

INFRASOUND SIGNAL LIBRARY

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ABSTRACT

The International Monitoring System (IMS) proposed for verifying compliance with the Comprehensive Nuclear-Test-Ban Treaty will include an infrasound network for detecting and identifying explosions in the atmosphere. As is the case with seismic monitoring, data collected from historic events of interest are vital for improving infrasonic monitoring capabilities. Unfortunately, however, infrasonic recordings of such events are rare and thus any additional data sets that might be available should be pursued. Towards that end, we will digitize, as a result of the ROA01-38 award, paper records and extract from 9-track tapes several unique data sets from Sandia National Laboratories and Los Alamos National Laboratory that have not been available to the monitoring community. These data sets include recordings of surface and atmospheric explosions representing different yields, altitudes and weather conditions, as well as bolides and other natural phenomena that may be detected by the international infrasound monitoring network. Once the data are all in digital form, we will convert them to the standard CSS format, including event and station information. The complete set of database tables and binary waveform files will be the ultimate product of our work.

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OBJECTIVES

Our objectives are to generate digital versions of relevant waveform data from older infrasound monitoring activities and distribute them to researchers and analysts, and to demonstrate a reasonably efficient digitizing system useful for retrieving additional data of similar type. In this joint Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL) effort, we will make available in a common digital format four valuable sets of infrasound event recordings (including explosions and other types of events) which have hitherto been largely unavailable to explosion monitoring researchers. This collection of data can be exploited to address a number of issues for infrasonic monitoring by the IMS. Information on yield scaling, source functions, regional-distance propagation and variability due to weather could all be derived from such a collection.

RESEARCH ACCOMPLISHED

At the time of preparation of this paper for submission to the SRR Proceedings, neither Sandia nor Los Alamos had received any funds for this work. This proposal was accepted in the FY 2002 phase of the ROA01 process. The funding had been transferred to DOE in Albuquerque and was making its way to each lab. Thus we have not yet begun working on this project, and will report here on what we are planning to do. Candidate records for digitizing include those from atmospheric, surface and shallow underground nuclear tests at the Nevada Test Site, along with earthquakes, conventional ammonium nitrate and fuel oil explosions and bolide signals measured by the older operational infrasound network.

During atmospheric testing, Sandia personnel made numerous microbarograph recordings of the acoustic signals from nuclear tests at several stations surrounding the Nevada Test Site at approximately first bounce distances (Reed, 1969). These data exist only as paper strip-chart records and would make up the bulk of the Sandia contribution to the digital library. Other Sandia records include some acoustic data from underground tests (UGTs) and Plowshare events. These latter two sets were also taken with Sandia microbarographs. Sandia has tested a software package for digitizing these paper traces. This software comes from the well logging community and has the potential to handle most of the data in an efficient and accurate manner.

Los Alamos has been operating infrasound arrays in the southwest since 1983 on a continual basis. Acoustic signal data have been collected from UGTs, earthquakes and conventional explosion tests at White Sands Missile Range. Regrettably, most of the original digital data from the Los Alamos arrays were lost. Some tapes exist, and the first part of the Los Alamos work will be to search the tapes for events and send them to Sandia for reading. The second part would be to find paper records of selected events for digitizing with the Sandia software. Los Alamos has numerous paper records of atmospheric tests and bolides, recorded at various infrasound stations around the world from the 1950's to the 1970's.

CONCLUSIONS AND RECOMMENDATIONS

Based on our preliminary examinations of the early infrasound data available in the Sandia and Los Alamos archives, we believe the recordings are of good quality and offer a valuable resource to infrasound researchers. Under this project we will digitize a representative sample of the records, spanning a range of source sizes and altitudes. We will then distribute the resulting data sets within the monitoring community either on CDs or via the Web.

REFERENCE

Reed, J. W., 1969, Climatology of Airblast Propagations from Nevada Test Site Nuclear Airbursts, Sandia Laboratories Report SC-RR-69-572.