Documentation and digital files in support of:

"Aftershock regions of Aleutian–Alaska megathrust earthquakes, 1938–2021"

PART A[1]: Relocated catalog of 553 Aleutian–Alaska events using NonLinLoc

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Version 2.0: June 18, 2022

Attribution: If you use these digital files, please cite *Tape and Lomax* (2022) and NonLinLoc (*Lomax et al.*, 2000, 2014). This digital collection can be referenced as *Lomax* (2022).

Overview

This collection provides the output files for the probabilistic relocations of 553 events along the Aleutian–Alaska subduction zone. See *Tape and Lomax* (2022) for details.

Description of files

- `TL2022_ZA_NonLinLoc.pdf` (this file)

- `20220113_ak135_ISC_PS_depthPhases__loc_corr1.zip`. Complete set of NonLinLoc output files for all 553 events, including arrival time data and probabilistic hypocenter solutions. See README file below.

- `nll_clouds.zip`. NonLinLoc probability density function locations ("clouds") for all 553 events.

- `nll_clouds_composite.zip`. 12 sets of clouds for the mainshocks and their aftershocks. Altogether, there are 324 clouds within the 12 files, corresponding to the events that are interpreted to have occurred on the megathrust.

References

Lomax, A., Documentation and digital files in support of "Aftershock regions of Aleutian–Alaska megathrust earthquakes, 1938–2021" by Carl Tape and Anthony Lomax: Part A, Version 2.0 [Data set]. Zenodo `https://doi.org/10.5281/zenodo.6330285`, 2022.

Lomax, A., J. Virieux, P. Volant, and C. Berge, Probabilistic earthquake location in 3D and layered models: Introduction of a Metropolis-Gibbs method and comparison with linear locations, in *Advances in Seismic Event Location*, edited by C. H. Thurber and N. Rabinowitz, pp. 101–134, Kluwer, Amsterdam, 2000.

Lomax, A., A. Michelini, and A. Curtis, Earthquake location, direct, global-search methods, in *Encyclopedia of Complexity and System Science*, edited by R. A. Meyers, 2 ed., pp. 1–33, Springer, New York, doi:`10.1007/978-3-642-27737-5_150-2`, 2014.

Tape, C., Documentation and digital files in support of "Aftershock regions of Aleutian–Alaska megathrust earthquakes, 1938–2021" by Carl Tape and Anthony Lomax: Parts B, C, and D, Version 1.0 [Data set]. Zenodo `https://doi.org/10.5281/zenodo.6274313`, 2022.

Tape, C., and A. Lomax, Aftershock regions of Aleutian–Alaska megathrust earthquakes, 1938–2021, *J. Geophys. Res. Solid Earth*, doi:10.1029/2022JB024336, 2022.

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[1]Parts B, C, and D are published together in a separate Zenodo collection: *Tape* (2022)

README.txt[2]

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README.txt
NonLinLoc (NLL) output files for probabilistic earthquake relocation results of
Tape and Lomax (2002) for 553 events in the Aleutian-Alaska subduction zone
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May 2022


Within this directory are:

Alaska_historical_2018_PS.in
    input file with NLL control statements determining the configuration and parameters
    for NLL relocation

Alaska_LOCSRCE_regional.in
International_Registry_of_Seismograph_Stations_20160926_woARRAY_VICcorr_NLL.txt
    station coordinates files included in Alaska_historical_2018_PS.in

Alaska_historical_2019.sum.grid0.loc.stat_totcorr
    station static corrections (mean of selected obs-calc residuals from initial run
    of NLL relocations) used for second, final run of definitive locations "loc_corr1"
    presented here and in the paper, these corrections are subtracted from the observed
    P and S times

In the sub-directory 20220506_ak135_ISC_PS_depthPhases__loc_corr1/ are:

Alaska_historical_2019.sum.grid0.loc.hyp
    summary NLL location results output file in "NLLoc Hypocenter-Phase file" format,
    without station/phase arrival time residuals.

Alaska_historical_2019.sum.grid0.loc.hdr
    summary NLL location results header file describing the location search volume
    and geographic transform

For each of the 553 events, there are four different files, e.g. for event
19381110.202118_902774:

Alaska_historical_2019.19381110.202118_902774.grid0.loc.hdr
    header/metadata file describing the NLL location search volume,
    in NLL "3D Grid Header file" format.

Alaska_historical_2019.19381110.202118_902774.grid0.loc.hyp
    main NLL location results output file, including arrival time residuals for
    each station/phase, in "NLLoc Hypocenter-Phase file" format.

Alaska_historical_2019.19381110.202118_902774.grid0.loc.scat
    binary file of samples of the posterior density function (aka the "cloud" of points),
    in NLL "Scatter file" format.

Alaska_historical_2019.19381110.202118_902774.grid0.loc.scat.asc
```

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[2]This file can be found within the set of files in the archive: 20220506_ak135_ISC_PS_depthPhases__loc_corr1.zip

ascii version of samples of the posterior density function (aka the "cloud" of points).

In the sub-directory TauP/ are files needed to generate the https://www.seis.sc.edu/taup/ travel-time grids used by NLLoc:

    ak135.tvel
        ak135 model specification

    TauP_Table_NLL.sh
shell script used to generate travel-time grids files used for NLLoc location

    plot_time.gmt4.sh
        shell script for plotting travel-time grids

NOTES:
+ The maximum likelihood hypocenters are aggregated into a single text file that is
  published as a supplemental file in Tape and Lomax (2022).
+ Details regarding the content and format of the NLL files can be found within the
  NLL documentation at http://alomax.net/nlloc and https://github.com/alomax/NonLinLoc