



Reference events used for developing and testing criteria in the global association of infrasound data at the International Data Centre

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The International Data Centre (IDC) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) Preparatory Commission in Vienna, Austria receives and processes in near real time the data from 39 of the 60 planned infrasound stations from the International Monitoring System (IMS). Specialized software has been developed to detect infrasound signals, highlight the most significant detections as phases (as opposed to Noise), and subsequently group these phases to form events.

Every day, a few tens of events which include infrasound detections are produced automatically in the development area at the IDC. Unfortunately the IDC presently has limited resources which do not permit a daily analytical review of infrasound data for their systematic contribution to operational event bulletins. Therefore, efforts have mostly been focused on the offline review of specific infrasound signals from known sources in order to better understand their characteristics, and to make sure that they could be automatically detected by the largest possible number of IMS stations and be associated to form events with the best location estimate.

The production of a good quality automatic event bulletin requires a correct association of signal detections and accurate location of the largest number of genuine sources, while keeping the rate of false alarms as low as possible. The association of infrasound arrivals is done with a grid search of hypothetical seed events which would best match time and azimuth criteria. The number of candidate infrasound events grows exponentially with the number of operating IMS infrasound stations.

Additional criteria need to be found and implemented into the association process in order to keep the lowest possible number of false associations. The frequency-distance attenuation is one of these criteria which has been introduced at the IDC to limit the number of false alarms.

The IDC Infrasound Reference Event Database (IRED) contains a large collection of identified events for which infrasound signals have been detected and reviewed on IMS stations. The IRED is in constant evolution as it is regularly updated with new reference events corresponding to various types of infrasound sources, in particular atmospheric or surface explosions, meteors, rocket launches and re-entries, large earthquakes, and volcanic eruptions. The IRED is being used as a benchmark for tuning the automatic system, in particular to determine/refine the empirical frequency-distance attenuation law, and to help discover and confirm additional criteria which would enhance the global association of infrasound data at the IDC.