NATIONAL DATA CENTRE PREPAREDNESS EXERCISE 2015 (NPE 2015): MY-NDC PRELIMINARY ANALYSIS RESULT

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ABSTRACT

Malaysia has established the CTBT National Data Centre (MY-NDC) in December 2005. MY-NDC is tasked to perform Comprehensive Nuclear-Test-Ban-Treaty (CTBT) data management as well as provide information for Treaty related events to Nuclear Malaysia as CTBT National Authority. In 2015, MY-NDC has participated in the National Data Centre Preparedness Exercise 2015 (NPE 2015). This paper aims at presenting MY-NDC preliminary analysis result of NPE 2015. In NPE 2015, MY-NDC has performed five different analyses, namely, radionuclide, atmospheric transport modelling (ATM), data fusion, seismic analysis and site forensics. The preliminary findings show the hypothetical scenario in NPE 2015 most probably is an uncontained event resulted high release of radionuclide to the air.

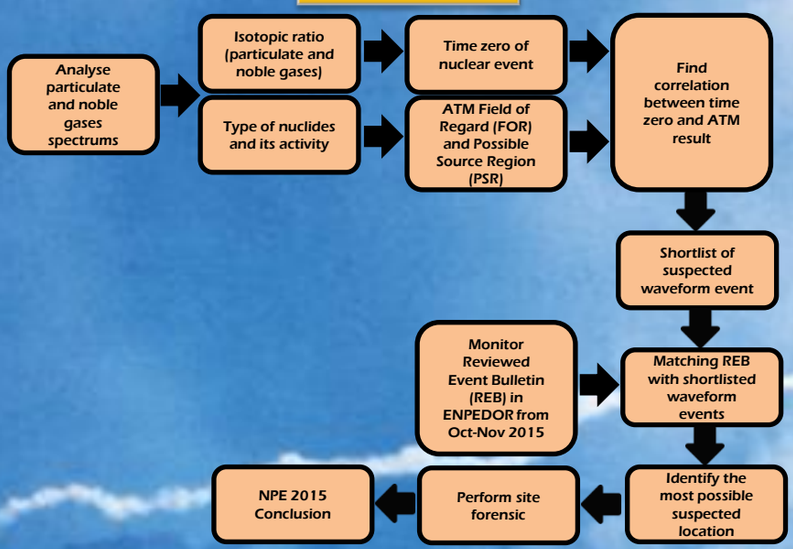
EXERCISE SCENARIO

The national authority has noticed some indications of suspicious activities in the fictitious State of ENPEDOR which is located in Central Europe (roughly around 51° N, 16° E) as shown in Figure 1. NDCs are requested to monitor waveform events occurring in the region. The period of higher alertness is initially planned to last two months from 1 October until 30 November 2015. The radionuclide data which consists of particulate and noble gas station were provided by the NPE Secretariat. Data from 18 particulate stations and 1 noble gas station under the International Monitoring System (IMS) network were provided to NPE participants for analysis and verification purposes as shown in Figure 2 . In addition, NPE participant may request for supplementary information for cross-checking or additional hints.

Figure 1: State of ENPEDOR

Figure 2: Location of IMS stations

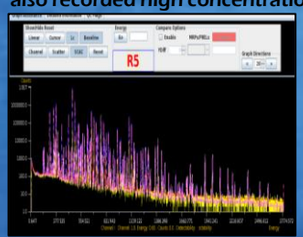
METHODOLOGY

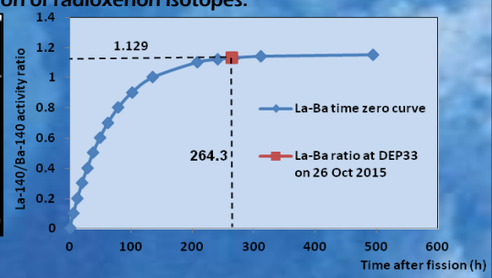


ANALYSIS FINDINGS

1) Radionuclide Analysis

Only 11 spectrums were analysed. Some of these spectrums contained many peaks, mainly from Iodine-132 . Little detection of Cs-134 suggest that the event might not be a release from nuclear reactor. We use isotopic activity ratio of Barium-140 and Lanthanum-140 to estimate the time zero of nuclear event. The time zero of nuclear event most likely took place on 15 October 2015. The event also recorded high concentration of radioxenon isotopes.





2) ATM and data fusion

Of 24 seismic events recorded from 1 October until 30 November 2015, 2 seismic events are recorded on 15 October 2015. ATM backward and forward simulation were performed to identify the possible source region (PSR). ATM simulations indicate the PSR covered the area of ENPEDOR as shown in Figure 3. Data fusion was performed to find the correlation between ATM results and seismic event as listed in Table 1.

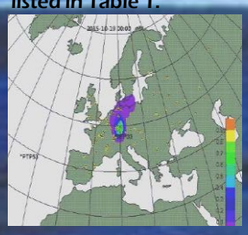


Figure 3. PSR covered the area of ENPEDOR

Table 1. Correlation between ATM results and seismic event recorded on 15 Oct 2015

Seismic Event	15 Oct 2015 03:46:37.43	15 Oct 2015 08:05:44.3
Correlation coefficient	0.91	0.95

3) Seismic Analysis

Figure 4 shows the comparison between seismic signal recorded at ENPEDOR on 15 October 2015 at 08:05:44.3 UTC with past earthquake recorded at ENPEDOR on 16 August 2015 and expected seismic signal generated from underground explosion detected at seismic station GERES. The analysis result shows the seismic event detected on 15th October 2015 at 08:05:44.3 UTC resembles an earthquake event rather than underground explosion event. However, due to low magnitude, we could not rule out the possibility that the seismic event might be triggered by underground explosion.

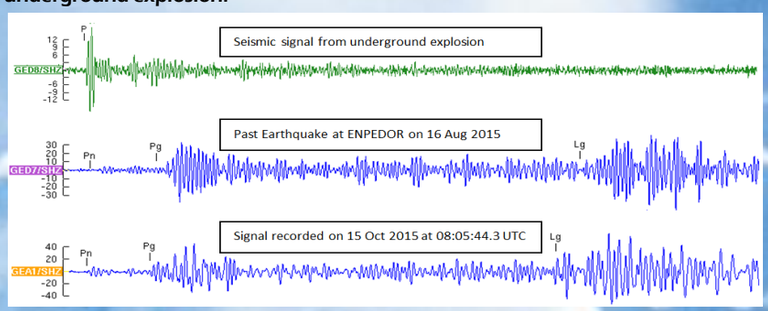


Figure 4. Comparison of seismic signals from explosion event (top), past earthquake at ENPEDOR (middle), and event recorded on 15th October at 08:05:44.3 UTC (bottom)

In addition, we use the following formula proposed by L.R. Syres et.al which draw the relationship between seismic magnitude and yield of nuclear explosion.

Mb = 4.262+0.973 logY, where, Mb: Richter seismic scale, and Y: yield of nuclear explosion (kt)

The International Seismic Centre has recorded a reading of 3.1 on the Richter scale for that seismic event. A reading of 3.1 would correspond to an explosive yield of between 0.06 and 0.07kt of TNT-equivalent.

4) Site forensic

From site forensic, the preliminary findings shows that the seismic site is located within fault zone and has a history of numerous seismic activity. There is also huge active mining activities within that area, which could involve man-made explosion activity. Several geological researches are being conducted at that area to study mining-induced seismic event.

5) NPE 2015 preliminary findings

Based on our analysis, we found that the seismic event recorded on 15 October 2015 at 08:05:44.3 UTC is the most likely origin of radionuclide release. The seismic analysis suggests that the seismic event is more likely resemble an earthquake rather than underground explosion. Due to low magnitude, we also could not rule out the association of the seismic event with underground explosion. The presence of mining activities within that seismic area which could involve the use of explosion has made the verification of the seismic event more complicated. The detection of numerous relevant radionuclide and radioxenon isotopes suggest that the event is indeed a nuclear explosion, and not related to release from nuclear reactor event.

CONCLUSION

These findings are preliminary and therefore are not conclusive. Other hypotheses have not yet been fully explored. More detailed investigation will be conducted to further verify the true nature of this suspicious event.

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