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Research Article

The Rise of Diapirs: A Catastrophe Scenario

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ABSTRACT

Current theory explains the kilometers high salt pillars that our found on many sites on Earth as the result of a millions of years lasting gradual process of cold flow of rock salt, which is pushed upward by the overburden of soil covering it. This explanation rests on the theory of David Griggs (1939) that plates of rock under high long-lasting stress behave like a fluid, possess the intrinsic property of viscosity and can be described by the equations of fluid dynamics. Lately, Griggs' theory has been falsified as a chain of mistakes, each of them violating one or more principles of correct academic research. To fill the resulting gap in geological theory, we explain diapirs as produced in short time by salt lava pushed upward in kilometers deep muddy, back and forth moving water. This explanation requires replacing the established uniformitarian scenario for the development of the geological outlook of the Earth by a catastrophe scenario. The catastrophe scenario we present does not only explain how diapirs arise but also the emergence of the main geological characteristics of the Earth, including its waterflow related geological macro-structures. The outcome of the catastrophe scenario is highly concordant with the actual geological and geophysical evidence, in contrast to the uniformitarian scenario.

Keywords: diapirs; uniformitarian scenario; catastrophe scenario; thermodynamics of the Earth; waterflow related structures

INTRODUCTION

Current theory explains the kilometers high salt pillars ('diapirs') that our found on many sites on Earth as the result of a millions of years lasting gradual process of cold flow of rock salt, which is pushed upward by the overburden of soil covering it [1-6]. This explanation rests on the theory of David Griggs (1939) that plates of rock under long-lasting stress behave like a fluid, possess the intrinsic property of viscosity and can be described by the equations of fluid dynamics [7]. Lately, Griggs' theory has been falsified as a chain of mistakes, each of them violating one or more principles of correct academic research [8]. To fill the resulting gap in geological theory, we explain diapirs as produced in short time by salt lava pushed upward in kilometers deep muddy, back and forth moving water. This explanation requires replacing the established uniformitarian scenario for the development of the geological outlook of the Earth by a catastrophe scenario. The catastrophe scenario we present does not only explain how diapirs arise but also the emergence of the main geological and geophysical characteristics of the Earth. We compare both scenarios, in particular their timeframe, their explanation of the existence of sedimentary rocks and fossils, and their explanation of water flow related geological macro-structures on Earth, which can be modeled by water flow related micro-structures. We find that the outcome of the catastrophe scenario closely matches the actual geological and geophysical evidence, in contrast to the uniformitarian scenario. We discuss these results, and indicate directions for further research.

METHODS AND MATERIALS

The Emergence of Salt Pillars by Hot Flow

The smooth shape of the kilometers high salt pillars found on Earth (see for instance Figure 1) suggests they have been produced by flowing salt. This flowing salt, however, cannot have been the result of cold flow in millions of years, because the theory of David Griggs that plates of rocks under long-lasting

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high pressure possess the intrinsic property of viscosity and can be described by the equations of fluid dynamics, has been falsified lately as a chain of mistakes [8]. Therefore the salt pillars must have been produced by hot flow of salt, which becomes possible if its temperature is above 850 °C. In addition, the emergence of salt pillars of kilometers high by salt lava requires the presence of kilometers deep muddy water, in which the salt lava is pushed upward, quickly cools down and solidifies. If the density of the mud is higher than the density of the salt lava, the typical mushroom-like shapes following from the Rayleigh-Taylor instability [9]. Are likely to occur. Computer simulations of flowing salt into an environment with a higher density closely reproduce these typical shapes [10].

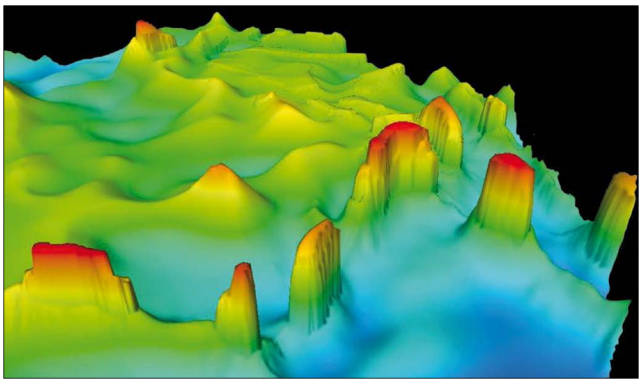

Figure 1: Three kilometer high salt pillars below North Netherlands.

Source: S. Heerema, Grondboor en Hamer, 4, 2015

A principle assumption of the established uniformitarian scenario for the development of the geological outlook of the Earth is that during its life time the geological processes on Earth have not changed considerably. As a consequence, every geological characteristic of the Earth can be explained by today's geological processes. Local submersions caused by storms or tsunami's in combination with outbursts of salt lava, however, cannot provide the circumstances in which pushed up salt lava produces salt pillars up to 10 km high. Therefore, the uniformitarian scenario cannot explain the presence of salt pillars on Earth. To explain their presence, replacement of the uniformitarian scenario by a non-uniformitarian scenario is required. The non-uniformitarian catastrophe scenario specified below not only explains the rise of diapirs, but also the development in a sequence of stages of the main geological and geophysical characteristics of the Earth.

A Catastrophe Scenario

Stage 1

The Earth starts its existence as a sphere of iron and nickel covered by liquid stone, shoveled from the surface of a mature star. The radius of the iron and nickel kernel measures more than half the radius of the entire Earth. The inner half of the kernel is solid, the outer half fluid. Cooling down in the vacuum of the universe at a temperature of about 3 °K, the mantle of liquid stone releases water vapor, as can be observed when liquid stone ejected by volcanoes cools down. The water vapor condensates in contact with the cold universe and forms a thin layer of water covering the surface of the Earth. If the present amount of water on Earth [11]. Would be spread uniformly over a sphere with the same radius R=6370 km as the Earth, the layer of water would be about 3 km thick (= 0.0004 R). Underneath the thin layer of water, the liquid stone transforms into a thin crust.

Stage 2

The Earth enters the gravity field of the Sun and life emerges in its light. The flows of liquid stone below the crust push a part of it above the layer of water. The up risen part now cools down faster than the crust beneath the water, and its size grows, resulting in a small island. In direct contact with the cold universe, the island cools down further and keeps growing at its boundary with the surrounding water, resulting in a big, largely flat, and island: Pangea [12,13].

Stage 3

The Sun captures the Earth in orbit. Life evolves, protected against high energetic radiation from the universe by the magnetic field produced by the Coriolis convection patterns in the upper half of the iron and nickel kernel of the Earth; in addition, the heavy kernel ensures stability of the axis of the Earth, and as a consequence in the alternation of day and night. The climate at Pangea is humid, warm and stable, allowing abundant flora and fauna. In the ocean surrounding Pangea, life is abundant as well, and thick layers of shells arise at its bottom.

Stage 4

Pangea keeps growing, in surface size as well as in thickness, resulting in an ever heavier bulge at the periphery of the spinning Earth. Increasing centrifugal forces pull Pangea into the direction of space. Cracks emerge at the boundary between Pangea and the oceanic crust and across Pangea from north to south, allowing the viscous and fluid stone underneath to reach the surface in volcanic eruptions of increasing frequency and magnitude. Gradually, the cracks multiply and deepen, and finally a cascade of interacting catastrophic events occurs:

(a) The reservoirs of water, water vapor, carbon dioxide and salt lava underneath the crust burst out from their containment. Large pieces of crust are blown away; some circular pieces flip half way, as indicated by different gravity and magnetism at both halves [14]. The volcanic outbursts disturb the atmosphere, its temperature drops, and the water vapor in the atmosphere condensates and begin to fall down, while water from reservoirs underneath the crust is pushed upward to the surface. Ultimately the entire surface of the Earth is covered by water again.

(b) Mega storms and earth quakes drive the water back and forth over the Earth, washing away soil from the land and sweeping marine sediments together. The muddy water flowing back and forth creates multi-layer macro-structures of sediments as shown in Figure 2a, which are comparable with the multi-layer micro-structures of sand that may arise at the bottom of sandy water where every forth and back moving wave of water adds a new thin layer of sand on top of the yet present layers, as shown in Figure 2b. Plants and animals are buried suddenly and air-tight

in the multi-layer sediments, preventing their decay by micro-organisms.

Figure 2a: Multi-layer sediments, Costa Verde, Portugal.

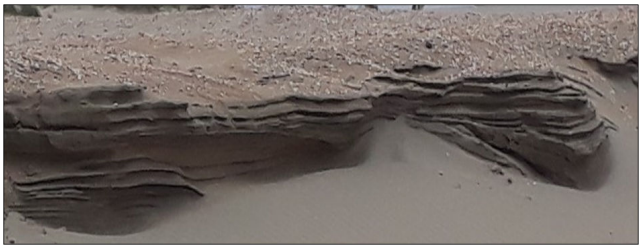

Figure 2b: Multi-layer micro-structure of sand formed by back and forth moving sandy water, after sand suppletion in front of the coast of Ter Heijde, the Netherlands, 2011.

(c) The crack from north to south across Pangea deepens and Pangea breaks into two halves. A massive flow of liquid stone bursts through the gap between both halves, pushes them aside and makes each of them slide away over its adjacent oceanic plate, which submerges into the viscous and fluid stone underneath and dives down toward the kernel of the Earth. The separation of both plates proceeds in short time as indicated by the multiple, dense, non-eroded shrink traces with identical width at their begin and endpoint, in the newly formed oceanic crust (Figure 3). While sliding away over the adjacent oceanic plate, the outer edge of each of the two plates of land is pushed upward and crumples, while the multi-layer sediments on it are folded as a tablecloth. The two halves of Pangea break into more pieces, as well as the oceanic crust, and collide in similar processes of subduction, upheaval and crumpling of plates, and folding of multi-layer sediments.

Figure 3: Multiple, dense, non-eroded shrinkage cracks of equal width, in newly formed oceanic crust. Source: R. de Meijer, et al. Hoe werkt de aarde? (How does the Earth work?), 2009, p 40

(d) Salt lava is pushed upward in kilometers deep muddy, back and forth moving water cools down quickly and solidifies into pillars of salt. In troughs, where an oceanic plate dives down sediments are captured in large quantities, the pillars can reach a height up to 10 kilometers.

(e) After short time, the weight of the water makes the thin oceanic crust sink into the viscous and fluid mantle below, in contrast to the plates of land, which keep floating on the mantle. As a consequence the water starts to flow away from the formed mountains and subsequently from the lower land into the deepening ocean, and produces broad, winding tracks with steep walls, as shown in Figure 4a, which are comparable with the micro-structures that occur when water flows away from the sand banks in front of a beach, in broad, steep walled, winding tracks, as shown in Figure 4b.

Figure 4a: Grand Canyon, California, USA

Figure 4b: Water flowing away from sandbank at ebb, Ter Heijde, The Netherlands, 2013

At the border between land and water, the water produces vertical structures, as shown in Figure 5a, which are comparable with structures that are formed on a sandy beach after a sudden decrease of the water level, as shown in Figure 5b.

Figure 5a: Chalk cliffs, Normandy, France

Figure 5b: Micro-structure shaped by water after a rapid increase of the distance between and land and water, by sand suppletion, Ter Heijde, The Netherlands, 2012

(f) Storms and streams sweep the floating remains of the abundant vegetation of Pangea together in large packages against the coasts of the plates of land, where they are covered by the sediments washed down from the land into the ocean. Some of the packages of vegetation break into pieces by storms and streams and are scattered into flow directed structures as shown in Figure 6a, which are comparable with micro-structures produced by wind and water flows breaking a plate of sea-foam into pieces, as shown in Figure 6b. The scattered packages are finally covered by sediments.

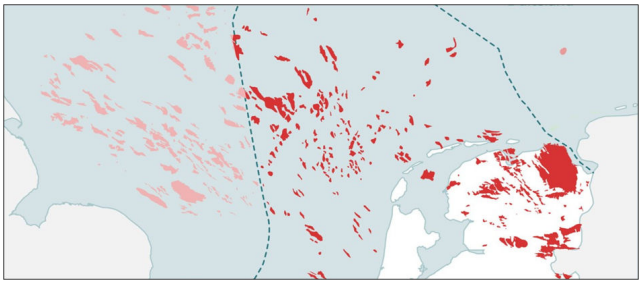

Figure 6a: Macro-structure of gas fields in the North Sea.

Figure 6b: Micro-structure of by wind and water flows scattered sea-foam.

(g) The water flowing away from the plates of land leaves behind large boulders and ridges of pebble stones, gravel and sand. The water also leaves macro-structures behind in the sedimentary surface of the dried up land, as shown in Figure 7a, which are comparable with the structures back and forth moving water leaves on dried up sandbanks during ebb, as shown in Figure 7b. Seeds germinate and vegetation starts to cover the Earth again. After some time, the sediments solidify under their own weight into rocks.

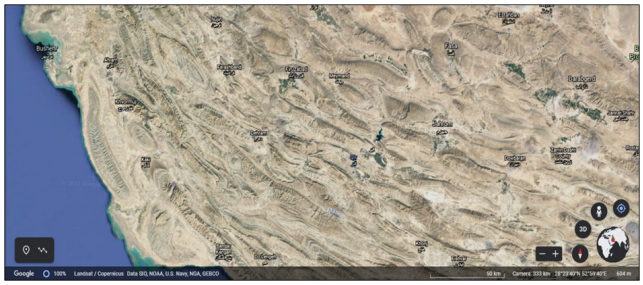

Figure 7a: Macro-structures of the Earth's surface, Derham, Iran. Google Earth, from 333 km height

Figure 7b: Micro-structure shaped by back and forth moving water at the surface of a sand bank. Ter Heijde, the Netherlands, 2021

Stage 5

Although the cascade of interacting catastrophic events has come to an end, the plates of the Earth's crust frequently move up, down, or horizontally, causing earthquakes and tsunami's that submerge parts of the plates of land again. Volcanic outbursts toss away water vapor into the vacuum of the universe, and clouds of volcanic ashes shield the Sun. The temperature on Earth decreases and on its poles a large icecap grows. The sea level decreases. Animal life conquers the land from the water again, building on the gene pool of marine mammals by punctuated equilibrium processes of evolution [15]. Which are speeded up by the increased mutation rate caused by the disturbance of the magnetic field of the Earth during the catastrophic events in stage 4.

Stage 6

A new equilibrium of the plates of land and the oceanic plates is reached and movements of no more than a few centimeters per year occur. The atmosphere stabilizes, the overall temperature rises, the icecaps on the poles largely melt, the level of the ocean rises, and todays geological outlook of the Earth is reached.

RESULTS

Comparison of the Uniformitarian and the Catastrophe Scenario

Time frame

According to the uniformitarian scenario, the same geological processes as can be observed today have shaped the outlook of the Earth step by step, over billions of years, into its current form. Radiometric dating techniques put the Earth's age at 4.54 billion years [16]. The catastrophe scenario, in contrast, is independent of the Earth's age, which might be in the order of

billions of years, derived from radiometric calculations, or in the order of millions of years, derived from thermodynamic calculations [17].

As to radiometric dating techniques, it must be noted, that every calculation of the age of a sample of rock not only depends on the amount of 'parent isotopes' and radiogenic 'daughter isotopes' found in the sample, but also on the assumptions made on the amount of parent and daughter isotopes in the sample at the moment of its origin, and the amount of parent and daughter isotopes that has left or invaded the sample since. If a sample contains multiple pairs of parent and daughter isotopes, additional assumptions must be made on when they came together in the sample, and what the initial conditions were at the time when each pair originated, since rocks that have been formed recently, may be built of components that have been formed long ago.

As to the thermodynamics of the Earth, it must be noted that they are unclear. In physical reality, a temperature difference between an object and its surrounding equalizes rapidly, because the flux of the radiated energy is proportional to the fourth power of the temperature difference, as predicted by Boltzman's Law. Therefore, the observation that the Earth is a largely fluid sphere of iron and nickel wrapped in liquid and viscous stone covered by a thin crust and positioned in the vacuum of the universe at 3 °K, does not suggest it is cooling down already for billions of years. In addition, the Earth not only loses energy (a) by radiation, but also (b) by the forth and back moving tides in the oceans, caused by the Moon; (c) by collisions of the plates of the Earth's crust; (d) by maintaining the magnetic field of the Earth; and (e) by the friction between the flows of liquid stone in the mantle of the Earth. A model for the impact of these frictions is provided by an unboiled egg. After making it spin around, an unboiled egg will stop spinning within about 2 seconds, while a boiled egg (where no internal friction of fluid and viscous material can occur) will keep spinning for more than 5 seconds. To compensate the heat loss by radiation and the dissipation factors (a) - (e), the uniformitarian scenario assumes the existence of georeactors at the boundary between the kernel and the mantle of the Earth [18]. which have maintained the temperature of the Earth for billions of years at its current level by a steady supply of uranium, thorium and potassium and a steady discharge of rest products. Recent assessment of the possibility of georeactors concludes that their existence today is highly unlikely [19].

Sedimentary rocks and fossils

The Earth is largely covered by multi-layer sedimentary rock, in which fossils are found.

The uniformitarian scenario explains the presence of multi-layer sedimentary rocks by local submersions, and the fossils found in its layers as the result of plants or animals sinking toward the bottom of rivers, lakes and seas, where they were slowly covered by mud. This explanation, however, is invalid because in normal circumstances any plant or animal that is slowly covered by mud is digested by micro-organisms within weeks or months and disappears.

The catastrophe scenario explains the presence of these multi-layer sedimentary rocks by a cascade of interrelated catastrophic events, and the fossils found in its layers as the result of sudden airtight sealing of plants and animals by heavy layers of sediments, preventing their normal decay by micro-organisms, ultimately resulting in fossilization.

Water flow related geological macro-structures

In the uniformitarian scenario, waterflow related geological macro-structures play no role. The catastrophe scenario, in contrast, distinguishes five types of such structures. Each of them is comparable with a waterflow related micro-structure, which can be used as a model for the corresponding macro-structure.

Type 1: In stage 4b of the catastrophe scenario, muddy water flowing back and forth creates macro-structures of sediments as shown in Figure 2a. These multi-layer macro-structures are comparable with the multi-layer micro-structure of sand shown in Figure 2b, found at Ter Heijde, the Netherlands. The micro-structure was produced by forth and back moving waves of sandy water, adding continuously new thin layers of sand on top of the yet present layers. The sandy water was caused by an innovative coastal maintenance project, called The Sand Motor, resulting in a large artificial sandbank in the shape of a peninsula off the coast of Ter Heijde, where ocean currents, wind and waves were given free rein to spread the sand along the coast [20]. The waterflow related multi-layer micro-structure found at Ter Heijde and its production process by forth and back moving waves of sandy water, can be used as a model for the production of multi-layer sedimentary rock in stage 4b of the catastrophe scenario.

Type 2: In stage 4e of the catastrophe scenario, water flows away from the formed mountains to the lower land and subsequently into the deepening ocean, producing broad, winding tracks with steep walls as shown in Figure 4a. Steep walled, broad winding tracks are widespread on Earth, both in mountains and lower lands. Usually a relatively small river occupies a tiny part of the broad track, transporting the present small amounts of water to the sea. These macro-structures are comparable with the micro-structures produced by water flowing away from a sandbank in front of a beach, as shown in Figure 4b. Water flow related winding, steep walled micro-structures can be used as a model for the broad track, winding, steep walled macro-structures produced by water flowing away in stage 4e of the catastrophe scenario.

Type 3: In stage 4e, the descended water produces vertical structures at the border between land and water as shown in Figure 5a. These macro-structures are widespread on Earth and comparable with the micro-structures that are formed on a sandy beach after a sudden decrease of the water level (or increase of the land level) as shown in Figure 5b, produced after sand suppletion in Ter Heijde. This water flow related vertical micro-structure can be used as a model for the macro-structures produced at the edge between land and water after a rapid decrease of the water level in stage 4e of the catastrophe scenario.

Type 4: In stage 4f, storms and streams sweep the floating remains of the abundant vegetation of Pangea together in large

packages at the coasts of the plates of land, where they are covered by the sediments flowing away from the land into the ocean, and ultimately transform into coal, oil or gas. Some packages of vegetation are scattered by storms and streams into flow directed macro-structures as shown in Figure 6a. These macro-structures are comparable with micro-structures produced by wind and water flows breaking up a plate of sea-foam, as shown in Figure 6b. The water flow directed micro-structures can be used as a model for the macro-structures of scattered packages of floating vegetation, covered by sediments in stage 4f of the catastrophe scenario, and ultimately transformed into coal, oil or gas.

Type 5: In stage 4g, the water leaves macro-structures in the sedimentary surface of the dried up land, as shown in Figure 7a. Such macro-structures are widespread and can be observed and investigated with the aid of Google Earth. They are comparable with the micro-structures on dried up sandbanks during ebb shaped by back and forth moving water flows driven by the tides, as shown in Figure 7b. These micro-structures can be used as a model for the macro-structures left by water on the dried up land in stage 4g of the catastrophe scenario.

DISCUSSION

The current uniformitarian scenario does not provide a valid explanation for the presence of the kilometers high salt pillars found on many sites on Earth. Therefore, we developed an alternative scenario, which explains salt pillars as produced by salt lava pushed up in muddy water, during a cascade of interacting catastrophic events. When comparing the uniformitarian and the catastrophe scenario, we found that the explanation of the uniformitarian scenario for the existence of fossils is invalid as well, since fossils cannot be formed in today's circumstances where micro-organisms digest the remains of plants and animals in short time. The catastrophe scenario, in contrast, not only explains how diapirs arise and fossils are formed by sudden airtight covering preventing their decay by micro-organisms, but also explains the emergence of the main geological and geophysical characteristics of the Earth, including 5 types of water flow related geological macro-structures, which are overlooked by the uniformitarian scenario. The outcome of the catastrophe scenario thus is highly concordant with the actual empirical evidence, in contrast to the uniformitarian scenario. According to the principles of (empirical) science [21]. The replacement of the uniformitarian scenario by the catastrophe scenario must to be considered.

When considering the replacement of the uniformitarian scenario by the catastrophe scenario, it cannot be ignored that the uniformitarian scenario is closely related to evolutionary theory, since layers of sediments are usually dated by the fossils in it, and fossils are usually dated by the type of sediment in which they are found. This close relationship does not stimulate a critical assessment of the empirical evidence that grounds the uniformitarian scenario or to develop a non-uniformitarian explanation of the geological and geophysical outlook of the Earth, including its waterflow related macro-structures.

A first direction for further research therefore, is a philosophy of science study whether geology and geophysics are servants of (evolutionary) biology, or can independently and critically judge the empirical evidence for an uniformitarian, respectively a catastrophe scenario, directed by the principles of (empirical) science.

A second direction for further research, is the thermodynamic behavior of the Earth over (deep) time, which is still unclear and needs further investigation, in particular the determination or estimation of: (a) the thermal conductivity and the specific heat of the inner and outer kernel and the mantle of the Earth; (b) the emissivity of the Earth on land and at sea; the heat loss of the Earth by (c1) radiation; (c2) by the forth and back moving tides in the oceans, caused by the Moon; (c3) by the collisions of the plates of the Earth's crust; (c4) by maintaining the magnetic field of the Earth; (c5) by the friction between the flows of fluid and viscous matter inside the spinning Earth; (d) the continual heat production by transformation of mass (U, Th, K) into energy in assumed georeactors; and (e) the sum of heat loss and heat production over time related to the measured total heat loss of 47 ± 2 TW today.

A third interesting direction for further research is the identification of waterflow related macro-structures on Earth and their modeling by waterflow related micro-structures. We have distinguished 5 different types yet, which need further investigation.

CONCLUSIONS

The theory of David Griggs (1939), which grounds current theory that the pillars of salt found on many sites on Earth are produced in millions of years by cold flow, has lately been falsified as a chain of mistakes, each of them violating one or more principles of correct academic research. To fill the resulting gap in geological theory, we explain diapirs as produced in short time by salt lava pushed upward in kilometers deep muddy, back and forth moving water. This explanation requires replacing the established uniformitarian scenario for the development of the geological outlook of the Earth by a catastrophe scenario. The presented catastrophe scenario does not only explain how diapirs arise but also the emergence of the main geological characteristics of the Earth, including its water flow related geological macro-structures. The outcome of the catastrophe scenario is highly concordant with the actual geological and geophysical evidence, in contrast to the uniformitarian scenario. The replacement of the uniformitarian scenario by the catastrophe scenario therefore needs consideration. Further research is required.

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