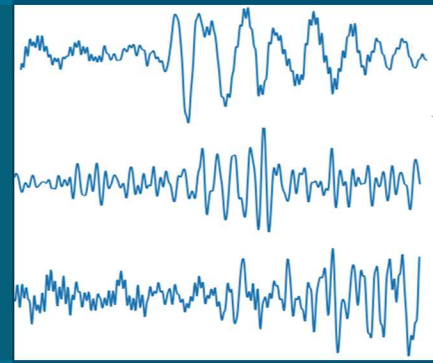
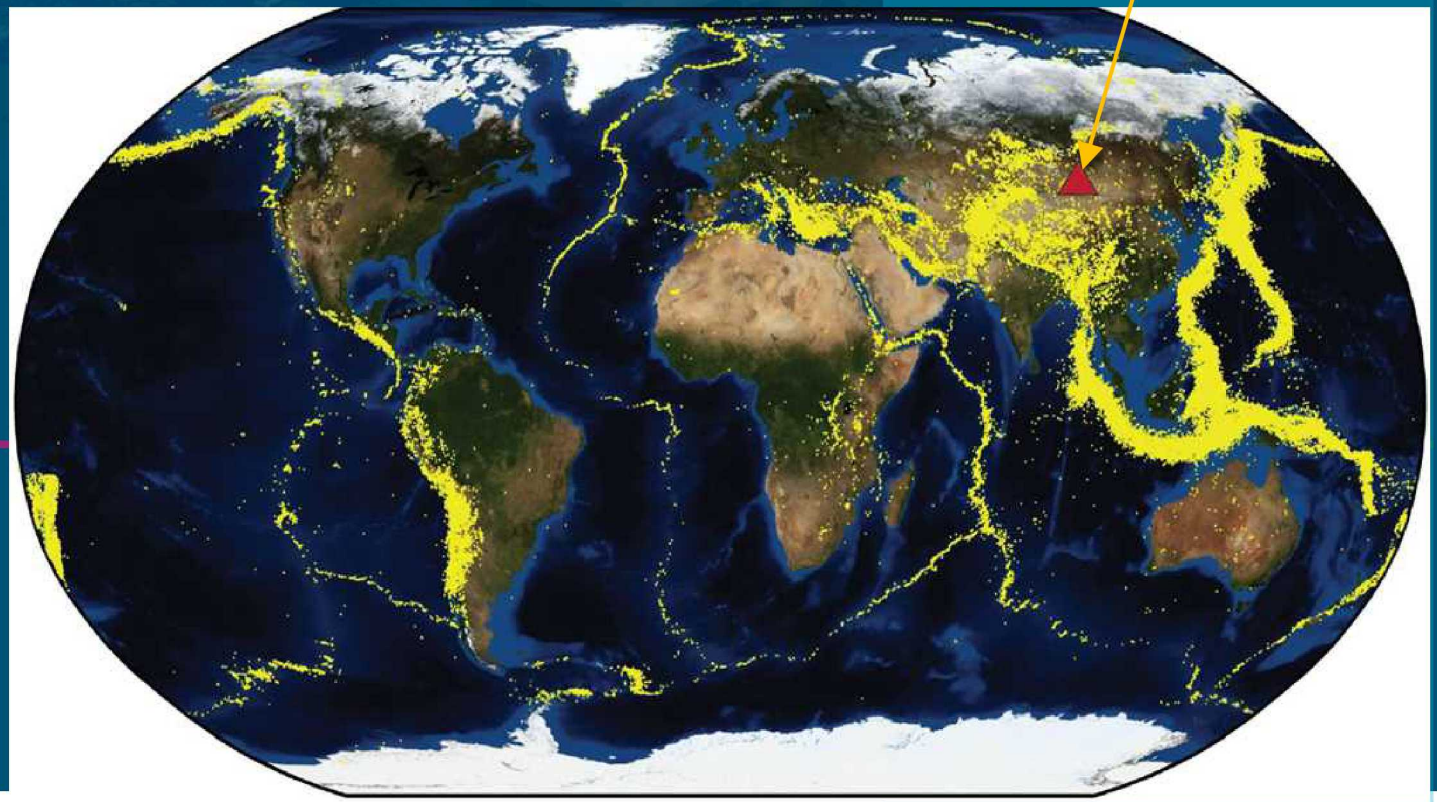
SAND2018-13557C

Seismic Phase Identification with a Merged Deep Neural Net



Makanchi Seismic Array in Kazakhstan (MKAR)



PRESENTED BY

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Data

Data from MKAR

- Beam-formed
- Multi-channel filtered
- Custom class sampling

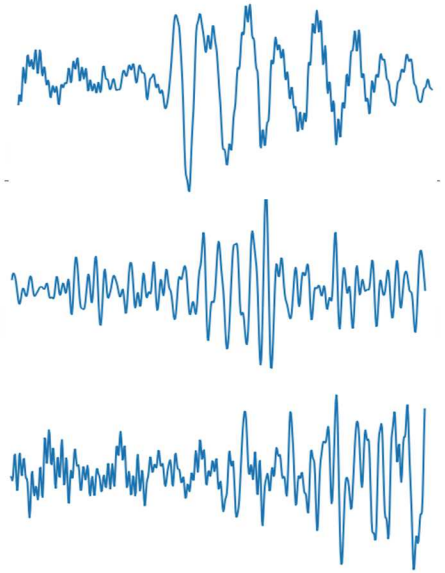
Origin ID	Phase List
15148126	P
15148127	P
15148128	P
15148166	PKP
15148216	P,pP,ScP
15148226	P
15148268	Pn
15148273	P,S,PKKPbc
15148278	PKP,SKPbc
15148281	Pn,Sn,Lg
15148323	P,PcP
15148325	P
15148366	P
15149933	Pn
15149965	P
15149971	Pn,Sn,Lg
15150034	P
15150038	P
15150039	P,PcP
15150043	P
15150070	P,PcP,ScP
15150076	PKP

Processing

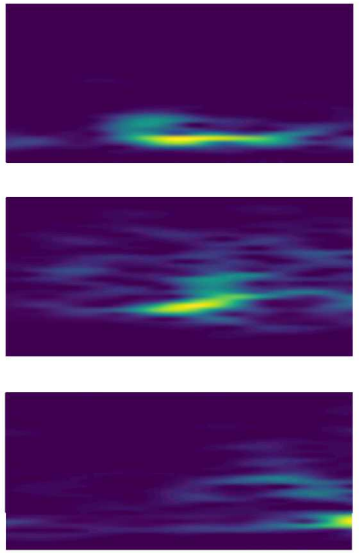
5 Filter Bands

0.5 Hz - 1.5 Hz
1.0 Hz - 2.0 Hz
1.5 Hz - 3.0 Hz
2.0 Hz - 4.0 Hz
4.0 Hz - 8.0 Hz

Seismograms

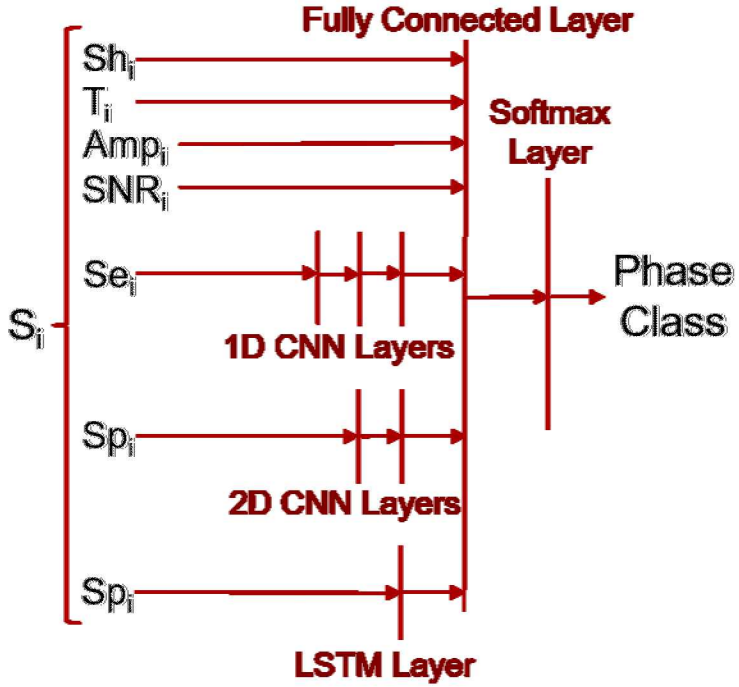


Spectrograms



Classifier

- Merged Deep Neural Net (DNN)
  - Seismogram
  - Spectrogram
  - Slowness
  - Amplitude
  - SNR
  - Time since previous phase



Impactful Phase ID Results

Merged Network

- Accuracy on held-out Test Set
  - 97.0% Overall
  - 95.6% Class Average

Network Predictions

Ground Truth	Not First-P	First-P	Accuracy
Not First-P	440	27	94.2%
First-P	29	1393	98.0%

Simple Slowness (sh) Test

First-P: sh ≤ 15

- Accuracy on held-out Test Set
  - 83.7% Overall
  - 58.1% Class Average

Network Predictions

Ground Truth	Not First-P	First-P	Accuracy
Not First-P	189	278	40.5%
First-P	30	1392	97.9%

Automated Phase ID (iphase)

- Accuracy on held-out Test Set
  - 65.7% Overall
  - 51.9% Class Average

Network Predictions

Ground Truth	Not First-P	First-P	Accuracy
Not First-P	114	353	24.4%
First-P	294	1128	79.3%