African Seismological Commission (AfSC) - Asian Seismological Commission (ASC)
Preparatory Joint Working Group on Neo-Deterministic Seismic Hazard Assessment (pJWG NDSHA)

Newsletters

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More reliable physics in seismic hazard assessment (SHA) for disaster risk reduction (DRR)
(More reliable physics in SHA for DRR)

This issue

Suggestion for a Webinar: 2023 Morocco M_S6.8 Earthquake and Seismic Hazard Assessment

On September 9, 2023, a M_S6.8 earthquake struck Marrakesh, Morocco, and caused severe casualties and economic losses in the area. The year 2023 is the first year of JWG actions, it is important to organize a webinar for this destructive earthquake. In this webinar, all researches and ideas about the Morocco earthquake as well as other events are welcome. The date will be announced once the preparation work is done. If you have any suggestion about the date for this webinar, please contact the two executive secretaries.

The Morocco earthquake highlighted the importance of NDSHA

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Before the recent Morocco earthquake, seismic hazard assessment in North Africa, based on the neo-deterministic methodology (NDSHA), was performed. The NDSHA was implemented by calculating synthetic seismograms through the modal summation technique. The assessment was conducted on a regular grid of 0.2° x 0.2° degrees, as demonstrated in Mourabit et al., (2014). The study marks the first attempt to develop NDSHA maps for North Africa, encompassing Morocco, Algeria, Tunisia, Libya, and

Egypt. The standard NDSHA algorithm relies on earthquake sources, seismotectonic zonation, and structural models as crucial input data. The estimated design ground acceleration at epicenter of 2023 Morocco M_S6.8 event, with a shear wave velocity (V_S) of 1800 m/s, falls within the 0.01-0.02g range.

The Global Seismic Hazard Map released by Global Earthquake Model (GEM) provides information about the world-widely geographic distribution of seismic hazard. The map indicates that the epicentral area of the 8th September 2023 Morocco earthquake, with a magnitude of M_S6.8, has a PGA value of 0.13g. It's important to note that the PGA value provided in the GEM Global Seismic Hazard Map represents the level of ground shaking with a 10% probability of being exceeded in a 50-year time span. It is computed for reference rock conditions, assuming a shear wave velocity (V_S30) range of 760-800 m/s.

According to Moroccan Seismic Building Code 2000 (version 2011), the PGA for this epicentral area is 0.1g. However, Moroccan authorities reported a recorded maximum intensity of VIII during the 2023 earthquake, where there were no records for acceleration near the source but on 35 Km away from the epicentre, the acceleration exceeded 0.19g recorded in an accelograph, indicating a significant deviation from the model's prediction. This discrepancy underscores the importance of considering and improving the quality of input data, particularly information related to active fault lines, paleoseismological evidence, morphostructural zonation and historical seismic data.

The case of the 2023 Morocco earthquake serves as a stark reminder of the need to priorities not only sophisticated models and intensive calculations but also the accuracy and completeness of input data. The Morocco earthquake is a red alarm for all of us; we have to pay more attention not only to sophisticated models and intensive calculations but also to realistic input data.

Accorging to Prof. G. F. Panza, apart from input data completeness, M_{design} could be a dynamic parameter for updating seismic hazard maps based on NDSHA. Considering M_{design}, in agreement with Rugarli et al (2019), from the values of Agadir quake in 1960, M=5.7-5.8 we obtain M_{design}=6.4-6.5 for the area, a value not so different, within global error estimate 0.2-0.3 (e.g. Båth, M. (1973); Bormann et al. (2007)), from the one observed for the 2023 M=6.8-6.9 earthquake. This fact should encourage the timely updating of the, about 10 years old, maps published in the paper Neo-deterministic seismic hazard assessment in North Africa by Mourabit et al. (2014). The obvious reason is to evidence that M_{design} value for the area was available since 2019 and that the easy computation considering M_{design} all over Morocco is natural with NDSHA, and not in the reach of PSHA. Same applies to entire North-Africa.

References

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Mourabit, T., Abou Elenean, K. M., Ayadi, A., Benouar, D., Ben Suleman, A., Bezzeghoud, M., Cheddadi, A., Chourak, M., ElGabry, M. N., Harbi, A., Hfaiedh, M., Hussein, H. M., Kacem, J., Ksentini, A., Jabour, N., Magrin, A., Maouche, S., Meghraoui, M., Ousadou, F., Panza, G. F., Peresan, A., Romdhane, N., Vaccari, F., Zuccolo, E., 2013. Neo-deterministic seismic hazard assessment in North Africa. *Journal of Seismology*, 18, 301-318. DOI: 10.1007/s10950-013-9375-2.

Rugarli, P., Vaccari, F., Panza, G. F., 2019. Seismogenic nodes as a viable alternative to seismogenic zones and observed seismicity for the definition of seismic hazard at regional scale. *Vietnam Journal of Earth Sciences*, 41, 289–304. DOI: 10.15625/0866-7187/41/4/14233.

SEE9

International Institute of Earthquake Engineering and Seismology (IIEES) after organizing 8 successful International Conferences on Seismology and Earthquake Engineering in past 34 years, now making the first announcement and calls for papers for the SEE9 to be held at 6-8 May of 2024 in Tehran, Iran. SEE9 builds on the strength of its predecessor conferences, and features a broad scope of topics on (1) Seismology and Early Warning System; (2) Geotechnical Earthquake Engineering; (3) Structural Earthquake Engineering; (4) Earthquake Risk Management. More details could be found in the SEE9 conferences website: http://www.seeconferences.ir/.

Collection of published results of NDSHA as a start of the regional/global unified NDSHA map

As a start of the regional/global unified NDSHA map, JWG is calling for the collection of published results about NDSHA. Members of JWG are invited to provide the published papers/books/open files and a short description of the regions as well as some of the technical details. The information sheet includes the following 8 items:

1. Latitude/longitude range of the region, and abstract description, e.g., Iranian plateau
2. Tectonic keywords of the region, e.g., subduction zone
3. Institutions conducting the related work
4. Technic details (1): structure model, 1 D model, or 3-D model?
5. Technic details (2): methods to select controlling earthquakes, from zonation data, by seismogenic nodes?
6. Technic details (3): site effects, averaged, or site specific?
7. Technic details (4): tested by real earthquake cases?
8. Related publications, in the same form as the reference of the papers published

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JWG Library (2)

To facilitate the exchange and discussion within the JWG, our newsletter will be attaching an important paper for the group to study. In this issue, in response to the recent earthquake in Morocco, we attach the paper Neo-deterministic seismic hazard assessment in North Africa by T. Mourabit et al., published in Journal of Seismology. (2014) 18: 301–318, DOI: 10.1007/s10950-013-9375-2. If you have any paper recommended, please contact us.

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