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-Guided Neural Networks for Emplacement Classification and Events Discrimination, including the Explosion Yield and Depth Estimation - Applications

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This study uses 48 000 synthetically generated time-domain source functions (TDSF) to illustrate the performance of newly developed physics-guided neural network algorithms for classification of the emplacement conditions in materials where the explosions are detonated. TDSFs were constructed at the elastic radii of many explosions for material properties representing the granite, shale, tuff-rhyolite, wet granite and wet tuff emplacement conditions at the source. For each material type, we allowed yield (W) to vary between 10 tonnes to 2 Kts and depth of burial (DOB) to vary between 100 m and 900 m, respectively. The effect of the one dimensional wave-propagation path models including the attenuation by convolving TDSFs with synthetic path seismograms for stations located at 100 km to 1200 km was further investigated. Different levels of real-time broadband noise and source complexity comprising of both isotropic and non-isotropic sources were added, and compared the performance of the algorithm in the material classification and estimation of W and DOB to the neural network algorithm without governing laws and regularization of the physics-guided method. Results will be presented showing the performance for the event classification applying the algorithm individually to the Pg, Pn, Sn, Lg amplitudes, including the Pg/Lg and Pn/Sn amplitude ratios.

Promotional text

PGNN Algorithms , TDSF, F-K Seismograms, Emplacement Classification, Discrimination, Yield and Depth of Burial, Explosions

Oral preference format

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