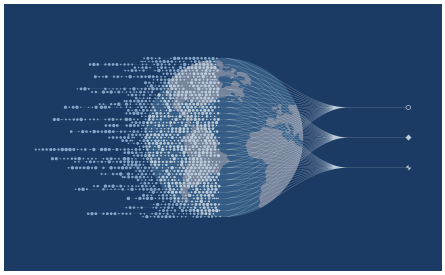

ID: **P2.1-258** Type: **E-poster**

Characterizing near-source physical parameters of buried explosion sources using deep learning

Thursday 11 September 2025 09:00 (1 hour)

Characterizing seismic sources is critical to accurately constraining important seismic source features of interest. Many factors affect seismic far-field waveforms (FFWFs) used for source characterization, including physical characteristics near the source, such as emplacement or ground material properties. How near-source characteristics and the methods with which we estimate source features affect FFWFs, however, is poorly understood, especially when considering near-source, nonlinear effects. We present our progress in developing deep learning methods to characterize near-source characteristics, including emplacement, ground material, yield strength, and fracture pressure. We outline our workflow for training data generation, where we use a nonlinear shock physics code coupled to a linear wave propagation code to simulate buried chemical explosions and the FFWFs they generate at the local scale (<~700 m distance). We vary numerous factors, including source depth, chemical explosion size, and receiver locations, in addition to the physical near-source characteristics we aim to characterize. We demonstrate success in our preliminary development of deep learning models for near-source characterization of emplacement, ground material, yield strength, and fracture pressure, and we discuss potential areas for improvement.
SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

E-mail

jlhardi@sandia.gov

In-person or online preference

Primary author: HARDING, Jennifer (Sandia National Laboratories (SNL))

Co-authors: PRESTON, Leiph (Sandia National Laboratories (SNL)); ELIASSI, Mehdi (Sandia National Laboratories (SNL)); GAUVAIN, Scott (Sandia National Laboratories (SNL))

Presenter: HARDING, Jennifer (Sandia National Laboratories (SNL))

Session Classification: P2.1 Characterization of Treaty-Relevant Events

Track Classification: Theme 2. Monitoring events and Nuclear Test Sites: T2.1 Characterization of Treaty-Relevant Events