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# Shallow structure of the Zafarraya Polje (SW Spain) from passive seismic techniques, electric and gravimetric studies

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The Zafarraya basin is a Neogene karstic hollow enclosed in the Betic Mountains (southwest Spain). That region suffers the highest seismic hazard in the Iberian Peninsula due to the collision between the Euroasiatic and the African plates. An example of this was the Andalusian earthquake on 24th December 1884, with estimated magnitude 6.8 and epicentral intensity X. Simulations based on simple models of the basin have shown amplification factors as large as 12 due to local effects (Luzón et al., 2004).

The shallow structure of the basin has been investigated in several campaigns during 2007 and 2008 by using three different methods: microtremor surveys, gravimetric studies and geoelectrical prospecting (vertical electric profiles, VEP).

Ambient noise records were obtained at 9 places in the basin by using small aperture arrays most of them consisting of 6 vertical-component sensors with a nested triangle configuration and a seventh central three-component sensor. Inter-station distances ranged from 7.5 m to 200 m. The dataset was analyzed by means of the Spatial Autocorrelation method (Aki, 1957) and the two-station method (2s-SPAC), assuming predominance of Rayleigh waves in the vertical components. A 1D S-wave velocity model was inverted for each array. Multiplicity of the solution was reduced by using the H/V resonance frequencies at the array centers as an additional constraint.

The gravimetric survey consisted of 148 observations at 122 different sites. Once corrected of topographic effects, a linear regional trend was fitted and removed from the data. The maximum local anomaly variation found in the basin was 7 mGal, with the largest negative values in the center of the basin, about midway between El Almendral and Ventas de Zafarraya villages.

Finally, a total of 24 VEPs were also performed across the basin. Results show maximum depths around 330m down to the resistive basement (∼6500 Ohm·m ) at its central part.

The resulting models are discussed and compared in order to find the geometry of the stiff basement and the main contrasts. These results permit a better understanding of the structure of the basin and will be the basis of more accurate simulations of its seismic response.