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# East African-Antarctic Orogen and initial Gondwana break-up: the role of structural inheritance during East Africa's passive margin formation

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The East African continental margin is a classic example where structural inheritance governs later continental break-up. Continental break-up is clearly related to the varying structural styles along the laterally strongly varying, then relatively young East African-Anarctic Orogen (EAAO).The EAAO is one of the largest orogenic belts on the planet and stretches along the entire length of East Africa. It resulted from the collision of various parts of East and West- Protogondwana during Late Neoproterozoic/Early Paleozoic times, between 650 and 500 Ma. The northern part (Arabian-Nubian Shield) is dominated by juvenile Pan-African island arc terranes, bound by ophiolite-decorated suture zones, and is characterised by "mild" accretion at low- to medium metamorphic grade. The central and southern parts of the orogen are typified by high-grade rocks, representing the overprinted margins of the various colliding continental blocks. The southern third of this Himalayan-type orogen can be interpreted in terms of a lateral tectonic escape model, similar to the situation presently developing in SE-Asia due to the indentation of India into Asia. One of the escape-related shear zones of the EAAO is exposed as the approximately 20 km wide dextral Heimefront transpression zone in western Dronning Maud Land (East Antarctica). During Gondwana break-up, the southern part of the EAAO broke up into a number of microplates (the Falkland, Ellsworth-Haag and Filchner blocks). These microplates of the "Natal Embayment" probably represent shear zone-bound blocks, which were segmented by tectonic translation during lateral tectonic extrusion. During Gondwana

break-up, these transcurrent shear zones were then preferential sites of continental fragmentation. Coats Land is a crustal block within the EAAO that escaped tectono-metamorphic overprint. This block along with probably a number of yet not identified crustal pieces escaped reworking by lateral tectonic escape. The southern part of the EAAO is also typified by large volumes of late-tectonic A2-type granitoids that intruded at c. 530-490 Ma, and can constitute up to 50% of the exposed basement. They are probably the consequence of delamination of the orogenic root and the subsequent influx of hot asthenospheric mantle during tectonic escape. The intrusion of these voluminous melts into the lower crust was accompanied by orogenic collapse, assisted by lower crustal flow. The large volumes of A2-type magmatism seem to terminate along the Lurio Belt in Northern Mozambique. Therefore, the Lurio Belt could represent an accommodation zone, separating an area to the South in which the orogen underwent a delamination of the orogenic root, and an area to the North, where the orogenic keel is stil present.

Erosional unroofing of the EAAO is documented by the remnants of originally massive areas covered by Cambro-Ordovician molasses-type sedimentary rocks throughout Africa, Arabia and Antarctica, testifying to the past extent and size of this largest of orogens. Whilst the EAAO molasse in northern Africa covers almost the entire N-African platform, the molasses deposits of the southern EAAO in Natal and Antarctica all lie close to inferred major Late Neoproterozoic/Early Paleozoic shear zones, where they probably were preserved from denudation in small pull-apart basins.