



DEVELOPING AND DOCUMENTING SEISMIC SOURCE ZONE MODELS: AN EXAMPLE FROM IBERIA

Susana Vilanova¹, Eliza Nemser² and the SHARE-WEST-IBERIA working group on seismic sources³

The modelling of seismic sources is the first and one of the major inputs in probabilistic seismic hazard analysis (PSHA). A seismic source model usually includes together with the set of known active faults, a seismic source zone (SSZ) model that accounts for the contribution to the hazard of earthquakes not directly correlated with known faults. These include earthquakes both occurring on previously unidentified active faults (surprises) and on structures whose dimensions do not warrant their inclusion in the fault model. Although SSZ models have been used in PSHA since the development of the methodology back in the 60's, the criteria underlying their design is seldom discussed and properly documented. Therefore, the process of updating existing SSZ models in the presence of new data is usually problematic and may lead to an unforeseen propagation of errors.

In the present paper we present a methodological framework for developing and documenting SSZ models, and emphasize the importance of including an extensive set of descriptive metadata (Vilanova et al., in press). The proposed methodology includes: 1) the assessment of the scale and degree of stationarity of the seismicity affecting the region; 2) the assessment of catalogue completeness; and 3) the assessment and ranking of physical criteria. The proposed documentation includes a table that describes the unique characteristics of the individual source zones, and a table that documents the criteria used to delineate the boundaries that separate contiguous SSZs.

In cases where SSZ models span political borders, as often happens in regional-scale seismic hazard studies in Europe, there are additional challenges. These include 1) the reconciliation of existing SSZ models; 2) the use of different input datasets (such as national seismicity catalogues); 3) the implementation of different methodological approaches; 4) the use of different schemes to rank the relative importance of input data; 5) the reconciliation of the appropriate scale; 6) the consideration of different levels of consensus for the geometry of controversial SSZs. We discuss this issue using as an example the development of a continuous, border-consistent SSZ model for Iberia, performed in the framework of project SHARE.

The preliminary SSZ model for Iberia was outlined in the SHARE-IBERIA workshop on seismogenic sources, on January 2010, in Algarve, Portugal, which involved about 40 regional experts in the fields of seismology, geology and seismic hazards. The external expert panel included Kuvvet Atakan (University of Bergen, Norway), Pilar Villamor (GNS, New Zeland), and Ivan Wong (URS Corporation, CA, USA). The model was further refined in subsequent meetings, and repeatedly revised in order to incorporate several rounds of feedback from the regional and external experts. The final model (Figure 1), was delivered to project SHARE in November 2010 and included in the SHARE SSZ model (Giardini et al., 2014).

¹ CERENA - Instituto Superior Técnico (IST), Universidade de Lisboa, Lisbon, susana.vilanova@mail.ist.utl.pt

² Seismic Hazards Group, URS Corporation, Oakland CA, eliza.nemser@urs.com

³ G.M. Besana-Ostman, M. Bezzeghoud, J.F. Borges, A. Brum-da-Silveira, J. Cabral, J. Carvalho, P.P. Cunha, R.P. Dias, J. Madeira, F.C. Lopes, C.S. Oliveira, H. Perea, J. García-Mayordomo, I. Wong, R. Arvidsson and J.F.D.B. Fonseca.

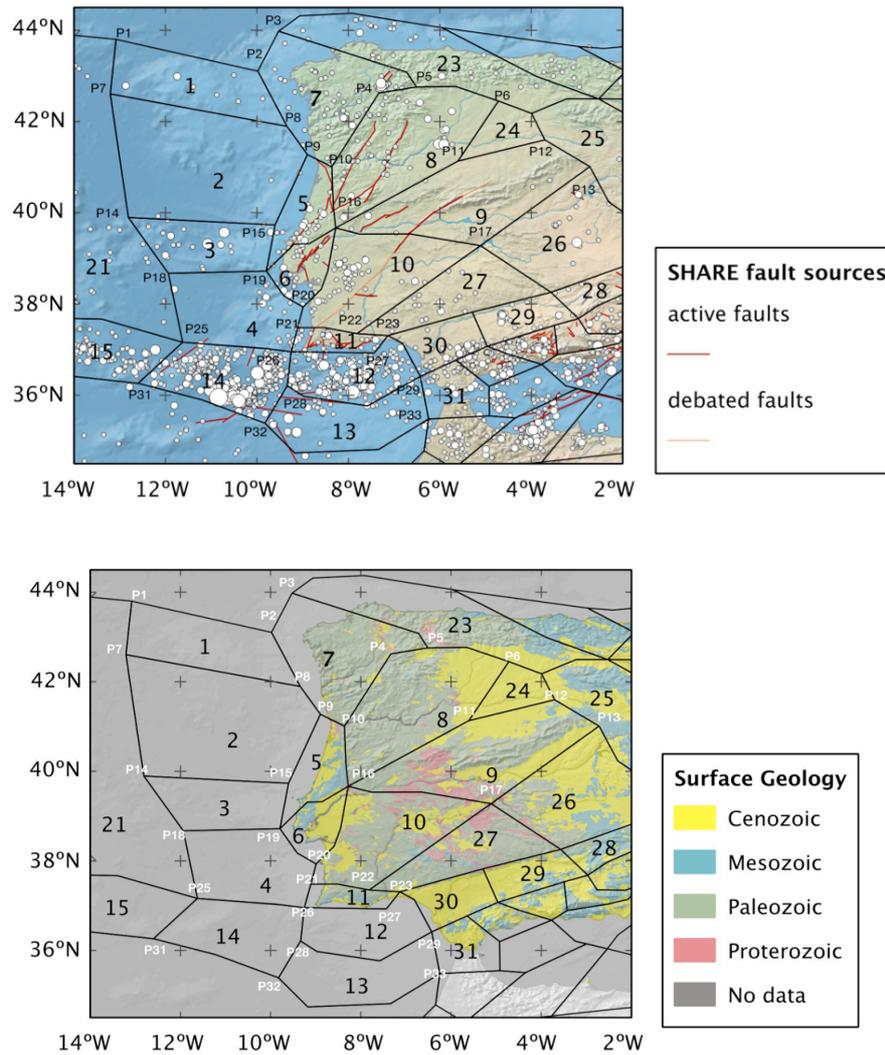


Figure 1. SHARE-IBERIA source zone model for West Iberia and underlying geologic data.

REFERENCES

- Giardini D, Woessner J, Danciu L, Valensise G, Grünthal G, Cotton F, Akkar S, Basili R, Stucchi M, Rovida A, Stromeyer D, Arvidsson R, Meletti F, Musson R, Sesetyan K, Demircioglu MB, Crowley H, Pinho R, Pitilakis K, Douglas J, Fonseca J, Erdik M, Campos-Costa A, Glavatovic B, Makropoulos K, Lindholm C., Cameelbeeck T. (2013). Seismic Hazard Harmonization in Europe (SHARE): Online Data Resource, doi: 10.12686/SED-00000001-SHARE, 2013.
- Vilanova SP, Nemser ES, Besana-Ostman GM, Bezzeghoud M, Borges JF, Brum-da-Silveira A., Cabral J., Carvalho J., Cunha PP, Dias RP, Madeira J., Lopes FC, Oliveira CS, Perea H, García-Mayordomo J, Wong I, Arvidsson R, Fonseca JFDB (in press) "Incorporating Descriptive Metadata into Seismic Source Zone Models for Seismic Hazard Assessment: A case study of the Azores-West Iberian region", *Bull. Seism. Soc. Am.* in press.