The Bouvet triple junction: a model of Gondwana fragmentation in Jurassic and Early Cretaceous times

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The mid-ocean ridges of the Atlantic and Indian oceans remain essentially fixed with respect to a constellation of mantle plumes throughout Gondwana dispersal. The Bouvet plume is central to the dispersal process. A model for the complex early Bouvet (Africa-Antarctica-South America) triple junction provides a link between the relatively simple tectonic histories of the South Atlantic and Indian oceans. The model is based on interpretation of ocean-floor topography and repeated, meticulous and iterative animation in 'Atlas' plate-modelling software.

East and West Gondwana started to separate at ~184 Ma (Toarcian) with a 2000-km-long dextral transtensional rift between Africa and Antarctica. The earliest triple junction was initiated south of Africa as the Malvinas plateau started to move west along the Agulhas fault at ~165 Ma (Callovian). Limpopia, a micro-fragment, at first remained attached to Antarctica while the Maurice Ewing Bank (MEB) retained its attachment to Africa. New dynamism initiated rifting in the South Atlantic Ocean and between India and Antarctica-Australia early in the Cretaceous. Complex reorganisation of micro-fragments near the Bouvet plume head led, by ~129 Ma (Hauterivian), to a triple junction configuration with the present outline of South America intact (including the MEB fixed off the Malvinas plateau) and with Limpopia, the continental core of the Mozambique Ridge (supplemented by copious Cretaceous volcanism) fixed to Africa. This configuration was to prove long-lived.

It is interesting to speculate whether the large Morokweng meteorite impact in southern Africa (J/K boundary) could have triggered tectonic acceleration.

The model is illustrated in animation at https://www.reeves.nl/gondwana/aac-anim-1