Organization of African Intra-Plate Tectonics

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ABSTRACT

Africa assembled by the end Precambrian as a cratonic collage with intervening mobile belts and sutures, the reactivation of which has been recognized as important in African tectonics. Their control over structural trends is one organizing factor in deformation associated with the assembly and breakup of Pangea. Recurrent opening and closing of Tethys has driven deformation in the Saharan area. The Central African Rift System (CARS) and its associated CASZ (Shear Zone) comprise the failed arm of the Gulf of Guinea triple junction in SA-AF breakup. In southern Africa, the Karoo Basins developed during closure of the Cape Fold Belt. A detailed tectonic synthesis done in connection with the GIS-based Exploration Fabric of Africa (the 'Purdy project') indicates that these are linked by shears similarly to but before CARS. Elements of pull-apart basins in NE Namibia (Kavango and Caprivi Basins) have been recognized in inversions of high-res magnetic data and studied using structural models. They link across the continent to the better-known Karoo Basins via established lineaments, forming a 'Southern Trans-Africa Rift System' (STARS). Implied is the possibility of a fairway of prospective extensional basins along STARS that are only apparent as basement lows in standard potential methods data. The kinematics of these systems can be understood as a blend of structural styles. Arrays of fault blocks loosely aligned in belts often comprise fields of extensional basins and/or compressional uplifts within continents, for example in the forelands of orogenic belts (e.g. the late Paleozoic Ancestral Rocky Mountains in the interior western North America) or as failed arms of plate triple junctions (as in the case of CARS). Transfer faults occur within and between individual elements of such systems (as intra- and inter-basinal faults): they are fundamental features and are necessary to facilitate the kinematic harmony of the system. At their extreme, these transfer fault systems may be localized into inter-basin/uplift, regional 'mega-shear' systems that exploit pre-existing defects in the crystalline basement, as is case in Africa. These mimic wrench faults in the detail of their geometry, but insofar as they only accommodate the net extension or compression of the overall system, they do not necessarily display a consistent sense of offset or accumulate much net strike-slip offset at the continental level.