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A non Newtonian view of the Universe based on Hydrodynamic Gravity and Expanding Earth

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Abstract. From Earth Sciences and geoneutrino experiments Borexino and KamLAND come clues on a role of the aether in the geological evolution of Earth and planets, and of all the structures of the universe. Through the problem of the storage of the aether arriving into the heavenly bodies, hydrodynamic explanation of gravitation is found closely related to the concept of the expanding Earth. Variable radius paleogeography allows a rough evaluation of the amount of ordinary matter that is added to the planet in the time unity, and the statement of some inferences on the Earth's inner energy balance. With the help of astrophysics the aether's density, flow rate, and velocity are computed. The origin of the cosmological redshift and the gravitational redshift is unified to the cause of gravitation, with a concept similar, but not coincident, with that of tired light, considered very plausible by cosmologists such as Edwin Hubble and Fritz Zwicky. A superluminal aether's speed at the Earth's surface is found. INFN experiments confirm hydrodynamic gravitation and superluminal velocities, and it is possible to highlight an interrelations of aether parameters with the actually known cosmological parameters H_0, G, c. The unification of the hydrodynamic gravitation and the expansion of the heavenly bodies, through the existence of a little dissipative force – a non-Newtonian concept – is linked to a revision of the theories of physics and cosmology, in which the actually accepted physics laws are only good approximations of a more complex reality.

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Contents

1 Historical perspective of the *central torrent*

Newton's research work on gravity was never separated from the knowledge that gravitation should have been explained by physical mechanisms. Newton admitted the existence of an aether pervading everything (Bellone, 2006), and was also surrounded by his scientific referents who proposed mechanical explanations of gravitation. A good friend and confidant of him was that Fatio De Duillier (1690) for whom gravity was caused by mechanical collisions of infinitesimal particles wandering with random directions and velocities in space: a mechanism further developed a little later by George Le Sage (1750) (van Lunteren, 1991, 2002). But Newton preferred other hypotheses about the nature and dynamics of the aether. He wrote of a first hypothesis in 1675 in a communication to the Royal Society:

> *The vast body of the earth, which may be everywhere to the very centre in perpetual working, may continually condense so much of this spirit as to cause it from above to descend with greater*

celerity for a supply; [. . .] nature making a circulation by the slow ascent of as much matter out of the bowels of the earth in aerial form, which, for a time, constitutes the atmosphere;[. . .] And, as the earth, so perhaps may the sun imbibe this spirit copiously, to conserve his shining, and keep the planets from receding further from him. And they, that will, may also suppose that . . . the vast aetherial spaces between us and the stars are for a sufficient repository for this food of the sun and planets (Newton, 1675; text reproduced in Cohen, 1958, pp. 181).

He was even perhaps for the first time proposing a central torrent and explaining the reason for the rapid flow of the aether towards the interior of the celestial bodies. The aether as food for the Sun and planets is also a first vague prelude to the concept of Expanding Earth. A few years later he devised a second possible mechanism for gravity: an aether whose consistency, as the size of its particles, grows away from the Earth (Evans, 1958), starting another line of research embraced at the time by Euler on a similar basis (increasing pressure instead of density). Despite conjectures on possible flows of aether towards the Earth's interior as the cause of the heaviness, Newton and many other successors, due to their philosophical and religious beliefs, could not conceive a progressive accumulation of matter in the planet: the aether was eliminated with improbable mechanisms. For Newton it had to return to outer space, and the problematic contrast between the arrival and the return constituted one of the reasons that ended up producing the British renunciation of imagining further hypotheses.

It was the Swiss Johann Bernoulli (1667-1748), although he was aware of the De Duillier-Le Sage-like mechanism (he translated the text of De Duillier), who proposed a true hydrodynamic flow of aether penetrating perpendicular to the Earth's surface – which he called the *central torrent* – directed towards the center of the planet. He wrote:

The gravitation of the planets toward the center of the sun, and the weight of bodies toward the center of the earth, are not caused either by the attraction of Newton, or by the rotary force of the vortex medium of Descartes, but by the immediate impulsion of a substance which under the form of what I call a ' central torrent,' is continually thrown from the whole circumference of the vortex to its center, and consequently impresses on all bodies encountered by it in its path the same tendency toward the center of the vortex. . . . And all that Newton has derived from his 'attractions' are by my theory, derived from the impulsions of the central torrent (translated and quoted in Taylor, 1876).

Not free from contradictions and incompleteness, Bernoulli blended, in his opinion, the best of the (incompatible) concepts of Newton (spherical symmetry of gravity) and Descartes (axial symmetry), convinced of reproducing all aspects of Newtonian gravity, but without a rigorous formal demonstration (Bernoulli, 1735). The problem of whether or not the incoming aether was stored in the heavenly bodies remained vague.

Pierre Simon Laplace (1749-1827), who considered hydrodynamic gravity plausible, calculated that the propagation speed of gravitation fluid had to exceed the speed of light by many orders of magnitude to make the effect of gravitational aberration negligible:

Si la gravitation était produite par l'impulsion d'un fluide vers le centre du corps attirant; l'analyse précédente, relative à l'impulsion de la lumière solaire, donnerait l'équation séculaire due à la transmission successive de la force attractive. [. . .]; on doit supposer au fluide gravifique, une vîtesse au moins cent millions de fois plus grande que celle de la lumière [. . .]. Les géomètres peuvent donc, comme ils l'ont fait jusquîci,supposer cette vîtesse infinie (Laplace, 1802, pp. 325-326).

Otherwise – aether flowing at speeds comparable to c – the planetary orbits would have destabilized in a few thousand years. Laplace does not pronounce about the problem of the aether final storage. However, the superluminal properties of the gravific fluid within the solar system seem to be confirmed by very recent experiments (see section 7 in the present paper).

In the nineteenth century at least two tried again: James Clerk Maxwell (1831-1879) and Bernhard Riemann (1826-1866). In the field of electrostatics, Maxwell had a hydrodynamic interpretation of Faraday's lines of force, describing them as tubes within which a fluid (but imaginary!) flowed, whose speed decreased as $1/r^2$ with respect to the charge (Maxwell, 1856); the analogy between electromagnetism and gravitation was later elaborated by Oliver Heaviside (1893). Riemann instead wrote a work in 1853 (published posthumously) *New Mathematical Principles of Natural Philosophy*, in which a hydrodynamic model of the incompressible fluid aether was developed, but also not knowing where to store the incoming stream of aether he wrote:

> *I make the hypothesis that space is filled with a substance which continually flows into ponderable atoms, and vanishes there from the world of phenomena, the corporeal world. Both hypotheses may be replaced by a single one, that in all ponderable atoms, a substance perpetually appears from the corporeal world into the mental world (Riemann, 1853, pp. 505-517).*

Maxwell and Riemann thus solved the storage problem in an idealistic way.

The aether found a place to settle in our real world a few decades later: the almost obvious solution was worked out by the Russian-Polish engineer and astronomer Jean O. Yarkovsky (1844-1902), best known in astronomy for a thermodynamic effect on the rotation of small heavenly bodies (Beekman 2005, 2006). He thought that the incoming aether formed new atoms in the depths of the Earth, giving rise to various phenomena including expansion of the planet, internal heat and earthquakes (Yarkovsky, 1889). Subsequently, at the beginning of the new century, he published a short pamphlet on the density of the aether, in Russian, in which he obtained a value eleven orders of magnitude greater than the one calculated here (Yarkovsky, 1901). Without giving a bibliographic reference, he cited as erroneous the value published by Lord Kelvin (which was near to the order of magnitude deduced here in section 4). His ideas, however, were closer to those of De Duillier-Le Sage, which give rise to gravitational screen effects searched without positive outcome also during XXth century (Majorana, 1930; Caputo, 1962, 2006; and many others).

A few decades later Ott Hilgenberg (1896-1976), a well-known scientist of Expanding Earth in Berlin from the early 1900s (Scalera and Braun, 2003; Scalera, 2020), resumed at a late age, his youthful research on the flowing aether. Setbacks prevented his oral presentation on hydrodynamic gravity as the cause of expansion at a conference organized by British geophysicist Keith Runcorn in Newcastle Upon Tyne. Shortly thereafter, he published the text of his talk in a 16-page booklet (Hilgenberg, 1967) criticizing Riemann (1853) for his idealistic disappearance of the aether once penetrating into the material bodies, and tried to derive the density of the aether with the help of the red shift of the solar light. The data of the time did not allow him to succeed, but it is remarkable that he took a path that was in principle the right one.

The concept of aether never has been abandoned (Whittaker, 1910; Selleri, 1993; Kostro, 2000; Wilczek, 2008) and numerous groups or individual researchers deal with hydrodynamic gravitation (Bhattacharyya et al., 2008; Rangamani, 2009; Barceló et al., 2011) and other

different concepts (a short review in Cristianto and Smarandache, 2008) but many of them in the theoretical context of general relativity and without connection with Expanding Earth. Only Wang (2008), without considering plausible an expansion of the heavenly bodies, is aware that the gravity, if formulated hydrodynamically, implies the property of an increase of masses and variation of G. In his master thesis Ngucho (2019) is aware that the existence of a thin material field can lead to a slow kinetics energy loss of the planets along their orbits. In his long activity Blinov (2012) has a concept of gravity acting as a transfer of energy from space to objects, and Cahill (2009) identifies the aether with a flowing space, while Consoli et al. (2014) prefer a flowing aether constituted by a Bose-Einstein condensate. Also the concept of Euler of an aether causing gravity by pressure gradient is cultivated today (Arminjon, 2004).

But for the vast majority of the scientific community the situation today does not differ much from that clearly reported by Riemann:

Rather, we should look to the circumstance that Newton's law of attraction has operated so long on the notions of researchers that they seek no further for explanations (Riemann,1853, pp. 505-517).

Finally, in modern manuals and treatises on hydrodynamics, the sink and source entities are considered with dismay because of the singularities present at their center and defined as pure theoretical abstractions: in no one it is proved formally that the singularity is canceled by the Newtonian laws (see section 8 in the present paper).

2 The Earth's heat flux budget is not balanced

Earth sciences provide numerous evidences of planet expansion (Mantovani, 1930; Egyed 1961; Hilgenberg 1967, 1974; Jordan, 1971; Carey 1976; Owen 1976; Heezen and Tharp, 1977; Shields, 1983, 1996; Vogel, 1984; Larin, 1993; Chudinov, 1998; Maxlow, 2002; Cwojdziński, 2003; Shehu, 2005; Betelev, 2009; Hurrell, 2012; Scalera, 1990, 1993, 1994, 2001, 2009, 2010, 2011, 2012, 2017, 2020; Xu and Sun, 2014;. Shen et al. 2015; Xu et al.,2016; Khan and Tewari, 2017). All these tests of a geological, paleontological, geomorphological, paleogeographic, paleomagnetic, geochronological, geodetic etc. nature, do not necessarily imply a link between Expanding Earth and a hydrodynamic gravitation with a central torrent. Only recently from the refined experiments in Italy, Borexino at Gran Sasso, and in Japan KamLAND on the island of Honshu, set up to measure the radiogenic heat of the Earth from the neutrino flux (Borexino collaboration, 2017: Shimizu, 2017; Scalera 2020) has grown the awareness that cause of the expansion could be a flow of aether that converges towards the planet, transforming itself into ordinary structured matter – particles and then atoms – during the surface-geocenter journey. The problem of the energy balance of the Earth has long been debated (Fiorentini, 2007; Anderson, 2009; among many others) without having had a definitive solution.

Today we can reexamine it from the new perspective provided by a central flow of constitutive matter. To satisfy the Earth's heat balance the total 45-47 TW, from wells and mines, should equal the sum of the primeval heat – created by the formation of the planet, which has slowly dissipated until it reaches the modern residue, estimated to be between 5 TW and 15 TW – plus the radiogenic one, but this is not the case. The exiguous tidal dissipation ($\approx$ 0.1 TW) and gravitational potential energy released in differentiation of crust from mantle ($\approx$0.2 TW) can be neglected (Bellini et al. 2021). The geodynamic approach, for its hypothesis of the existence of convective motions in the mantle, would estimate a faster

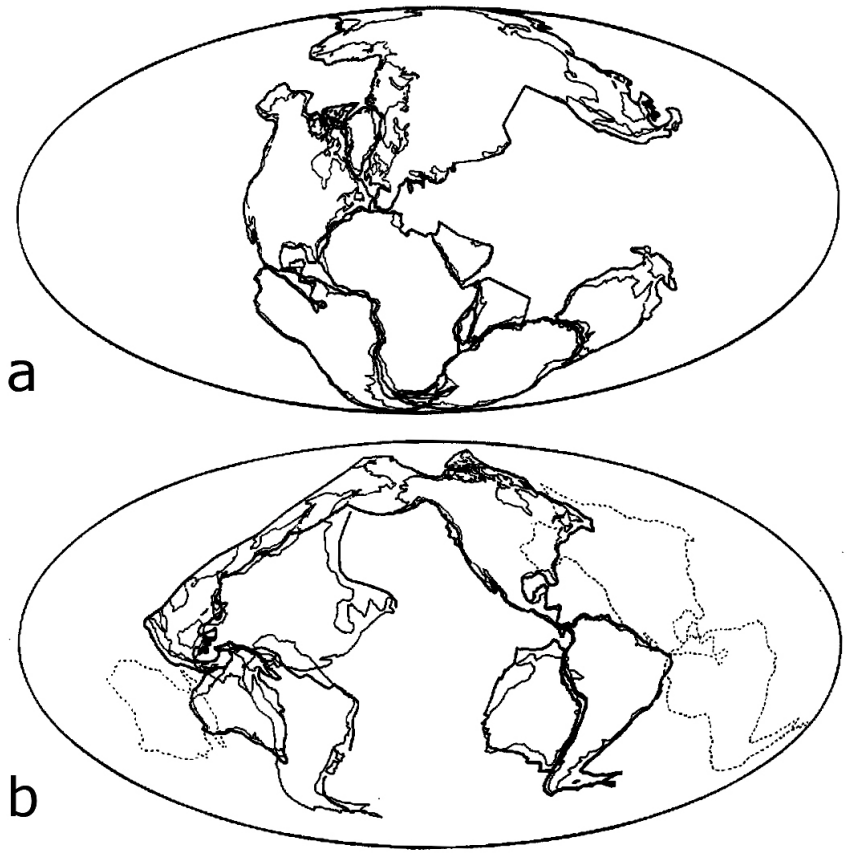

Figure 1. Cartographic experiment performed in Scalera (1993; pag. 50, Fig. 3). a) Reference Pangaea. The supercontinent has been reconstructed following the classic work of Bullard, Everett and Smith (1965), Smith and Hallam (1970), Owen (1983). b) Circumpacific continental scarps (bold line) and coastlines in their modern position besides all the conformities among continents and basins (see Scalera, 1993) together with the outlines of Australia, Laurentia and South America (dotted lines) in the positions which they assume in (a) in the reference Pangaea. It is impossible to imagine how the conformities could be formed by convergence of Laurentia, South America and Australia coming from Pangea and drifting towards their modern position and towards the Pacific. The circumpacific conformities find satisfactory overlap with the relative basins and a reciprocal juxtaposition if the mutual position of continents is reconstructed on a half radius globe as in the next Fig. 02.

dissipation of the primordial heat, preferring for it today's values below the average of ≈10 TW. To the three radiogenic heat flux values predicted by the models (Table 1) respond the Borexino and KamLAND experiments (Borexino collaboration, 2017: Shimizu, 2017) with results of 8-16 TW (best value) and 18-28 TW (best value) respectively (Table 1). With these values, the sum of radiogenic (average KamLAND-Borexino ≈18 TW, average Borexino ≈ 24 TW, maximum Borexino ≈ 28 TW) and primordial (mean ≈10 TW) is more distant from the surface heat flux value. Some geophysicists (Anderson 2009; among others) invoke the possibility of counting the highest values allowed by standard deviations, but the problem should not be underestimated.

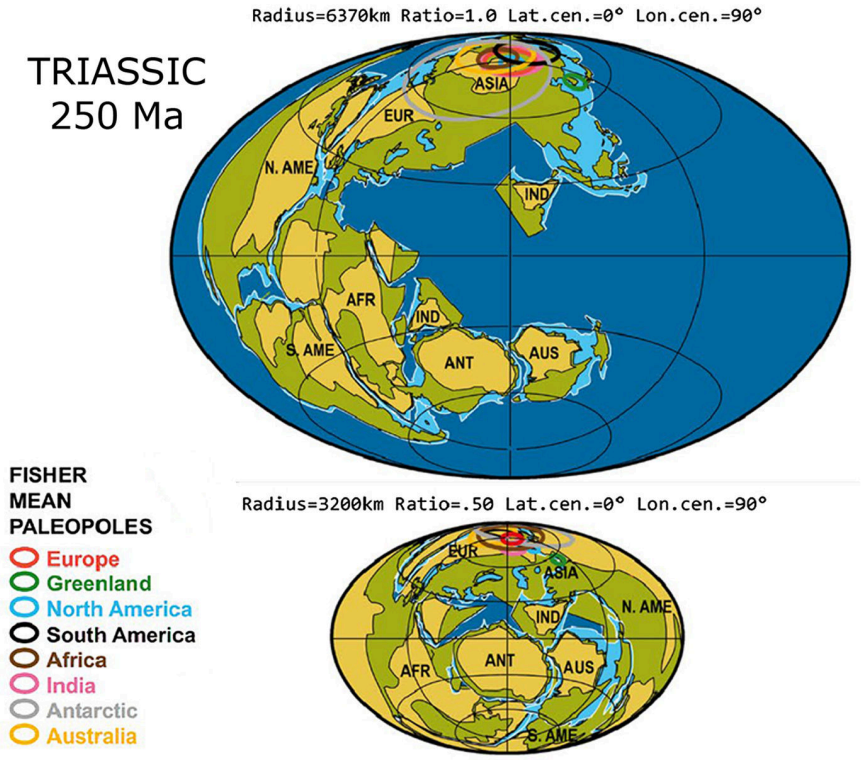

Figure 2. Paleogeographic reconstructions performed (Scalera, 2018, 2020) for the Triassic, assisted by the GPMDB (Global Paleomagnetic Database) (Pisarevsky, 2005). Paleopoles were traced as Fisher averages. The beige color defines the Paleozoic shields; olive green the mainland of the current continents; and light blue the modern continental shelves. More details and the lists of GPMDB data used, can be found in the Supplementary Materials file accompanying Scalera (2020). This is a typical cartographic experiment leading to the possibility to evaluate the Earth's annual mass growth. But it constitute also a proof of the expanding Earth because the same selection of poles enables reconstruction of both the classical Pangea with all its exaggerations (Tethys Sea too vast, pre-Triassic Pacific crust more than hemispherical and today completely disappeared, India too isolated from Asia, etc.) and the globe of 3200 km, the terella of Triassic without oceans. If the selections of poles were incorrect or biased for the 3200 km globe, then the reconstruction of Pangea with the modern radius would also be wrong, and/or the GPMDB catalogue would be useless. In Triassic Antarctica was not covered by a thick ice cap: fossil forest has been found and fossils of animals that cannot survive to several months of absence of sun-light. My reconstructed Terrella is more adequate to fit the real Triassic paleoclimatic situation.

It has been hypothesized that the missing heat could be provided by an exothermic processes of nuclear fission in a reactor generated by the migration by gravity of the radioactive elements towards the region near the Earth's center (Herndon, 1993). It would produce no more than 5-7 TW, but some researchers would reject it on the basis of various arguments, including geochemical ones (Degueldre and Fiorina, 2016). The same difficulties exist for nuclear reactor eventually located in the layer *D*", a thin shell enclosing the liquid core. These nuclear fission reactors hypotheses both suffer of the strong difficulty of the lack of an efficient mechanism of eliminination of the nuclear fission waste that inexorably poison and stop the reaction.

Table 1. Decay of radioactive elements: comparison between models and experimental results

Cosmochemical approach	The composition of the Earth is based on the enstatite chondrites, which show a closer isotopic similarity with the mantle and an iron content high enough to explain the terrestrial metallic core	11±02 TW
Geochemical approach	For the relative abundances of the lithophile refractory elements it adopts a chondritic composition, then placing limits on the absolute abundances from terrestrial samples	20±04 TW
Geodynamical approach	It is based on the hypothetical energetics of mantle convection and on the observed heat flux on the surface	33±04 TW
Borexino experiment	Observed best value	18-28 TW
KamLAND experiment	Observed best value	8-16 TW

From the neutrino experiments it is deduced that the terrestrial radiogenic heat flux predicted by the convective cell geodynamic model (33 ± 04 TW) is not confirmed (Borexino collaboration, 2017; Shimizu, 2017; Scalera, 2020, p. 112) (Table 1). Even taking the Borexino mean value of ≈ 23 TW, we would have to add a primeval heat value taken from the low end of its estimate due to the higher dissipation caused by convective motions, but even adding conservatively its mean of ≈ 10 TW we would be far from the 45-47 TW total.

Furthermore, it is important to consider that the feedback of Expanding Earth with the primeval heat evaluation would lead to a primitive heat reevaluation much less than 5-15 TW, making the lack of a plausible heat source more dramatic. This serious problem of the real Earth's evolution bias all estimates of the Earth's primordial heat, unbeknownst to the authors, who are mainly interested in closing the Earth's heat budget in balance within the framework of current knowledge, in which the expansion of heavenly bodies (Fiorentini, 2007; Anderson, 2009; Bellini, et al. 2021; among others) is not considered. The budget can close in balance only arguing the existence of an unidentified source of heat that could be linked to the unknown physical phenomenon that drives the terrestrial expansion. It is therefore necessary to ask whether a part of the neutrinos detected in Borexino and KamLAND is produced by matter-genesis, and whether part of the heat flux missing from the call is due to the increase in the kinetic (thermal) energy of the Earth's core materials due not to radioactive decay but to the convergence of the aether and its ways of converting into ordinary matter.

3 Geologic quantification of the incoming aether

What we call the gravity field, the intensity of which decreases as $1/r^2$, is nothing more than the force exerted on a unitary mass m placed in a given point, but that force does not exist in another different point if we do not place there a unitary mass m. The field is therefore a point-by-point mapping of what a unit mass m would experience if placed in each of the

infinite points of the space surrounding the central massive body with $M >> m$. It is not perceptible what really exists in all the infinite points in which we could place m, and which exerts a physical action on m (something that is there even if we do not place the test mass m in that place). The Newtonian gravitational field is therefore a phenomenological and incomplete description of physical reality (similar fate for the electromagnetic field).

We can then begin to think about a gravitation due to the material field of an incompressible perfect fluid aether of density ρ, converging towards the Earth with a speed depending on $1/r^2$ (above the surface of the planet; r = distance from the geocenter). Starting from the known relationship for the force $f = \rho Q \upsilon$ (called the dissipative term) exerted by a fluid current of uniform flow with velocity υ on a sink singularity having flow rate Q, we arrive at the expression of the attractive force between two static sinks (or even between two sources) analogous to the expression of Newtonian gravity (Buffoni, 2015):

$$f = \frac{\rho}{4\pi} \cdot \frac{Q_1 Q_2}{R^2},$$

which can be compared with the force of gravity between two masses:

$$F = G \cdot \frac{mM}{R^2}.$$

Obvious dimensional problems do not allow to identify G with $\rho/4\pi$. What makes this conception (only apparently old) very attractive is that it is not a Newtonian conception, since the expression of force in the non-static case has a dependence on the speed of the sinks or sources.

The same attraction force would be obtained both with high flow rates Q_i and low density ρ, as well as low flow rates and raising ρ, and the velocity field υ also plays its part in the dissipative term. There are only clues that the density of aether is very low (Buffoni, 2015; Wang, 2009; Scalera, 2020), otherwise the dissipative term f would be too important and the founding fathers of modern science could not have posited the principle of inertia, the concept of conservative field, of escape velocity, etc. as good approximations.

From the sciences of the Earth, with paleogeography (Fig.01, Fig.02) and its precision limits (Scalera, 2020), the mass in the spherical shell added up to now to our globe can be evaluated and thus it is possible to approximately calculate the rate of transformation of the aether into ordinary matter as energy transferred to the planet in the unit of time (per second; averaging from the Triassic to Recent, 250 My; assuming conservatively terrestrial radius at the Triassic time $R_{Trias} \approx 3400$ km) (Scalera, 2020). The volume of the Earth (which today is V_T) was in the Triassic $V_{Trias} \approx 0.152 \cdot V_T$. So the volume acquired in 250 My would be $V_{acq} = V_T - V_{Trias} \approx (1 - 0.152) \cdot V_T = 0.848 \cdot V_T$.

This does not ensure that the acquired mass was $M_{acq} \approx 0.848 \cdot M_T$ (with M_T = Earth's current mass), because a poorly known process of differentiation of materials may have been taking place in the deep planet with phase changes and large volume increases. Therefore, assuming very crudely that the acquired mass is only $M_{acq} = 0.5 \cdot (0.848 \cdot M_T) = 0,424 \cdot M_T$ and linear growth – while in fact it is exponential – we can evaluate the approximate amount of energy per second absorbed at the expense of the constituent matter:

$$E_s = (M_{acq} c^2)/(2.5 \cdot 10^8 y \cdot 3.1557 \cdot 10^7 s) = 2,889 \cdot 10^{25} J/s.$$

The Earth Sciences alone do not uniquely solve the problem of obtaining the density ρ of the aether, nor the aether flow rates nor its velocities υ(x,y,z) around sinks (heavenly bodies).

Perhaps this lack of outcome prevented Bernoulli and his successors' conception of gravity from spreading and taking root in the scientific community.

4 Help from astrophysics

To fix an at least approximate value of ρ, we ask astrophysics for the help that it could not give in their time to Yarkovsky (1901) and Hilgenberg (1967). We hypothesize that the velocity-dependent dissipative hydrodynamic term, the force $f = \rho qc$, is responsible for the phenomenon of the redshift $z = (\nu_0 - \nu_1)/\nu_1$ of the electromagnetic radiation coming from celestial bodies, which gives rise to the Hubble law $z = (H_0 D)/c$. This idea is similar, but not coincident, with that of tired light, considered as much more plausible than the Doppler effect by cosmologists such as Edwin Hubble, Fritz Zwicky, and other colleagues who first worked on the redshift-distance relationship (Assis et al., 2011; Kragh, 2017).

Today we can argue that the energy variation E of each photon emitted with frequency ν_0 and received with frequency ν_1, $E = h(\nu_0 - \nu_1)$, is caused by the work $L = E = fD = \rho qcD$ of the dissipative term f on the motion of a sink having flow rate q (the photon), on the distance D between the emitter and the observer. It can be written as follows: $\rho q = E/Dc$. The same quantity ρq can be obtained from the hydrodynamic force f (equal to the Newtonian one F) between a black hole of flow rate Q_{BH} and a photon of flow rate q forced to orbit around it circularly at a distance set by us R: $F = f_I = (\rho/4\pi) \cdot (qQ_{BH})/R^2$; from which we have: $\rho q = F(4\pi R^2)/Q_{BH}$.

By combining the previous relations, we can know the aether flow rate of the black hole: $Q_{BH} = F(4\pi R^2)/EDc$. Knowing now that the circular orbital velocity for negligible masses with respect to the central one is $v_0 = \sqrt{GM/r}$, we can obtain the mass of the black hole that causes the photon to orbit around itself at velocity $v_0 = c$ at a distance fixed by us R: $M_{BH} = (c^2 R)/G$, and then

$$F = G\frac{mM_{BH}}{R^2} = G\frac{M_{BH}h\nu}{R^2c^2} = \frac{h\nu}{R}. \tag{4.1}$$

From (4.1) and from Hubble's law we derive the constant ratio between any flow rate Q and its associated mass M, in this case between Q_{BH} and M_{BH}:

$$\frac{Q_{BH}}{M_{BH}} = \frac{Q}{M} = GF\frac{4\pi R}{Ec}D = 4\pi G\frac{h\nu}{R}\frac{R}{h\Delta\nu c}\frac{zc}{H_0} = 4\pi\frac{G}{H_0} = \ell, \tag{4.2}$$

with ℓ=3.6 $\cdot$ 10^8 $m^3/(kg{\cdot}s)$, a universal constant, at the present time, of "transfer" from the phenomenological world of the masses to the real hydrodynamic world of the flow rates. Finally, from (4.2), with a few more algebra we obtain ρ starting from the constant ratio between flow rates and masses of black holes and photons:

$$\frac{Q_{BH}}{M_{BH}} = \frac{q}{m} = \ell,$$

from which:

$$q = \frac{Q_{BH}}{M_{BH}}m = 4\pi\frac{G}{H_0}\frac{h\nu}{c^2} = \frac{k}{c^2}\nu = \frac{\ell}{c^2}h\nu,$$

or, following a different more direct way:

$$\frac{q}{m} = \ell, \qquad \Rightarrow \qquad q = \ell m = \frac{\ell}{c^2}h\nu,$$

which has some analogy, in the flow rates world, with the Plank quantization. Reordering the Newtonian force: $m = FR^2/(GM_{BH})$, we obtain the flow rate of the photon:

$$q = F\frac{Q_{BH}}{GM_{BH}^2}R^2,$$

and finally, from the latter, recalling the dissipative term, the force of the black hole on the photon and the Hubble law, we obtain the long-sought fundamental parameter:

$$\rho = \frac{1}{4\pi}\frac{{H_0}^2}{G} \tag{4.3}$$

having the value $\rho = 0.647 \cdot 10^{-26}$ kg/m^3.

5 Two roads that should converge

With (4.3) we can define the velocity field $\upsilon(x, y, z)$ of the fluid. (with Q_T = Earth's flow rate; R_T = Earth's radius):

$$\upsilon = \frac{Q_T}{4\pi {R_T}^2} = \frac{M_T\ell}{4\pi {R_T}^2} = \frac{M_T G}{H_0 {R_T}^2}, \tag{5.1}$$

with the value υ =$0.42 \cdot 10^{19}$ m/s at the Earth's surface, 10 orders of magnitude greater than c, and which decreases as $1/\mathrm{r}^2$ similarly to the classical field of gravity g.

The value (5.1) obtained from astrophysics must be compatible with the value of the energy in the unit of time injected into the Earth by the aether and transformed into mass of ordinary matter $E_s = 2.889 \cdot 10^{25}$ J/s, already obtained as averaged value on 250 My from the paleogeographic reconstructions. From which we have:

$$\rho\frac{dV}{dt} = \rho 4\pi {R_T}^2\frac{dx}{dt} = \frac{E_s}{c^2}; \tag{5.2}$$

and:

$$\upsilon = \frac{dx}{dt} = \frac{E_s}{\rho 4\pi {R_T}^2 c^2} \tag{5.3}$$

with the value υ =$9.72{\cdot}10^{19}$ m/s to the Earth's surface. Although different, the values (5.1) and (5.3) are in adjacent order of magnitude (they would have no reason to be if it were false the terrestrial expansion, or false hydrodynamic gravitation, or both false) confirming their link with physical reality. The value (5.1) should be considered closer to true, with H_0 the most uncertain parameter.

The value of υ derived from geology is however higher than that derived from astrophysics and we could hypothesize various ways to make them to converge.

i)- The importance of volume increases due to phase changes of the crystal lattice may be greater. For example, it could be assumed that additional dilation phenomena related to a hydridic Earth occur (Larin, 1993).

ii)- The radius of the Triassic globe could still be increased – albeit slightly.

iii)- Finally, one could also venture to hypothesize new special properties of the ether: e.g. the "gravific" aether, with the density ρ expressed in (4.3), may be just a part of the central flow of aether transforming into new mass within the planet. If this actually happens, the total density of the ether flux $\rho_m > \rho$ should appear in (5.3), with a consequent lower

value of the velocity v. Alternatively the "non-gravific" aether could constitute a stationary background on which the central torrent acts germinating new ordinary matter.

All of these three points could happen concomitantly, but we currently have no way to confirm or reject them.

6 Additional improvements

As previously mentioned, while the Earth mass and flow rate increase with exponential regularity (neglecting the depletion of aether from the space reservoir), the same cannot be said for the volume that could grow according to an irregular and even non-monotonous function. Assuming then an exponential increase of the mass or of the terrestrial flow rate $M_T(t) = (Q_0/\ell) \cdot e^{t/\tau}$, we can arrive to the value of τ (time of increase of M_T by a factor e). Initially, we proceed starting from the Triassic Earth mass equal to about $M_{Trias} \approx 0.5 M_T$ of the current value (and not 0.1 as would be following the volume increase), giving importance to the additional processes of volume variation caused by the reorganization of the crystal lattice.

We find this way:

using	$Q(t) = Q_0 \cdot e^{t/\tau}$	and	$\int_{-\infty}^{0} \rho \cdot Q(t) dt = M_T$
with the values	$Q(t) = 0$	when	$t = -\infty$;
	$Q(t) = 0.5 \cdot Q_T$	when	$t = -250$ My ;
	$Q(t) = Q_T$	when	$t = 0$;

then:

$Q(-250) = 1/2 \cdot Q_T = Q_T \cdot e^{-250/\tau}$

and then

$e^{-250/\tau} = 1/2 \quad \Rightarrow \quad e^{250/\tau} = 2 \quad \Rightarrow \quad 250/\tau \approx 0.7,$

and finally:

$$\tau = 250/0.7 \approx 357 \text{ My.}$$

All this will help to calibrate paleogeographic reconstructions and estimate the terrestrial paleoradius, in particular, taking into account not only the extension of the isochronous soils of the ocean floor, but also the more limited expansion of the continents, especially along the orogenetic zones; by better evaluating phase changes, accretion periods with external masses, and errors in estimating geological time.

The effect of decreasing the density of the aether ρ over time due to its transfer from space to celestial bodies must be carefully evaluated in the future.

7 Ancient and recent experiments

An old experiment: as we have seen in this view of the universe, light does not propagate hooked to the aether. Otherwise, due to the speed $v >> c$ of the aether entering the celestial bodies, the light could not move away from them. Light rays propagate by self-induction phenomena, and are only weakly influenced by the aether, giving rise to the cosmological and gravitational redshift, and to the deflection of light by hydrodynamic gravity. It was a badly posed problem to try to reveal the aether wind as intended by Michelson and Morley. Only one type of aether wind acting on the light in one of the possible ways was excluded, but not all, and in particular not this one of the central torrent that causes gravity.

Recent experiments: if gravitation propagated at finite speed $v_g = c$, it could be shown that the planets would feel the force of the sun as it was many minutes before (depending on the distance of the planet). The planets would accelerate in the direction of motion, and the orbits would expand rapidly, as forecasted by Laplace (1802).

Recently Van Flandern (1998) confined the values v_g to a range greater than $2.0 \cdot 10^{10} c$ which are in the order of those estimated here (eqs. 5.1 and 5.3) near the Earth, and an INFN experiment (at Frascati, Italy) proved that the Coulomb field of charges in motion has a rigid behavior (De Sangro et al., 2015), a result that can be interpreted as a very high speed of propagation of the fields within their hydrodynamic formulation (more complete than the classical theory). The unrealistic exclusion of the dissipative hydrodynamic term (small but not negligible if $\rho \neq 0$) leads to theoretical results which are also unrealistic with instantaneous propagation of the Coulomb field (De Sangro et al., 2015, cite the delayed potentials of Liénard-Weichert), generating misleading interpretations that would justify both action at a distance and non-locality.

However, the existence of gravitational aberration is not excluded for very large distances. For example, a field velocity of 1.0 m/s is reached for the Earth at about $1.3 \cdot 10^{16}$ m (1.4 light years), for the Sun at $7.55 \cdot 10^{18}$ m (163 light years), for the galaxy – assuming a galactic mass of 10^{12} solar masses – at $7.55 \cdot 10^{24}$ m ($8 \cdot 10^{8}$ light years). Gravitational aberration should therefore be important for galactic dynamics, and its contributing factor to the unsolved problem of the anomalous flattening of the galactic rotation velocity curve with increasing distance must be evaluated.

8 Aether velocity field into the Earth's interior

Given the analogy between the $1/r^2$ trend of the Newtonian gravity field and the hydrodynamic velocity field moving away from the surface of the Earth, and given that it is precisely the speeds of the omnipresent fluid that produce forces identifiable with those of gravity, the same analogy must be posed for the terrestrial interior. In fact, given that g and v under the Earth surface are both obtained as an integration of the contributions of all the elements of mass dm or flow rate dQ, the result of the integrals will have the same trend but different scale (Fig.3).

The value of both the g and v fields from the surface to the geocenter does not increase without limits towards infinite singular values (as in hydrodynamic sinks), but starting from the core-mantle boundary begins an almost linear decrease towards the zero value in the terrestrial center (Fig.3). The accumulation of a small amount of matter in the center is sufficient for Newton's laws to prohibit the existence of those singularities so feared by Riemann and by the authors of modern fluid dynamics treatises.

In this region of the core, with the deceleration of the incoming flux, a more efficient transformation from aether to ordinary matter must be expected, with probable exothermic reaction which would constitute the unknown source of heat missing in the Earth's energy balance. A second zone of self-overlapping flow, which maintains an almost constant speed from 700 km to about 2000 km depth (Fig. 3), could be related to the maximum observed depth of earthquakes, which in the Wadati-Benioff regions is 700 km. These regions are interpreted in the theory of plate tectonics as lithospheric subduction, but are actually, in the interpretation of the Expanding Earth, areas of material extrusion (Scalera 2020) whose origin is now identifiable.

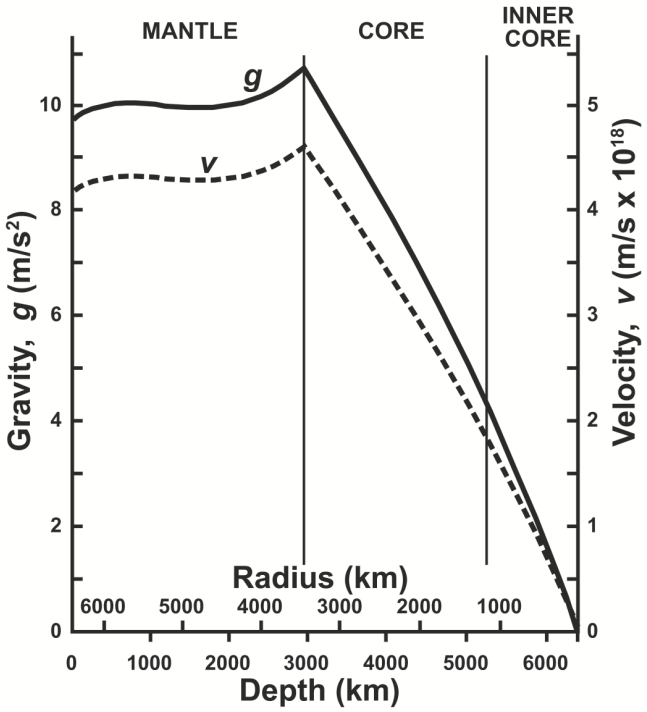

Figure 3. Variation of the acceleration of gravity (g, solid line) in the Earth's interior. The analogy between gravitation g and forces among sinks in hydrodynamics – both with a trend as $1/r^2$ outside the celestial bodies – leads to a prolongation of the correspondence also within the planets. Then, starting from the astrophysical estimated value for the velocity v of the fluid at the Earth's surface, $v = 4.2 \cdot 10^{18}$ m/s, the trend for v (dashed line) was plotted. Unlike for sinks or sources, no singularity occurs at the planetary center.

9 Discussion of the alleged difficulties

9.1 Criticisms of the matter-genesis within the Earth

Some criticisms to this matter-genesis process have already been made explicit. The more frequent is that *aether would generate subatomic particles that would join to form protons, neutrons and electrons, and finally to make hydrogen, but our planet is not made of hydrogen: heavy elements require specific conditions for their synthesis from hydrogen, conditions that do not exist inside planets like the Earth and are only found in stars and supernovas*.

The replay is that the chemical constitution of the Earth's core is today still debated and the possibility that small or large part of it is made up of hydrogen (whether in a metallic state or not) has never been ruled out and also corroborated (see Hu and Mao, 2021; Tagawa et al., 2021; among others). But additionally, an erroneous logical dislocation is committed when it is claimed that the conditions for the formation of heavy elements occur only within stars and supernovae. Such conditions are imposed in an incomplete theory of stars which mistakenly exclude the main actor: the presence of a convergent flow of aether towards the center of bodies, a flow that is subjected to an extreme deceleration and accumulation, creating conditions and processes that are unknown to us in detail (see also point iii) in section 5). The environment (chemical, static, dynamical) in the interior of real planets are then peculiar and still without a complete theory describing it (see a review of the Earth's core problems

in Sumner, 2015). The two matter-genesis theories – the stellar and the aether central flow – are not incompatible but only related to different environments and conditions.

It should be clear from the above that expanding Earth is compatible with Laplace nebula cosmogonies, in which heavy elements have already been produced in processes described by the theory of stars and supernovae. This already developed theory of matter-genesis has additional and cumulative effects with the central aether flow matter-genesis, a theory which should in future be developed.

9.2 Criticisms about neutrino generation within the Earth

Again it is supposed that *generation of heavy elements from elementary particles implies fusion reactions that would generate an emission of geoneutrinos. The geoneutrino flow detected by Borexino and KamLAND experiments is not even close to the one we could expect if large amounts of new matter were generated inside the Earth.* And again it must be recalled that this kind of worries is posed within a stellar and supernovae framework, while a theory for the matter-genesis produced by a "central torrent" of aether does not yet exist, and therefore it is not clear on the basis of which evaluations the critics compare the results of the experiments with non-existent theoretical expected values: it is impossible.

Lastly, a criticism states that *neutrinos are generated both by nuclear fusion and nuclear fission. Geoneutrinos are generated by nuclear decay of radioactive elements in the crust, the mantle and the core of the Earth. Therefore, the ability of detectors to measure the flux of geoneutrinos means they can discriminate neutrinos generated by the different sources. If new matter is generated inside the planet, we should expect a strong emission of neutrinos from nuclear fusion with terrestrial origin largely exceeding the flux of geoneutrinos from nuclear decay.*

During nuclear fission many neutrons develop, which decay by emitting antineutrinos $\overline{\nu}_e$ according to the reaction:

$$n \rightarrow p^+ + e^- + \overline{\nu}_e \tag{9.1}$$

while in matter-genesis inside stellar matter neutrinos are produced by the fusion of 4 hydrogen atoms according to the reaction (prevailing at 99.77% compared to other reactions):

$$4H \rightarrow {}^4H_e + 2e^+ + 2\nu_e. \tag{9.2}$$

However, if new matter is generated inside the planet by a convergence of aether, we should guess that the process of creation is active from the more microscopic level to the known particles level (quarks, fermions, bosons) in a chaotic environment that can partially resemble the primordial soup which has been hypothesized in the initial phases of the expanding universe theory. The presence of this active germinating soup could constitute a still unknow very complex physical environment able both to activate processes and reactions different from (9.1) and (9.2) and to inhibit or screen others, without excluding a possible catalyzing power.

9.3 About controverse topics

Today we can only say that the experimental outcome of Borexino and KamLAND is different from the expected one and that our speculations about the neutrinos detailed provenance are still far from a final stable theoretical description, eventually adherent to physical reality. The revealed discrepancy is a further piece of the already known anomalous energy emission of the giant planets – e.g. Jupiter, Saturn, which emit 150 and 50 times the Earth's emission

respectively. This emission was generalized and explained by Wang (1990) as the effect of specific thermonuclear fusion reactions.

Albeit the subject is still controverse, many researchers have folloved Wang (1990) vindicating the existence of a geo-fusion process catalyzed by heavy metals in the depths of the Earth's core (Jones and Ellsworth, 2003) or thermonuclear fusion into deep Earth as cause of formation of nitrogen, oxygen, and water along the geological time (Fukuhara, 2020a, 2020b). Also the degassing on the surface, from apparatuses and lakes both of volcanic origin, of ^{3}He and ^{3}H (tritium ha only 12 years of half-life, and, if not fed from atmosphere, must be produced in situ in the depths of the mantle or beyond) has been abscribed to Earth's interior nuclear reactions (Jiang and He, 2012; Terez and Terez, 2013; among others). Finally, Makarenko (2012), following Wang (1990) in noting an anomalous heat emission of the planets, proposes a not yet identified cause of cosmic origin for this surplus of energy.

The presence of a decelerating stream of aether towards the Earth's core could therefore be an important missing piece to explain the observed or to improve the modeled catalysis of "juvenile" elements, and of additional heat. Critics should reflect that if the aether does not reach the center of the Earth (where its velocity $v = 0$) it must necessarily transform along the way.

9.4 Criticisms about energetics of the Earth

In some papers (Beck, 1960, 1961; Cook and Eardley, 1961; Birch, 1968; Burša and Hovorkovà, 1994) it is shown that an expansion with a strong increase in the radius would be impossible due to a lack of sufficient energy sources to produce the necessary variation in the potential energy of the materials gradually moving away from the geocenter. The argument is remembered and adopted by the followers of the "slow" version of expanding Earth (Edwards, 2019). The necessary energy which they cannot take into account is equal to $E \approx 10^{31}$ J in about 400 Ma. This enormous amount of energy was considered impossible to justify within the framework of commonly accepted physical theories and constituted a crucial argument against the expansion of celestial bodies without a central aether torrent.

But the assumption of the physical reality of a central flow of aether as the cause of gravitation and expansion, completely overcomes the objections formulated by the authors (Beck, 1960, 1961; Cook and Eardley, 1961; Birch, 1968; Burša and Hovorkovà, 1994; Edwards, 2019). Indeed, the energy injected by the aether into our planet from Triassic to the Recent is:

$E \approx 10^{41}$ J .

Therefore many orders of magnitude higher than that estimated (for a longer period of time! From 400 Ma to the Recent) by the critics of Expanding Earth. The smallness of the variation of potential energy in the expansion models without convergent flow of aether, is analogous to the little energy that our arms spend to lift a pack of one kilogram compared to the total energy contained in the matter of the pack according to the formula $E = mc^2$. In his paper of 1961 Beck was aware that if Earth has doubled his radius different sources of energy should exist. He wrote:

> *But even here the maximum expansion that can plausibly be expected is less than 1500 km. For the approximate doubling of the Earth's radius implicit in the ideas of Carey and Heezen a completely unknown source of energy must be postulated.(Beck, 1961, p. 1489)*

9.5 Criticism on stability of the haevenly bodies orbits due to mass increase

The present concept of Universe is an evolutionary one, and the stability of the planetary orbits is not one of its properties. Stars and planets (as also galaxies etc.) are increasing their mass, and Earth mass is exponentially increasing with $\tau \approx 350$ Ma. The Earth's orbit, and those of the other planets, could be then strongly affected in absence of compensating effects.

But it is also true that we do not yet know the laws that regulate the transformation of the ether into matter (or rather into additional sinks), and we do not know if the new mass is created with a speed equal to that of the planetary body.

In this case the process would be analogous to that of placing a heavy brick on a light little carriage already loaded with an identical brick, which travels by inertia at a constant speed with respect to our laboratory. If you put it down – when it is stationary with respect to the laboratory – by dropping it on the carriage the speed of the carriage is approximately halved. If, on the other hand, it is dropped onto the other by first bringing it to the carriage speed, the carriage speed does not change. At the moment we have no way to distinguish between the two modes of occurrence, even if a clue in favor of the invariance of speed (the second mode) comes from the fact that otherwise the galactic (or even more general) reference system would have an influence, with disastrous effects.

However, the increase of the solar mass certainly causes a shrinkage of the planetary orbits, very important along times of the order of hundreds of millions of years.

9.6 Criticism on stability of the haevenly bodies orbits due to dissipative term

The current kinetic energy of the Earth (without that of spin) is:

$E_c \approx 26,87 \cdot 10^{32}$ J.

While, not taking into account the increase in mass, the work E_w of the dissipative term on the length D_o of a current Earth's orbit (for a current year) is:

$f \cdot D_o = E_w \approx 39,48 \cdot 10^{22}$ J.

The ratio between the annual friction work of the ether and the Earth's kinetic energy (excluding that of rotation) is:

$E_w/E_c = 1,4710^{-10}$

Then the kinetic energy of the earth could be significantly decreased (halved for example) in a time of the order of 10 billion years. The dissipative term alone has a negligible influence on the shortening of the orbits compared to the effect of the increase in mass of the Sun.

10 No relationship between dissipative term and Pioneer anomaly

The idea may arise about a possible relationship between the dissipative term and the Pioneer anomaly. Assuming the values provided by NASA for the mass and velocity of the Pioneer 10 probe (M_{P10} =222 kg; $V_{P10} = 36\ 737$ ms^{-1}) we obtain a value for the additional acceleration due to aether:

$f = \rho V_{P10} Q = \rho V_{P10} M_{P10} \ell$ =18.996·10^{-12} kg m/s^2

$a = f/M_{P10} = 8.557{\cdot}10^{-14}$ m/s^2

Which is 4 orders of magnitude less than the anomalous acceleration measured for the probe, equal to $a = 8.47{\cdot}10^{-10}$ m/s^2.

We must therefore give credit to the explanation based on the recoil of the probe caused by the thermal radiation of the circuits. The progressive attenuation over time of the anomalous acceleration value is in fact compatible with the progressive exhaustion of the on-board

batteries. We can conclude that the aether's viscous force has nothing to do with Pioneer Anomaly.

11 Compatibility of aether flux with observed Polar Motion (PM)

The mass absorbed every second by Earth from the gravific aether flux at the present time is:

$M_s = \rho dV \cdot 1s = \rho dx 4\pi r^2 \cdot 1s = \rho \upsilon dt 4\pi r^2 = 1.387{\cdot}10^7$ kg/s.

And the mass per year:

$M_y = M_s \cdot 3.1557 \cdot 10^7 s = 4{,}377{\cdot}10^{14}$ kg/y,

which is $7.33{\cdot}10^{-11}$ of the Earth mass ($M_T = 5.972 \cdot 10^{24}$ kg).

Albeit more refined treatments exist which take into account the viscoelastic behaviour of the Earth (Scalera, 2006), considering that the probable absence of mantle convection in the expanding Earth framework leads towards a more rigid behaviour of the planet as a whole, and with the aim to evaluate magnitude orders, here I assume a simplified rigid behaviour in the following PM computation.

The Earth rotation pole displacement PP' in the rigid case is (following Schiaparelli, 1891; Scalera, 2006):

$$PP' \approx W \cdot \frac{rm}{M_T} sin(2\varphi) \ , \qquad \text{with} \qquad W = \frac{M_T br}{2(B-A)} \approx 460 \ ,$$

(m = added mass; φ = colatitude; $(B - A)$ = difference between the Earth's polar and equatorial inertia moment; b = Earth's polar semi-axis; r = Earth's radius).

If hypothetically all the mass $m = M_y$ was annually added on the geographic point 30°S, 79°W (colatitude φ =60°S), near Nazca, the following Polar Motion drift would be obtained:

$$PP' \approx W \cdot \frac{rM_y}{M_T} sin(2 \cdot 30°) = 18 \text{ cm/y}$$

towards Nazca. A factor of ≈ 0.5 applied to M_y is then sufficient to reach the value of the observed annual Polar Motion of ≈ 10.0 cm/y.

At the present time it suffice only about an half of the mass injected by the gravific aether, estruded asymmetrically each year, to cause the observed PM. But because the consideration in point iii) of section 5, the yearly accumulated total mass could be due to an additional flow or in situ transformation of "non-gravific" aether, and then the unbalanced asymmetrically emplaced mass could be less than 1/20 of the yearly total. A different behavior – a more intense asymmetrical extrusion – in different epochs cannot be ruled out, especially during periods of the Earth's greatest expansion rate.

It can be concluded that the values of PM found starting from the ether flux is compatible with those actually observed, once again indicate that the concepts adopted are close to physical reality.

12 An aether advantage: the reappearance of antimatter in the Universe

The rationalist party in physics believes that every structure should be made up of even smaller structures in a sort of infinite regression (see Fig.4). For its followers the particles are similar to indivisible points only because of our temporary ignorance of what constitutes them. In this scheme open to future progress can also be framed the general idea of aether and its infinite levels, more and more microscopic.

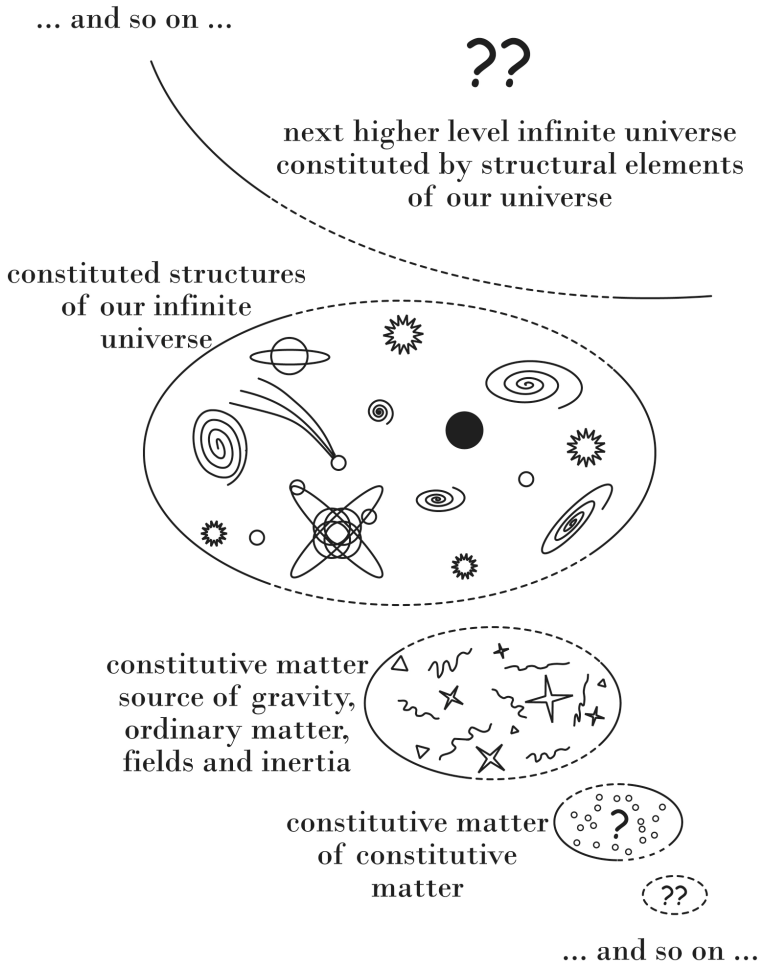

Figure 4. The evolutionary universe derived from hydrodynamic gravitation and Earth Sciences. The universe that we can now observe directly or indirectly, from large-scale cosmic structures to microphysics, is being set up at the expense of a constitutive material, the aether, which we can notice due to the expansion of celestial bodies. This impalpable matter is being formed by absorption of a constituent material of a lower order, and so on. Our ordinary matter and its structures (micro and macro) are constituent matter – an effective "aether" – for a universe of higher order of spatial and temporal scales immeasurably greater than ours. All these *Chinese-boxes* universes are supplied by the structures of a lower order and all form a continuum in mutual evolution. The boundaries between one universe and the next of major or minor order are not well defined. For example, the micro and macro boundaries of our universe are only due to our current ability to build devices and observational experiments, and are in progressive enlargement.

The nucleosynthesis and the origin of the chemical elements have been explained for few decades in the scenario of the expanding universe. First with the fusion of baryons and leptons, and then with a primordial quark soup, always set in the high temperatures and pressures of the initial phases of the big-bang and of the interior of stars. It is assumed in these studies that matter, in the early stages of the universe, is already constituted only by particles and not by antiparticles. But for reasons of symmetry, the initial explosion, the primitive singularity, would have produced matter and antimatter in equal amount. The first party mentioned above is therefore obliged to hypothesize a generation of a surplus of matter in

the first moments of the expansion. After the rapid annihilation of matter with antimatter, this surplus would have reached our time by aggregating according to the mechanisms of subsequent nucleosynthesis.

For Andrei Sakharov (1967) there are three conditions that must be satisfied for an excess of bariogenesis to occur:

– i) Violation of the baryonic number according to the laws of physics to be revealed.

– ii) Violation of the C and CP symmetry. The hypothetical process that changes the baryon number must act favoring the production of baryons on the production of antibaryons.

– iii) Be far from thermodynamic equilibrium.

If all levels are populated according to a Boltzmann distribution, because CPT guarantees that each level with a positive number of baryons has a corresponding level with a negative baryon number, the total baryon number is zero. At equilibrium, transformations in one sense would be equiprobable to inverse transformations, but if with the thermodynamic non-equilibrium an arrow of time is present, direct and inverse processes would not be zero-sum. There is a vast literature in which one seeks to find sufficiently efficient processes of baryon number violation, and not in conflict with aspects of the big-bang cosmology, but without yet come at the head.

Instead, going back to thinking in terms of aether and infinite regression opens up completely different scenarios. The universe would possess infinitely more microscopic levels (Fig. 4) and in one or more of these matter and antimatter could coexist – in structures unknown to us – separate by fields of emergent forces at that level. The matter we observe today at our level would therefore already be a container of both, and the “antiparticles” that we are able to produce in the laboratories would also be manifestations of matter. The problem of the disappearance of antimatter in our universe would appear to be ill-posed. So, the mere persistence in the "main stream" of a lack of solution to this problem should be seen as proof that the aether and expanding Earth belong to physical reality.

13 Concluding remarks

The last century was a historical period in which a ”virtuosic” way of doing physics prevailed that moved further and further away from the search for a faithful description of reality. We are not referring here to the wonderful experiments in large colliders in search of new particles, still an expression of microscopic vibrational properties of the aether.

With the advent of relativistic theories, *horror vaqui* had been replaced by *horror pleni*, with a consequent demonization of the concept of aether and whoever dealt with it or who wanted to study it. Today, however, we see that the simple recognition that the expansion of celestial bodies is a natural phenomenon still recognizes the aether a leading role in reconnecting many physical phenomena with each other, and interpreting several of them simultaneously:

i) – Origin and functioning of the gravitational field, rediscovering a concept that has been around for a few centuries in Western science, without being able to establish itself due to the scarce geological and astrophysical knowledge of the time (marginality of Expanding Earth, low awareness for redshift). More generally clarifies the cause of the phenomenological fields of acceleration, calling into question the material field in motion which is the cause of those accelerations. It gives rise to a formula that has the elegance of physical reality:

$$\rho = \frac{1}{4\pi}\frac{H_0^2}{G},$$

which determines the mechanism of the Universe, with mass increase and expansion of heavenly bodies. We overcome the centuries-old dismay of scientists (for example Newton, Riemann, Maxwell etc.) and of the authors of manuals and treatises on hydrodynamics in front of sinks and sources with their infinite speeds in the center. In the real sinks – the heavenly bodies – due to the inevitable accumulation of material around their center and Newton's laws of gravitation, the singularity is not created.

ii) – Origin of the cosmological redshift and the gravitational redshift, unifying the cause of gravitation with that of redshifts. It is the presence of a very rarefied aether and its dissipative term that gives rise to both these phenomena. The dissipative term is fundamental as a moderator, homogenizer, large-scale stabilizer of the Universe. It is also critical in making non-Newtonian this version of gravitation. Additionally, its frequency damping effect give rise to a plausible solution of the Olbers paradox.

iii) – The analogy between gravitation and forces between sinks in hydrodynamics – both with a trend as $1/r^2$outside the bodies – extends the correspondence also inside the planets. The area of maximum deceleration of the aether flow coincides with the liquid and solid core, where consequently the aether must efficiently transform into ordinary matter. This role of the core should generalize to planets and celestial bodies. Unlike for sinks or sources theoretical entities, no singularity occurs at the planetary center.

iv) – The superluminal speeds of the aether near celestial bodies explain the apparent "rigidity" of the moving Coulomb fields, revealed by the experiments of De Sangro et al. (2015). This is linked to the querelle on gravitational aberration resolved by Laplace by requiring a superluminal velocity of gravitation, a solution confirmed by Van Flandern (1998) with its value $v_g \geq 2 \cdot 10^{10} c$, comparable with that obtained in this text at the Earth's surface.

v) – The sound waves travel by vibrations of the medium they pass through and are transported by it if eventually in motion. The central torrent does not carry the light radiation and consequently the experiments of Michelson-Morley and successors must be rethinked. It should be clarified whether a non-gravific Lorentzian aether is part of physical reality, as some clue (see point iii in section 5) would seem to indicate. The universe, for its part, provides us with the clue of the dipole anisotropy of the CMBR (Cosmic Microwave Background Radiation) which identifies a reference system at rest. Observed in the deep infrared field with the Webb telescope, the Universe indicate a time axis infinite towards the past.

vi) – The presence of the gravific fluid and the consequent dissipative term $f = \rho q v$ (a static fluid tends to slow down the motion of the singularities of sinks or sources) means that the principle of inertia, conservative field, escape velocity, etc., are stated only as good local approximations of a more complex non-Newtonian reality. We could also try to develop a hydrodynamic interpretation of the quantum world (an example – among others possible – in Buffoni, 2013). The expansion of the celestial bodies is therefore inextricably linked to a general revision of the concepts of physics and cosmology, prefiguring a more unitary and realistic image, in which an upper limit to the reachable speed values is no longer required.

In particular, the classical field theory needs revision because it is formulated without the dissipative term, which, although tiny (the density of the aether is $\rho \approx 10^{-26}$ kg/m^3) and with generally negligible astronomical effects on orbits – apart from small effects on the perihelions of the planets – is of enormous cognitive value for the structure, dynamics and evolution of the universe on a large spatial and temporal scale.

In the present paper I have explained some of the new solutions and possible advantages of adopting this non-Newtonian concept of flowing aether coming from hydrodynamic gravitation and Earth sciences, but many other questions must currently remain open.

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References

Anderson, D.L., 2009. Energetics of the Earth and the Missing Heat Source Mystery. Technical Report: www.mantle plumes.org/Energetics.html.

Arminjon, M., 2004. Gravity as Archimedes' thrust and a bifurcation in that theory. Foundations of Physics 34 (11), 1703-1724.

Assis, A.K.T., Neves, M.C.D., Soares, D.S.L., 2011. Hubble's Cosmology: From a Finite Expanding Universe to a Static Endless Universe. arXiv:0806.4481v2 [astro-ph]

Barceló, C., Liberati, S., Visser, M., 2011. Analogue Gravity. Living Reviews in Relativity 14 (3). doi:10.12942/lrr-2011-3.

Bhattacharyya, S., Minwalla, S., Hubeny, V.E., Rangamani, M., 2008. Nonlinear fluid dynamics from gravity. JHEP, Published by Institute of Physics Publishing for SISSA, 39 pp.

Beck, A.E., 1960. An expanding earth with loss of gravitational potential energy, Nature, 185, 677-678.

Beck, A.E., 1961. Energy Requirements of an Expanding Earth. Journal of Geophysical Research, 66 (5), 1485-1490.

Bellini, G., Inoue, K., Mantovani, F., Serafini, A., Strati, V., Watanabe, H., 2021. Geoneutrinos and geoscience: an intriguing joint-venture. La Rivista del Nuovo Cimento, Published online on 12 December 2021 https://doi.org/10.1007/s40766-021-00026-7.

Beekman, G., 2005. The nearly forgotten scientist Ivan Osipovich Yarkovsky. J. Br. Astron. Assoc. 115 (4), 207-212.

Beekman, G., 2006. I. O. Yarkovsky and the discovery of 'his' effect. J. History of Astronomy, xxxvii, 71-86.

Bellone, E., 2006. Isaac Newton. In Rossi P. (Ed.) Storia della Scienza. Vol.1, La rivoluzione scientifica: dal Rinascimento a Newton. Editoriale L'Espresso, Roma, 419-447.

Bernoulli, J., 1735. Essai d'une nouvelle physique celeste. Imprimerie Royale, Paris, 144 pp.

Betelev, N.P., 2009. The Concept of an Expanding Earth, Journal of Volcanology and Seismology, Pleiades Publishing Ltd., Vol. 3, No. 5, 355-362.

Birch, F., 1968. On the possibility of large changes in the Earth's volume. Physics of the Earth and Planetary Interiors, 1(3), 141-147.

Blinov, V.F., 2012. Kinetic Gravity and Growing Earth. Published by the Author, Kiev, 27pp.

Borexino collaboration, 2017. Borexino: geo-neutrino measurement at Gran Sasso, Italy. Ann. of Geophysics 60(1), S0114, 9 pp.

Buffoni, E., 2013. I Quanti e la Teoria Generale Dello Spazio Fluido. Tipografia Editrice Pisana, Pisa, 91 pp.

Buffoni, E., 2015. Idrodinamica. Tipografia Editrice Pisana, Pisa, 179 pp.

Bullard, E., Everett, J.E., Smith, A.G., 1965. The fit of the Continents around the Atlantic. Phil. Trans. Roy. Soc. London Series A, 258 (1088), A Symposium on Continental Drift (Oct. 28, 1965), 41-51.

Burša, M., Hovorková, O., 1994. Expanding Earth hypothesis and the Earth's gravitational potential energy. Studia Geoph, et Geod., 38, 235-245.

Cahill, R.T., 2009. Dynamical 3-Space: A Review. In Duffy & Levy (eds.) Ether Spacetime and Cosmology: New Insights into a Key Physical Medium. Apeiron, 135-200.

Caputo, M., 1962. Un nuovo limite superiore per il coefficiente di assorbimento della gravitazione. Accademia Nazionale Lincei, Rendiconti della Classe di Scienze Fisiche, Matematiche e Naturali 32, 4, 509-515.

Caputo, M., 2006. On New Limits of the Coefficient of Gravitation Shielding. J. Astrophys. Astr., 27, 439-441.

Carey, S.W., 1976. The Expanding Earth. Elsevier, Amsterdam, 488 pp.

Chudinov, Y.V., 1998. Global eduction tectonics of the expanding Earth. VSP-BV, Utrecht, The Netherlands, 201 pp.

Cohen I.B. (ed.), 1958. Isaac Newton's Papers and Letters On Natural Philosophy – and related documents. Newton's second paper on color and light, read at the Royal Society in 1675/6. Harvard University Press, Cambridge, Massachusetts, 501 pp.

Consoli M., Pluchino A., Rapisarda A., Tudisco S., 2014. The vacuum as a form of turbulent fluid: Motivations, experiments, implications. Physica A, 394, 61-73.

Cook, M.A., Eardley, A.J., 1961. Energy requirements in terrestrial expansion. Journal of Geophysical Research, 66(11), 3907-3912.
Cristianto, V., Smarandache, F., 2008. What gravity is. Some recent considerations. Progress in Physics 3, 63-67.
Cwojdziński, S., 2003. The tectonic structure of the continental lithosphere considered in the light of the expanding Earth theory – A proposal of a new interpretation of deep seismic data. Polish Geol. Inst. Special Papers, 9, 80 pp.
Degueldre, C., Fiorina, C., 2016. The proto-Earth geo-reactor: Reassessing the hypotheses. Solid Earth Sciences 1, 49-63.
De Sangro, R., Finocchiaro, G., Patteri, P., Piccolo, M., Pizzella, G., 2015. Measuring propagation speed of Coulomb fields. Eur. Phys. J. C, 75:137 (10 pp.)
Edwards, M.R., 2019. Deep mantle plumes and an increasing Earth radius. Geodesy and Geodynamics, 10, 173-178.
Egyed, L., 1961. The expanding Earth. Trans. New York Acad. of Sciences, 23 (5), 424-432.
Evans, M.G., 1958. Newton and the Cause of Gravity. American Journal of Physics, 26, 619-624.
Fiorentini, G., Lissia, M., Mantovani, F., 2007. Geo-neutrinos and Earth's interior, arXiv: 0707.3203v2 [physics.geo-ph]
Fukuhara, M., 2020a. Did nuclear transformations inside Earth form nitrogen, oxygen, and water? J. Phys. Commun., 4, 095007, 1-12.
Fukuhara, M., 2020b. Possible nuclear fusion of deuteron in the cores of Earth, Jupiter, Saturn, and brown dwarfs. AIP Advances 10, 035126, 6 pp.; doi: 10.1063/1.5108922
Heaviside, O., 1893. A gravitational and electromagnetic analogy. Part I, The Electrician, 31, pp. 281-282; Part II, The Electrician, 31, p. 359.
Heezen, B.C., Tharp, M., 1977. World Ocean Floor (a map). Washington, dc, U.S. Navy Office of Naval Research.
Herndon, J., 1993. Feasibility of a nuclear fission reactor at the center of the Earth as the energy source for the geomagnetic field. J. Geomagnet. Geoelectr. 45, 423-437.
Hilgenberg, O.C., 1967. Why Earth expansion? Talk held to the Technical University Berlin on February 7 1967. Published by the author, Berlin, 16 pp.
Hilgenberg, O.C., 1974. Geotektonik, neuarti gesehen (Geotectonics, seen in a new way). Geotektonische Forshungen, 45 (1-2), 194 pp.
Hu, Q., Mao, H., 2021. Role of hydrogen and proton transportation in Earth's deep mantle. Matter Radiat. Extremes 6, 068101; doi: 10.1063/5.0069643
Hurrell, S., 2012. Ancient Life's Gravity and its Implications for the Expanding Earth. In Scalera G., Boschi E. and Cwojdziński S. (Eds.) The Earth Expansion Evidence – A Challenge for Geology, Geophysics and Astronomy. Aracne Editrice, Roma, 307-325.
Jiang S., He M., 2012. Anomalous Nuclear Reaction in Earth's Interior: a New Field in Physics Science? Plasma Science and Technology, 14(5, May), 438-441.
Jordan, P., 1971. The Expanding Earth: Some Consequences of Dirac's Gravitation Hypothesis (translated by A. Beer from the 1966 German edition). Pergamon Press, Oxford, 202 pp.
Laplace, P., 1799-1825. Mechanique Celeste, Tome Troisième (1802), Seconde Partie, Livre X, Chapitre VII (22), L'Imprimerie De Crapelet, Paris, 325-326.
Larin V.N., 1993. Hydridic Earth: the New Geology of Our Primordially Hydrogen-rich Planet. Translated and edited by C.W. Hunt from the 2nd Russian edition of 1980, Polar Publishing, Calgary, Canada, 242 pp.
Lorentz, H.A., 1900. Considerations on Gravitation. In: Proc. of the Royal Netherlands Academy of Arts and Sciences vol. 2, 559-574.
Khan, Z.A., Tewari, R.C., 2017. Indus-Yarlung-Tsangpo Suture Zone Concept - A Second Opinion. Journal of Tethys 5(3), 218-239.
Kostro, L., 2000. Einstein and the ether. Apeiron, Montreal, 242 pp.; Italian edition: (2001) Einstein e l'etere. Edizioni Dedalo, Bari, 317 pp.
Kragh, H.S., 2017. Is The Universe Expanding? Fritz Zwicky And Early Tired-Light Hypotheses. Journal of Astronomical History and Heritage 20 (1), 2-12.
Majorana, Q., 1930. Quelques recherches sur l'absorption de la gravitation par la matière. J. Phys. Radium, 1 (9), pp.314-324.
Mantovani, R., 1930. Troublante découverte: La Terre grandit. Notice preliminaire sur la découverte de la dilatation planétaire destinée aux mathématiciens, physiciens, astronomes, géologues et à tous ceux qui s'intéressent aux grandes énigmes de l'Univers (Intriguing discovery: The Earth grows. Preliminary note

on the discovery of planetary dilation intended for mathematicians, physicists, astronomers, geologists and all those interested in the great enigmas of the Universe). In French, Printed by the author, Tipografia Ferrari, Parma, 20 pp.

Maxlow, J., 2002. Quantification of an Archaean to Recent Earth expansion process – a review of current research. Australian Geologist, 122, 31 Mar, 22-26.

Maxwell, J.C., 1856. On Faraday's lines of force. Trans. Cambridge Philos. Soc. 10 (part I), 158-159.

Munera, H.A., 2017. Gravity from Classical Fluid Theory: Prediction and Retrodiction of Quantized Planetary Structures. Apeiron, 207-237.

Newton I., 1675. Newton's second paper on color and light, read at the Royal Society in 1675/6. Reproduced in I.B. Cohen (ed.) 1958, Harvard University Press, Cambridge, Massachusetts, 181.

Ngucho, Y.J.M., 2019. Analogies Between Gravity and Fluid Dynamics. Master degree thesis at the African Institute for Mathematical Sciences (AIMS), Cameroon, 23pp.

Ollier, C.D., Pain C.F., 2000. The Origin of Mountains. Routledge, London, 345 pp.

Owen, H.G., 1976. Continental displacements and expansion of the Earth during the Mesozoic and Cenozoic. Philosophical Trans. Royal Society of London, Series A: Mathematical and Physical Sciences, 281 (1303), 223-291.

Owen, H.G., 1983. Some principles of physical palaeogeography. In Sims, R.W., Price, J.H., Whalley P.E.S. (Eds.) Evolution, Time and Space: The Emergence of the Biosphere. Systematic Association Special Vol. n.3, Academic Press, London-New York, 85-114.

Pisarevsky, S., 2005. New edition of the Global Paleomagnetic Database. EOS 86(17), 170.

Rangamani, M., 2009. Gravity & Hydrodynamics: Lectures on the fluid-gravity correspondence. Class. Quant. Grav. 26:224003,2009; arXiv:0905.4352v3 [hep-th]

Riemann, B., 1853. Natural Philosophy (Section: New mathematical principles of natural philosophy), in Collected Papers, translated on 2004 by Baker R., Christenson C. and Orde H., Kendrick Press, Heber City, UT-USA, 505-517.

Rumyantsev, V.N., 2016. Hydrogen in the Earth's outer core, and its role in the deep Earth geodynamics. Geodynamics & Tectonophysics 7 (1), 119-135.

Sakharov, A.D.,1967. Violation of CP in variance, C asymmetry, and baryon asymmetry of the universe. JETP Lett., 5, 24-27.

Scalera, G., 1990. General clues favouring expanding Earth theory, in Augustithis S.S. et al. (Eds.) Critical Aspects of the Plate Tectonics Theory, volume II (Alternative Theories. Theophrastus Publications, Athens, 65-93.

Scalera, G., 1993. Non-chaotic emplacements of trench-arc zones in the Pacific Hemisphere. Annali di Geofisica XXXVI (5-6), 47-53.

Scalera, G., 1994. Earth complexity vs. plate tectonic simplicity. In Barone M. and Selleri F. (Eds.) Frontiers of Fundamental Physics. Plenum Press, New York, 257-273.

Scalera, G., 2001. The Global paleogeographical reconstruction of the Triassic in the Earth's dilatation framework and the paleoposition of India. Ann. di Geofisica 44 (1), 13-32.

Scalera, G., 2006. TPW and Polar Motion as due to an asymmetrical Earth expansion. Annals of Geophysics, Suppl. to Vol.49, N. 1, 483-500.

Scalera, G., 2009. Roberto Mantovani (1854-1933) and his ideas on the expanding Earth, as revealed by his correspondence and manuscripts. Annals of Geophysics, Vol. 52 (6), 615-648.

Scalera, G., 2010. Earthquakes, phase changes, fold belts: from Apennines to a global perspective. GeoActa, Spec. Publ. n.3, "Geology of the Adriatic area", 25-43.

Scalera, G., 2011. Roots of modern geodynamical views in Schiaparelli's thought – The volcano-seismic correlation events on the Andes. Mem. Società Astronomica Italiana, Vol. 82, 377-384.

Scalera, G., 2012. Distensional Mediterranean and World Orogens – Their Possible Bearing to MegaDykes Active Rising. In Scalera G., Boschi E. and Cwojdziński S. (Eds.) The Earth Expansion Evidence – A Challenge for Geology, Geophysics and Astronomy. Aracne Editrice, Roma, 115-160.

Scalera, G., 2015. La cartografia a raggio variabile. Nascita e prospettive di una disciplina sperimentale. Giornale di Astronomia, Serra editore, Pisa-Roma, Settembre 2015, Vol. 41°, N.3, 111-121.

Scalera, G., 2017. Can the history of the ether receive new boost from geosciences? Atti del XXXVII Convegno annuale SISFA – Bari 26-29 settembre 2017, Pavia University Press, Pavia, 307-316.

Scalera, G., 2020. An Expanding Earth – A reply to two recent denial papers. Rendiconti Online Società Geologica Italiana Vol. 52, 103-119.

Scalera, G., Braun, T., 2003. Ott Christoph Hilgenberg in twentieth-century geophysics. In Scalera G. and Jacob H. (Eds.) Why Expanding Earth? – A book in honour of Ott Christoph Hilgenberg, Proc. 3rd

Lautenthaler Montanistisches Coll., Lautenthal (Germany) May 26, 2001, INGV Publication, Rome, 25-41.

Schiaparelli, G.V., 1891. Della rotazione della Terra sotto l'influenza delle azioni geologiche; memoria presentata all'Osservatorio di Poulkova nell'occasione della sua festa semisecolare. Nuovo Cimento (Tipografia Pieraccini-Salvioni, Pisa), terza serie, tomo XXX, 5-33.

Selleri, F., 1993. On the meaning of special relativity if a fundamental frame exists. In: Arp H.C, Keys C.R., Rudnicki K. (eds.) Progress in New Cosmologies. Plenum Press, New York, 269-284.

Selleri, F.,2011. La relatività debole. La fisica dello spazio e del tempo senza paradossi. Book Time, Collana Melquiades, Milano, 278 pp. (Posthumous English translation 2014, Barone M. (Ed.): Weak Relativity. Kostarakis, Petroupoli, Greece. 274 pp.)

Shehu V., 2005. The Growing and Developing Earth. BookSurge, North Charleston - USA, 218 pp.

Shen, W.-B., Shen, Z.-Y., Sun, R., Barkin, Y., 2015. Evidences of the expanding Earth from space-geodetic data over solid land and sea level rise in recent two decades, Geod. Geodyn. 10, 1-5.

Shields, O., 1983. Trans-Pacific Biotic Links that Suggest Earth Expansion. In Carey, S.W. (ed.) Expanding Earth Symposium. Sydney 1981, University of Tasmania, 199-205.

Shields, O., 1996. Geological significance of land organisms that crossed over the Eastern tethys 'Barrier' during the Permo-Triassic. Palaeobotanist 43 (3), 85-95.

Shimizu, I., 2017. KamLAND: geo-neutrino measurement in Japan. Ann. of Geophysics 60(1), S0113, 4 pp.

Smith, A.G., Hallam, A., 1970. The Fit of the Southern Continents. Nature 225, 139-144.

Sumner, T., 2015. Mystery at the Center of the Earth. Science News, Sept. 19, 18-21.

Tagawa, S., Sakamoto, N., Hirose, K., Yokoo, S., Hernlund, J., Ohishi, Y., Yurimoto, H., 2021. Experimental evidence for hydrogen incorporation into Earth's core. Nature Communications 12:2588; https://doi.org/10.1038/ s41467-021-22035-0. www.nature.com

Taylor, W.B., 1876. Kinetic Theories of Gravitation. Annual Report of the Board of Regents, Smithsonian Institution, for the year 1876, 205-282.

Terez, E.I., Terez, I.E., 2013. Thermonuclear Reaction as the Main Source of the Earth's Energy. International Journal of Astronomy and Astrophysics, 3, 362-365.

Van Flandern, T., 1998. The speed of gravity – What the experiments say. Physics Letters A 250, 1-11.

van Lunteren, F., 1991. Framing hypotheses: Conceptions of gravity in the 18th and 19th centuries. Unpublished dissertation, by the Author, Utrecht, 338 pp.

van Lunteren, F., 2002. Nicolas Fatio de Duillier on the Mechanical Cause of Universal Gravitation. In Edwards M.R. (Ed.) Pushing Gravity: new perspectives on LeSage's theory of gravitation. Apeiron, Montreal, 41-59.

Vogel, K., 1984. Beitrage zur Frage der Expansion der Erde auf der Grundlage von Globenmodellen (The question of expansion of the Earth based on global models) (in German). Zeitschrift für Geologische Wissenschaften 12(5), 563-573.

Wang, H.-Z., 1990. On the internal energy source of the large planets. Chin. Astron. Astrophys. 14 (1990) 361-370. (translation of Acta Astrophys. Sin. (1990) 10/1, 82-909.

Wang, X.-S., 2008. Derivation of the Newton's Law of Gravitation Based on a Fluid Mechanical Singularity Model of Particles. Progress in Physics 4, 25-30.

Whittaker, E.T., 1910. Theories of Aether and Electricity – From the Age of Descartes to the Close of the Nineteenth Century. Longmans, Green, and Co., London, 475 pp.

Wilczek, F., 2008. The Lightness of Being: Mass, Ether, and the Unification of Forces. Basic Books (AZ), 270 pp.

Xu, C., Sun, W., 2014. Earthquake-origin expansion of the Earth inferred from a spherical-Earth elastic dislocation theory. Geophys. J. Int. 199, 1655-1661.

Xu, C., Wei, D., Sun, W., 2016. Contribution of coseismic deformations on the current expansion of the Earth. J. Geodyn. 99, 10-15.

Yarkovsky, I.O., 1883. Hypothèse cinétique de la gravitation universelle en connexion avec la formation des éléments chimiques. By the Author, Moscow, 139 pp.

Yarkovsky, I.O., 1901. The density of luminiferous aether and the resistance it offers to motion. (in Russian) By the Author, Bryansk, 17 pp.