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A Few Notes Regarding Origin of Diamonds, Water, Natural Gas and Oil

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Abstract

This study investigated the origin of water, natural gas and oil, as well as diamonds. In this paper, it has been shown that diamonds, water, oil and natural gas on Earth were formed as a result of a thermal nuclear explosion following the collision of a comet with the surface of a protoplanet at a sliding angle. The hypothesis proposed by the author is the only one explaining the predominance of diamond deposits in the southern hemisphere and oil and gas deposits in the northern hemisphere. It was explained why the spatial distribution of diamond deposits forms pronounced linear or circular spatial clusters. Two types of diamond deposits and four types of gas and oil deposits were identified in this study. The recommendations for the search for these deposits have been specified.

Keywords

Comet Impact, Buoyancy Theory, Thermal Nuclear Explosion, Diamonds, Water, Natural Gas and Oil

1. Introduction

The goal of this work is to continue the research and also to get acquainted with the previously obtained results and [1] and [2] for a wider audience, including not only astronomers and astrophysicists, but also geologists, geophysicists, and specialists in the field of diamond, oil and gas mining. It should be noted that the developed concept of cometary origin of diamonds, oil and gas also provides a theoretical basis for the search for new deposits of diamond and coal, and new oil and natural gas fields. The success of the developed concept was determined by the joint application of achievements in astrophysics, geophysics and nuclear physics. The concept developed by the author is the only theory that explains the predominance of diamond deposits in the southern hemisphere (near the impact point), and oil and gas deposits in the northern hemisphere. Thousands of scientific articles and monographs are devoted to the formation of diamonds, oil and natural gas deposits. Therefore, in the introduction we will provide a brief review of the literature, where we will mainly focus on the problems of the geophysical approach in solving the tasks set. This study explained why the problems of diamond formation and the synthesis of hydrocarbon (HC) compounds have not found their logical solution only within the framework of geophysics.

1.1. Diamond Synthesis

As noted above, many scientific articles and monographs have been devoted to diamonds and diamond-bearing rocks (kimberlite and lamproite magmas), but a number of problems have not been solved. Below is a list of unsolved issues:

1. Kimberlite and lamproite deposits are found only on old continental platforms, which are stable and powerful blocks of the Earth's crust. It is unclear why kimberlite pipes penetrate the thick crust of old platforms, and not the thin crust of the ocean floor or the transition zone at the boundary between continents and oceans, *i.e.* zones that are characterized by powerful volcanic activity.

2. The forces that force the heavy rocks of the Earth's mantle, violating the principle of stratification of the inner layers of the Earth and Archimedes' law, to break through the thickness of lighter basalt, granite and sedimentary rocks, have not been established.

3. As is known, the mantle layers contain very few heavy and rare earth elements. While kimberlite magma and diamonds can contain uranium, thorium, boron, barium, lead and rare earth elements hundreds and thousands of times more than the mantle itself. This fact is one of the serious arguments against hypotheses about the mantle origin of kimberlites. At the same time, there is no correlation between the chemical composition of the kimberlite magmas themselves and the rocks in which the kimberlite pipes were burned.

4. Diamond is a crystalline structure of carbon. Carbon is an active chemical element, so when it enters into chemical reactions, it can quickly form various compounds. Therefore, the next problem is the problem of the presence of "free" carbon in the crustal and mantle layers. As a result, the diamond should be formed instantly, as a result of explosive reactions. Therefore, subduction models of diamond formation, in the framework of which diamonds are formed during slow processes of dragging organic compounds into the deep mantle layers in the subduction zone, seem to be unjustified.

5. In geophysics, there is no clear explanation for the unique shape of kimberlite pipes (diatremes). Recall that kimberlite pipes have the shape of a cone on a thin foot extending into the depths of the mantle. Experts call them "explosion tubes", although, firstly, underground explosions do not form tubes at all, but spheres, and secondly, the nature of such an explosion is not specified, that is, it is not specified which chemical compounds can explode in the layers of the mantle or the earth's crust.

6. Further, on the Earth's surface, diamond deposits form clearly expressed linear or circular structures. With the exception of a few papers, researchers do not even try to give explanation for such a phenomenon. Attempts to link the linearity of the distribution of kimberlite (diatreme) tubes with geological faults proved to be unsuccessful.

7. The mineral grains in kimberlites have an unusual shape. Thus, inclusions of apatite, garnet, zircon, olivine, ilmenite, and chromdiopside, which are often found in diamonds, do not form crystalline facets, but no loss of crystal structure can be detected inside these rounded grains. At the same time, diamonds with such inclusions do not melt and often have a super-ideal shape of octahedra or rhombodododecahedra with sharp edges, and formed by nature in kimberlite pipes. According to existing knowledge, these diamonds originated in the depths of the mantle and, despite their fragility, abundance of internal stresses and the ability to easily split along certain planes, they were extracted in perfect shape, with shiny sharp edges, along with kimberlite magma through narrow kimberlite pipes from a depth of at least 150 - 200 km. According to the author, it looks unrealistic.

8. Numerous problems related to radionuclide methods for determining the absolute age of diamonds (U-Pb, Rb-Sr, or ^{40}Ar-^{39}Ar) deserve attention. In particular, numerous radiological determinations of the age of kimberlite rocks by the potassium-argon (K-Ar) method have yielded significantly overestimated results due to the introduction of excessive amounts of radiogenic argon into the crystal lattice of kimberlite rock minerals. Note that argon is an inert gas that easily leaves not only the porous structures of sedimentary rocks, but also easily seeps through cracks in crustal structures. However, discrepancies in the dating of diamonds obtained by the standard radionuclide U-Pb and Rb-Sr methods can be significant. We also remember that diamonds are made entirely of carbon atoms, but radiocarbon dating is not applicable to them, since the half-life of ^{14}C is only 5.703 years.

9. The ages of the various granular inclusions found in natural diamonds can vary greatly, making it extremely difficult to determine the absolute age of diamonds.

10. Further, the age of diamonds extracted from a single diamond cluster, linearly located deposits, and determined by a single radionuclide method can also vary greatly. There are cases (kimberlite pipes of the Khibiny massif, the Kola Peninsula, Russia) when the absolute age of kimberlites according to Rb-Sr is older than the basic rocks, which is completely absurd from the point of view of "modern" geophysics.

11. There is no explanation for the fact that the inner part of diamond crystals is often enriched in a light carbon isotope ($\delta^{13}C$ from −17% to −9%), while the outer zones of the same crystals are enriched in a heavy isotope ($\delta^{13}C$ from −7% to −4%). Nitrogen isotopes behave similarly. The inner parts of the Zaire kimberlite crystals are dominated by the light isotope $\delta^{15}N = -5.8\%$, while the heavy isotope is sharply concentrated in the outer parts: $\delta^{15}N = +13.4\%$ [3] [4].

12. There is no explanation for the presence of gas-liquid inclusions in some diamonds of H_2O, H_2, CH_4, CO_2, CO, N_2, Ar, C_2H_4 and even ethyl alcohol C_2H_5OH, therefore, in a certain sense, we can talk about the presence of "biogenic" markers in diamond crystals, see [5] [6] and also information about it could be found in monograph of [7]. Gas-liquid inclusions of hydrocarbons are the main argument of the proponents of the biogenic version of the subduction theory of the diamond origin. About subduction mechanism of diamond origin please see e.g. [8] and [9].

13. As is known, diatremes are divided into the following types of diatremes depending on their petrographic composition and size: trap formation diatremes, kimberlite, alkaline basaltoids, carbonatites, and trachytes. At the same time, trap tubes are several times larger in size than tubes of other compositions, but diamonds are formed only in kimberlite pipes. According to some researchers, the main objection to the mantle origin of kimberlites is related to the shortage of magmatic melt in kimberlite diatremes, the amount of which is often insufficient to fill the exit channel to the Earth's surface. If the source of the gas flows was a mantle plume or an intermediate magmatic hearth, then a gas breakthrough within single diatreme tube would lead to an upward rise of the magmatic mass and would be accompanied by an outpouring of magma onto the surface with the formation of a characteristic volcanic cone.

We have listed only the main problems and questions of diamond formation, to which geophysicists do not have clear and well-founded answers. The discussion of the problems mentioned above in paragraphs 1 - 13 and heated discussions on this topic can be found in many articles, reviews and monographs, see, for example [3] [4] [7] [10]-[22], and many others cited in them.

Below, we will take a closer look at studies that address the spatial aspects of diamond formation. There are few such works, and they are mainly devoted to the formation of micro-diamonds. For example, in a review [23] it was written that "impact" diamonds were formed as a result of meteorite impacts on the Earth's surface.

Shock waves from the fall of a large meteorite can cause a temporary increase in pressure at the impact site, sufficient to crystallize diamonds. As a result, the carbon-containing substance at the point of impact instantly turns into diamond.

Diamonds of this type from meteorites have been found at the Popigai impact structure in Russia, at the Nördlinger Ries in Germany, at the Sudbury impact structure in Canada and elsewhere.

Diamonds that were formed as a result of such collisions with meteorites are usually small. Most diamonds are fractions of a millimeter in size, but some polycrystalline diamond formations formed as a result of collisions with meteorites can exceed a centimeter. The authors also wrote about another type of diamond formed in a collision. Diamonds have also been found in some iron and chondritic meteorites, which were probably formed during collisions between the meteorite's parent bodies in space, rather than during a collision with Earth. Like diamonds produced by hitting the ground, these diamonds produced by hitting the ground are very small. We also highlight Shemyakin's studies, see [24] and [25], in which the author wrote about that the study of rock strength in the massif suggests that high-speed collision of meteorites with rocks of planets can create thermodynamic conditions for the formation of diamonds, and rocks composing diamond kimberlite pipes. Heaven and Kjarsgaard in [26] discuss that kimberlite magmatism in North America, spread over more than 2000 km, is associated with the Great Meteor mantle plume hotspot track. At the 9th International Kimberlite Conference Lyukhin reported about own hypothesis of impact origin of diamonds and kimberlites [27]. In [28], a model of the formation of a single kimberlitic pipe after the collision of a comet with the Earth at an angle to the horizon was proposed and investigated. In the course of serial studies, Khazanovitch-Wulff and colleges hypothesized a "bolide" model of kimberlite pipe formation, in which a bolide creates an electric field that causes the formation of kimberlite pipes, please see, e.g. [29]-[31].

Thus, there are few works that discuss the cosmic aspects of diamond origin, and they mainly deal with the formation of micro-diamonds in the crater of a meteorite impact.

1.2. Origin of Oil and Natural Gas

The origin of oil and natural gas, as well as the synthesis of diamonds, is another important problem of geology, which has been the subject of irreconcilable dispute for more than 100 years. The dispute is mainly between proponents of the organic and mineral (abiogenic, inorganic) hypotheses of the formation of hydrocarbons.

In the middle of the last century, the dominant paradigm was the origin of hydrocarbons from organic sediments.

However, at the end of the last century, after the discovery of oil deposits at great depths, the mineral hypothesis of the origin of oil gradually began to prevail. A more detailed description of the discussion between the organic and inorganic hypothesis of oil formation can be found in the following reviews [32]-[41] and many other works cited in therein.

Thus, according to the biogenic concept paradigm, the origin of oil is as follows. All combustible carbonaceous fossils, that is, oil, natural gas, asphalt, coal, and oil shale, arose from the dead remains of living organisms that inhabited the Earth in past geological epochs. That is, the starting material for the formation of oil and natural gas was the decomposition products of biogenic material dispersed in the bottom sediments of the seas and other polls of water. During diagenesis, organic components of bottom sediments slowly transformed into sedimentary condensed macromolecules (kerogen), which are embedded in rocks. Further maturation of kerogen was accompanied by the gradual formation of hydrocarbon components called "micro-oil". For tens and hundreds of millions of years, micro-oil migrated from the parent rock into permeable formations, moving through such geological formations, and then these hydrocarbons entered natural reservoirs limited by weakly permeable rocks, in which they formed accumulations of oil and natural gas, known as oil fields.

A significant part of the proponents of the biogenic paradigm of oil origin adheres to the sedimentary-migration theory. According to this theory, the main factor of oil formation is the thermal destruction of mature kerogen when rocks reach shallow depths of up to 4 km during immersion. It should be noted that the biogenic concept of the origin of oil explains the fact that more than 99% of oil and gas deposits are concentrated in sedimentary rocks that is, in rocks formed from sediments of ancient water basins in which life developed.

On the other hand, proponents of the abiogenic (inorganic) origin of oil and gas believe that the process proceeded in the opposite direction. Thus, according to the paradigm of the inorganic oil origin, hydrocarbons are synthesized from inorganic matter in the deep interior of the Earth, from where they then flow to the surface, where they accumulated in the form of oil and gas deposits in traps in the sedimentary cover. In particular, it was shown that at high pressures and temperatures similar to the conditions of the Earth's upper mantle, heavy hydrocarbons can be synthesized from inorganic components, and these heavy hydrocarbons are similar in composition to natural oil, please see [42], printed in Russian, with additional reference to [36] and [43], the texts of which are available in English.

In [42] and [44], it was predicted that the maximum depth of oil deposits could be about 10 - 12 km. Thus, the presence of biomarkers in natural oils in sedimentary rocks, that is, at a depth of up to 4 km, according to the inorganic hypothesis, may be due not to their organic origin of oil, but to the accumulation of biomarkers during migration through sedimentary layers.

Note that the theory of inorganic oil formation makes it possible to explain the presence of certain amounts of hydrogen and sulfur in crude oil. It should be recalled that the content of these substances in sedimentary rocks is low. Thus, hydrogen easily escapes from porous sedimentary rocks; sulfur compounds predominate in volcanic lavas. A sufficiently high sulfur content in some oil deposits, as well as the high temperature required for the formation of paraffin, are not characteristic for the existence of most biological forms. Another significant disadvantage of the organic hypothesis of the origin of oil is the extremely low content of nitrogenous compounds in it. It is known that biological compounds (DNA) are formed mainly from 4 nucleotides: adenine (A), cytosine (C), thymine (T), and guanine (G), as well as a phosphorous group. Thus, in addition to carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and phosphorus (P) must be present in organic sediments. Once again, sulfur is present in organic deposits in extremely limited quantities, since it is a part of only some proteinogenic amino acids, such as systeine, $HOOC\text{-}CH\ (\text{-}NH_2)\text{-}CH_2\text{-}SH$. The discovery of methane in the comets of the Oort cloud, on planets of the Solar system, in particular on Mars and Titan, has opened a new page in the long-standing debate about the origin of water, methane and oil. Some information on this issue can be found, for example, in [45]-[49] and many others.

In addition to the organic and inorganic paradigms of oil origin, another one is known. This is a cosmochemical paradigm, first expressed by V.D. Sokolov, see [50]. Currently, it is known that molecules (radicals) of CH and CN are observed in interstellar space, CH, CN and C_2 have been detected in the spectra of stars, and C_2, C_3, CH, CN, OH, NH, NH_2, CO, and N_2 have been detected in the spectra of comets. Methane (CH_4) molecules have been found in the atmospheres of the gas planets of the Solar system, such as Saturn, Jupiter, Uranus, and Neptune. Carbon oxides and various hydrocarbon compounds have also been found in the composition of minor planets, please see e.g. [51]-[57]. Thus, CO_2, CO, CH_4, C_2H_6, C_2H_4 are present in the atmosphere of Venus. The atmosphere of Mars contains molecules of CO_2, CO, CH_4, H_2CO, CH_3CNO and others. The spectra of CH_4, C_2H_2, C_2H_6, C_2H_4, C_3H_8, CH_3C_2H, C_2HCN and others were recorded in the atmosphere of Titan, Saturn's moon. Therefore, the cosmochemical paradigm according to which water and methane were brought into the Earth's atmosphere by small bodies of the Solar System that collided with the Earth for billions of years, is now becoming popular again in the scientific community. However, the migration of gases H_2O, CH_4, CO_2, CO, and NH_3 from the atmosphere to the lithosphere of the planet has created certain difficulties in explaining the formation of deep deposits of carbon dioxide, methane, and oil, see e.g. [58].

In the introduction, we briefly described the state and problems that arise in explaining the physical causes that lead to the synthesis of diamonds, water, oil and gas. As will be shown below, the main reason for all the problems of geophysics and planetary astrophysics is the fact that these branches of scientific knowledge do not recognize Archimedes' law of buoyancy.

2. Results

2.1. Collision with a Comet

The problem of the formation of diamonds, water, oil and gas, as well as the origin of ores, the formation of the paleomonous continent Rodinia, and the separation of the Moon was solved by the author several years ago in 2016 in [1], see also [2]. The basis for solving these problems was the application of the atomic theory of buoyancy to the inner layers of the Earth. It has been shown that the ^{40}K nuclear layer located between the upper and lower mantles is the theoretical basis for modern seismology, volcanology, subduction, and stratification of the Earth's internal structure. Despite the fact that comets have been known to mankind for a long time, since ancient times, in reality, researchers limit themselves to considering the collision of our planet with asteroids, or within the framework of the impact theory of the formation of the Moon, with the collision of our protoplanet with the hypothetical planet Thea. However, asteroids are significantly different from comets. An asteroid has a solid body, while a comet is mostly made up of frozen ice that evaporates as it approaches the Sun, forming a typical comet's tail. The composition of comets may vary, but they mostly consist of dry ice, that is, frozen carbon dioxide.

As a result, the danger of an asteroid is estimated based on its kinetic energy, only the mass of the asteroid and its velocity are taken into account. Therefore, in order for a collision with the hypothetical planet Thea to lead to the formation of the Earth and the Moon, Thea must be comparable in size to Mars. It should be noted that in [59] and [60], computer simulations of a nuclear explosion of the inner U-layers of the planet, activated by a collision with an asteroid with a diameter of 100 km, were carried out. However, in these studies, the U-layer was placed unreasonably high, at the boundary of the lower mantle and the outer core. There was no ^{40}K nuclear layer in these works.

On the other hand, a gas, unlike a solid, has internal energy of expansion, that is, a gas can expand significantly when heated, according to law of Mendeleyev. Simply put, placing dry ice in a hot environment of a closed volume will inevitably lead to an explosion. If the protoplanet already had a sufficiently strong crust at the time of the collision, and if the comet hit the protoplanet at a sliding angle, which ensured the safety of a limited volume, then an explosion is guaranteed, even in the absence of explosive materials. However, in fact, at a depth of 660 km, according to the author's hypothesis about buoyancy, there is a nuclear layer of the ^{40}K nuclear fuel isotope. Under such a load, the ^{40}K nuclear layer is compressed and explodes due to the release of nuclear energy during a thermal nuclear explosion. Next, the Th-U layers lying below, closer to the center of the Earth, explode with a time lag.

Recall that the isotope ^{40}K has a half-life of $T_{1/2} = 1.248(3) \times 10^9$ years. Therefore, the lifetime of ^{40}K will be slightly less than 2.5 Ga. The presence of such an isotope, which is widespread on Earth, means that the age of our planet cannot be of ~4.5Ga years old. Bananas are known to contain a lot of potassium, including isotope ^{40}K. There is a concept of one Banana Equivalent Dose (BED), and one Banana Equivalent Dose (BED) is often correlated with 0.1 μSv. Thus, the existence of bananas, which give alarm signals when passing through customs, refutes the generally accepted concepts of the formation of the Earth and the Moon 4.57 and 4.4 billion years ago.

Therefore, isotope dating methods or geochemical analysis tools can only be used if the Earth and Moon were formed as a result of dust accretion or Moon capture. These hypotheses were dominant in the period before the Apollo missions. In the case of a collision with the hypothetical planet Thea (GIH hypothesis), this hypothesis dominated until 2000, isotope dating methods or geochemical analysis tools are of limited use, since it is additionally necessary to prove that the sample taken for research belonged to Earth, and not to our protoplanet or planet Thea. It should be recalled that within the framework of the GIH hypothesis, a nuclear explosion was not assumed, that is, from the point of view of nuclear physics, there are no restrictions on the use of the isotope method. Within the framework of a comet impact (CIH), a thermal nuclear explosion is assumed, therefore, the use of isotope dating methods or geochemical analysis tools a priori becomes very doubtful. It should be recalled that the liquid-droplet fission of a protoplanet was first proposed by G.H. Darwin in 1879, but the mechanism of such fission of a protoplanet was indicated incorrectly, in those early days scientists did not yet know about nuclear energy [61].

A quick look at the chronological table of geological periods allows to more accurately determine the time of the collision with the comet. Given that the planet is a heat engine, a collision with a comet will be accompanied by a change in the energy balance. Simply put, the comet collided with the protoplanet between the Cryogenic boundary (The Snowball Earth) and the Tonian boundary, *i.e.* 0.75 - 1.0 Ga years ago, taking into account the accuracy of determining these periods. Based on the features of nuclear processes, the author believes that Cryogenian was underestimated, and Tonian was greatly overestimated. The method of studying moon dust gives slightly lower values. According to [1], the time of the Moon's formation is T = 510 - 765 Ma. During this period, the protoplanet (planet) was already covered with a sufficiently strong crust with a thickness of at least 10 km. The general scheme of the collision of a comet with a protoplanet is shown in **Figure 1**.

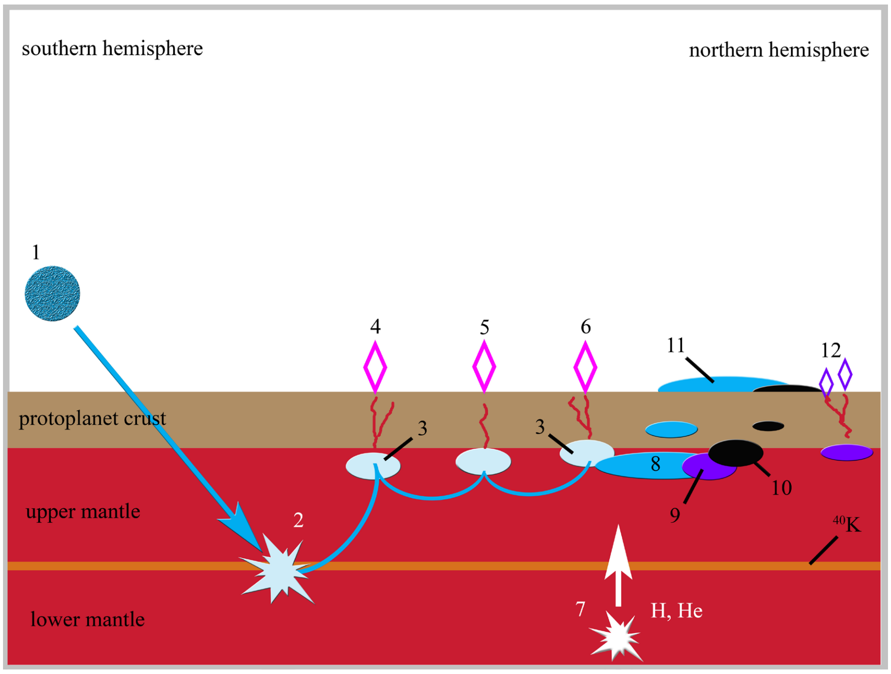

Figure 1. A diagram is drawn explaining the predominance of diamonds in the southern hemisphere of the Earth and oil and gas deposits in the northern hemisphere. (1) collision of a comet with the protoplanet of Earth. The comet falls to the surface of the protoplanet at a sliding angle; (2) primary explosion of the comet after hitting the ^{40}K nuclear layer; (3) spasmodic movement of the plasma cloud formed by the comet's products such as CO_2, CO, and C; (4)-(6) diamonds deposits. Regular arrangement of diamond deposits occurs due to the linear and spasmodic movement of cometary derbies; (7) a secondary deep explosion of the inner nuclear layers of the protoplanet with the release of a large amount of H and He, creation of the Earth, and separation of the Moon; (8) water synthesis (H_2O); (9) methane deposits formation (CH_4); (10) formation of oil fields; (11) the release of water and oil onto the surface of the already existing planet Earth; (12) formation of secondary type of diamonds from methane vapor in the northern hemisphere.

2.2. Diamond Synthesis and the Problem of Free Carbon

First, we will consider the synthesis of diamonds near the impact point, so let's pay attention to the left part of Figure 1. A comet flying at a sliding angle to the surface of a protoplanet pierces through the earth's crust and explodes in the mantle layers. The decay products of cometary matter continue to move abruptly under the crust of the protoplanet, forming linear structures in places of cumulative burning of the crust of the protoplanet (planet).

Figure 1 shows the formation of linear structures in the form of diamond placers, periodically spaced apart along the linear movement of comet fragments. In addition to linear distributions, the circular distribution of diamond placers that occur after intermediate explosions of comet fragments is known. The most famous of these is the Richat Structure in the Sahara. A detailed study of the spatial distribution of diamond mines was conducted by the author earlier in [1].

Comets can have various elements in their composition, but most of them consist of dry ice, that is, frozen carbon dioxide. Frozen carbon dioxide, when released into a hot environment, explodes, while CO_2 decomposes and CO, O and atomic C are formed. The basic CO_2 decay equations (Equation 1) are given below:

$$\begin{aligned}
&\mathrm{CO_2} \to \mathrm{C} + 2\mathrm{O} \\
&\mathrm{CO_2} \to \mathrm{C} + \mathrm{O_2} \\
&\mathrm{CO_2} \to \mathrm{CO} + \mathrm{O} \\
&2\mathrm{CO_2} \to 2\mathrm{CO} + \mathrm{O_2} \\
&\mathrm{CO_2} + \mathrm{C} \to 2\mathrm{CO}
\end{aligned} \tag{1}$$

Compounds such as CO_2, CO and atomic C are chemically active compounds. On the other hand, diamond is a carbon crystal, so the main problem of diamond formation in the bowels of the Earth's is the problem of "free" carbon. Below, as examples, we present the equations of the interaction of CO_2, CO and C with various elements. First, we will write down the reactions of CO_2 with light elements ($z < 19$): Na, Mg, Al, Si, P, and S, which are abundant in the crust and upper mantle of the planet, see Equation (2):

$$\begin{aligned}
&\mathrm{CO_2} + 4\mathrm{Na} \to 2\mathrm{Na_2O} + \mathrm{C} \\
&\mathrm{CO_2} + 2\mathrm{Mg} \to \mathrm{MgO} + \mathrm{C} \\
&\mathrm{CO_2} + 2\mathrm{Al} \to 2\mathrm{AlO} + \mathrm{C} \\
&3\mathrm{CO_2} + 4\mathrm{Al} \to 2\mathrm{Al_2O_3} + 3\mathrm{C} \\
&3\mathrm{CO_2} + 2\mathrm{Al} \to \mathrm{Al_2O_3} + 3\mathrm{CO} \\
&\mathrm{CO_2} + \mathrm{Si} \to \mathrm{SiCO_2} \\
&3\mathrm{CO_2} + 2\mathrm{P} \to \mathrm{P_2O_3} + 3\mathrm{CO} \\
&5\mathrm{CO_2} + 4\mathrm{P} \to 2\mathrm{P_2O_5} + 5\mathrm{C} \\
&\mathrm{CO_2} + \mathrm{S} \to \mathrm{SO_2} + \mathrm{C}
\end{aligned} \tag{2}$$

According to the author's concept of buoyancy [1], there are layers containing heavier elements ($z > 19$) such as Ca, Fe, and Zn, under the hot ^{40}K nuclear layer that forms the boundary between the upper and lower mantle. During the process of plunging into magmatic layers, a comet can reach the underlying layers, in particular, those enriched with iron. So, we present the possible reactions of CO_2, CO, and C with elements such as Ca, Fe, and Zn. Equation (3) shows the possible reactions of CO_2 with Ca, Fe, and Zn:

$$\begin{aligned}
&CO_2 + 2Ca \rightarrow 2CaO \\
&CO_2 + 4Ca \rightarrow 4CaO + C_2 \\
&CO_2 + 5Ca \rightarrow 4CaO + CaC_2 \\
&3CO_2 + 2Fe \rightarrow Fe_2O_3 + 3CO \\
&3CO_2 + 4Fe \rightarrow 2Fe_2O_3 + 3C \\
&4CO_2 + 3Fe \rightarrow Fe_3O_4 + 4CO \\
&CO_2 + Zn \rightarrow ZnO + CO \\
&CO_2 + 2Zn \rightarrow 2ZnO + C
\end{aligned} \tag{3}$$

The reactions of CO with Fe are given in Equation (4):

$$\begin{aligned}
&CO + Fe \rightarrow FeO + C \\
&CO + Fe \rightarrow FeCO \\
&2CO + 3Fe \rightarrow Fe_3C + CO_2 \\
&5CO + Fe \rightarrow Fe(CO)_5 \\
&6CO + Fe \rightarrow FeC_3 + 3CO_2
\end{aligned} \tag{4}$$

Equation (5) summarizes the possible chemical reactions of atomic carbon with iron:

$$\begin{aligned}
&C + Fe \rightarrow FeC \\
&C + 2Fe \rightarrow Fe_2C \\
&C + 3Fe \rightarrow Fe_3C \\
&3C + 4Fe \rightarrow Fe_4C_3 \\
&4C + 3Fe \rightarrow Fe_3C_4
\end{aligned} \tag{5}$$

We emphasized the reactions with iron in Equations (3)-(5), because the soils of Australia, South Africa, and South America have a pronounced reddish color due to iron oxide enrichment, which indicates that the comet strongly shook the mantle layers lying below the interface between the upper and lower mantle.

The process of diamond formation itself took minutes or hours, that is, on a geological time scale, this process occurred almost instantly. The pressure and temperature gradient prevented the comet's decay products from mixing with the magmatic layers of the mantle, as well as the entry of the comet's decay products (CO_2, CO, and C) into chemical bonds with other chemical compounds.

When compressed, the nuclear Th-U substance located at the boundary of the inner and outer core explodes. This process is schematically shown in the middle of **Figure 1**. As a result of the secondary explosion, hydrogen, He and, under certain conditions, rare earth and transuranic elements are released, which, in accordance with the law of buoyancy lie far below the surface of the planet. These ejected rare earth and transuranic elements enrich the methane-synthesizing crystals of diamonds. Thus, impurities in methane-synthesizing diamonds can characterize the nuclear processes occurring in the bowels of our planet during a collision with a comet and the formation of the Moon.

2.3. Synthesis of Water, Oil and Gas

As a result of the nuclear explosion of the inner Th-U layers of the protoplanet, a large amount of atomic and molecular hydrogen and isotopes of helium are formed. Thus, the presence of a large amount of hydrogen in the bowels of the Earth would lead to the formation of water, natural gas and oil. The Th-U explosion also led to the separation of the Moon, disruption of the internal stratification of the layers and, as a result, the formation of terrestrial and lunar ore deposits [1] and [2].

The reactions that lead to the formation of water, oil and natural gas are well known. Let's introduce them. The Carl Bosch reaction describes the interaction of CO_2 and H_2 during the catalysis of Fe, Co, Ni to form water (Equation 6):

$$\begin{aligned} &CO_2 + H_2 \rightarrow CO + H_2O \\ &\underline{CO + H_2 \rightarrow C + H_2O} \\ &CO_2 + 2H_2 \rightarrow C + 2H_2O \end{aligned} \tag{6}$$

In addition, the Paul Sabatier ratio between CO_2 and H_2 during of Al_2O_3 catalysis can lead to the formation of water and methane (Equation 7):

$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O \tag{7}$$

As a result of the interaction of CO_2 and H_2O with the formation of molecular oxygen, various hydrocarbons can be obtained (Equation 8):

$$\begin{aligned} &CO_2 + H_2O \rightarrow H_2CO_3 \\ &2CO_2 + 2H_2O \rightarrow 2C_2H_4 + 3O_2 \\ &4CO_2 + 2H_2O \rightarrow 2C_2H_2 + 5O_2 \\ &6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2 \\ &7CO_2 + 4H_2O \rightarrow C_7H_8 + 9O_2 \end{aligned} \tag{8}$$

Many researchers believe (see the literature given above in the Introduction) that oil is formed as a result of the Fisher-Tropsch reaction between CO and H_2 (at $n > 1$). Note that this process also includes the formation of water (Equation 9):

$$\begin{aligned} &nCO + (2n+1)H_2 \rightarrow C_nH_{2n+2} + nH_2O \\ &nCO + 2nH_2 \rightarrow C_nH_{2n} + nH_2O \end{aligned} \tag{9}$$

At $n = 1$, the CO and H_2 reaction equations give various hydrocarbons, including C, CH_2, and CH_4 (Equation 10):

$$\begin{aligned} &CO + H_2 \rightarrow C + H_2O \\ &CO + 2H_2 \rightarrow CH_3OH \\ &CO + 2H_2 \rightarrow CH_2 + H_2O \\ &CO + 3H_2 \rightarrow CH_4 + H_2O \\ &2CO + H_2 \rightarrow CH_2 + CO_2 \\ &2CO + 2H_2 \rightarrow CH_4 + CO_2 \end{aligned} \tag{10}$$

In the next stage, the interaction between CH_2 and H_2 can also lead to the formation of hydrocarbons (Equation 11):

$$\begin{aligned} &CH_2 + H_2 \to CH_4 \\ &2CH_2 + H_2 \to C_2H_6 \\ &3CH_2 + H_2 \to C_3H_8 \end{aligned} \tag{11}$$

Finally, chemical reactions between C and H_2 are possible in the channels of kimberlite pipes, resulting in the formation of H_2 and CH_4 (Equation 12). Recall that according to (Equation 11), the formation of CH_2 can lead to the formation of other hydrocarbons, for example, such as C_2H_6 and C_3H_8.

$$\begin{aligned} &C + 2H_2 \to CH_4 \\ &C + H_2 \to CH_2 \\ &4C + H_2 \to 2HC_2 \end{aligned} \tag{12}$$

The left part of **Figure 1** shows a general scheme for the synthesis of other types of diamonds (methane-forming diamonds); they are shown in purple in **Figure 1**. According to the author, this type of diamond is determined by blowing a mixture of carbon dioxide and methane through kimberlite pipes (Equation 13):

$$CO_2 + CH_4 \to 2C + 2H_2O \tag{13}$$

Most of the chemical reactions listed above in Equations (1)-(13) are well known, and some of these reactions, such as those of Carl Bosch, Paul Sabatier, and Fischer-Tropsch, were discovered in the century before last. The formation of hydrogen, deuterium, and helium isotopes ^3He and ^4He in the bowels of the planet was predicted earlier in the pioneering work of Herndon and colleagues, see e.g., [62] [63], and [64]. Thus, the author's contribution is to suggest the possibility of a protoplanet colliding with a comet, followed by the activation of a thermal nuclear explosion, which, in turn, leads to the synthesis of isotopes of hydrogen, deuterium, and helium.

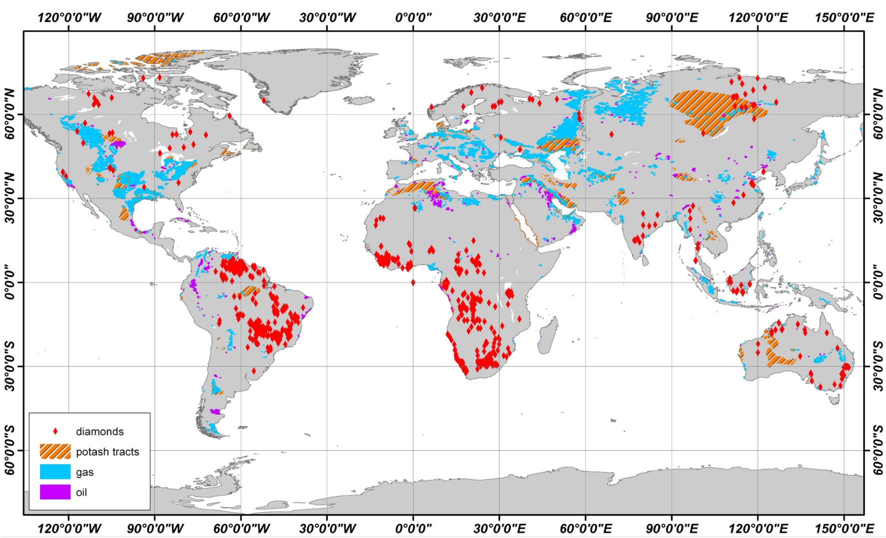

Figure 2. The spatial distribution of oil, gas and diamond deposits is shown. In addition, the Figure shows vast areas occupied by potash tracts (K_2CO_3), which are markers of the deep explosive nuclear process during a collision with a comet. The diamond deposits predominate in the southern hemisphere (South Africa and South America), while oil and gas deposits predominate in the northern hemisphere.

Thus, the ^{40}K hot nuclear layer located near the surface of the planet is a key link in a new theory of seismology, volcanology, and subduction. Upon collision with a comet, the Moon separates, the monocontinent Rodinia is formed, and terrestrial and lunar ores, diamonds, water, oil and natural gas are formed. The nuclear layers of K-Sr-Cs-Pb-Th-U determine the internal stratification of our planet, therefore, the concept of the mantle-core of the Earth's structure and the statement about the solid inner core of our planet undoubtedly require revision.

Therefore, this theory is the only theory explaining why diamond deposits predominate in the southern hemisphere (South Africa and South America), while oil and gas deposits predominate in the northern hemisphere. The spatial distribution of oil, gas, and diamond deposits is shown in **Figure 2**.

2.4. Galaxy Storms and Oil Migration

After the formation of the planet in a collision with a comet and the separation of the Moon, our planet experienced a number of other cataclysms in the course of its further development history. Milky Way galaxy has a spiral structure, so all the stars in this galaxy are periodically subjected to strong gravitational effects from the spiral structure of the galaxy. In the work [65], it was supposed to refer to periods with low galactic load as galactic calm, and periods when our star and its planets are in a zone of increased galactic turbulence as galactic storms. Previously, a number of researchers have shown that mass extinctions on our planet occur with a certain frequency and are associated with the passage of our star through galactic storms; please see the literature cited in [65].

On the other hand, it is well known that any external loads on a nuclear substance leads to its heating, but, unlike many metals, when nuclear material is heated, it does not expand, but, on the contrary, its compression due to the fusion of nuclei. Moreover, during a galactic storm, the vertical stratification will be disrupted, and the $^{87}Sr/^{86}Sr$ ratio, whose isotopes are lighter than those of the other main decay element ^{137}Cs, will change accordingly. The compression of the planet while maintaining approximately the same volume of water in the world oceans would lead to a global flood. Sea level rise can occur for a number of reasons.

Thus, the thermal expansion of water can lead to an increase in ocean level by several centimeters; accounting for latent moisture in clouds and soil can result in an increase in ocean level of the order of several meters; melting of the ice of Greenland, Antarctica, Tibet can contribute to the order of hundreds of meters; however, the nuclear thermal compression of the planet, as shown in [65], led in certain periods of the Earth's history to a more significant increase in the level of the world ocean by ~ 1 - 2 km. At the same time, the planet's crust itself is shrinking due to a decrease in its radius, which leads to numerous geological faults and a swelling of the earth's crust [65].

The question arises what will happen to that part of the oil and natural gas that was formed during the explosion of the comet, but remained trapped under the monocontinent Rodinia. **Figure 3** shows in a simplified form the process of oil migration during a galactic storm. Oil from the bubbles remaining under the earth's crust begins to seep up through cracks and kimberlite pipes under the influence of an external galactic load. Recall that oil and natural gas seepage occurs in approximately the same way during earthquakes.

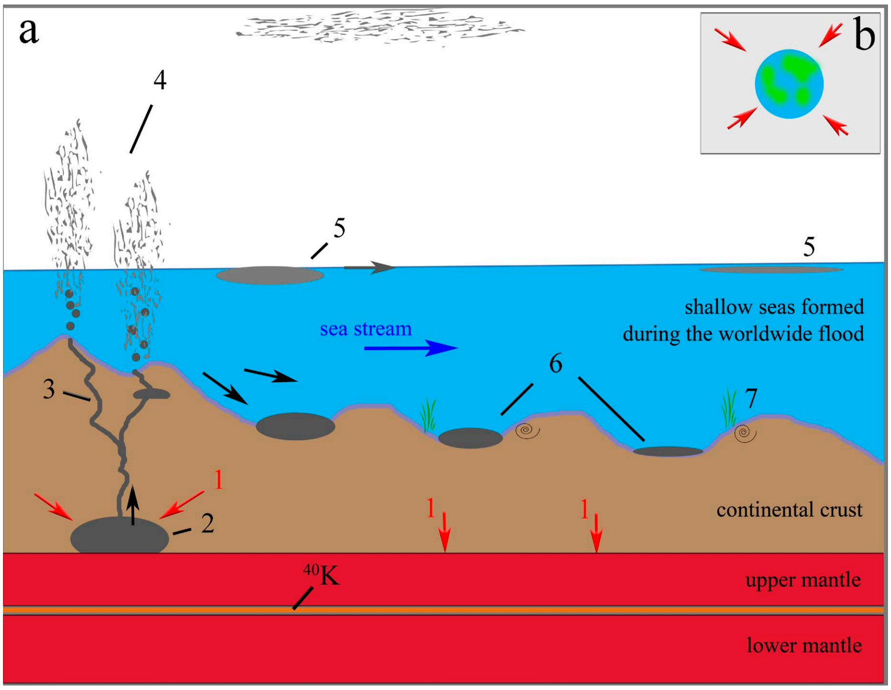

Figure 3. (a) The diagram shows the syntheses of abiogenic ("inorganic") and sedimentary-migratory ("organic") gas and oil fields during galaxy storms; (b) a galactic storm with the burning of the inner nuclear layers of the earth, heating and compressing the Earth. The following objects are indicated by numbers: (1) the compression of the planet due to the burning out of the inner nuclear layers of the earth. This process is accompanied by the formation of shallow seas on the surface of the continental plates; (2) the oldest deep gas-oil deposits as a result of a collision with a comet impact ("primary" gas-oil deposits); (3) gas and oil rise through geological cracks and pipes (similar to kimberlite pipes); (4) gas fraction of hydrocarbon products; (5) is the lightest fraction of oil floating on the sea surface and widely distributed in the waters of the World Ocean. (6) medium and heavy fractions of oil transported over a limited distance and deposited at the bottom of newly formed shallow seas; (7) fossils of difference biological organisms that lived in the shallow seas during this time period, including fossil layers of methanotrophic bacteria. Thus, small but numerous "biogenic" gas-oil deposits are formed as a result of the deposition of fractions of hydrocarbon products mixed with organic residues located at the bottom of shallow newly formed seas and later covered with layers of clay.

During the galactic storm, most of the Earth's surface was covered by shallow seas. When an oil and gas mixture is released, a natural separation occurs, and the gas fraction of hydrocarbons is carried by wind currents over long distances. The light components of oil are also transported by sea currents over long distances and dispersed over large areas. However, some of the heavy fraction of hydrocarbons ejected from great depths settles in the canyon and depressions of shallow seas.

Later, when the galactic storm ended, our planet cooled down, the size of the planet increased, and the shallow seas receded. Deposits of heavy oil fractions, which are concentrated in the lowlands of shallow seas, were covered with various sedimentary rocks. Often, due to a violation of vertical stratification, our planet immediately passed into the ice Age, that is, in addition to sedimentary rocks, oil deposits are also covered with thick layers of ice.

2.5. The Types of Oil and Gas Fields

Oil and natural gas are an important component of the modern economy, so the question arises about where oil and gas fields can be located. The flotation of oil and gas compounds and their dispersion by the currents of shallow seas formed during galactic storms significantly complicate the search for deposits, as well as the assessment of the volumes of possible oil and gas production. In this study, four main types of oil and gas deposits are distinguished, which are schematically shown in Figure 4.

Firstly, these are the initial, deep-lying oil and gas fields, indicated by the number (1) in Figure 4. These deposits correspond to the directions of scattering of comet fragments, that is, the deposits are located linearly from the point of intermediate explosion of cometary products. Secondary, sediments are sedimentary

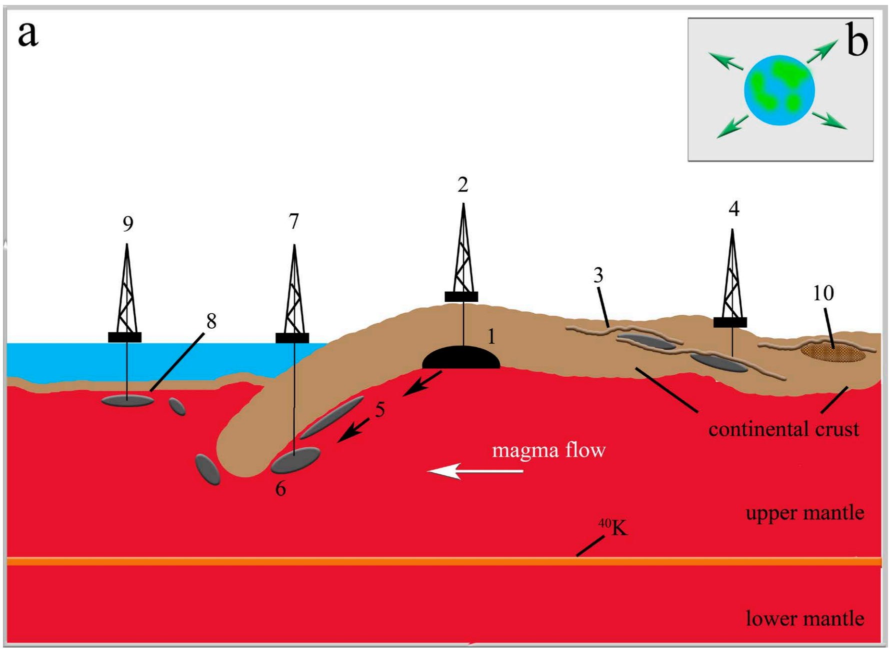

Figure 4. (a) There are four main types of gas-oil fields; (b) our planet is in a state of galactic calm. The following objects are indicated by numbers: (1) primary gas and oil fields formed during a collision with a comet (synonyms: "inorganic" or "abiogenic" gas-oil deposits); (2) deep mining of geothermal ("inorganic") oil; (3) secondary migrating ("biogenic") gas and oil deposits in shallow sedimentary layers; (4) extraction of "biogenic" oil; (5) natural gas and oil migrate under the influence of magma flow; (6) "captured" gas and oil fields in the subduction zone; (7) offshore oil production; (8) gas-oil of the high seas; (9) offshore gas and oil production using floating oil platforms; (10) degraded sedimentary gas-oil deposit.

deposits, indicated by the number (4) in **Figure 4**, formed by the currents of shallow seas. These oil deposits will be defined by the currents of shallow paleo seas.

The third type of oil deposits is subduction deposits of oil and gas. Such deposits are also formed during galactic storms due to the extrusion of deep pockets of oil and gas over the edges of oldest continental plates. Such fields should be located mainly at the west-eastern margins of the continental plates, that is, in places where the old continental plates are submerged with the younger and thinner crust of our planet, please see number (6) in **Figure 4**.

And the last type of deposits is oil deposits in the open sea; see number (9) in **Figure 4**. These deposits allocated in the open sea, far from the continental shelf. Please see number (5) in **Figure 4**. These deposits were formed as a result of magma flow during galactic storms, but they are not captured by subduction traps (threshold), so such deposits will prevail to the north and south edges of the oldest continents.

3. Conclusions

In this paper, it was demonstrated that diamond, water, oil and natural gas on Earth were formed as a result of a thermal nuclear explosion that followed the comet impact at a slinging angle to the protoplanet surface. The hypothesis proposed by the author is the only one that explains the predominance of diamond deposits in the southern hemisphere and oil and gas deposits in the northern hemisphere. It was explained why the spatial distribution of diamond deposits forms pronounced linear or circular spatial clusters. In this study, two types of diamond deposits were identified.

d1. The first type of diamond deposits is deposits that are mainly located in the Southern Hemisphere, in South Africa, India, Antarctica, and South America. In these deposits, diamonds were formed as a result of the explosion of the comet itself, that is, before the explosion of the Th-U nuclear layers and the formation of the H, He isotopes. Since these diamonds are formed before the synthesis of water, methane, and oil, such diamonds can be described as "dry" or "cometary" diamonds.

d2. The second type of diamonds is diamonds that were formed after the explosion of the underlying Th-U layers. According to the author, this type of diamonds is formed from a mixture of carbon dioxide and methane. These diamonds, which are mainly mined in the northern hemisphere, are smaller and may contain various impurities, including water, rare earths and transuranic elements.

This study identifies four main types of oil and gas deposits (p1 - p4). It is shown that oil fields are formed not only immediately after a collision with a comet, but also during subsequent galactic storms.

p1. The first type of oil deposits is deep deposits of oil and gas, which are the results of the interaction of comet fragments with hydrogen formed in the terrestrial nuclear Th-U layers;

p2. The second type of deposits is sedimentary deposits formed as a result of oil being squeezed to the surface during the compression of a galactic storm and dispersed by the currents of shallow seas also formed during these galactic storms;

p3. The third type of oil deposits is subduction deposits of oil and gas, which were formed as a result of the fact that magmatic currents during galactic storms carried part of the deep oil deposits into the subduction trap zone;

p4. The fourth type of deposits corresponds to oil and gas deposits in the open sea. Deposits of this type are located far from the edges of the old continents. These deposits, like those of the previous type, were carried out by magmatic flows, but they did not encounter subduction traps on their way.

Not all geologists, geophysicists, and oilmen read astrophysical journals, so the important results that were obtained in the work [1] were unknown to them. Therefore, the main purpose of this paper is to describe in more detail the hypothesis proposed by the author, which would help to popularize and detail the important results obtained earlier. It should be recalled that based on the generalization of buoyancy theory, it was found that the ^{40}K layer is a key factor influencing the liquid-drop separation of the Moon from the Earth, the formation of the Rodinia monocontinent, and the synthesis of diamonds, water, oil and gas.

This layer also plays a key role in understanding the processes of subduction and continental drift and is the theoretical basis of modern seismology and volcanology. The processes occurring in this layer during a galactic storm lead to the compression of the planet, floods on a planetary scale (worldwide floods), migration of volumes of oil squeezed out of the bowels of our planet, drastic changes in climate and habitat, as well as the mass extinction of most biological forms.

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Conflicts of Interest

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

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