



Performance of the primary seismic array stations of the IMS network for the year 2015 Part II): An Analyst's perspective

Ezekiel Jonathan and Fekadu Kebede

Comprehensive Nuclear-Test-Ban Treaty Organisation, Vienna, Austria

Verification of the CTBT is partly dependent on the ability of the automatic system to detect and present correct attributes for all phases that are detected at the stations. This helps in building of more accurate automatic event solutions and thus reducing the work load and time for interactive analysis whilst increasing the quality of bulletins issued out to member states so that they can decide if there are any treaty violations.

During interactive analysis automatic event solutions are refined and/or re-estimated by checking the correctness of the associated phase identity, phase arrival time, azimuth and slowness using raw waveform data. This refinement procedure leads analysts to rename, associate, disassociate and manually add seismic arrivals. The final event solution is accepted or rejected based on the existing rules, guidelines and procedures. In addition, new event solutions are built using unassociated signal detections and the raw waveform data during scanning.

In this study differences between seismic phases associated to automatically produced SEL3 bulletin and the Late Event Bulletin (LEB) obtained through interactive analysis are investigated using data from all primary seismic array stations of the International Monitoring System (IMS) network during the year 2015. The performance of the network is evaluated from an analyst's perspective by looking at the number of phases that are renamed, manually added, associated, and disassociated by analysts during interactive analysis. The observed differences do shed some light on analysts workload as well as the performance of the primary seismic array of the IMS network.

For example, the results indicate that for the Waramunga array station in Australia (WRA) out of a total of 41175 detections associated to saved events in 2015, 13305 (32.3%) of them were renamed during interactive analysis and 7667 were automatic detections that were associated to events by analysts. 1174 detections were manually added by analysts and 684 of these had signal-to-noise ratios greater than or equal to 5. Out of a total of 22279 detections of WRA in SEL3 2480 were disassociated from the events during interactive analysis.

The study shows that there is still room for improvements; (1) to reduce the number of manually added arrivals, (2) to ensure that phases are named properly, (3) to monitor the quality of the data from stations such that it does not negatively impact automatic processing. Improvements in these areas have the potential to reduce the number of events missed by the automatic system. This contributes to the quality of the data products disseminated to states parties, thus enhancing the CTBTO's ability to fulfil its important mandate.