

Data Mining in the Pacific Northwest

Marine Denolle

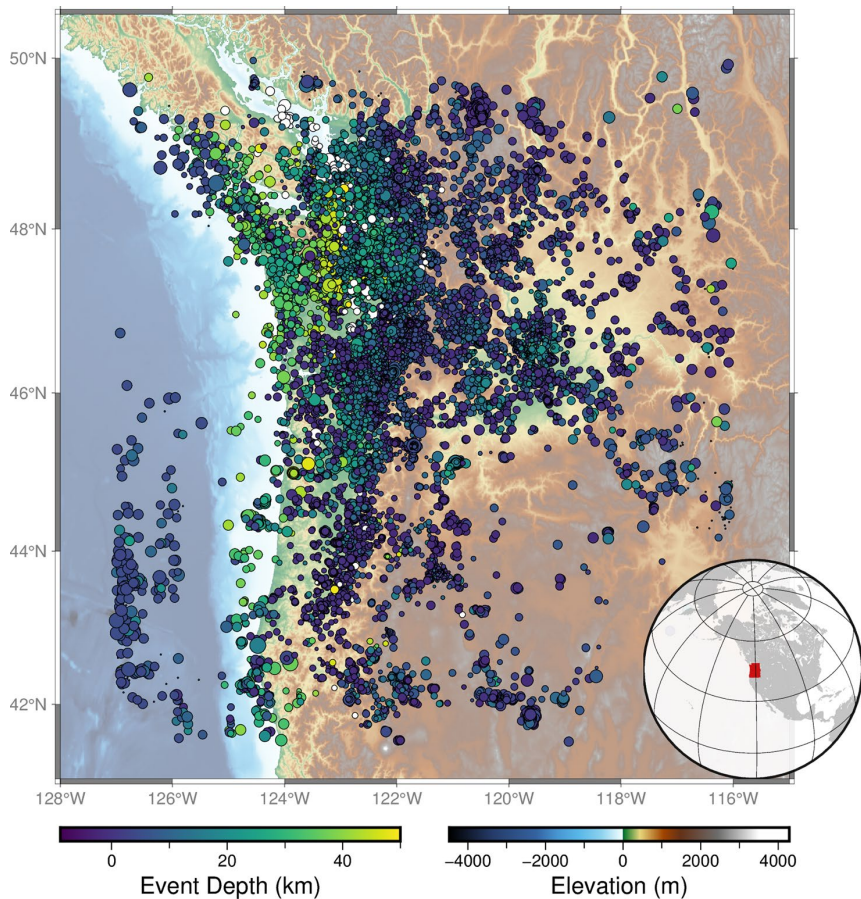
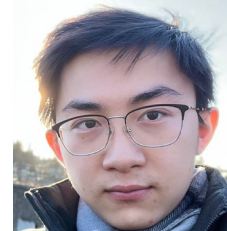
Undergraduate: Francesca Skene & Nick Smoczyk

Graduate: Yiyu Ni, Congcong Yuan, Akash Kharita, Manuela Koepfli

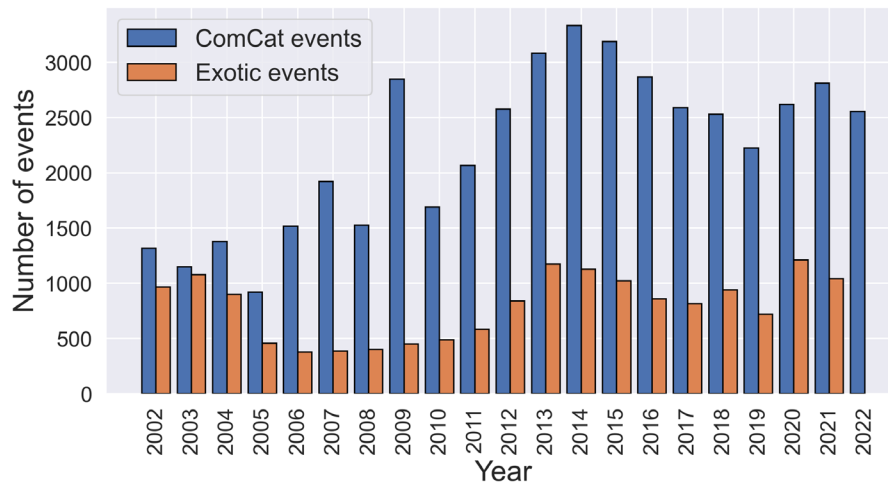
PNSN colleagues: Alex Hutko, Renate Hartog, Amy Wright, Steve Malone

Data Curation: PNW AI-ready dataset

(Yiyu Ni, grad)

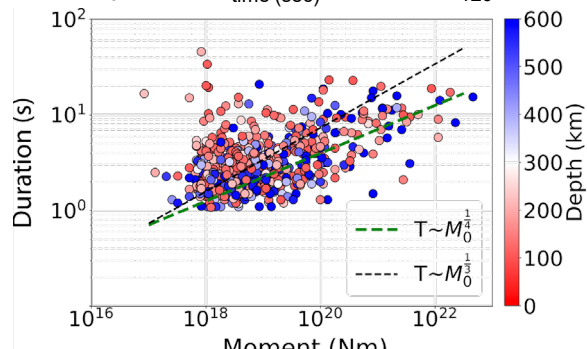
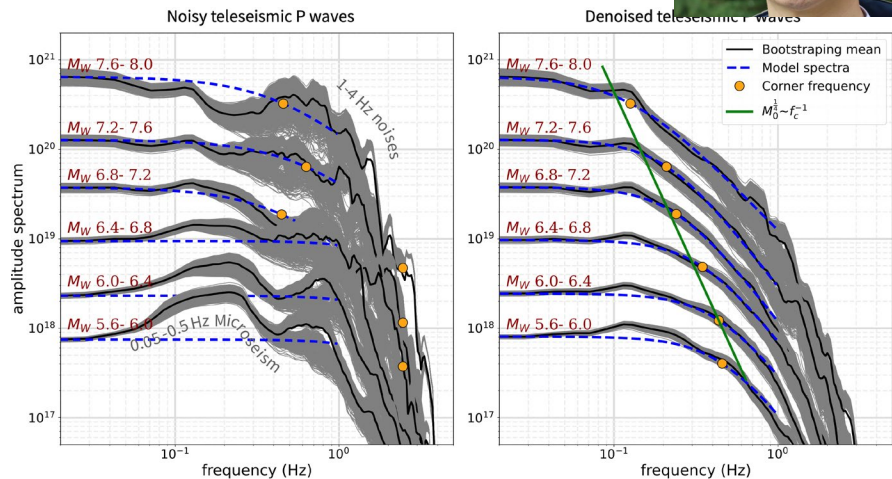
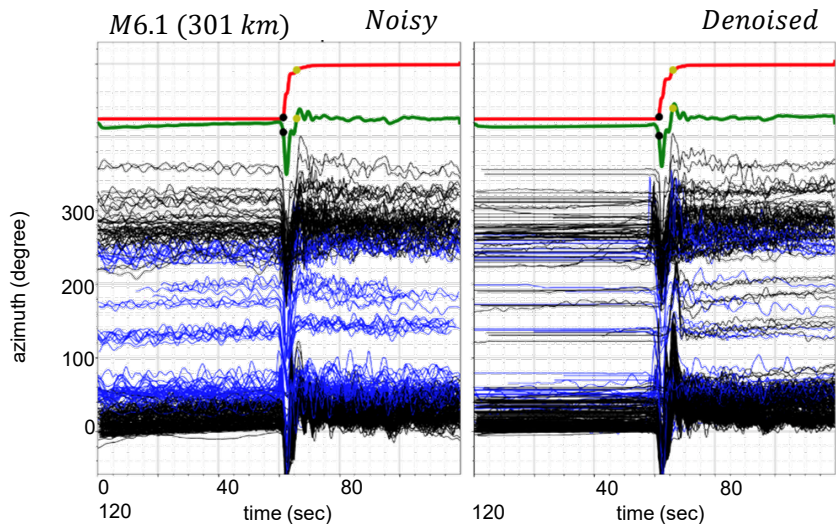
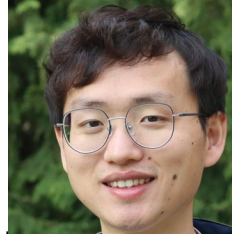


- 44k events reported by PNSN
- 178k three-component waveforms, P- and S-wave picks
- 150 sec time window (50 sec before, 100 sec after origin time)



Denoising subduction zone deep earthquakes

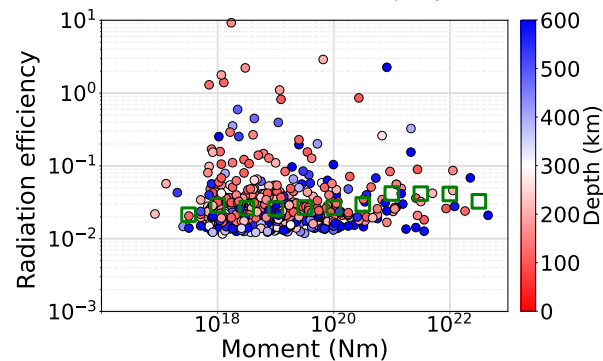
(Qibin Shi, postdoc)



$$T \sim M^{1/4}$$

No unilateral directivity

Low radiation efficiency



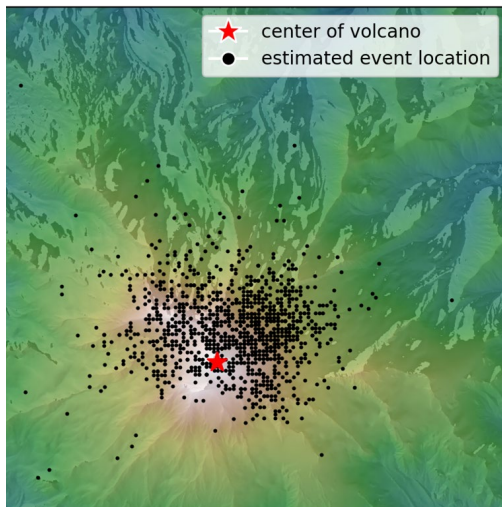
Characterizing Surface Mass Movements

(Francesca Skene, undergrad)

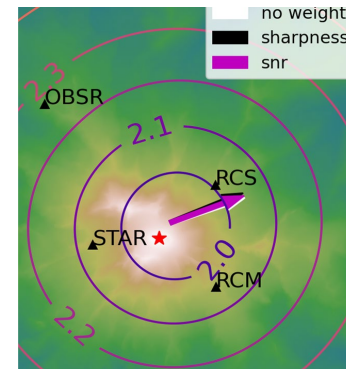
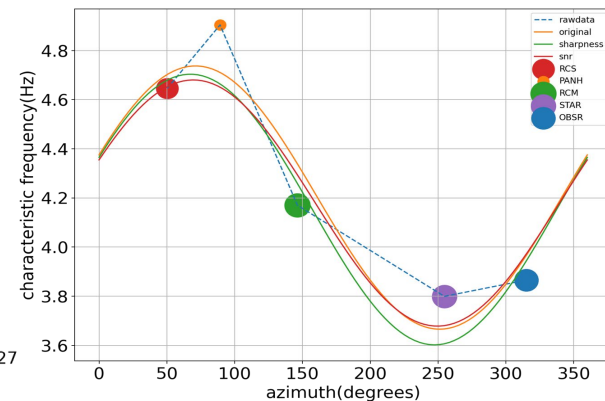
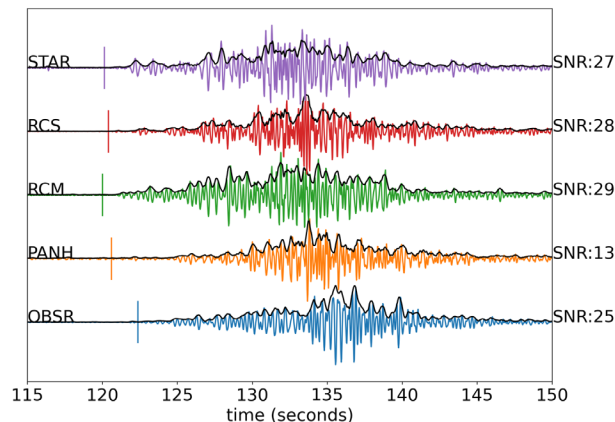


We use the “Surface event” labels from PNSN to locate them and find flow directivity from **Doppler effects**

Event Locations at Mt Rainier



evtID:UW1262743Mt_Rainier



Comprehensive



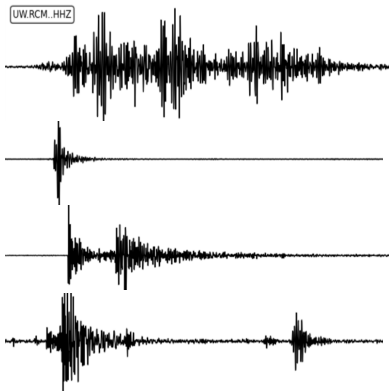
Catalog - V2.0

Aka. Alicia Hotovec-Ellis' catalog

(Nick Smoczyk, undergrad, Congcong Yuan, grad@Harvard)



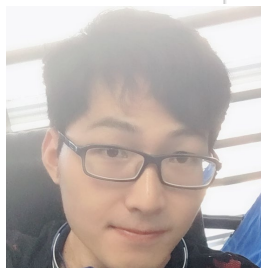
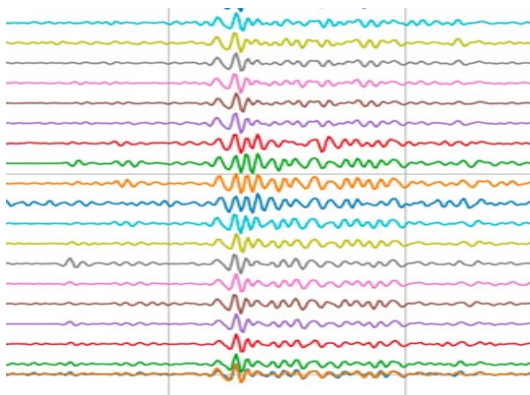
Diverse



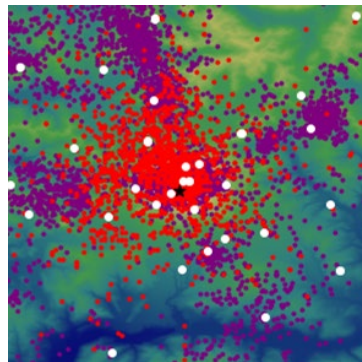
CC-based hierarchical clustering (not great)

specufex (in test)

Repeat



Locate



- ML-based phase picking
- NonLinLoc travel-time location

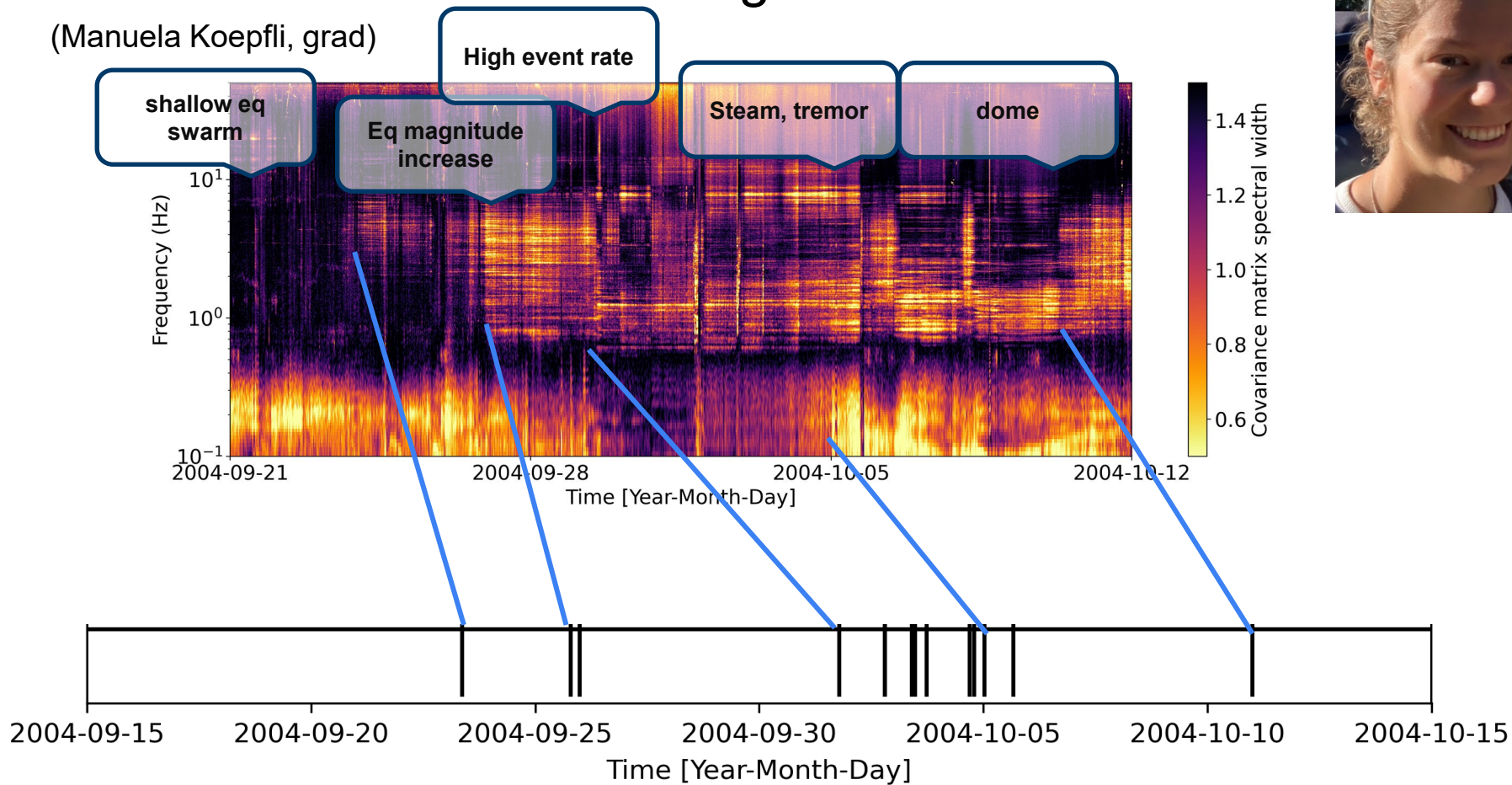
Match

- 30k templates
- 147 stations
- 5 volcanoes
- 20 years
- 400k day-long waveforms.
- **>184 billion** cross-correlations



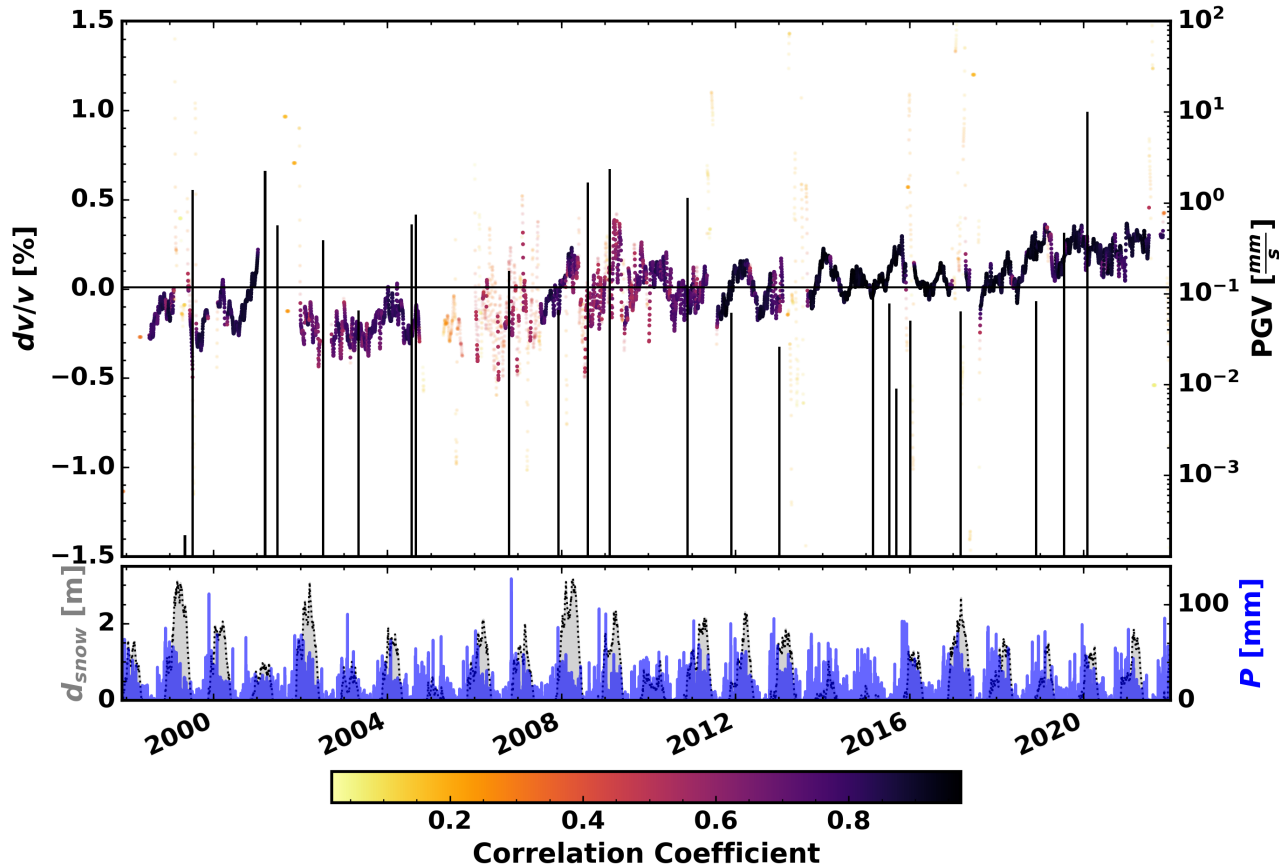
Ambient Seismic Field Investigations of Volcanoes

(Manuela Koepfli, grad)



Ambient Seismic Field Investigations of Volcanoes

(Peter Makus, grad @ GFZ)



Software and Data are Open Source



github.com/niiyu/PNW-ML

github.com/Denolle-Lab/expand_redpy

github.com/Denolle-Lab/surface_events

github.com/Denolle-Lab/Mt-St-Helens

github.com/qibinshi/TeleseismicDenoiser



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