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Damaging earthquakes in Africa: their seismotectonic background and seismic hazard implications

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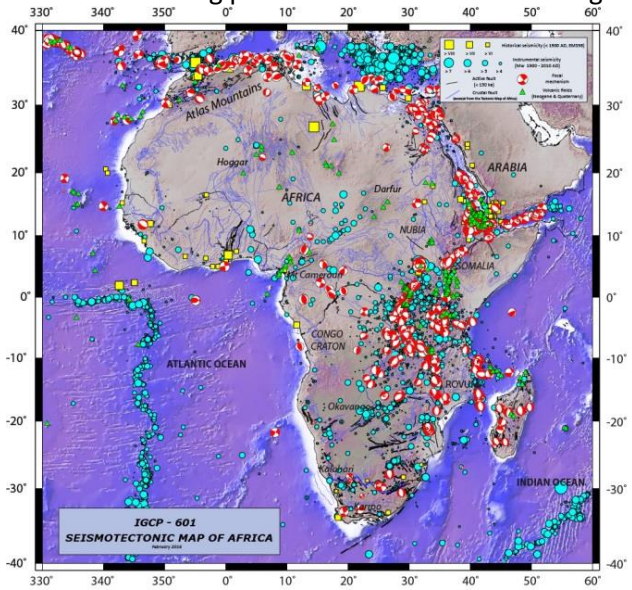
The African continent was the site of several destructive earthquakes with moment magnitude Mw ≥6.5 since the beginning of the 20th century. Large seismic events such as in 1910 Lake Tanganyika (Mw 7.4), 1928 Subukia – Kenya (Mw 7.0), 1935 Al Qadahia – Libya (Mw 7.0), 1980 El Asnam – Algeria (Mw 7.2), 1990 Juba – South Sudan (Mw 7.1), 1995 Nuweiba – Egypt (Mw 7.2), and 2006 Machaze - Mozambique (Mw 7.0) provide an insight into the geodynamics and level of crustal deformation in the continent (1). Most of these earthquakes are shallow and some of them reveal surface faulting with prominent coseismic slip that can be correlated with seismotectonic structures (plate boundaries, rift systems, transform faults and active intraplate regions). Their occurrence in densely populated areas with increase in building plans has caused severe damage and significant economic loss in Africa (2).



Among the oldest major seismic events reported in Africa is the 1200 BC Thebes earthquake that destroyed the Memnon Colossi and Amenhotep III temple in the Nile Valley. Other damaging earthquakes such as the 1862 Ghana (Mw 6.6), 1911 Cameroun (Mw 6.0), 1920 Cape Town (Mw 6.2), 1974 Gabon (Mw 6.1), and 1983 Guinea (Mw 6.2) events took place in regions previously considered as stable continental interiors (3, 4). The recently prepared seismotectonic map of Africa (1), published by the Commission of the Geological Map of the World (CGMW) in the frame of the IGCP-601 (UNESCO) project, displays the main seismically active zones along with their stress and strain distribution, volcanic fields, and crustal and lithospheric structures.

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Figure 1: The seismotectonic map of Africa (1)

Seismic hazard and risk assessments in Africa have always been a challenge in the absence of a complete database that includes well located earthquakes, active faulting and strain rates across the continent (5). Difficulties are compounded in that many regions remain poorly studied. The recent increase of seismic and GPS stations and progress with regional active tectonic projects provide optimistic perspectives for well-studied African Plate geodynamic and related earthquake hazard assessments. The Seismotectonic Map of Africa is clearly the first step to be carried out at a regional level.

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