# Manual Phase Picking

- Large earthquakes are complete in the public catalogs, while may be missed by matched filter because of poor waveform coherence (e.g. Shelly 2019)
- The S arrivals of a large earthquake can be hard to pick, due to the contamination of P tails
- Thus, it may require manual phase picking to complement the microseismic catalog, and to test the location uncertainty with different combination of phase picks.

# Manual Phase Picking

- Input
  - fctlg: catalog file, just rough location would be enough
  - fsta: station file for predicting P & S arrival times
  - data_dir: directory of continuous waveform

- Output
  - fpha_hyp: manually picked and located phase file

| **Input** | **Operation** | **Output** | ***Notes*** |
|---|---|---|---|
| fctlg & fsta | *ctlg2pha.py* | fpha_org | predicted phase arrival |
| fpha_org | *cut_events.py* | events/[event_name]<br>/[net.sta.chn] | |
| | SAC *ppk*<br>P/S/N in t0/1/2/3 | | only use *wh* |
| events<br>& fpha_org | *head2pha.py* | fpha_man | only phase lines change |
| fpha_man | *cut_events.py* | events/[event_name]<br>/[net.sta.chn] | may repeat the manual picking process |
| fpha_man | event location | fpha_hyp | use Hypo-Interface-Py |

# References


- Douglas, A., Bowers, D., & Young, J. B. (1997). On the onset of P seismograms. *Geophysical Journal International*, *129*(3), 681-690. https://doi.org/10.1111/j.1365-246X.1997.tb04503.x
- Diehl, T., Kissling, E., Bormann, P. (2012): Tutorial for consistent phase picking at local to regional distances. - In: Bormann, P. (Ed.), New Manual of Seismological Observatory Practice 2 (NMSOP-2), Potsdam : Deutsches GeoForschungsZentrum GFZ, 1-21. https://doi.org/10.2312/GFZ.NMSOP-2_IS_11.4
- Lomax, A. (2020). Absolute location of 2019 Ridgecrest seismicity reveals a shallow M w 7.1 hypocenter, migrating and pulsing M w 7.1 foreshocks, and duplex M w 6.4 ruptures. *Bulletin of the Seismological Society of America*, *110*(4), 1845-1858. https://doi.org/10.1785/0120200006