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The Making of the Pangean Superplate

Daniel Pastor-Galán
Segovia, Spain (dpastorgalan@gmail.com)

Rocks are the pages of the Earth History book: the evolution of continents, oceans, atmosphere, and biosphere. Although sometimes struck by punctual catastrophes, secular changes have shaped most Earth history: crustal growth and loss, biogeochemical cycles, global mantle circulation, long-term secular changes in sea-level, major variations in the geomagnetic field, global climate changes, mass extinctions... There are emerging signs that the supercontinent cycle controls, at least partially, these episodic changes (Pastor-Galán et al., in press). During at least the later half of Earth's 4.5 billion years' history, plate tectonics led continents to amalgamate into continental super-plates, which inexorably met their demise when they broke up again after a generally accepted tenure of over 100 million years.

The supercontinent Pangea formed in the late Carboniferous as a result of the collision between Gondwana, Laurussia, Siberia and various minor plates and island arcs. Tectonic reconstructions assume that Pangea, the latest continental super-plate, formed ∼320 Ma to break finally up ∼180 Ma (Pastor-Galán et al., 2018) representing an absolute minimum of 25% of Earth's area (larger than the present day Pacific plate). Others, mostly relying on paleomagnetic data suggest a mega-shear zone with several thousand kilometers of displacement to fit the paleomagnetic data, despite the absence of evidence of such transform (see Pastor-Galán et al, in press).

An appraisal of the global geological and paleomagnetic record from 320 to 280 Ma evinces large-scale deformation coeval with vast igneous activity within the alleged Pangean super-plate. We quantitatively reconstructed the kinematics imposed by geological and paleomagnetic data resulting in great activity within the core of Pangea: buckling around a vertical axis, consumption of >2300km of oceanic crust and opening of several basins. The kinematics suggested by the reconstruction require global tectonic changes including multiple processes working in consonance, subduction initiation and/or ridge subduction, worldwide rifting, strike-slip motion and possibly a true polar wander event collectively explaining how Pangean and other supercontinents became rigid super-plates.

References:

-Pastor-Galán, D., Nance, R.D., Murphy, J.B., Spencer, C., in press. Supercontinents: myths, mysteries, and milestones. Geological Society of London Special Publications.

-Pastor-Galán, D., Pueyo, E.L., Diederen, M., García-Lasanta, C., Langereis, C.G., (2018). Late Paleozoic Iberian Orocline(s) and the Missing Shortening in the Core of Pangea. Paleomagnetism From the Iberian Range. Tectonics, 37, 3877–3892.