Global wrench tectonics: new model of Earth evolution

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Abstrak (Extended Abstract)

The plate tectonic revolution during the late 1960s has, in the aftermath of that transformation, been nearly unanimously acclaimed as a "quantum leap" in our understanding of the Earth. The basis for this conceptual framework is a series of rigid lithospheric plates which, driven by mantle convection, is assumed to perform slow relative creep motions on an underlying more "plastic" asthenosphere. This mode of operation is offered not only as an explanation of the instantaneous tectonomagmatic picture, but is regarded also as a general basis for inferring past lithospheric history. The admiration and affection for plate tectonics have become so strong that a plethora of emotional terminology is frequently used (the model is often described as beautiful, excellent, nice, wonderful, perfect etc.). This strange glorification of a very tentative scientific model, for which all fundamental tenets have remained unverified, signifies that the Earth sciences are in a state of theoretical crisis. Critical observations have not conformed to expectations, and basic assumptions have been allowed "indefinite" mutability. Because of the invocation of an ever increasing flora of new parametres and considerable special pleading, the originally promising plate tectonic model has gradually turned the solid Earth into a heap of unrelated special cases, and therefore the alleged unifying global system is no longer in sight. As a consequence of all the "rescue operations" the state-of-the-art is now so loaded with ad hoc modifications, idiosyncratic complexity, and observational paradoxes that the model at this stage can hardly be called scientific. The chaotic situation has recently been discussed by Prof. C.-F. Wezel (Urbino, Italy) who states that "a radical change of approach is necessary in order to overcome the fragmentation that is characteristic of geology today".

In my recent seminars in Malaysia a number of fundamental problems facing plate tectonics were discussed. It was concluded that all central tenets of the model (e.g. transform fault, seafloor spreading, subduction etc.) are highly problematical and should therefore be abandoned. The Earth is a system and this would suggest more or less close interrelationships between its various phenomena. In other words, an hypothesized solution of one global phenomenon should, if relevant, automatically lead to the prediction of other well-known phenomena. Further successful solutions and predictions should then build up a coherent chain of interconnected phenomena and observations. The theoretical framework thus constructed must be simple and straightforward, and escape routes through localism and ad hoc explanations would be signs of erroneous turnings. Only if a tight and logical system can be established is there a real chance that we are facing a substantive Earth model. Most of the geological record is contained by the continents, so we must first of all turn to them to unravel the long-term dynamic processes of the Earth. Some of the most outstanding structural features are posed by the trans-continental northern hemisphere foldbelts, which display systematically decreasing ages southward, and by the circum-Pacific deformation belts that have been the sites of superimposed events of tectonomagmatic activity during Phanerozoic time. These structural systems have never been given a realistic explanation by plate tectonics despite frequent assertions to the opposite. Foldbelts have been dealt with on an individual basis only, and they have never been treated as a system that requires holistic understanding. Another major problem, unanswered by plate tectonics, is the first order pattern of global climatic change, including the fact that the climate of the present Arctic and Antarctic regions have turned from tropical to polar while that of Africa simultaneously has changed from polar to tropical. Also, the history of sea water on the continents, i.e. the overall progressive draining of the land masses since the Lower Palaeozoic and the superimposed transgression-regression cycles, have remained enigmatic in the context of plate tectonics.

A new theoretical framework, Global Wrench Tectonics, is advanced as a replacement model for plate tectonics. From the overall global palaeoclimate pattern, from Palaeozoic to Tertiary times, there are good reasons for believing that the Earth has undergone systematic changes in its spatial orientation (relative to the celestial axis). This process of Polar Wander is naturally linked to changes in the planetary moments of inertia, which in turn must be caused by internal reorganization of mass. The observed mantle heterogeneity, as revealed

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by seismic tomography, including the evidence for deep mantle roots beneath continents, is most likely associated with the observed strong crustal inhomogeneity. It may be hypothesized that in its early history the Earth had a pan-global granitic-granulitic crust that became chemically unstable during subsequent cooling of the planet. In this process, provided by intermittent mantle upwelling, the virgin crust has been variably thinned/assimilated. Major parts of it has then been replaced by the thin basaltic crust of the oceans, but "undigested" remains of continental material are widely scattered throughout most of the oceanic domain. It appears that we should be talking about CONTINENTAL DESTRUCTION RATHER THAN CONTINENTAL ACCRETION. In fact, with such a starting point a novel dynamical system of the Earth, built on simple physical principles, can be developed, and a long range of previously unrelated phenomena are now automatically connected. Global tectonics appears to be strongly associated with planetary rotation. Foldbelts have developed along the time-equivalent (palaeo-) equators, and their geosynclinal precursor stage follows as a natural consequence of mantle upwelling within a rotating planetary body. By Alpine time the loss of continental crust to the mantle had reached an advanced stage, and as a consequence of planetary rotation the lithosphere turned into a stage of mobility, during which the continents underwent variable azimuthal changes. These mostly minor continental rotations were the result of a certain westward wrenching of the entire global lithosphere, governed by inertia forces. The new mobilistic system explains the observed discrepancies of palaeomagnetically based Apparent Polar Wander Paths, yet the continents have remained fairly stationary with respect to their mantle roots. Wegenerian-type drift, which has caused numerous fitting problems and an endless number of other inconsistencies, is no longer needed. As would be the situation in any case of major paradigm change the whole range of landscapes and seascapes of the past can now be looked at with new eyes and given new meanings.

Laporan (Report)

The Geophysics Working Group of the Geological Society of Malaysia, in collaboration with the local hosts at the School of Physics, Universiti Sains Malaysia, the Department of Geology, Universiti Malaya, and PETRONAS, KLCC, held an exposition on a new model of Earth evolution through a series of 3 seminars/lectures recently. Participation was good with about 90 members, friends and affiliates turning up for the last seminar!

The speaker was Professor Karsten M. Storetvedt, Research Professor from the Institute of Geophysics, University of Bergen, Norway. A distinguished European paleomagnetists, Professor Storetvedt in the mid-seventies brought about a consciousness of remagnetization problems in paleomagnetism, and, the concept a few years ago that the well known diverging APW paths can be fully explained by *in situ* continental rotations. Today, after many plate tectonics based contributions in reputed scientific journals in the earlier years, he is one of the few diehards who completely dismiss plate tectonics.

Professor Storetvedt very kindly presented the following lectures:

Date: Saturday, 28th November, 1998
Time: 10.00 am – 12.30 pm
Venue: School of Physics Conference Room, Universiti Sains Malaysia, Penang
Title: i) Public Lecture — The Wandering Poles: Earth History in New Perspective
ii) Research Seminar — Research methods in Global Wrench Tectonics

Date: Monday, 30th November 1998
Time: 5.00–6.30 pm
Venue: Department of Geology, Lecture Hall, Universiti Malaya, Kuala Lumpur
Title: An Alternative Evolutionary Model for The Earth — Part 1

Date: Tuesday, 1st December, 1998
Time: 10.00 am – 12.00 noon
Venue: Tower 1, Level 41, Petronas Twin Towers, KLCC, Kuala Lumpur
Title: An Alternative Evolutionary Model for The Earth — Part 2