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Reactivation of Pan-African structures during the opening of the proto Indian Ocean

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During late Neoproterozoic - early Cambrian times (Pan-African) Gondwana amalgamated along the East African Orogen, its continuation into East Antarctica and the Kuunga Orogen. East Africa, Madagascar, the Indian - Seychelles block, Sri Lanka and East Antarctica were welded together and formed the Gondwana supercontinent. Approximately 350 Myr later the supercontinent broke into its original fragments and the proto Indian Ocean was opened. Paleo-reconstructions from Cambrian to Mesozoic times show that the separation of the Gondwana fragments took place along the late Neoproterozoic - early Cambrian organic junctions indicating that structures related to the amalgamation were used during the break-up. Today, mid-crustal remnants of the Pan African organic roots are exposed to surface conditions as metamorphic basement rocks with some well defined structural anisotropies like ductile high strain or major shear zones. Field evidences for structural reactivation within these zones are sparse, thus geochronological and thermochronological data are needed to constraint the cooling history of the high strain zones and the basement blocks bounded by them. Examples of combined structural field and remote sensing data together with fission track age distribution maps from Sri Lanka, northern Mozambique and Madagascar show the significance of structural inheritance (e.g., south-western Highland Complex, Lurio Belt, Ampanihy, Ejeda and Ranotsara shear zones) on the later continental margin formation within the reactivated older orogens during post Pan-African times. Apatite fission track data indicate two main rock cooling episodes in the upper crustal level during the Carboniferous-Permian and the Cretaceous related to intracontinental rifting within Gondwana and the Cretaceous geodynamic reorganization when India started its drift northwards.