

## **Estimation of slip rates and seismic hazard parameters using conventional techniques of structural geology in a slow-moving fault: Alhama de Murcia – Alcantarilla segment of the Alhama de Murcia Fault (Murcia, SE Spain)**

Paula Herrero-Barbero (1), José Antonio Álvarez-Gómez (1), Jose Jesús Martínez-Díaz (1,2)

(1) Department of Geodynamics, Complutense University of Madrid, 28040 Madrid, Spain (paulah01@ucm.es), (2) Geosciences Institute IGEO (UCM, CSIC), 28040 Madrid, Spain

The convergence between Nubian and Eurasian plates in the Western Mediterranean is being accommodated by the Eastern Betic Shear Zone, located in Southeastern Iberia. This is a low strain region whose faults show low slip rates and long recurrence periods of their maximum earthquakes, so they do not provide clear evidence of their seismogenic activity. The Alhama de Murcia - Alcantarilla segment, defined as the NE end of the Alhama de Murcia Fault, is one of the structures of the Eastern Betic Shear Zone and there are few in-depth studies about its seismic potential. In order to assess the seismogenic potential and slip-rate of this segment we have carried out a structural analysis.

We have built a 3D geological model of the area where the fault is currently bounding the Neogene Fortuna basin. The structural model is based on seismic reflection profiles which have been later input in MOVE, structural modelling and analysis software. The analysis of the model has revealed several structural features related to positive inversion tectonics in Fortuna basin, specifically a typical “harpoon” structure whose deformation is estimated to have begun since Upper Miocene (Messinian). Geometric models and area balance methods (e.g. depth-to-detachment method) applied to the previously mentioned structure have allowed to estimate the heave of the fault, representing the amount of shortening observed in the fault section during its recent activity.

The horizontal shortening rate estimated is between 0.09 and 0.26 mm/yr during the last 5.3 - 2.6 Ma. Projecting the obtained shortening onto the fault plane and considering the present regional tectonic shortening it has been possible to obtain a net slip rate between 0.13 and 0.37 mm/yr. Such parameters suggest that the Alhama de Murcia - Alcantarilla segment has less activity than other segments of the fault. The result obtained is consistent with the fact that the Carrascoy Fault, oriented parallel and located to the south of the Alhama de Murcia - Alcantarilla segment, seems to absorb part of the regional tectonic shortening. That is why the relief uplifted by the Alhama de Murcia - Alcantarilla segment during the Quaternary is significantly less prominent than the mountains fronts generated by the Carrascoy Fault. Even so, Alhama de Murcia - Alcantarilla segment should be considered as an active structure with implications for seismic hazard. The maximum size of earthquake is calculated to be Mw 6.3 - 6.6 according to magnitude-area and magnitude-length scaling relationships, with a mean recurrence interval lower than 10.000 years for the slip rate obtained. In the same way, Mw 5.0 earthquakes, such as those recorded in the historical seismic catalog, are estimated to have a recurrence interval lower than 50 years. These earthquakes could be very destructive in densely populated areas, as is the case of SE Spain, so they should be considered in seismic-hazard analysis.