Mechanisms of inheritance of rift faulting in the western branch of the East African Rift, Tanzania

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Abstract
The western branch of the East African Rift system is commonly cited as a result of Phanerozoic reactivation of the Paleoproterozoic Ubendian belt in western Tanzania. Geological evidence is provided to show that prominent mechanical anisotropies successively appeared during Proterozoic evolution of the Precambrian basement and that their different reactivation behavior contributed to the Phanerozoic rift pattern. The Ubende belt (1950–1850 Ma) is a NW oriented, amphibolite facies ductile lateral shear belt in which older (2100–2025 Ma) and complex granulite facies terranes are included along trend. Retrograde multiphase sinistral strike-slip mylonites developed along the NW oriented ductile shear belt. They reflect persistent Proterozoic wrench fault reactivation of the latter. Shallow level sedimentary basins upon and along the ductile shear belt display deformational structures attributable to the Proterozoic wrench fault reactivation. Neoproterozoic sinistral transpression produced the final geometrical pattern of the wrench fault zone, which appears as an elongate and NW trending positive flower structure, locally enhanced by late Proterozoic contraction. Phanerozoic rifting is demonstrated by others to occur in three distinct episodes, during which the complex rift segment formed upon the multiphase Proterozoic wrench fault zone. The evaluation of the relationship between multiphase rift and multiphase prerift fabrics is reconsidered. The Proterozoic prerift fabrics correspond with a dextral transpressional and ductile deformational pattern, which became selectively reactivated by sinistral transpressional ductile-brittle mylonites. Proterozoic mylonites constitute shallow level mechanical anisotropies and define the general trend of the rift faults. According to the position of these mylonites in the center or in the external parts of their NW oriented Neoproterozoic transpression, they reactivate as complex and multiphase rift faults or as normal and recent faults, respectively. The Paleoproterozoic NW oriented and ductile lateral shear belt constitutes the deep level mechanical anisotropy. Its reactivation in Phanerozoic stress fields is likely dextral oblique transtension, considered as a leading mechanism of the pluriphase and NW oriented deep rift basins.