Modelling Modern Global Geodata on the Ancient Earth

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Abstract

Investigating the extensive range of modern tectonic observational data on anything other than a constant radius Earth model has never been done before. Because of this lack of enquiry, scientists have, in essence, been deprived of a valuable scientific basis to thoroughly test and independently evaluate the merits of this modern data. The reason why this investigation and modelling has not been done before is simply because our culture has been stereotyped into firmly believing that Earth radius has always been the same size as it is today, based originally on very tenuous palaeomagnetic evidence. Because of this insistence, conventional plate tectonics considers that continental and seafloor crustal development has been a random, non-predictive, and somewhat catastrophic process. It is unfortunate that we are now firmly conditioned into accepting this belief and insistence, as well as accepting any shortfalls this insistence imposes on the global data, without further enquiry.

Introduced here is a geology-based tectonic modelling process whereby breakup and formation of the continents as well as sympathetic opening of each of the modern oceans is shown to be progressive, predictive, and evolutionary. All diametrically opposed ancient magnetic north and south poles are precisely located, and the established poles and equator coincide fully with observed climate zonation and plant and animal species development. Plant and animal species evolution is shown to be intimately related to continental development, the distribution of ancient continental seas, formation of the modern continents and oceans, and subsequent changes to climate zonation. This knowledge then leads to a completely different understanding of other naturally occurring phenomena such as formation of the Earth, global extinction events, the distribution of continental seas, changing coastlines, sea-levels, climate changes, and the global distribution of natural resources, including metals, coal, petroleum, and natural gas.

Key Words: Expansion Tectonics,

Introduction

Considering the vast amount of research effort that has gone into making sure plate tectonics remains the dominant tectonic theory in science today, geodata modelled on anything other than a constant radius Earth may seem counterintuitive and counterproductive. In fact, apart from its implicit assumption of a constant radius Earth, there is very little in plate tectonic observational data that is incompatible with the largely historical expanding Earth theory, and vice versa. It is the same global data gathered about the same Earth. What is exemplified in this paper is rather than confining modern tectonic observational data and plate tectonic thinking to a mathematically constrained constant-sized Earth—the current dogma—we must at least test this observational data to see if the data, and hence the basis of plate tectonic theory, are not better suited to an increasing radius Earth scenario. This test has never been done using modern observational data, in particular global geological mapping, and hence urgently needs to be done before continuing to ridicule and unscientifically reject this proposal out of hand.

It is unfortunate that science has not encouraged further testing of this alternative proposal whereby the increase in surface areas of all oceans is a direct result of an increase in Earth mass and radius over time. Because of this lack of encouragement, rejection of the expanding Earth theory in favour of plate tectonics should not be perceived as rejection because the theory is wrong, it is only the proffered mechanisms behind the theory that may have been lacking in credibility. Many scientists have demonstrated that an Earth increasing its size over time is perfectly feasible and provides a better explanation of many geologic observations than does a fixed-radius Earth model. Researchers, such as Lindeman 1927, Hilgenberg 1933, Brösske 1962, Barnett 1962, Dearnley 1965, Shields 1979, Schmidt and Embleton 1981, Owen 1983, Vogel 1983, Luckett 1990s, Scalera 1988, Maxlow 1995, 2001, and Adams 2000, have each constructed models of the Earth and shown that all of the present-day continents can be completely assembled together on a fully enclosed smaller radius Pangaean supercontinental Earth some 200 million years ago.

In contrast to historical and current palaeomagnetic and space geodetic studies, measuring surface areas of seafloor basaltic lava intruded along the mid-ocean-ridges to determine a rate of increase in ancient Earth radius over time was pioneered by Jan Koziar during the early 1980s. Koziar did not constrain the surface area data to a constant radius Earth model, as predecessors had done, but set out to determine ancient Earth radii in order to quantify an increasing Earth radius model. A present-day rate of 25.9 millimetres per year increase in Earth radius was measured by Koziar (1980), and similarly 19.9 millimetres per year increase was also measured by Blinov (1983). By removing the constant radius and surface area premises from similar measurements made by Garfunkel (1975), Steiner (1977), and Parsons (1982), a rate of increase in Earth radius can also be calculated from their data as 20, 20, and 23 millimetres per year respectively, giving a mean rate of all 5 calculations of 22 millimetres increase in radius per year—which is consistent with the exponential rate of 22 millimetres per year measured and calculated by Maxlow (1995).

Small Earth Modelling

The testing and quantification of tectonics on increasing radius small Earth models is based on an extensive range of modern global geodata from the fields of geology, geography, biogeography, palaeoclimate, palaeomagnetics, metallogeny, fossil fuels, and space geodetics (Maxlow, 2001). Two important contributions to scientific understanding of the Earth, which are particularly relevant, have only been available since 1990 and 2000 respectively. These include:

- Completion of bedrock geological mapping and age dating of all continental and seafloor crusts (Geological Map of the World, CGMW & UNESCO, 1990), and
- Post-year 2000 space-based near Earth data collection and recognition of the significance of large quantities of solar wind related charged electron and proton particles entering the Earth (European Space Agency).

In this geological modelling study heavy reliance is placed on the published *Geological Map of the World* map (CGMW & UNESCO, 1990) (Figures 1 and 2) to constrain assemblage of both the oceanic and continental plates back in time. In order to constrain plate assemblages, all mathematical-based preconceptions about Earth surface areas are simply ignored in order to both measure the ancient surface area of the Earth and establish a formula to determine an ancient Earth radius at any moment in time. This geological mapping and measured surface area data are then used to accurately constrain plate assemblages on small Earth geological models of the ancient Earth extending from the early-Archaean, some 4,000 million years ago, to the present-day plus one model extended to 5 million years into the future.

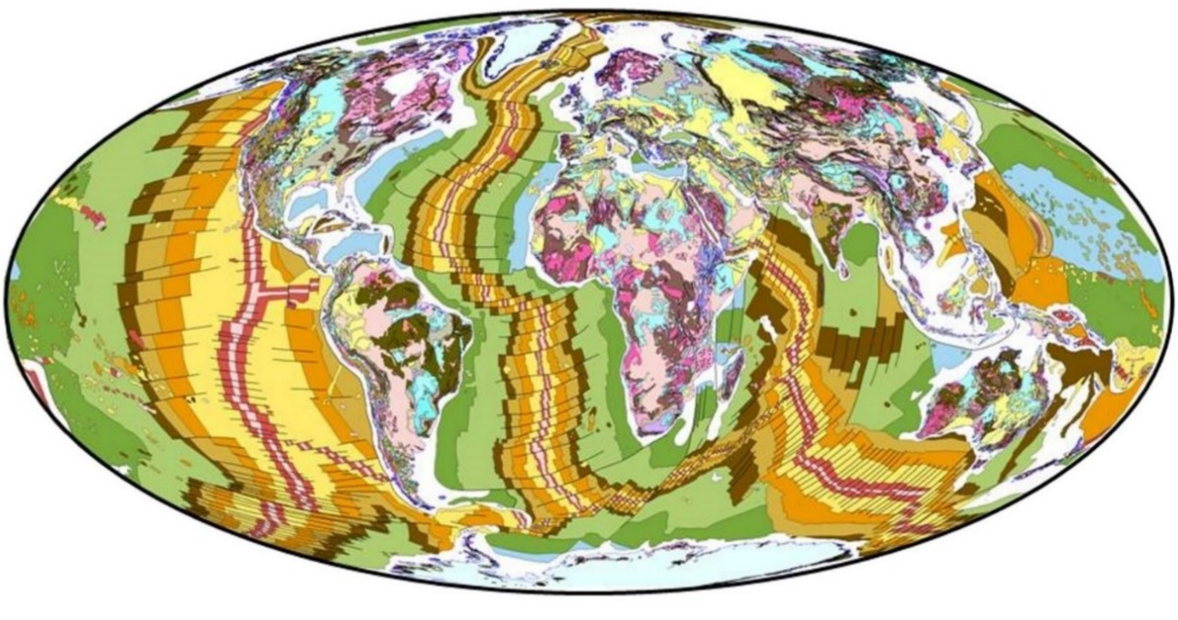

Figure 1 Geological Map of the World (CMGW & UNESCO, 1990) showing time-based bedrock geology reproduced in Mollweide projection.

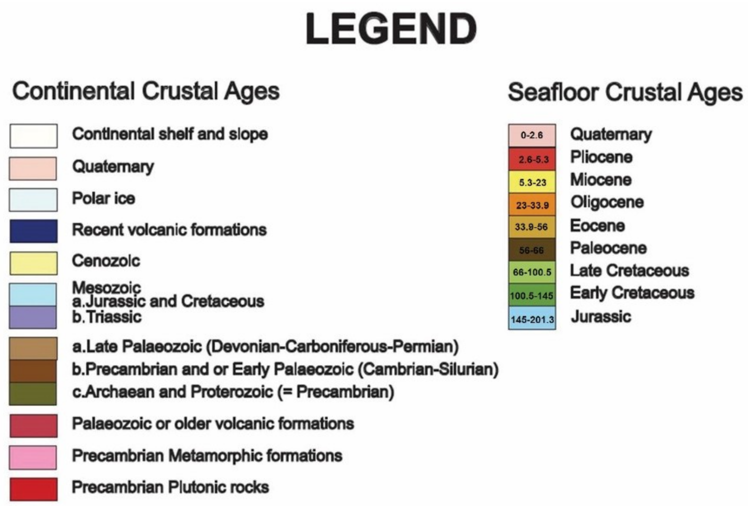

Figure 2 Geological timescale legend showing the various colours of the continental and seafloor crustal ages as shown in Figure 1. Seafloor crustal ages are in millions of years before the present-day.

The seafloor mapping shown on the Geological Map of the World was initially used to constrain the location and assemblage of all post-Triassic seafloor crustal plates on smaller radius Earth models (Maxlow 1995) (Figure 3). Moving back in time, this assemblage involved progressively removing each coloured seafloor stripe in turn and refitting all remaining plates back together along their respective mid-ocean-ridge spreading zones.

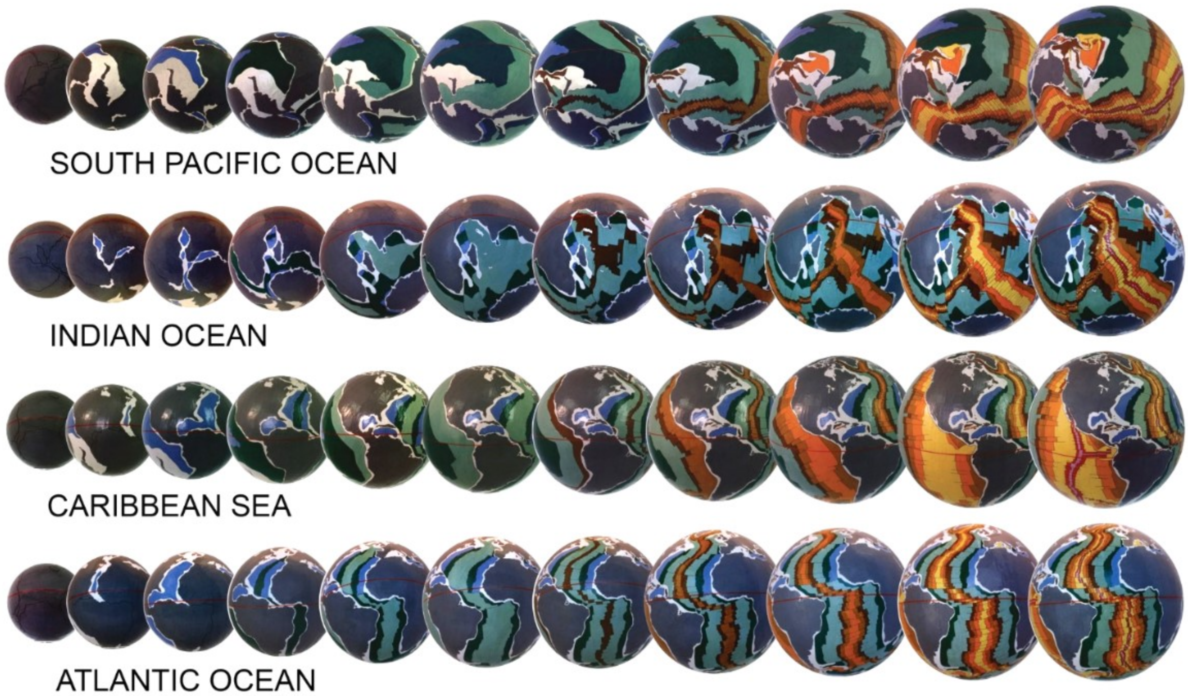

Figure 3 Spherical small Earth models of a Jurassic to present-day increasing radius Earth. Each small Earth model demonstrates that the seafloor crustal plate assemblage coincides fully with seafloor spreading and geological data and accords with derived ancient Earth radii (Maxlow 1995).

Modelling seafloor crustal plates on small Earth models consistently show that all plates assemble back in time with a single unique fit, where each plate assembles together with a high degree of precision along their respective mid-ocean-ridge spreading zones. This single unique plate-fit contrasts strongly with the multitude of poorly constrained plate-fit options and ill-defined schematic supercontinental assemblages proposed by conventional palaeomagnetic studies (e.g. Scotese, 2000; Zhao et al., 2004; Li et al., 2008; Meert, 2014). The uniqueness of small Earth assemblages also contrasts strongly with the conventional plate tectonic requirement to arbitrarily fragment continents in order to comply with the seafloor mapping data. It also contrasts with the requirement to dispose of large areas of inferred pre-existing crust beneath subduction zones in order to maintain the mathematical-based constant surface area premise.

What is seen from the seafloor small Earth modelling studies is that all remaining continental crusts unite precisely to form a single global Pangaean supercontinental crust covering the entire ancient Earth during the late-Permian Period, at around 50 percent of the present Earth radius. At that time the bulk of the seafloor volcanic crust, along with much of the atmosphere and hydrosphere, were retained within the mantle from where they initially came from. From this Pangaean supercontinental assemblage, continental sedimentary basins are then shown to merge to form a global network coinciding with relatively shallow continental seas and the ancient supercontinents and seas were, in turn, defined by the variation in coastal outlines and sea-levels.

Testing the application and viability of tectonics on small Earth models back to the early-Archaean requires an extension of the fundamental cumulative seafloor crustal premise to include continental crusts. Continental crust is reconstructed on pre-Triassic small Earth models by considering the primary crustal elements cratons, orogens, and basins. In order to construct small Earth models, further consideration is given to an increase in Earth surface area occurring as a result of crustal stretching and extension within an established network of continental sedimentary basins (Maxlow, 2014).

Moving back in time, this crustal extension is progressively restored to a pre-extension, pre-stretching, or pre-rift configuration by simply removing young sedimentary and intruded magmatic rocks and reducing the surface areas of each of the sedimentary basins in turn, consistent with the empirical geology shown on the Geological Map of the World (Figure 1). During this process, the spacial integrity of all existing ancient cratons and orogens is retained until restoration to a pre-orogenic configuration is required. By removing all basin sediments and magmatic rocks, as well as progressively reducing the surface areas of the sedimentary basins in turn, a series of small Earth models can be readily assembled back to the early-Archaean (Maxlow, 2001). During the early-Archaean the primordial Earth then comprised an assemblage of the most ancient Archaean cratons and basement rocks existing on Earth today; all other rocks, minerals, and elements were simply returned to their places of origin (Figure 4).

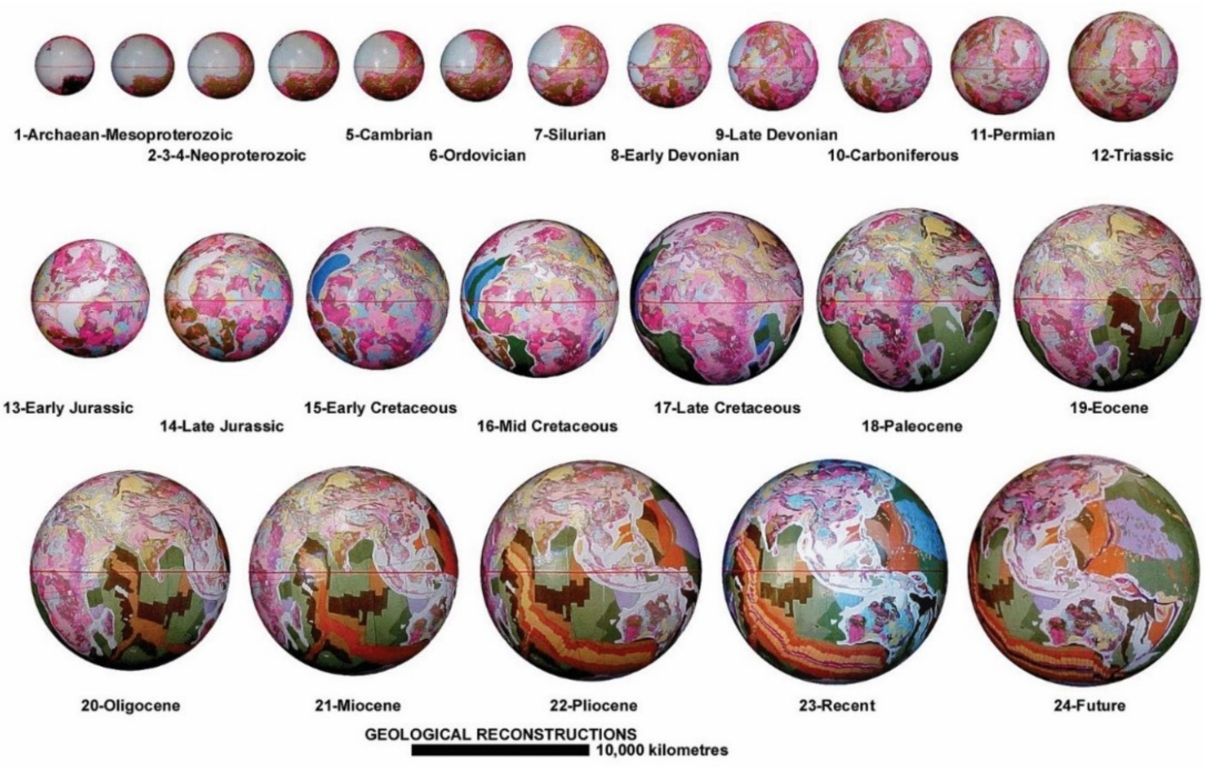

Figure 4 Spherical Archaean to future small Earth geological models. Models show relative increase in Earth radii over time showing both continental and seafloor geology. Models range in age from the early-Archaean to present-day, plus one model projected 5 million years into the future (Maxlow, 2005).

The outcomes of an extensive range of additional global data modelling (Maxlow, 2014) on each of the small Earth models show that:

- Formation of the ancient supercontinents and breakup to form the modern continents as well as sympathetic opening of each of the modern oceans is predictive, progressive, and evolutionary.
- All diametrically opposed ancient magnetic north and south poles are precisely located using published palaeomagnetic palaeopole data (data after McElhinny & Lock, 1996).
- Established poles and equator coincide fully with observed climate zonation and plant and animal species development (data after Pisarevsky, 2004).
- Coastal geography defines the presence of more restricted continental Panthalassa, Iapetus, and Tethys Seas, which represent precursors to the modern Pacific and Atlantic Oceans and emergent Eurasian continents respectively (data after Scotese, 1994, and Smith et al., 1994).
- Plant and animal species evolution is intimately related to supercontinental development, the distribution of ancient continental seas, and changes to climate zonation (data after PaleoBioDB, 2015).
- Extinction events are primarily related to and coincide with a number of drastic and prolonged changes to sea-levels (data after Scotese, 1994, and Smith et al., 1994).
- The spatial and temporal distribution of metals across adjoining continents and crustal regimes enables mineral search and genetic relationships to be extended beyond their known type localities (data after MRDS, 2015).
- The presence of fossil fuels highlights the global interrelationships of resources coinciding with the distribution of a network of Palaeozoic continental seas and low-lying terrestrial environments (data after U.S. EIA report, 2013; Major Coal Deposits of the World map, 2010; World Oil and Gas Map (4th edition), 2013).

Proposed Causal Mechanism

However, this is not the problem that people see when modelling tectonic data on an increasing radius Earth model. The fundamental problem that scientists and the general public have is comprehending where did the huge volume of material making up the seafloor crusts and underlying mantle go to when moving back in time in order to reassemble the continents? And, more importantly, where does this huge volume of material come from when moving forward in time? From this perceived problem, it would seem that it doesn't matter how unique or empirical the constructed models or data modelling are, if an explanation for these observed phenomena cannot be given to the satisfaction of scientists and the general public alike then all increasing Earth radius theories must remain rejected.

It is fair to then ask the very pertinent question that if an acceptable causal mechanism is proposed, as palaeomagnetics did for the rejected continental drift theory during the 1950s, do we seriously consider this mechanism, test the new proposal in light of modern tectonic observational data, accept the empirical evidence in support of this proposal and revise the current plate tectonic theory? Or do we continue to reject the observational data and acceptable mechanism and instead remain supportive of an outdated theory based on a pre-assumed mathematically constrained constant Earth radius premise?

In strong contrast to what was available 50 years ago when this increasing radius Earth concept was initially rejected, the influence of charged solar wind-related particles emanating from the Sun on the near Earth environment has only been available since the Cluster II satellites were launched by the European Space Agency in year 2000. The new space-based observational data subsequently collected has highlighted the introduction of large quantities of solar wind-related electrons and protons into the Earth, propelled by the Earth's magnetic field, which begs the question as to what is happening to these particles—the building blocks of all matter on Earth—once they enter the Earth?

The proposed causal mechanism for an increase in Earth mass and radius over time is based on, but not necessarily constrained to, the input of charged solar wind related electrons and protons originating from the Sun (Maxlow, 2014). It is envisaged that magnetically charged electrons and protons enter the Earth's magnetosphere and lower terrestrial layers primarily at the polar auroral zones and as random lightning strikes during electrical storms. These magnetically charged particles are further attracted by conduction to the strongly magnetic core-mantle region of the Earth. The elevated core-mantle temperatures and pressures present enable the particles to dissipate and recombine via nucleosynthesis as new matter within the upper core or lower mantle regions, in particular within the 200 to 300 kilometres thick D" region located at the base of the mantle directly above the core-mantle boundary.

It is envisaged that new matter is synthesised mainly within the reactive upper core or D" region of the lower mantle which in turn results in an increase in Earth mass. This growth of new matter causes the mantle to increase in volume. This increase in volume is then transferred to the Earth's outer surface crust via two primary mechanisms. Firstly, as an increase in Earth radius and secondly, as laterally-directed crustal extension which is presently occurring on the surface of the Earth as extension along the full length of the mid-ocean-rift zones, within continental sedimentary basins, and within more localised mantle plume and igneous complex regions (Figure 5).

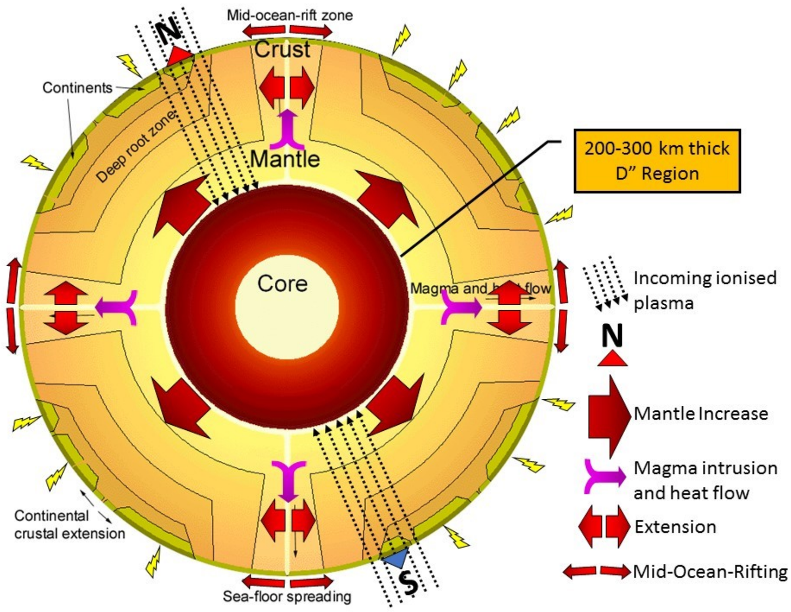

Figure 5 A schematic cross-section of the present-day Earth highlighting the influence of charged electrons and protons entering the Earth resulting in an increase in mass and radius over time (Maxlow, 2014).

Palaeomagnetics

Applying this small Earth modelling study to palaeomagnetics shows that when the mathematically imposed constant surface area and constant Earth radius premises are removed from palaeomagnetic observations, these same observations demonstrate that the palaeopole data (McElhinny & Lock, 1996) is consistent with an increasing radius Earth. The application of palaeomagnetics to small Earth models shows that all ancient magnetic poles cluster as unique diametrically opposed north and south poles (Figure 6) and similarly, plotted palaeolatitude data (Pisarevsky, 2004) coincide with and quantify predicted climate zones on each small Earth model constructed. Additional geographical and biogeographical information aptly quantify the location of these ancient magnetic poles, equators, and climate zones as determined from unconstrained palaeomagnetic pole and latitudinal data.

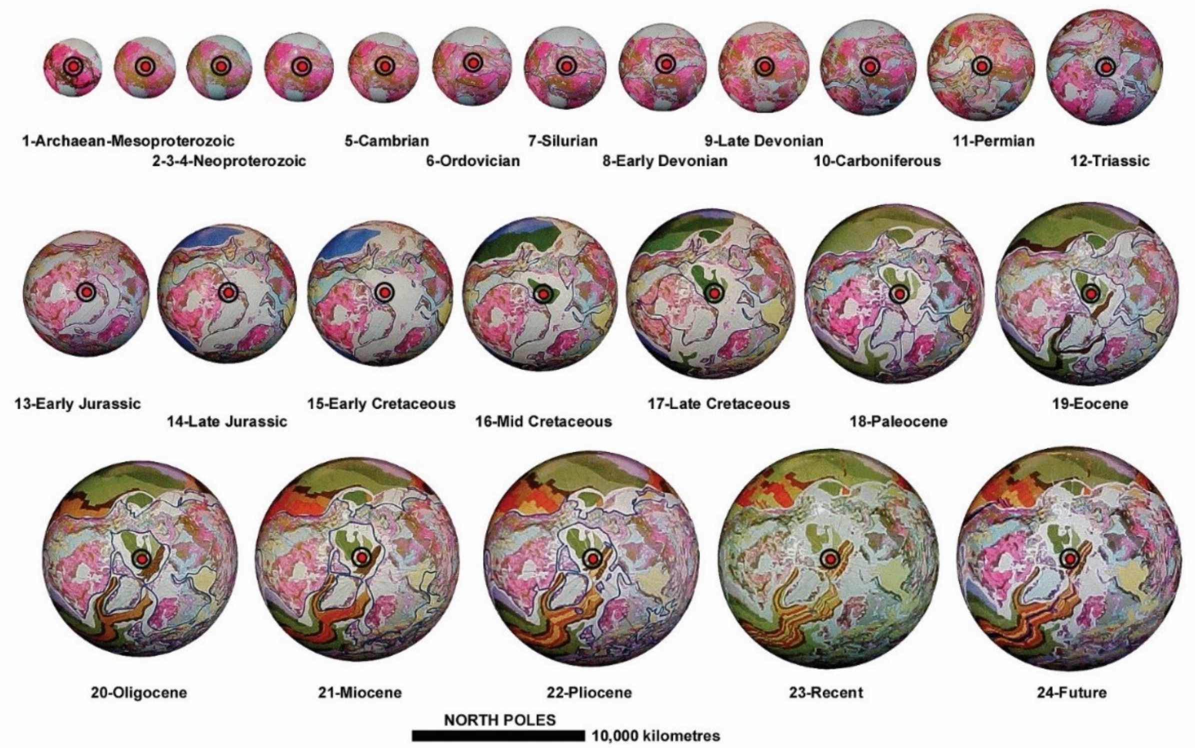

Figure 6 Small Earth Archaean to Future magnetic North Poles (red dots). During the Precambrian and Palaeozoic the North Pole was located within eastern Mongolia, prior to continental breakup and dispersal during the Mesozoic to present-day times. (Data after McElhinny & Lock, 1996).

Palaeogeography

When published coastal geography (Scotese, 1994, and Smith et al., 1994) is plotted on each of the small Earth models it is shown that large, conventional, Panthalassa, Iapetus, and Tethys Oceans are not required on a smaller radius Earth. Instead, this same coastal geography defines the presence of a more restricted network of continental Panthalassa, Iapetus, and Tethys Seas, which represent precursors to the modern Pacific and Atlantic Oceans and emergent Eurasian continents respectively (Figure 7). From this coastal geography the emergent land surfaces on each small Earth model is then shown to define the position and outline of the ancient Rodinia, Gondwana, and Pangaea supercontinents and sub-continents (Figure 8). This coastal geography demonstrates an evolutionary progression and development of each of the ancient seas and supercontinents throughout Earth history which is shown to be intimately related to changes in sea-level, changes to the outlines of continental sedimentary basins, changes incurred during crustal mobility, and changes to sea-levels once the modern oceans opened during the late-Permian breakup of Pangaea.

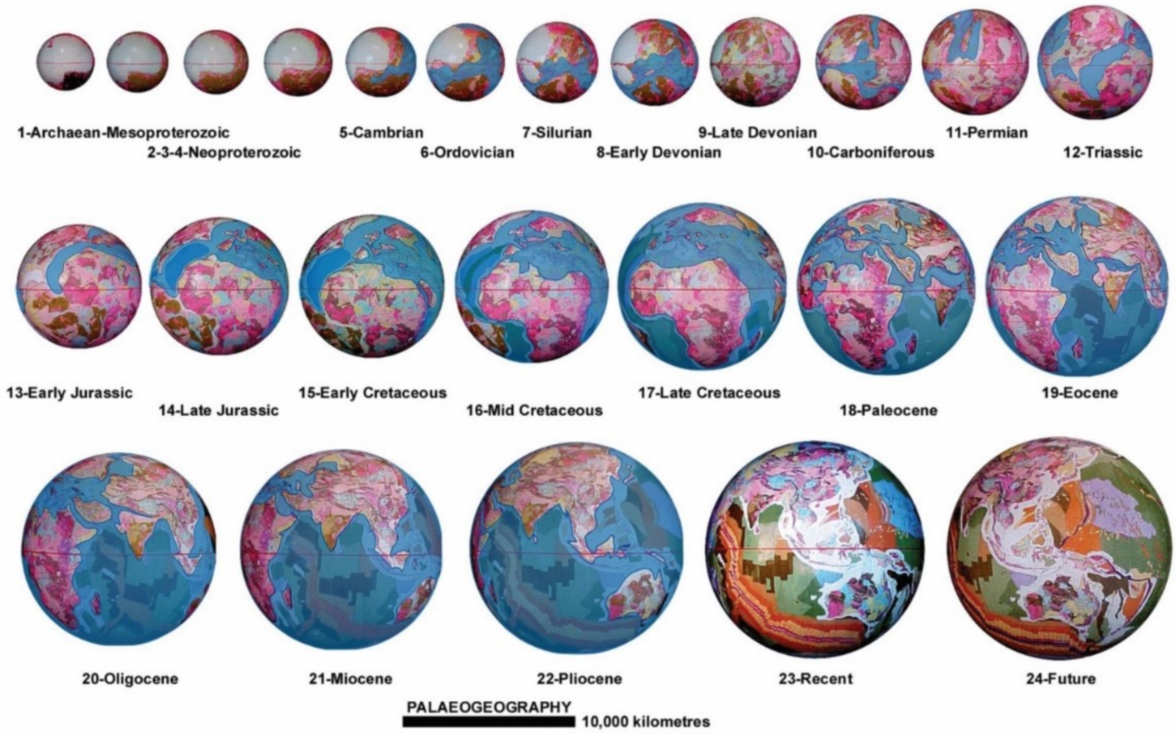

Figure 7 Shoreline palaeogeography on Archaean to present-day small Earth models (data after Scotese, 1994, and Smith et al., 1994). Each image advances 15 degrees longitude throughout the sequence to show a broad coverage of palaeogeographic development. Note: there are no published data available for the late-Devonian model or models prior to the Cambrian Period.

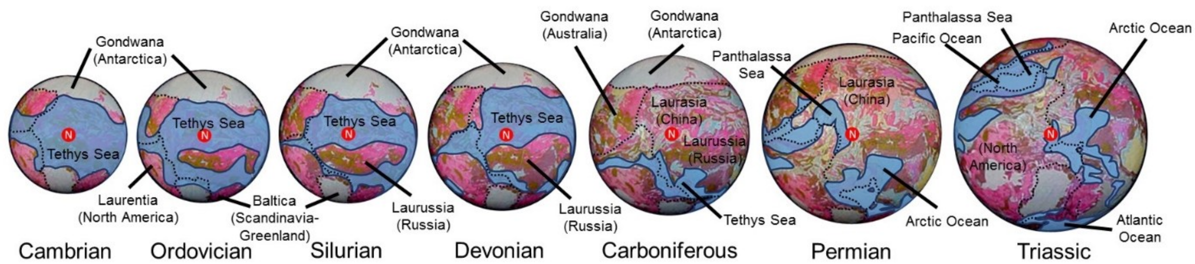

Figure 8 The Tethys Sea and Laurentia, Baltica, Laurussia, Laurasia, and Gondwana supercontinental configurations centred over the ancient North Pole, extending from the Cambrian to Triassic Periods (data after Scotese, 1994, and Smith et al., 1994).

Palaeobiogeography

The timing and development of these ancient continental seas and supercontinents, along with formation of the modern continents and oceans, is shown to be the prime cause for evolution of all life forms on Earth. The network of ancient continental seas, in particular, provided an ideal setting for the primitive Precambrian microbe’s effectiveness as nurseries of evolution and to markedly drive subsequent evolutionary change in all life forms. On each of the small Earth models, it is shown that warm sea waters existing during much of the Palaeozoic extended from equatorial regions through to the North Polar Region (Figure 8) allowing newly evolved species to readily colonise and populate throughout each of the interconnected ancient Tethys, Iapetus, and Panthalassa seaways (e.g. distribution of early-Palaeozoic trilobites, Figure 9) (PaleoBioDB, 2015). This distribution of warm seas also limited the presence of a polar ice cap in the North Polar Region and restricted presence to the exposed Gondwanan South Polar Region throughout much of this time.

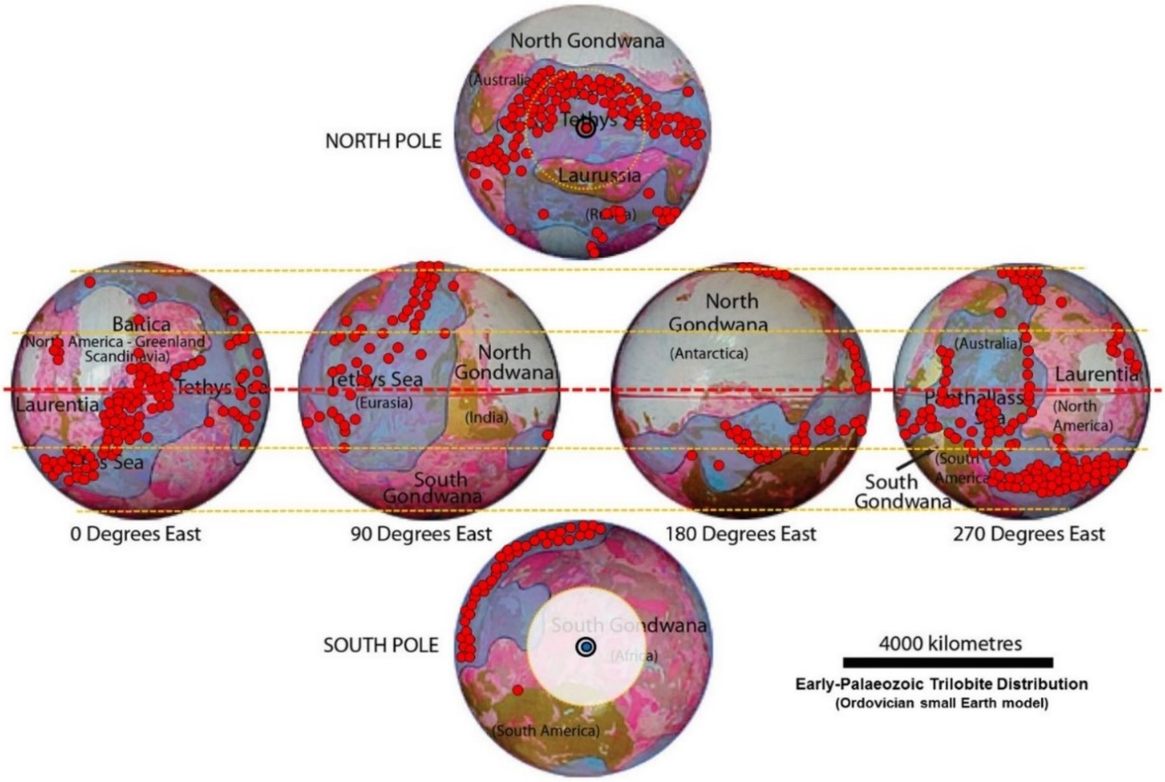

Figure 9 Distribution of early-Palaeozoic trilobite species plotted on an Ordovician small Earth model. Trilobite data are shown as red dots (data after PaleoBioDB, 2015) in relation to ancient climate zones, an early-Palaeozoic South Polar ice-sheet, shaded white, and the distribution of ancient continental seas.

Extinction Events

On an increasing radius Earth the small Earth modelling studies show that, during early-Palaeozoic to present-day times, there have been a number of drastic and prolonged changes to sea-levels which coincide precisely with known extinction events. On these models, major changes in sea-levels are shown to occur as a result of separation or merging of previous ancient continental seas, as well as onset of geosynclinal activity and orogenesis, breakup of the ancient supercontinents, opening of the modern oceans, and post-Permian draining of the ancient continental seas. Depending on the severity of these events, it is considered that sea-level changes may have also adversely affected regional to global-scale climate, as well as ocean-water circulation patterns, species habitats, and the type and location of sedimentary deposition (e.g. end-Permian extinction event, Figure 10).

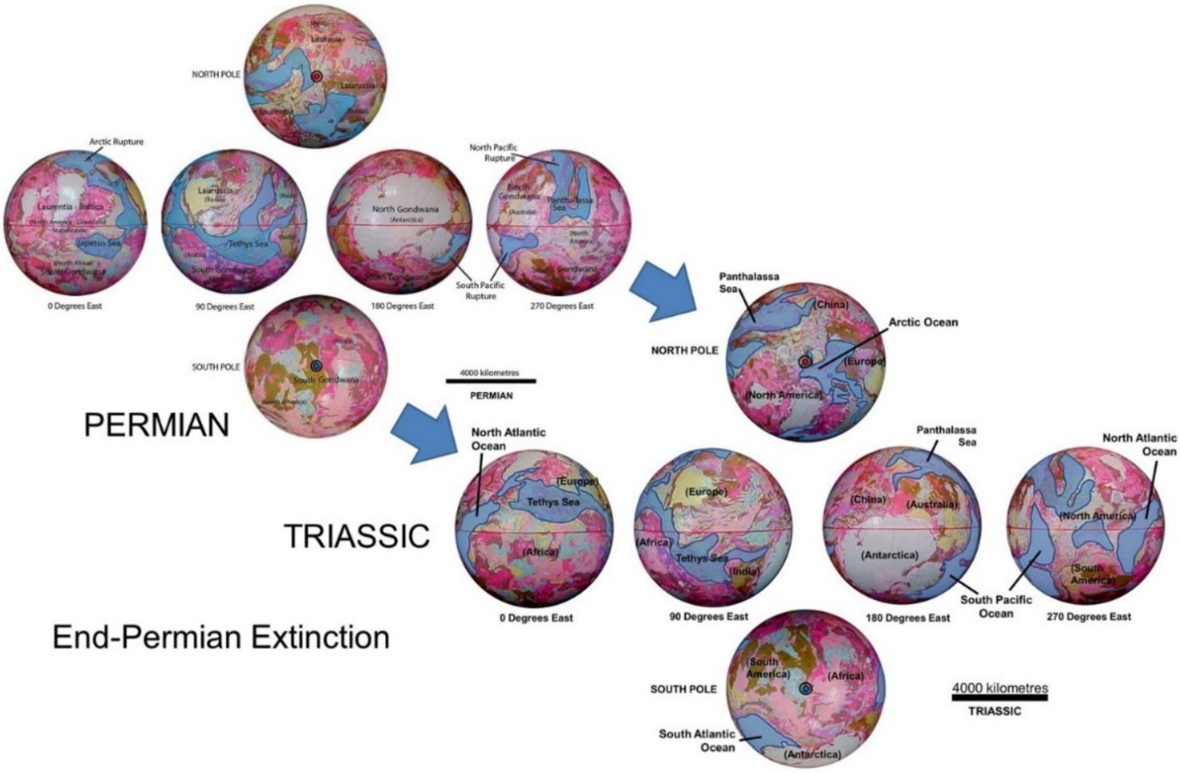

Figure 10 Permian and Triassic small Earth crustal assemblages showing the ancient coastline distribution as well as remnants of the ancient Pangaea supercontinent (coastlines after Scotese, 1994, and Smith et al., 1994) during the end-Permian extinction event. The figure also shows the locations of Permian continental rupture commencing in the north and south Pacific and Arctic Ocean regions to form the modern oceans.

Metallogeny

Modelling metallogenic data and mineralisation settings on small Earth models shows that the data and settings are essentially the same as those identified within conventional studies. The difference being that, on an increasing radius Earth, prior to the early-Triassic Period, all continental crusts were assembled together on a smaller radius supercontinental Earth. The small Earth assemblages then enable pre-Triassic metallogenic provinces from otherwise remote locations to be assembled together as unique, inter-related provinces on smaller radius Earth models. The assemblage of continents and crustal elements on small Earth models then provides a means to investigate the spatial and temporal distribution of metals across adjoining continents and crustal regimes. Recognition and understanding of past metal distributions on the present-day Earth then potentially enables mineral search and genetic relationships to be extended beyond their known type localities.

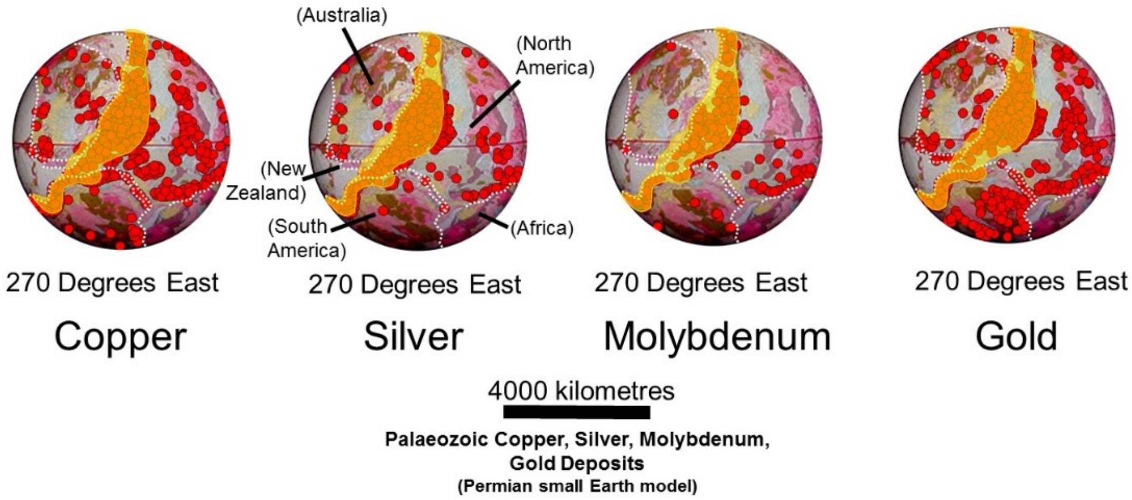

Figure 11 Distribution of orogenic copper, silver, molybdenum, and gold plotted on the Permian small Earth model. Data are shown as red dots (data after USGS Mineral Resource Data Set, 2015) in relation to continental crustal assemblages highlighted as dashed white lines. Cross-cutting orogenic plate boundary metal deposits located along the west coasts of the Americas are shaded yellow.

Fossil Fuels

Modelling the distribution of all fossil fuels on small Earth models highlights the global interrelationships of resources coinciding with the distribution of a network of Palaeozoic continental seas and low-lying terrestrial environments. The transition from deposition of oil and gas shale to coal to petroleum and natural gas is found to be consistent with the various periods of maximum and minimum sea level changes occurring during periods of marine transgression and regression, in particular after regression of the continental seas during the Palaeozoic time periods leading to crustal breakup and opening of the modern oceans during the late-Permian.

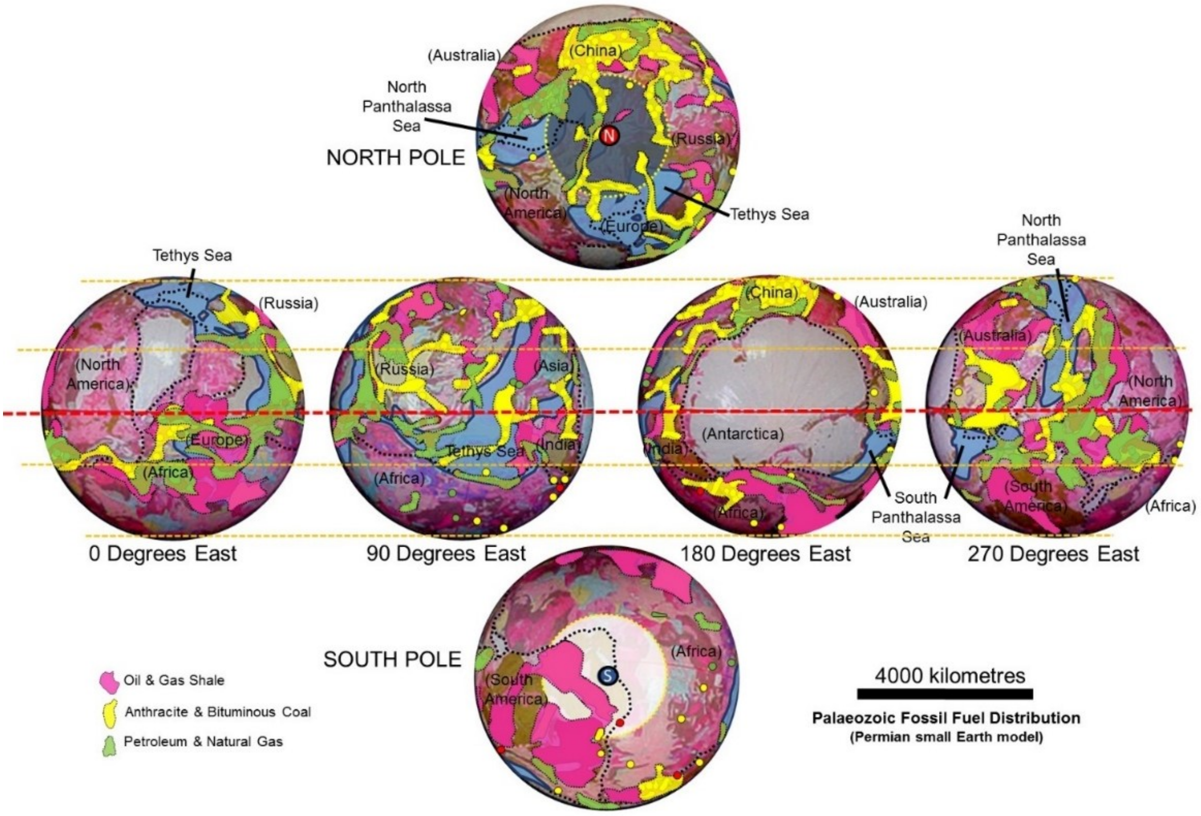

Figure 12 Compilation of oil and gas shale (magenta), coal (yellow), and petroleum and natural gas (green) distributions shown on the Permian increasing radius small Earth model (data after U.S. EIA report, 2013; Major Coal Deposits of the World map, 2010; World Oil and Gas Map (4th edition), 2013).

Conclusions

The outcomes of this extensive research demonstrates that the often highly emotive, albeit very outdated, past rejection of this tectonic concept is irrelevant to the needs of industry. By abandoning mathematical-based preconceptions about Earth radius and using geology to constrain past plate assemblages of the ancient Earth it is possible to recreate and model the entire 4,000 million years of Earth's known geological history. Researchers therefore have the right to access this new technology and all that flows from rejecting old established concepts in order to remain innovative and competitive in their chosen field of work, study, or interest. By simply reconsidering our long established physical understanding of the Earth, the successful integration of modern global geodata into the non-conventional tectonic perspective presented here constitutes a paradigm shift in geoscientific understanding of the ancient Earth.

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