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

JWG attended the AfSC meeting

On July 16, 2023, JWG members attended the meeting of AfSC. Prof. G. F. Panza, Prof. M. El Gabry, Prof. A. Peresan, and Dr. Yan Zhang participated in the meeting. Attendees of the meeting included leaders of the AfSC and IASPEI, e.g., Prof. Johannes Schweitzer, secretary general of IASPEI, and Prof. Michelle Grobbelaar, president elected of IASPEI and secretary general of AfSC.

Dr. Yan Zhang presented the background of the proposed joint ASC and AfSC working group on Neo-Deterministic Seismic Hazard Assessment (JWG-NDSHA). It was agreed that the next step would be to share the information with the AfSC Execom and engage with the ASC Execom to discuss how to take the proposal further.

It was also announced that the next AfSC GA is planned to be held with the Southern African Geophysical Association (SAGA) in 2024.

JWG prepares for the 2024 ASC GA

The 15th General Assembly of Asian Seismological Commission (ASC) is going to be held the next year, with its sessions in preparation. JWG is planning to propose a session 'Physics-based seismic hazard assessment: recent progress and scientific debate'.

Since recent years physics-based seismic hazard assessment has attracted wide spreading attention in

seismological and engineering communities. The developments of neo-deterministic seismic hazard assessment (NDSHA) as a new generation of deterministic seismic hazard assessment well captures the tensor nature of strong ground motion based on the up-to-date seismology, data science, and computational technology, and has been applied to several places. This led to the necessity of comparative studies, testing of the results by earthquake cases with data intensive observations, and communicating with engineering and emergency management communities for its application. The research and its application play an important role in the endeavor of disaster risk reduction (DRR). The proposed session includes but is not limited to the theoretical, computational, and application aspects of NDSHA (for a recent review see *Earthquakes and Sustainable Infrastructure Neo-deterministic (NDSHA) Approach Guarantees Prevention Rather Than Cure*, 1st Edition - May 21, 2021, Editors: Giuliano Panza, Vladimir G. Kossobokov, Efraim Laor, Benedetto DeVivo), with comparison with other approaches, and related scientific discussion.

Suggestions for the revision of the session scope and volunteers to act as or to recommend conveners (and key speakers) please contact the secretaries of the JWG.

Editorial: **JWG and BRI**

A few members of JWG might also be the members of the Initiative of Seismic Disaster Risk Reduction within the framework of the Belt and Road Initiative (BRI), in which 'Belt and Road' stands for the Silk Road Economic Belt and the 21st Century Maritime Silk Road (started since 2013, just a decade ago). In a seismological perspective, the Belt and Road region overlaps with the Eurasian seismic belt and the Pacific seismic belt, which calls for the cooperative research and application of seismic hazard assessment for the reduction of seismic disaster risk. Failures of some of the competing approaches as shown in some destructive earthquakes further highlights the importance of NDSHA. JWG-NDSHA, as well as its close relation with the BRI, has had long lasting roots since the beginning of the 21st century. In 2005 Prof. Giuliano Panza was conferred the honorary professorship of the Institute of Geophysics, China Earthquake Administration, Beijing. In the ceremony he was called as the 'Marco Polo in seismology'. It is well known that Marco Polo played an important role in the transmission of knowledge along the Silk Road. Indeed, this is the case considering the many students of Giuliano Panza in Asian and African countries (some of whom are members of the current JWG) and the cooperative studies performed in different regions which can be traced back as early as the 1980s.

In recent years, along with rapid urbanization and fast development of economy, the population in earthquake-prone areas has significantly increased (e.g., Environ. Res. Lett. 11 (2016) 074028 doi:10.1088/1748-9326/11/7/074028), which indicates that more reliable physics in SHA for DRR is an urgent agenda in sustainable development, especially for the Belt and Road regions. In 2021 Prof. Panza was invited to write an editorial in the *BRI Newsletters*, advocating the cooperation in the BRI regions on NDSHA. Publication of the book *Earthquakes and Sustainable Infrastructure Neo-deterministic (NDSHA) Approach Guarantees Prevention Rather Than Cure* in 2021 was a milestone event which paved the systematic theoretical basis for such cooperation.

Communicating with African Seismological Commission (AfSC) and Asian Seismological Commission (ASC),

respectively, the proposal of JWG obtained active responses, both from the colleagues in the African countries and Asian countries, and form the international organizations. The history is still going on, which calls for your contribution.

Response from readers

Yan,

Slogan Suggestion: "Reliability" is more informative (and positive) than "physics". Also, PSHA method is to: (a) use "physics"; and then (b) input the synthetic ground motion into a PSHA anyway.

It is always preferable to send pdf format, rather than word. Pdf can be read on any device (computer or mobile phone, etc., and also probably more secure.

Best regards,
James Bela

James,

Please clarify which physics is used by PSHA; GMPE have nothing to do with physics, it is "educated" numerology. At present I would like to propose in the slogan to replace “physics” with “reliable physics”. I let editors’ final decision, accounting for possible additional suggestions.

I absolutely agree with your suggestion that it is always preferable to send pdf format, rather than word.

Ciao,
Giuliano Panza

I am not totally sure what they are doing; but I think they are viewing synthetic earthquakes (for Magnitudes and locations not in earthquake catalogs) as additional data points in their probabilistic PSHA (GMPE dependent) paradigm. A synthetic "time history" (physics-based) could be used in design standards where it would have a response spectrum that *matches* the PSHA (GMPE driven) probabilistic spectrum. The Endgame is always *project approval* within probabilistic design standards, not deterministic applications to consider *what is possible* (not just probable). Zhenming Wang keeps assuring me there are wiser practitioners out there who are using deterministic maximum design values for California San Andreas fault. But there is not the technoscience application/appreciation now that the "new" physics-based ground motions represent *a new model that makes the existing PSHA model obsolete*. And they are (they tell themselves) still *comfortable with the possibility of a bad outcome* per our Table 1 in Seismic Rigoletto (of which there have been many).

Best,
James Bela

JWG Library (1)

To facilitate the exchange and discussion within the JWG, each newsletter will be attaching an important paper for the group to study. This issue we attach the paper Giuliano F. Panza, Antonella Peresan and Cristina La Mura (2013) Seismic hazard and strong ground motion: an operational neo-deterministic approach from national to local scale, in *Geophysics and Geochemistry,* [Eds.UNESCO-EOLSS Joint Committee] *Encyclopedia of Life Support Systems(EOLSS)*, Developed under the Auspices of the UNESCO, EOLSS Publishers, Oxford ,UK, [http://www.eolss.net]. If you have any paper recommended, please contact us.

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