SnT2023 Comparative Study of the Performance of Seismic Waveform Denoising Methods In the second second and Online 19 To 23 JUNE Comparative Study of the Performance of Seismic Waveform Denoising Methods Rigobert Tibi, Christopher Young, and Robert Porritt Sandia National Laboratories P3,5-196

- We implemented and applied 3 classes of noise suppression methods. The denoising methods, consists of approaches based on:
 - Nonlinear thresholding of continuous wavelet transforms (CWTs),
 - o Convolutional neural network (CNN) denoising, and
 - Frequency filtering.
- The approaches were all subjected to the same analyses and level of scrutiny.
- We found that in terms of degree of fidelity for the denoised waveforms with respect to the ground truth seismograms, CNN denoising outperforms both CWT denoising and frequency filtering.
- If the purpose of the analysis is to exploit the amplitude information of the seismograms for magnitude, yield, or moment tensor estimation, among the methods evaluated, CNN denoising would be the most suitable approach.



Acknowledgments: Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525. The views expressed here do not necessarily reflect the views of the United States Government, the United States Department of Energy. This Ground-based Nuclear Detonation Detection (GNDD) research was funded by the National Nuclear Security Administration, Defense Nuclear Nonproliferation Research and Development (NNSA DNN R&D).



