

Trial by fire: Testing the paleolongitude of Pangea of competing reference frames with the African LLSVP

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Paleogeography can be reconstructed using various crust- or mantle-based reference frames that make fundamentally different assumptions. The various reconstruction models differ significantly in continental paleolongitude, but it has been difficult to assess which models are more valid. We suggest here a “LLSVP test”, where an assumed correlation between present-day large low velocity shear-wave provinces and the paleogeography of supercontinent Pangea at breakup ca. 200 million years ago can be used to assess the relative accuracy of published reconstructions. Closest correlations between continental paleolongitude and the African LLSVP are achieved with mantle-based reference frames (moving hotspots and true polar wander), whereas shallower crust-based reference frames (paleomagnetic Euler poles and slabs) are shown to be invalid. The relative success of mantle-based frames, and thus the importance of the depth of reference frame, supports the notion that mantle convection is largely vertical compared to the horizontal plate motion of tectonics.