, fungi spread widely. It is known that they are able to assimilate not only organic matter, but also metals, plastic, radioactive waste and lignin; the latter is not absorbed by other organisms. Thus, after the Permian extinction, when about 70% of terrestrial vertebrate species died out on land, as well as a large number of species of plants and insects [40], an increase in fungal mass was noted. Among the microscopic fungi, *Reduviasporonites* is called, which fed on dead trees. The authors believe that fungi took over the world after the catastrophe and caused changes in the environment [41].

It has been noted that an increase in volcanic activity in the northern hemisphere of the Earth is accompanied by a decrease in the southern hemisphere, and vice versa [19]. This indicates the interconnection of processes in different hemispheres and acts as one of the manifestations of natural homeostasis, that is, the planet Earth behaves as an integral system. Similar interconnections have been noted for other planets. Long-term observations of Jupiter's weather conditions have established that the increase in temperature at certain latitudes in the northern hemisphere is accompanied by the decrease in temperature at similar latitudes in the southern hemisphere [42]. In addition, when Jupiter's stratosphere heats up, the temperature in the troposphere decreases. Currently, the sharp decrease in temperature in the Earth's stratosphere is observed, almost to absolute zero. Based on Jupiter data, the question arises: could this be related to the anomalous increase in global troposphere temperature? Reteum explains this by the low absorption capacity of the ozone layer due to its thinning due to hydrogen outgassing [43].

Increased humidity due to global warming (increased rainfall in recent decades, along with decreased snowfall) plays a negative role, causing hurricanes and floods. But ultimately, it should lead to an increase in the amount of water on the planet, which is also facilitated by the melting of glaciers. That does not bear benefit

to humans (destruction, flooding), but it is worth recognizing such a reaction as natural and appropriate within the framework of the planet experiencing heating, if we recall the cooling function of water. Increased degassing is accompanied by heating of the subsurface along the path of hydrogen and the increase in temperature in the surface layer of air, since it is a coolant, but the increase in the amount of water should ultimately contribute to cooling of the environment. The intensity of geodynamic processes has increased significantly since the Mesozoic, when the cumulative effect of heating the interior reached a certain value and began to manifest itself especially vividly, but oceans are formed just from this time. Blinov [10] points out that the accelerated development of the planet was accompanied by the increase in its energy potential, the increase in internal temperature and led to a qualitatively different stage of crust formation – the oceanic one. Formation of the oceans can be explained by the action of natural homeostasis, that is, the abnormally large amount of water on the planet acts as a compensatory mechanism in relation to the long-term heating of the core and the growth of endogenous energy in general.

9. Discussion

The abundance of hypotheses about the origin and development of the Earth, which may also contradict each other in some way, indicates that the general theory of the geological evolution of the Earth is far from complete and is in the development stage. Some hypotheses are touched upon here, and a number of the most important issues are highlighted.

Below we would like to draw attention to separate controversial points.

There is still much that is hypothetical about the development of neutron stars, and the concept presented reflects the point of view of an astrophysicist [8]. But from the standpoint of a geologist, to say that the mountains arose as a result of the crust swelling during cooling is to say practically nothing, since the mechanism of swelling itself is unclear. A review of the viewpoints on folding shows that different, sometimes opposite, mechanisms can be used to explain the formation of mountains and folding. With the fixist approach, the process vector is directed vertically upwards, with the mobilist approach it is horizontal, and from the standpoint of the hypothesis of the initially hydride Earth, the vector is directed vertically downwards – the swallowing of rocks into the tectonogen. In addition, the increase in the size of the neutron-hyperonic "drop" cannot last forever; over time, the expansion must slow down and at some point, stop completely. Geological facts indicate the opposite: the beginning of expansion from the certain point in time and its acceleration in the future.

The age of the Universe is approximately three times greater than the age of the Earth and the Solar System. Light elements form first, so newtonium, if it exists, must have been arriving on Earth since its formation. Then why did the planet expansion and degassing of hydrogen begin only 2 billion years after formation? The hypothesis proposed by Reteum [6, 19] does not provide answers to these questions.

Blinov sees the development of the planet in the increase of its diameter from the size of an asteroid through the lunar and Martian to the modern Earth [10]. The expansion is a consequence of the influx of matter from space into the planet's body, but the small size of asteroids suggests accretion as the initial stage of formation. Proposed by Larin [4] and supported by astrophysicists (by Shklovsky and others) the magnetic separation of atoms and ions, which took place during the formation of the Solar System (and not by atomic weights, as most people believe), fully explains the elemental composition of the Sun, Earth and the asteroid belt and does not contradict geological and astrophysical data, whereas Blinov's accretion hypothesis does not provide an idea of the initial composition of the Earth's matter (under such a scenario it could be anything) and the quantitative determinacy of certain elements. Separation of chemical elements by their ionization potentials is possible only if the matter was partially or completely ionized (cold plasma), and this prohibits the accretion development of the Earth in the manner proposed by Blinov. The appearance of the oldest igneous rocks on Earth only 600-800 million years after its formation is considered as convincing evidence of the "cold" origin of the Earth [18].

If we compare figures 16 and 17, which reflect the character of seismicity of seismic focal zones as presented by different authors, we will see that they complement each other. Chudinov points out that there is a wide sub horizontal "gap" between 300 and 550 km without any earthquake foci. Such the gap, sometimes of lesser depth, is observed in most of the deepest SFZ of the Earth. Chudinov believes that it probably reflects a universal feature of the upper mantle of ancient platforms, but such an explanation does not seem convincing, because the influx of masses of hot matter from the depths (eduction) should cause the liquid state not of the middle, but of the lower part of the zones. According to the caption (Figure 16), this interval is associated with the "formation" of magma, and not with its inflow, that is, not with eduction.

There is no such gap (and probably cannot be) in Larin's diagram (Figure 17), who explains all the main tectonic processes with the help of tectonogens. But in his work, he emphasizes that the plane of the SFZ is vertical at the beginning (which is not in Chudinov's diagram), and only starting from certain depths does it acquire an inclined position. The vertical nature of the lower (deep) part of the earthquake propagation curve is associated in Larin with the orientation of the boundaries of tectonogens, but it is quite acceptable from the standpoint of the explanation we propose below.

It was said above that the tilt of the seismic focal plane towards the continent is explained differently by different researchers. The lack of unanimity of opinions is due to the ambiguous understanding of the nature of the seismic focal zone. The version of explanation of the tilt of the plane that we propose below seems to be the simplest and most logical.

It is no secret that not only the oceanic crust, but also the continental crust experiences stretching. This is expressed in the

emergence of continental rifts, in the formation of lowlands and basins, which often represent established stretching zones. The length of the Baikal rifting zone, for example, reaches one and a half thousand km with a width of 200 km, and Lake Baikal is only one of the depressions of this zone [4]. The increase in the area of continental plates due to stretching can be figuratively compared to the fact that we would put several thinner books of successively increasing size on a book of the smaller size, but of sufficient thickness. The lower boundary (corresponding to the more ancient crust) should be vertical, and the combined contour (profile) of the remaining overlying books will be an inclined line, moving away from the original vertical line towards the ocean. However, we are not talking about subduction here; this scheme only explains the inclination of the seismic focal plane under the continent. Chudinov [11] emphasizes the distinctness of the boundary on the ocean side, which is ignored in the subduction model. The junction zone of continents and oceans is the boundary between heterogeneous formations, which predetermines its weakening, but also tectonic activity at the same time. The weakening of these zones does not contradict the fact that in these places (as well as in rift areas) there is an upwelling of deep matter (according to Larin – the injection of diapirs of intermetallic silicides). Tectonic activity is expressed, among other things, in the increased seismicity of these zones. The deep focus of earthquakes, in our opinion, is inherited; before the expansion of platforms (the building up of overlying parts), the maximum depth of the spread of earthquake foci was smaller.

The presence of a gap filled with liquid magma in the vertical propagation of earthquakes (Figure 16) can be explained as follows. A very small part of the energy generated by earthquakes is spent on the dynamics of seismotectonic processes – no more than 1.0-2.0% and the rest are converted into heat. In the opposite case, that is, the dominance of kinetic energy over thermal energy, any sufficiently strong earthquake could destroy the planet. This follows from laboratory experiments on the deformation and destruction of samples, which showed that only the insignificant part of the elastic energy accumulated in the samples (0.1-0.0004%), is converted into seismic energy. The authors believe that the experimental data are in good agreement with the data obtained in natural conditions, in particular, with observations in mines [44]. Thus, the formation of a liquid magma layer can be explained by the combined effect of heat generation by deep-focus earthquakes in the background of an increased heat flow from the interior, characteristic of weakened zones. For example, it is believed that in the Kuril-Kamchatka SFZ, earthquakes (of varying intensity) occur almost continuously [11]. The presence of the gap in the deepest SFZ of the Earth may support the proposed explanation: the greater the number of earthquakes, the more seismogenic heat will be released and the greater the volume of molten magma. As it moves upward, the temperature of the melt will drop, and earthquakes above this zone will no longer produce heat sufficient for large-scale melting of rocks, due to the proximity to the surface of the crust and generally lower temperatures, but pockets of magma are present, as evidenced by volcanic eruptions.

Radioactive heating was maximal at the initial stages of the planet's development, and it is believed that now it does not play a significant role, since most of the radioactive substances have already reacted. But the intensity of tectonic processes is growing, and this means that there must be an additional energy supplier. Many scientists believe that these may be cosmic sources (the influence of the Sun, Jupiter, supernova explosions, the passage of the Solar System through galactic arms, nebulae, etc.). We do not deny the complex influence of factors to our planet, but in our work, we considered it necessary to pay attention to the 12-thousand-year cyclicity, most clearly recorded in the Quaternary chronicle and taking place at the present time, since it is associated with the catastrophic phenomena to which humanity and the planet as a whole are now exposed.

10. Conclusions

The above review shows that there is no consensus on any of the key issues listed. The causes of the Earth's expansion, the mechanisms of folding, and the nature of seismic focal zones are interpreted differently, different sources of endogenous heat are proposed, and the influence of cosmic factors is still being studied. Therefore, it is natural that many statements are only hypothetical. It is impossible not to see the similarity of the processes and structures postulated by the glacial model of geodynamics (the external similarity is due to the internal similarity), which became visible and demonstrably comparable only after humanity mastered space photography. We can't just attribute everything to compression, stretching and vertical movements, that is, to the horizontal and vertical components embodied in the disputes of mobilists and fixists. The inclined components may be of no less importance, but from the standpoint of plate tectonics and fixism they have not been given due attention. It seems to us that the glacial model of geodynamics complements what was missed by the mobilists and fixists, and when creating a general theory of the Earth's development, the processes of free sliding of large masses of rocks leading to folding and overthrusting sheets should be considered, and not only the "forced" convergence caused by compression.

Hydrogen degassing has been implicated in the planet's expansion, and some scientists see it as the primary cause of the expansion. But degassing can only begin after the core reaches certain temperatures, and from this position it is hardly logical to consider it the main cause of expansion. The primary factor is the increase in temperature, and degassing is secondary, so the expansion is ultimately a consequence of heating with all the ensuing consequences. The beginning of expansion only in the Proterozoic may indicate the initially low temperature of the planet. Some may think that in order to accelerate the development of celestial bodies (stars, planets), the amount of energy coming from outside must increase over time. But the laws of physics convince us of the opposite: the influx of small but regular portions of energy is sufficient to shift the balance and increase the intensity of processes that become exponential over time. Single influxes of too much energy will cause nothing but destruction, as was observed in the explosion of the magnetar mentioned earlier (the Sumatra earthquake of 2004, when the subsequent tsunami killed 300,000 people). It was said above that on the scale of the planet's

existence, a time of 12 thousand years is very insignificant, and this effect can be considered practically constant. Thus, there are not only external cosmic threats, including the one that Zeilik wrote about in 1988, but also an internal one – the steady growth of endogenous energy. It is not known what will ultimately win – fire or water: will there be a complete meltdown of the interior or will further oceanization wipe out the continents from the face of the Earth. In both cases, the outcome could be disastrous. As a planet of smaller size, lower gravity and a weaker atmosphere, Mars has already passed its point of no return. The main reason for the increase in the intensity of geodynamic processes is the long-term heating of the core, which is facilitated by the influx of energy from space probably related to cyclicity. Many facts must be rethought from this position, and there are insufficient grounds to say that the main cause of modern catastrophic events is human activity.

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