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Paleostress in Central Africa reveals the Late Paleozoic-recent evolution of Central Gondwana

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In most parts of Congo-Tanzania plate in Central Africa, the onset of brittle deformation occurred at the end of the Pan-African amalgamation of Gondwana, in early Palaeozoic. Since then, the last ± 500 Ma of the tectonic history of Africa occurred in the brittle regime. The tectonic evolution of this long period in Central Africa is still poorly known, despite the fact that it has major influences in the development of both mineral and hydrocarbon deposits.

Brittle faults can be studied by the now classical techniques of fault kinematics and palaeostress inversion. The ultimate goal is to reconstruct the ancient tectonic stress fields which prevailed during the development of the observed structures. The ancient tectonic stress fields are themselves governed by the plate configurations and tectonic processes. Therefore, the kinematics analysis of brittle fractures and faults and their stress inversion provide an insight in the Phanerozoic tectonic evolution of Central Africa.

We compiled fault-slip data obtained during numerous field trips across Tanzania, DR Congo, Zambia and Burundi. They have been inverted using the Win-tensor program and the results are presented in map view using the same conventions as in the World Stress Map. We evidence several brittle deformation events that can be recognised over large regions of the Congo-Tanzania plate and affected also the Congo Basin. The older ones are related to the E-W convergence and collision between East and West Gondwana, and the N-S convergence and collision between the Kalahari and the Congo cratons at the end of the Pan-African times.

A brittle deformation event of regional importance affects the basement and the Karoo Supergroup (Permian-early Triassic) in various places. It is related to a transpressional stress field generated by the distant Gondwanide collision at the active southern margin of Gondwana (now exposed in the Cape Fold Belt). Since the Late Mesozoic, the Congo-Tanzania plate was dissected by various rifting events, the last and still active one being related to the development of the western branch of the East African rift system.

