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Comparing earthquake models for the Corinth rift for Mw>=5.5/6/6.5 (Greece)

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The Corinth rift (Greece) is identified as a site of major importance for earthquake studies in Europe, producing one of the highest seismic activity and strain in the Euro-Mediterranean region. It is characterized by an asymmetrical structure, with the most active normal faults dipping north and a north-south extension rate measured by GPS increasing from 0.6 mm/year in the eastern part of the rift to 15 mm/year in the western part. Frequent seismic swarms and destructive earthquakes are observed in this area.
The Corinth rift Laboratory (CRL, http://crlab.eu) european project investigates fault mechanics, its relationship with earthquakes, fluid flow and the related hazards in the western part of the rift, covering an area about 50 km by 40 km, between the city of Patras to the west and the city of Aigion to the east.
As part of this project, within the CRL-SISCOR group, we construct earthquake forecast models (EFM) for M>=5.5/6/6.5 events of the Corinth rift area based on the in-depth seismotectonic studies available for this region. We first present the methodology used to construct the earthquake and fault databases and to quantify the associated uncertainties. We then propose EFM following two approaches: one based on the definition of seimotectonic areas with similar geologic or strain characteristics, the second one based on the definition of fault sources mapped at the surface as well as blind ones. In order to compute the probability of occurrence for M>=5.5/6/6.5 for seismotectonic areas, we analyse two earthquake catalogues available for Greece (National Observatory of Athens, Thessaloniki), apply two declustering methods (Reasenberg and Gardner) to construct a Poissonian earthquake catalogue and test the influence of the minimal magnitude (3.5; 4.0). We compare the impact of maximum magnitude and corner magnitude (Kagan 1997, 2002) estimations. We then apply the Weichert method to estimate the probability of occurrence of M>=5.5/6/6.5 based on different options.
In the fault approach, only the main fault sources are considered and the probability of occurrence is calculated from the geological characterization of each fault (geometry and slip rates) identified by the CRL-SISCOR working group. A suite of rupture scenarios is proposed reflecting the opinion of all the members of the Working Group, including the activation of multiple fault segments in a short time period (as suggested by some historical earthquake sequences), as well as more classical EFM often hypothesized for faults in seismic hazard studies (characteristic, Gutenberg-Richter truncated or not). For well-known faults (Aigion, East Helike and Psathopyrgos) we also calculate the probability of occurrence using a model integrating the seismic history of these faults (BPT model). A key question that will be addressed concerns the amount of deformation that may be taken up aseismically within the rift.
Advantages and shortcomings of each EFM and underlying hypothesis will be analyzed in the context of seismic hazard assessment studies in general and for the Rift of Corinth, in particular.