LinSlipInv

## General input files

List of the general input files:

|  |  |  |
| --- | --- | --- |
| Name | Needed by | Purpose |
| *input.dat* | DWN  Inversion codes  Graphical codes | Information about the source (moment, mechanism, fault dimensions), discretization in time and space, filtering frequencies, time windows, etc. |
| *SlipInvSVD.in* | Inversion codes | Information regarding the slip inversion (synthetic vs. real data, truncation, smoothing, etc.) |
| *crustal.dat* | DWN  Inversion codes | Information about the crustal model (1D homogeneous layers). |
| *stations.dat* | DWN  Inversion codes | List of station coordinates. Can be created by conversion from lat, lon using stations.f90. |
| *stainfo.in* | Inversion codes  Plot of seismogr. | Specifies which stations/components are to be used in the inversion, individual station component weights and station names. |
| *rvseis[nez].dat* | Inversion codes | N, E, Z components of seismograms to be inverted if real-data inversion is chosen. |

In the following the individual input files are described in detail:

input.dat

This input file is almost self-explanatory:

No. of computed frequencies (should be larger than half of the temporal discretization)

130

Length of seismograms, slip rate time window, start and end time for waveform comparison (sec)

102.4 10. 30. 70.

Artificial time shift (sec), number of segments

30. 1

Number of receivers (waveforms, static GPS)

56 0

Spatial discretization along strike and dip for each segment

35 20

Scalar seismic moment (Nm)

1.06d19

Strike Dip Rake (degrees) for each segment

90. 80. 180.

Depth of fault reference point (m) for each segment

10.

Length and width of the fault (m) for each segment

35000. 20000.

Position of reference point on the fault (m) for each segment

17500. 20000.

Number of samples in the time domain

256

Rupture velocity (m/s) - used only if generating synthetic forward model

3000

Number of filter ranges, followed by corner frequencies

1

0.05 .5

SlipInvSVD.in

Data (1 = synthetic data, 0 = read from files, -1 = custom target model from a file)

1

10 5

Std.dev for slip rate (0 = no smoothing), Std.dev for GF's, GPS weight, M0 constraint weight, Weight of additional constraint, Smoothing aspect ratio

1.d0 0.01 .1d0 1.d0 0.d0 1.d0

Station component weights (1=no distance distance-dependent weights, 2=distance-dependent approximated CD)

1

Choice of use of eigenvectors (see further)

1

1: single minimum singular value, 2: defined min and max number of eigenvectors to be considered

100.

Additional temporal shift (in sec)

0.

Compact SVD (0=NO, 1=YES - then it is not possible to use ANNLS)

1

Explanations:

|  |  |  |
| --- | --- | --- |
| Data | Option number |  |
|  | 0 | data are read from files rvsei[nez].dat |
|  | 1 | synthetic data are created assuming a point source on fault plane location specified at the same input line (0 0 for Haskell-like model) |
|  | -1 | Target model is read from file specified on the next line |
| Weights | Five values in a row |  |
|  | 1st | Std. dev for slip velocity (typically 1., 0. = no smoothing), |
|  | 2nd | Std. dev for GF's |
|  | 3rd | General weight of GPS |
|  | 4th | Weight of M0 constraint (typically 1, 0. = not applied) |
|  | 5th | Weight of additional slip constraint (0. = not applied) |
|  | 6th | Aspect ratio of the smoothing constraint (1.d0 for isotropic smoothing) |
| Station component weights | Option number | Note: weights are modified according to stainfo.dat |
|  | 1 | No distance dependent weights |
|  | 2 | Uses approximated data covariance (ACOV) calculated from the data vector following Halló and Gallovič (submitted to GJI), still in testing mode |
| Use of eigenvectors | Option number |  |
|  | 1 | Defined single cut-off singular value (by means of fraction of the largest singular value) |
|  | 2 | Defined min and max number of eigenvectors to be taken into account |
| Eigenvector specifications | Value(s) | Specify values according to the option above |
| Additional temporal shift | Value | Specify additional data shift (in sec) |
| Compact SVD | Option number |  |
|  | 0 | Do not use compact SVD (waste of memory if Augmented NNLS is not used) |
|  | 1 | Use compact SVD (Augmented NNLS cannot be applied) |

crustal.dat

Another self-explanatory input file:

Crustal model (free format)

number of layers

2

Parameters of the layers

depth of layer top(km) Vp(km/s) Vs(km/s) Rho(g/cm\*\*3) Qp Qs

0.00 4.00 2.000 2.600 9000. 9000.

1.00 6.00 3.464 2.700 9000. 9000.

The first layer has to be always 0.00 (free surface). The model finishes below the last interface by a homogeneous half-space.

stations.dat

An example of this input file:

13.9579 8.4784 0. STA1

9.1667 7.6681 0. STA2

The columns are:

#1: X distance from the reference point to the north (in km)

#2: Y distance from the reference point to the east (in km)

#3: Depth of the station (in km)

#4: Optional station name

stainfo.dat

An example of this input file:

1 1 1 1. 1. 1. 1 I01

1 1 1 1. 1. 1. 1 I02

The columns are:

#1-3: For N, E, Z components either 1 or 0 to select whether the station component is or is not used in the inversion, respectively

#4-6: Weights of N, E, Z components

#7: Refers to the number of the filter range specified in file input.dat.

#8: Station name (used just for seismogram plotting)

rvseis[nez].dat

Three files consisting of displacement seismograms sampled, time shifted and filtered according to the specification in *input.dat*. The file format is as follows: the first column corresponds to time and the other columns give amplitudes for all the stations. Note that the filtering must be exactly the same as the filtering of GFs utilized in the inversion code (see *CreateGandD.f90*).

## Main output files

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Created by | Input for | Purpose |
| *NEZsor.dat* | DWN | Inversion codes | Contains all Green’s functions. |
| *mtilde.dat* | Inversion codes | Graphical codes | Result of the inversions: slip rate samples along time and space in a single column. The order of the samples is as follows:  do k=1,NW !Samples along dip  do j=1,NL !Samples along strike  do i=1,NT !Time samples  May consists of several columns if applicable. |
| *mtildeslip2D.dat* | Inversion codes | Graphical codes | Inverted model in terms of static slip distribution in a matrix format. |
| *srcmod.dat* | Inversion codes |  | Result of the inversions in the srcmod format. |
| *rvseisnez.dat* | Inversion codes | Graphical codes | Parts of input seismograms that are actually used in the inversion. In case of synthetic tests the file contains synthetics of the target model. |
| *svseisnez.dat* | Inversion codes | Graphical codes | Parts of output seismograms that are actually used in the inversion. Seismograms due to the inverted model. |
| *singularvalues.dat* | SlipInvSVD1 |  | Singular values of the forward matrix (including smoothing, M0 constraint, etc., if considered). |
| *singularvectors.dat* | SlipInvSVD2 |  | 10 first singular (i.e. eigen) vectors in columns. The column format is the same as in case of mtilde.dat |