Geophysical Research Abstracts
Vol. 21, EGU2019-11517-1, 2019
EGU General Assembly 2019


# Plates Pushing Back: An example of lithospheric control over plate kinematics during Gondwana dispersal

Jordan Phethean (1), Ken McCaffrey (2), Lara Kalnins (3), and Jeroen van Hunen (2)

(1) University of Derby, Derby, United Kingdom, (2) Durham University, Durham, United Kingdom, (3) University of Edinburgh, Edinburgh, United Kingdom

Shifts in Euler poles are commonly assumed to result from changes in far-field plate driving forces such as slab-pull and mantle convection, but is this always the case? In this study, deep-imaging seismic reflection data reveals a significant compressional event affecting the Tanzania Coastal Basin during the Jurassic-Cretaceous separation of East and West Gondwana. This impressive compressional episode, which resulted in the abandonment of MOR segments, buckle folding of young (< 3 Ma) oceanic crust and the development of a > 250 km long oceanic thrust belt along pre-existing fracture zones, was triggered by a $\sim$ 30 $^{\circ}$ rotation of plate motion vectors from NW-SE to N-S. However, no contemporaneous variation in far-field plate driving forces occurred during this plate motion change. Instead, plate kinematic modelling reveals that a contemporaneous N-S alignment of weak rifted margins and young MOR segments, along which the 2000 km Davie Fracture Zone (DFZ) propagated northwards, instigated the rotation. It was therefore not a change in driving forces, but the appearance of an alternative weak (and "preferable") pathway that led to this plate motion change. Interestingly, but not surprisingly, the DFZ was then dominated by transpression subsequent to its development. Although the N-S alignment of weak lithosphere along which it formed was "preferable" to continued NW-SE spreading, for no reason would it be expected to be perfectly oriented with plate driving forces.

Plate kinematics during the opening of the Western Somali Basin therefore did not directly reflect the active plate driving forces but were heavily influenced by transform-normal forces and opportunistic plate boundary reconfigurations. We argue that continental transform margins and long-offset oceanic transforms have a significant control on plate motions when under transpression and need to be taken into consideration when inferring mantle processes from plate kinematics.