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Building a new PSHA earthquake source model for South America: the SARA model

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Seismic hazard modelling in South America - one of the most seismically active regions on the planet, where many of the largest earthquakes ever recorded took place - presents for hazard modellers a diverse set of challenges because of the complexity of the tectonic settings, the inhomogeneous characterization of seismicity between countries and the diverse properties of national active faulting and strong motion databases.
The earthquake hazard model created in the framework of the South America Risk Assessment (SARA) project, one of the key goals of this programme, resulted from collaboration between the GEM hazard team and scientists from the South American region. The main activities completed within this collaboration included the harmonization of critical earthquake datasets (e.g. both historical and instrumental earthquake catalogues, seismically active faults, and local and national databases of strong motion recordings), the development of common standards for representing data, the development of open tools for data collection, the analysis and computation of hazard and – ultimately - the construction of the hazard model.
The SARA hazard model [v.1.0] can be considered novel in many respects, since it is a model developed within a community-based effort which promoted advanced and original methods for earthquake modelling, such as: a) the shallow seismicity modelled using an integrated model of distributed seismicity (area-source for both, active shallow crust and stable continental regions) and crustal fault sources, b) the subduction interface seismicity, modelled as large fault sources with a 3D geometry, and c) the subduction in-slab seismicity, modelled as 3D volumes of ruptures describing the spatial distribution of events within this area.
To manage the basic information for the construction of the Earthquake Source Model, the OpenQuake Hazard Modeller's Toolkit (HMTK) was used. New functionalities were introduced to support specific components of the model, computed using the hazard component of the OpenQuake engine (OQ-engine).
In this communication, we intend to describe the process followed for the construction of this model, with a special focus on the newest, innovative and controversial aspects, on illustrating the impact of various modelling assumption of the hazard and on the final results computed.