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Estimating the probability of occurrence of earthquakes (M>6) in the Western part of the Corinth rift using fault-based and classical seismotectonic approaches.

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The Corinth rift, Greece, is one of the regions with highest strain rates in the Euro-Mediterranean area and as such it has long been identified as a site of major importance for earthquake studies in Europe (20 years of research by the Corinth Rift Laboratory and 4 years of in-depth studies by the ANR-SISCOR project). This enhanced knowledge, acquired in particular, in the western part of the Gulf of Corinth, an area about 50 by 40 km, between the city of Patras to the west and the city of Aigion to the east, provides an excellent opportunity to compare fault-based and classical seismotectonic approaches currently used in seismic hazard assessment studies. A homogeneous earthquake catalogue was first constructed for the Greek territory based on two existing earthquake catalogues available for Greece (National Observatory of Athens and Thessaloniki). In spite of numerous documented damaging earthquakes, only a limited amount of macroseismic intensity data points are available in the existing databases for the damaging earthquakes affecting the west Corinth rift region. A re-interpretation of the macroseismic intensity field for numerous events was thus conducted, following an in-depth analysis of existing and newly found documentation (for details see Rovida et al. EGU2014-6346). In parallel, the construction of a comprehensive database of all relevant geological, geodetical and geophysical information (available in the literature and recently collected within the ANR-SISCOR project), allowed proposing rupture geometries for the different fault-systems identified in the study region. The combination of the new earthquake parameters and the newly defined fault geometries, together with the existing published paleoseismic data, allowed proposing a suite of rupture scenarios including the activation of multiple fault segments. The methodology used to achieve this goal consisted in setting up a logic tree that reflected the opinion of all the members of the ANR-SISCOR Working Group. On the basis of this consensual logic tree, median probability of occurrences of M>=6 events were computed for the region of study. Time-dependent models (Brownian Passage time and Weibull probability distributions) were also explored. The probability of a M>=6.0 event is found to be greater in the western region compared to the eastern part of the Corinth rift, whether a fault-based or a classical seismotectonic approach is used. Percentile probability estimates are also provided to represent the range of uncertainties in the results. The percentile results show that, in general, probability estimates following the classical approach (based on the definition of seismotectonic source zones), cover the median values estimated following the fault-based approach. On the contrary, the fault-based approach in this region is still affected by a high degree of uncertainty, because of the poor constraints on the 3D geometries of the faults and the high uncertainties in their slip rates.