Geophysical Research Abstracts
Vol. 20, EGU2018-10511, 2018
EGU General Assembly 2018

Fault rupture hypothesis at the Eastern Betics (SE Iberia); insights from the "collective thinking" within the frame of the FAULT2SHA approach

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Interdisciplinary working groups help to sort out the problems and misunderstandings between researchers from different branches of science, but also to come up with new ideas resulting from the "sharing" experience. The FAULT2SHA ESC working group is devoted to fill the gap between geologists and modelers involved in the incorporation of geological data into seismic hazard assessment. Within this frame, we created the FAULT2SHA-Betics last year, focused on the Eastern Betics Shear Zone (EBSZ, SE Iberia). A few months after its birth, we conducted a collective experience to take the first step of the approach: defining the most reliable hypothesis of fault surface ruptures. This experience involved 15 earthquake geologists/geophysicists with previous experience in the EBSZ, some of them trained in the development or implementation of seismic hazard tools. We followed a working plan consisting on: 1) creation of three working sub-groups specialized in different fault sources within the EBSZ that discussed and proposed clue seismic parameters (slip rate, maximum earthquake) and possible models of surface rupture for the EBSZ. This was accomplished in different short/local meetings; 2) a two days general meeting of the working group, aimed to review the most challenging problems and uncertainties, to share the proposed models, and to come up with agreed models for the surface fault rupture; 3) the revision of key-data and surface faulting possibilities by considering the discussion of the general meeting and though further group-sessions.

The experience provided the opportunity to learn several lessons in a practical and useful way. For instance, data from the EBSZ served to feed examples of SHERIFS and FISH seismic hazard tools. These enable us to detect how the maximum magnitude and recurrence time vary as a function of the linked or independent fault behavior of the faults within the EBSZ. The working sessions pinpointed the variety of sources of uncertainties, as the dating methods, the measure of the slip or the source complexity, and how these are often not properly defined in our reports. Rupture segmentation rules published for Italy and California were adapted to the EBSZ, considering feasible synchronic ruptures along faults separated > 5 km. We agreed on the need to 1) use a common representative time frame (Upper Pleistocene) to express the slip rate, and 2) simplify the fault source geometry that is provided to the seismic data modelers, since detailed surface traces introduce "noise". Finally, we came out with new rupturing models, not envisaged to date, which seem structurally and geodynamically feasible and which consider a linking behavior among up-to three aligned fault sources: Carboneras, Palomares and Carrascoy-Bajo Segura (up to 250 km, Mw = 7.5 - 8). Further geological evidence is needed, however, to evaluate the likelihood of such a relatively long seismogenic rupture at Present.