Archaean to Recent Geological Models of the Earth

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A series of modelling study PDF papers are freely available from the author. These are focussed mainly on giving you examples of what real geological models of the ancient Earth should look like in order to model your commodity, research find or project, or to simply answer basic questions commonly talked about in the social media. These papers are summarised from a more extensive manuscript, also available on request.

You can either request the complete set of modelling study PDF papers listed below to be sent to you, or if you have specific interests you can simply select and request particular topics listed below by contacting the author at: james.maxlow@bigpond.com

- Paper 1: Introduction & Causal Mechanism [see below]
- Paper 2: Modelling the Modern Oceans
- Paper 3: Modelling the Ancient Supercontinents
- Paper 4: Modelling the Modern Continents
- Paper 5: Palaeogeography
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- Paper 8: Palaeobiogeography
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- Paper 13: The Geological Rock Record

You are also encouraged to view an extensive range of interactive geodata modelling studies from the fields of geology, geography, climate, biogeography, palaeomagnetics, metallogeny, and fossil fuels from my website at: www.expansiontectonics.com / Data Modelling

Paper 1: Introduction & Causal Mechanism

"Science, does not - in the proper sense - discover new facts or regularities in nature, but rather offers some new ways of seeing and understanding the physical world." Zarebski 2009

Are you involved with or interested in the collection, modelling, and display of geoscientific data but frustrated with the lack of application of palaeomagnetic supercontinental assemblages to the real world of search, exploration, discovery, and exploitation?

Every corporate leader or executive involved in mineral or petroleum-based exploration and exploitation knows that they must be mindful of the need to continue exploring in order to remain both competitive and solvent in their respective industries. Geoscientists involved in the gathering and comprehension of geoscientific data about the Earth may also need to know how their valued find or research project relates to the distribution of the ancient supercontinents over time. And similarly, interested persons need to feed their curiosity in order to understand more about what we are told in the social media.

Yet, how often have you had access to detailed geological and geographical reconstructions of the ancient supercontinents that tell you exactly where your particular mineral or petroleum-based commodity was in relation to the global distribution of other related commodities? Or similarly, told you precisely where your valued find or research project was in relation to other finds or projects over time, and what did Gondwana, for instance, really look like? All good questions just begging for answers as to why, after over 50 years of conventional palaeomagnetic-based Plate Tectonic research, we still do not have access to detailed geological and geographical reconstructions of the ancient supercontinents?

Conventional ill-defined schematic sketches of the ancient supercontinents currently available are just not good enough to be of any use to geoscience!

With this point in mind you have the right to access new technologies, new ideas, and all that flows from rejecting old established concepts in order to remain innovative and competitive in your chosen field of work, study, or interest. The geodata and global modelling studies highlighted in this handout have been consistently denied access to publication by well-meaning peer reviewers, which means that you have also been consistently denied access to this new modelling science. It will be shown in this handout that 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.

The potential benefits of this shift in thinking to both you and modern geoscience are considered immeasurable.

In this series of handouts I am going to introduce new geological and geographical reconstructions of the ancient Earth and globally model a selection of modern geodata that collectively challenges conventional supercontinental crustal assemblages based on palaeomagnetic apparent-polar-wander constraints. This global modelling geodata encompasses each of the geoscientific disciplines, including geology, geography, climate, biogeography, palaeomagnetics, palaeoclimate, metallogenesis, and fossil fuel-based natural resources.

In contrast to conventional apparent-polar-wander based reconstructions of past supercontinental assemblages, modern global geological mapping of the oceans and continents is used exclusively throughout these handouts to recreate and model the entire 4,000 million years of Earth's known geological history. Spherical small Earth models constructed represent accurate reconstructions of precise continental and seafloor crustal plate assemblages extending from the early-Archaean to 5 million years into the future. This global geological mapping has only been available since 1990, well after conventional palaeomagnetics was first established, and its use represents a unique means to use geology rather than geophysics to accurately constrain and reconstruct past plate assemblages independently of conventional palaeomagnetic apparent-polar-wander constraints.

In further contrast to conventional palaeomagnetic supercontinental assemblages the outcomes of this non-conventional modelling study are 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.
- Established poles and equator coincide fully with observed climate zonation and plant and animal species development.
- 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.
- Plant and animal species evolution is intimately related to supercontinental development, the distribution of ancient continental seas, and changes to climate zonation.
- Extinction events are primarily related to a number of drastic and prolonged changes to sea-levels.
- 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.
- 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.

The benefits of this modelling study to you as corporate leaders, geoscientists, or interested persons are considered immeasurable. The least of which includes provision of a set of accurate geological and geographical small Earth models of the ancient Earth extending from the early-Archaean to the present-day.

The small Earth reconstructions presented here are uniquely relevant to geoscience and industry by providing models that are accurate enough to know precisely where a particular research project, mineral discovery, *climate change indicator, field project, fossil or mineral find was at any moment in time.*

This paper acknowledges that there are two main fields of mathematical science that are routinely used to negate any suggestion that the size of the Earth may be increasing over time. This, often highly emotive insistence has long been used to stifle any attempt to scientifically test alternative proposals, to the point where any submissions that dare challenge a static Earth radius insistence are ridiculed and automatically rejected from publication. Hence you, as respected corporate leaders, geoscientists, and interested persons, have been consistently denied your right to have an informed opinion on the matter, in particular opinions based on the vast amount of modern geoscientific data that has only been available since palaeomagnetics first rejected this proposal during the 1960s.

Both palaeomagnetic and space geodetic measurement techniques are now routinely used in Plate Tectonic studies for determining past and present-day plate motions and plate assemblages constrained to a constant radius Earth. Palaeomagnetics has been used to determine an ancient Earth radius and space geodetics has been used to determine the present Earth radius. It is important to appreciate, however, that the evidence presented by both of these disciplines are **derived mathematical entities** and the established formulae used are constrained to, and must adhere to, a number of applied constancy assumptions prior to calculation. If these constancy assumptions are varied or changed then the outcomes of the mathematics will also change. If these assumptions are found to be lacking, or at least partially inadequate, then true science must insist that they be subject to the rigors of scientific scrutiny or change as necessary—which they clearly are not.

For additional details see Paper 9 Palaeomagnetics and Paper 10 Space Geodetics.

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, and similarly 19.9 millimetres per year increase was also measured by Blinov in 1983. By removing the constant radius and surface area premises from similar measurements made by Garfunkel in 1975, Steiner in 1977, and Parsons in 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 rate of 22 millimetres per year calculated by Maxlow 1995.

It is shown in separate papers dealing with modelling seafloor and continental crusts that the rate of change in Earth surface area and radius over time is exponential, increasing from microns per year for much of the Precambrian, to a present-day rate of 22 millimetres per year increase in Earth radius.

A completed version of the global geological mapping was published by the Commission for the Geological Map of the World and UNESCO in 1990 (Figure 1) which forms the basis for ancient radius determinations, small Earth plate modeling studies, and quantification of alternative Plate Tectonic studies presented throughout these handouts. A legend for the geological timescale depicted by the various colours is given in Figure 2. The mapping data shown in the Geological Map of the World represents time-based geology where the coloured seafloor stipes, for instance, represent seafloor basaltic crusts intruded and preserved during each of the Mesozoic and Cenozoic periods and epochs.

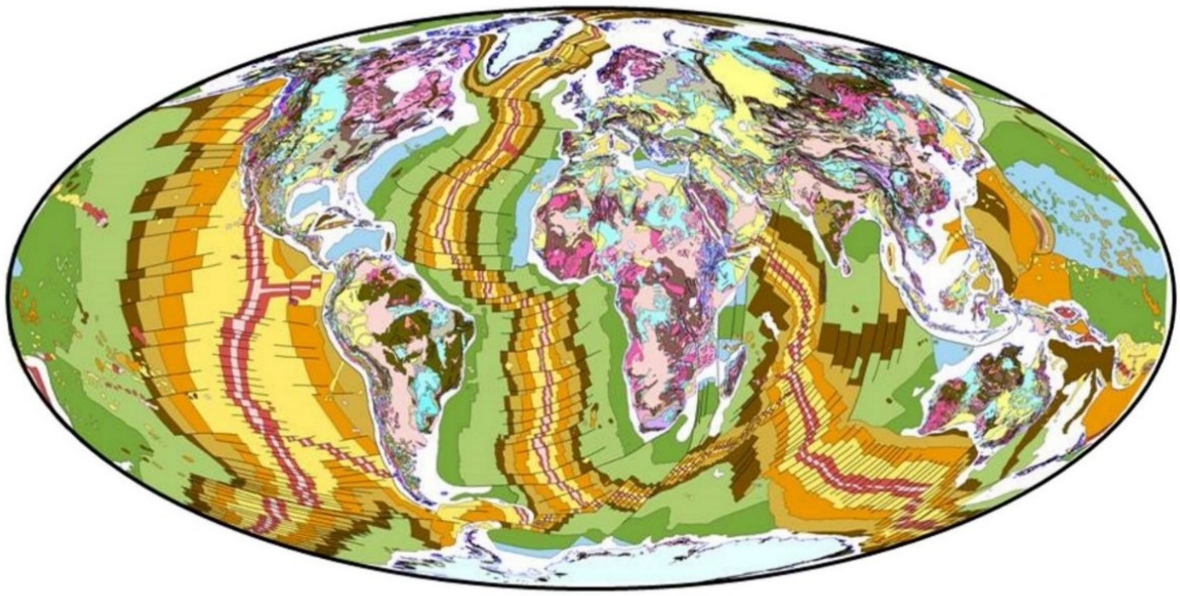

Figure 1 Geological Map of the World (CMGW & UNESCO, 1990) showing time-based bedrock geology reproduced in Mollweide projection.

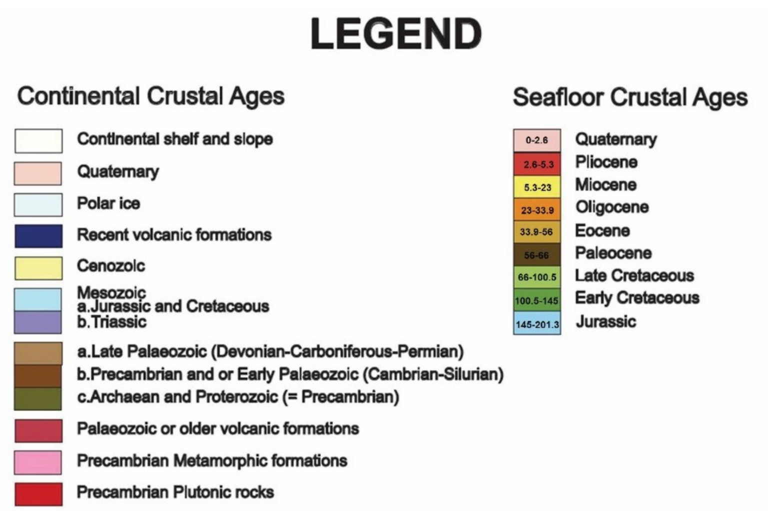

Figure 2 Geological timescale legend showing the various colours of the continental and seafloor crustal ages as shown in Figure 1. Seafloor crustal ages are in millions of years before the present-day.

A study of this geological map immediately shows a distinct, symmetric, stripe-like growth pattern of seafloor crusts centred over the pink-coloured Quaternary mid-ocean-ridges. Age dating of the seafloor crustal rocks shows that these patterns are youngest along the centrally located mid-ocean-ridge spreading zones and, in all cases, age away from the mid-ocean-ridges towards the continents. These growth patterns, in effect, represent a preservation of the opening and subsequent growth history of each of the oceans, extending in time from the early Jurassic Period, around 170 million years ago, to the present-day.

What these seafloor growth patterns mean to non-conventional Plate Tectonic studies is that, when moving forward in time, new basaltic lava is intruded and accumulates along the entire length of the mid-ocean-ridge plate boundaries, which in turn spread and enlarge each of the oceans—irrespective of any implied subduction or pre-existing crusts. Logic dictates that by moving back in time this same seafloor crustal process must be reversed. The youngest seafloor crust must be returned to the mantle, from where it came, each of the oceans must be reduced in surface area, and each of the continents must move closer together.

By moving back in time, this crustal formation process must then be reversed in strict accordance with the seafloor growth patterns shown on the Geological Map of the World map, regardless of which tectonic theory or prior assumption is adhered to. This process then represents an independent method for constraining all plate assemblages back to at least the early-Jurassic Period as well as an independent test for the presence of any implied subduction of pre-existing crusts.

It is unfortunate that science has not encouraged testing of the alternative proposal whereby the increase in surface areas of all oceans is a direct result of an increase in Earth surface area and radius over time. Because of this lack of encouragement, rejection of this theory in favour of Plate Tectonics should not be perceived as rejection because the theory was 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, Owen 1976, Shields 1976, Schmidt and Embleton 1981, Vogel 1983, Luckett 1990s, Scalera 1988, Maxlow 1995 (Figure 3), Adams 2000s, and Maxlow 2001, 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.

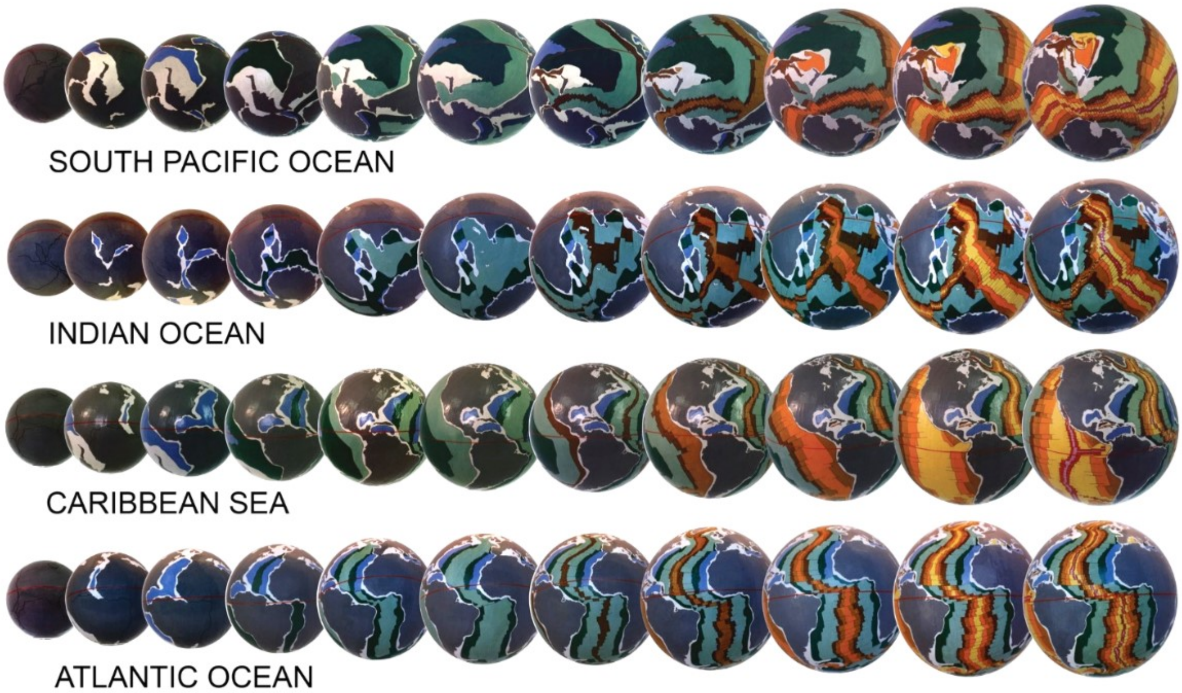

Figure 3 Spherical small Earth models of the Jurassic to present-day increasing radius Earth. Each small Earth model demonstrates that the seafloor crustal plate assemblage coincides fully with seafloor spreading and geological data and accords with the derived ancient Earth radii.

This, however, is not the problem that people see. 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 accurate or empirical the constructed models or postulated theories are, if an explanation for the observed phenomena cannot be given to the satisfaction of scientists and the general public alike then all increasing Earth radius theories must remain rejected.

Proposed Causal Mechanism

"...it may be fundamentally wrong to attempt to extrapolate the laws of physics as we know them today to times of the order of the age of the Earth and of the Universe." Creer, 1965

It is fair to 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 plate tectonic observational geodata, accept the empirical evidence in support of this proposal, and revise the current Plate Tectonic theory? Or do we continue to reject the observational geodata and acceptable mechanism and instead remain supportive of a theory based on a pre-assumed constant Earth radius premise?

A detailed knowledge and understanding of 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 electron and proton ions into the Earth, propelled by the Earth’s magnetic field, which begs the question as to what is happening to these ions—the building blocks of all matter on Earth—once they enter the Earth?

Effects on Earth

In strong contrast to what was available during the mid-twentieth century, modern space technologies now show that the Earth and other planetary bodies are constantly immersed in a solar wind. This solar wind travels to Earth with a velocity of around 400 kilometres per second and a density of around 5 ions per cubic centimetre. During solar magnetic storms, the flow of plasma-related ions can be several times faster and the interplanetary magnetic field may also be much stronger.

The Earth’s magnetosphere has now been shown to be full of trapped plasma emanating from the solar wind as it passes the Earth. This flow of plasma into the magnetosphere increases with increase in solar wind density and speed, as well as increases in turbulence in the solar wind during solar storms. In addition to moving perpendicular to the Earth’s magnetic field, it is shown that magnetospheric plasma travels down along the Earth’s magnetic field lines within the auroral zones. New Cluster II satellite research by the European Space Agency suggests that this process may be more common than previously thought and possibly represents a means for the constant penetration of solar wind-related plasma into the terrestrial environments.

The suggested effects of this penetration on a present-day Earth are schematically summarised in Figure 4. The Earth is known to have a strong iron-related magnetic field that extends from the interior to the outer magnetosphere. The Earth’s magnetic field approximates that of a magnetic dipole and is currently tilted at an angle of about 10 degrees with respect to the Earth's rotational axis. This magnetic field contrasts with the inner rocky planets of the solar system, as well as the Earth’s Moon, which have no to very weak magnetism, and the giant planets which all have very strong to exceptionally strong magnetic fields. This contrast between the essentially non-magnetic inner rocky planets and the strongly magnetic giant planets may suggest a common theme for increase in mass and radius of the giant planets as distinct from no to very little increase in mass or radius of the smaller planets and moons.

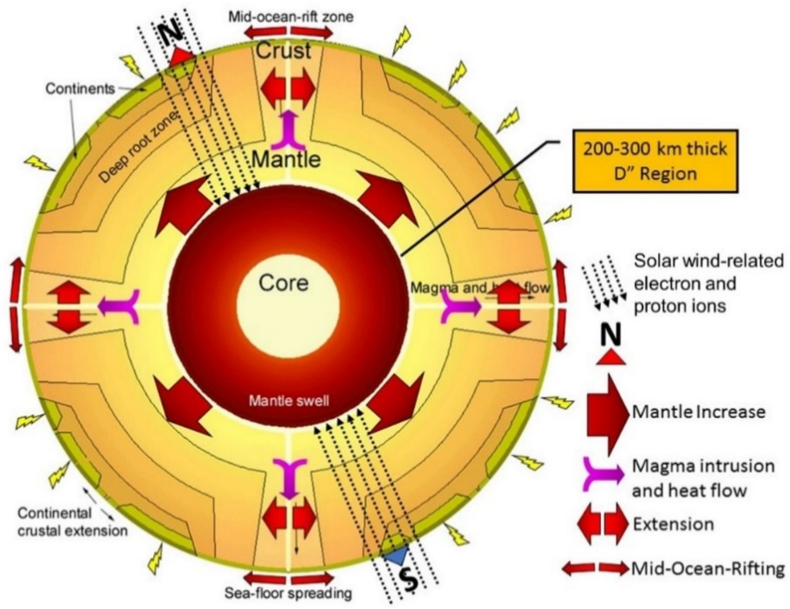

Figure 4 A schematic cross-section of the present-day Earth highlighting the effects of an Earth increasing its mass and radius over time.

It is suggested 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 ions 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 ions to dissipate and recombine via nucleosynthesis as new matter within the upper core or lower mantle regions, in particular 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 core and 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 large igneous complex regions.

Extension within the upper mantle and surface crustal regions is highlighted by paired red arrows shown at each mid-ocean-rift spreading zone (Figure 4). This mantle and crustal extension process enables newly formed magma to be squeezed from deep within the Earth where it travels by convective flow up to the surface, as indicated by the upward facing magenta coloured arrows. The surface expression of this magma and high heat flow process is focussed along the full length of the centrally located mid-ocean-rift zones, plus leakage along known hot spots, volcanic centres, and large and small igneous provinces. This process is also accompanied by intrusion and extrusion of new basaltic mantle-derived lava and granite-related magma, as well as expulsion of new water and atmospheric gases at the surface.

On an Earth increasing its mass and radius over time all geological phenomena now seen at surface, such as basin formation, folding, faulting, orogenesis, magmatic intrusion, mountain formation, and so on, are considered to be related to this crustal extension and continental breakup processes. These phenomena are particularly related to changes in relief of surface curvature of continental and seafloor crusts as a direct result of an increase in Earth radius and surface area over time.