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The law of decreasing dynamic pulsation activity of the Earth's core as the main factor of the planet's evolution

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ABSTRACT

Evolution of the Earth historically was defined by four large stages of a catastrophism. The first of them was in the end of astronomical study when the Proto-Earth was explosive disintegration and the mother Earth was formed. During next the most third stages of catastrophism in Hadean, Archean and Mesozoic-Cenozoic was formed earth crust of continents. In the Cenozoic continents became finally steady land, and the peridotite land surrounding them was deeply lowered and filled with water of the World Ocean. The geological processes of forming earth crust on power energy consistently decreasing in time.

Key words: Earth crust, evolution, catastrophism, four large stages, reduction energy

1. TOPICALITY OF A PROBLEM

Hypothesis of formation of cold Earth by accretion of cold particles in the cold nebular cloud, stated by the American geologist T. Chamberlain in 1907 (Agafonov, 1932) and supported by the Russian physics in 1950-2007 (Vityazev et al., 1990; Sorokhtin, 2007), safely existed all XX century. And now it uses a wide circulation in the Russian school textbooks and monographs of a number of physicists and astronomers (Levitan, 2005; Adushkin and Vityazev, 2007).

However the second revolution in astronomy and the space geochemistry, taken place in the second half of the XX century, in the direction of interpretation of a problem of education and evolution of stars (and planets – as collateral process), significantly undermined bases of this hypothesis (Abalakin and Sochilina, 1984; Shklovsky, 1984, Voytovich, 1988). The third revolution in astronomy and the astrophysics, begun in the XXI century in connection with opening of hundreds hot star and planetary systems, allowed to understand the real mechanism of formation of planets and their satellites (Marakushev, 1999; Cherkasov. 2002; Zhirnov, 2005; Astronomy..., 2007). New opening led to full loss of trust to a hypothesis of originally "cold" Earth: "the assumption that the warming up of Earth occurred at its collision with the space body having the size of planet Mars, is speculative and can't seriously be discussed" (Anfilogov and Hachay, 2009, page 16).

The question of driving forces of evolution of Earth always drew attention of representatives of sciences about Earth and in this respect there are different opinions. But only in the last quarter of the XX century researchers came to understanding of a defining role of a liquid kernel of Earth, as source of fluids (plums), breaking through a cloak and causing various tektonic-magmatic transformations in crust. Opening in observation astronomy, geology and deep geodynamics of Earth allowed to refuse outdated idea of Earth development on the basis of model of "cold Earth" and to create modern idea of formation of a planet and its development (Abalakin and Sochilina, 1984; Marakushev, 1999; Ebeling et al., 2001; Zhirnov, 2014_2).

For a geological history of Earth the role of a liquid core of Earth, as activator and the initiator in creation of energetically excess substance –plums and their periodic break in the top horizons of a mantle (Larin, 1975, 1980; Marakushev, 1999; Dobretsov et al., 2004). Thus activity of a core of Earth in time naturally decreases that is established on the example of geological evolution of continents of Earth (Salop, 1982; Pronin et al., 2000; Zhirnov, 2011). The core's role at an astronomical stage when there happened an explosive disintegration of Proto-Earth was the mightiest and when appeared a mother Earth and its satellites (Marakushev, 1999; Zhirnov, 2014_2). Therefore the main law of the Earth's formation and evolution became possible to formulate: "the law of decreasing dynamic pulsation activity of the Earth' core as the main factor of a planet evolution ".

The law is understood "as the steady, repeating relation between the phenomena in the nature" (Soviet encyclopedic ..., 1980, page 453). In other words the law is the unique trend of manifestation of natural processes and the phenomena. For example, the law of rotation of a planet Earth round the Sun, the law of terrestrial gravitation (any body falls only down, but never – up), etc.

2. SCOPE OF THE STUDY

Object of this research are Continents of Earth, their structure and development in time. The North megacontinent covers a planet from the North Pole in the form of a cap and crossing a body of a planet from the North to the South by three separate huge continental branches ("radials"). The southern small continent (Antarctic) covers Earth on the South Pole. Geological development of the Continents' earth crust is the main factor of development of Earth in general.

2.1. Materials

The materials used include the author's papers on the theme, synthesis and critical analyses of the published materials on many sciences: geography, geology, geochemistry, geophysics. The special attention is paid to the data proving geological evolution of the Earth's Continents.

2.2. Methodology

Known determined data of XX century and both the new geological –geophysical data of XXI century about geological development of the Earth's Continents are used for solution of the problem.

3. RESULTS

3.1 Earth's continents as markers of astronomical and geological stages of a planet's evolution

The problem of formation and development of Earth is now the least developed in cosmological science. The reason of insufficient development of a problem is explained not by readiness of some sciences, in particular, geology, to the reasoned approach in its research. Whereas academician O. Schmidt explained, that this problem is a complex problem and the decision it is possible only on the basis of association of efforts of a number of interdisciplinary sciences - and first of all astronomies, astrophysics and geology. In particular, establishment of geophysical, geochemical and geological consequences of the theory of formation of a planet is very important (Vityazev et al., 1990, page 6).

However sciences about Earth, especially geology, long time were in a stage of growth and accumulation of knowledge of structure and a crust and planet structure as a whole. Only by the end of the XX century and the beginning of the XXI century there were rather full data on a structure of crust of all planet (Demenitskaya, 1975; Bluman, 1998, 2011; Vasilyev, 2009; Kuprin, 2010; Kashubin et al., 2013). In particular, allocation of two types of crust – continental and oceanic is now quite reasonable.

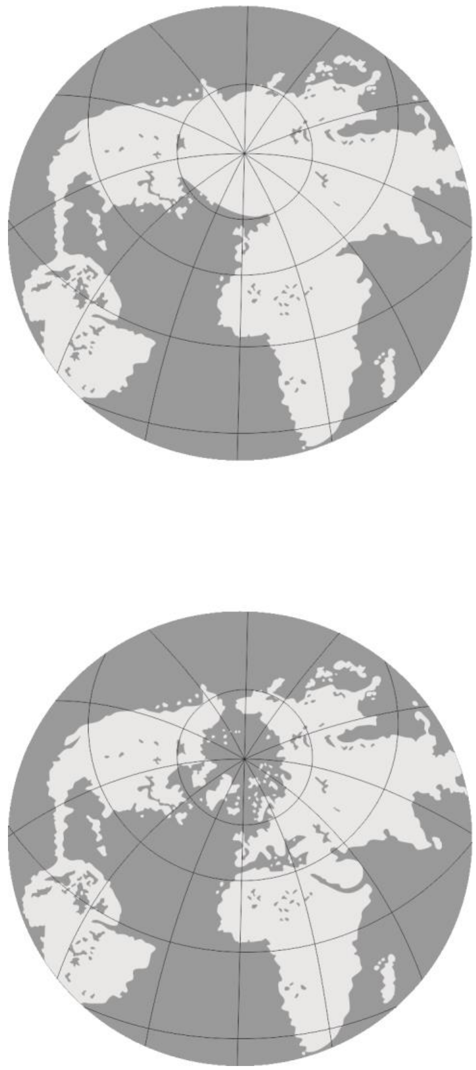

Figure 1

Position of the main megacontinent of the Earth (Zhirnov, 2014[3]).

Continental structures, with sialic composition of crust and exhausted mantle under it, created as a result of long (4 billion years) process of remaking peridotite top mantle under the influence of powerful fluids (plums), periodically separating from Earth core. And the central parts of an ancient platforms prevailing in their addition, are formed in the most initial stages of geological evolution of continents, in Hadean and Archean time. The border between modern continents, with continental crust, and oceans with basalt-peridotite crust often is under surrounding oceans, in the basis of a continental slope at a depth of 2-3.5 km that long complicated studying of their relationship (Demenitskaya, 1975; Belousov, 1989; Zhirnov, 2014$_3$).

Oceanic structures are put, on the contrary, by the peridotite crust (under young basalts) – almost invariable from the very beginning of formation of Earth, and only from a surface are covered low-power (1-1,5 km) with a basalt cover of Mesozoic and Cenozoic age. The actual development of oceanic crust happened only in the Mesozoic – the Cenozoic in the course of large-scale formation of breaks and an active global volcanism in the bottom of oceans. This situation is proved in many works: **in the tectonic relation oceans are the huge parts of a planet deprived of a granite layer** (Pushcharovsky, 2005).

Besides, distribution of different planetary types of crust is very specific and is natural. Primary peridotite crust (under the World Ocean) composes generally lateral parts of the globe, and continental crust covers a planet from poles, in the form of two continents – Northern and Southern. And the Northern continent is the huge megacontinent consisting of the American, African and Australian parts of Euro-Asian continent, and all continuously connecting in the north under the Arctic Ocean (Zhirnov, 2014$_3$).

Thus, the globe can be presented, figuratively, in the form of the flattened egg broken since two ends, with the general peridotite shell and the silica covers which have grown in broken trailer parts of egg, on a place of partially flowed out protein (Figure 1). The continents of Earth formed during all geological history of Earth, are the specific geological markers reference points which have impressed all information about development of a planet at a geological stage of its evolution. And their birth in strictly certain places of a surface of Earth testifies to the first and most powerful explosive process in the gas and liquid core of Proto-Earth which has caused its disintegration (Marakushev, 1999; Zhirnov. 2014$_2$).

In development of continents and Earth as a whole some stages of catastrophic excitement of the Earth's core and manifestation of mighty tektonic-magmatic processes in the crust, radically transforming its geological structure and an external face are determined.

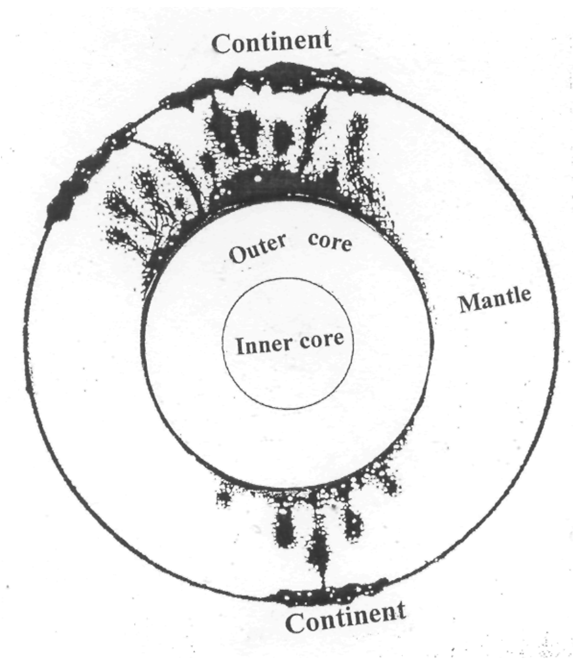

Figure 2

Model of the Earth's continents forming (Zhirnov, 2014$_1$)

3.2. The main stages of catastrophic excitement of the earth's core

3.2.1. Explosive disintegration of the Proto-Earth's core at the end of an astronomical stage of evolution – The first study of catastrophism

According to modern data, evolution of star and planetary systems happens due to nuclear processes in stars owing to what there are emissions of part of star substance at an early stage of their development. At the first cosmogony meeting in 1951 the academician V. G. Fesenkov stated idea of the birth of planets due to plasma emissions by the central forces quickly rotating young Sun. This representation was supported by the large astronomer academician V.A. Ambartsumyan: "planets are a by-product of formation of stars and creation of the theory of their formation is impossible, the theory of formation of stars won't be created yet" (Safronov, 1997, page 435).

Stars are born usually in the form of large (in 10-100 times more the Sun), quickly rotating, unstable educations which soon are breaking up on two-three multiple systems. In other cases there are numerous emissions of a matter from a star, Earth weighing 1-10 masses, then stars turn into the long stationary development caused by thermonuclear reactions of burning – transition of hydrogen to helium. Process of formation of planets is considered as collateral at the birth of stars – in cases of emissions from stars of rather small volumes of plasma (Abalakin and Sochilina, 1984; Shklovsky, 1984). As stars represent the heated gas spheres, with a temperature in the center about 10 - 15 million degrees, and the parts (clots) of weight thrown out from them represent the same hot plasma. Therefore, planets at the initial moment of the birth represented clots of hot plasma.

The concept of formation of planets from hot plasma clots was considered further as the most reasonable (Larin, 1975; Voytkevich, 1988; Cherkasov, 2001; Latkin and Shilo, 2007; Zhirnov, 2011, 2014_2). In particular: "at achievement of mass of a star is higher critical, process of thermonuclear synthesis begins, and emission of excess weight in space allows to forming planets" (Latkin and Shilo, 2007, page 186). Respectively, Proto-Earth was in the beginning the heated fast-rotating gas clot (a cyclonic whirlwind), in a condition of the electromagnetic plasma, thrown out of the massive young Sun, as stars of the second generation. At gravitational compression of a rotating body and Coulomb interaction of heavy elements, the cloud was quickly stratified on a heavy dense gas core and easier, magnesium-silicate mantle. The considerable part of gases and heavy elements was concentrated in Proto - Earth's gas dense core (Shilo, 1997; Marakushev, 1999).

Fast formation of two main geospheres of Earth –core and a mantle was caused by also oxygen barrier, i.e. affinity of arising chemical elements to oxygen. Elements with big affinity to oxygen and density smaller, than at Fe (Si, Al, Ca, Mg, Be, etc.) concentrated in a mantle and cover of a planet in the form of silicates, oxides, carbonates. Elements with a big density and low affinity to oxygen were a part of a core in the form of native metals and possible connections together with a huge amount of hydrogen, nitrogen and other gases (Letnikov, 2008).

In cold space Proto-Planet enters in the period of consecutive long cooling, consolidation of its top cover and all body and passes in a liquid condition, and then in a liquid - viscous state. According to A. Poincare and A.M. Lyapunov law (Surdin, 2004; Sytinskaya, 1956), a non-uniform, liquid, rotating body gets extended (like sigar, then pear-shaped) a form and sharp dynamic instability, in connection with moving of a heavy gas core to one party of a pear-shaped body (Zhirnov, 2014_2), and is inevitably divided into parts.

In the liquid space body containing a heavy gas core (with a possible embryo of a firm core), division begins with explosive division of a core into parts and emissions of a liquid mantle in space with core's fragments. Explosive properties of gas and liquid streams in a core of a planet are caused by the increased concentration of singular flying elements – N, C, O, CH_4 and ZN. Such gases represent quickly igniting explosive mix. Sharp pressure differences in different parts of a core, in combination with mechanical instability of gas and liquid pear-shaped Proto-Planet and big energy at gas and liquid transformations in a core (Karnaukhov, 2010), inevitably cause explosive disintegration nuclear "a powder cellar". In particular: "the chemical composition of a subsoil of the blown-up star has to be sharply other than a modern solar core. This distinction is expressed in incomparably bigger abundance of easy elements (nitrogen, oxygen, carbon, neon) in relation to hydrogen … These elements form potential "a powder cellar", filled with explosive nuclear fuel" (Eveling et al., 2000, p. 267-268).

As the separation of fragments of a mantle of Proto-Earth occurred from rotating it from the West to the East, the bottom made narrower ends of coming-off mantle bodies got a bend to the East. Respectively, the continents which have grown subsequently on curved sites of a separation of a mantle bodies, also got bends to the East (Zhirnov, 2014_2).

Thus, the planet Earth birth took place at explosive disintegration of a large initial planet of Proto-Earth. The central part which has remained after explosive disintegration of Proto-Planet, with destructive trailer parts of a mantle, represented the arisen planet Earth. Whereas the continents of Earth which have grown later in these destructive parts (deep pits), are geological indicators - markers (Figure 1) of the great space drama which has taken place on a planet Proto-Earth at the end of an astronomical stage of its evolution.

3.2.2. Transition to a stage of a planet's geological evolution

From the beginning of cooling of a surface part of a planet to the temperature of 800 - 900^o and crystallization of superficial part of a mantle (Reznikov, 1995, 2006), evolution of planetary geological structures was defined by different factors and their development was carried out on opposite algorithms, according to the geological law of autonomous development of continents and "oceanic" crust (Zhirnov. 2014[1]). However the geodynamics of all subsequent geological processes was defined by the periodic catastrophic ex citing of a gas and liquid core and explosive emissions from its destructive parts of powerful endogenous fluids of hydrogen and silica-oxygen –hydrogen composition. Respectively, all these emissions were always carried out in strictly selective direction which was defined still during a catastrophic era of an astronomical stage – from destructive part of a gas and liquid core to destructive sites on a surface of a planet (Figure 2). For this reason continents of Earth are remarkable geological indicators both previous explosive processes on a planet, and the subsequent catastrophic geological processes which have defined formation of the Earth crust.

3.2.3. Nitrogen – carbon - hydrogen radiation of the Earth's core in Hadean (400 million years) and formation of a proto-basalt layer of continents – The second stage of a catastrofism

In Hadean and the Archean time was actively formed the ancient crystal base in a sole of all continents which has made about 80% for the general power of crust of continents. It and the longest period in a geological history of Earth, the made 85% of time of development of crust (Belousov, 1989; Hain and Lomiza, 2005).

Directly in Hadean (4.4-4.0 billion years ago) was formed basalt layer of continents, huge power – till 10-15 km and more (Rezanov, 1995; Hain and Lomiza, 2005). The initial pits which have arisen on a body of a planet at disintegration of Proto-Earth, were filled in the Hadean on all area of bottom pits with large volumes of the basalt magma melted from a peridotite mantle under the influence of streams of ascending nuclear gases (H, N, CO, CH_4), and intensively heated-up situation (Letnikov, 2008).

Dynamics of geological processes was defined at this time by mass lifting's of fluids (plums) from an external core of Earth, to sites of a separation of fragments of a mantle from Proto-Earth where formation of a sole of future continents in primary destructive holes and began (Zhirnov, 2014[1]). The top mantle in deep holes was constantly under influence of hot powerful streams of nitrogen-hydrogen fluids – "the planet surface here reminded a surface of boiling cooked semolina" (Mikhaylov, 1988, page 59). Under continuous influence of nuclear fluids, the large volumes of the basalts which have consistently increased the bottom basalt layer of continents on height of 10-15 km were melted from a peridotite top mantle, and more. In the top part of section basalt layer in significant volume layers of quartzite, the graphitic and phosphate-siliceous rocks were formed in the first superficial sedimentary pools (Salop, 1982). Basalts and sedimentary rocks quickly underwent to metamorphism under influence of high pressure and temperature of the super dense hydrogen atmosphere existing at that time (pressure of 6-10 Kbar, temperature 700-900^{o} C), and turned into highly metamorphic crystal slates (two pyroxene, amphibole-pyroxene) the highest, granulite facies of metamorphism (Rezanov, 1995; 2006; Marakushev, 1999).

Thus the lowermost granulite-basalt layer of the continents' crust was created (Gluhovsky and Pavlovsky, 1973; Salop, 1982; Cheglov and Govorov, 1985; Hain and Lomiza, 2005). At the end of the Gothob period of tectonic and magmatic catastrophism the sedimentary rocks were collected in the first concentric folds, and strongly transformed by the first intrusions of granites (Salop, 1982). The most known and pronounced example of the described layer are kabaktinsk and chogarsk series of the main crystal rocks on the Aldan craton (Eastern Siberia), with absolute age of 4.0 - 4.5 billion years. They have a chemical composition of basalt and are very close to toleit basalts of oceanic crust and lunar basalts (Table 1). These rocks very dense (3.05 - 3.51 g/cm^3) also are characterized by the high speed of passing to them longitudinal seismic waves – 6.36 – 7.2 km/s, with a pressure of 1 bar (Gluhovsky and Pavlovsky, 1973; Pavlovsky, 1975).

Table 1

Chemical composition Aldan (I), oceanic (II) and lunar (Ш) basalts (Glukhovsky and Pavlovsky, 1973)

Type of rocks	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
I	47.48	1.08	15.53	2.41	10.65	0.37	9.71	9.35	1.73	0.39
II	45.6	1.7	8.3	2.3	10.2	0.1	21.7	7.5	1.3	0.4
III	43.1	9.0	11.2	_	17.4	0.21	7.0	11.5	0.5	0.14

However metabasalts of the Aldan craton differ very high contents of nickel, cobalt and copper (is 2-5 times higher than terrestrial Clark) – characteristic metals of the Earth's core, and high contents of fluorite, tin and tantalum (is 5-10 times higher than Clark) that sharply distinguishes them from oceanic and lunar basalts (Cheglov and Govorov, 1985). This stage of formation of crust of continents it is for the first time called by A.P. Pavlov "lunar", by analogy to a final stage of basalt magmatism of the Moon that is supported also by other researchers (Pavlovskiy, 1975).

Characteristic feature of crust of continents is consecutive reduction of power of crust from their center to suburbs. Average power of crust is equal in the central parts of continents of 40-50 km, to suburbs it decreases to 25-30 km, and in the suburban seas it decreases to 20-10 km. The lower, granulite-basalt, layer of this crust also decreases on power to regions of continents (Figure 3). And in grabens of a bottom of East Asia and the Arctic Ocean its power makes 5-7 km. But unlike primary oceanic crust lying under cover of young sedimentary rocks and basalts, this layer was transformed and in some cases (Gakkel's ridge, etc.) is directly bared on an ocean floor surface (Kashubin et al., 2013; Zhirnov, 2014_3).

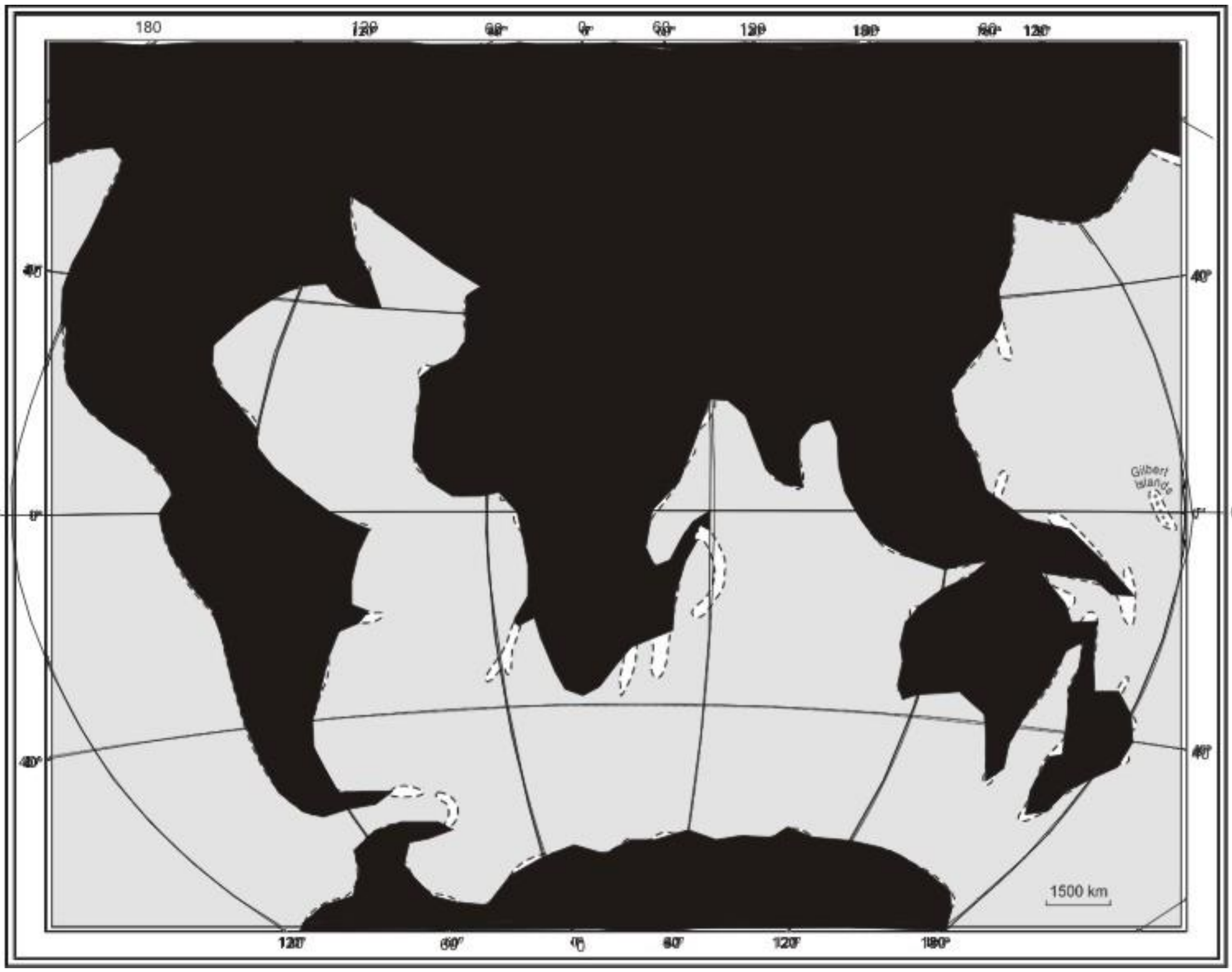

Figure 3

Position of the lower granulite-basic layer of continents at the end of Hadean (World tect. map..., 1982; Katz and Ryabukhin, 1984)

3.2.4. Silicon - aluminum - alkaline - hydrogen radiation of Earth's core in AR-PR_1 during 2.3 billion years and formation of a sialic layer of continents – The third stage of a catastrophism

By the Archean beginning chemical conditions in a core of Earth significantly changed, but its geodynamic activity remained so mighty, as well as in Hadean. Powerful hydrogen radiation, characteristic for Hadean, was replaced with radiation essentially another - silicon - aluminum – alkaline – hydrogen composition. This radiation actively proceeded, periodically, throughout a huge period –

more than 2 billion years. Characteristic of its spatial direction – on vertical channels from a core to a sole of the same initial deflections holes on a surface of the planet Proto-Earth (Figure 2) which has arisen at disintegration. These nuclear fluids (plums) were so large-scale on the area, as well as in Hadean. They were shown on all square of earlier created metabasalt layer of continents in this connection this stage of formation of crust call often pan - geosynkline (general geosynkline). Emergence of the first hot (80-150º) sea basins of small depth is characteristic for the Archean in which the ultrabasic effusive rocks (comatiits) and the basalts streamed in the beginning, with tuffs and lavas, and later – volcanic rocks of an average and sour composition. For example, in a greenstone belt of Abitibi (North America) the ratio of basalts, andesites, dacites and rhyolites is equal, agrees A. Goodwin, 55: 30: 10: 5 (Salop. 1982). Comatiits differ the high contain of MgO (to 40%), NiO and Cr_2O_3. Sedimentary rocks are presented generally gray wacke, arkosic sandstones, aleurolitics rocks and clay slates, and also the siliceous and ferruginous and siliceous rocks which layers alternating with layers of volcanic rocks.

And only on the average and the late Archean there were deep (10-25 km), oval basins in which powerful thicknesses of sedimentary rocks were formed (Pilbara - in Australia, Barberton-in South Africa, Aldan in Eastern Siberia).

For the Archean broad development of circular and oval folded structures of sedimentary and magmatic rocks is characteristic. Therefore this period often call the nuclear period of formation of crust (Gluhovskiy and Pavlovskiy, 1973; Salop, 1982; Gluhovskioy, 1990).

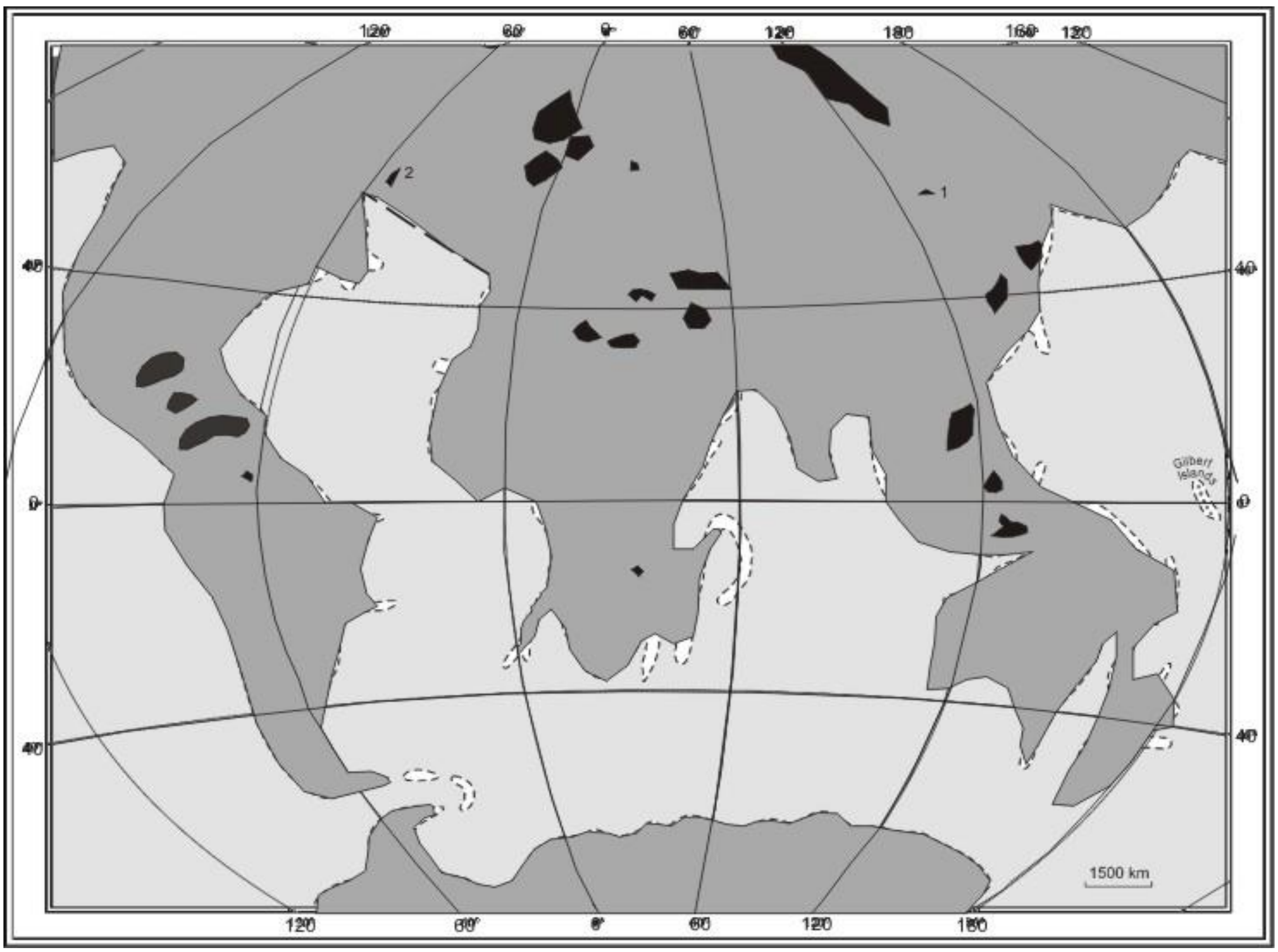

Figure 4

Position of sialic granite-gneissic layer of continents at Archean time (World tect. map..., 1982; Katz and Ryabukhin, 1984)

General feature of the Continents' formation an Archean crust is widely large-scale granitization of earlier created rocks and plentiful development of again created granite plutons under the influence of nuclear silicon - hydrogen fluids. Granitization is process of enrichment of rocks by silicon dioxide (SiO_2), oxygen and aluminum, and also – group of incoherent elements: alkaline (Li, Na, K, Cs), rare-earth (La, Ce, Sm, Eu, Gd, Dy) and radioactive elements (Rb, Sr, Ba, U, Th, Zr, Nb). Nuclear hydrogen fluids were a source of silicon, aluminum and radioactive elements mainly whereas alkaline and rare-earth elements were taken by hydrogen streams from the top mantle. Therefore the top mantle under continents is exhausted concerning the specified elements (Lutz, 1973; Ringwood, 1982; Cheglov and Govorov, 1985; Belousov, 1989).

During the Archean and the early Proterozoic there were some stages of the crust's granitization. The largest stages of a granitization were the Saam stage (3.8-3.6 billion years ago) low potassium granitization, the Kenoransky stage (2.8-2.6 billion years) with characteristic potassium alaskite granites, anorthosites and charnokites and the Karelian stage of a granitization (1.8-1.6 billion years ago) with potassium granites and fold intensity of sedimentary rocks (Salop, 1982; Glukhovsky, 1990). Thus, folded sedimentary thicknesses of rocks were raised in mountain chains and very transformed in amphibolite and green stones facies.

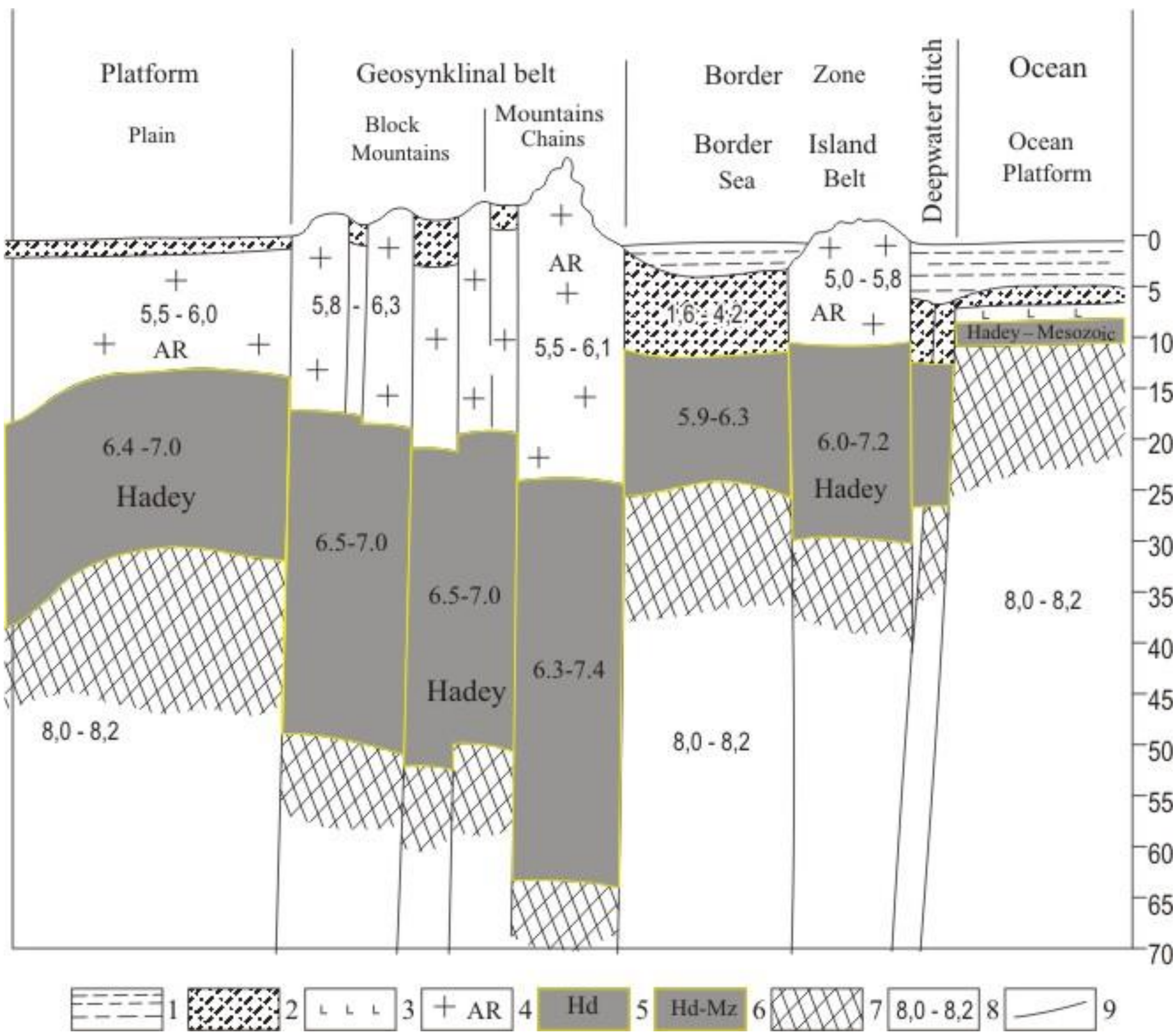

Figure 5

The generalized section of the earth continental crust (Khain, 1964; Жирнов, 2011).

As a whole, all Archean sedimentary rocks and, partially, underlying granulite-basic rocks were transformed to rocks tonalit-trondyemit-granodiorite composition ("gray gneisses"), made the sialic consolidated base of continents. The period of formation of a sialic layer of crust – the longest in geological development of Earth, from 4,0 to 1,8 billion years ago, i.e. it included all Archean and the lower Proterozoic (Lutz, 1973; Salop, 1982; Belousov, 1989; Glukhovsky, 1990). Emergence of water in deep fluids' composition (their oxidation) and emergence of large water basins, - characteristic feature of Archean and the subsequent stages of geological time as gives rise to a long stage of formation of local water basins (geosynclines) and folded belts of sedimentary rocks in a frame of ancient and young platforms of continents (Khain, 1964; Larin, 1980; Salop, 1982).

Unlike the lower metabasalt layer there were some places ("windows") in a granite-gneissic layer in which it is absent. In particular, the granite-gneissic layer is absent in deep-water basins of the Mediterranean Sea and East Asia (Khain, 1964), in some grabens of the bottom of the Arctic ocean, in Europe (Caspian Depression, the Southern Caspian Sea, etc.) and in other places (Figure 4).

As a result of the considered geological processes of vertical increase of powerful granulite-basalt and granite-gneissic layers the ancient consolidated base of the 20 - 40 km modern continents making dominating part (80-90%) as a part of continental crust (Figure 5) was formed.

3.2.5. Silicon - oxygen – potassium - the hydrogen local radiation of the Earth's core in the Proterozoic – Paleozoic time and formation of covering and folded sedimentary layer of continents during 1.5 billion years (1.7 - 0.2 billion years ago)

Extent of consolidation of the arisen crystal base is non-uniform on the area. One sites didn't undergo impact of the subsequent geological processes (ancient platforms), other sites were insufficiently steady and became objects for transformation at geological processes of the Proterozoic and the Paleozoic time. Thus some f them were simply lowered as large depressions or grabens, and were covered with a horizontal cover of young sedimentary rocks or basalt (trappean) rocks. Continuous covers start being formed with a boundary 1.8-1.6 billion years ago. The cover of the Siberian platform is composed by Late Proterozoic (Rifey) rocks, the Russian and Southern American platforms become covered by a cover in Vend time, the North American platform becomes covered by a cover since the Paleozoic beginning (Kazansky, 1988). Large basalt covers on continents were shown in different intervals of time, from the Paleozoic time to the Mesozoic time (Larin, 1980; Orlenok, 2010).

Sites at the edges of ancient platforms became a place of manifestation of geosynkline -folded processes in the Paleozoic and the Mesozoic time developing with broad participation nuclear silicon - hydrogen, including metal-bearing, fluids and active manifestation of processes of granitization (Figure 7, 8). These processes developed according to the usual scheme of development of geosynkline -folded process: formation of local depressions, up to 3-5 km in depth, synchronous emergence of sea water and intensive sedimentation, inversion of deep basins, injection large granite plutons, folding, and formation of ore deposits. The third was as a result created, the most top, a layer of crust of the continents, called a sedimentary layer (Figure 5).

With the largest tectonic-magmatic eras of the Precambrian and the Phanerozoic time are connected, according to V. Smirnov, large metallogenic stages of formation of various endogenous metals. As magmatism of the catastrophism eras developed usually in two stages – basalt early and granitoid late, and the type of deposits significantly differed (Figure 8). Ore fluids of mantle are connected with bazalt magmatism (Fe, Pt, Cu, etc.), with granitoid magmatism formed deposits of tin, gold, polymetals, etc. (Kazansky, 1988).

3.2.6. Silicon-hydrogen and oxygen - the hydrogen radiation of the Earth's core in the Mesozoic Cenozoic time and formation of the World Ocean (200 - 1 million years ago) – The fourth study of catastrophism

The fourth era of a tektonic-magmatic catastrophism in the history of Earth took place in the Mesozoic Cenozoic time, later 1.5 billion years after end of the Archean – Lower Proterozoic period of formation of sialic (the second layer) the crystal base of the Earth's crust. Two huge interfaced processes were shown at this time. On the one hand planetary geosynkline-folded processes on suburbs of continents took place, in particular on east suburb of Asia and on the western suburb of America – where in end huge volcanic belts and linear granodiorite batholits (marked in America mountain chains of the Cordilleras and the Andes) were created. Mesozoic geosynclines developed as on new squares in continents, and only inherited – on former sites of development of Paleozoic geosynclines. The western suburb of the American continent along which geosinkline-folded processes of the Proterozoic, the Paleozoic and the Mesozoic were consistently shown is especially well-known in this regard (Salop, 1982, World tectonic map…, 1980). Active geosynkline-folded processes were shown also within a midland Mediterranean and Himalaya tectonic belt (Hain, 1964; World tectonic map, 1980; Rezanov, 2006). Huge volcanic belts - East Asian andesite-ryolite, Island basalt-peridotite (Kuril - Japan- Philippine) and Cordilleras-And ryolite-andesite were created in the end of the Mesozoic - Cenozoic tektonic-magmatic study, on suburbs of the continents (Figure 9). The territory of continents considerably was raised and became close on outlines to the modern position of land (but with the flooded suburbs - shelves) (Figure 10, 11).

On the other hand, for the first time in the history of Earth the interfaced grandiose process of lowering of the huge territory of peridotite crust outside the continents, representing before passive land began. This territory started being split up intensively by numerous breaks, both on the area, and on borders with continents, unevenly to fall with a parallel covering of a bottom of the arisen huge depressions thickness of basalts and for the first time the water which has arisen in the Mesozoic Cenozoic of the modern World Ocean.

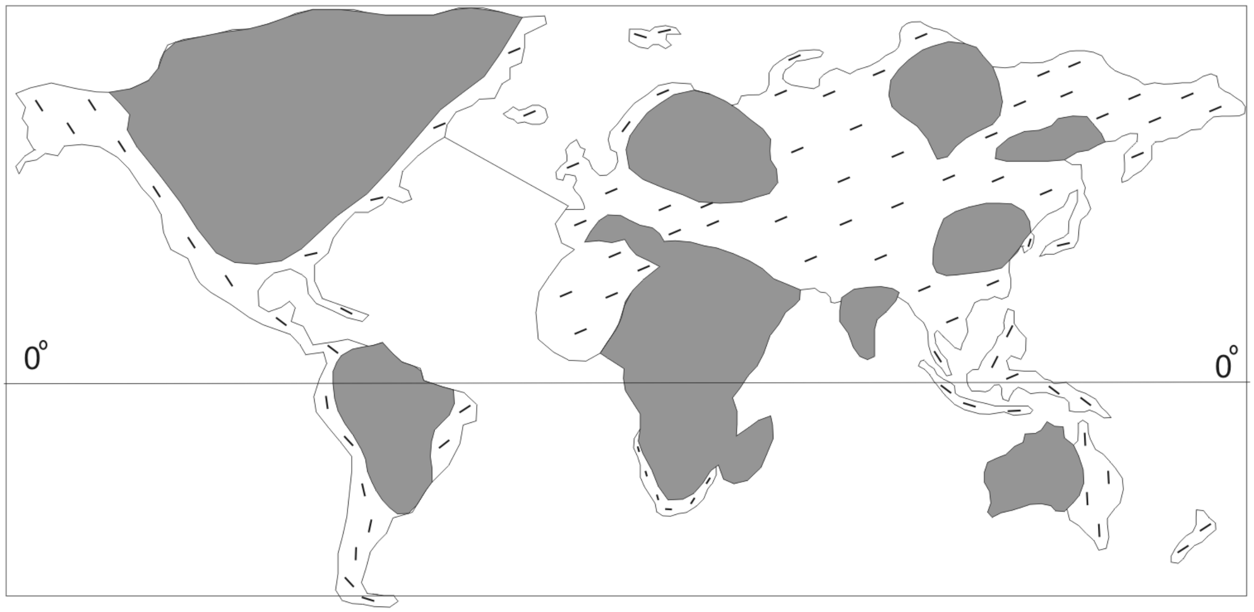

Figure 6

Geosynclinals basins on the Continents in Proterozoic time (Magnitsky, 1953; World tect. map..., 1982)

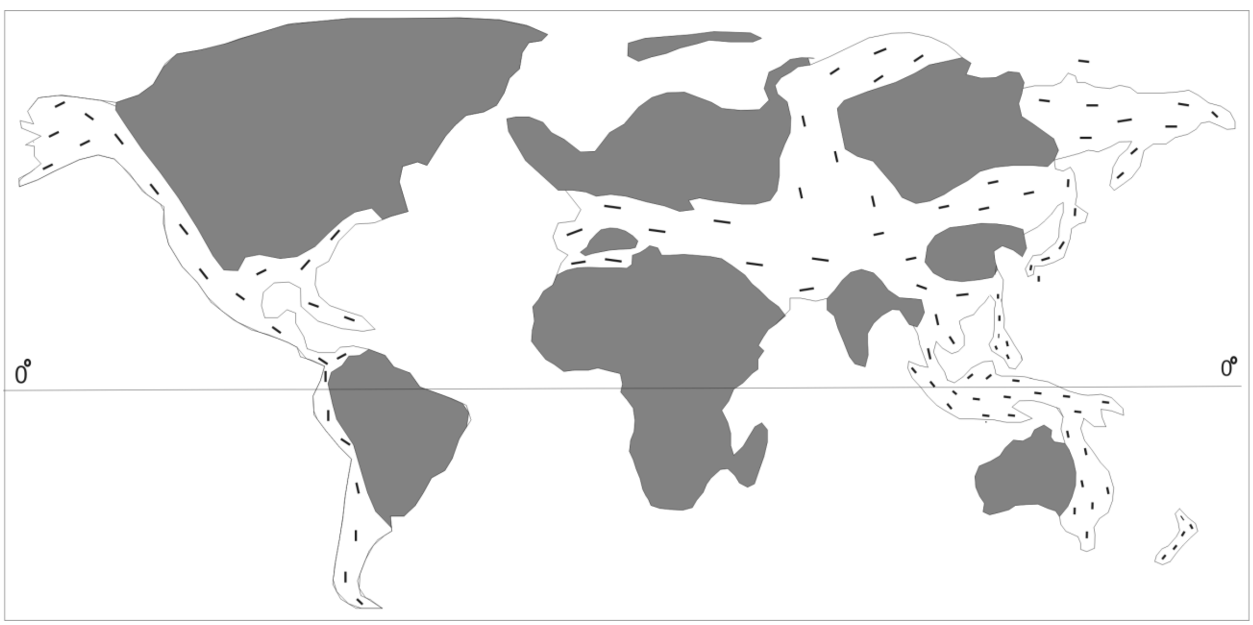

Figure 7

Geosynclinals basins on the Continents in Paleozoic time (Devonian –Carbonic) (Magnitsky, 1953)

Establishment of shallow character of a precipitation of the World Ocean and their quiet horizontal bedding became the most important result of deep-water drilling at oceans in the second half of the XX century. The age of formation of a shallow precipitation varies from Mesozoic (160-135 million years) to later age. However the volcanism proceeds and in modern time - in axial parts of oceanic ridges and in zones of ancient and modern tectonic breaks of crust. Depth of lowering of territories of primary peridotite crust and interfaced to it intensity of a volcanism and speed of intake of endogenous oceanic water were extremely uneven in time. At the beginning the Mesozoic time formed shallow sea basins (to 0.5-1 km) and shallow precipitations. But at the beginning of the Cenozoic the speed of lowering sharply increased in the World Ocean (Figure 12). For example: in late Jure the speed of lowering of an oceanic bottom made 25-30 mm / 1000, in late chalk – 50-60 mm / 1000, at the beginning of the Neogene – 180-200mm / 1000, and in an anthropogen – 600-640 mm /1000, i.e. increased by 20 times in comparison with later Jurassic Period (Orlenok, 1983). So many Jurassic shallow precipitations were lowered on depth of 6-7 km.

It should be noted, a cardinal difference between sedimentation on continents and in the World Ocean which has arisen in Mesozoic-Cenozoic time. Geosynclines basins on continents were formed owing to cyclic descending-ascending tectonic movements and differed fast accumulation of huge thicknesses on the power of sedimentary rocks, then collected in the fold-mountain structures, broken through by magmatic and ore-bearing bodies and intensively metamorphosis. Contrary a precipitation in the modern World Ocean has the low thickness (0.2-1 km), a horizontal bedding, and often alternately with covers of basalts. They only passively filled hollows in arising depressions of an oceanic bottom (Schlesinger, 1991).

Tectonic hollows of the World Ocean are specific expression of a compensation contraction of the earth crust, caused by reduction of the Earth a liquid terrestrial core for long geological history owing to radiation from it huge volumes silicon - hydrogen and metal-bearing fluids (Orlenok, 2010). The place of excitement of a terrestrial core (on opposite from a former place – under continents) essentially changed also. The composition of nuclear fluids from a liquid core of a planet changed also. They became mainly oxygen - hydrogen, capable to cause only melting of the top mantle under a bottom of the World Ocean and formation of basalts and oceanic water.

3.2.7. Natural reduction of dynamic activity of the Earth's core in time

Thus, Earth geodynamics, at all stages of its evolution, was defined by power its gas, and then a gas and liquid core. Non equilibrium processes of differentiation of gas and liquid substance in a core of the Proto-Earth (and then in core of Earth) four times led to the most powerful catastrophic explosive processes. On astronomical study the Proto-Earth was broken off on parts in liquid - viscous condition and the mother Earth was formed¸ and then Hadean, Archean and Mesozoic-Cenozoic largest stages of the catastrophism took place at a geological stage of development of the Earth (Magnitsky, 1953; Khain, 1964; Salop, 1980; Belousov, 1989; Zhirnov, 2008, 2014_2).

It is characteristic that dynamic activity of the Earth's core consistently decreased in time. It is well proved by data of a geological structure of the earth crust, saved up for the last century. The areas of distribution of geological formations of various ages and their thickness naturally decrease from the most ancient periods of geological time to the youngest. In the Hadean the basalt layer of crust of very big power, about 15-20 km on ancient platforms and 25-35 km in Proterozoic-Phanerozoic folded belts and on all area in a sole of continents was created (Figure 3). In the Archean the same powerful layer (Zlobin, 2006), but other granito-gneissic composition and also almost on all area in a sole of continents was formed (Figure 4).

However dynamic activity of the Earth's core was the highest in the Hadean where it continuously proceeded 400 million years. In the Archean its activity was already significantly less and was shown during three separate large stages of a catastrophism (Figure 13). In the Proterozoic activity of the Earth's core considerably decreased, and geological processes were shown only on a half of the area of continents (Figure 6), in the Paleozoic of the area of geological development were even more reduced, and in the Mesozoic these processes took place mainly on suburbs of continents, also as well as in the Cenozoic (Figures 7, 9). Constructive geological processes on continents almost completely stopped, they considerably rose and became land (Figure 10).

Active destructive processes of lowering of large territories outside continents became in the Mesozoic Cenozoic time in connection with reduction of the Earth's core: an active volcanism in them and filling with waters of the World Ocean. Activity of the Earth's core became even less and was shown generally in generation of the thermal streams which have caused melting of the top mantle and formation of oceanic water (Figure 13).

The mightiest dynamic processes were in a core of Proto-Earth when they caused a gap it on parts. Energy of this explosive process can be estimated approximately in 10^{20}-10^{25} erg if at birth of the Sun to accept energy of explosive emissions equal 10^{30} erg (Gorbatsky, 1967).

Questions of numerical values of power of the Earth's core in different geological time (and astronomical time too) while aren't developed absolutely not.

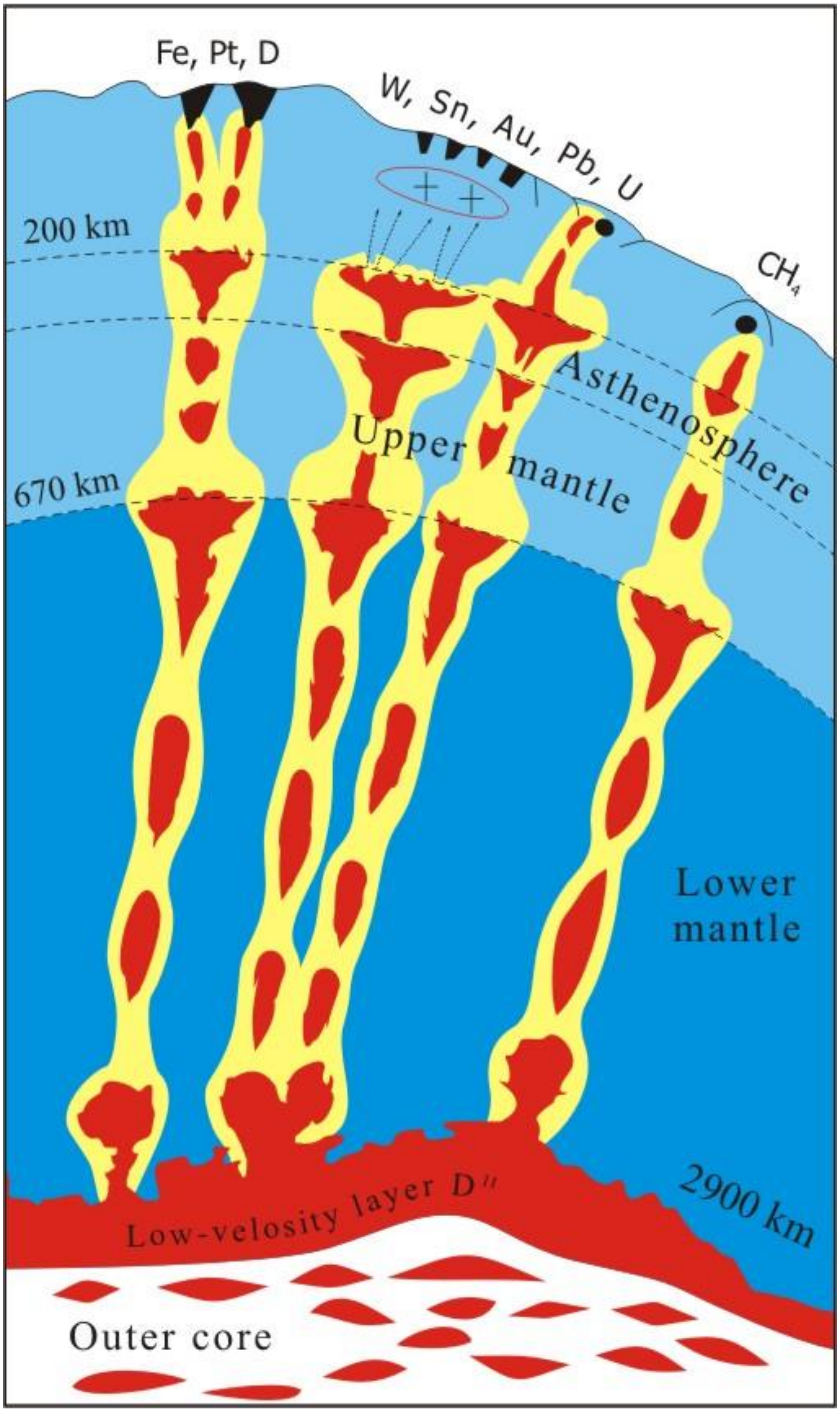

Figure 8

Vertical channels silicon - hydrogen, including metal-bearing, fluids (plums) delivering nuclear substance from an external core of Earth to a sole of continents (Zhirnov, 2012)

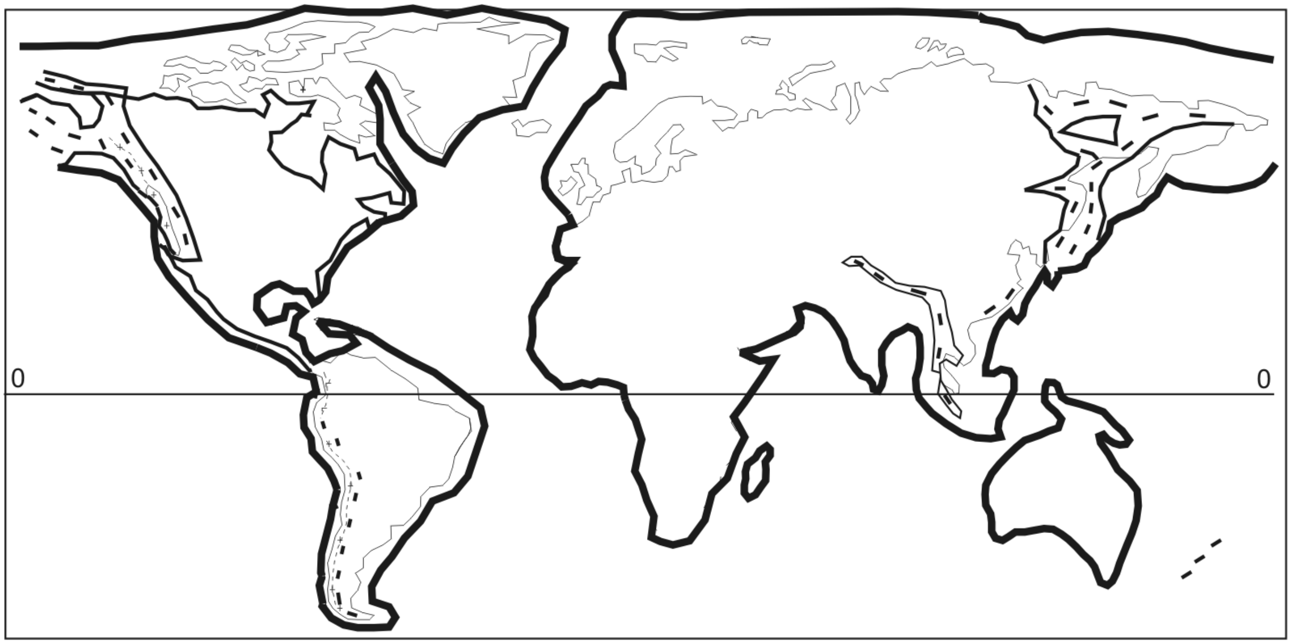

Figure 9

Geosynclinals basins on the Continents in Mesozoic time (Magnitsky, 1953)

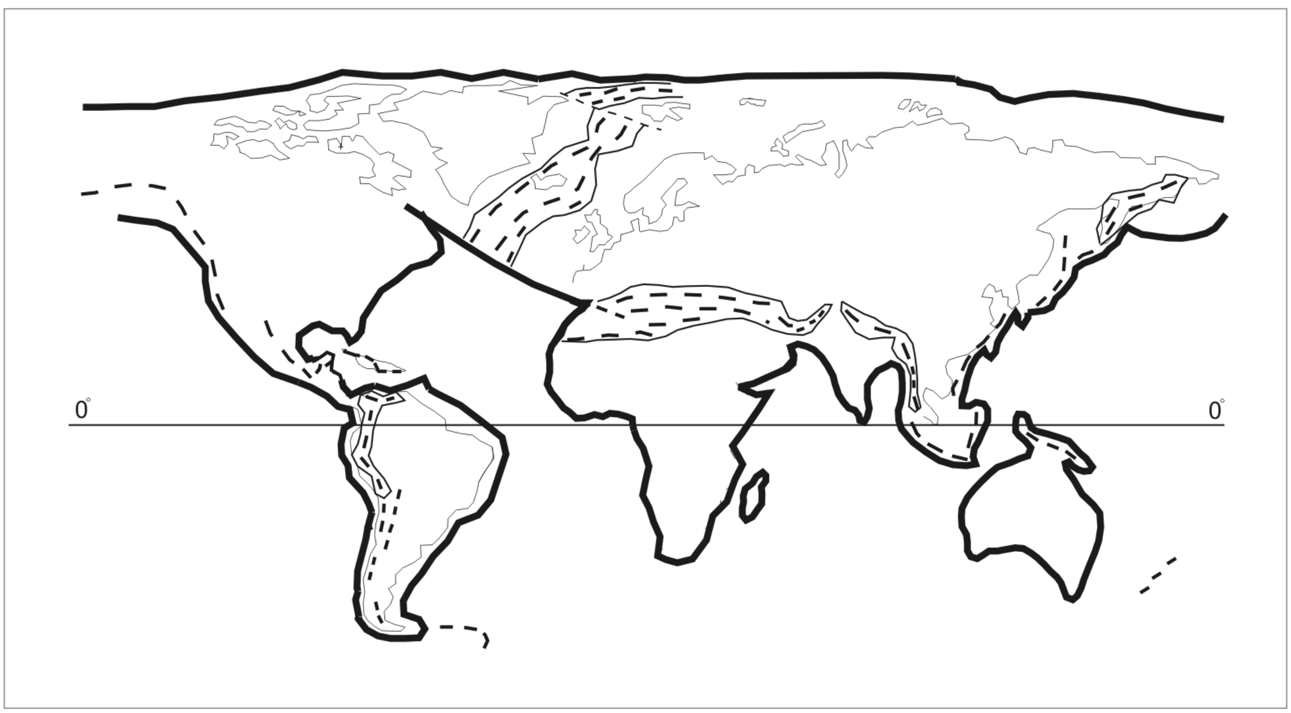

Figure 10

Geosynclinals basins on the Continents in Cenozoic time (Magnitsky, 1953; World tect. map…, 1982)

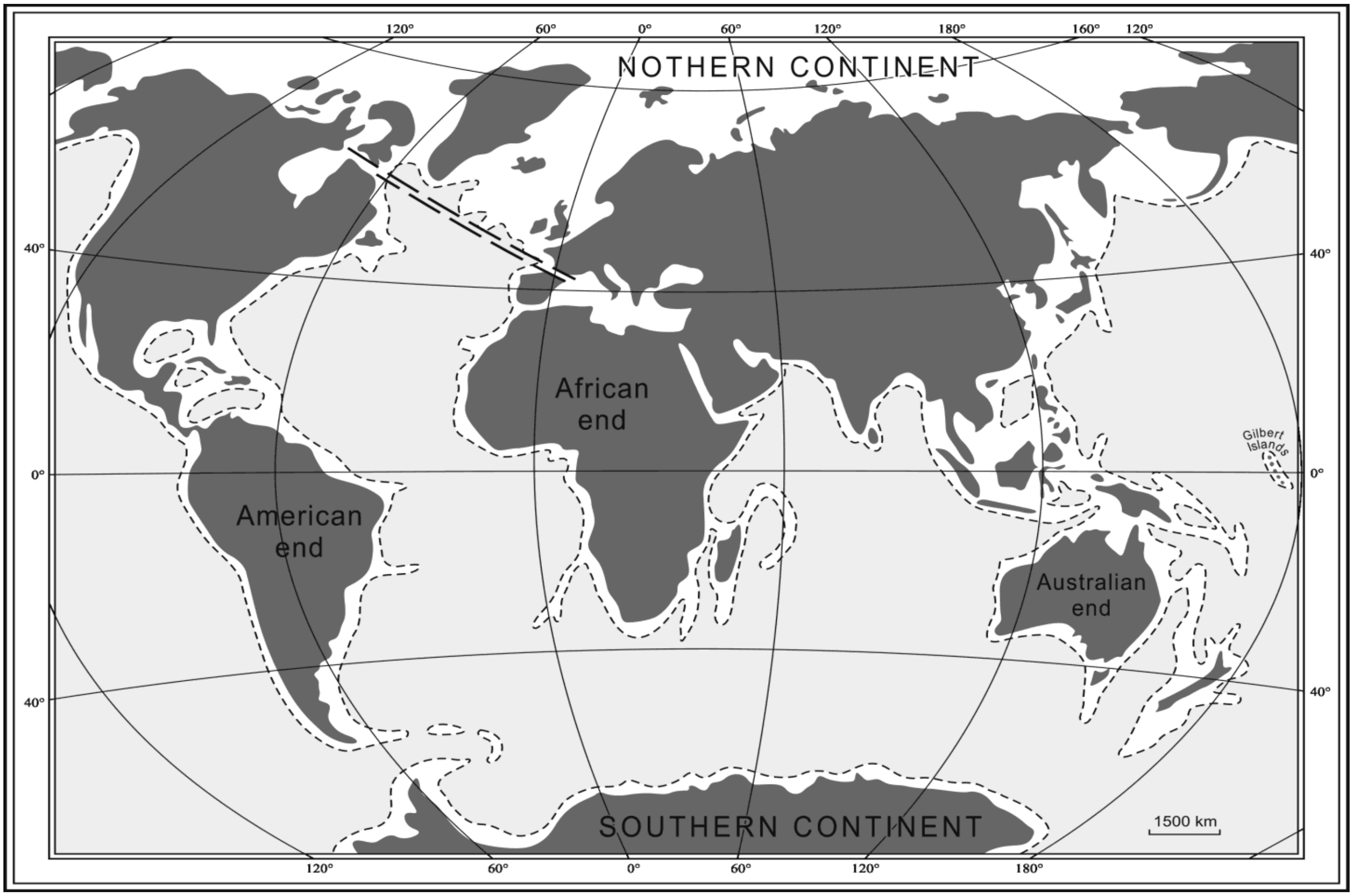

Figure 11

The Raised Position of the Earth's Continents at the end of the Cenozoic time, with the flooded suburbs (shelves). According to N. Shatsky (Magnitsky, 1953) and Yu. Leonov (World tect. map.., 1982)

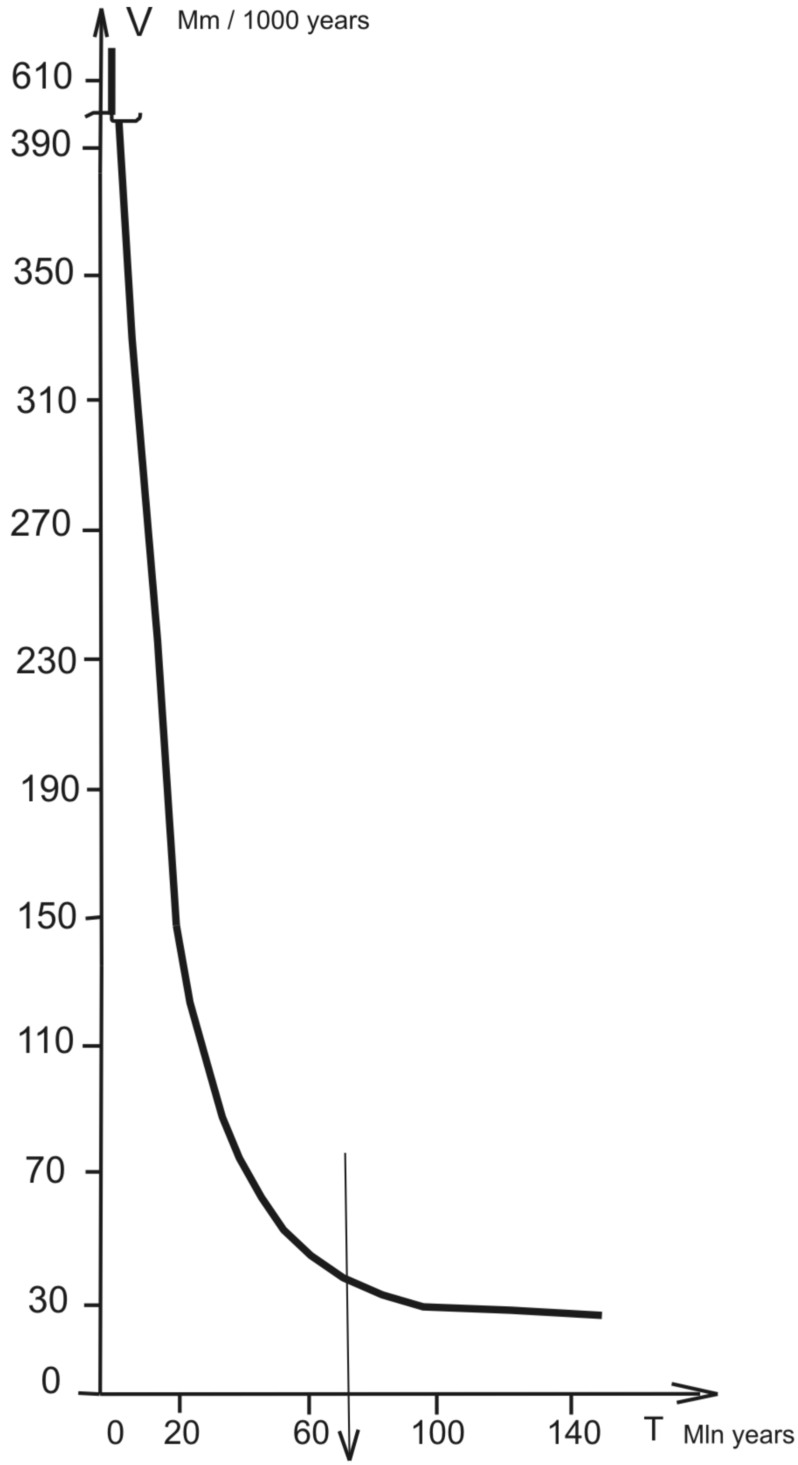

Figure 12

Speed Schedule of lowering of an oceanic bottom of the World Ocean and speed of intake of endogenous water, according to 149 wells (Orlenok, 1983)

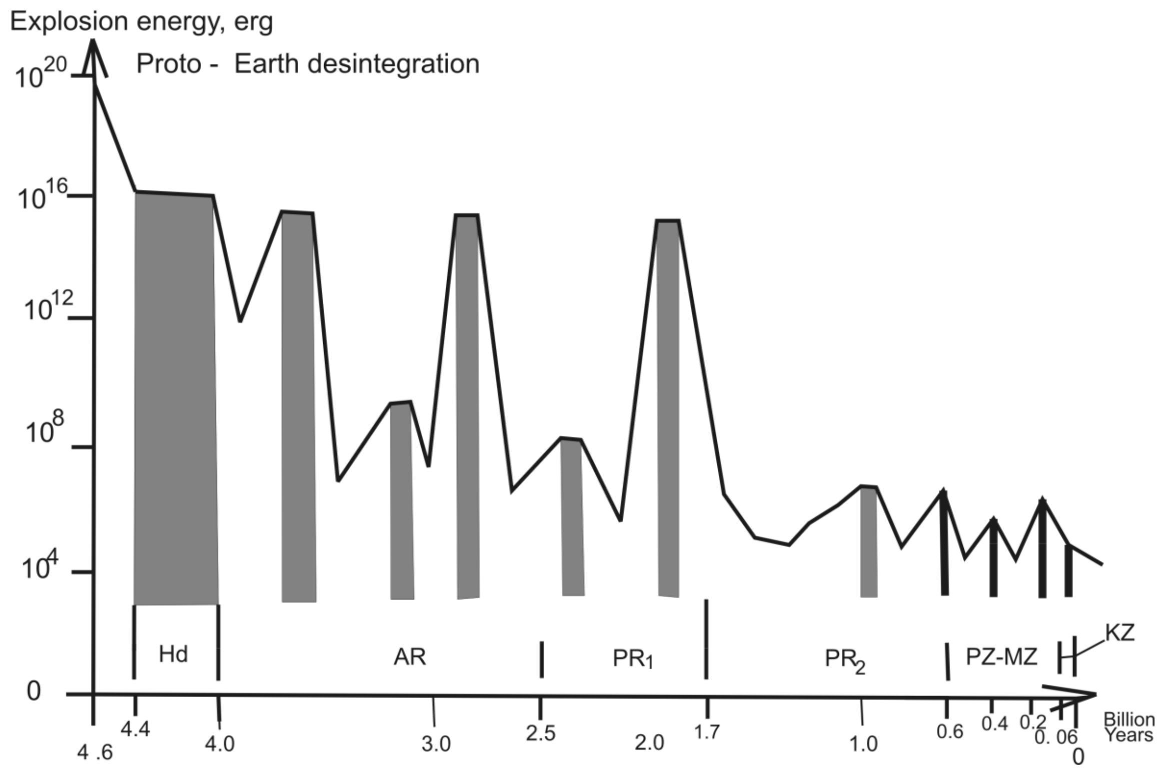

Figure 13

The schedule of reduction of dynamic pulsation activity of the Earth core in the course of its evolution. Taking into account data (Gorbazky, 1967; Orlenok, 2010)

4. DISCUSSION

The problem of the leading role of the Earth's core as main factor in evolution of crust arose 40 years ago, after issue of large works of V. Larin (Larin, 1975, 1980). Then this idea was supported by some other researchers (Artyushkov, 1979; Dobretsov et al., 1994; Marakushev, 1999; Letnikov, 2001, 2008; Zhirnov. 2005, 2014_1) and now admits the majority of researchers. The researchers stated above consider in a certain measure both astronomical and geological regularities in crust and Earth development as a whole. This concept finds the increasing confirmation in new astronomical opening of star and planetary systems and in new results of a structure of crust of continents and an oceanic bottom (Vasilyev, 2009; Kuprin, 2010; Blyuman, 2011, 2013).

However the plate-tectonic concept offered 45 years ago by scientists-geophysicists now dominates in world geological literature. It is based on hypothetical ideas of horizontal movements of large earth's plates, their immersion down in an Earth's mantle deeply both other so illusory and physically impossible processes (Anfilogov, 2008; Vasilyev, 2009; Kuprin, 2010; Blyuman, 2011, 2013; Zhirnov, 2014_1).

The actual geological data stated in this work allow to plan, from our point of view, new solutions planetary geological and tectonic problems.

5. CONCLUSION

Evolution of the Earth historically was defined by large stages of a catastrophism. At the basis of them there were nuclear explosions in a gas and liquid core of the planet generating the ascending hydrogen fluids of various compositions which cardinally transformed earth crust. There were fourth studies of a catastrophism. The first of them was in the end of astronomical study when the Proto-Earth was explosive disintegration and the mother Earth was formed. The second study was in Hadean when the lower granulate-basalt layer was formed. The third study of catastrophism happened in Arhean - Lower Proterozoic when the second layer of ancient consolidated earth core, granite-gneissic composition, was formed. The fourth study of catastrophism took place in Mesozoic – Cenozoic time when the large volcanic – plutons belts were formed on the suburbs of the Continents and the large territory of peridotite land round of Continents became immerse. In the Cenozoic time continents became finally steady land, and the peridotite land surrounding them was deeply lowered and filled with water of the World Ocean. The geological processes on power consistently decreasing in time according to the main law of evolution of the Earth's core and planet – the law of decreasing dynamic pulsation activity of the Earth's core.

SUMMARY OF RESEARCH

Planet Earth underwent four large stages of a catastrophism in the astronomical and geological evolution. During the first of them there was a mother Earth, and during the subsequent stages of a catastrophism the geological structure of crust and the image of the planet radically changed.

At the end of an astronomical stage of its evolution there was an explosive disintegration of large Proto-Earth, as a result of explosive disintegration of its core (Zhirnov, 2014_2), the central body from which became the planet Earth in its initial state. The deployed sites on a planet body Earth as traces from emission in space of trailer parts of a mantle of Proto-Earth, became places of the subsequent long (4 billion years) growth of crust of continents, under the influence of nuclear fluids, is directed arriving from a planet core to earlier arisen destruction sites.

Second stage of a catastrophism. In an initial Hadean stage of geological development of Earth on sites of a separation of former parts of a mantle the continents' lower granulite-basic layer thickness the 15-25 km was created during 400 million years. This layer represents the sites of the top peridotite mantle processed under the influence of nuclear hydrogen plums.

Third stage of a catastrophism. During the following the Archean - the Early Proterozoic stage, lasting 2.3 billion years, the second powerful (15-25 km) a layer of the continents' consolidated base were created on the lower layer. The sedimentary rocks turned as a result of repeated processes of a granitization into the rocks of granite-gneissic composition. Both layers make the ancient consolidated base of continents with a power of 30-50 km., sharply dominating (85%) in a structure of crust of continents.

During the subsequent the Proterozoic - Paleozoic stage of the Earth's development, lasting 1.5 billion years, local geosynkline-sedimentary basins of the sedimentary rocks were formed, round ancient platforms (as steadiest sites of the consolidated crust). They turned then in folded belts which are broken through by massifs of ultrabasite and granites composition.

The fourth stage of a catastrophism took place in the Mesozoic Cenozoic, later 1.5 billion years after end of the Archean-Lower Proterozoic period of the Earth's crystal base formation. At this time were shown two huge interfaced processes.

On the one hand final geosynkline-folded processes on suburbs of continents took place, in particular on east suburb of Asia and on the western suburb of America – where the huge volcanic belts and linear granodiorite batholits (marked in America by mountain chains of the Cordilleras and the Andes) were created. On the other hand, for the first time in the history of Earth the interfaced grandiose process of lowering of the huge territory of the peridotite crust outside continents representing before the passive land was began. This territory started being split up intensively by numerous breaks, both on the area, and on borders with continents, unevenly to fall with parallel covering of a bottom of the arisen huge depressions with thickness layer basalts and for the first time the arisen water of the modern World Ocean.

Tectonic depressions of the World Ocean are specific expression of a compensation contraction of crust caused by reduction of a liquid external core of the Earth owing to loss from it huge volumes silicon - hydrogen and metal-bearing fluids for long geological history (Orlenok, 2010). Essentially also the place of excitement of external core changed (on opposite to a former place – under continents). Also the composition of nuclear fluids from a liquid core of the planet changed. They became mainly oxygen - hydrogen on composition, capable to cause only melting of the top mantle under a bottom of the World Ocean and formation of basalts and oceanic water.

Thus, evolution of Earth historically was defined by large stages of a catastrophism. At the basis of them there were nuclear explosions in a gas and liquid core of the planet generating the ascending hydrogen fluids of various compositions which cardinally transformed earth crust. Power of nuclear explosions decreased in time and they transformed crust only on suburbs of continents to a final Mesozoic-Cenozoic stage of a catastrophism. In the Cenozoic continents became finally steady land, and the peridotite land surrounding them was deeply lowered and filled with water of the World Ocean.

Continents are specific geological markers in which results and power of the nuclear explosive processes in a gas and liquid core of the planet are impressed. The geological processes in them on power consistently decreasing in time according to the main law of evolution of the Earth's core and planet – the law of decreasing chemical and dynamic pulsation activity of the Earth's core.

FUTURE ISSUES

I believe that many scientists in sphere of sciences about Earth have to pay attention to the real geological and geophysical data obtained for last 50 years and summarized a little in this work. The solution of the problem of determination of numerical values of catastrophic processes in Earth core is also important.

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