

# Newsletters

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## Important events of JWG

**January 24, 2022:** Prof. G. F. Panza was invited to write an editorial in the *BRI Newsletter* (Vol.2, No.1) 'NDSHA along the B&R region: a research initiative'.

**October 10-13, 2022:** Joint General Assembly of ASC and AfSC held in Kairo. Prof. Panza proposed to set up the Joint Working Group on Neo-deterministic Seismic Hazard Assessment (JWG-NDSHA), and obtained active response.

**February 6, 2023:** Two earthquakes ( $M_w$ 7.8 and  $M_w$ 7.6) occurred in Turkey-Syria region, invoking discussions among the JWG.

**June, 2023:** The 2023 Best Paper Award awarded to Profs. G. F. Panza and J. Bela for the paper published in Volume 275, September 2020, in *Engineering Geology*.

**July 10, 2023:** Preparatory meeting of JWG-NDSHA held online.

**July 15, 2023:** JWG member took part in the meeting of AfSC. Prof. Michelle Grobbelaar, secretary general of AfSC, replied to JWG with encouraging message.

**July 17, 2023:** JWG reported in the ASC EC meeting, with the endorsement of Prof. Li Li, secretary general of ASC.

**August 1, 2023:** First issue of JWG newsletter distributed.

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## Experiment with GPT4.0

On March 14, 2023, OpenAI released its new deep learning model GPT-4.0, after two years of the birth of GPT-3.5. It is said that GPT-4.0 is more close to a human. Deep learning is showing its great power for helping people to deal with natural problems (e.g., Wilson et al., 2023; Xue et al., 2023). Here, we did a experiment with GPT4.0 about neo-deterministic seismic hazard assessment (NDSHA).

**Question: Can you say something about difference between Neo-deterministic Seismic Hazard Assessment and Deterministic Seismic Hazard Assessment?**

**GPT4.0:** The difference between Neo-deterministic Seismic Hazard Assessment (NDSHA) and Deterministic Seismic Hazard Assessment (DSHA) can be understood in the context of their approaches to evaluating seismic hazard.

Deterministic Seismic Hazard Assessment (DSHA) focuses on identifying the maximum credible earthquake for a given location based on geological and seismic data. It considers the largest earthquake that is likely to occur at a site and uses this to determine the potential ground motion. This approach does not statistically consider the probability of different earthquake scenarios occurring but instead uses a worst-case scenario based on historical seismicity and active faults.

Neo-deterministic Seismic Hazard Assessment (NDSHA), on the other hand, is a scenario-based approach that expands upon the deterministic method by considering a wide range of possible earthquake sources and constructing scenarios using full waveform modeling. This method does not rely on empirical attenuation models and aims to supply realistic time series of ground shaking. NDSHA provides envelope estimates of maximum seismic ground motion from a set of possible scenario earthquakes, which include the largest deterministically or historically defined credible earthquakes. It allows for the generation of ground shaking maps at specified long-term return times, facilitating a direct comparison with probabilistic seismic hazard assessment (PSHA) maps in terms of average rates of exceedance for specified time windows.

In essence, while both DSHA and NDSHA focus on the physical modeling of seismic waves to assess seismic hazard, NDSHA provides a more flexible and comprehensive approach by incorporating a broader range of scenarios and not being dependent on empirical ground motion prediction equations. The NDSHA method also enables the assessment of seismic hazard over longer time windows and can be compared with probabilistic estimates for validation purposes

### References

- [1] Wilson, M. P., G. R. Foulger, M. W. Wilkinson, J. G. Gluyas, N. Mhana, and T. Tezel, 2023. Artificial intelligence and human-induced seismicity: initial observations of ChatGPT, *Seismol. Res. Lett.*, doi: 10.1785/0220230112.
- [2] Xue, Zhiwen, Chong Xu, and Xiwei Xu, 2023. Application of ChatGPT in natural disaster prevention and reduction. *Natural Hazards Research*, <https://doi.org/10.1016/j.nhres.2023.07.005>

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**Future Directions: Physics-based ground motion modeling,  
Vancouver, Canada, October, 10-13, 2023**

On October, 10-13, a poster titled as NDSHA Scenario Seismic Hazard Map, Vancouver, b.c. Area - XeRis Methodology was presented in the international meeting, Future Directions: Physics-based ground motion modeling, hold in Vancouver, Canada. In the poster, James Bela, Giuliano Panza, Yan Zhang, and Zhiwei Ji shown an interactive tools XeRis of NDSHA, and computed seismic hazard maps around Vancouver area. They also present some preliminary results based on Maximum Credible Seismic Input (MCSI) in Vancouver city. Please feel free to contact Yan Zhang if you need its PDF version with higher quality.

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**Minute: The 2023 Morocco  $M_s$ 6.8 Earthquake and Seismic Hazard Assessment**

In response to the September 8, 2023,  $M_s$ 6.8 earthquake in Marrakesh, Morocco, pJWG organized a Webinar on November 29, 2023, with participation of the AfSC leader Prof. Paulina Amponsah. Secretary general of ASC Prof. Li Li who was in the field work sent her warm words to the Webinar. Attendees of the Webinar include: Alexander Gorshkov, Antonella Peresan, Djillali Benouar, Giuliano Panza, Imtiyaz Parvez, Irwandi Nurdin, Paulina Amponsah, Vladimir Kossobokov, Yan Zhang.

In the webinar, **Prof. Alexander Gorshkov** talked about the current results on identifying seismogenic nodes in North Africa (without Morocco). He also proposed a pilot project to identify seismogenic nodes in this region. The experience of working with Prof. Panza has shown that information about such nodes is very useful for calculating seismic hazard using the NDSHA approach. If there is the possibility of some kind of funding for this project, young scientists from North African countries, for example from Egypt, could undergo an internship at Institute of Earthquake Prediction Theory and Mathematical Geophysics. In the second talk **Prof. Vladimir Kossobokov** reviewed the deadliest earthquakes of 2023, asking whether they are unexpected surprises. He commented that GEM's map appears to ignore ground shaking resulted by many earthquakes with epicenters off shore. **Prof. Giuliano Panza** commented that 'The main contribution of GSHAP and GEM is to have supplied the proof that PSHA method is totally unreliable and wrong, not only formally but also on the base of Occam razor'. He said that 'Considering that the  $M_{design}$  obtained by NDSHA approach has been in agreement with the real situation, and has been further confirmed by the Morocco earthquake, it should encourage the timely updating of the, about 10 years old, maps published of the neo-deterministic seismic hazard assessment in North Africa. 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, and not only.'

Dr. Mohamed ElGabry, the African side secretary of pJWG, who could not attend this meeting due to schedule conflict, chatted with Dr. Zhang Yan via the web and discussed the agenda of this meeting. He especially mentioned that he is going to attend a meeting about 2023 Morocco  $M_s$ 6.8 earthquake the next

week. In the free discussion stage, attendees discussed the importance of earthquake disaster reduction in Morocco, which extended to the importance of disaster reduction work in Asia and Africa, especially in underdeveloped areas. It is agreed that pJWG has opened up new platforms and opportunities for cooperation, information exchange, and academic exploration, which will greatly promote the application and promotion of NDSHA methods, and also contribute to pJWG's continuous and greater role as a platform for information exchange and cooperation promotion. Prof. Zhongliang Wu who could not attend the webinar sent his encouraging words regarding to the functioning of pJWG.

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