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FALSIFICATION OF THE EULERIAN MOTIONS OF LITHOSPHERIC PLATES

EXTENDED ABSTRACT

Wrocław, September 2016

This is a reprint of an article that was originally published in the volume of extended abstracts of the 3rd Polish Geological Congress Wrocław, Poland, 14–18 September 2016

A full text of the article will be published in a congressional volume of The Polish Geological Institute Bulletin (Biuletyn Państwowego Instytutu Geologicznego)

WYZWANIA POLSKIEJ GEOLOGII

3. POLSKI KONGRES GEOLOGICZNY

Tom kongresowy

Redakcja naukowa: **Jurand Wojewoda**

POLSKIE TOWARZYSTWO GEOLOGICZNE
SOCIETAS GEOLOGORUM POLONIAE
1921

WYZWANIA POLSKIEJ GEOLOGII, s. 175–179, 2016
3. Polski Kongres Geologiczny

FALSIFICATION OF THE EULERIAN MOTIONS OF LITHOSPHERIC PLATES

Falsyfikacja eulerowskiego ruchu płyt litosfery

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Słowa kluczowe: Ruchy Eulera, połączenie potrójne, sztuczne rozwarcia, ekspansja Ziemi
Key words: Eulerian motions, triple junction, gaping gores, Earth's expansion

SUPPOSED EULERIAN MOTIONS OF LITHOSPHERIC PLATES

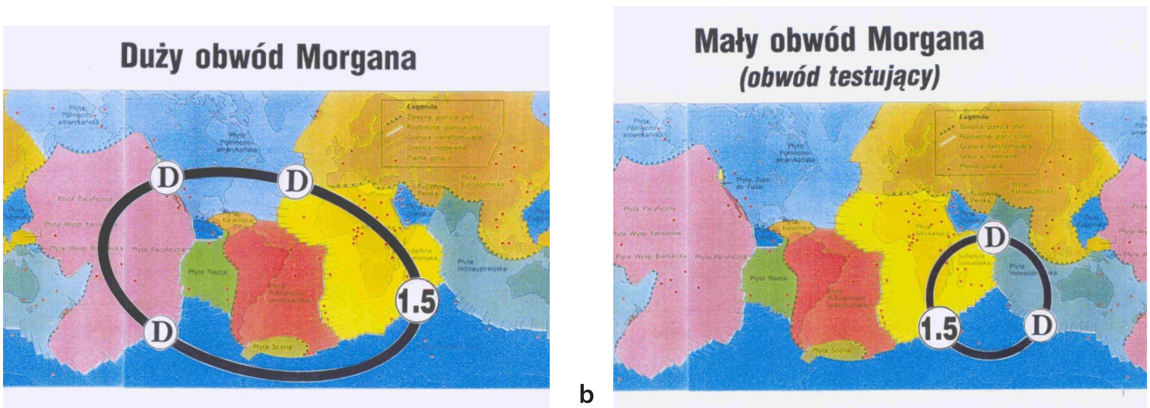
According to Euler's theorem any relative movement of two elements on a sphere is equivalent to a rotation around an axis (an Euler axis) crossing the centre of the sphere. The points where the axis crosses the sphere are called poles of rotation. The theorem was applied to describe relative motion of two plates of lithosphere by Bullard *et al.* (1965) then to describe relative motion of many plates by McKenzie and Parker (1967), Morgan (1968) and Le Pichon (1968). In this way the basic and specific element of the plate tectonics paradigm was constituted. In this paradigm the Euler axis was extended to Euler vector which describes a relative angular speed of a pair of plates, deduced from the spreading rate between them. Such vectors obey the rules of vector calculus and in this way the relative motion of two plates can be find indirectly without known spreading rate between them and even without any oceanic ridge between them or even a common boundary. The motion of plates in the frame of plate tectonics can be called "the Eulerian motion" and differs basically from the motions on an expanding Earth which were mathematically specified by Koziar (1994; www.wrocgeolab.pl/plates). Morgan (1968) tried to test the validity of the Eulerian motions of lithospheric plates and was allegedly successful. I will demonstrate in this extended abstract and in the full paper on the topic (already prepared for publication) that he failed.

MORGAN'S TEST OF THE EULERIAN MOTIONS OF PLATES

Morgan (1968) presented his test of the Eulerian motions of the plates in a section entitled: *„The motion of the Antarctica block relative to the African block"*. He was able to determine Euler vectors for three pair of plates: 1. Antarctic and Pacific, 2. Pacific and North American, 3. North American and African.

It was difficult to determine spreading rate for the African and Antarctic plates and Morgan calculated it by summing up the vectors mentioned above along a circuit which can be called "Morgan's great circuit" (fig. 1a). He obtained the value of 1.5 cm/year.

Then he tried to confirm this result by an independent calculation along another circuit, around the Indian Ocean triple junction, which can be called "Morgan's small circuit" or "Morgan's test circuit" (fig. 5b). The result was apparently (see text below) also 1.5 cm/year which was treated as a proof of the Eulerian motion of the plates on a non-expanding Earth. However, a proof of such great significance should be based on at least a few similar confirmations to reduce the possibility that it is merely accidental. Such doubts are the more justified because



a b

Fig. 1. Structure of Morgan's test, a) Morgan's great circuit, b) Morgan's small circuit, D – data (measured spreading rate), 1.5 – calculated spreading rate (cm/year) – detailed explanation in text

Ryc. 1. Struktura testu Morgana, a) duży obwód Morgana, b) mały obwód Morgana, D – dane (zmierzone tempo spreadingu), 1.5 – obliczone tempo spreadingu (cm/rok) – szczegółowe objaśnienia w tekście the second Morgan calculation was not made in a precise way using Euler vectors but merely by appealing to what is "more or less" true (!) as can be seen below:

The mid-Indian Ocean rise between Antarctica and Australia is opening north to south at a rate of about 3.0 cm/yr (Le Pichon, 1968), and the Carlsberg ridge is opening ***more or less*** [bold by J.K.] *north to south at a rate of about 1.5 cm/yr. The difference between these rates agrees with the value of 1.5 cm/yr listed in Table 8–5.* (Morgan, 1968; p. 1982).

The „*value of 1.5 cm/yr listed in Table 8-5*" is the value seen in figure1a.

SOUTH-WEST GAPING GORE IN THE INDIAN OCEAN TRIPLE JUNCTION FALSIFIES APPARENT POSITIVE RESULT OF MORGAN'S TEST

The falsification was carried out by the author of the present paper on a physical model comprising a geographical globe with geological structure of the Indian Ocean superposed, and transparent plastic spherical caps imitating tectonic plates.

The map used for this purpose was the Structural Map of the Indian Ocean by Ségoufin *et al.* (2004). The map was digitally segmented into longitudinal strips and the strips then digitally transformed into globe's wedges (peels). The wedges were then printed on self-adhesive paper and pasted onto the geographical globe (fig. 2a).

Next, three plates (the African, Antarctic and Indo-Australian) were cut from transparent plastic caps. The cutting was along the 20 Ma isochrones (turn of the Paleogene/Neogene) that define their common boundary in the Indian Ocean as it was at the time. These old boundaries were colored in black. Then, the plates were put on the globe in their present positions (fig. 2b).

After that the African and Antarctic plates were pushed into position against the Indo-Australian one, along the transform faults (fig. 2c) in order to restore the relative position of all three plates before 20 Ma.

All the plates should find themselves close together. However, between the African and Antarctic plates a significant gaping gore appears. It means that at opposite (real) movement of both plates their edges should not be divergent as they are in fact, but convergent. It means that something is wrong with allegedly positive result of Morgan's test.

CAREY'S "GAPING GORES" AS ONE OF THE PROOFS OF THE EXPANSION OF THE EARTH

The term "gaping gore", as used here, follows Carey (1958, 1976) and denotes artificial wedge-shaped gaps, which appear on reconstructions which neglect the greater curvature of the Earth's surface in the past (smaller radius of the ancient Earth). In fact this problem is what

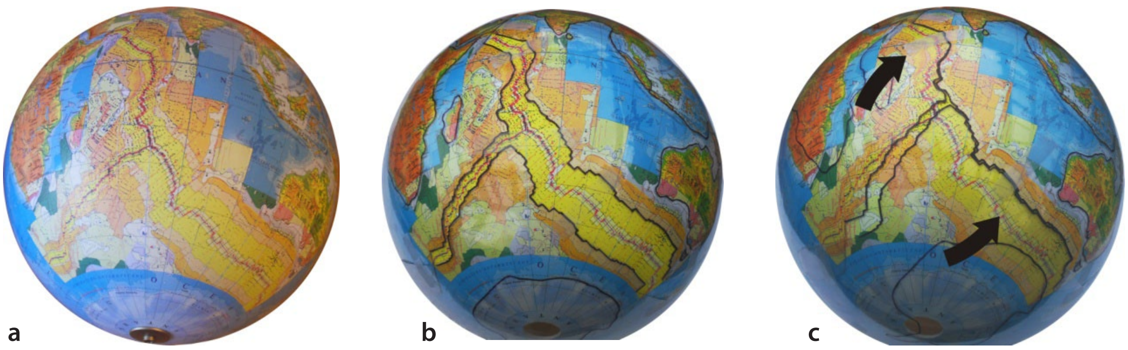


Fig. 2. Presentation of appearing of an artificial gaping gore between the African and Antarctic plates on a non-expanding Earth (explanation in text)

Ryc. 2. *Pojawianie się sztucznego rozwarcia pomiędzy płytą afrykańską i antarktyczną na Ziemi nieekspandującej (objaśnienia w tekście)*

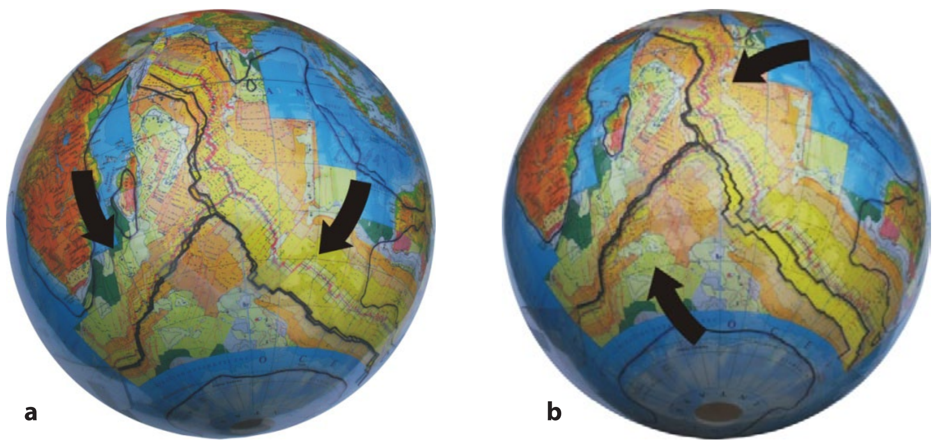


Fig. 3. Northwest Indian Ocean gaping gore (a), and Southeast Indian Ocean gaping gore (b)

Ryc. 3. *Sztuczne rozwarcie NW Oceanu Indyjskiego (a), oraz sztuczne rozwarcie SE Oceanu Indyjskiego (b)* led Carey, after strenuous attempts at better assembling Wegener's Pangaea on a non-expanding Earth, to understanding the expansion of the Earth. The appearance of gaping gores on reconstructions is one of the proofs of the Earth's expansion.

The gap between the African and Antarctic plates in figure 2c is just one example of a gaping gore *sensu* Carey. It can be called "Southwest Indian Ocean gaping gore". It is an artefact which disappears on a smaller Earth. Similarly, pushing the -20 Ma Indo-Australian and African plates close to the Antarctic one produces an analogous gaping gore between them in the Northwest (fig. 3a). It can be called "Northwest Indian Ocean gaping gore".

In the same way, pushing the -20 Ma Indo-Australian and Antarctic plates against the African one produces a subsequent gaping gore between them in the Southeast (Fig. 3b). It can be called "Southeast Indian Ocean gaping gore". All three gaping gores disappear on a smaller Earth.

REAL GEODYNAMICS IN THE INDIAN OCEAN AND ANOTHER TRIPLE JUNCTIONS

The oceanic ridges in the Indian Ocean form the greatest triple junction structure on our globe, and this structure signifies divergent movement of three plates which together cover almost a hemisphere (fig. 4a). Kinetic and dynamic explanation of such a structure is very simple on an expanding Earth, as can be demonstrated on a physical model (fig. 4 b, c,); see for details (Koziar, 1980; www.wrocgeolab.pl/floor) and geometrical model (Koziar, 1994; www.wrocgeolab.pl/plates).

CAREY'S ARCTIC PARADOX AS ANOTHER PROOF OF THE EXPANSION OF THE EARTH

Carey (1976) noticed that all plates except for the Antarctic move northward. Carey checked this motion in the northern hemisphere by northward shifting of paleoclimatic zones and paleomagnetic latitudes. On an Earth of constant dimensions such a northward motion of the plates should result in convergence in the Arctic zone. However the dominating structure in this region is the Arctic Ocean which is of divergent origin. This structure attests to a general southward motion of plates beyond the Arctic area. The two opposite movements are precisely what create the Arctic Paradox (but only on a constant size Earth). The only solution of this paradox is the expanding Earth. Carey demonstrated the solution on his model of a schematic opening flower bud. Below it is demonstrated also on a flower bud model but based on real geography of lithospheric plates (fig. 5); see also Koziar (2011; www.wrocgeolab.pl/geodesy1).

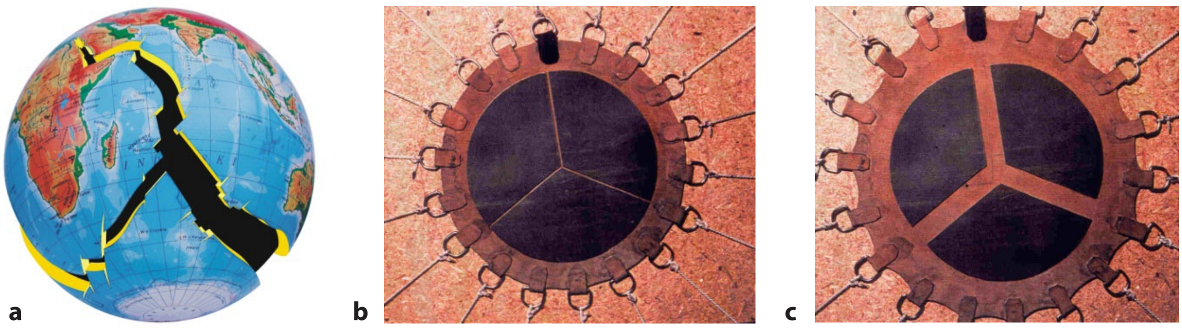


Fig. 4. Indian Ocean triple junction with removed post-Paleogene lithosphere (a), and evolution of the triple junction on the expanding Earth demonstrated on a physical model of stretched rubber disc (b) and (c)

Ryc. 4. *Połączenie potrójne Oceanu Indyjskiego z usuniętą post-paleogeńską litosferą (a), oraz rozwój tego połączenie potrójnego na ekspandującej Ziemi, demonstrowany na fizycznym modelu z rozciąganym gumowym krążkiem (b) i c)*

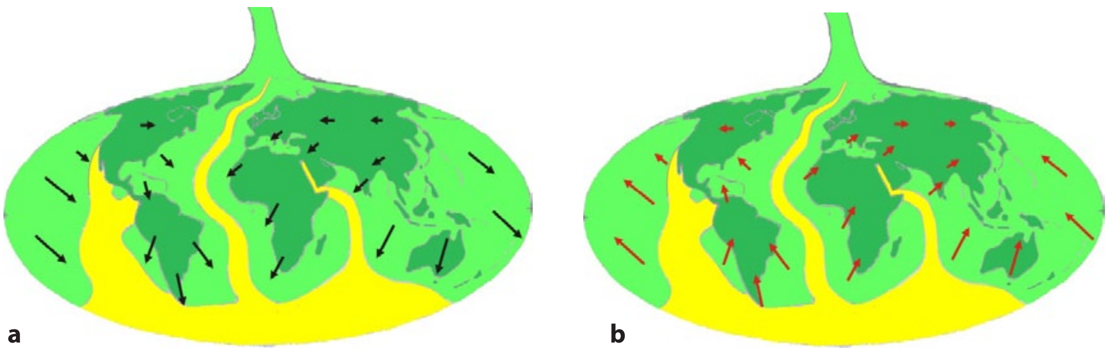


Fig. 5. In this flower bud model of the Arctic Paradox all of the young post-Paleogene lithosphere together with the whole Antarctic plate is removed; all northern plates form one huge megaplate, a) motion of the expanding mantle relative to the megaplate, b) apparent motion of parts of the megaplate relative to the expanding mantle

Ryc. 5. *Model paradoksu arktycznego w formie pączka kwiatu, z usuniętą post-paleogeńską litosferą wraz z płytą antarktyczną i z jedną megapłytą północną, a) ruch ekspandującego płaszcza względem megapłyty, b) pozorny ruch megapłyty względem ekspandującego płaszcza*

The black arrows (fig. 5a) are explicitly determined only by expansion of the basement and geometry (geography) of tears (rifts) in the lithosphere. The movement of the lithosphere relative to the expanding basement is precisely opposite and presented by red arrows in figure 5b. These arrows must be treated on a non-expanding Earth as real ones, which is this what produces the Arctic Paradox. All convergences and compressions suggested by arrows in Fig. 5b are only apparent. On a non-expanding (Eulerian) Earth they are treated as a real processes.

GLOBAL APPARENT EULERIAN MOTION OF PLATES CONFIRMS CAREY'S ARCTIC PARADOX

Plate tectonics has a permanent problem with specifying motions in the Earth's mantle and thus with the driving mechanism of plates and their absolute reference frame. At last it elaborated such a frame based on a Tisserand condition. Briefly, in this frame the weighted sum of Eulerian vectors of all plates is zero. It is labeled NNR (No-Net- Rotation). Global maps of Eulerian motion in this absolute reference frame, based on spreading rates, is as shown on figure 6a.

Space geodesy follows plate tectonics and treats the Eulerian motions of lithospheic plates as a tenet of faith. Thus the global map of plate motion obtained in the framework of this discipline (Fig. 6b) is almost the same as the former one. Both show general northward motion of plates (apart from the Antarctic one) with very weak and problematic reverse compensating motion. Thus both plans present a kinetic impossibility. However both confirm Carey's Arctic Paradox (compare with Fig. 5b) and thus they are independent proof of the expansion of the Earth. For other proofs see Koziar (2004 and 2006; www.wrocgeolab.pl/handbook).

AN ATTEMPT OF REJECTION OF EXPANDING EARTH BY SPACE GEODESY, USING EULERIAN CALCULATIONS – A CIRCULAR ARGUMENT

The contact of space geodesists with geotectonics comes down to plate tectonics Eulerian motions. In this way the motions come to be treated as if they are a fundamental law of physics for them, independent of any theory of evolution of the Earth. On the basis of such understanding, an attempt was made by Wu *et al.* (2011) to test expanding Earth by space geodesy data but using Eulerian machinery. In effect, what they tested was whether the plate tectonics model (not the real Earth) can expand and to what degree. The result was that the rate of the radius change of the Euler sphere should be less than 0.2 mm/year. This is a spectacular example of circular argument. Testing of the expansion of the Earth cannot be based on the assumption that the Eulerian motions of plates *(i.e.* plate tectonics) are true.

In fact the rate of the radius change of the real Earth is two orders higher and comes to 2.0 to 2.5 cm/year. The value results from both geological and geodesic data (Koziar, 2011; www.wrocgeolab.pl/geodesy1).

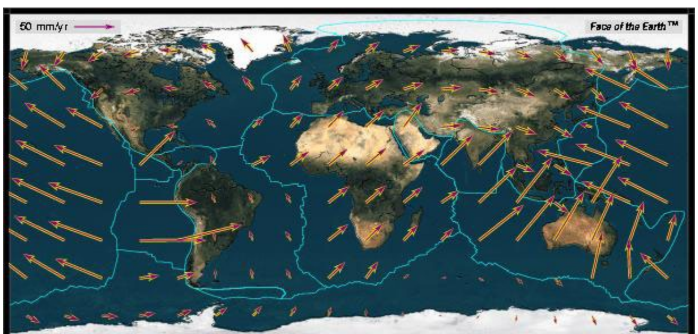
INTERPLATE CAREY'S SPHENOCHASMS INSTEAD OF EULERIAN OPENINGS

One can wonder, why the divergent movements of plates on an expanding Earth can be quite precisely described by Eulerian theorem while their nature is different? The answer is: because the ripping of the envelope of an expanding spherical object (fig. 7a, b) is similar to the Eulerian model of rifting.

Long before plate tectonics appeared, Carey (1958) introduced to geotectonics a new class of structures which he called "sphenochasms". According to his definition (p.193) the sphenochasm is: *"the triangular gap of oceanic crust separating two cratonic blocks with fault margins converging to a point, and interpreted as having originated by the rotation of one of the blocks with respect to the other".*

The sphenochasms can be of very different scale and it is not necessary they be filled with oceanic crust. They can be also filled with sedimentary basin formations (exogenic filling) or by magmatic continental or oceanic formations (endogenic filling).

A sphenochasm consists of a V-shaped gap, arms and a vertex (fig. 8). The bigger sphenochasms are those between lithospheric plates and their vertices are erroneously equated with Euler poles. Interplate sphenochasms are governed by expansion of the Earth interior not by Eulerian plate motions on a constant-size Earth.



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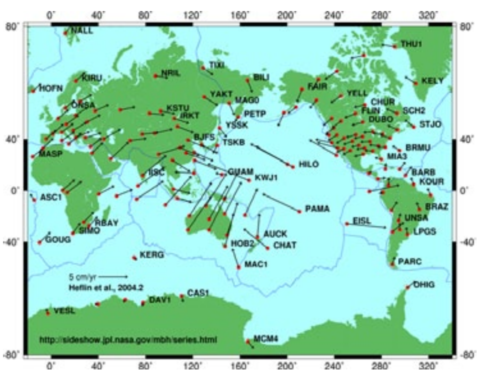
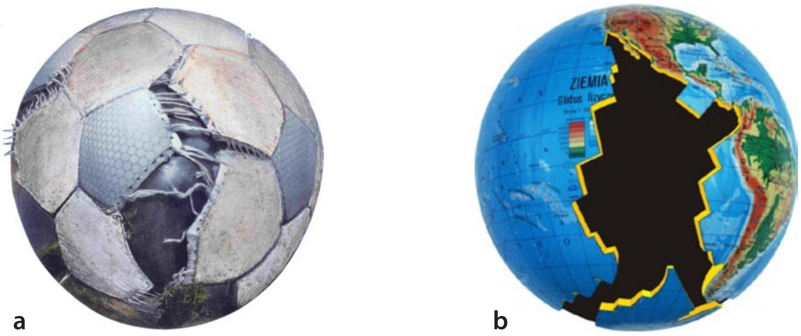


b

Fig. 6. Global plate motions in NNR absolute reference frame, a) based on geological data (spreading rates; DeMets et al. 1994 – Internet version) and b) on space geodesy data (Altamini et al. 2007 – Internet version)

Ryc. 6. *Globalny ruch płyt w absolutnym układzie odniesienia NNR, a) oparty na danych geologicznych (tempa spreadingu; DeMets i in. 1994 –wersja internetowa) i b) na danych geodezji kosmicznej (Altamini i inni, 2007 – wersja internetowa)*



a b

Fig. 7. Shabby soccer ball model of rifting on the expanding Earth (a), and Pacific with removed post Paleogene lithosphere (b)
Ryc. 7. *Model "bulącej" piłki przedstawiający ryftogenezę na ekspandującej Ziemi (a), oraz Pacyfik z usuniętą post-paleogeńską litosferą (b)*

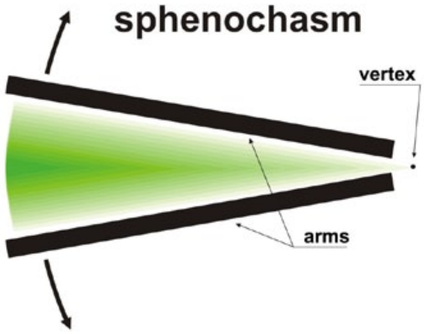


Fig. 8. Carey's sphenochasm (explanation in text)
Ryc. 8. *Sfenochazm Careya (objaśnienie w tekście)*

CONCLUSIONS

Geology and subsequently space geodesy were trapped, almost a half century ago, in a plate tectonic paradigm based on supposed Eulerian motion of lithospheric plates. In this paper the Eulerian motion of tectonic plates has been falsified. The right alternative for the wrong plate tectonics paradigm is the expanding Earth. However this time the expanding Earth is no paradigm but a real phenomenon.

I thank Steven Athearn for English correction of this text.

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