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A new PSHA model for Sub-Saharan Africa using OpenQuake and the GEM Modelling Toolkits

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The East African Rift System (EARS) is the major active tectonic feature of the Sub-Saharan Africa (SSA) region. Although the seismicity level of such a divergent plate boundary can be described as moderate, several earthquakes have been reported in historical times causing a non-negligible level of damage, mostly because of the high vulnerability of the local buildings and structures. The last regional seismic hazard model published in the scientific literature for Sub-Saharan Africa is the one of Midzi et al. (1999). Formulation and enforcement of national seismic codes is therefore an essential future risk mitigation strategy that can be effectively implemented only on the basis of an updated seismic hazard model for the region.

Unfortunately, the major issue in assessing seismic hazard in Sub-Saharan Africa remains the lack of basic information needed to construct source and ground motion models. The historical earthquake record is largely incomplete, while instrumental catalogue is complete down to sufficient magnitude only for a relatively short time span. In addition, mapping of seimogenically active faults is still an on-going program. Recent studies have identified major seismogenic structures, but there is still a substantial lack of kinematic information on intermediate-to-small scale tectonic features, information that is essential for the proper definition of earthquake recurrence models.

In this study, we propose a new probabilistic seismic hazard model for the Sub-Saharan Africa region based on the most recent and up to date information available from scientific literature, open datasets, global earthquake bulletins and local networks, such as the catalogues from the partner AfricaArray programme. We describe the use of OpenQuake-engine software and Modelling Toolkits for all stages of the PSHA model build up. Working assumptions, main processing steps, data analyses and interpretations will also be discussed, in line with the strategy of transparency and reproducibility adopted by the Global Earthquake Model Foundation (GEM).