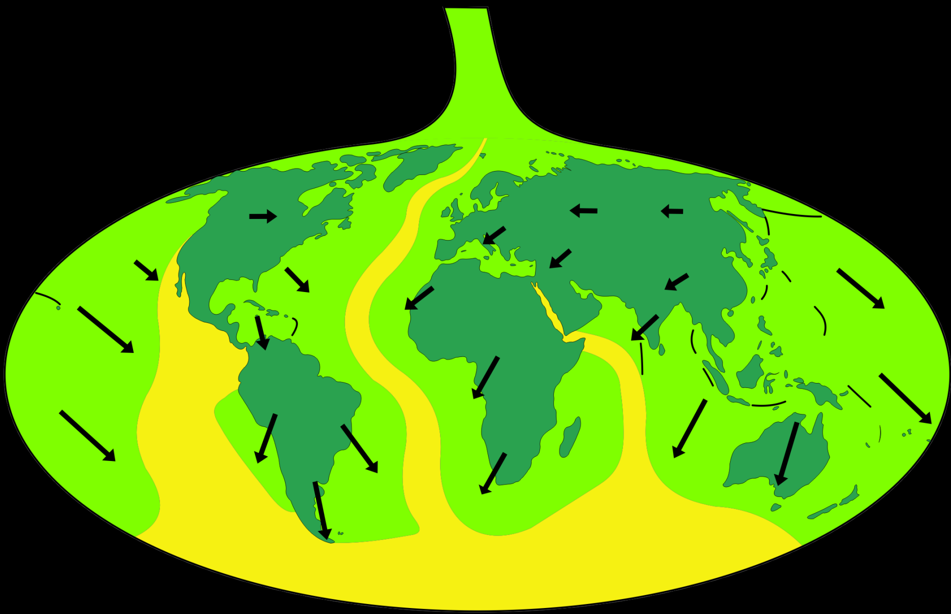
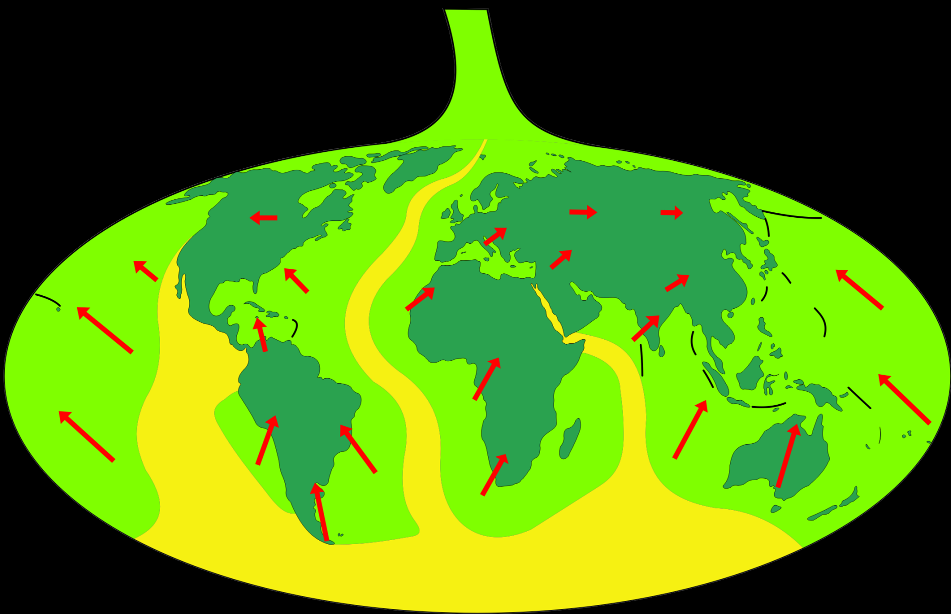
Jan Koziar

Expanding Earth and Space Geodesy





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Jan Koziar

Expanding Earth and space geodesy

Association of Geologist Alumni
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Front cover:

The schemes of the expansion of the Earth resulting from Carey's Arctic Paradox are presented. The schemes are in the form of Carey's flower bud model, but based on the real geography of plates, without the Antarctic one and without the post-paleogene oceanic lithosphere. Thus, the yellow color marks sublithospheric mantle.

***The black arrows** in the upper scheme indicate the real movement of the expanding sublithospheric mantle relative to the lithosphere resulting only from expansion of Earth's interior and the geography of plates and rifts.*

***The red arrows** in the lower scheme indicate the opposite apparent movement of plates relative to the sublithospheric mantle. Both space geodesy and plate tectonics treat this second movement as a real one. However it is without any dynamic explanation and is kinematically impossible (see chapter V).*

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The Board of the Association of Geologist Alumni of Wrocław University (AGAWU)

Introduction

Since long the Wrocław's geological community has followed with interest Jan Koziar's investigations of expansion of the Earth. Many members of the community have taken part in the investigations. In 2016 the Association of Geologist Alumni of Wrocław University published in the Polish language an abstract of Koziar's comprehensive paper ***Falsification of the Eulerian motion of lithospheric plates*** (www.wrocgeolab.pl/falsification2.pdf). The edition was funded by a member of AGAWU Władysław Niżyński. Following this, several members of the Society approached the Board of AGAWU with an initiative to publish the present paper by Koziar, ***Expanding Earth and space geodesy***. Several other members have undertaken to finance this paper. These are: Władysław Niżyński, Maria Skręt-Niżynska, Wojciech Hubert and Krzysztof Kilar. The above editorial initiatives are compatible with the bylaws of the AGAWU which include a clause of supporting scientific activity of members of the Association.

The present published paper deals with the most complicated issues at the interface of geotectonics and space geodesy. The Board of the AGAWU is pleased to support solving problems in such difficult field of contemporary geology.

Jan Koziar started investigations of the expansion of the Earth in 1970, taking advantage of the scientific openness of the late Professor Józef Oberc. Up to now he has published 44 papers on this topic (separately and as co-author), has given about 140 lectures and has taken part in 9 international conferences.

A distinctive feature of Wrocław's scientific community has been the formation of a whole group of scientists (geologists and physicists) who have dealt actively with the issues of the expanding Earth. Ten of them have become authors or co-authors of Wrocław's papers on the expanding Earth.The list of these papers is now approaching one hundred items (www.wrocgeolab.pl/papers.pdf). Another of Wrocław's expansionists, Stefan Cwojdziński, takes second place on the list.

Another distinction of Wrocław's geotectonic investigations were the first, worldwide, undergraduate course lectures on the expanding Earth. They were given by J. Koziar in 2001 – 2008 at Wrocław University up to his pensioning and founding the Wrocław Geotectonic Laboratory. The contents of these lectures (www.wrocgeolab.pl/lectures.pdf) show the range of ways contemporary geotectonics has been restructured by work in Wroclaw, as well as proving the reality of the process of significant expansion of the Earth.

The range of the early works on the expansion of the Earth (up to beginnings of 1990s) is demonstrated by the paper ***Research on the Expanding Earth in the Wrocław scientific community*** (www.wrocgeolab.pl/research.pdf).

The Board of the Association of Geologist Alumni of Wrocław University, hopes that the present paper will contribute significantly to solving the fundamental problem of contemporary geology. The problem is the alternative: "***The expanding Earth or the non-expanding Earth***". The second element of the alternative is, of course, **plate tectonics.** This concept is up to now a ruling geological theory though long since raising among geologists more and more doubts.

The Board of the Association
of the Geologists Alumni of Wrocław University
February 2018

Introduction

The text intended for the Proceedings of the Erice (Sicily) Conference "The Earth expansion evidence" (2011), is given in this brochure. The extended abstract of this topic "Expanding Earth and space geodesy" was published in the pre-conference book and is available at www.wrocgeolab.pl/geodesy1.pdf.

The space limit for full texts in the Proceedings was 15 pages. However I negotiated with the chief editor of the proceedings, Giancarlo Scalera, the space of 45 pages. The 30 additional pages were figured as follows: 15 pages based on forgoing publication of my second conference paper, and another 15 based on my colleague Stefan Cwojdziński's agreement to forgo publication of one of the papers he had presented at the Conference.

Thus I sent the 45 pages paper to the editor at the end of February 2012. However the paper was not published. After that I decided to publish an even more elaborated version independently, being not limited by length. Unfortunately work on my website and the necessity to make digital English versions of many of my already published papers, postponed this goal.

In the meantime, presentation of an elaborated text on expanding Earth and space geodesy has become urgent. In my mentioned extended abstract "Expanding Earth and space geodesy" of 2011, two tables of annual growth of the Earth's radius were presented (page 13 of the digital brochure www.wrocgeolab.pl/geodesy1.pdf). The data in the first table are based on four space geodetic methods and in the second one on five geologic methods. All the methods give comparable results and show that the real annual increment in the Earth's radius lies in the range of 2.0–2.5 cm/year. In the full version of the paper on this topic, sent in 2012 to Rome for the proceedings of the Erice conference, a new geodetic method and its result was added. It is based on the recorded growth of the longer semi-axis of the global geodesic ellipsoid WGS-84. The method is described on page 18 of the present brochure and the updated first table is presented on page 71 (remember that the main text of this brochure was written in 2012). The new method and its result becomes today more crucial than in 2012 because a lapse of several additional years. Let us describe the method separately in this introduction.

At the time (1984) the world geodetic ellipsoid WGS-84 was established, its longer semi-axis was estimated at 6 378 137 ± 2 meters. In 1989 the value was reduced by 1 meter to 6 378 136 meters (McCarthy, 1989). Then the series of precise measurements and calculations began, achieving the accuracy of 1 decimeter. They began to record gradual increase in the length of the major semi-axis. Thus:

1992 – 6 378 136. 3 meters (McCarthy, 1992)
1996 – 6 378 136. 49 ± 0.1 meters (McCarthy, 1996)
2003 – 6 378 136. 6 ± 0.1 meters (McCarthy & Petit 2003)

The calculated values are evidently increasing. However, space geodesists probably consider them as being only scattered. Thus the last value was accepted as being of sufficient precision and further calculations were not carried out up to now. In the subsequent paper of this kind (Petit & Luzon, 2010), a new value of the size of the longer semi-axis was not calculated but the value given by McCarthy &Petit (2003) was still used.

The increase in the length of the longer semi-axis between 1992 and 2003 is 30 cm. This gives 2.72 cm/year. I noticed this in 2012. Because all results of this kind (geodetic and geological) suggest the most probable range of 2.0 – 2.5 cm/year, I predicted for the year 2012 a result about 20 cm longer (that is 6 378 136. 8 meters) than the one recorded in 2003. This predicted increment is twice as much as the achieved precision of measurements.

Today, after a lapse of an additional 5 years, it should be about (rounded to decimeters) 30 cm longer than in 2003 – that is about 6 378 136. 9 meters. This predicted present increment is three times as much as the achieved precision of measurements.

Thus it is today crucial for both space geodesy and geology that the calculation of the length of the longer semi-axis of the WGS-84 ellipsoid should be repeated once again.

***

Because of urgency of the topic I have decided to print and simultaneously place on my website the version of Expanding Earth and space geodesy from 2012, putting off plans for an even more elaborated text for the time being. The obvious result is termination of the references of this paper in the year 2011.

The only changes I have introduced to the 2012 version are updated internet addresses for my other papers, a table of contents, a few new footnotes (with 2017 data), enlarged figures and fonts and significant decompression of the whole text. Thus this brochure is of much larger size than the original text.

Jan Koziar
January 2018

CONTENTS

Abstract

Artefacts in geodynamic interpretations, caused by the neglect of the expansion of the Earth by non-expanding-Earth space geodesy, are presented. Such effects appear in analysis of relative movement of the plates as well as in their movement in the absolute (NNR) reference frame. In both cases the effects confirm Earth's expansion. In later sections, present values for the annual increment in the Earth's radius, resulting from different space geodesy methods, are presented. They are found to be in agreement with similar values (2 – 2.7 cm/year) obtained by several geological methods. The paper expands on a presentation given at an international conference at Erice, Sicily, October, 2011 (Koziar, 2011 a) www.wrocgeolab.pl/geodesy1.pdf .

Key words: expanding Earth, space geodesy, plate tectonics

I. Expanding Earth

1. Expansion of the Earth as a real process

Expansion of the Earth is established on the basis of several proofs[1]. Three of them were published above half century ago by Samuel Warren Carey (Carey, 1958). The first is based on moving apart of all the continents around the Pacific perimeter which implies expansion of this ocean and consequently expansion of the Earth. The topic was further elaborated (Koziar,1993; www.wrocgeolab.pl/Pacific.pdf).

The second proof is the lengthening of oceanic ridges (real plate boundaries) relative to their parent (matrix) continental margins (see Fig. 2 c, 15 and 17). The third is based on so-called "gaping gores". These are artificial wedge-shaped gaps between fragments of the lithosphere when their past configurations are reconstructed but on the present size Earth. The phenomenon is also known as Van Hilten's "orange peel effect" (Van Hilten, 1963).

[1] Four of them are presented in: www.wrocgeolab.pl/handbook.pdf, seven of them are presented in Koziar "Expansion of the Earth and its proofs" 2017 (only in Polish) www.wrocgeolab.pl/dowody_EZ.pdf. The English brochure "Proofs of the expansion of the Earth" is in preparation – see back cover of this brochure. (Note 2018)

The effect appears when we try to reassemble an orange peel on a bigger sphere than the orange from which it came[2].

Later, Carey (1976) published the fourth proof called "Arctic Paradox". It is presented in this paper (point V.4) with reference to space geodynamic problems.

Another proof is mutual moving apart of all hot spots. The process was pointed out by Stewart (1976). The next proof is the existence of cooled mantle ("continental roots") under the central regions of plates, reaching down to depths of 400 km. This was confirmed in the 1980s and indicated a generally autochthonous position of plates relative to the mantle.

Yet another proof is the existence of a great circle which crosses only divergent zones discovered by Perin (1994). The circle crosses the equator at 140^0 W and 40^0 E while latitudinal deviation is 51^0 south at 130^0 E and north at 50^0 N.

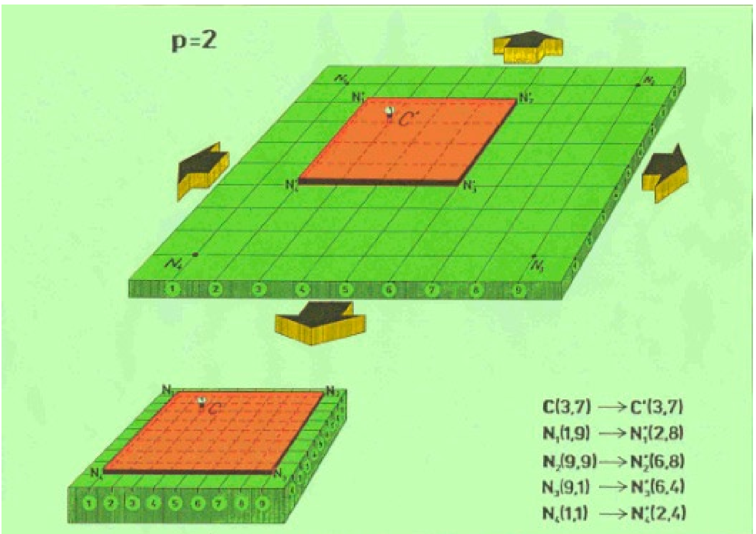
The annual increment of the Earth's radius is between 2.0 – 2.5 cm/year (see section VI).

2. Geometrical transformation and dynamics of plates on an expanding Earth

A model of plate transformation and dynamics on an expanding Earth was elaborated by the present author (Koziar, 1994; www.wrocgeolab.pl/plates.pdf). Here it can only be briefly outlined, but its essentials are necessary for understanding the analyses carried out in this paper.

Let us consider a regularly stretched basement with a graticule of coordinates (Fig. 1 a.) and a rigid plate lying on it and pinned to the basement at some point C. After stretching the basement (in the presented example doubling its linear scale) the coordinates of all points of the plate have changed except those of point C. The transformation of the coordinates of the corners of the plates and point C is described by the table in Fig.1a. The point C is the stable point of the transformation (SPT). The general algebraic form of the transformation is described by the equations in Fig. 1 b). The black line reproducing the contour of the plate in magnified form records its previous, pre-stretching coordinates, but on the now-expanded graticule and basement.

[2] See: Koziar "Falsification of the Eulerian motions of lithospheric plates" www.wrocgeolab.pl/falsification2.pdf (footnote 2018).



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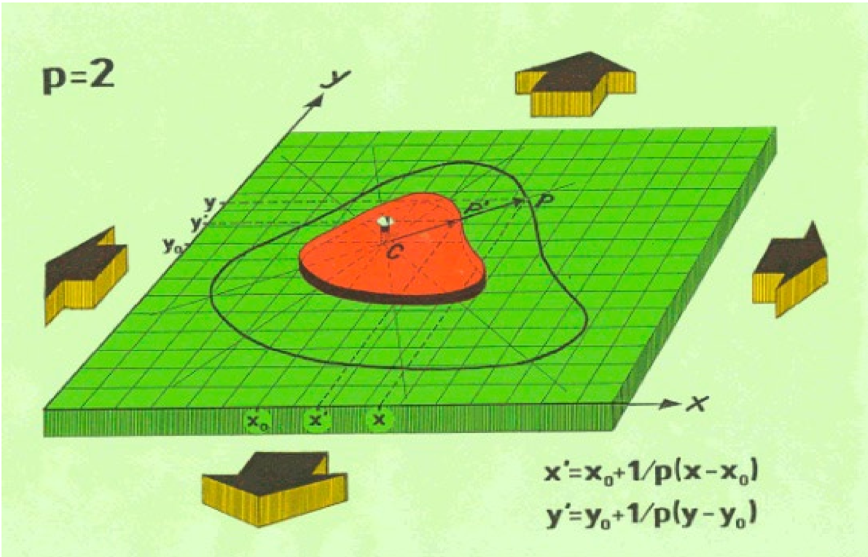

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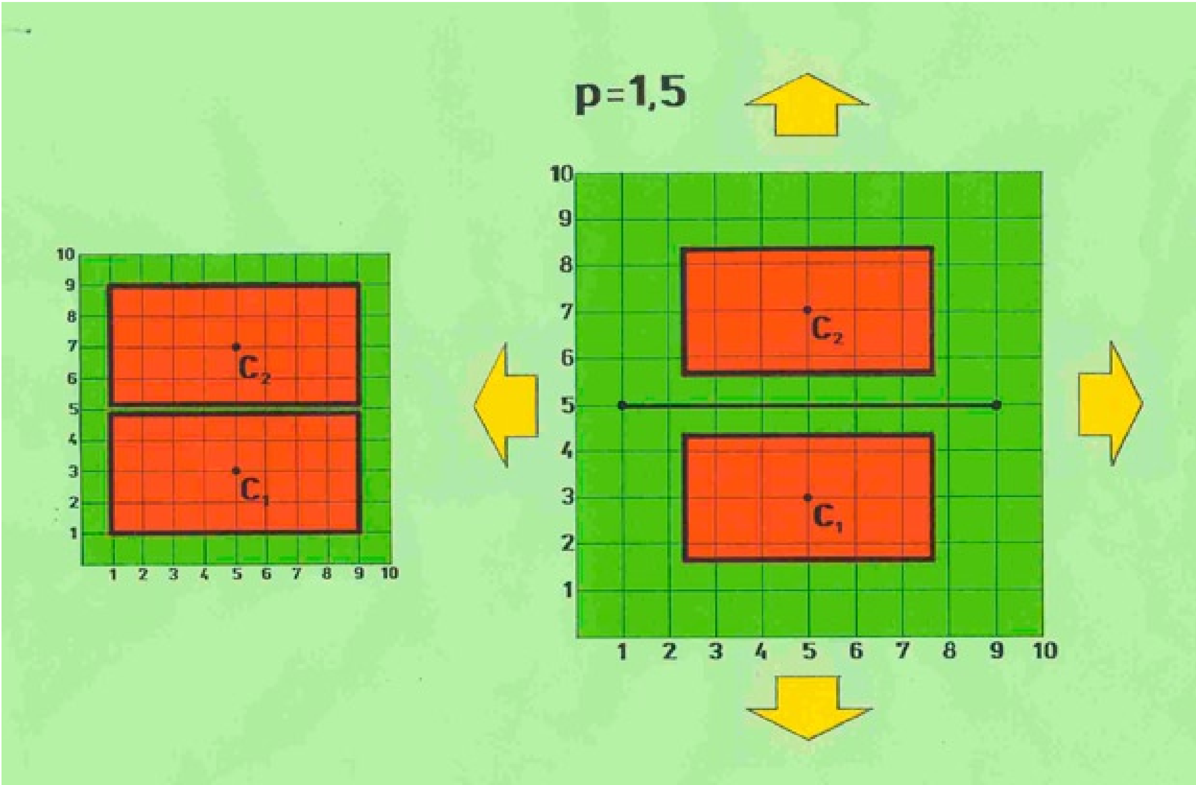
Fig. 1. *A plate on an expanding basement, (**a**) transformation of coordinates of the corners of the plate described by the table, (**b**) transformation of coordinates of the contour of the plate described by the algebraic formula*

A plate that is not-pinned also has a stable point of transformation. It can be shown that when only the force of friction acts between the plate and the basement then the stable point of transformation coincides with the barycentre of the plate (Koziar, 1994; www.wrocgeolab.pl/plates.pdf). In the simpler case of a symmetrical plate the SPT coincides with the centre of symmetry.

The model plate corresponds to a lithospheric plate, the basement to an expanding sublithospheric mantle and the graticule of the basement to the expanding geodetic (ellipsoidal) graticule stretched together with it.

The stretched mantle of the expanding Earth provides a simple driving mechanism for the lithospheric plates and a simple absolute reference frame for them (Fig. 2 a).



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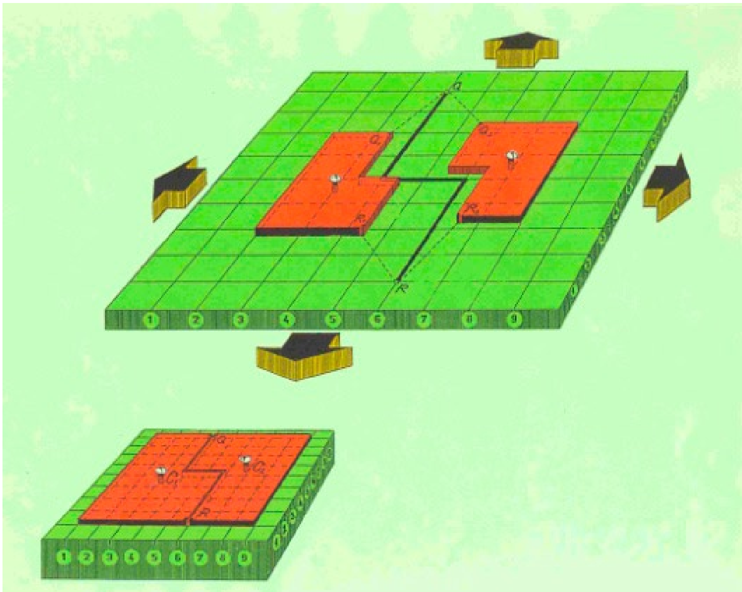

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Fig. 2. *Plates on an expanding basement, (**a**) plate break-up and mutual increase in distance between fragments driven by an expanding basement, (**b**) model of tectonic development of Central and South Atlantic on an expanding basement, (**c**) elongation of Mid-Atlantic Ridge (border of African and American plates[3]) relative to parent continental margins (compare with 2 b)*

[3] Plate border consists of sections of oceanic ridge and sections of transform faults between them which are active. The mantle diapir which feeds the spreading is continuous under both structures. The black line in Fig. 2 a refers more to the diapir than to the ridge itself.

Plate tectonics cannot successfully solve both problems. The stretched mantle also explains magnification of the shape of the oceanic ridges (plates borders, more precisely speaking) relative to their parent continental margins (Fig. 2 b, 2 c). Plate tectonics is unable to explain this first order geotectonic phenomenon.

3. Non-expanding-Earth assumption of plate tectonics

The whole theory of plate tectonics is founded on the unproved assumption that the Earth is not expanding (the non–expanding-Earth assumption).

This assumption is well-exemplified in quotations from the fundamental paper by Le Pichon (1968), a founding father of the paradigm.

> *In this paper we try (...) to test whether the more uniformly distributed data on sea-floor spreading now available are compatible with a non-expanding earth. (p. 3661)*
>
> *If we assume that the earth is spherical and that the length of its radius does not change with time, we can then proceed to the complete determination of the movements of the major crustal blocks relative to each other. (p. 3674).*

and:

> *If the earth is not expanding, there should be other boundaries of crustal blocks along which surface crust is shortened or destroyed. (p. 3673).*

Such an approach led to construction of several models which inversely confirm the starting assumption. Thus the whole paradigm has the structure of a circular argument[4].

4. Tensional-diapiric-gravitational development of the supposed collisional zones

The last of these statements by Le Pichon concerns fold belts and island arcs. So, collisional character of these zones (in the framework of plate tectonics) is deduced on a speculative way from the non-expanding-Earth assumption. However, a direct analysis of both types of zones reveals their tension-diapir-gravitational development. The general mechanism was given by Carey (1976)[5]– Fig. 3.

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[4] See Koziar, 2017; www.wrocgeolab.pl/falsification3.pdf (footnote 2018).

[5] See also Koziar & Jamrozik, 1985; www.wrocgeolab.pl/Carpathians.pdf and Koziar, 2005. (Footnote 2018).

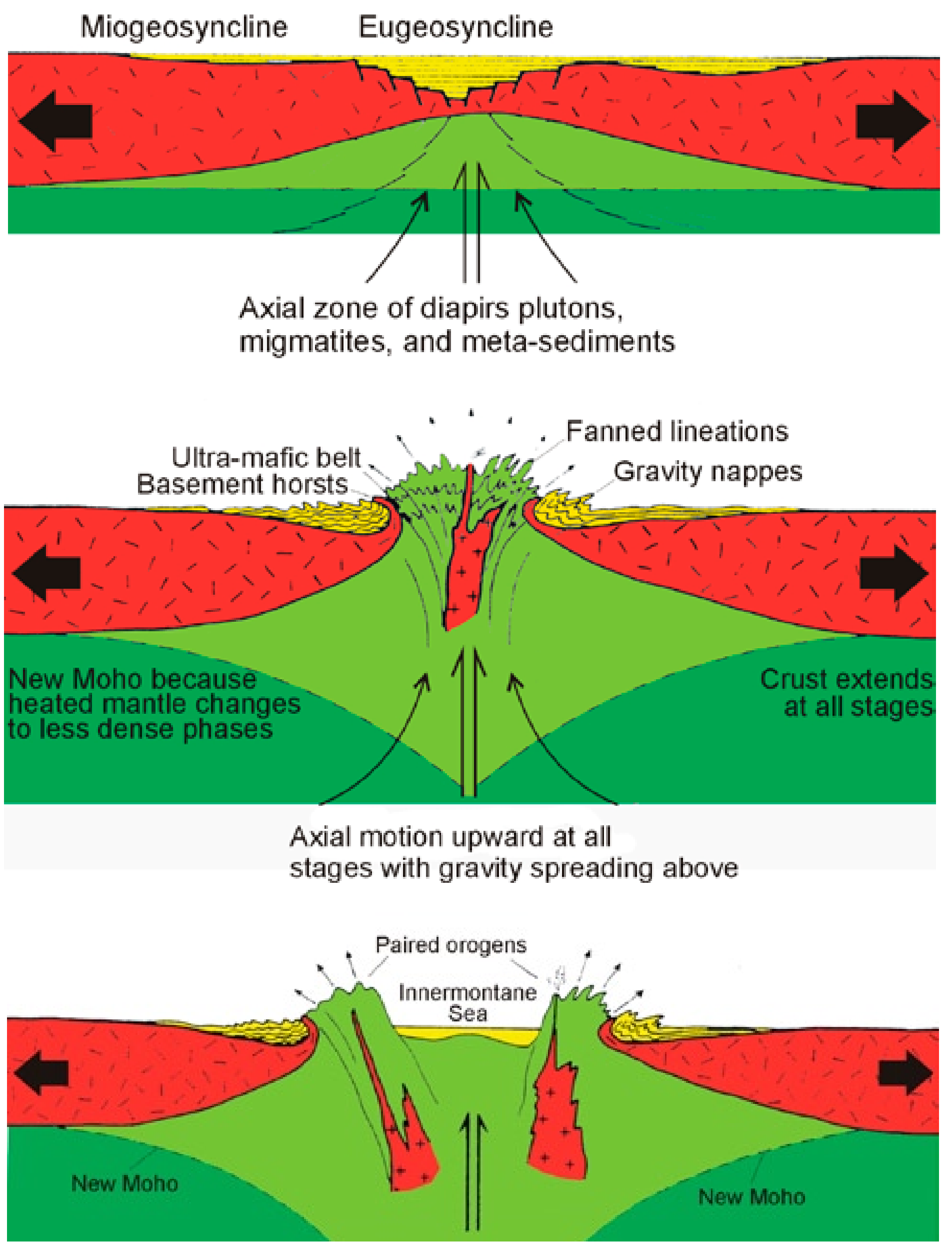

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Fig. 3. *Carey's tensional-diapiric-gravitational scheme of development of fold belts*, *(**a**) geosynclinal stage, (**b**) folding stage, (**c**) innermontane depression stage*

The scheme overcame the limitations of traditional diapir-gravitational tectonics which was unable to explain the development of mantle diapirs. In fact they are driven by large-scale tension as the more fundamental factor.

The regional tension is well visible in island arcs, back-arc basins and even in continental backstage of both (Fig. 4). The direct analysis of these zones gives the following mechanism of their development (Fig. 5) – (Koziar, 2003 a; www.wrocgeolab.pl/margins2.pdf).[6]

[6] See also www.wrocgeolab.pl/margins2a.pdf. Improved and more detailed schemes are now available at www.wrocgeolab.pl/falsification3.pdf, p. 30-31 and soon at www.wrocgeolab.pl/LOD.pdf – supplement (footnote 2018).

The scheme was published earlier (Koziar & Jamrozik, 1991; Koziar & Jamrozik,1994; www.wrocgeolab.pl/margins1.pdf) and Carey referred to it in his last book (Carey, 1996).

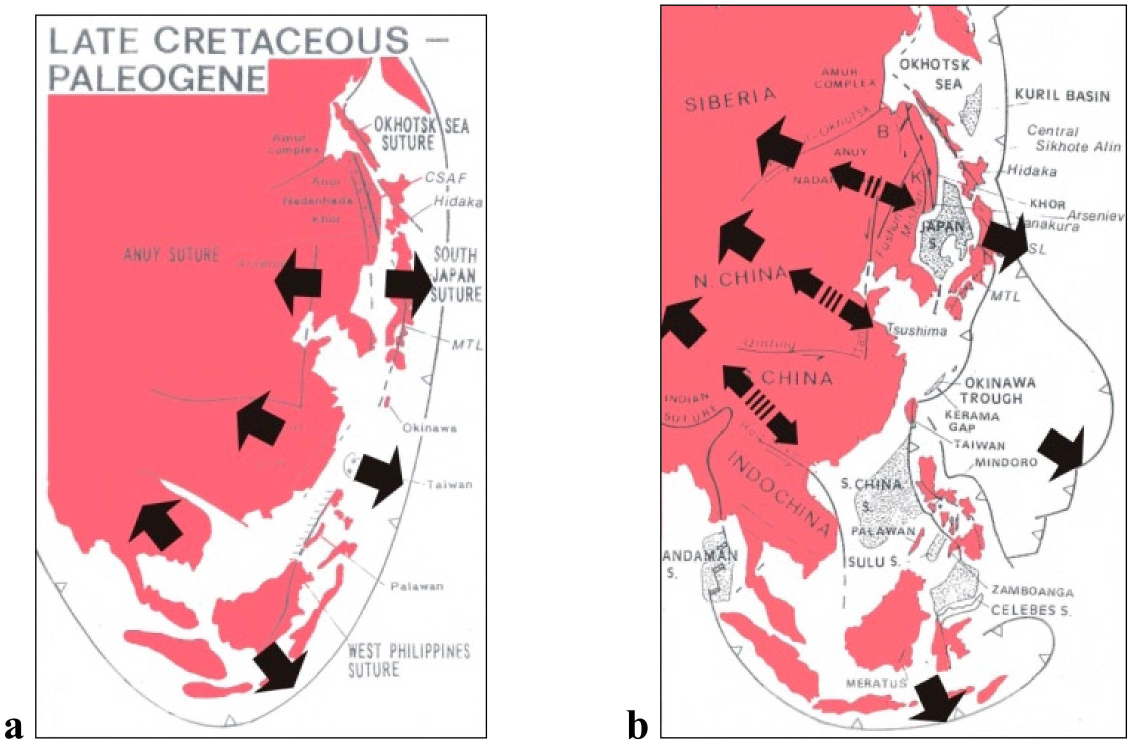


Fig. 4. Tectonic stretching of the East-Asia continental margin (on the basis of Faure and Natalin, 1992; arrows by present author), ***(a)*** *Late Cretaceous – Paleogene,* ***(b)*** *Present*

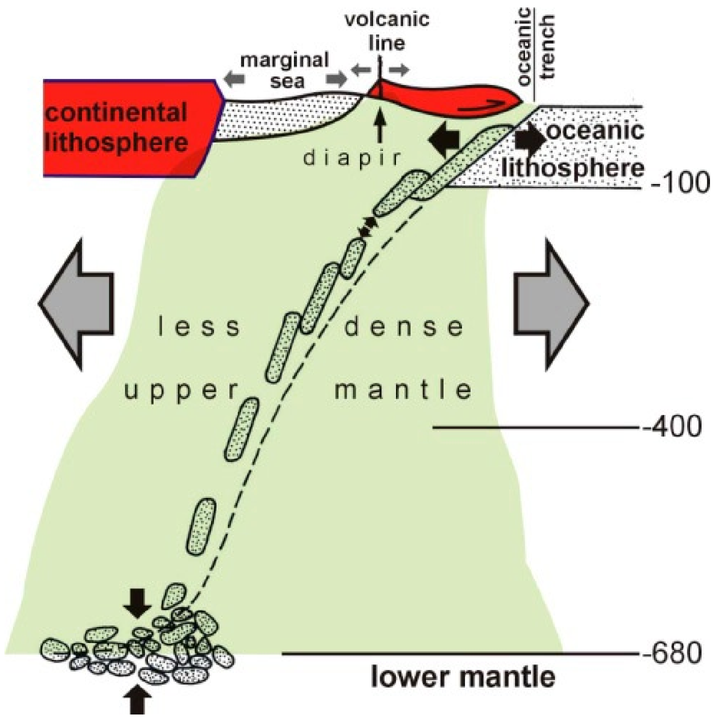


Fig. 5. *Tension-diapiric-gravitational development of island arcs (see text for explanation)*

The mechanism is as follows: regional tension causes decompression of the upper mantle and its thermal activation. It also causes detachment of the island arc from its continental background and tensional development of the marginal sea. Simultaneously it causes gravitational destruction of the oceanic plate and sinking of its fragments along the Benioff zone. The semi-graben at the upper part of the zone creates an oceanic trench. Heating of the upper mantle creates a diapir under the volcanic line. Both: the sinking at the oceanic trench and the diapiric uplifting on the volcanic line constitute the primary tectogenesis of Haarmann – Van Bemmelen gravitational tectonics. Secondary tectogemesis periodically results in catastrophic gravitational transport of island arc towards the oceanic trench.

II. Basic geodynamic problems of contemporary space geodesy

1. Space geodesy and geodynamics

Space geodesy has developed several special techniques for measuring present plate movements. Geology (geophysics) measures them directly only along oceanic ridges, basing on adjacent magnetic anomaly stripes. In geological terms, the measured present rates of movement (spreading rates) are averaged for the last 3 Ma. Space geodesy is able to measure movements either at the borders of plates or in their interiors but only in places where geodetic stations are located. Space geodesy operates in a time span of a few to a dozen or so years. It uses techniques based on many kinds of artificial satellites as well as on the Moon and quasars.

Space geodesy, like geology, measures relative movements of two plates or movements of several plates in a so-called absolute reference frame. It adopted this kind of frame from plate tectonics in “no net rotation” version (NNR) which will be explained later.

Space geodesy currently occupies a strong position in contemporary geo-tectonics. First – it has become a very precise tool of geodynamic investigation. Secondary – its results are treated as a decisive confirmation of plate tectonics.

However, from the very beginning of space geodynamic activity researchers have accepted the unproven non–expanding-Earth assumption of plate tectonics applying it to the global geodesic ellipsoid and using Eulerian plate motion for calculation of their mobile geodetic reference frames (ITRFs) [7]. It led to the confirmation of the assumption on the same circular basis as in the case of plate tectonics itself.

The problem of expansion of the Earth was taken up by Czech geodesists far from the main centres of space geodesy investigations. Kostelecký & Zeman (2000) concluded that an upper limit for the rate of the Earth's radius is 1.0 cm/year. The conclusion of the more recent paper by Bajgarová & Kostelecký (2005) is more liberal. The authors wrote: *„present results of the space geodesy methods cannot be used to prove if the Earth expansion appears or not!"* (emphasis in original). However, both papers used plate tectonic motion models as the basis of calculations which is improper.

Quite recently the problem was undertaken by team being at the center of space geodesic technique (Wu *et al.,* 2011)[8] but no special test was performed only calculation based still on Eulerian principle which cannot be applied to the expanding Earth and leads to its rejection of the basis of circular argument reasoning[9]. The authors referring to present accuracy of space geodetic measurement estimated possible expansion rate below 1mm/year. However, it is possible to achieve a big level of accuracy within a wrong paradigm what does not bring us closer to the real world. It can be explained on the example of dramatic but fictitious slowing down of Atlantic spreading rate in space geodesic calculations (see points III/6 and IV/3; Fig. 26 a). The precision of this calculation is ±3 mm but calculated value of 4 and 3 mm is several times lower than real value calculated by plate tectonics: respectively 19/17 and 24/21 m/year. In the first case is minimum 13 mm lower and in the second minimum 18 mm lower (by the way, plate tectonics almost covers with expanding Earth at oceanic ridges[10] and divergent calculations of the first are generally correct). The very precise but wrong

7 International Terrestrial Reference Frames.

8 The authors refer to Carey's book of 1976 but insists that Earth expansion is unproved. Whereas this book presents four such proofs (see point I.1).

9 And leads to its rejection. See: Koziar "Falsification of the Eulerian motions of lithospheric plates" www.wrocgeolab.pl/falsification2.pdf and "Falsification of the Eulerian motions of lithospheric plates. Supplement" www.wrocgeolab.pl/falsification3.pdf. (Footnote 2018).

10 Spreading on oceanic ridges was discovered by expansionists Carey (1958) and Heezen (1960) who immediately understood its proper global context. Later the process was intercepted by plate tectonics and deformed by not-expanding-Earth assumption.

values obtained by space geodesy are artefacts caused by expansion of the Earth not taken into account.

Buis & Clavin (2011) discussing the above paper wrote:

> *So why should we care if Mother Nature is growing?*

And they answered:

> *Scientists care because, to put movements of Earth's crust into proper context, they need a frame of reference to evaluate them against. Any significant change in Earth's radius will alter our understanding of our planet's physical processes and is fundamental to the branch of science called geodesy…*

This is true.

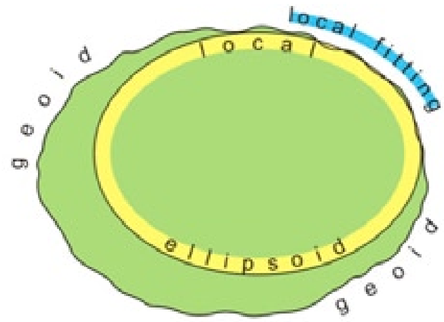
It will be demonstrated below that at the critical, detailed and complex analyses of space geodesy results the Earth expansion emerges from them in different ways. At the end the principles of correct reference frame for geodesy and geotectonics are presented.

2. Geodetic reference frames and the expanding Earth

a. Local (non-geocentric) ellipsoidal reference frames and their uplifting during expansion of the Earth

A local geodetic ellipsoid is constructed by the best fitting of some rotational ellipsoid to the geoid in some region (Fig. 6 a). The fitting is accomplished by the procedure of minimization of the sum of the squares of mutual distances between the ellipsoid and the geoid at different points of them. The polar axis of the ellipsoid is parallel to the Earth's rotational axis but its centre does not coincide with the centre of the Earth.

Because the ellipsoid is mathematically coupled with the geoid, it is lifted with the latter (without changing its own size) during expansion of the Earth (Fig. 6 b). So, expanding Earth reveals another aspect of mathematical procedure of "fitting", reflected by the word "coupling", which has more mechanical meaning. Geodetic heights *(h)* are measured relative to the surface of the ellipsoid. Thus the process of expansion is unnoticed because the expanding geoid pulls the ellipsoid behind itself. The changes of geodetical heights reflect only local tectonics but not expansion of the globe as a whole (change of the Earth's radius).



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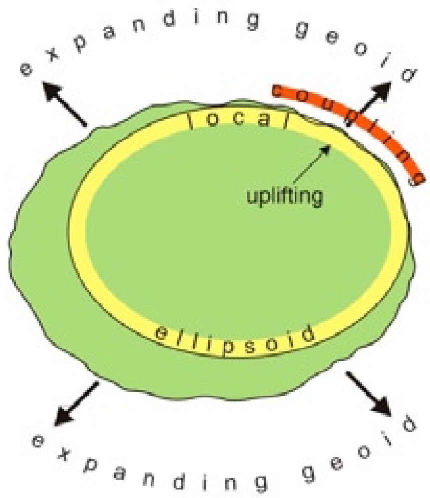

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***Fig. 6.** Geoid and local geodesic ellipsoid,*
*(**a**) local fitting of local ellipsoid with geoid,*
*(**b**) uplifting of the local ellipsoid mathematically coupled with the expanding geoid*

Before the advent of space geodesy, all geodetic ellipsoids were of only local character and it was impossible to tie together geodetic networks between continents or even between them and neighbouring islands hidden beyond the horizon. Space geodesy has removed this limitation.

b. Geocentric orthogonal reference frame

Space geodesy, for the first time in the history of geodesy, established a global reference frame originating at the Earth's centre of mass (the geocentric reference frame) – Fig. 7

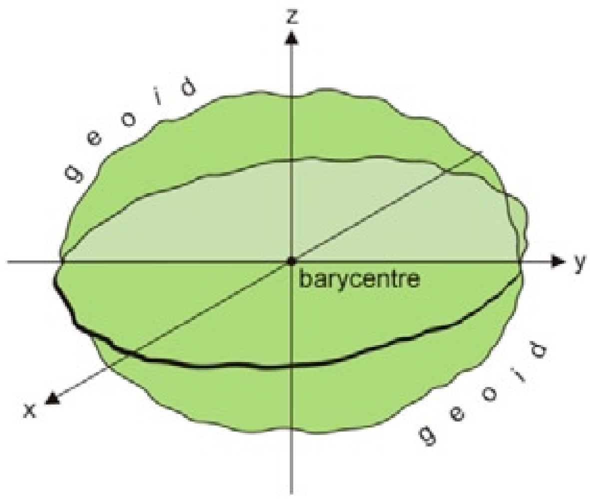


***Fig. 7.** Orthogonal geocentric reference frame*

It is a Cartesian (orthogonal) reference frame. The coordinates of space geodesy sites (stations) are measured directly in it. The distance R of the sites from the Earth centre can be calculated from the known formula:

$$R = \sqrt{x^2 + y^2 + z^2}$$

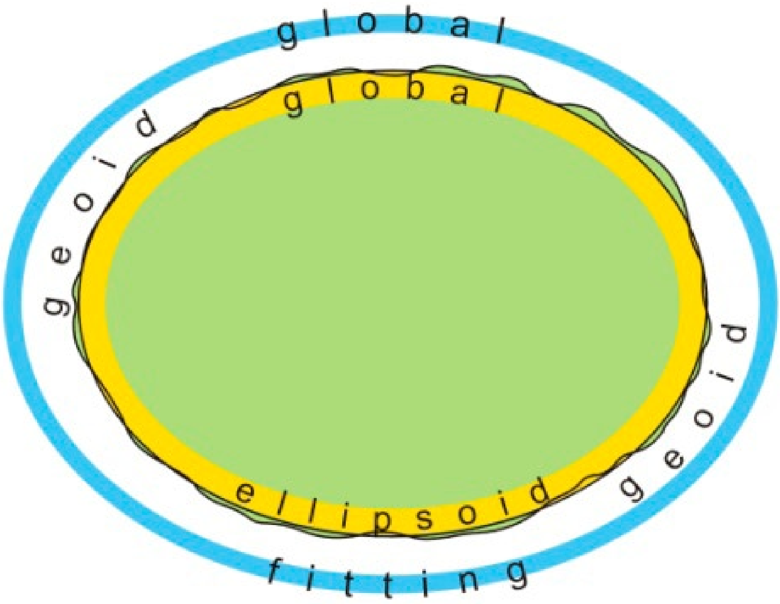
However the quantity obtained in this way is not the radius of the Earth as the whole but only the length of “the radius vector” of a given point on the Earth surface.

Expansion of the Earth could be recorded by comparison of the radius vectors of many points in different parts of the Earth’s surface, after some period of time. However, such comparisons are not performed in general because geodynamic interpretations are made only after transformation of orthogonal coordinates to ellipsoidal ones, this time on global geodetic ellipsoid (see below). Only exceptionally are such comparisons made and they record expansion of the Earth, but space geodesists treat them as some artefacts (see section VI).

c. Global (geocentric) ellipsoidal reference frame and its stretching during expansion of the Earth

The orthogonal reference frame is not suitable for geographical presentation of geodynamic data and relations. Thus, space geodesy returned to the ellipsoidal reference frame but now in its new global version (Fig. 8 a). The construction of this version was possible only on the basis of the former orthogonal reference frame.

The currently used global geodetic ellipsoid was constructed in 1980 (Geodetic Reference System 1980; abbreviation GRS’80). It was only slightly changed in 1984 to World Geodetic System 1984 (WGS-84).



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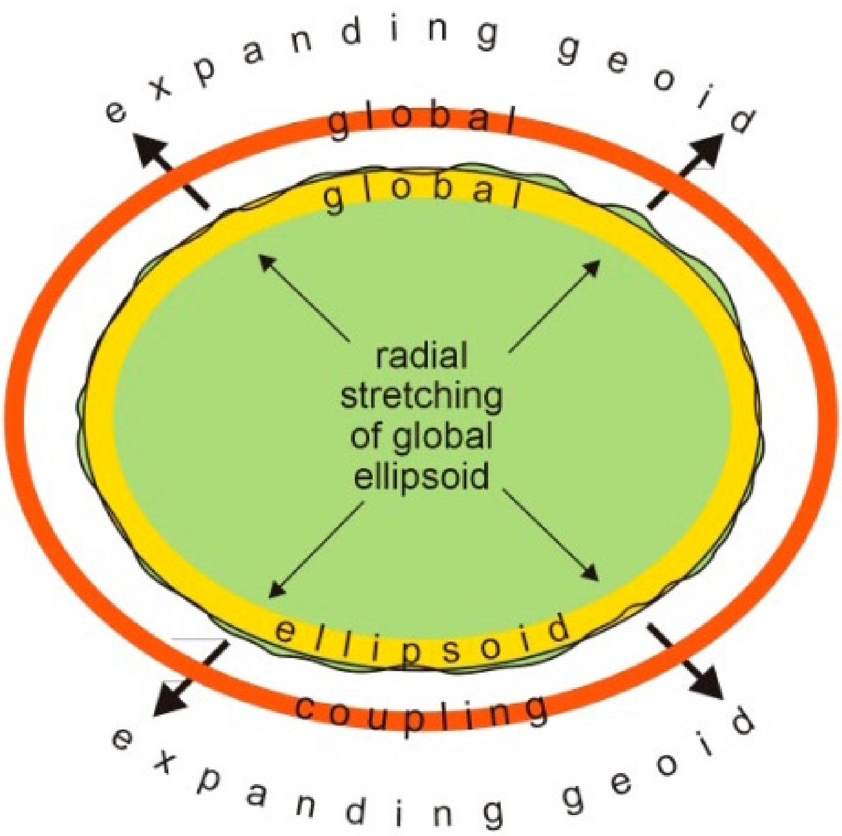

b

*Fig. 8. Global ellipsoid, (**a**) global ellipsoid globally fitted to geoid, (**b**) radial stretching of global ellipsoid globally coupled with the expanding geoid*

The global ellipsoid is globally fitted to the geoid and so globally coupled with it. Thus, during expansion of the geoid the ellipsoid must expand together with it (Fig. 8 b).

d. *A priori* assumption of constant size of global ellipsoid

The fundamental problem of contemporary space geodesy is the *a priori* assumption of invariability of the global ellipsoid. The value of its longer semi-axis, treated as equatorial radius of the Earth, was calculated as equal to 6 378 137 m, the flattening as 1/298.257.

Both quantities are treated as astronomical constants on equal terms with the speed of light (*cf.* Smith *at al.,* 1990).

Because in fact the ellipsoid is expanding and the majority of direct orthogonal coordinates are transformed to ellipsoidal ones, the false assumption results in serious problems discussed in this paper.

e. Recorded stretching of the global ellipsoid

It should be stressed that though the accuracy of calculation of ellipsoidal coordinates of a given point on the Earth surface is recently below the level of 1 cm, the precision of calculation of the size of the axes of the geodetic ellipsoid is far less than that (about two orders worse). Thus, the "constant" length of 6 378 137 m of the WGS 84 ellipsoid's longer semi-axis is more the result of convention than of any precise measurement. Already in 1989 a new calculation gave a result less than this by 1 meter *i.e.* 6 378 13<u>6</u> m (McCarthy,1989), what means that the precision at calculation of WGS4 equatorial semi-axis was above the level of 1 meter. Despite the new result, the earlier value continued to be used. From 1989 the subsequent values, given in literature, have gradually increased, approaching incrementally the inaccurate starting estimate. In 1992 it came to 6 378 136.3 m (McCarthy, 1992). By this time the precision head already reached decimetre level. In 1996 the value of 6 378 136.49 m ± 0.1 m appeared (McCarthy, 1996) now with error margins bounding the level of precision. In 2003 the value came to 6 378 136.6 m ± 0.1m (McCarthy & Petit, 2004). This last value was adopted by the 2010 IERS[11] Conventions (Petit & Luzum, 2010).

The comparable values are only these starting from 1992, for which the uncertainty is 10 cm. In the time span 1992 – 2003 the increment in the calculated Earth's radius was 30 cm. That averages to 2.72 cm/year. This value fits well with other values of the annual increment obtained from other geodetic data as well as from the geological ones (see section VI). These data suggest the most probable range 2.0 – 2.5 cm/year. Next year a decade will have elapsed since the last calculation was performed and the subsequent increment should on this basis be a minimum of 20 cm, *i.e.* twice the recent level of uncertainty in the calculation of the size of the global ellipsoid. So the next calculation of the size should give at least 6 378 136.8 m, which would seriously confront with the non-expansion-Earth assumption.

However, as will be demonstrated in this paper, the expansion of the Earth and its rate has already revealed itself in space geodesy in several other ways from the heights calculated directly from orthogonal coordinates and from some strange phenomena connected with horizontal coordinates of an expanding geodetic ellipsoid..

f. Transformation of orthogonal coordinates to ellipsoidal ones

As it was mentioned above, directly obtained orthogonal coordinates are usually transformed to ellipsoidal ones prior to geodynamic interpretation (Fig. 9).

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[11] International Earth Rotation and Reference Systems Service.

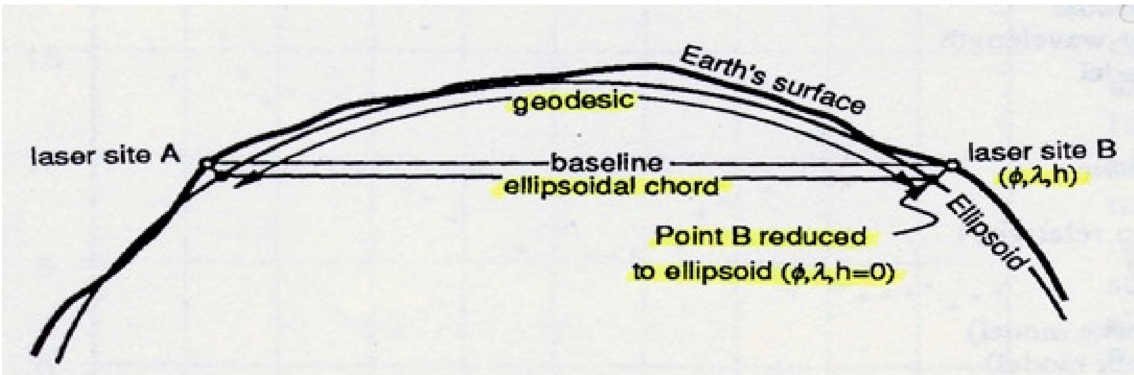


Fig. 9. *Three kinds of distances between geodetic stations. Only the baseline is directly measured by VLBI method. Geodesic distance is always calculated from ellipsoidal coordinates (φ, λ). After Smith et al. (1990)*

In the above scheme the location of the space geodesy station (B) is already determined in ellipsoidal coordinates (φ, λ, h), which are counterparts of geographical ones, but (h) here means the height above the ellipsoid and not the geoid, which corresponds to sea level. The location of station (A) is determined in coordinates of the same kind.

There are three kinds of distances between A and B in the scheme:

1. straight distance between A and B (baseline)
2. distance along the ellipsoidal chord between points obtained by projection of A and B onto the ellipsoid (h = 0)
3. geodesic distance (along the surface of the ellipsoid) between projected points A and B.

All the distances are calculated from the ellipsoidal coordinates. Only in the VLBI[12] method is the first distance (baseline) measured directly, but location of a VLBI station is expressed (as with all the other kind of stations) in ellipsoidal coordinates. Thus, geodetic distances between VLBI stations (used in geodynamic interpretations) are also calculated from these coordinates, not measured directly. This is a very important circumstance since such converted coordinates camouflage Earth's expansion, as will be demonstrated.

Many geologists believe that space geodesy geodynamic interpretations are based on direct measurements and that is why they are convinced that this discipline has directly confirmed plate tectonics.

[12] Very Long Baseline Interferometry method based on radio-signals from distant quasars.

g. Problem with vertical coordinates

The global ellipsoid is coupled in the same way with the geoid (and by it with the surface of the Earth) as with the local ones, but is coupled globally. Thus, during expansion of the Earth, the global ellipsoid is radially stretched by the expanding geoid. Unlike the local ellipsoid it is not pulled up as a whole toward a chosen part of the Earth surface but it is regularly stretched in all directions. The heights of geodetic stations are related to the surface of the ellipsoid in the way similar to the case of the local ellipsoid.

If the radius vectors of geodetic stations are globally compared (for elimination of local vertical tectonics) in the time span of one year then their average increment will be about 2.0 – 2.5 cm (see former point) and expansion will be noticed. However, if the direct orthogonal coordinates are transformed to ellipsoidal ones then, since the surface of the ellipsoid is also lifted about 2.0 – 2.5 cm per year, the expansion will remain unnoticed. In this case only local relative (neotectonic) changes of heights will be recorded.

In this way the expansion of the Earth remains undetectable as in case of the local ellipsoid. Thus, the starting assumption of constant size of the ellipsoid (Earth) is wrongly confirmed by way of a circular argument.

h. Problem with horizontal coordinates

Stretching of the global ellipsoid means stretching of its horizontal grid of coordinates (φ, λ) as is shown in Fig. 2. When the stretching goes unnoticed or rejected then it creates fictitious shrinking of the plates, in accordance with the so-called “Blinov’s effect” and the related “Heezen’s effect” (see section III). This leads to another spurious confirmation of plate tectonics by circular argument. Apart from that, the unnoticed expansion of the ellipsoid causes fictitious slowing down of the geophysically recorded spreading rate. The slowing is the bigger the farther from the oceanic ridge the geodetic stations are placed (see point IV.3).

i. Problem of the connection of the reference frame with the Earth’s body through the mobile lithosphere

All space geodesy stations (sites) are situated on tectonic plates and all the plates are moving. Within the plate tectonic paradigm there is no way to fix the more stabile interior of the Earth. This circumstance creates a serious problem with coupling of the axes of the geodetic reference frame with the Earth as a whole. However such operation is necessary for precise measurements, especially those applied to geodynamics. Lacking an alternative, space geodesy adopted from plate tectonics the method of averaging the motions of all plates and tied its reference frame to this abstract averaged plate (see point V.2., below, for details). The reference frame established in this way is called the International Terrestrial Reference Frame (ITRF). It is a mobile reference frame (the averaged result is changing with time) so its axes move relative to its former position at speed of several or more millimetres per year. Thus, the frame is established only for a period of few years (termed an 'epochs') and then re-established. There have been ITRFs for 1994,1996, 1997, 2000, 2005 and 2008 epochs. ITRF-11 is in preparation.

ITRF system is based, like plate tectonics, on the non-expanding-Earth assumption. This creates several problems presented and explained in points V.3-V.6.

The principles of creation of a proper reference frame connected with expanding Earth's mantle (*i.e.* Earth's biggest and most stabile body) are discussed in point VII.1.

III. Nature of space geodesy artefacts of an assumed non-expanding Earth

1. Blinov's effect of fictitious shrinking of the plates

a. Blinov's effect demonstrated on a cross-section of a globe

Let us consider a cross-section of the expanding Earth with an inextensible plate (Fig. 10 a). For simplicity the Earth is spherical not ellipsoidal. Two points on the plate A and B form a central angle $\boldsymbol{\alpha}_{1.}$ After some time the radius of the Earth has increased (Fig. 10 b). Since the plate is not stretched the distance between the points has not increased. Therefore, their central angle has decreased. At the same time the geographical coordinates of the points has been changed and from them a new, lesser central angle can be deduced. The only deformation of the plate is flattening which does not change the geodetic distance between A and B.

Now let us consider the situation in which the change of the geographical coordinates of the points A and B is recorded but the expansion of the Earth is not taken into account (Fig. 10 c). Thus, on the base of changing coordinates, and the decreased central angle corresponding to that change, a reduction of the distance between A and B will be inferred. Of course the reduction is fictitious (false).

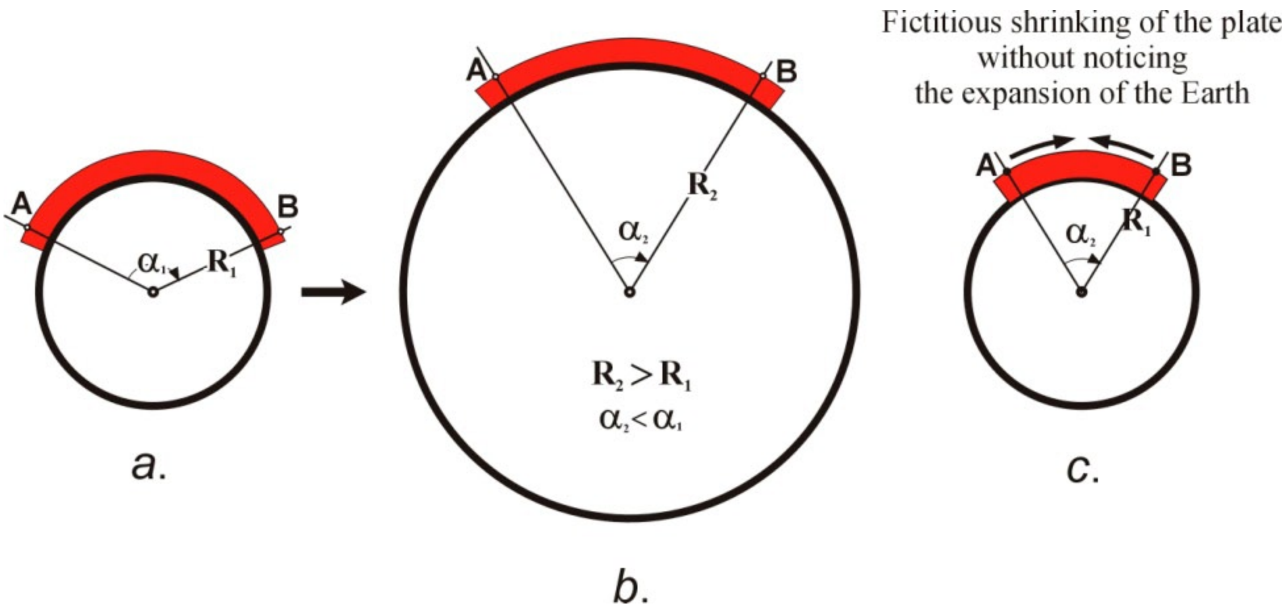


***Fig. 10.** Blinov's effect (explanation in text)*

The above rule was originally signalized by Blinov (1987) and so I designated it "Blinov's principle" (Koziar, 2003 b)[13]. Carey formulated it independently a year later (Carey, 1988, p. 171). Let us quote him:

> *As all NASA chord measurement ultimately involve the angle subtended by the chord at the center [of the Earth], any continental block or stabilized oceanic crust will appear to shorten if constant radius is assumed.*

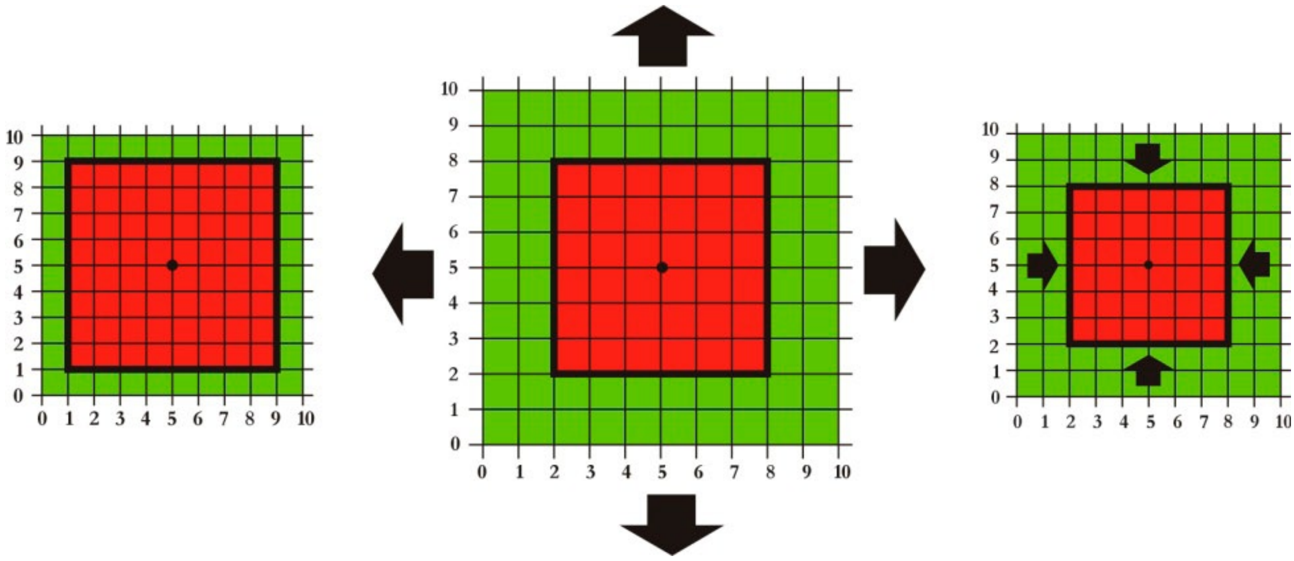
Blinov's effect applies to paleomagnetic measurements as well (Koziar, 2006) but the problem cannot be discussed here.

b. Blinov's effect demonstrated in horizontal dimensions

Blinov's principle can be demonstrated in horizontal dimensions on the geometrical model of plates lying on an expanding basement, presented in point I.2.

Let us consider a single plate on an expanding basement with an expanding graticule of coordinates (Fig. 11 a). The stable point of transformation of the plate is (5, 5). The basement is a flat counterpart of the fragment of the expanding geodetic ellipsoid and the plate is a flat counterpart of a lithospheric plate. As was already explained, all points of the plate change their coordinates during expansion except of the stable point of transformation (Fig. 11 b).

[13] The paper entitled "Satellite geodesy and expanding Earth" was rejected for publication by the journal "Acta Montana", for among other reasons because it did not take into account subduction (!). However, the term has entered the literature (Bajgarová & Kostelecký, 2005). The authors mistakenly cited my paper as a published one.

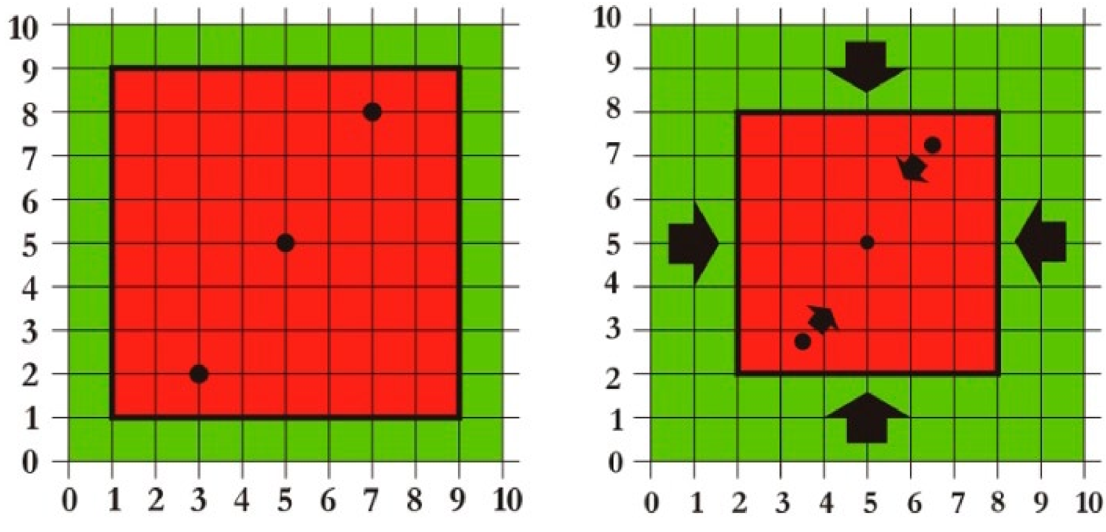


a **b** **c**

Fig. 11. *Blinov's effect in horizontal dimensions (explanation in text)*

Now, if the expansion is unnoticed (or rejected) and the change of co-ordinates is correctly recorded then the whole plate will fictitiously shrink (Fig. 11 c).

The apparent shrinking of the plate means that for any two points on it (Fig. 12 a) which really do not change their mutual distance, the distance will be apparently reduced (Fig. 12 b).



a **b**

Fig. 12. *Fictitious approach of any two points (explanation in text)*

In this situation if one draws any line on the plate and assumes that it is a line of convergence, then calculated reduction of distances between any two points placed on opposite sides of the line, will confirm this assumption (Fig. 13 a,b). The same applies to any other line (Fig. 13 c, d).

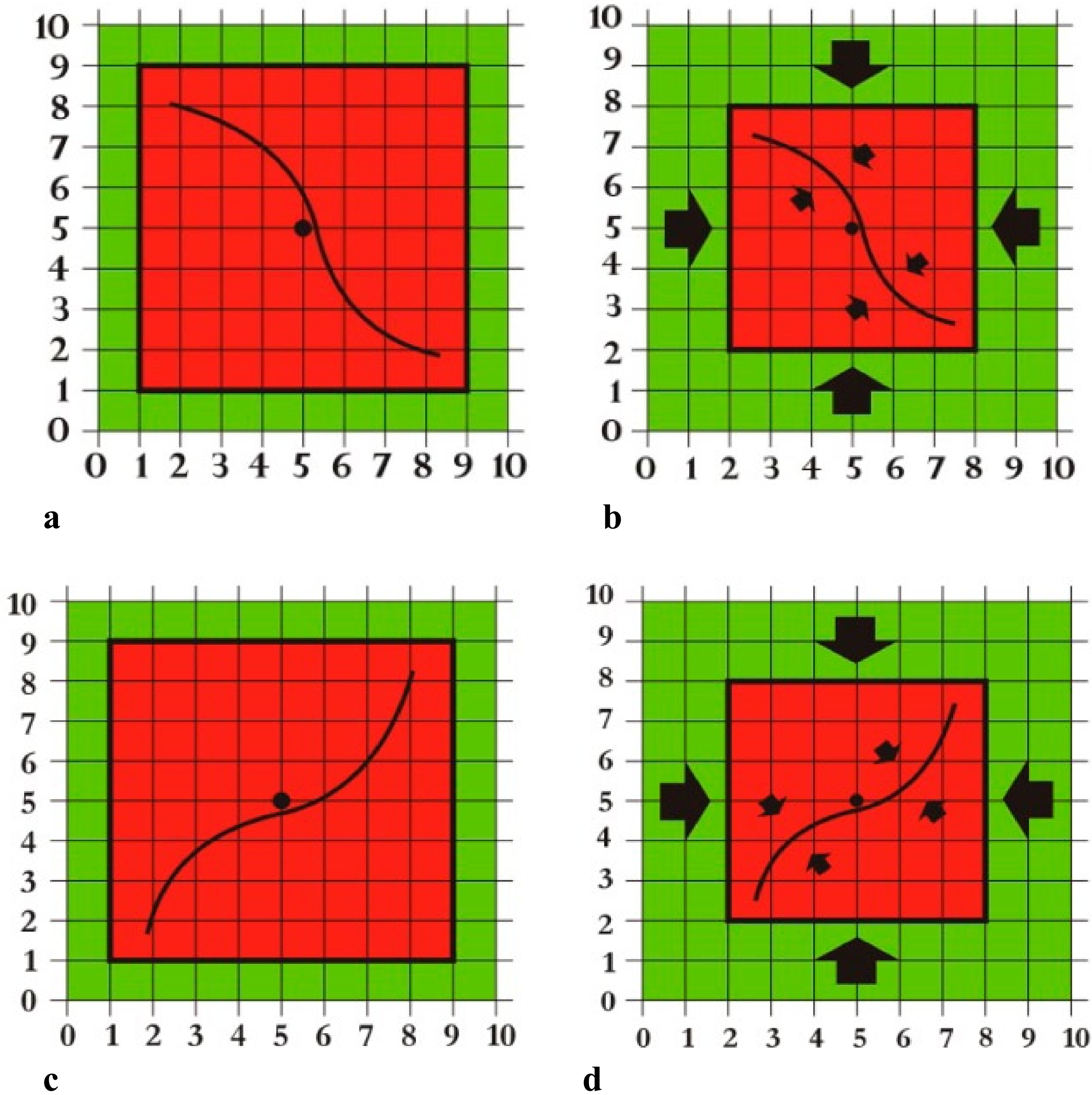


Fig. 13. *Fictitious convergence along any line (explanation in text)*

Of course this result is not a result of direct measurement but only comparison of calculated distances from changed coordinates of the points (compare point I.2 e).

It has to be underlined that convergent plate borders assumed in plate tectonics (young fold belts and oceanic trenches) are in fact divergent ones (see point I.4). However, the divergence is here much less than at oceanic ridges. Thus, both sides of such zones effectively form one plate to which the principle of fictitious convergence applies.

2. Two principles of fictitious convergence

Two rules can be formulated, linked with the fictitious convergence. They will be used in point IV.2.

1. *The velocities of apparent convergence of two points on a plate and real divergent movement of two cross points of geodetic grid corresponding to them are equal as scalars but opposite as vectors (equal in magnitude but opposite in direction).*
2. *Since the real divergent velocity of two cross points of expanding grid of coordinates is proportional to their mutual distance, thus the apparent convergent velocity of two corresponding to them points of a plate is also proportional to their mutual distance.*

The velocity of expansion and the corresponding velocity of fictitious contraction is determined by a coefficient of proportionality which determines velocity of any expanding medium. I have called it Hubble's factor (Koziar, 1994) and designated it by small letter (h) to distinguish it from Hubble's constant designated by a capital letter (H) and used in astronomy. Of course, Hubble's constant is a particular case of Hubble's factor (coefficient).

For present rate of Earth's expansion indicated by my value (Koziar, 1980; accessible at the address www.wrocgeolab.pl/floor.pdf) of annual growth of the Earth radius (2.6 cm/year), the Hubble coefficient is $h_E = 4 \times 10^{-9}$ year^{-1}**.** For Maxlow's more recent and probably more accurate value (Maxlow, 2002) of annual growth of the Earth radius (2.2 cm/year) the Hubble coefficient is $h_E = 3.5 \times 10^{-9}$ year $^{-1}$.

3. Heezen's effect of fictitious drift of a plate towards its centre

Heezen's principle is similar to Blinov's one and was formulated already in 1962 but without any reference to geodesy (geodetic grid), only to oceanic ridges. He wrote (Heezen, 1962, p. 278-9):

> *If Africa has moved east relative to the Mid-Atlantic Ridge, it must be running into the Mid-Indian Ridge. If South America has moved west relative to the Mid-Atlantic Ridge, it must be colliding with the Easter Island Ridge; and if one considers the drift of Antarctica relative to the Mid-Atlantic, Mid-Indian and Easter Island portion of the Ridge, one must only conclude that Antarctica has shrunk, for the pattern of the Ridges would indicate that Antarctica must have drifted towards its geographical centre.*

a. Heezen's effect demonstrated on a physical model

Expanding oceanic ridges around continents can be demonstrated by analogy using a mechanical device (Koziar,1980; www.wrocgeolab.pl/floor.pdf) on which a rubber disc can be stretched radially (Fig. 14).

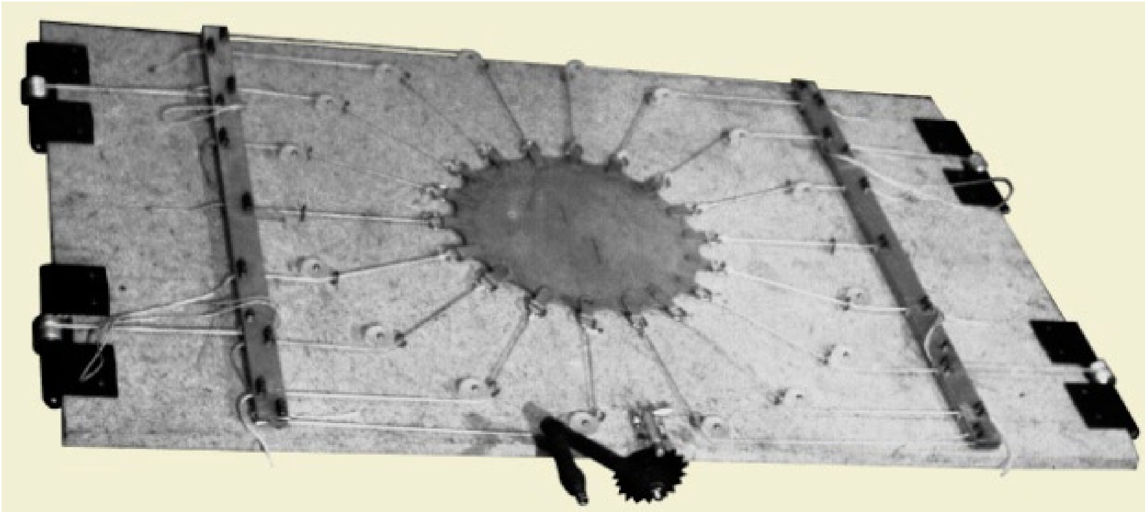
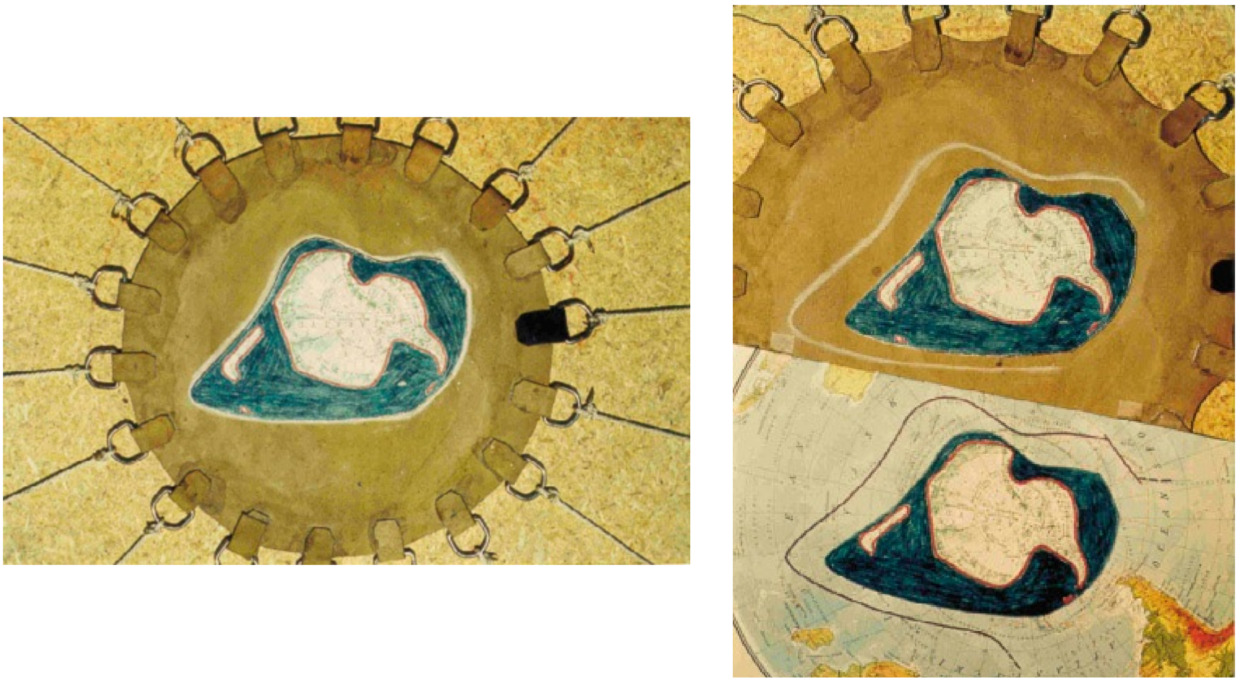


***Fig. 14.** Device for radial stretching of the rubber disc*

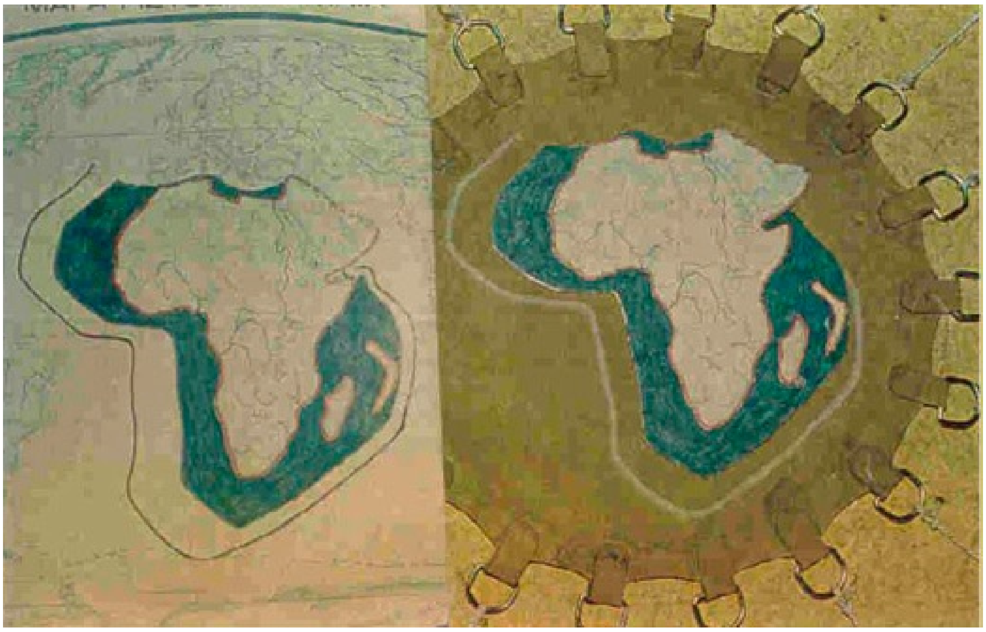
A stiff plate in the shape of the Mesozoic Antarctic plate is placed on the rubber surface and outlined with chalk (Fig. 15 a). After isotropic stretching of the rubber the outline is enlarged (Fig. 15b top) which corresponds to the real situation (Fig. 15 b bottom).



a **b**

***Fig. 15.** Heezen's effect illustrated by radial growth of oceanic ridges around Antarctica (explanation in text)*

a



b

Fig. 16. *Heezen's effect illustrated by radial growth of oceanic ridges around Africa (explanation in text)*

When we now consider relative movement of the Antarctic plate with respect to the surrounding ridges used as a reference frame (and they really are such a frame) and do not take into account the stretching of the basement, it appears that the whole Antarctic plate "must have drifted towards its geographical centre".

The same is true of the African plate (Fig. 16). In Fig. 16 b right, the plate is artificially (after the experiment) shifted to NE because it is not tectonically independent and is pulled in this direction by Eurasia. This mechanism is explained in more detail in points V.4 – V.6.

b. Heezen's effect demonstrated on a geometrical model

Heezen's principle can be also demonstrated on the previous geometrical model and this variant will be very useful to analyse the global geodynamic pattern (points V.4 – V.6).

Let us consider a round continental plate with surrounding plates lying on an expanding basement with an expanding geodetic grid (Fig. 17 a). The central plate is separated from other plates by a narrow rift with an initial oceanic ridge (black circle). During expansion the basement slips out from under the plate in all directions (Fig. 1 b) and the black arrows mark its real movement.

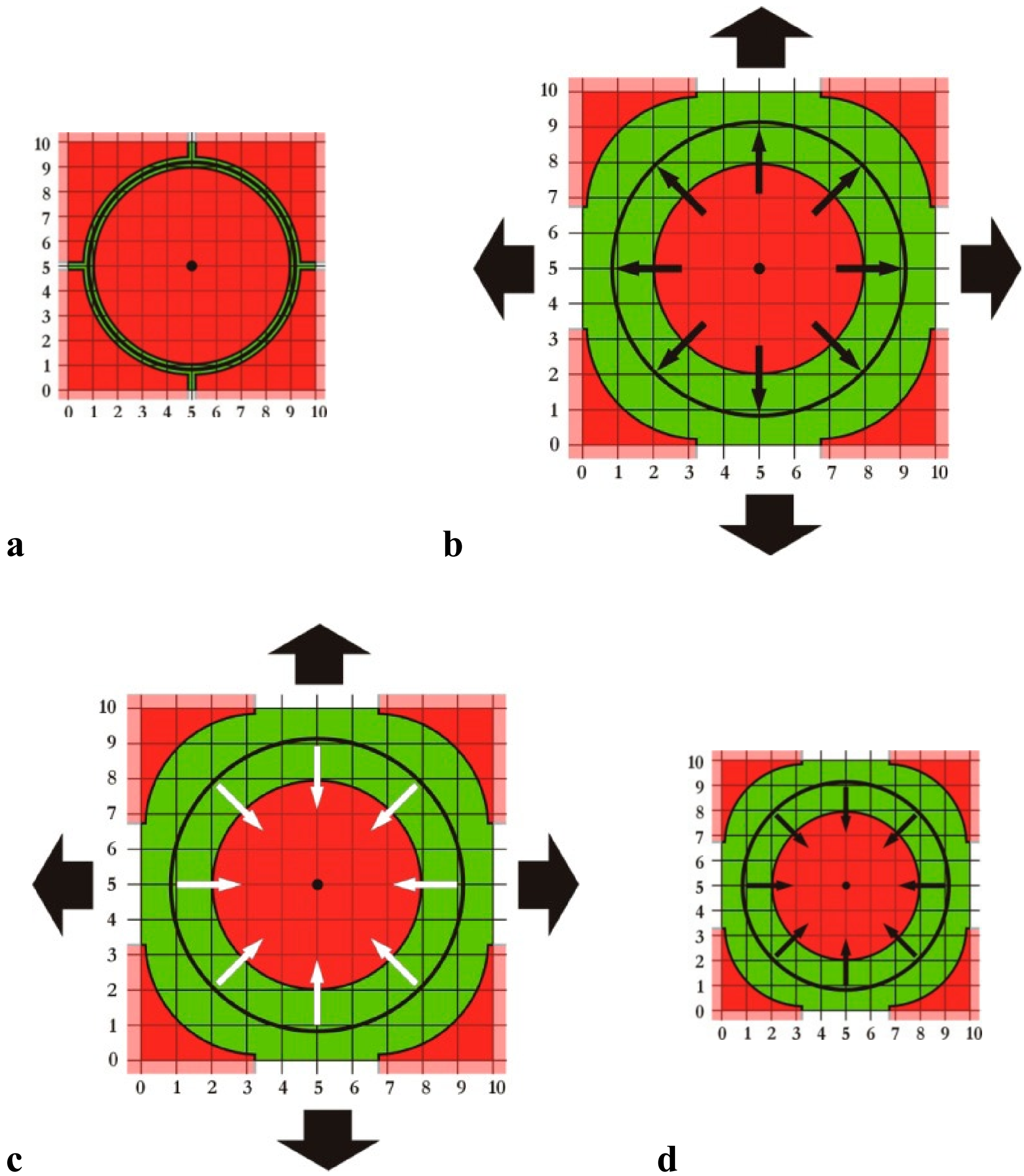
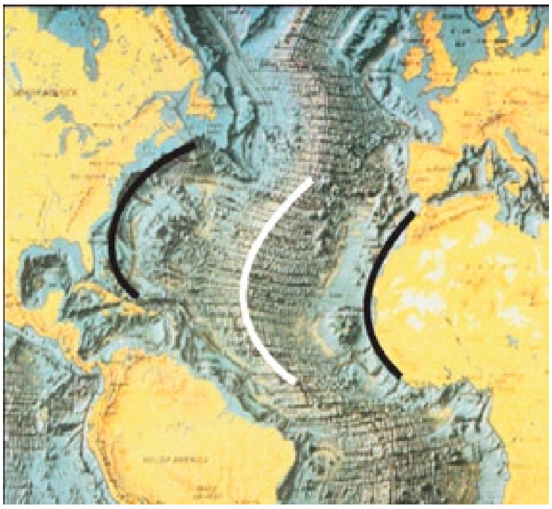


Fig. 17. Heezen's effect presented on geometrical model (explanation in text)

Now, if the displacements of the points on the perimeter of the plate are measured relative to the expanding geodetic grid (as space geodesy does) then each of them will apparently move toward the centre of the plate (white arrows). These oppositely directed arrows will display fictitious, collisional movement and the whole plate will fictitiously shrink. If the expansion of the basement is unnoticed or rejected then the conviction that the opposing arrows are real and that the plate is really shrinking is a natural one (Fig. 17 d).

As a result of the expansion the curvature of the ridge is diminished relative to its parent continental margins (Fig. 17 c and d). It is especially well visible in comparison with the concave margins of outer plates. These relations are well visible in the central and south Atlantic (Figs. 18 a, 18 b).

a 

b 

Fig. 18. *Lesser curvature of oceanic ridges in relation to parent continental margin (with reference to Fig. 17). Explanation in text.*

4. Effect of fictitious "rear-end collision"

Let us consider a plate lying on an expanding basement (Fig. 19 a). The points of the basement are moving away radially from the stable point of transformation and their speed is proportional to the distance from this stable point. The velocity vectors of the points of the plate, measured relatively to the expanding geodetic graticule, have opposite sense (Fig. 19 b). Because each such a vector is greater than its antecedent, any two points lying on the line directed to the stable point of transformation will imitate a "rear-end collision" (as opposed to "head-on" collision") *i.e.* collision of two cars moving in same direction but the back car is moving faster. (Fig. 20). If the expansion of the basement is neglected (Fig. 19 c) then the fictitious rear-end collisions will be treated as a real process.

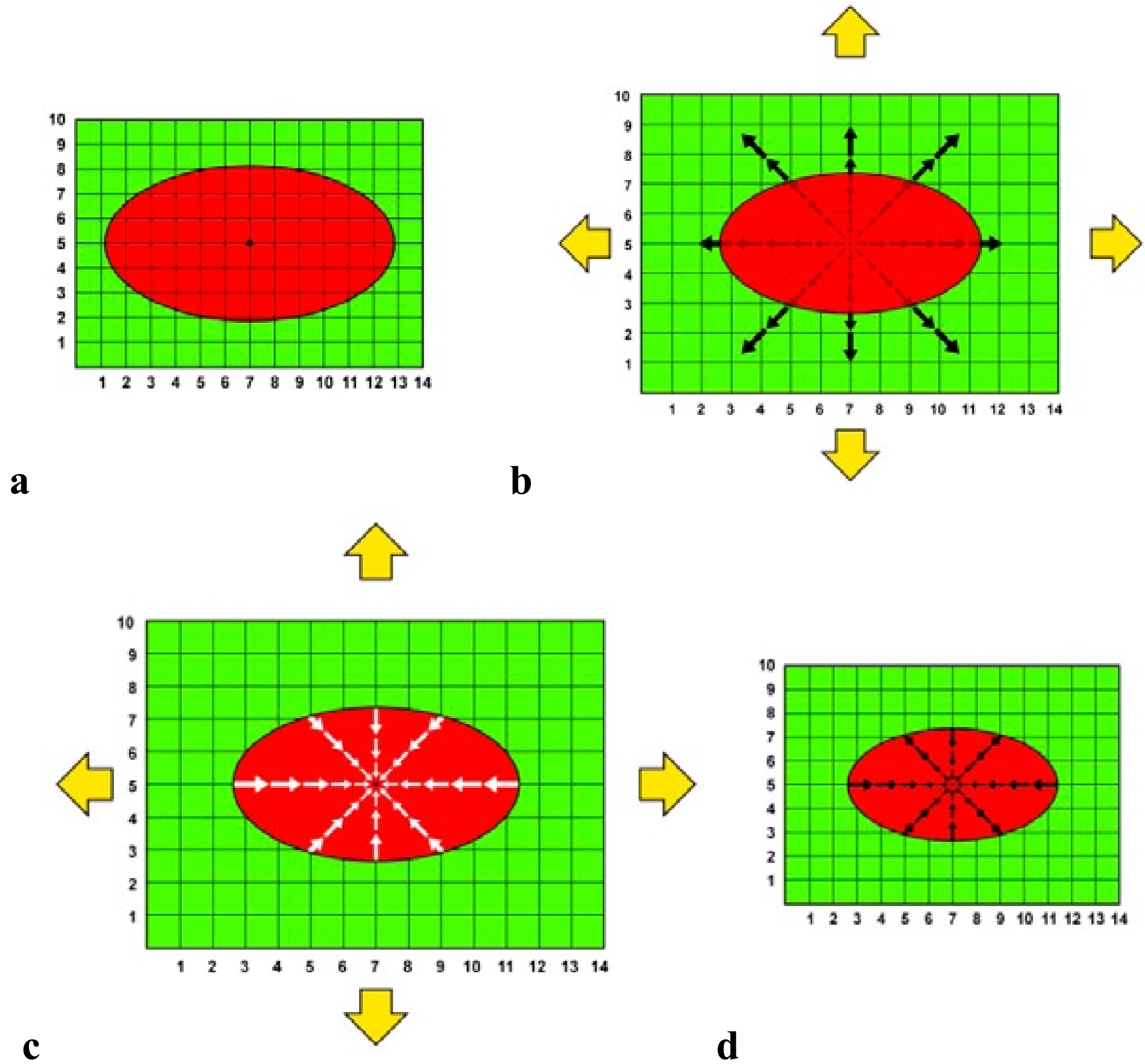


Fig. 19. *Presentation of the of the "rear-end collision" effect in horizontal dimensions (explanation in text)*

Fig. 20. *Mechanism of rear-end collision (Internet)*

Such situations take place in the case of Alps, Mediterranean Sea and Himalayas as well (see points V.5 and V.6). Let us consider apparent nature of the process, this time on a cross-sectional model of the lithosphere and upper mantle with a marked mountain chain and an adjacent sea basin (Fig. 21 a).

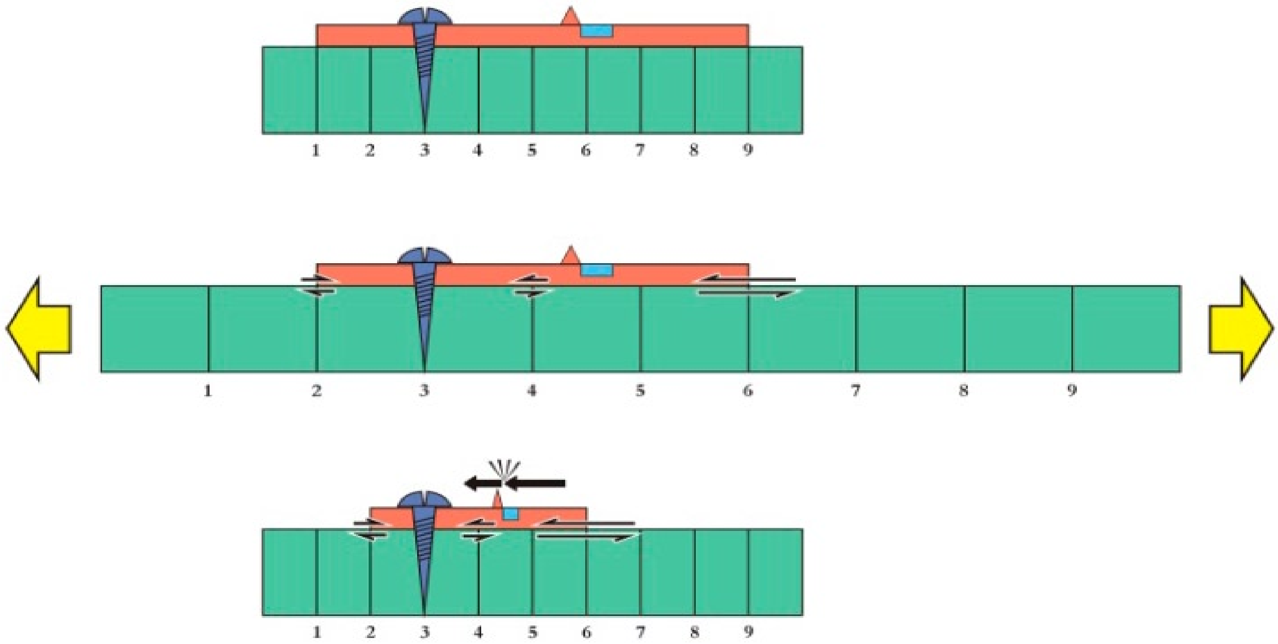


Fig. 21. *Demonstration of the effect of fictitious rear-end collision on a cross-section of the lithosphere and upper mantle (explanation in text)*

During stretching of the basement (Fig. 21 top and middle) it moves away from the stable point of transformation (screw) together with the stretched geodetic grid. The movement is the faster the further is a given element of the basement from the SPT, as illustrated by the lower shearing arrows. This is a real movement. The movement of particular points of the plate, measured relative to the stretched grid, proceeds apparently in the opposite direction (upper shearing arrows). This apparent opposite movement is also bigger the further from the SPT a given point of the plate is. Thus, the whole plate apparently shrinks, and in that way points further from SPT "collide from behind" with points nearer to it. If we concentrate on special structures of the plate, those which were preconceived as collisional, and simultaneously neglect the expansion of the geodetic graticule, we will obtain fictitious confirmation of their assumed collisional origin (Fig. 21 bottom). The confirmation is once again circular.

5. Effect of fictitious "head on collision"

In certain situations a fictitious "head on collision" can appear and probably this happens in the east-Asia margin (see points V.5 and V.6).

Let us consider a similar scheme as before but a section of the plate near the stable point of transformation is weak and substantially stretched during expansion of the basement (Fig. 22 top and middle).

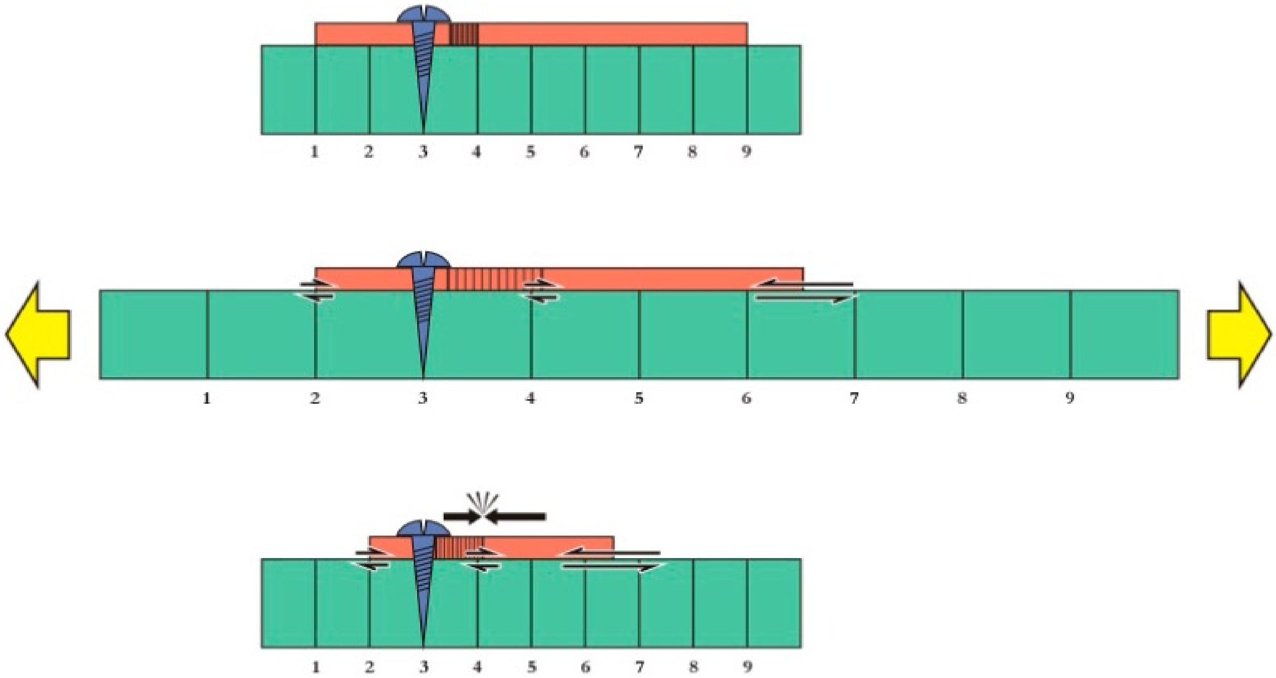


Fig. 22. *Effect of fictitious head-on-collision (explanation in text)*

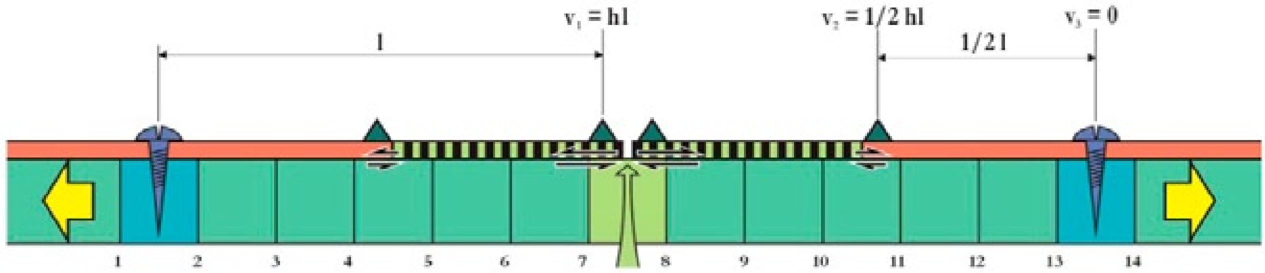
By means of such local extension the outer border of the stretched fragment can move away relative to SPT along with the expanding basement and the geodetic grid. However more distant part of the plate will still *apparently* move toward the SPT (Fig. 22 middle). Neglect of the expansion of the basement will produce a fictitious head on collision (Fig. 22 bottom).

6. Effect of fictitious slowing down of the spreading rate

Earth expansion reveals itself also in the distortion of the results of interplate satellite measurements (*i.e.* where compared points are separated by an oceanic ridge). An apparent slowing down of the spreading between the plates occurs, in comparison to the values obtained by the geophysical methods (based on analysis of the magnetic stripes) – see point IV.3.

The apparent slowing down, as with other artefacts, results from the expansion of the Earth not being taken into account in space geodesy calculations. This may be explained using, as above, vertical sections of the basic model (Fig. 1).

Fig. 23 shows a section of two plates, fastened to the stretched basement at their stable points of transformation (SPTs; the screws).

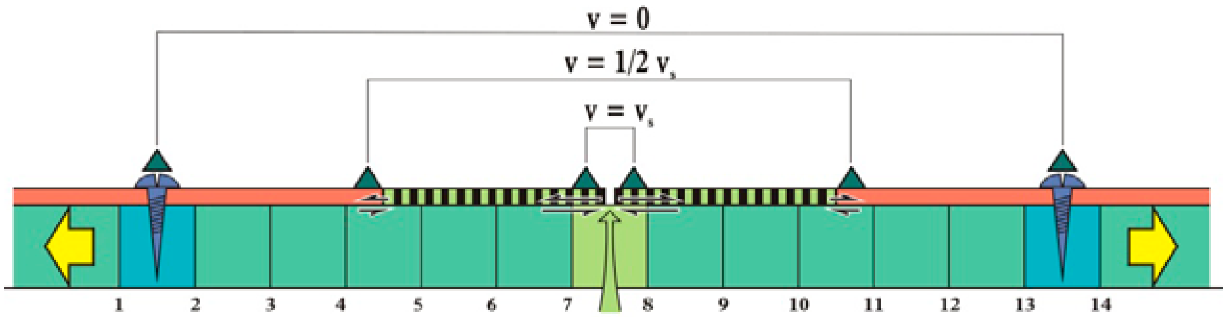


$v = hl$

Fig. 23. *Speed of the expanding basement in relation to a plate (explanation in text).*

The speed of the basement in relation to the edge of the plate (i.e. the rifting speed $\mathbf{v_1}$) is equal to the distance **l**, between the rift and the stable point of transformation, multiplied by the Hubble coefficient **h**. The rifting speed is, of course, equal to the speed of spreading, calculated from magnetic stripes. If a distance from the SPT is half as long then the speed of the basement in relation to the plate $\mathbf{v_2}$ is half as fast. At the stable point of transformation (**l = 0**) the speed $\mathbf{v_3} = \mathbf{0}$.

Let us now consider, the mutual relative speed **v** of two points (corresponding to sites of geodetic stations), moving apart on either side of the rift (Fig. 24).



$v = 2hl$

Fig. 24. *Relative speeds of the geodetic stations on the opposite sides of the ridge when the expansion of the basement is not noticed (explanation in text).*

The speed is measured, of course, relative to the expanding geodetic graticule. Between pairs of points lying in the vicinity of the rift, the calculated speed will be equal to the speed of bilateral spreading $\mathbf{v_s}$. At points placed midway between the rift and the SPTs, the speed will be halved. If the both stations lie on SPTs the speed will be zero. If the stations lie beyond SPTs then the speed of relative movement between them will reach negative values. That is, since the mantle beyond the "screws" moves in opposite direction relative to them. Thus the really divergent plates will appear to be converging (if expansion of the basement and geodesic grid is unnoticed).

It must be pointed out that on an expanding Earth (Fig. 23 and 24) the real velocity between any two points, located on either side of the rift, is equal to the spreading rate at the rift. However, the velocity relative to the basement (and the geodetic graticule) is reduced as the distance from the rift increases. And these values are interpreted incorrectly by space geodesy (in the framework of plate tectonics) as the current spreading rates. In this way the real spreading rates are fictitiously reduced.

It must be also pointed out that plate tectonics, perforce, does not distinguish these two different types of velocities discussed above.

IV. Recorded artefacts in relative motion of points and plates

All plate tectonic convergences at island arcs and young fold belts, confirmed by space geodesy, are artefacts. However below, only those artefacts are presented which are inexplicable even by plate tectonics.

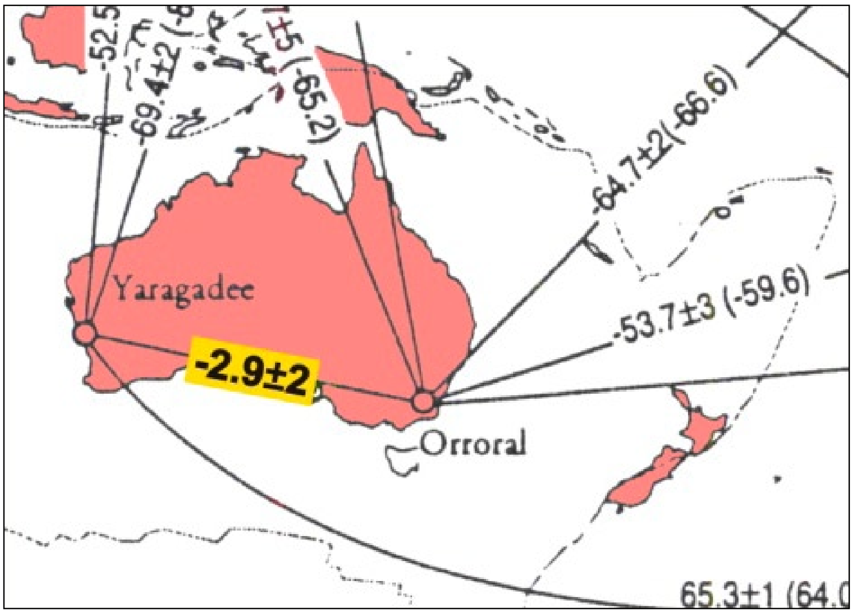
The papers used in this section were published in the 80s and 90s of the former century, so they can be considered outdated. However, these were the decades when calculation of relative movement of plates mainly appeared. More recently, calculations of movements in the so-called absolute reference frame have dominated. Artefacts produced by this method will be presented in the following section.

1. SLR intraplate velocities displaying fictitious convergence

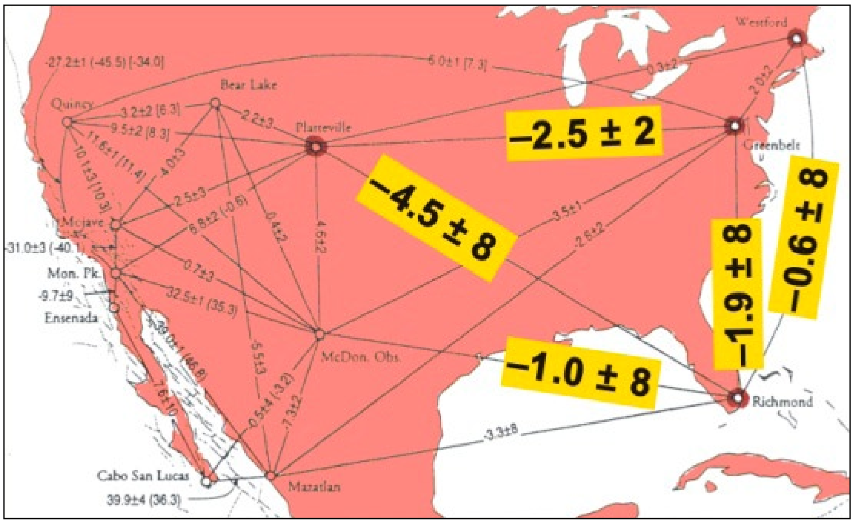
Fictitious shrinking of plates reveals itself unequivocal in the regions where between two mutually converging geodesic stations there does not exist any geological structure which could be interpreted as a tectonic zone of convergence. Such regions include for example Australia and the cratonic part of North America. Fictitious shrinking on these cratons was for the first time noticed by Carey (Carey, 1988, p. 172):

> *According to the mean of nine measurements on four chords, stable America (that is, east of Rocky Mountain Front) appears to be shrinking at 1.2 cm per year, and from the mean of four measurements on one chord, stable Australia appears to be shrinking at 2.4 cm per year.*

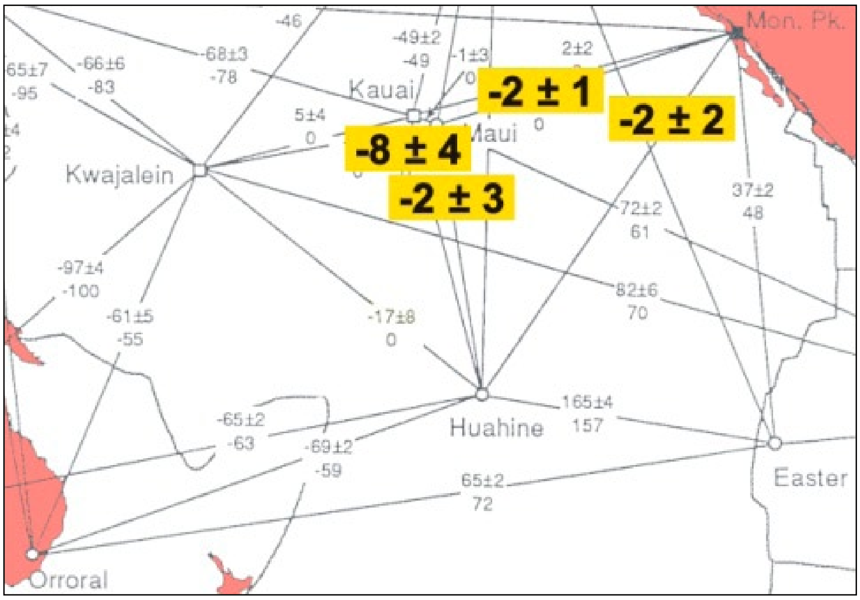
This fictitious shrinking is visible in both regions on maps published later: in Australia (Fig. 25 a) and the cratonic part of North America (Fig. 25 b).


Yaragadee
Orroral
-2.9±2
-53.7±3 (-59.6)
-64.7±2(-66.6)
-69.4±2
-65.2)
-52.5

a


Westford
Greenbelt
Platteville
Bear Lake
Quincy
Mojave
Mon. Pk.
Ensenada
McDon. Obs.
Richmond
Cabo San Lucas
Mazatlan
–2.5 ± 2
–4.5 ± 8
–1.9 ± 8
–0.6 ± 8
–1.0 ± 8
-27.2±1 (-45.5) [-34.0]
6.0±1 [7.3]
39.9±4 (36.3)
-3.3±8

b


Mon. Pk.
Kauai
Maui
Kwajalein
Huahine
Easter
Orroral
-2 ± 1
-2 ± 2
-8 ± 4
-2 ± 3
-46
-49±2
-49
-1±3
2±2
-68±3
-78
-66±6
-83
5±4
0
72±2
61
37±2
48
82±6
70
-97±4
-100
-61±5
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165±4
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-65±2
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72

c

d

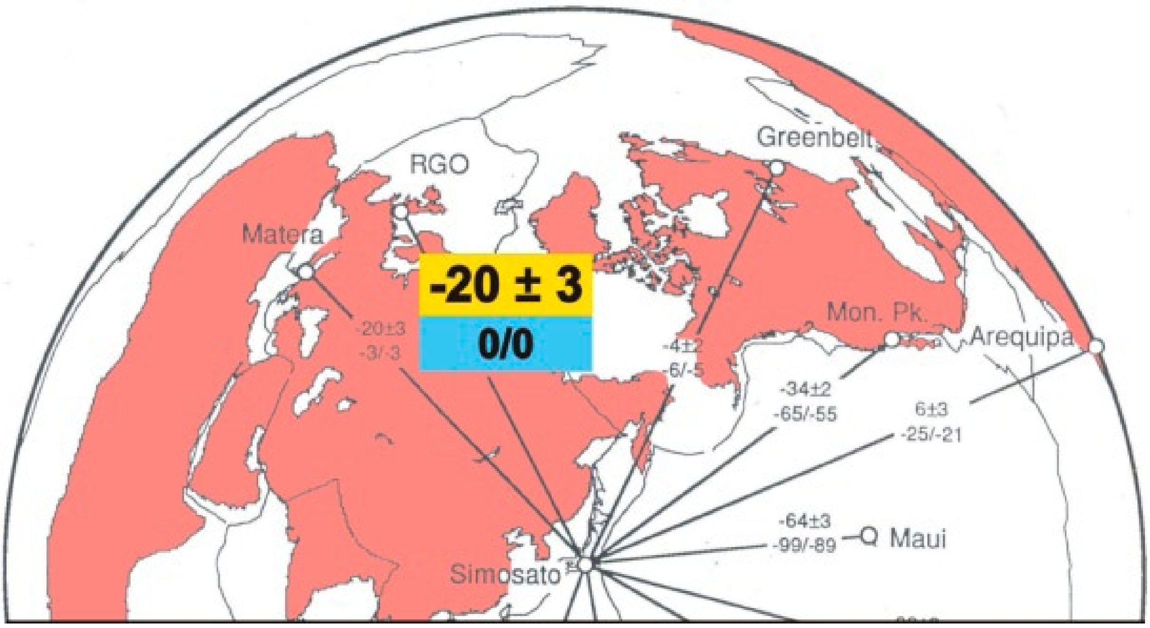


Fig. 25. *Fictitious shortening of geodetic distances displayed by tectonically stable areas (explanation in text)*

Fictitious shrinking appears also inside the Pacific plate (Fig. 25 c); Robbins *et al.* (1993) and between west and east edge of Asia (Fig. 25 d – in blue are geophysically based plate tectonic calculations); Smith *et al.,* (1990).

2. Fictitious contraction of VLBI networks

a. Location of VLBI networks

Space geodesy stations are located mainly in the northern hemisphere. This is especially true of VLBI stations which use big radio telescopes. Thus, the networks of VLBI stations covered mainly the northern megaplate[14]. Compactness of this megaplate grows northward (see Fig. 38). Therefore it is expected that apparent contraction of it and the VLBI networks disposed on it should appear in spite of the fact that many zones of dilatation exist there. And in fact such an effect is found.

b. Size of the contraction of VLBI networks

A Japanese team (Heki *et al.,*1989) calculated the change of the chord distances (baselines) between two different groups of VLBI stations (both on the northern hemisphere). The results were published and discussed in a section titled: ***"Apparent(?) Uniform Contraction of the VLBI Networks".*** The first group of 50 sites comprised all VLBI stations of the northern hemi-

[14] The northern megaplate consists all plates apart from the Antarctic one (see sectionsV.4 – V.6).

sphere. It appeared that all calculated mutual velocities had negative deviation from the values predicted by plate tectonics. What is more, it appeared that the deviations are proportional to the length of the baselines and equals 1.3 mm/year/1000 km.

The authors stated, that indeed the plates move in accordance with known kinetics (which in fact means accordance with Carey's Arctic Paradox which records Earth expansion – see points V.4 – V.6) *"but also seem to be uniformly/isotropically contracting"* (p. 681).

The second group consisted of 5 stations from the region of northern Pacific: Kashima (Japan), Fairbanks (Alaska), Vandenberg (California), Kauai (Hawaii) and Kwajalein (Marshall Islands). In this region the same effect appeared as previously, and the rate of proportional contraction was almost the same: 1.1 mm/year/1000 km.

The authors calculated a Hubble coefficient for such uniform contraction – it came to be about $1x10^{-9}$/year and they suspected contraction of the whole Earth. Both previously calculated parameters (calculated by the authors) yield the rate of shortening of the Earth's radius: 7-8 mm/year. The authors suggested geophysical verification of the process by measurements of the predicted growth of the force of gravity (a few microgals/year) and predicted increase in the speed of the rotation of the Earth (a few milliseconds/century).

Simultaneously the authors considered the possibility that the effect might be only apparent rather than real. However, the factors they considered in this regard – atmospheric interference, synchronization errors – were trivial in comparison with Blinov's effect, of which they were evidently unaware. The authors even reported that they were developing a special computer program to control these factors, the application of which was supposed to help decide ***„whether the uniform contraction is real or apparent"*** (p. 682).

c. Explanation of the contraction of VLBI networks

The answer is: the contraction is apparent, however it does not result from secondary factors disturbing measurements but from a first-order geotectonic factor which is Earth expansion. The problem is not one of measurement technique but that of not taking into account the expansion of the geodetic graticule and Blinov's effect.

Apparent contraction of the VLBI network (and even – as the authors considered – of the Earth) corresponds to a real expansion of the Earth described by the same Hubble coefficient. In point (III.2) there were given two values of the coefficient, calculated from the annual increment in Earth radius given by me ($h_E = 4 \times 10^{-9}$ year $^{-1}$) and Maxlow ($h_E = 3.5 \times 10^{-9}$ year $^{-1}$). Hekki *et al.*'s result (1×10^{-9} year^{-1}) is of the same order as these, despite having been obtained in a quite different way. If the Earth were not expanding then such concordance would be improbable. Meanwhile the actual concordance may be better still. The lower value of Hekki *et al.*'s coefficient should be linked with unavoidable stretching during expansion of such big piece of lithosphere as the the northern megaplate.

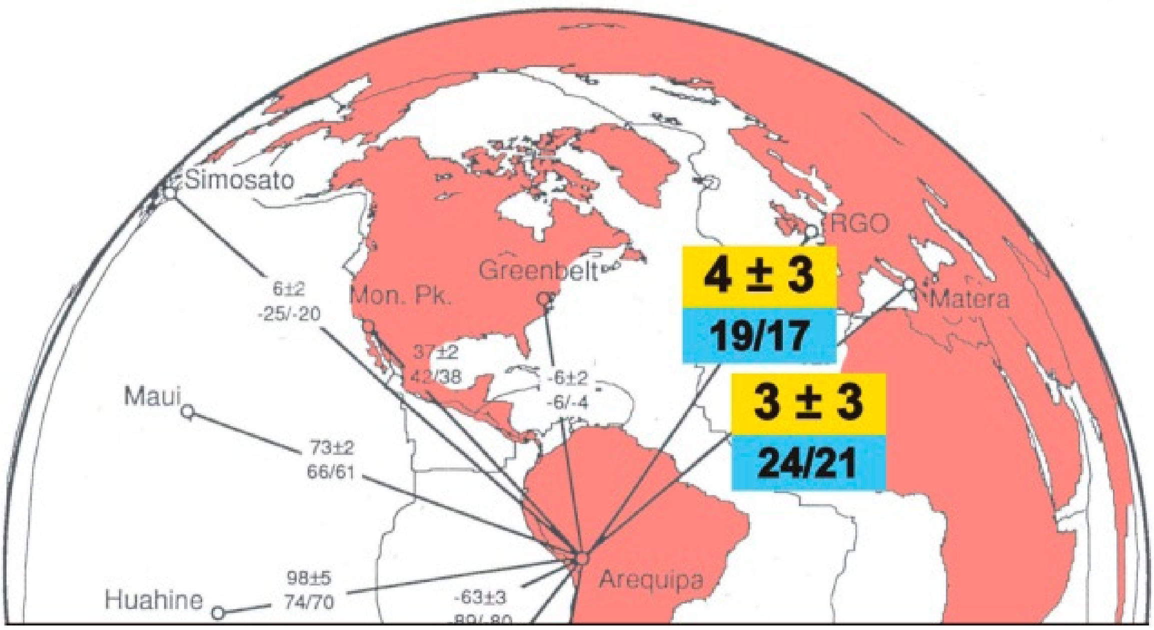
The apparent annual shortening of the Earth's radius translates to an equivalent annual increment (7 – 8 mm) which should be treated as a lower limit of the real value. The annual increment of the Earth's radius, resulting in this way, certainly exceeds 1 cm/year.

3. Interplate SLR velocities displaying fictitious slowing down of the spreading rate

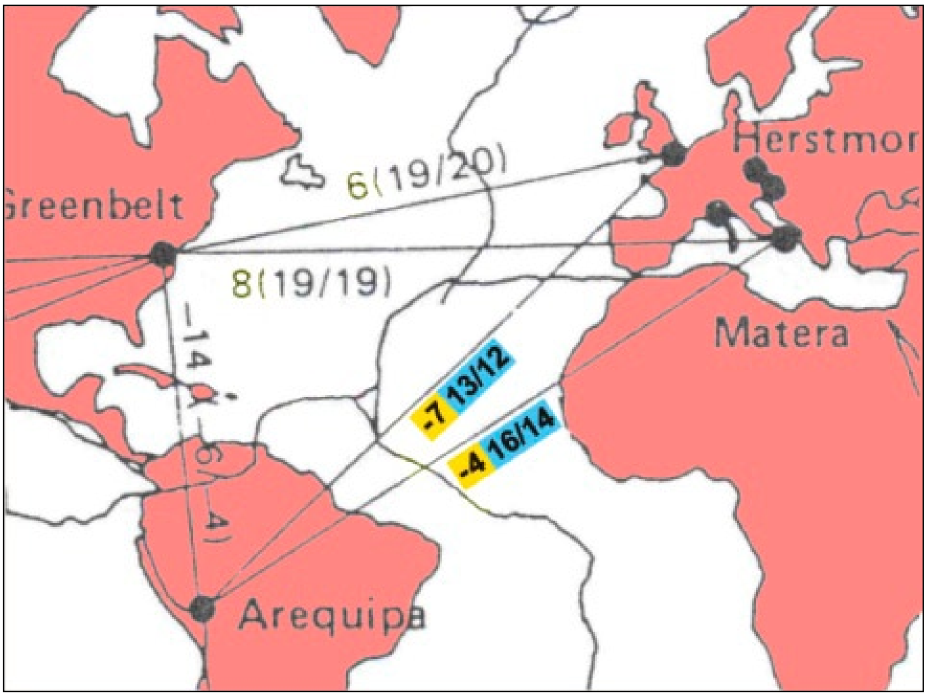
In the paper by Smith *et al.* (1990, p. 22028) the authors noticed that:

> *the global comparison between SLR estimates of relative motions and those deduced from the geologic models indicate a general slowing.*

This statement specifically applies to divergent movements on oceanic ridges *i.e.* spreading rates. The effect was explained in point (III.6) and is clearly seen between points on both sides of the Atlantic Ocean (Fig. 26 a).



a



b

Fig. 26. Fictitious slowing down of spreading rate (explanation in text)

The SLR measurements between Arequipa in Peru and the RGO and Matera stations in Europe, give respectively 4 and 3 mm/yr, while the speed estimated on the basis of the magnetic stripes is about 2 cm/yr (Smith *et al.,* 1990).

As was explained in point (III. 6), if the stations lie beyond SPTs then the speed of their relative movement will reach negative values.

Such negative values (Fig. 26 b) for evidently diverging border of Atlantic Ridge appeared in the subsequent paper (Murata, 1993) which obtained such negative speeds between European stations and Arequipa.

All these results are readily explicable in terms of Earth expansion, while they remain unexplained in terms of plate tectonics.

4. SLR velocities across the Pacific displaying expansion of this ocean

Apparent collisions of the plates on the lines of Pacific trenches are confound by the results of measurements of distances across the Pacific, which prove directly the expansion of this ocean.

a. Expansion of the South Pacific

It has to be pointed out that expansion of the South Pacific results even from plate tectonic calculations. Thus, in the framework of plate tectonics, *all* ocean basins are expanding with the single exception the North Pacific. That by itself makes problematic the plate tectonic position that all oceanic growth is being compensated by subduction, if only the North Pacific is experiencing net contraction

Expansion of the South Pacific calculated by plate tectonics is confirmed by space geodesy (Fig. 27).

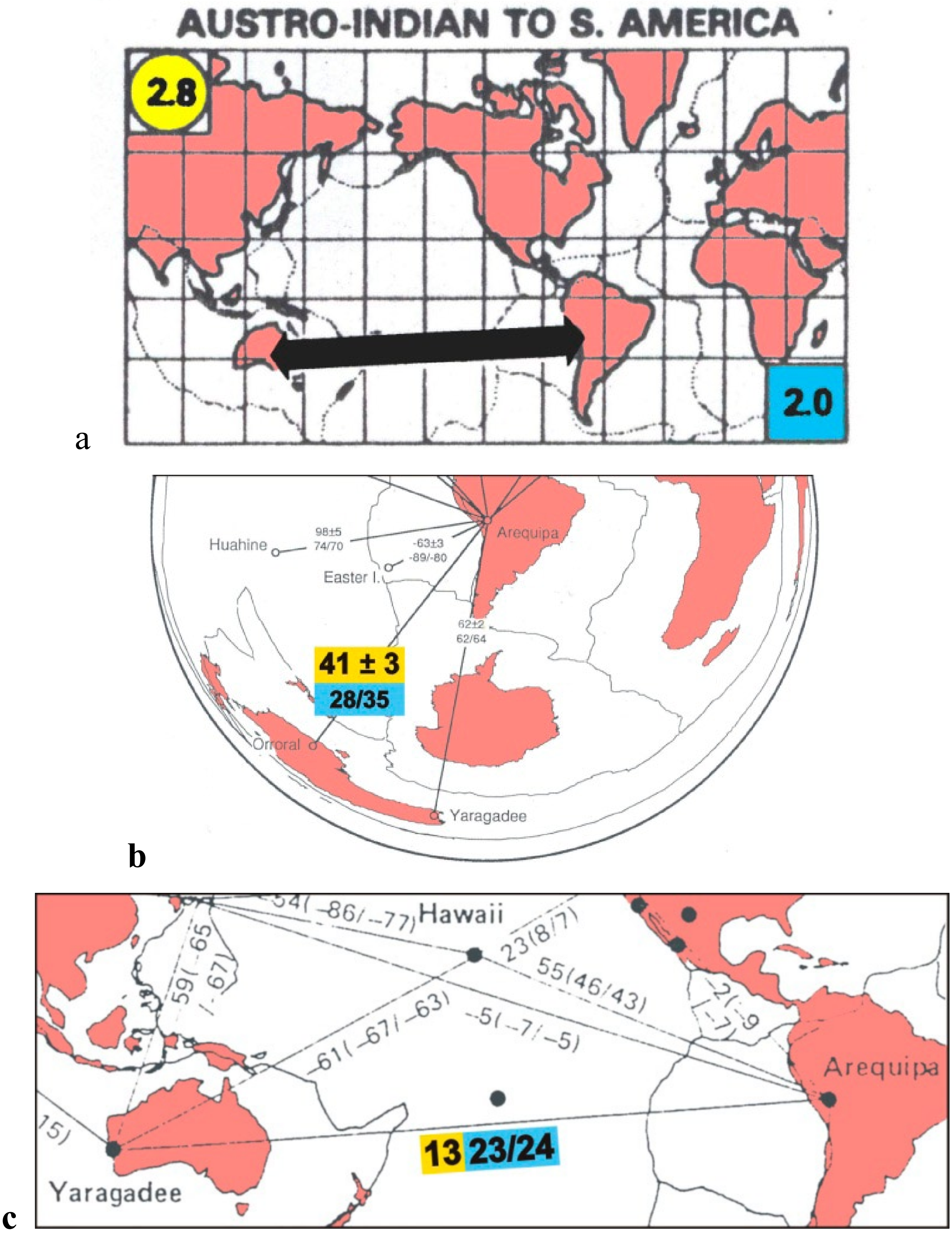


*Fig. 27. Rates of expansion of the South Pacific, (**a**) 2.8 cm/year by space geodesy, 2.0 cm/year by plate tectonics (Christodulidis et al., 1985), (**b**) 4.1 cm/year by space geodesy, 2.8/3.6 cm/year (two different calculations) by plate tectonic (Smith et al., 1990), (**c**) 1.3 cm/year by space geodesy, 2.3/2.4 cm/year by plate tectonics (Murata, 1993)*

b. Expansion of the North Pacific

The results of geodetic calculations across the North Pacific are conclusive (Fig. 28)

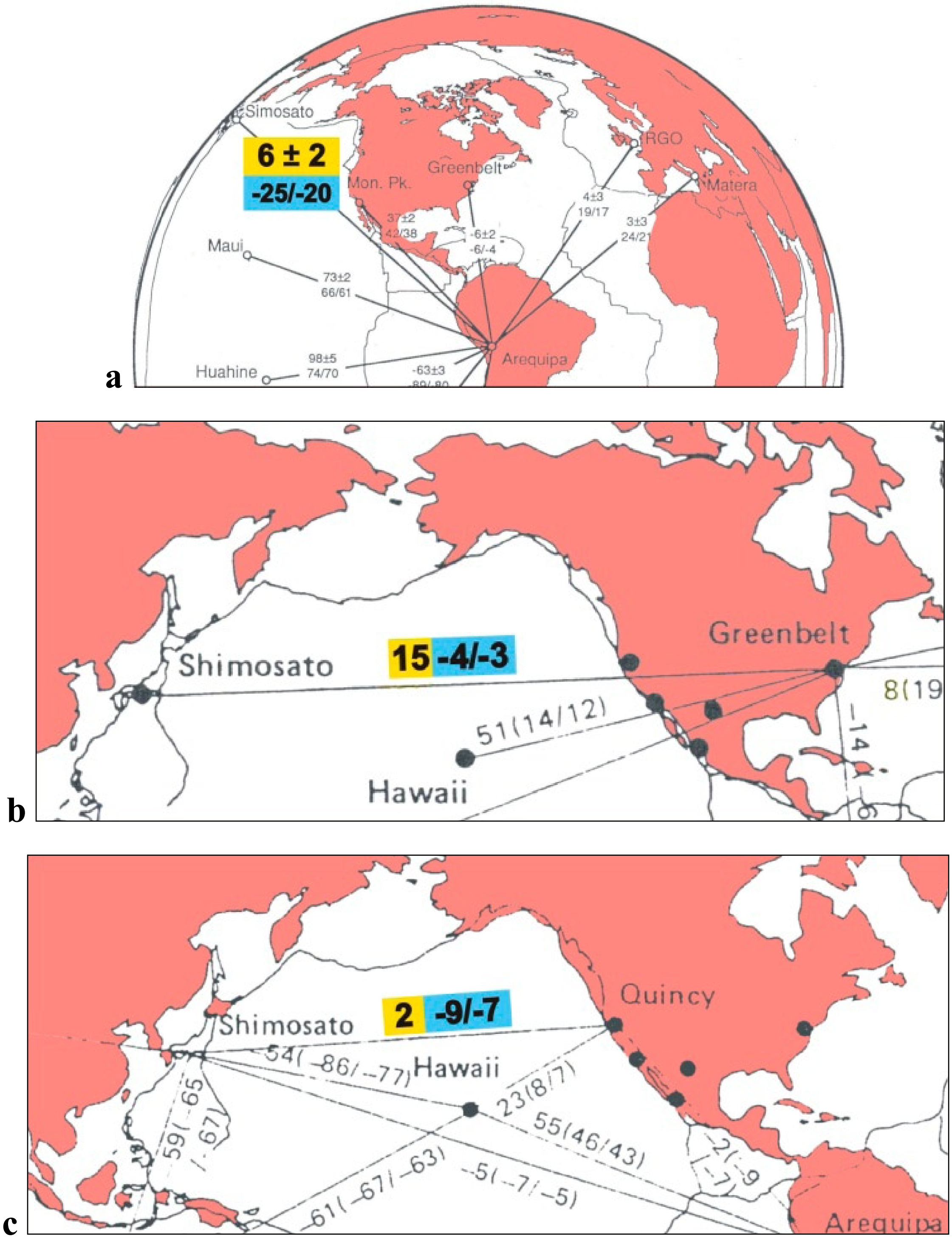


*Fig. 28. Rates of expansion of the North Pacific, (**a**) 0.6 cm/year by space geodesy, -2.5/-2.0 cm/year (different calculations) by plate tectonics (Smith et al., 1990), (**b**) 1.5 cm/year by space geodesy, -0.4/-0.3 cm/year by plate tectonics (Murata, 1993), (**c**) 0.2 cm/year by space geodesy, -0.9/-0.3 cm/year by plate tectonics (Murata, 1993)*

Thus according to space geodesy the whole Pacific is expanding. It confirms Carey's geological analysis finding the elongation of the perimeter of this ocean (see point I.1).

The expansion of the Pacific together with the expansion of the other oceans is equivalent to an expansion of the Earth.

V. Recorded artefacts in the movements in so called "absolute" reference frames

In this section a different class of recorded artefacts is presented.

With respect to plate tectonics perspective, the individual artefacts fall into three categories: those which are accepted and explained by the paradigm, those which are accepted but not explained, and those which cannot be accepted. To the first belongs convergence on oceanic trenches and fold belts. To the third belongs convergence inside cratons. To the second belongs northward movement of almost all plates in so-called "absolute" reference frames (NNR and hot spot reference frames), which will be discussed in this section.

1. Problem of absolute reference frame in plate tectonics and contemporary space geodesy

Expanding Earth provides simple driving mechanism and an absolute reference frame for lithospheric plates (see section I). Both problems are difficulties in plate tectonics. The paradigm is unable to connect the movement of the plates with hypothetical convection currents in the mantle. Thus, the currents are not a driving mechanism of the plates. According to plate tectonics the mantle matter is continuously displaced and mixed as boiled water in a pot. Thus, the mantle matter cannot be (in this situation) a reference frame for the movement of plates. Plate tectonics has admitted this from the very beginnings and each of its three fundamental papers (McKenzie & Parker, 1967; Morgan, 1968; Le Pichon, 1968) dealt only with mutually relative movement of the major plates.

The problem of an absolute reference frame is well illustrated in quotation from the book "Plate tectonics" (Le Pichon *et al.,* 1973, p. 128–129):

> *A major confusion has appeared in the literature concerning the definition of a reference frame in which to measure the plate motions. For example, Irving and Robertson (1969) believed that, even though the*

plates do not define an "absolute" reference frame, the plate boundaries do. Franchetau and Sclater (1970) have demonstrated, that, if one uses Le Pichon (1968) six-plate model, neither the system of all the ridges nor that of all the trenches form a reference frame, since the ridges and trenches are all in relative motions.

It is worth emphasizing that the plate-tectonics model does not provide any "absolute" reference frame and the plate motions will be different depending upon the frame of reference chosen. No special reference frame is therefore favored by the observations.

However, the warning against "major confusion" notwithstanding, absolute reference frames have been sought and proposed by plate tectonicists in what appears to be an internal contradiction of its basic premises. For instance Burke and Wilson (1972) assumed that the African plate is such an absolute reference frame. Jordan (1975) assumed that the tiny Caribbean plate is such a reference frame, anchored to the mantle by two subducting plates.

Recently two kinds of the absolute reference frame have been accepted in plate tectonics. One is based on hot spots which are at the same time assumed to be unstable, relative to the mantle and one another. Therefore such a reference frame inherently cannot be of an absolute character. However, it is correct on the expanding Earth.

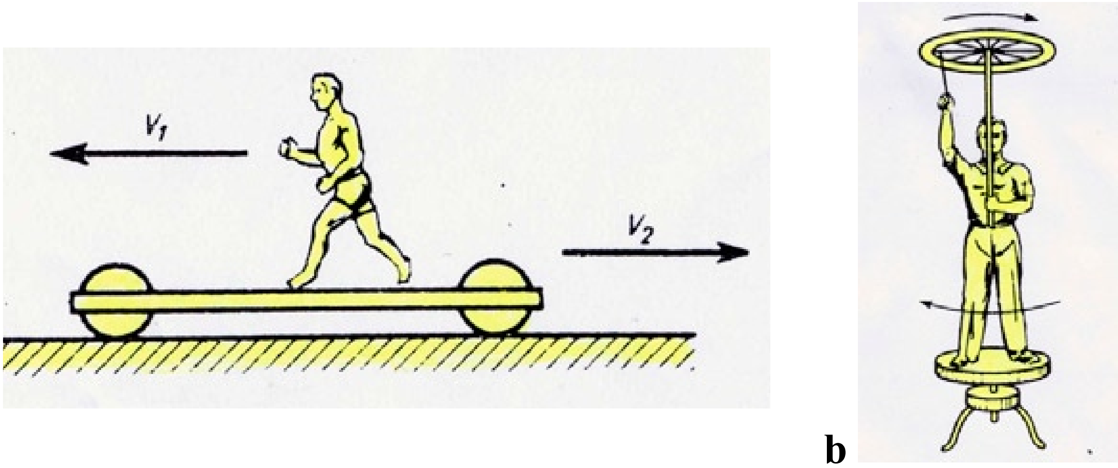
The second type is based on the so-called "No Net Rotation" condition (NNR absolute reference frame). It is derived only from the movement of the plates without any reference to their basement. This type of frame is also used by space geodesy and will be explained in the following section. Because on a non-expanding Earth it is only a quasi-absolute reference frame the term "absolute" will be used in inverted commas or omitted.

2. NNR "absolute" reference frame

a. Principles of NNR reference frame

The principles of the NNR absolute reference frame (based on the "No Net Rotation" condition) may be explained as follows.

Lets us first consider a motionless system of a wheeled platform with a man standing on it. Then, the man begins to run on the platform Fig. 29 a).



a b

Fig. 29. *Introduction to the NNR reference frame, (**a**) demonstration of the principle of preservation of momentum, (**b**) demonstration of principle of preservation of angular momentum (explanation in text)*

Automatically the platform begins to move in opposite direction. The basement is an absolute reference frame for the whole system. The sum of the momenta of both moving elements of the system, measured relative to the basement, is zero as it was before. Thus, if we lose the possibility of direct observation of the basement, as the absolute reference frame, we can find it as a frame in which the sum of the momenta is zero (no net momentum).

For the plate tectonic paradigm a better explanation is the one linked with rotation (Fig. 29 b) because of the assumed rotational (Eulerian) movement of plates. In this situation the absolute reference frame may be found by zeroing the sum of angular momenta of the components of the system. In the general case, of calculations of momenta and angular momenta, the mass of the elements plays the essential role. In the case of lithospheric plates it is reasonable to assign this role to area as a proxy for mass, since if their average thickness is treated as equal so their mass will be proportional to their areas.

The method corresponds to Tisserand's method of finding a distinguished reference frame for a system of many moving elements, by minimizing their kinetic energy. So, the NNR reference frame is also called a "Tisserand reference frame" (Altamini *et al*., 2003).

b. Visual model of NNR reference frame

The use of the NNR method is a good example of geodynamic problems that plate tectonics and space geodesy grapple with. For a better visualization of these problems let us consider the Earth covered globally by an ocean with floating ice floes inhabited by Eskimos (Fig. 30 a). The ice floes motion is very Eulerian. The Eskimos need some distinguished reference frame for determination of locations and speed vectors of particular ice floes. However, they are unable to link the frame with the bottom of the ocean. Thus, they use Tisserand's NNR condition and calculate an "absolute" abstract ice floes (Fig. 30 b) with which they link their absolute reference frame.

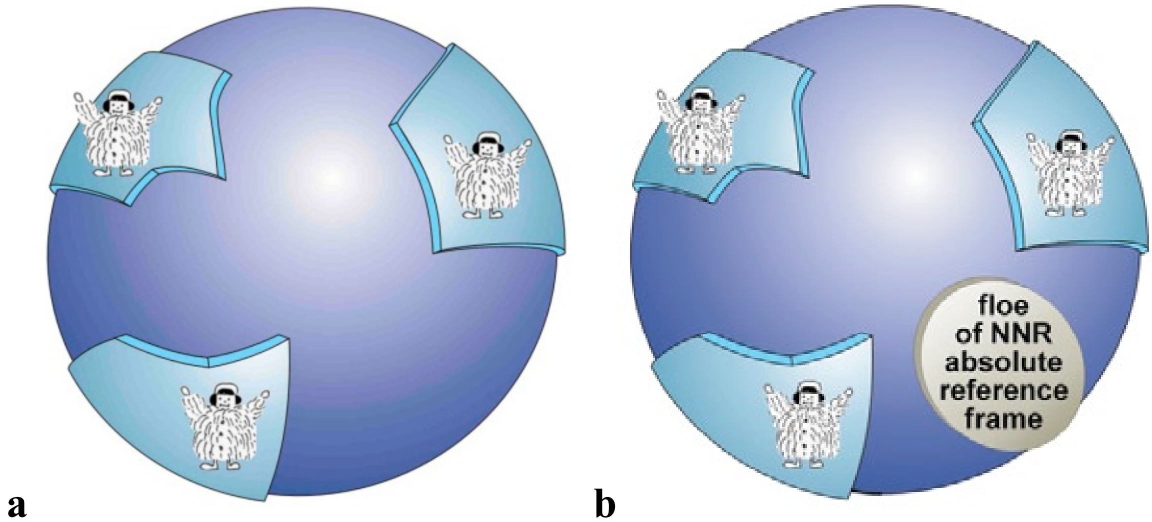


Fig. 30. *Visual presentation of the No Net Rotation reference frame (explanation in text)*

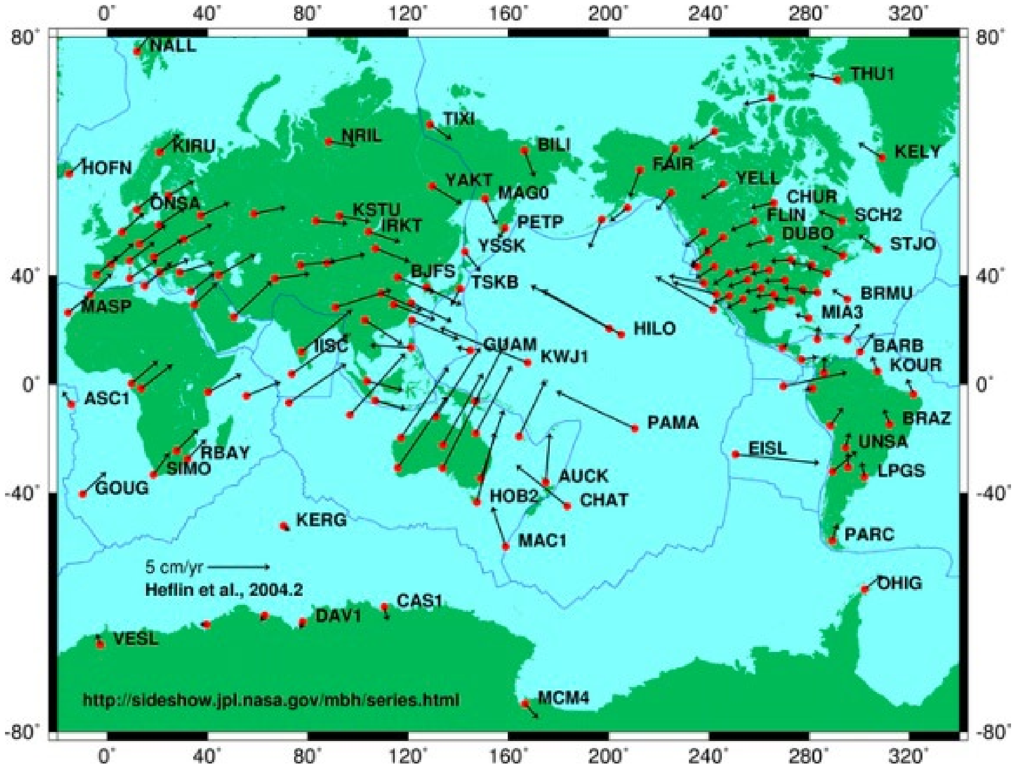
The proper solution would be to link the frame with the bottom of the ocean. An expanding Earth provides such a frame for geotectonics and space geodesy.

Cooperation between geodesy and geology begins to be symmetrical. Up to now geodesy has only served geology. However, despite the increasing technical accuracy of the space geodesy, the construction of its global reference frames interferes with apprehension of real geodynamics. Thus, it is now a task for geology to deliver a correct geodynamic base for construction of a correct geodetic absolute reference frame. This correct base will be discussed in the last section.

3. Strange northward motion of plates in NNR reference frame

Plate movements calculated by space geodesy in the NNR reference frame present a quite uniform pattern. Fig. 31 a presents results of GPS calculations compiled in 2005. Fig. 31 b presents the analogous compilation for 2008. The only difference consists in density of geodetic sites. The direction and length of the arrows are the same. The same features are presented by movements based on all space geodesy techniques combined (Fig. 31 c and d). Apart from the techniques represented, Figs. 31 c and d are analogous to Figs. 31 a and b, respectively.

As is visible on all the above schemes (and all others of this type) the plates are generally moving to the north. The opposite movement is completely marginal and is unable to provide a north – south kinetic balance. This strange situation in the framework of plate tectonics was labelled the Arctic Paradox by Carey's and is one of the proofs of the expansion of the Earth.



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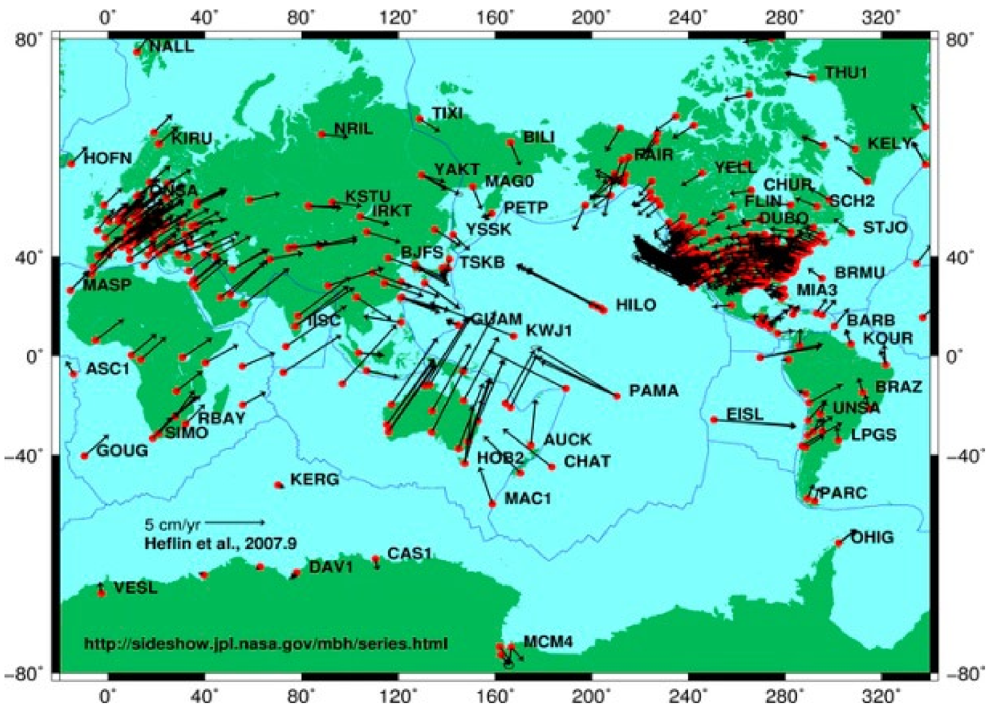

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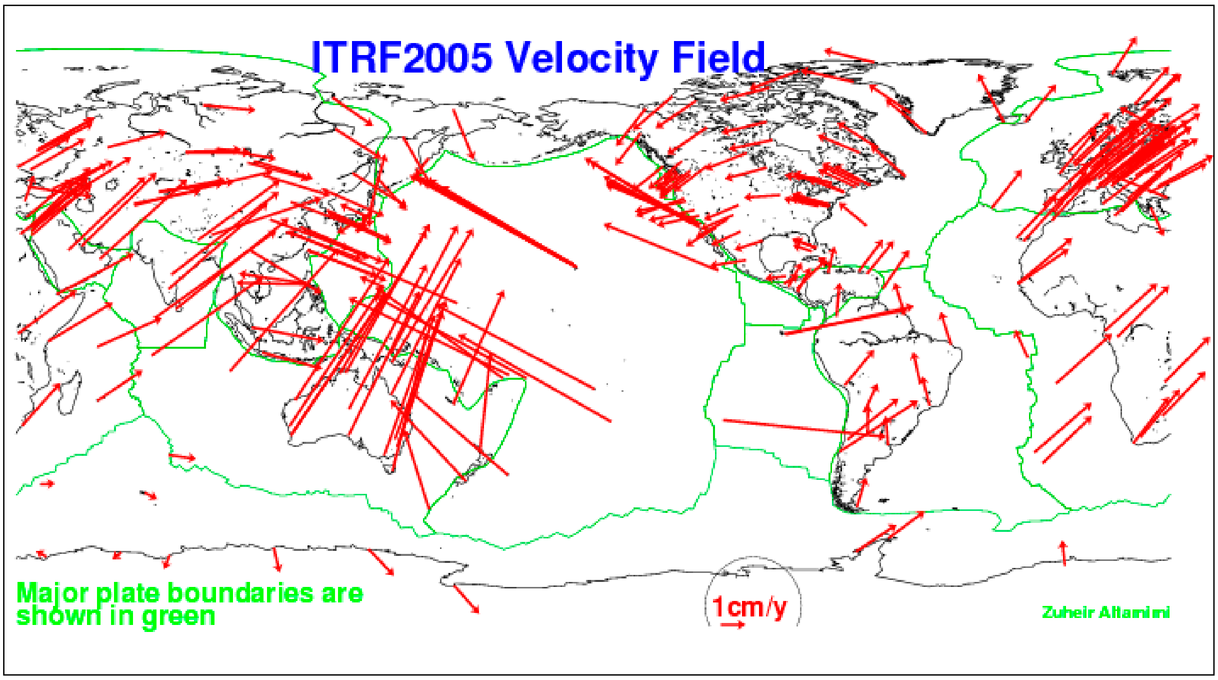

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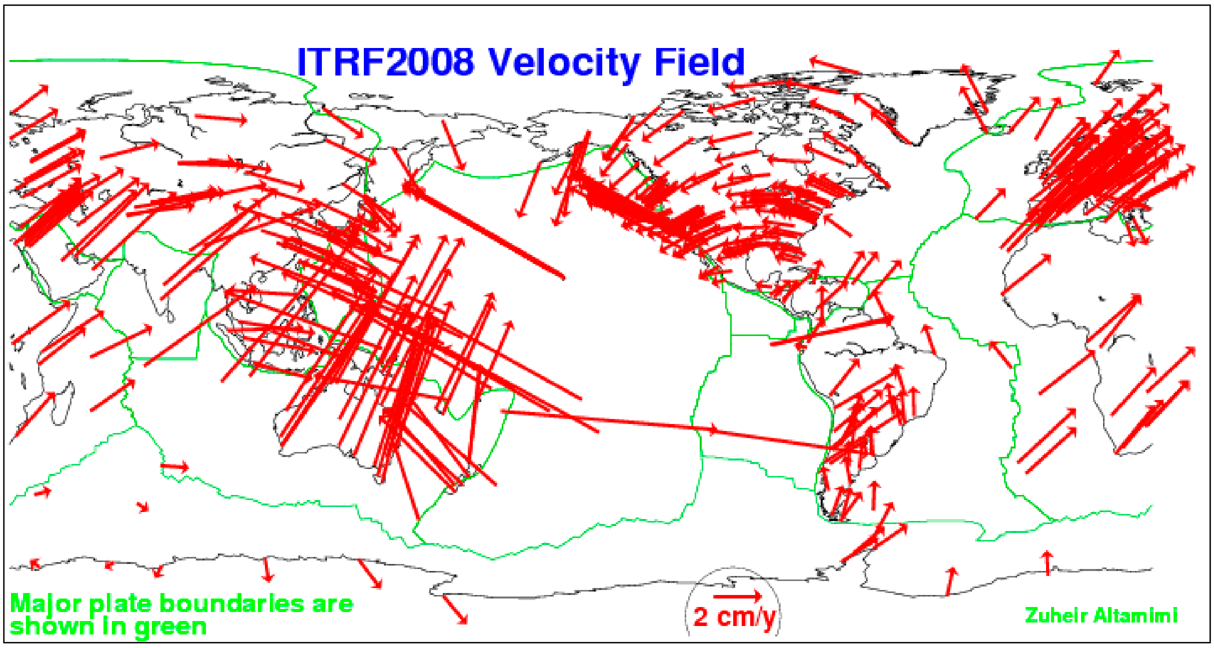


d

Fig. 31. *Global plate motion in the No Net Rotation reference frame (explanation in text)*

4. Carey's Arctic Paradox

a. Formulation and solution (asymmetrical expansion) of Arctic Paradox

Carey (1976) noticed that all plates apart of the Antarctic one move northward. The plan is well visible around the Antarctic plate (Fig. 32)

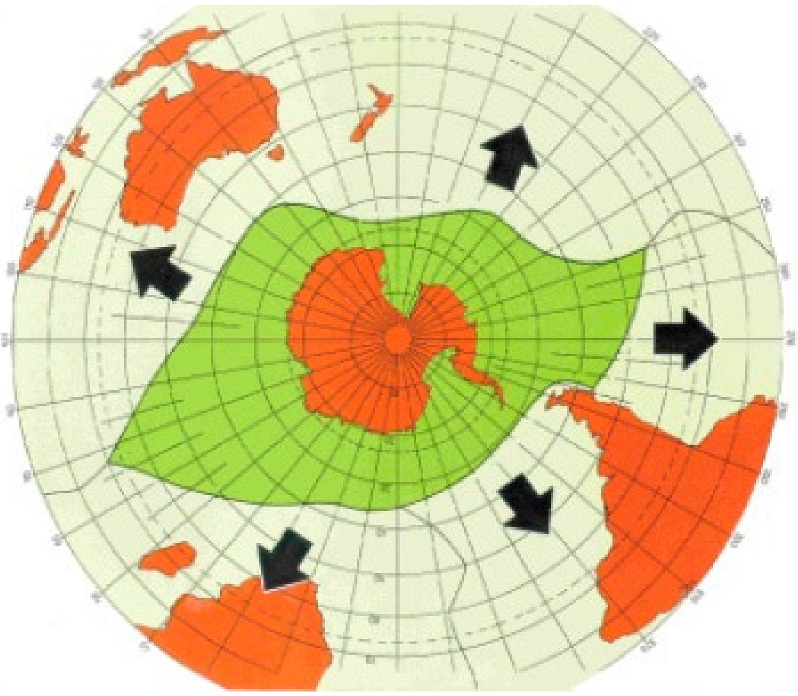


Fig. 32. *Northward movement of all plates surrounding the Antarctic plate*

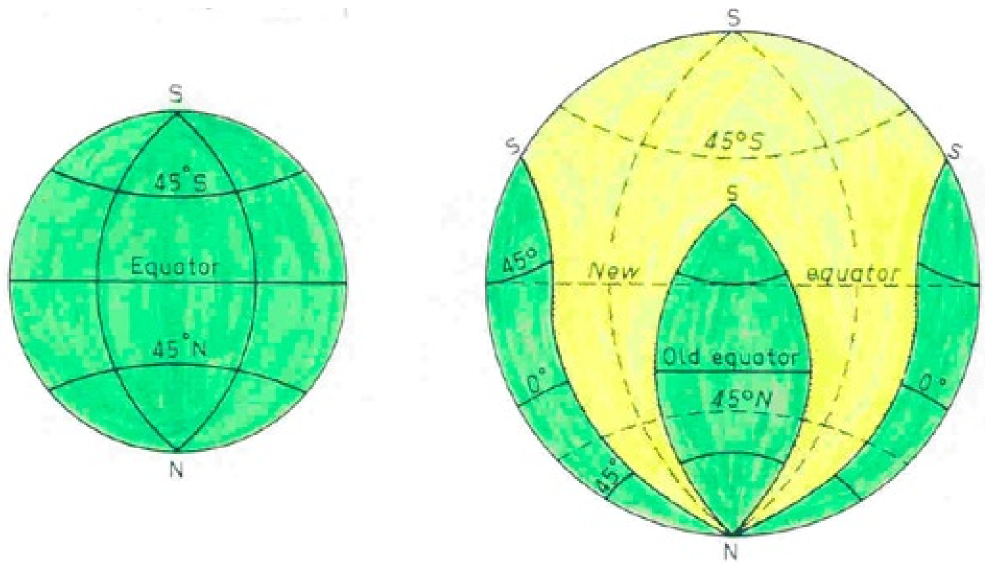


Fig. 33. *Arctic Paradox presented in Carey's model of a flower bud*

Carey checked this movement on the northern hemisphere by northward shifting of paleoclimatic zones and paleomagnetic latitudes. On an Earth of constant dimension such a northward movement of the plates should result in collision in the Arctic zone. However the dominating structure in this region is the Arctic Ocean which has a divergent origin. This structure documents a general southward movement of plates in the Arctic area. The two opposite movements create just the Arctic Paradox (but only on a constant size Earth). The only solution of this paradox is an expanding Earth.

Carey demonstrated the solution on his model of a flower bud opening upwards (Fig. 33) but it plays better in reverse position (Fig. 34 a) with conventional orientation of poles. Carey's model can be compared with a real flower bud (Fig. 34 b) and with professor Józef Oberc's "shabby soccer ball" model (Fig. 34 c). The latter takes into account the position of the Antarctic plate.

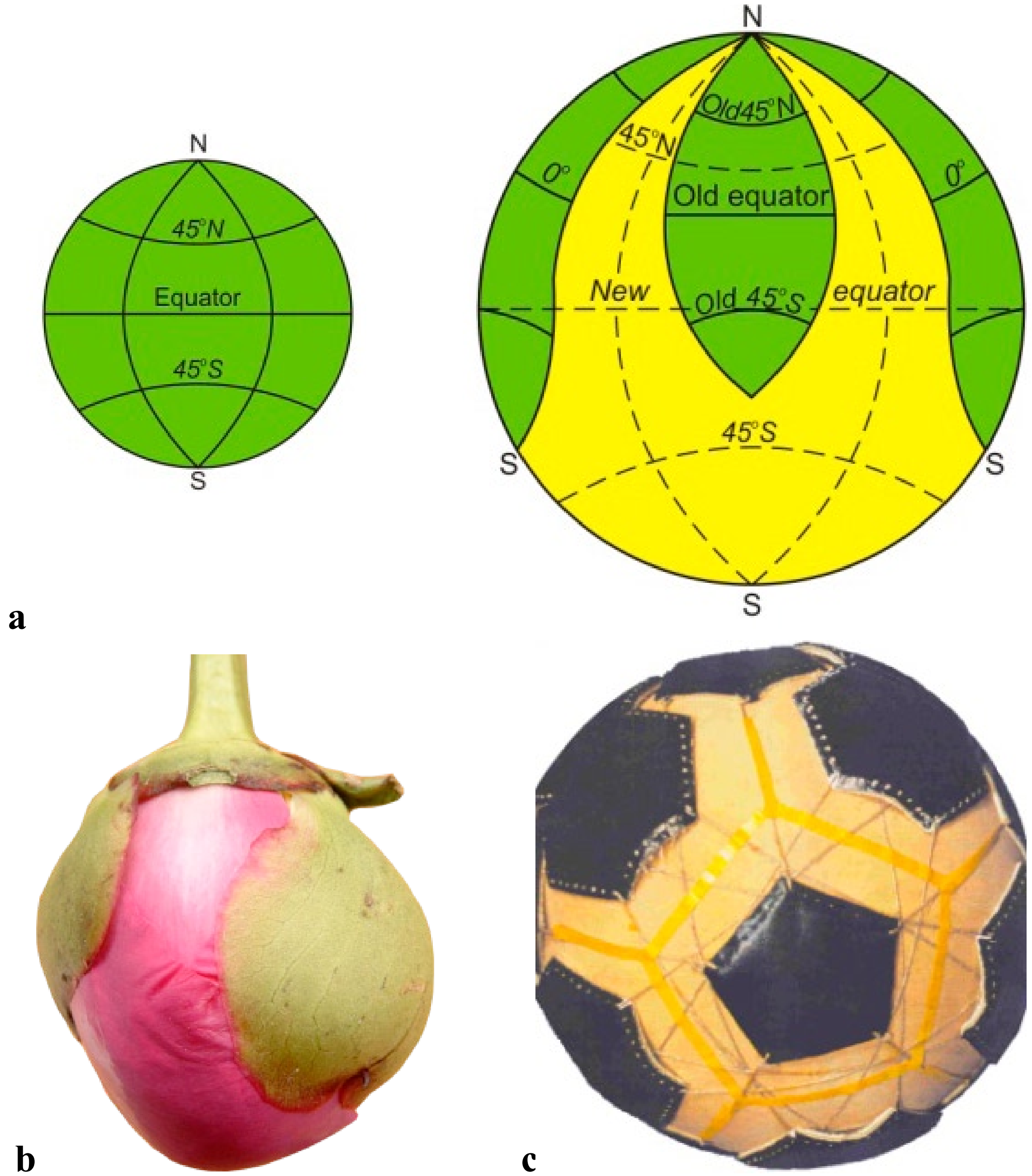


Fig. 34. *Different models of the Arctic Paradox; (**a**) Carey's model in inverted position, (**b**) model of peony bud, (**c**) Oberc's model of "shabby soccer ball"*

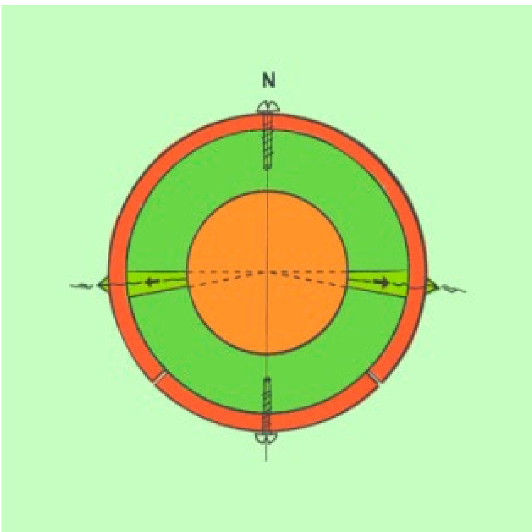
The solution of the Arctic Paradox is not only the expanding Earth but the asymmetrically southward expanding Earth. The essential movement is in fact the southward movement of the deep mantle relative to almost all plates except for the Antarctic one. The northward movement of plates relative to the mantle is only an apparent one.

All the plates in the Arctic Paradox pattern, apart from the Antarctic one, create one huge northern megaplate referred to in point (IV.2). It reveals global integrity despite large tears between its partially independent fragments.

b. Hot spot volcanic chains confirm asymmetrical expansion

Independent confirmation of the Arctic Paradox pattern (not used by Carey[15]) is provided by volcanic chains generated by hot spots.

Let us consider a small continental Earth with initial northern megaplate, small southern plate and two antipodal mantle plumes placed in its equatorial plane (Fig. 35 a). During expansion the whole megaplate apparently migrates northward (apart from north pole) and both mantle plumes (preserving constant position in the mantle) produce volcanic chains directed northward (Fig. 35 b). This rule is valid for all chains on the northern megaplate. In fact the megaplate is being enlarged all the time by the oceanic lithosphere and reaches all the time to the southern plate which is being enlarged in the same way (see Fig. 32). Because the megaplate had to be torn and lengthen latitudinally during expansion (see Fig. 34), the volcanic chains would only change their direction to NW or NE, but always would preserve their northern component. Such a situation is in fact observed (Fig. 35 c).



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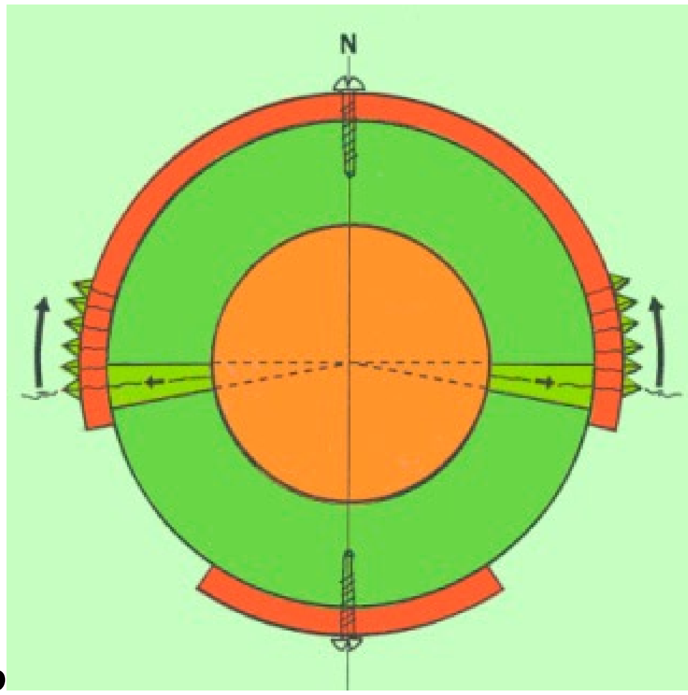
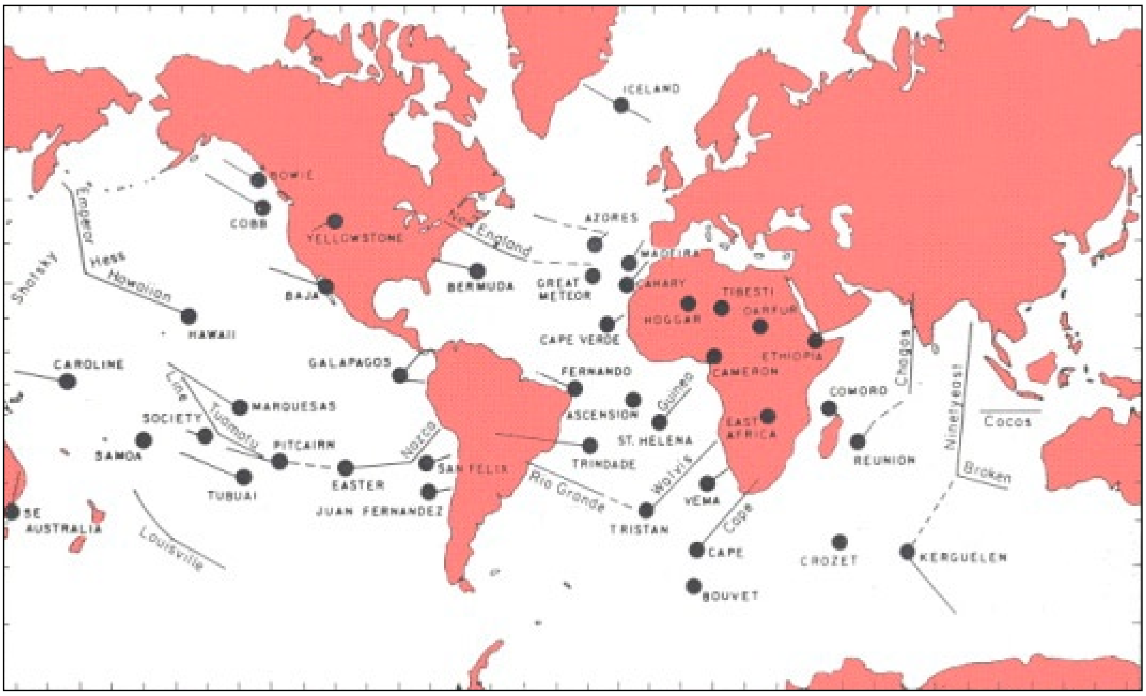


b

[15] Carey attitude to the concept of hot spots was critical.

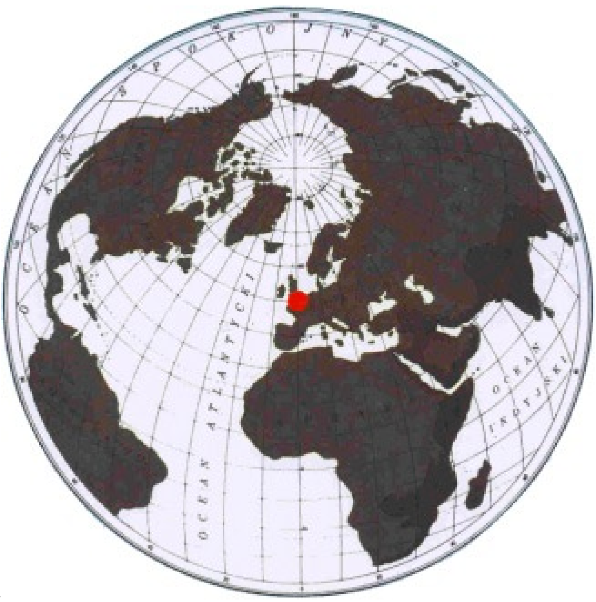


c

Fig. 35. *Model of the Arctic paradox with hot spot volcanic chains,*
*(**a**) initial position, (**b**) present position (explanation in text), (**c**) global pattern of hot spot volcanic chains (Thompson & Morgan, 1988)*

c. Asymmetrical expansion explains division of the Earth's surface into continental and oceanic hemispheres

As it is well known from the beginnings of modern geography the Earth surface is divided into continental (Fig. 36 a) and oceanic (Fig. 36 b) hemispheres. The genesis of this first-order feature of the Earth has been in need of an explanation, and in recent decades plate tectonics has only obstructed the quest for one.



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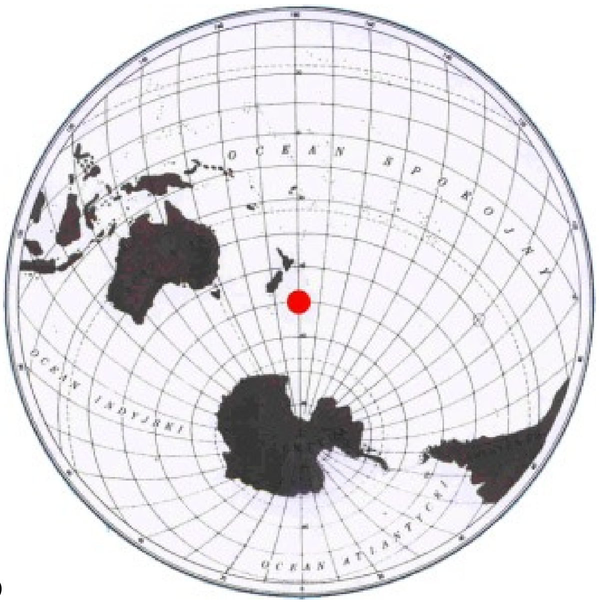

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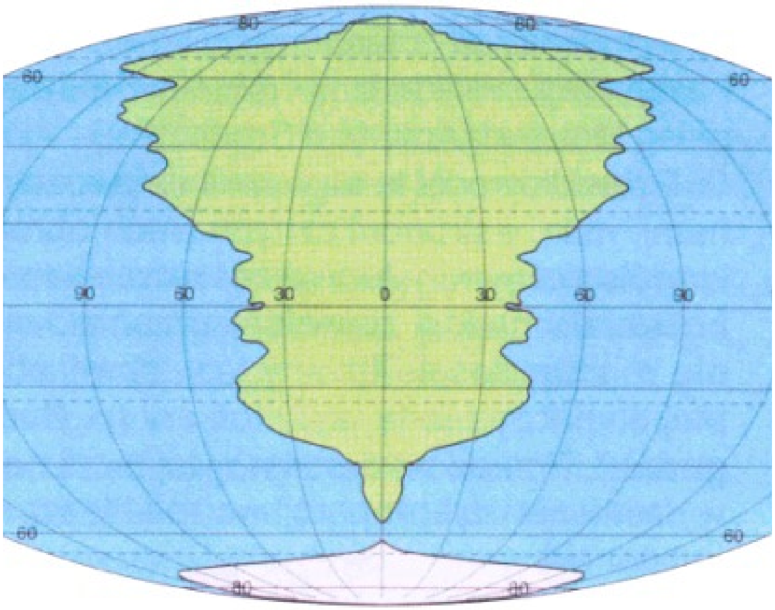


c

Fig. 36. *Geographical picture of southward asymmetrical expansion (Arctic Paradox), (**a**) continental hemisphere, (**b**) oceanic hemisphere, (**c**) diagram of dispersion of continental masses at particular latitudes*

Asymmetrical expansion, noticed already in 1976, explains this phenomenon. Of course geography and geotectonics are not the same discipline and the northern megaplate extends far into of the oceanic hemisphere (*cf.* Fig. 32). However a geographical cumulative diagram of the disposition of continental masses at particular latitudes (Fig. 36 c) demonstrates well the division of the lithosphere into the northern megaplate and the small Antarctic plate.

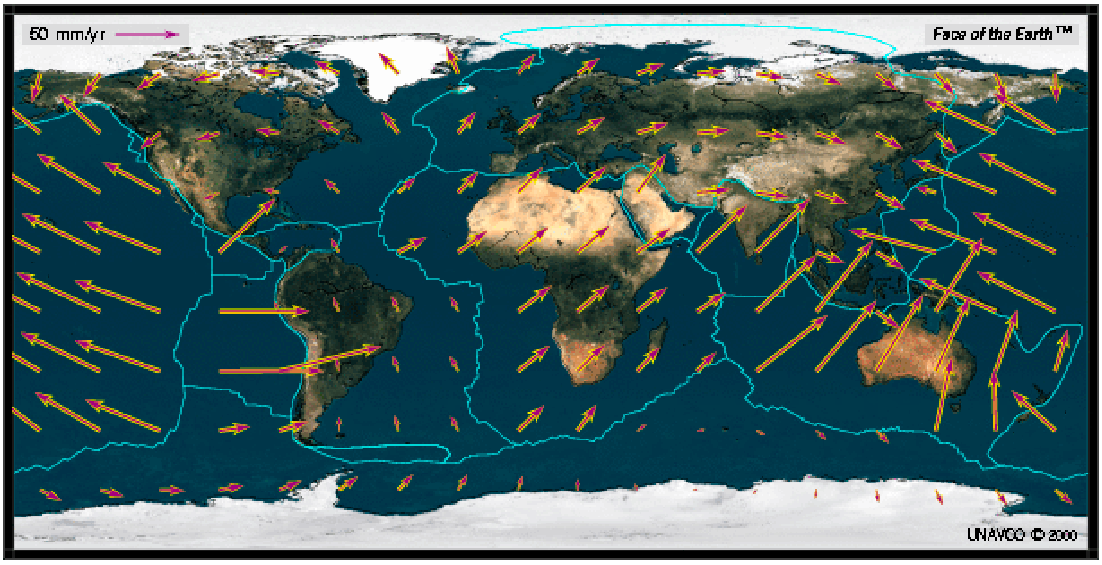
It must be pointed out here that another first-order morphological feature of our globe, *i.e.* the division of the Earth surface into continental masses and oceanic deeps, is also explained only by expansion of the Earth.

5. Space geodesy geodynamics in NNR reference frame confirms Carey's Arctic Paradox pattern

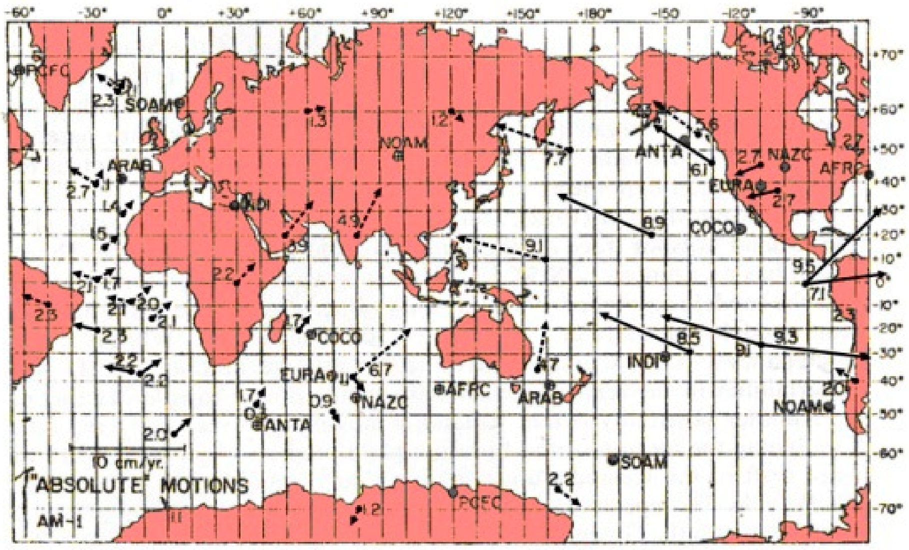
a. Confirmation of general models

Comparison of the space geodesy plans in Fig. 31 with the models of southward asymmetrical expansion (Fig. 34 a-c), shows that, in general, the first confirms the second.

The same is of NNR calculations made by plate tectonics (Fig. 37 a) and of plate tectonics movements in the hot spot "absolute" reference frame (Fig. 37 b). The latter obviously reflects the explanation given in point (V.4 b).



a



b

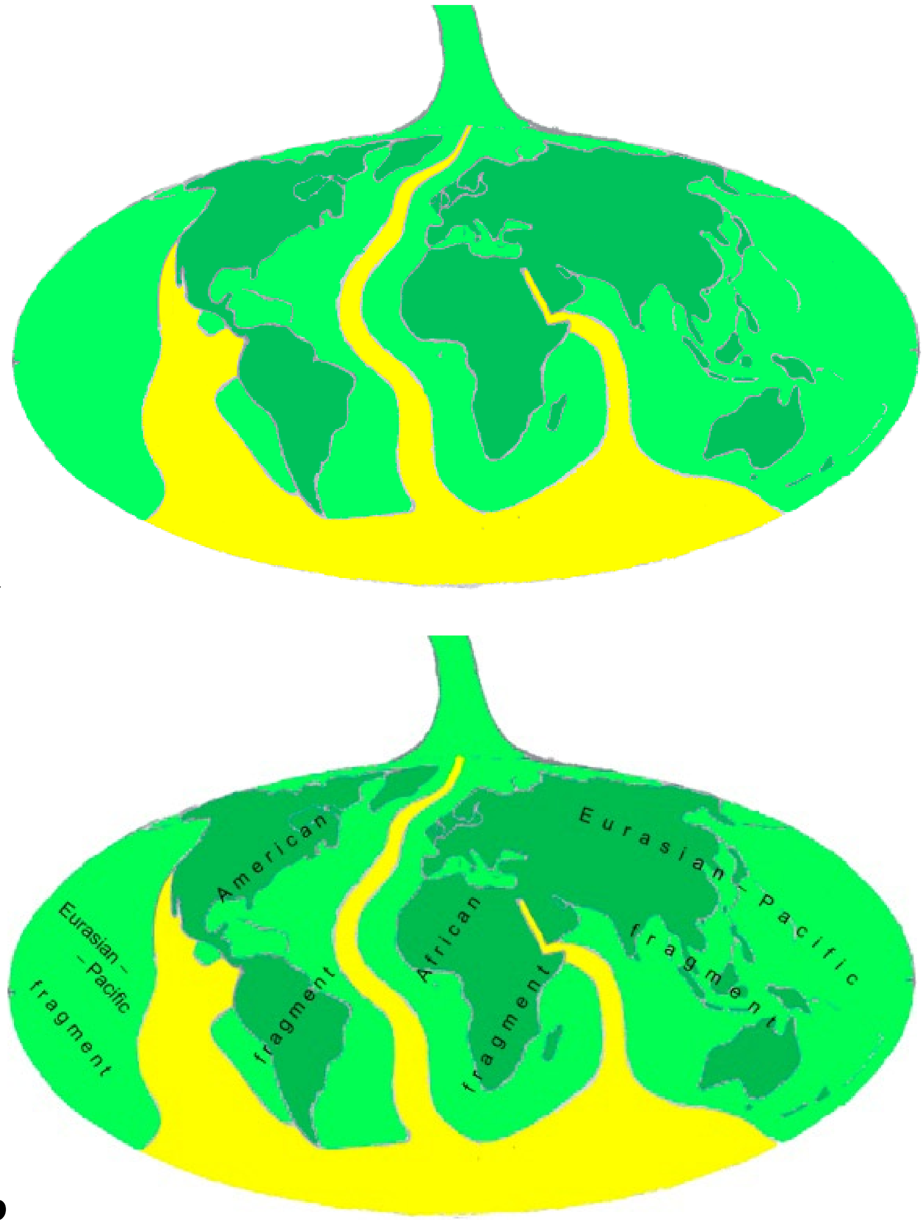
Fig. 37. *Plate tectonic motions in absolute reference frames, (**a**) NNR reference frame (http://www.unavco.org/community_science/science-support/crustal_motion/dxdt/model.html), (**b**) hot spot reference frame – AM1 (Minster et al., 1974)*

For more precise confirmation a more concretely detailed picture of asymmetrical expansion should be made.

b. Confirmation based on the real geography of the plates

Carey's Arctic paradox pattern can be more precisely demonstrated using the real geography of continents and plates and removing all of the young post-Paleocene lithosphere together with the whole Antarctic plate. For better visualisation of the process of southward asymmetrical expansion, the whole structure can be compared with Carey's model of the opening flower bud. For effect a stem was added at the North Pole (Fig. 38 a). The green areas (parts of the northern megaplate) can be compared to sepals, and yellow mantle basement – to petals of a flower bud.

Northern megaplate is divided into three huge fragments: Eurasian-Pacific, American and African (Fig. 38 b). Only the last of these corresponds to a conventional plate.

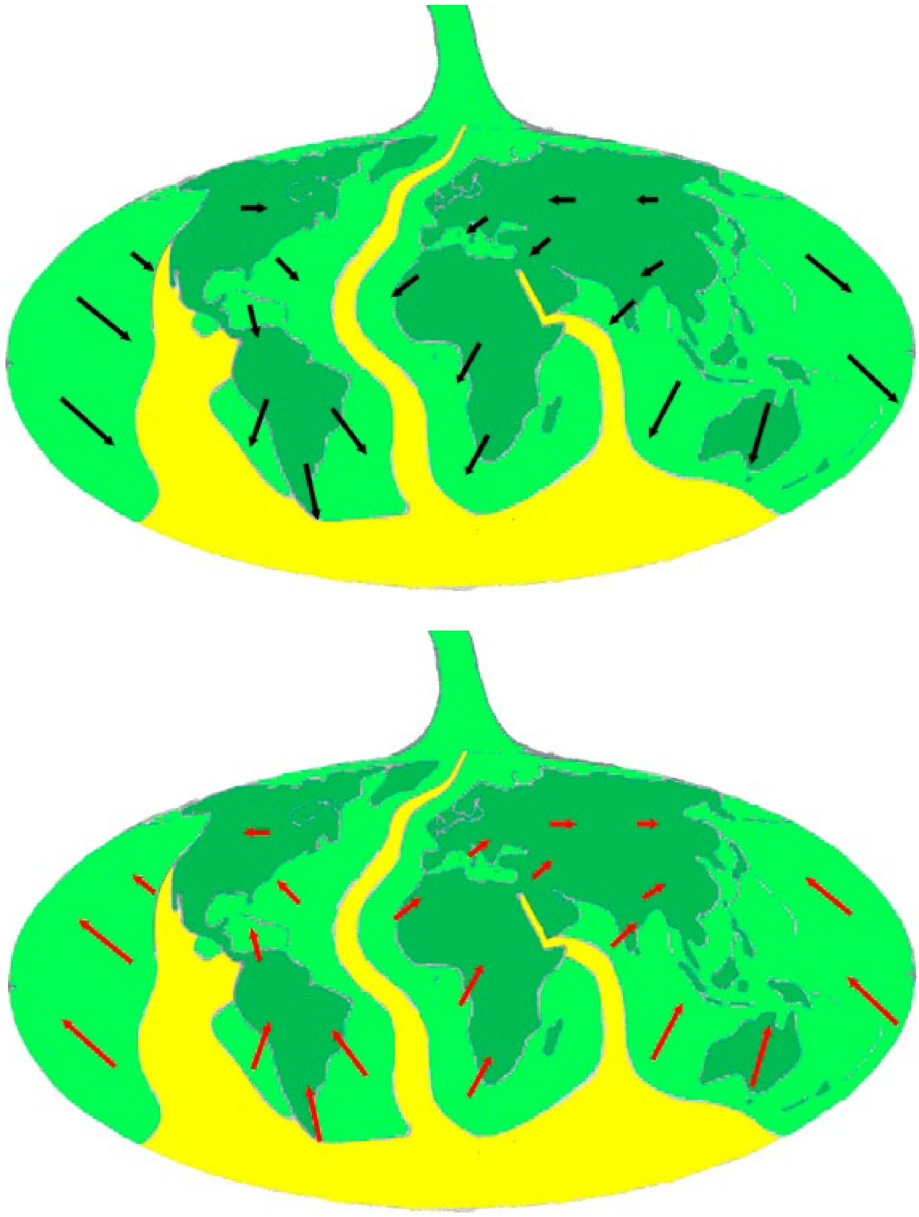


a

b

***Fig. 38.** (**a**) model of the Arctic Paradox based on real geography of continents and plates, (**b**) division of the northern megaplate into three big fragments*

The expanding basement is shifted relative to plates as indicated by the black arrows (Fig. 39 a). Notice that the black arrows are unequivocally determined only by expansion of the basement and geometry (geography) of tears (rifts) in the lithosphere and their intensity.



a

b

Fig. 39. *(**a**) Motion of the mantle relative to the megaplate,*
*(**b**) apparent motion of the megaplate relative to the mantle*

The northernmost latitudinal arrows are determined by the North Atlantic Ridge which is the only tear acting at high latitude. Its prolongation *i.e.* the Nansen Ridge reaches even beyond the North Pole. The southern arrows in Africa are small in comparison with southern range of the continent. That is because Africa is being torn from Eurasia along Red Sea and Carlsberg Ridge what diminishes the southern movement of the basement relative to it.

Of course the relative movement of the lithosphere to the expanding basement is precisely opposite and presented by red arrows in Fig. 39 b. These arrows must be treated on a non-expanding Earth as real ones which is what produces the Arctic Paradox. This is the case of plate tectonics and contemporary space geodesy.

As is seen the arrows correspond very precisely to the arrows in Fig. 31. Thus, space geodesy geodynamics recorded in the NNR reference frame proves in fact the process of the expansion of the Earth.

The fictitious collisions and contractions marked by the red arrows will be discussed in the following section.

6. Explanations of fictitious collisions, contractions and rotations obtained by space geodesy in the northern megaplate

a. East part of the Eurasian-Pacific fragment

The expanding sub-lithospheric mantle determines the pattern of velocity vectors in this region (Fig. 40 a). The black arrows mark the movement of the mantle relative to the lithosphere. Because the geodetic graticule expands together with the mantle, the apparent movement of the lithosphere measured in this graticule is precisely opposite (Fig. 40 b). Ideogram of the process is presented in Fig. 40 d. The results obtained by space geodesy (Fig. 40 c) are almost the same as these in Fig. 40 b.

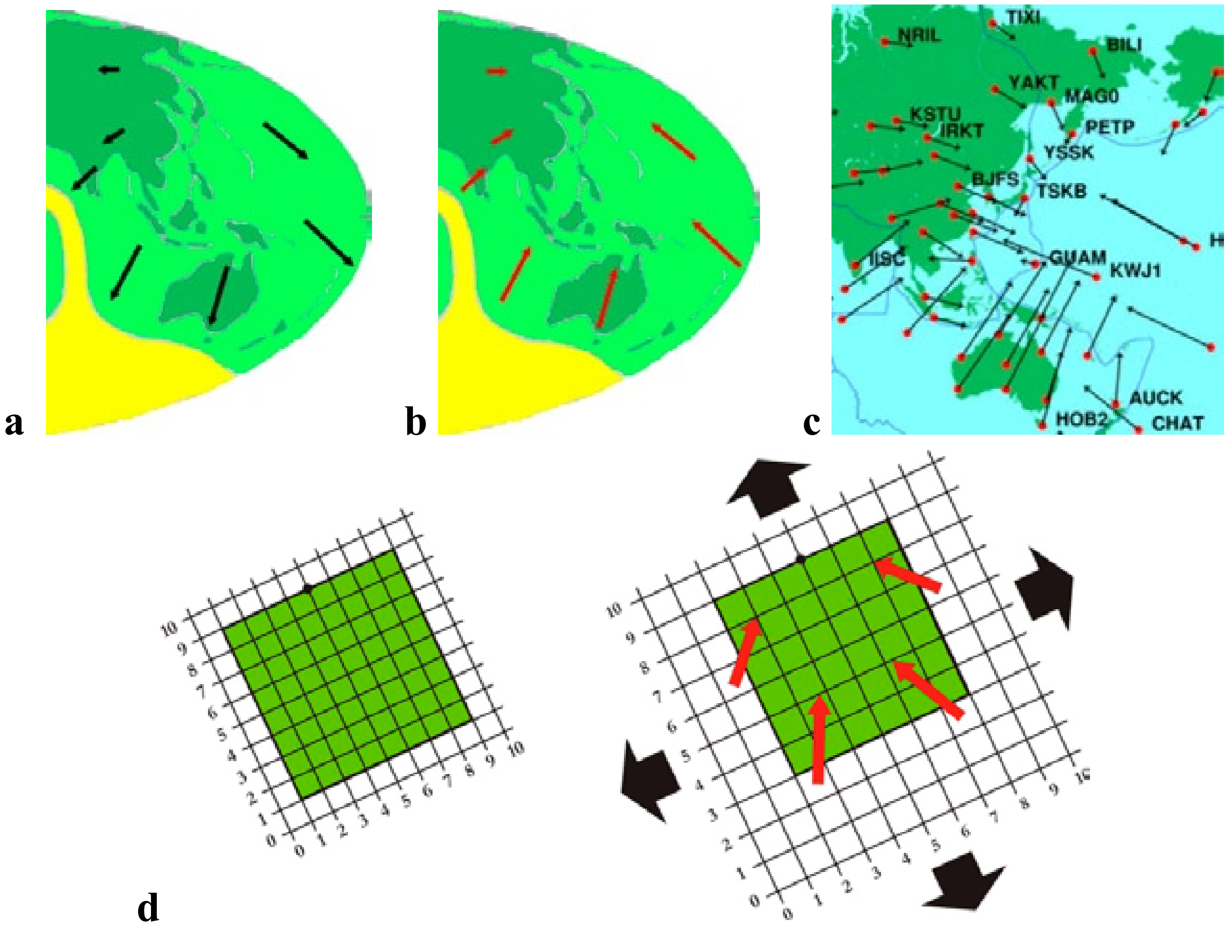


__Fig. 40.__ Fictitious convergences in eastern part of the Eurasian-Pacific fragment (explanation in text)

Apparent convergent movements in Figs 40 b and 40 c produce several fictitious collisions at tectonic zones considered *a priori* as collisional *i.e.* oceanic trenches (which themselves are tensional) and intra-continental fold belts. In the discussed area these are fictitious collisions of: Australian and Pacific plates, Eurasian and Pacific plates, Indian and Eurasian plates (at Himalayas).

On the border between Pacific and Eurasian plates a wide zone of unquestionable extension exists (Fig. 4 – section I), reaching deeply into the Asian interior. It is consistent with the process visible in Fig. 40 a. A similar situation holds between the Australian and Pacific plates. The whole area between the Australia and New Zealand – Kermadec – Tonga line is an area of vast extension –mostly extinct today. The same is true of a vast area between Java and Mariana trenches.

Let us return to the Asia – Pacific border. The northern arrows in Fig. 40 c, directed to the south-east, can manifest fictitious "head on collision" (see point III.5). The arrows in the northern part of map (Fig. 40 c) can be connected with spreading at Nansen Ridge in the Arctic Ocean.

The southern arrows in Fig. 4 indicate pulling and tearing the whole Asian margin by the Pacific plate, but not squeezing it from behind by the Indian plate (as in supposed "escape tectonics"). Incidentally, one may ask why, at the supposed squeezing, some parts can be separated and move forward independently. At tearing it is natural.

The Indian subcontinent is not colliding with the main continent of Asia but is pulled out of it by the expanding mantle according to the arrows in Fig. 40 a. India is a part of Asia from the Precambrian time as was strongly pointed out by Meyerhoff & Meyerhoff (1972).

Of course India is moving north relative to the expanding geodetic graticule. However, in this way, Asia is also moving north, "pulling" India to the north from the Indian Ocean. Because the apparent north velocity of India is greater than that of its trans-Himalayan neighbourhood, the apparent collision is of "rear-end" type (point III.4).

The whole region between the Himalayas and the Siberian shield is under tension. Especially the huge diapir of asthenosphere is recorded under Tibet. The diapir is both: a result of and an indicator of regional tension and it is what caused the gravitational transport of Himalayas toward the south prior to causing their uplifting (see Carey's scheme, Fig. 3).

b. African fragment

The expanding basement of the African fragment and its northern neighbourhood is shifting relative to the lithosphere, according to the black arrow in Fig. 41 a. The relative apparent movement of the lithosphere is opposite (Fig. 41 b) and it corresponds with space geodesy results (Fig. 41 c). The interior of the African continent is poor in space geodesy stations, therefore also in the relevant arrows. It is no problem for plate tectonics which can calculate the velocity for any geographical point. Thus it will be useful to show the plate tectonic arrows too (Fig. 43 d).

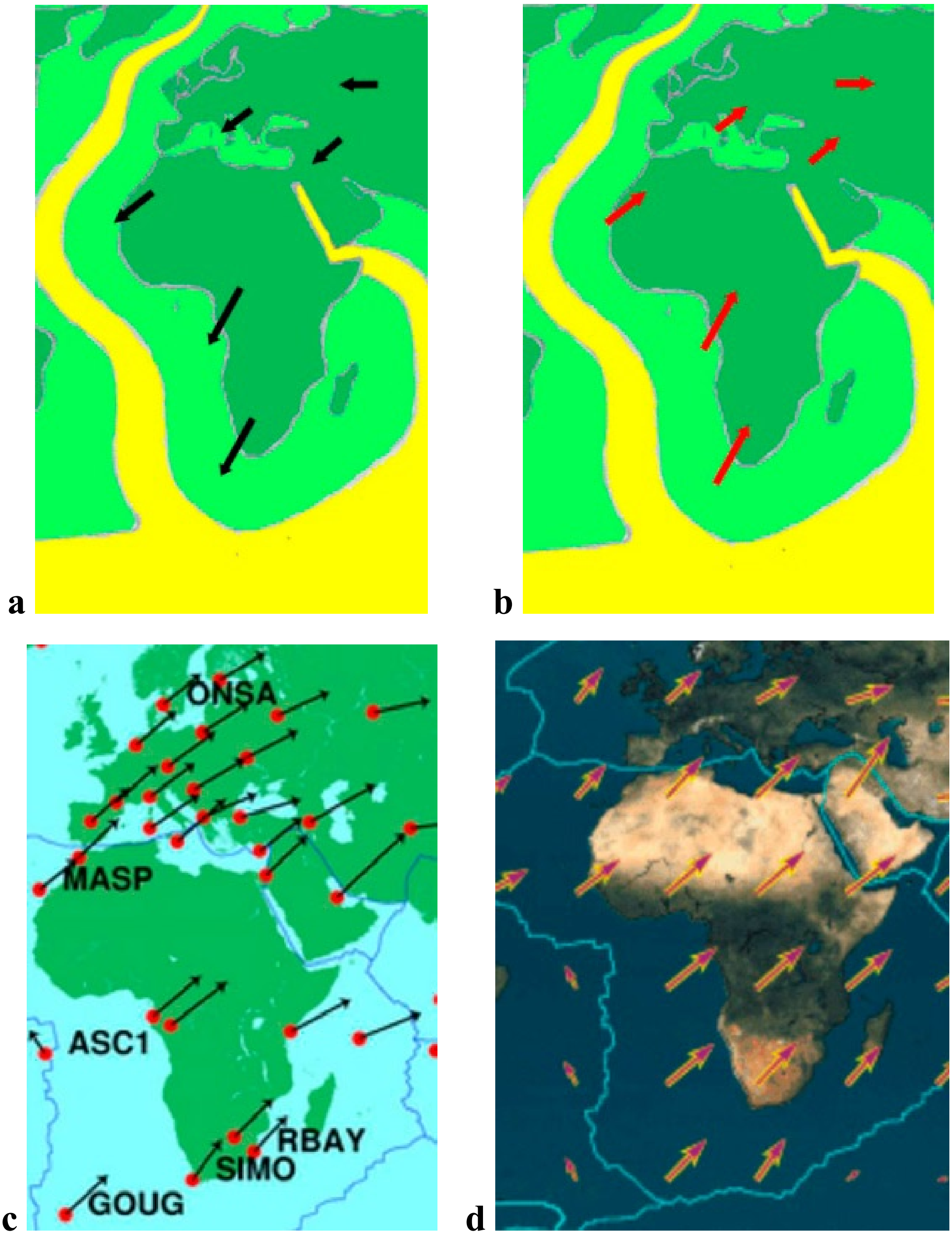


__Fig. 41.__ Fictitious convergence on Africa – Eurasian border (explanation in text)

The arrangement of arrows in Fig. 41 b-d, reflects fictitious rear-end collisions in the whole Alpine zone from Iberian Peninsula to the Arabian Sea. While according to the real movement marked in Fig. 41 a, the zone is under tension. This is clearly visible at the Red See rift. But not only at it. The Mediterranean Sea is of tensional structure too, what was noticed already by Argand (1916). It is well visible in the western part of the region (Fig. 42 a) in the central part (Fig. 42 b) and even in the eastern part (Fig. 42 c). In the last part the whole region of Aegean Sea is pulled to the south by Africa. The Anatolian Peninsula is also stretched. The latter process is again interpreted by plate tectonics as another case of "escape tectonics" caused by the assumed northern push of the Arabian Peninsula. In fact this peninsula is less torn from Eurasia than Africa is. The opening of Red Sea and total translation on the Dead Sea – Jordan Fault makes the difference (Fig. 42 c).

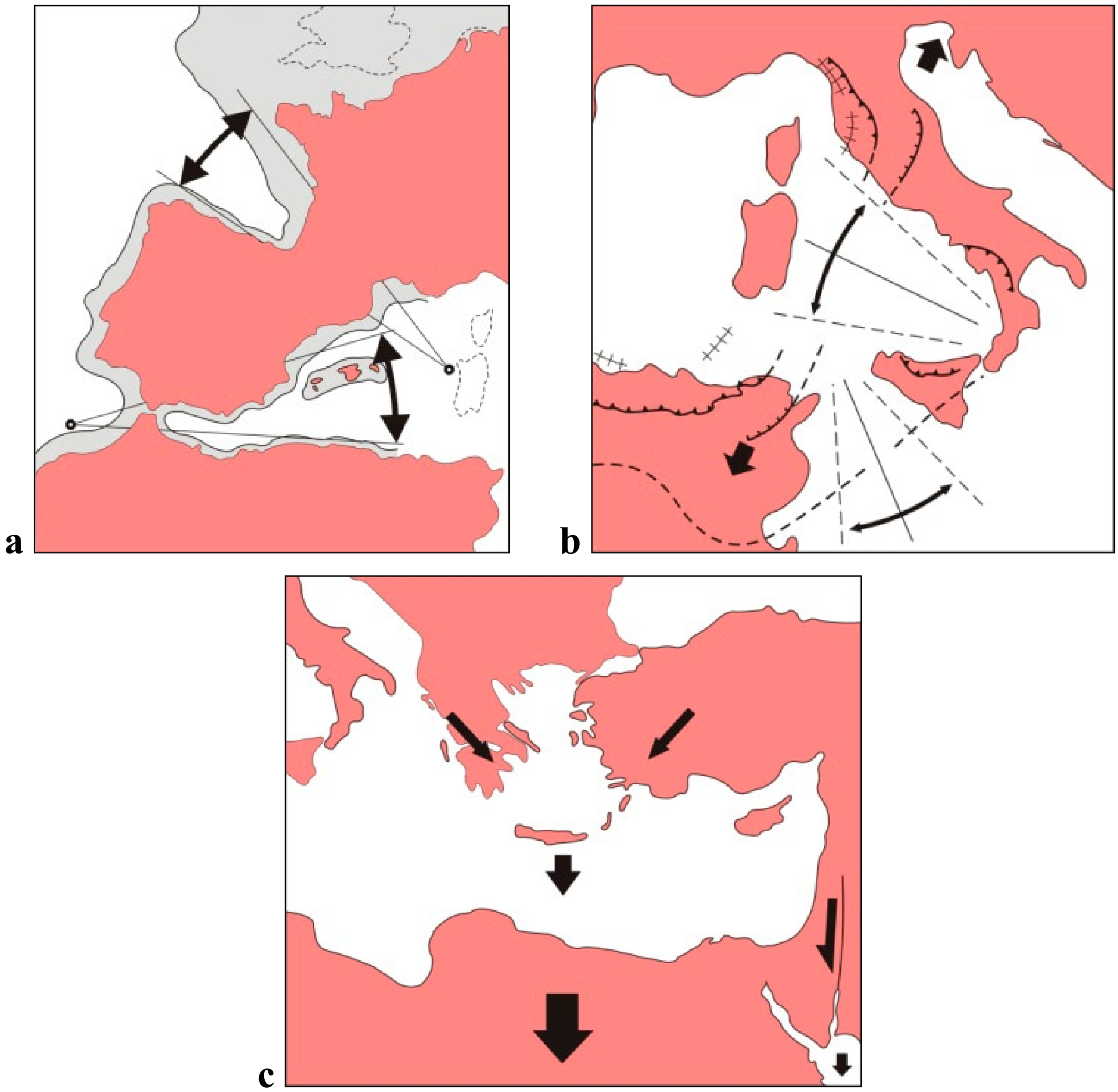


Fig. 42. *Tensional opening of the Mediterranean Sea (Koziar, 2005) – explanation in text*

The young reconstruction of divergent Mediterranean zone is presented in Fig. 43.

Fig. 43. *Tectonic reconstruction of Mediterranean Sea (Koziar & Muszyński, 1980)*

All the Alpine fold belts, between the east Atlantic and the Arabian Sea, were driven by tensional-diapiric-gravitational tectonics (Koziar, 2005). The diapirs were correctly situated in this region by Van Bemmelen (1960). The only problem for him was an explanation of their origin. It is the regional tension and this explanation was given by Carey in 1976.

Recently the divergent movement in the Mediterranean region has been almost frozen, so it produces a good geodesic "rear-end collision" effect.

Finally, the odd orientation of arrows in the eastern part of the African plate (Fig. 31), should be explained. These are based on the MALI (Malindi – Kenia) and SEY 1 (Seychelles) geodetic sites. According to the process shown in Fig. 39 they should have more northern orientation and in case of Seycheles – Mauritius Plateau it may be even directed towards north-west. However the Carlsberg Ridge is not opening latitudinally but along NE-SW transform faults. The orientation of arrows in the eastern part of the African plate indicates that Red Sea and Carlsberg ridges are not stable relative to the basement but are moving to the NE relative to it. Differences in the length of arrows on each side of the Carlsberg Ridge (Fig. 31) indicate the delayed apparent NE movement of the east part of the African plate. The delay is equal to the spreading rate at the Carlsberg Ridge.

c. American fragment – southern and central parts

Let us now consider the southern and central part of the American fragment of the northern megaplate *i.e.* the South American plate together with the Nazca plate (Fig. 44).

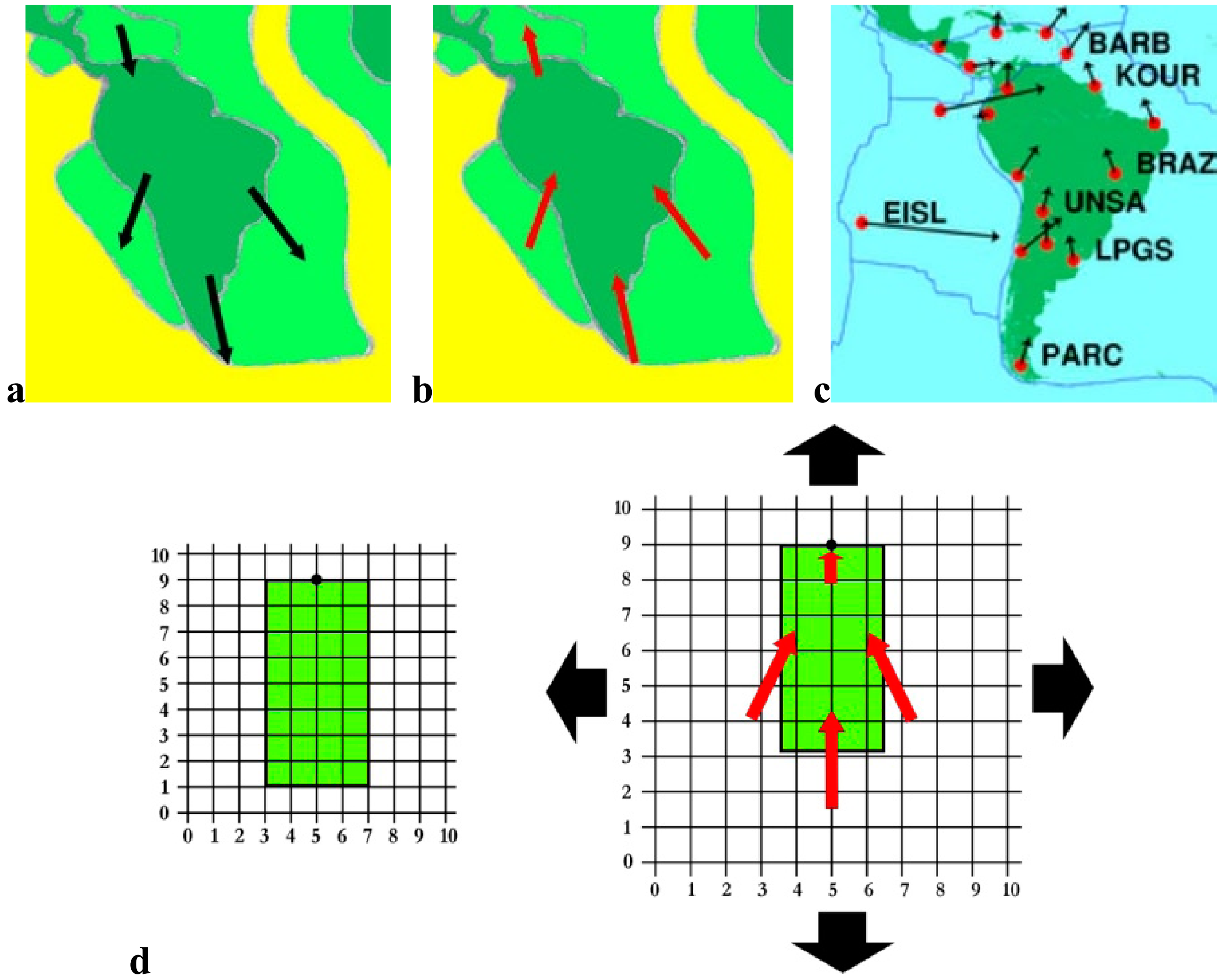


Fig. 44. *Fictitious convergences in the American fragment – southern and central parts*

It must be remembered that active continental margins are not convergent zones but divergent ones (see Fig. 4 and 5). However, the divergent movement is there much smaller than on oceanic ridges. Thus, the zones are not treated in the context of an expanding Earth as plate borders.

The whole southern promontory of the American fragment is surrounded by spreading zones. The expanding mantle basement is moving, relative to the lithosphere, generally southward and to both sides of the promontory (Fig. 44 a). The apparent movement of the lithosphere is opposite (Fig. 44 b). The same movement relative to the expanding geodetic graticule is demonstrated on an ideogram (Fig. 44 d). The general plan of these apparent movements (b and d) corresponds well to those obtained by space geodesy (Fig. 44 c).

Fictitious convergence of the Nazca “plate” with the South America continent obtained by space geodesy, allegedly confirms plate tectonic “subduction” in Peru and Chile trenches which is a false process (see section I).

The situation is more evident within South America because of the odd apparent contraction of this continent, visible in Fig. 46 c. This contraction is not considered real even in the framework of the plate tectonic paradigm.

The short, northward arrow near the Caribbean Sea (Fig. 44 b and c) suggests “collision” with the North America continent. This is an artefact of space geodesy (see Fig. 45) which contradicts the evidently tensional development of the whole Central American region.

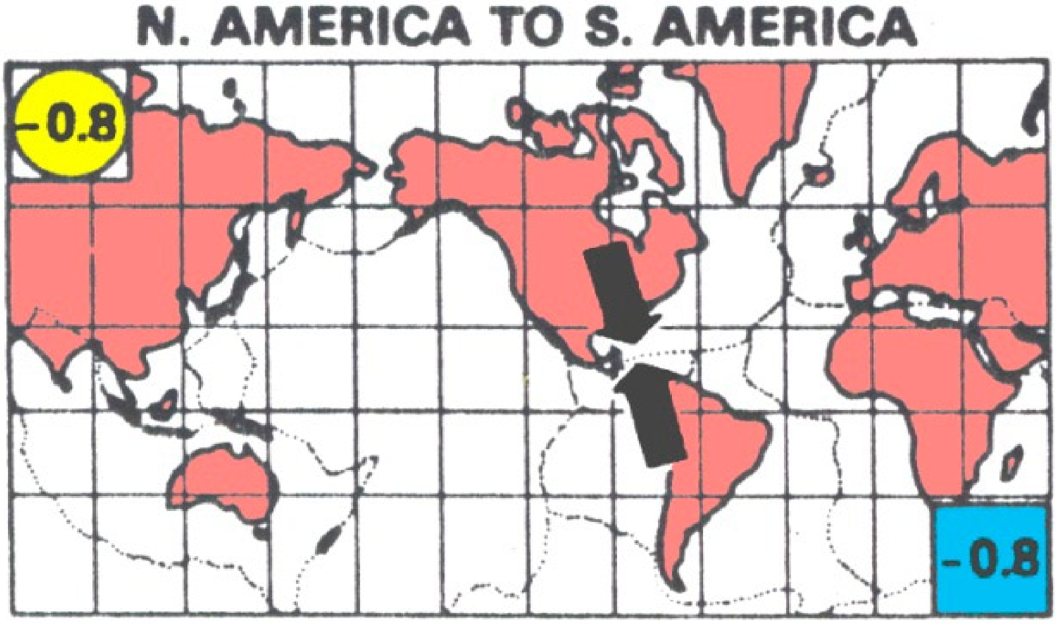


Fig. 45. *Fictitious collision between South and North America (Minster & Jordan, 1978)*

The development is visible in the geology of the region. It is also an unequivocal result of the reconstruction of the Central Atlantic. The opening of the Central Atlantic and concomitant growing distance between both Americas are unidirectional processes without any reversals.

“Head on collision” visible in Fig. 47, measured as relative movement of both plates, is changed to ”broadside collision” in the NNR reference frame (Fig. 33 b) but it remains a collision – in both cases, an apparent one.

Finally, the small length of northward directed arrows in Patagonia (Fig. 44 c) should be explained. It could be connected with the longitudinal stretching of the whole tip of South America south from the line Santiago – Buenos Aires.

d. American fragment. North American – Pacific border

The expanding basement moves here relative to the lithosphere according to the black arrows in Fig. 46 a. Opposite apparent movement of the lithosphere is according to the red arrows in Fig. 46 b. The latter fits generally with results obtained by space geodesy (Fig. 46 c).

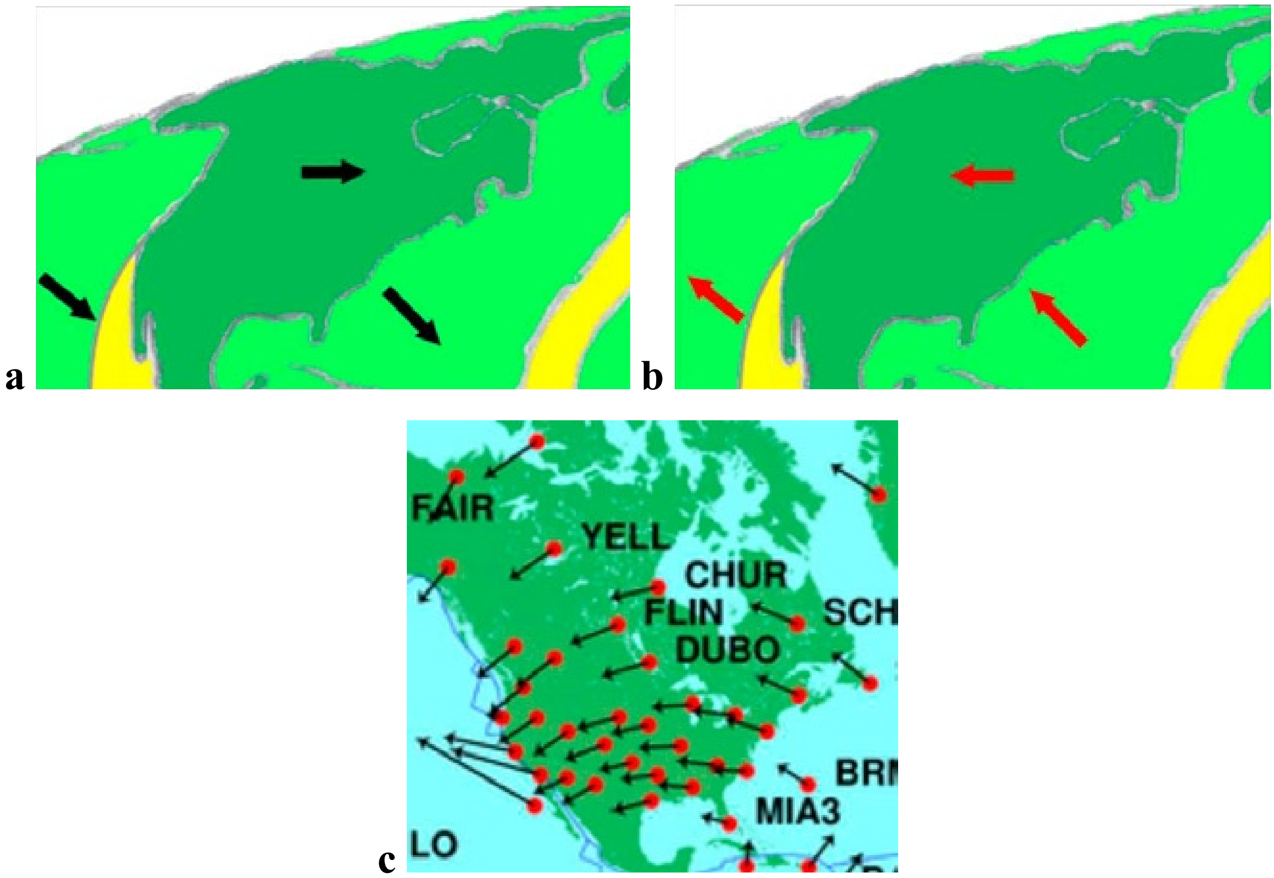


Fig. 46. *Fictitious collision between North American and Pacific plates (explanation in text)*

Geodetic vectors on the North American plate suggest its collision with the Pacific one. However, even plate tectonics does not postulate collision there. The plate border is of “strike-slip” character along the San Andreas Fault. What is more, the adjacent mountainous region to the east is being intensively stretched. Thus, the border is trans-tensional in fact. The process of intensive stretching of the whole western territory of the USA is confirmed by space geodesy (Harrison & Douglas, 1990) which, as has been seen, leads to internal contradictory results in space geodesy itself.

However, the plate tectonic interpretation is also wrong. According to this paradigm the Pacific plate is moving north-westward along the San Andreas Fault. This movement is supposed to cause collision and subduction in the Aleutian Trench. However, the north-westward movement marked by the westernmost arrows in Fig. 46 b and c is only apparent. The real movement here is south-eastward, indicated by the westernmost black arrow in Fig. 46 a, which means tension under the Aleutian Trench.

Complicated tectonic processes in the Pacific margin of the North American continent, as for instance, the San Andreas Fault activity, could not be taken into account in general schemes in Fig. 39 a and b. Now, I will briefly relate my tectonic analysis of the region (Koziar, 2006), which explains the rotational arrangement of the arrows in Fig. 46c. In the Canadian and Alaska Cordilleras the result of the analysis is as follows (Fig. 47).

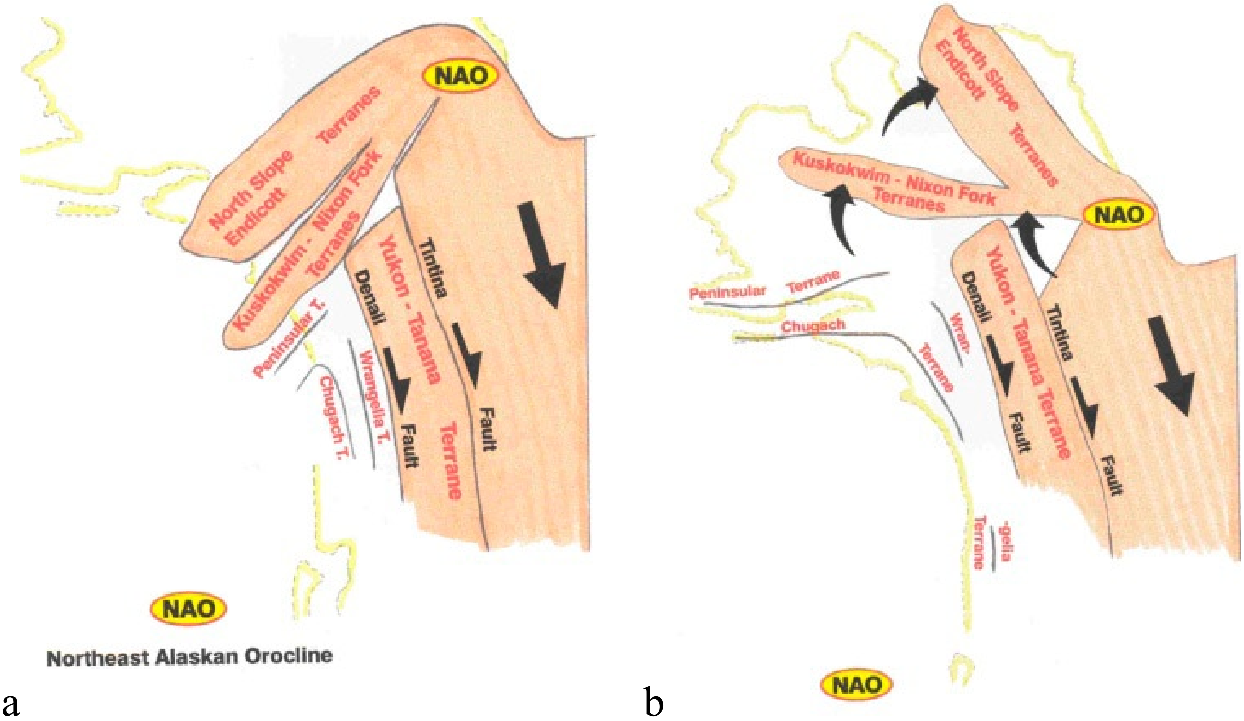


Fig. 47. *Tectonic processes in Alaska and Canadian Cordilleras, (**a**) initial situation, (**b**) present situation (explanation in text)*

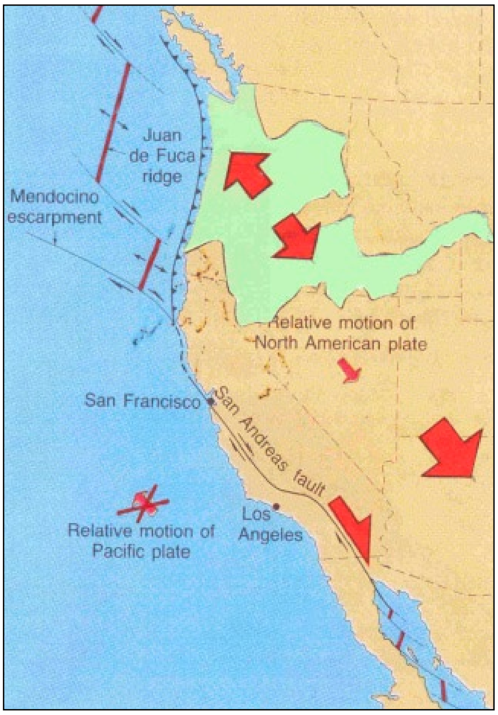


Fig. 48. *Tectonic processes in the western part of USA territory (explanation in text)*

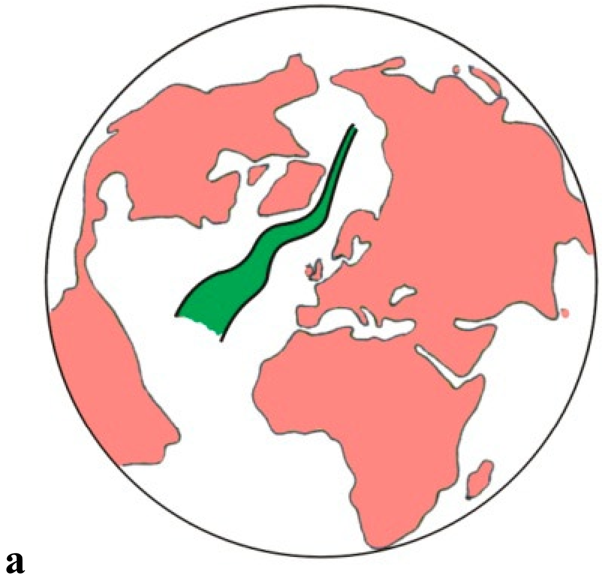
The opening of Alaskan orocline to the North is connected with the tearing of the North America from Siberia and the opening of the Canadian Basin in the Arctic Ocean. Alaska is mechanically connected with Siberia at the Chukchi Peninsula and its moving away (to the SE) is delayed (held back) by this part of Siberia. As is seen, the interior of North America moves southward relative to its western coastal parts and the Pacific plate. The movement was the most intensive in the Cretaceous but still not extinct up today.

The situation is similar in the southern part of Cordilleras (Fig. 48). The movement along the San Andreas Fault is in fact connected with tearing off the southwest part of the North America to the southeast by the South America. Thus, the real movement is to SE on east wing of the fault. The NW movement of the Pacific wing is only apparent.

Both movements (Fig. 47 and 48) mean that the whole western border of the North American craton (running inside the mountain ranges) moves south-eastward in a strike-slip manner relative to the Pacific plate and western coastal part of the North American continent. It can give a rotational effect showed by arrows in Fig (46 c). However, it is not a rotation which leads to collision with the Pacific plate (as the arrows suggest). It also is not a rotation which could compensate the northward movement of the all plates (besides the Antarctic one) on a non-expanding Earth (see the next point).

e. Discrepancy between alleged rotations of North-American and Eurasian plates with development of North Atlantic rift

Schemes of plate movements in the NNR frame (geodetic and plate tectonics ones) show some sinistral rotational movement of North America and dextral rotational movement of Eurasia (compare respectively Fig. 31 and Fig. 37). Western part of the North America and eastern part of the Eurasia gain, in this way, some southward movement which might compensate the general northern movement. However, it may be clearly seen that it is very insufficient for such compensation. Apart from that such rotational movement is in contradiction with plate tectonics which does not postulate an "in situ" rotation. The alleged rotations are also in contradiction with the opening of the North Atlantic Rift. As is known, it opens southward (Fig. 49 a). However, according to the suggested rotations on a non-expanding Earth, it should be opened northward (Fig. 49 b).



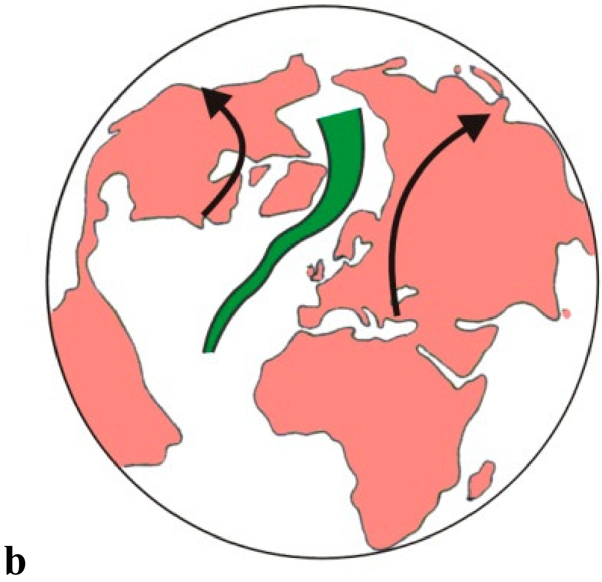


Fig. 49. *Fictitious rotations of the North-American and Eurasian plates (explanation in text)*

VI. Increase in the Earth's radius

1. Increase in the Earth's radius by geodetic methods

The growth of the Earth's radius results directly from the space geodesy, independently from the former findings, and in a form of exact values of the annual increment of the radius. What is more, the geodetic values are mutually very similar and correspond with analogous results obtained from geological data.

The papers referred in this chapter were published long ago and are susceptible to the contention that they are outdated. However their value is exceptional. Besides that, one of them, recording expansion, assumes that the result is impossible and recommends that future calculation should set any general uplift of geodetic sites to zero. Thus, an approach is advocated by which more recent papers will only "confirm" the non-expanding-Earth assumption.

a. Results from Doppler method

Blinov (1987) obtained the value of 2.4 cm/year from the Doppler satellite observations data, published by Anderle & Malyevac (1983). The data consisted in changes in the radius vectors (not heights above the geodetic ellipsoid) of 22 Doppler stations scattered throughout the world. Blinov simply calculated their averaged value and interpreted it correctly.

b. Results from SLR method

The SLR data were analyzed by Parkinson at the behest of Carey. He analyzed the geodetic arc given by three SLR stations: Arizona, Hawaii and Canberra and got yearly increment in the radius equal to 2.08 ± 0.8 cm/year. The result was published in Carey's book (1988). However, an erroneous value of 2.8 ± 0.8 cm/year (probably the printer's error) was given there. The error was corrected in the next Carey's book (1996), in which the author referred to the similar value (2.6 cm/year) obtained by me from geological data (Koziar, 1980)[16].

c. Results from VLBI method (general uplift)

Maxlow (2000) pointed out the unequivocal results obtained by the VLBI method (Robaudo & Harrison, 1993) and the astonishing attitude of the authors towards their own finding. Let us quote the authors:

> *A further constraint on our solution was that the stations were not allow [sic] to have any up-down motion. A solution (...) allowing the stations to have three independent velocities gave an RMS value of up-down motions over 18 mm/yr. This is extremely high when it is realized that areas of maximum uplift due to deglaciation are moving at only 10 mm/year or less. We must expect that most VLBI stations will have up-down motions of only a few mm/yr. It therefore seems reasonable to restrict the vertical motion to be zero, because this is closer to the true situation than an average motion of 18 mm/yr.*

This time we can see a special kind of circular argument, not in the method itself but in the treatment of its results. The method gives the clear increment in the radius of the Earth but the authors assuming the stability of the radius, rejected the result as a wrong one on the basis of their assumption.

d. Results from VLBI method
(fictitious shrinking of the VLBI network)

This result was deduced in point IV.2 and is > 1 cm/year**.**

e. Recorded increase in equatorial semi-axis
of global geodesic ellipsoid

This result was calculated in point II.2.e and is 2.72 cm/year.

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[16] See: www.wrocgeolab.pl/floor.pdf

2. Increase in Earth radius by geological methods

There are three geological methods of calculations of the growth of the Earth radius:

– based on increments in the Earth's surface area

– based on increments in the Earth's perimeter

– based on the relation of the present length of an oceanic ridge to its initial length as indicated by its parent (matrix) continental margin.

a. Calculation of present rate of Earth's radius based on increments in Earth surface

A simple method, but not very precise, is to measure the area of some young global increment in the lithosphere (increment in the surface area of the sphere) and to calculate the corresponding past radius of the Earth (sphere). This is done according to the formula:

$$R_t = \sqrt{\frac{S_0 - \Delta S_t}{4\pi}}$$

where: S_0 – present Earth's surface area

ΔS_t – increment in the Earth's surface since time (t) up to the present

R_t – Earth's radius at the time (t)

R_0 – present Earth's radius

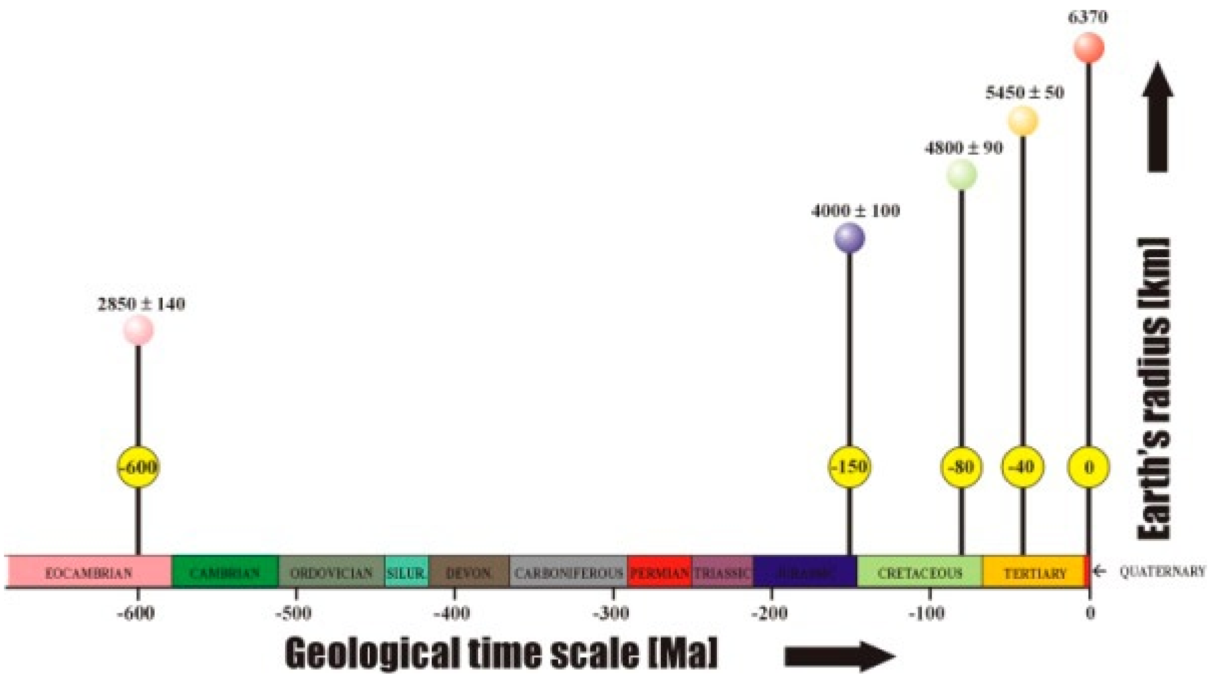
The increment in the Earth's radius $\Delta R=(R_0 - R_t)$ divided by a relevant time span (Δt) gives the quantity $\Delta R/\Delta t$.

This method was applied by Blinov & Schuber (1984) for the whole Cenozoic increment in the lithosphere and they obtained $\Delta R/\Delta t = 2$ cm/year. This result would have been precise if the growth had been linear.

However expansionists have suspected, starting with Hilgenberg (1933), that the growth is exponential which should give a higher value for the present time. Thus, a more precise method is to first calculate the function representing growth of Earth's radius and then differentiate it. To find this growth function, calculations are made according to the above formula, but applied to several points of geological time.The method was applied first by me (Koziar, 1980; www.wrocgeolab.pl/floor.pdf)[17].

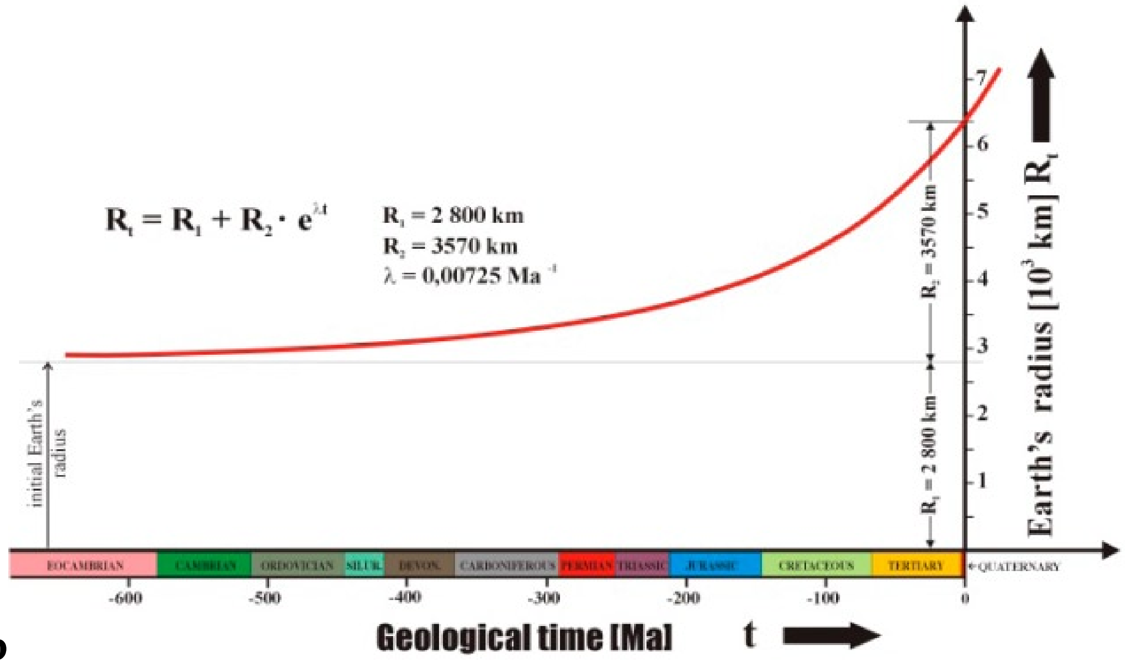
[17] Carey (1996) referred to my result, similar to his, but obtained by different method.

The planimetry (measurements on equal area maps) and calculation were done for four time points in the geological past: –40, –80, –150 and –600 Ma. The first three calculations were made on the basis of planimetry of increments in oceanic lithosphere. The fourth was based on planimetry of Precambrian shields with addition of 10% of their area to account for Precambrian crust dispersed within Phanerozoic continental crust. All the Phanerozoic continental crust was treated as a crust accreted to Precambraian shields by the process of expansion. The set of values obtained in this way (Fig. 50 a) had characteristics of an exponential function (Fig. 50 b). Parameters of the function were found by means of successive approximations. The function approaches an asymptote of 2800 km at t = -∞, which means that this value will have been negligibly less than a primordial Earth radius. The function derived in this way was the first one based on measurements and expressed as a mathematical formula. As can be seen, expansion has been continuous probably from the beginnings of the Earth and did not start in Jurassic time (at the beginning of the oceanic period of expansion) as is imputed by opponents.



a

John Robbins, from NASA/GSFC Lab for Terresstrial Physics (SLR analysis group), in his letter (31 Jan 1999) to an Australian expansionists Dave Ford, complied that "Koziar's investigation is not readily obtained". Here it is presented.



b

Fig. 50. Function of growth of the Earth radius, (a) four calculated values of former Earth's radius (explanation in text), (b) exponential growth of the radius of the Earth calculated from the increase in the Earth's surface (explanation is in text)

Their objections rest on misunderstanding of the character of the exponential function or from failure to realize that the growth is exponential. But as mentioned that kind of growth was already recognized by Hilgenberg.

Differentiation of the function (Fig. 50 b) gives the function of the rate of the Earth's radius increase (Fig. 51) which also grows exponentially. Its present value is equal to 2.59 cm/year (Koziar, 1980).

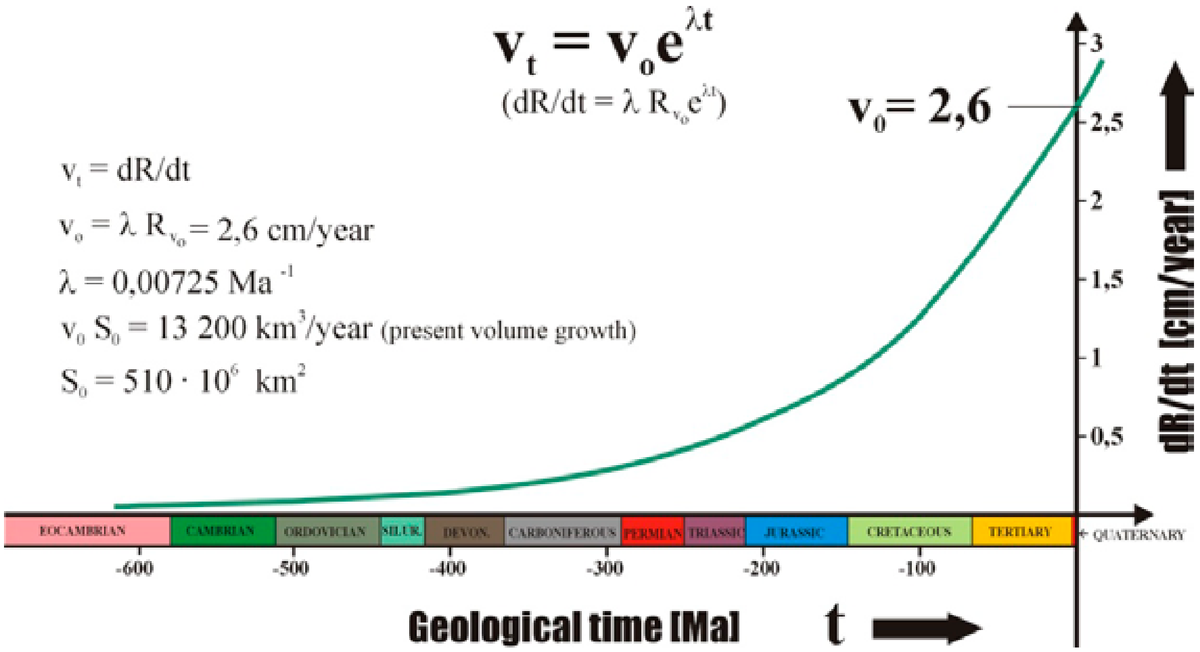


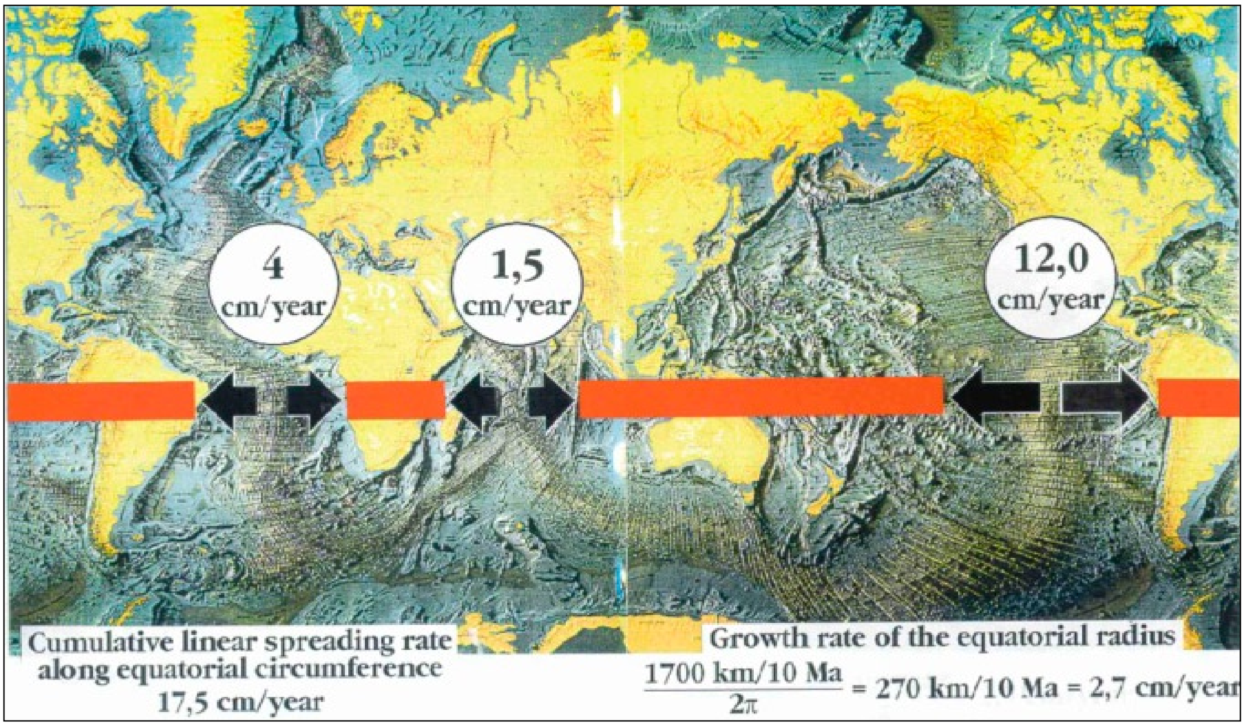
Fig. 51. Exponential rates of the growth of the Earth's radius (explanation in text)

The same way basic method was followed by Maxlow (2002) who used more recent maps and obtained a value for the present rate of expansion of 2.2 cm/year.

b. Recent annual rate of the Earth's radius resulting from the rate of the Earth's perimeter

Le Pichon (1968) tried to prove that the Earth is not expanding. This in itself was an exceptional attitude among founders of plate tectonics. He noticed, that oceanic ridges are mostly meridional, so the spreading occurs mainly latitudinally. He reasoned that in the absence of subduction this would make the Earth's equatorial radius much bigger than the polar radius (on the order of hundreds km in the past 10 Ma). Because this does not happen, a subduction exists and the Earth does not expand. However Le Pichon did not take into account the fact that the system of ridges also lengthens longitudinaly (see Fig. 2 c), as pointed out by Carey as far back as 1958. He also did not take into account Carey's Pacific Paradox (Carey, 1958) which proved expansion of this ocean. This paradox, in a simplified form (Koziar, 1993; www.wrocgeolab.pl/Pacific.pdf), reduces to longitudinally growing distances between continents (Fig. 52 a) which is an evident phenomenon. The factor which keeps Earth spherical, even during such asymmetrical expansion as was discussed in chapter V, is gravity not subducion.

a



b

***Fig. 52, (a)** Divergences along the great circle $60^0W–120^0E$ (Koziar, 1993), **(b)** spreading rates added up by Le Pichon (1968)*

Le Pichon tried to support his reasoning by calculation of the sum of the spreading rates along the equator (Fig. 52 b). He obtained 17.5 cm/year. After rounding this result down to 17cm/year he obtained 1700 km/10Ma and after dividing it by 2π, he obtained an increment in the equatorial radius equal to 270 km/10 Ma. That means 2.7 cm/year. This is a quite different way of calculation than that based on increments in the Earth's surface area. The coincidence of the results is striking. A proper interpretation of Le Pichon's result was done in (Koziar, 1996).

c. Recent rate of the Earth's radius resulting from the ratio of the length of the Mid-Atlantic Ridge to the parent margin of Africa

The calculation is based on the situation presented in Fig. 2 c. The ratio of the length of the section of the Mid-Atlantic Ridge to the length of the western shoreline of Africa corresponding to it, is 1.4. So, the Earth's radius would have been 4550 km at that time (before about 100 Ma) when both structures were joined together. The increment in the Earth's radius since that time is 1820 km. Dividing this value by 100 Ma we obtain 1.82 cm/year. This is the result at a linear growth of the Earth's radius. Because the real growth is exponential the real present result will be higher – certainly in excess of 2 cm/year.

3. Juxtaposition of values of present annual increments of the Earth's radius obtained by geological and geodesic methods

Let us now put assemble all the values of annual increments in the Earth's radius obtained by different methods – geodesic (Table I) and geological (Table II).

Table I. Present rates of the growth of the Earth's radius obtained by space geodesic methods

Author	Year	Rate [cm/yr]	Method
Blinov[1]	1987	2.43	Doppler Surveying (general uplift)
Carey[2]	1988	2.08 ± 0.8	SLR (chord analysis)
Maxlow[3]	2000	>1.8	VLBI (general uplift)
Koziar[4]	2011	>1.0	VLBI (apparent baselines contraction)
Koziar[5]	this paper	2.72	increase in the equatorial semiaxis of global geodesic ellipsoid

1) correct interpretation of the results published by Anderle and Malyevac (1983)
2) W.D. Parkinson's calculations
3) correct interpretation of the results obtained by Robaudo and Harrison (1993)
4) correct interpretation of the results obtained by Heki *et al*. (1989)
5) correct interpretation of the results published by McCarthy ed. (1992) and McCarthy & Petit eds (2003)

Table II. Present rates of the growth of the Earth's radius obtained by geological methods

Author	Year	Rate [cm/yr]	Method
Koziar	1980	2.59	Increase in the Earth's surface area (Phanerozoic)
Blinov & Šuber	1984	≅ 2.0	Increase in the Earth's surface area (Cainozoic)
Koziar[1]	1996	2.7	Increase in the Earth's circumference
Maxlow	2002	2.2	Increase in the Earth's surface area (from the Archean)
Koziar	2011	>2.0	ratio of the lengths of Atlantic Ridge and its parent western margin of Africa

1) correct interpretation of the result obtained by Le Pichon (1968)

The convergence of the values presented in the two tables speaks for itself.

VII. Final considerations

1. Basis of a correct absolute reference frame for space geodesy and geotectonics

a. Great stability of the expanding Earth body

It must be stressed at the start that the expanding Earth is a much more stable body than the plate tectonic non-expanding Earth. By itself, such a situation is much more conductive to establishing a terrestrial absolute reference frame. It can be shown that the mantle, mixed by the supposed convection currents, is about 200 times more mobile than a mantle expanding only (Koziar, 1991). The plates on the expanding Earth do not drift but they are being generally uplifted. They are staying generally at the same places and their mutual distances grow in the manner of spots on an inflating balloon. A better model is ruptures in the bark of a growing tree trunk (Fig. 53).

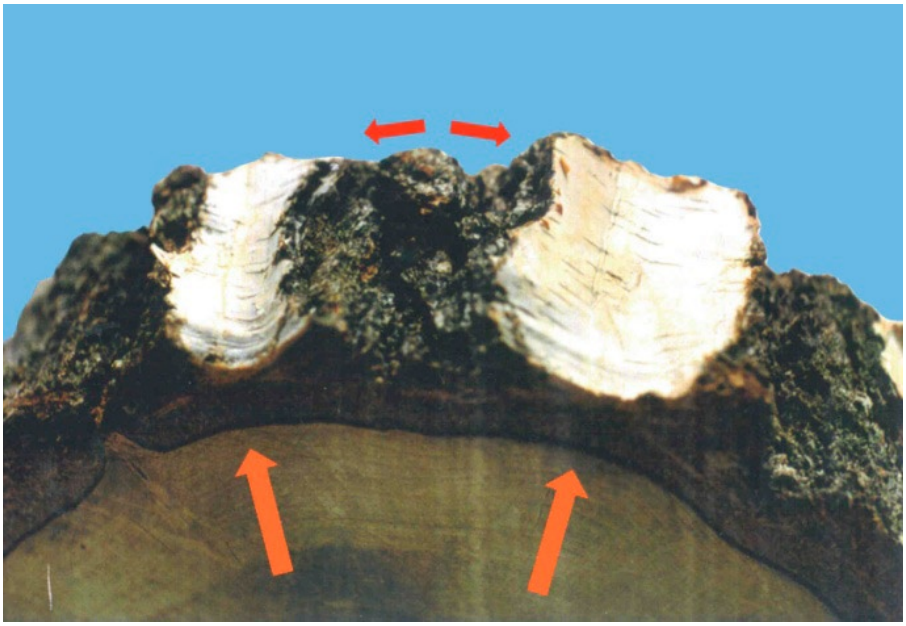


Fig. 53. *Kinetics and dynamics of the deformation of the bark on a growing tree*

Only the recorded southward asymmetry of expansion disturbs this ideal pattern.

b. Evolutionary dynamic parameters in relation to the correct absolute reference frame

The correct geodetic absolute reference frame should take into account an annual increment in the Earth's radius which should be precisely specified. According to current calculations it is in the range of 2.0 – 2.5 cm/year. On this basis the following ranges of increments can be calculated:

1. Earth's perimeter: 12.6 – 15.7 cm/year
2. length of an arc of 1 geographic degree (1 nautical mile): 0.035 – 0.044 cm/year
3. length of an arc of 1 radian (it is equal to a radius of a sphere): 2.0 – 2.5 cm/year.

These are basic parameters determining dynamics and evolution of the a new absolute reference frame. In contrast with plate tectonics it is really evolutionary, not simply changing, since it can never return to previous states.

The geodetic ellipsoid should be enlarged according to above parameters. The geoid, coupled with the ellipsoid by vertical ties (minimization of distances) should be elevated, too. However, its horizontal regional enlargement will be a matter of properly deciphered geodynamics.

c. Combining of the correct absolute frame with lower mantle

The new absolute reference frame should be coupled (in a quasi physical sense) with the lower mantle as the most massive and stable (in the absence of fictitious convection currents) part of the Earth. The mantle admittedly expands but has the least lateral movement.

The upper mantle is much more stable than the lithosphere but less stable than the lower mantle. It is characterised by diapirism under oceanic ridges and first of all by the asymmetrical expansion in which the upper mantle must certainly be involved.

d. Surface benchmarks of correct absolute reference frame

The basic benchmarks tying the new absolute frame with an expanding but stable (in the sense of lateral movements) mantle are first of all hot spots. Liberated from the plate tectonics paradigm, they cease to move laterally with respect to the mantle and become a firm basis for the new frame.

The system of oceanic ridges can serve as another benchmarks of the new frame.

The stable points of transformations, as geometrical barycentres of the plates, are less firm because of existence of the northern megaplate. There are no isolated plates in its interior (do not connected by mechanical ties with other fragments of the megaplate). Taking into account the idealised situation presented in Fig. 33 a and b, there are only two antipodal SPTs determining an absolute reference frame. However, the Antarctic plate has recently had larger mechanical ties with South America and Africa than with

Australia. On the other hand the northern megaplate does not constitute a coherent mechanical structure but its elements are displaced southwardly more by ductile stretching than by brittle cracking.

2. Increase in the Earth's mass – Yarkovski's gravitational effect

Most expansionists, starting with the founder of the theory, the Polish engineer (working in Russia) Jan Jarkowski[18] (1888), treat (and recently prove (Hurrell, 2011) the Earth's expansion as a result of the growth of its mass. The recent annual growth is of the order 10^{19} g/year:

– 2.8×10^{19} g/year (Ciechanowicz & Koziar, 1994),

– 1.37×10^{19} g/year (Scalera, 2003),

– and most probably 6.0×10^{19} g/year (Maxlow, 2002, 2005).

This rate of the growth of the Earth's mass corresponds well with the mysterious decrease in the orbit of the geodetic satellite Lageos discovered in 1980s (Alfonso *et al.,* 1985; Rubincam, 1987) which is about 40 cm/year. This decrease may be partially explained by "the Yarkovski's (radiation) effect". In fact it is the "Yarkovski's gravitational effect" at work.

3. Cosmological implications

The presented results (and the whole theory of the expansion of the Earth) correspond with the concept of creation of new matter developed by many physicists and cosmologists and elaborated best by Fred Hoyle. Hoyle's idea was developed within his quasi-steady-state model of the universe and was assimilated by supporters of the Big Bang theory. Thus, it is accepted by almost all cosmologists. The only innovation brought by the expansion of the Earth is that the process happens also under our feet and can be empirically proved (see Hurrell, 2011). The site of new matter generation is most probably the Earth's inner core.

The expanding Earth corresponds also with Ambartsumian's eruptive (explosive) cosmology. It rejects the speculative hypothesis of condensation of celestial bodies from nebulas, and demonstrates empirically that they develop from super-dense pre-stellar matter. In the case of our Solar System, and particularly of the Earth, this will be neutron matter. The eruptive origin of the Solar System from a neutron star is consistent with the fact that our local atomic matter is not older than the system itself.

[18] "Yarkovski" in English spelling

The two theories are put together (but without relating them to the expanding Earth) in the book “A Different Approach to Cosmology” (Hoyle *et al.,* 2000).

4. Micromechanism of Earth’s expansion

Both ways of creation or formation of atoms, either from neutron matter or as new matter, have a common stage in which electron shells are created around newly formed naked atomic nuclei. This entails enormous increment in volume in a ratio of the order 10^{14}:1.That fits (with a large excess) with the more than tenfold increase in the Earth’s volume since the Precambrian recorded by geological data (Koziar, 1980; Vogel, 1990; Maxlow, 2002, 2005).

The formation of new atoms (almost from a zero volume) constitute a physical micromechanism of Earth expansion and a driving force for all tectonic processes.

5. Propelling super-rotation of the inner core, expansion of the Earth and long-term changes of the length of day (LOD)

Expansion of the Earth should cause a significant slowdown in the Earth’s rotation by the law of conservation of the angular momentum (pirouette effect). Because the appropriate long term shortening of the length of day (LOD) is not observed, for a long this has been treated as an argument against Earth expansion. But maybe the new matter is created with a large angular momentum? It would be odd if it were created exclusively with momentum of nature not affecting the existing rotation.

However, leaving aside the problem of creation of the new matter and its momentum, and generally the question of Earth’s expansion, it now appears to be well-established that the inner core rotates faster than the rest of the planet. This phenomenon was discovered by Song & Richards (1996) and subsequently confirmed by other investigations. The first authors estimated the eastward differential angular rotation of the inner core relative to the rest of the Earth (ΩIC, in the notation introduced by Glatzmaier & Roberts (1996) as about 1^0 per year. It is an enormous motion. The 1^0 means <u>linear</u> differential velocity along the inner core equator (against the external core) equals to 21.3 km/year, 58 m/day, 2.4 m/hour and 4 cm/minute This is motion which would be perceptible by eye. Let us compare this value with the maximal bilateral spreading rate which is only about 16 cm/year.

Su *et al*.'s (1996) calculations arrived at a result considerably higher still at about 3^0/year. This translates to an inner-core-equatorial linear speed 12 cm/minute. Glatzmaier & Roberts (1996) arrived at a high, intermediate value of between 2^0 and 3^0 per year. Subsequent papers reported values about a tenth of these estimates. Thus, Craeger (1997) estimated the range at $0.2 – 0.3^0$ per year. Zhang *et al*. (2005) place the value between 0.3^0 and 0.5^0 per year. Cao *et al.* (2007) confirmed this result. The average value of the last range still gives an enormous linear speed of 1m per hour. Some authors (Laske & Masters, 1999; Waszek *et al*., 2011) tried to reduce the differential motion almost to zero but its large value can be treated as real.

This is a phenomenon of the first rank tectonic process, apart from expansion of the Earth itself. Such propelling rotation inside the Earth of such a huge mass (almost the size of the Moon) should accelerate the rotation of the whole globe. However such an acceleration is not observed. So we must look for a significant factor delaying the Earth rotation. The hampering pirouette effect provided by Earth expansion provides just such a factor. Thus the whole rotational problem is turned on its head. The tables are turned to the advantage of Earth expansion.

The expanding Earth can even caused very small and short changes of LOD (connected with big tsunami earthquakes) but this is a separate topic presented in a separate paper (Koziar, 2011b[19]).

VIII. Euler versus Euler

Two of Euler's concepts have met in the plate tectonic pattern of plate movements, allegedly confirmed by space geodesy. First of these is well-known-Euler's theorem concerning rotation of spherical plates on a sphere, which is the basis of plate tectonic kinematics. The second one is less well-known – the idea of space geodesy as such.

Over two centuries ago Euler presented, at French Academy of Science, a new method of measurements of the Moon for calculation of the shape of the Earth. He wrote (after Czarnecki, 1994, p. 18):

> *If the Moon was closer to the Earth or if there were other observable close celestial bodies, then my method of establishing of the figure of the Earth would be more useful than measurements of the length of the degree of latitude and triangulation.*

[19] It will be available at www.wrocgeolab.pl/LOD.pdf (footnote 2018).

Euler surely did not expect that in the future it would be possible to create artificial satellites capable of realising his idea. However, a "collision" happened between the geodynamic results of space geodesy as based on his idea (results which confirm expansion of the Earth) and application of his spherical theorem to the plate tectonics paradigm built on the non-expanding Earth assumption. Of course this contradiction does not invalidate his theorem but only its wrong application to geotectonics.[20]

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[20] The direct falsification of the supposed Eulerian movement of the lithospheric plates was carried out separately, see:
J. Koziar, 2016. Falsification of the Eulerian motions of lithospheric plates
Biuletyn Państwowego Instytutu Geologicznego, tom 466, s. 147–178,
DOI: 10.5604/01.3001.0009.4576
Falsification of the Eulerian motions of lithospheric plates*.*
Bulletin of the National Geological Institute, vol. 466, p. 147–178,
DOI: 10.5604/01.3001.0009.4576
www.wrocgeolab.pl/falsification2.pdf (footnote 2018).

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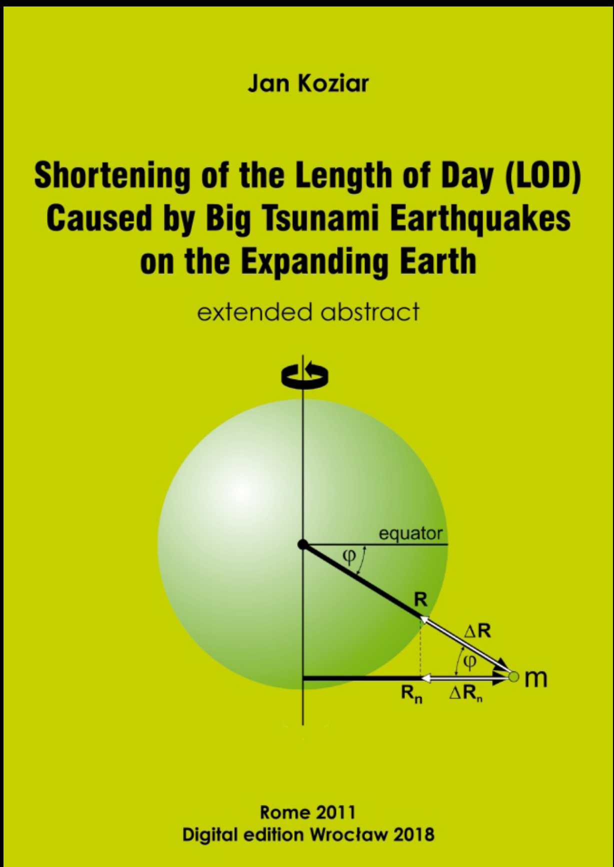
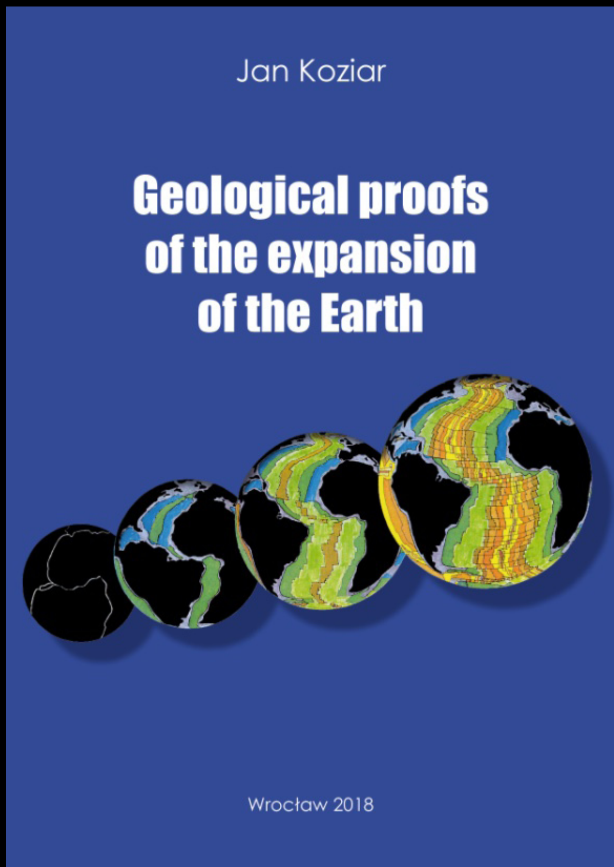
Jan Koziar

The paper ***Expanding Earth and space geodesy*** deals with the most embroiled relations in contemporary geotectonics. Most geologists do not want to discuss geological relations (belonging to their profession) which prove the expansion of the Earth, because they believe that space geodesy (which is not their profession) proved the constant size of the Earth. Whilst space geodesy accepted as a dogma the false geological (plate tectonics) assumption on Eulerian motions of lithosheric plates. These motions can happen only on the constant size sphere. Thus the circularity of reasoning is closed. In my other paper ***Falsification of the Eulerian motions of lithospheric plates*** (www.wrocgeolab.pl/falsification2.pdf) I demonstrated that this basic assumption of plate tectonics is false. The current paper shows that despite of acceptation by space geodesy the false plate tectonics assumption, the expansion of the Earth emerges from the first discipline on manifold ways. Thus this paper helps to solve the basic problem of contemporary geotectonics. (J.K.)

Publishing announcement





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