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

Newsletters

Vol. 3 No.2 February 1, 2025

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

This issue

A new cooperation project between Italy and Egypt

Recently, a new cooperation project between Italy and Egypt, coordinated by Prof. Antonella Peresan, has been approved. Various partners are involved in JWG activities, i.e., the National Institute of Oceanography and Applied Geophysics (OGS), Department of Engineering and Architecture (DIA), University of Trieste, and the National Research Institute of Astronomy and Geophysics (NRIAG). The information about the project is attached here.

Cooperation project KNIGHT - "Strengthening resilience to geo-hazards and climate challenges along the Nile corridor".

We are pleased to inform you that a Development Cooperation project between Italy and Egypt has just been launched. Project title: "Strengthening resilience to geo-hazards and climate challenges along the Nile corridor" - Acronym: KNIGHT (Knowledge-base for NIle Geo-Hazards Tackling).

The project, funded by the Friuli Venezia Giulia Region (Italy) and coordinated by Dr. Antonella Peresan (OGS), aims to strengthen the resilience of the natural, economic and cultural heritage along the Nile River and its delta. The outcomes of the project will contribute to the revision of the Egyptian national plan for natural hazards mitigation with data, models and innovative technologies. In particular, the collaboration between the partners will enable the sharing of data that will be analysed, standardised and integrated into a database using a GIS platform, making it possible to identify the areas most vulnerable to natural and anthropogenic hazards, and to assess the related risks and possible cascading effects.

This project has solid foundations in the long-standing collaborations between the Italian partners, including OGS and the DIA University of Trieste, and the Egyptian partners from NRIAG, all active members of the pJWG.

Further information on the project can be found via the following link: https://www.ogs.it/en/news/preventing-natural-hazards-along-nile-knight-project-begins. You can find here the OGS news and press release (in Italian) announcing the beginning of the project: https://www.ogs.it/sites/default/files/CS%20progetto%20knight_3.pdf
https://www.ogs.it/en/news/preventing-natural-hazards-along-nile-knight-project-begins.

M_{design} estimation to 2025 Tibetan M_W6.9 earthquake

Reported by China Earthquake Networks Center (CENC), an M_W6.9 event occurred in Tibet, China at 09:05:16, 7th January 2025 (UTC+8). The estimated epicenter is located at 87.45°E, 28.50°N. Figure 1 shows the spatial distribution of historical earthquakes within 200 km distance away from the epicenter of the 2025 event in Tibet. The parameters of these events are listed in Table 1 (CENC). It is easy to find an M_W6.2 event, 14 km away from the epicenter to 2025 event, occurred in 1998, highlighted in yellow in Table 1. According to Panza-Rugarli law (Wang and Wen, 2024), M_{design} is defined as:

$$M_{design}=6.2+0.7=6.9$$

That is the magnitude of the recently occurred event in Tibet.

Reference:
Wen, Z. P., Wang, G. X., 2024. Earthquakes and Sustainable Infrastructure - Neodeterministic (NDSHA) Approach Guarantees Prevention Rather Than Cure. *Earthquake Science*, 37, 494-497.

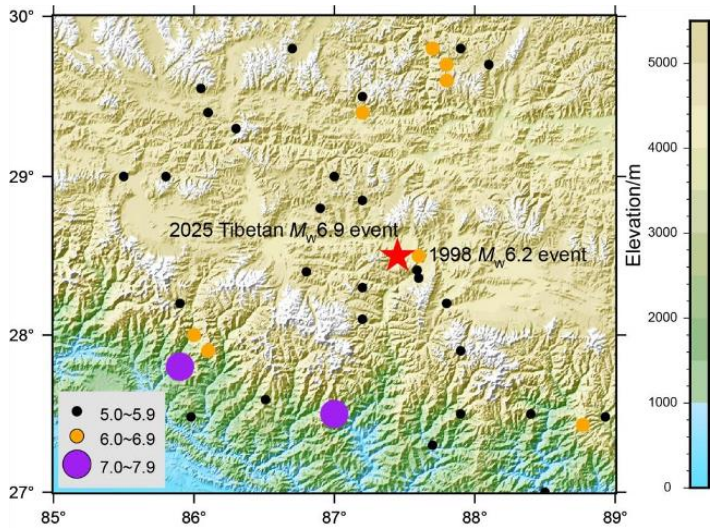

Figure 1 Spatial distribution of epicenters of historical events (CENC) occurred around 200 km away from the epicenter of the 2025 Tibetan M_W6.9 event.

Table 1 M⩾5.0 earthquake catalogue within 200 km distance from the epicenter of 2025 Tibetan M_W6.9 event

Time (UTC+8)	Lat (°)	Lon (°)	Depth (km)	M	EPI* (km)	M_{design}
2025-01-07 09:05:16	28.50	87.45	10	6.9		
2020-03-20 09:33:15	28.63	87.42	10	5.9	14	
2019-01-20 22:28:33	30.09	87.77	10	5.0	179	
2016-11-28 07:35:18	27.59	86.51	8	5.1	136	
2016-05-22 10:05:54	28.41	87.59	6	5.3	16	
2016-05-22 09:48:45	28.36	87.60	10	5.3	21	
2015-04-26 15:09:08	27.80	85.90	10	7.1	170	
2015-04-26 01:42:53	28.20	85.90	10	5.3	155	
2015-04-25 17:17:05	28.40	87.30	20	5.9	18	
2014-08-03 13:57:33	29.00	85.50	10	5.0	198	
2010-02-26 12:42:32	28.40	86.80	33	5.0	64	
2009-11-08 04:08:49	29.40	86.10	33	5.6	165	
2001-04-28 18:37:53	28.85	87.20		5.2	45	
1998-09-04 02:15:56	28.50	87.60	33	6.2	14	6.9
1998-07-20 09:05:58	29.80	87.70	33	6.1	146	
1996-07-03 14:44:44	29.70	87.80		6.0	137	
1996-05-10 17:06:58	29.70	88.10		5.1	147	
1993-03-31 21:44:11	29.50	87.20		5.2	113	
1993-03-20 22:52:02	29.40	87.20		6.6	102	
1982-04-05 10:19:45	27.48	88.93	33	5.2	184	
1980-11-20 03:00:47	27.43	88.77	17	6.6	175	
1978-10-04 21:53:51	27.80	85.90	19	5.6	170	
1975-11-26 23:02:31	28.20	87.80	33	5.0	47	
1974-09-27 13:26:36	29.00	85.80	20	5.5	170	
1974-03-24 22:16:00	27.90	86.10	18	6.1	148	
1973-03-22 09:06:57	28.10	87.20	33	5.3	50	
1971-12-04 16:38:00	27.90	87.90	29	5.4	79	
1971-10-24 16:59:06	28.30	87.20	57	5.0	33	
1970-02-27 03:30:04	27.48	85.98	18	5.1	183	
1965-01-12 21:55:18	27.30	87.70		5.2	135	
1965-01-12 21:32:25	27.50	87.90		5.6	119	
1964-11-10 00:12:51	29.55	86.05		5.0	179	
1964-08-30 10:35:07	27.50	88.40		5.1	145	
1960-08-21 11:29:05	27.00	88.50	29	5.0	196	
1958-11-24 04:15:48	28.80	86.90		5.2	63	
1954-06-29 05:31:44	29.30	86.30		5.0	142	
1952-11-19 18:23:31	29.80	86.70		5.3	161	
1951-05-28 23:59:19	29.00	87.00		5.5	70	

Time (UTC+8)	Lat (°)	Lon (°)	Depth (km)	M	EPI* (km)	M_{design}
1938-01-29 12:13:08	27.50	87.00		5½	119	
1936-09-07 10:30:49	27.50	87.00		5½	119	
1936-02-11 12:48:00	27.50	87.00		5½	119	
1935-01-03 06:23:24	29.80	87.90		5¼	151	
1934-01-16 12:59:22	28.00	86.00		5¼	152	
1918-02-05 01:54:49	29.60	87.80		6.0	126	
EPI: epicentral distance						

Comments from the readers to the paper "Why probability probably doesn't exist (but it is useful to act like it does)" by David Spiegelhalter (Cambridge University)

We would like to draw your attention on the following paper: Spiegelhalter, D., 2024. Why probability probably doesn't exist (but it is useful to act like it does). *Nature*, 636, 560-563. DOI: 10.1038/d41586-024-04096-5.

Antonella Peresan: In this general article the author (who has a huge publication track) argues that any numerical probability "**is not an objective property of the world**, but a construction based on personal or collective judgments and (often doubtful) assumptions". He concludes stating that "any practical use of probability involves subjective judgments" and that "**The objective world comes into play when probabilities**, and their underlying assumptions, **are tested against reality**, but that doesn't mean the probabilities themselves are objective". These considerations are especially relevant when dealing with probabilistic earthquake hazard, where probabilities and underlying assumptions are largely untested (or even claimed untestable). Although such considerations are not new to us, I think they are expressed very clearly in this article and reading it could be useful to the members of the pJWG. When compared to reality, the shaking recorded for the largest earthquakes often exceeded the one predicted by probabilistic maps.

Volodya Kossobokov: The points raised by David Spiegelhalter (Cambridge University) recently are not new, but important to keep in mind (e.g., I've learned these from "Probability: A first course" by Frederick Mosteller et al. (1961) translated and published in Russian (1969); I did not manage getting the original for citing their ***§ 2. Probability interpretations*** for you). As well as the key points of hypotheses testing summarized in by Press et al. [Press, W. H., S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery (1992). Numerical recipes in C: the art of scientific computing 2nd ed., New York: Cambridge University Press, 994 p.], which I keep noting to interested parties:

Data consist of numbers, of course. But these numbers are fed into the computer, not produced by it. These numbers to be treated with considerable respect, neither to be tampered with, nor subjected to a numerical process whose character you do not completely understand. You are well advised to acquire a reverence for data that is rather different from the "sporty" attitude that is sometimes allowable, or even commendable, in other numerical tasks.

The analysis of data inevitably involves some trafficking with the field of statistics, that gray area which is not quite a branch of mathematics - and just as surely not quite a branch of science. In the following sections, you will repeatedly encounter the following paradigm:

- *apply some formula to the data to compute "a statistic"*
- *compute where the value of that statistic falls in a probability distribution that is computed on the basis of some "null hypothesis"*
- *if it falls in a very unlikely spot, way out on a tail of the distribution, conclude that the null hypothesis is false for your data set*

If a statistic falls in a reasonable part of the distribution, you must not make the mistake of concluding that the null hypothesis is "verified" or "proved". That is the curse of statistics, that it can never prove things, only disprove them! At best, you can substantiate a hypothesis by ruling out, statistically, a whole long list of competing hypotheses, every one that has ever been proposed. After a while your adversaries and competitors will give up trying to think of alternative hypotheses, or else they will grow old and die, and then your hypothesis will become accepted. Sounds crazy, we know, but that's how science works!

Volodya Kossobokov: The following earthquakes are two recent deadly/disastrous underestimations of the GEM's Global Seismic Hazard Map (OpenQuake Map Viewer):

(1) M7.1 - 2025 Southern Tibetan Plateau Earthquake
Event: Time 2025-01-07 01:05:16 (UTC) Location 28.639°N 87.361°E Depth 10.0 km UTM:(45R 0535 3168 1000) IX MMI 157.29 %g PGA 121.57 cm/s PGV 6.49 km dist (Location 87.3632°N 28.6431°E).
“An earthquake killed at least 125 people and left 188 injured after it struck a remote area of southern Tibet near China’s border with Nepal at dawn on Tuesday {2025-01-07 - VGK}, Chinese state media reported."
OpenQuake Map Viewer: Seismic Hazard PGA (g) 10% POE in 50 years ~0.26
R = PGA_{obs}/PGA_{GEM} = 1.5729/0.26 **> 6 !**

(2) M5.7 - 54 km N of Āwash, Ethiopia
Event: Time 2025-01-04 00:52:21 (UTC) Location 9.480°N 40.154°E Depth 8.0 km UTM:(37P 0629 1049 1000) VIII MMI 82.45 %g PGA 56.48 cm/s PGV 8.62 km dist.
"Starting late September 2024, central Ethiopia experienced a series of earthquakes, most of which were located in the Awash Fentale region, and mainly located between or around the volcanoes of Mount Fentale and Dofan, in Ethiopia's Awash National Park. The earthquakes were widely felt across much of central Ethiopia, with many of them causing localized but severe damage. ...”
OpenQuake Map Viewer: Seismic Hazard PGA (g) 10% POE in 50 years 0.133668 (< 0.16 at 50 km distance)
R = PGA_{obs}/PGA_{GEM} = 0.8245/0.133668 **> 6 !**

NOTE: OpenQuake Map Viewer could be accessed interactively at the following link - https://maps.openquake.org/map/global-seismic-hazard-map/#2/58.8/66.6

JWG Library (7)

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, we attach the paper, received from Giovanna Vessia, Comparison between the Neo-deterministic Seismic Hazard and FEM approach to assessing 2D local seismic response at Chieti's city site (Abruzzo, Italy), by Ricci et al., published in Engineering Geology. (2025) 107891, DOI: 10.1016/j.enggeo.2024.107891. If you have any paper you like to recommend, please contact us.

Contact address:
Yan Zhang: zhangyan@cea-igp.ac.cn | Mohamed El Gabry: elgabrymn@gmail.com