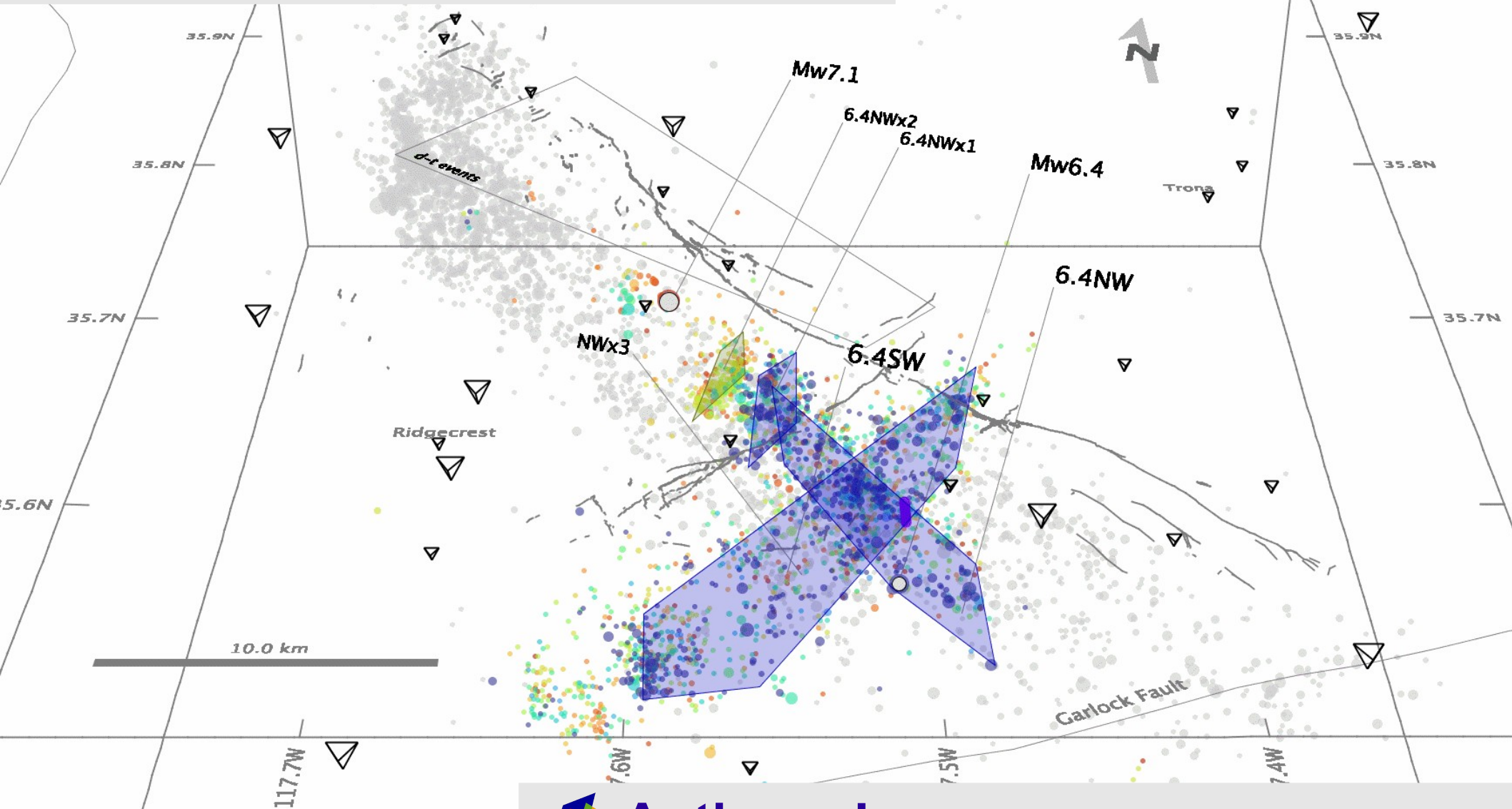


NonLinLoc Control File



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NonLinLoc Control File

Overview

NonLinLoc programs share control file syntax and "Generic" control statements.

All control statements for a project may be combined into one file.

The basic control file statement syntax consists of a control keyword followed by one or more parameters:

KEYWORD parameter1 paramter2 ...

```
TRANS  LAMBERT  Clarke-1880  61.0 -150.0  60.0 62.0  0.0
VGOUT   ./model/layer
VGTYPE  P
VGTYPE  S
VGGRID  2 401 106  0.0 0.0 -5.0  1.0 1.0 1.0  SLOW_LEN
GTFILES  ./model/layer  ./time/layer P
GTMODE  GRID2D ANGLES_YES
LOCFILES ./obs/2018-11-30-mww70-southern-alaska.obs NLLOC_OBS  ./time/layer
./loc/alaska
LOCSEARCH  OCT 10 10 4 0.01 20000 5000 0 1
LOCGRID  201 201 106  -100.0 -100.0 -5.0  1.0 1.0 1.0  PROB_DENSITY  SAVE
LOCMETH  EDT_OT_WT 9999.0 4 -1 -1 1.68 6 -1.0 1
LOCGAU2  0.02 0.05 2.0
LOCPHASEID  P  P p Pn Pg
```

NonLinLoc Control File - Generic

Generic Control Statements

Used by one or more of the programs in the NonLinLoc package.

INCLUDE - CONTROL - TRANS - MAPLINE - MAPGRID

NonLinLoc Control File - Generic

CONTROL

Sets various general program control parameters.

Syntax: CONTROL messageFlag randomNumberSeed

CONTROL 1 54321

```
> NLLoc run/nlloc_sample.in
NLLoc (NonLinLoc v7.00.02 17Oct2018)
... Reading observation file ./obs/2018-11-30-mww70-southern-alaska.obs
Reading next set of observations (Files open: Tot:3 Buf:0 Hdr:0 Alloc: 0) ...
... 57 observations read, 35 will be used for location (./loc/alaska.20181130.172935).
LOCgau param CorrLen is zero, will not be used: 0.000000
Locating... (Files open: Tot:3 Buf:0 Hdr:0 Alloc: 140 3DMem:
used:0/avail:0/load:0) ...
OctTree num samples = 20000 / 20000
Octree oct_node_value_max= 2.375170e+02 oct_tree_integral= 4.808800e+01
ellipsoid_volume = 8.040543e+02
Finished event location, output files: ./loc/alaska.20181130.172935.*
<./loc/alaska.20181130.172935.grid0.loc.hyp>
Reading next set of observations (Files open: Tot:3 Buf:0 Hdr:0 Alloc: 0) ...
... 34 observations read, 30 will be used for location (./loc/alaska.20181130.173543).
```

NonLinLoc Control File - Generic

TRANS

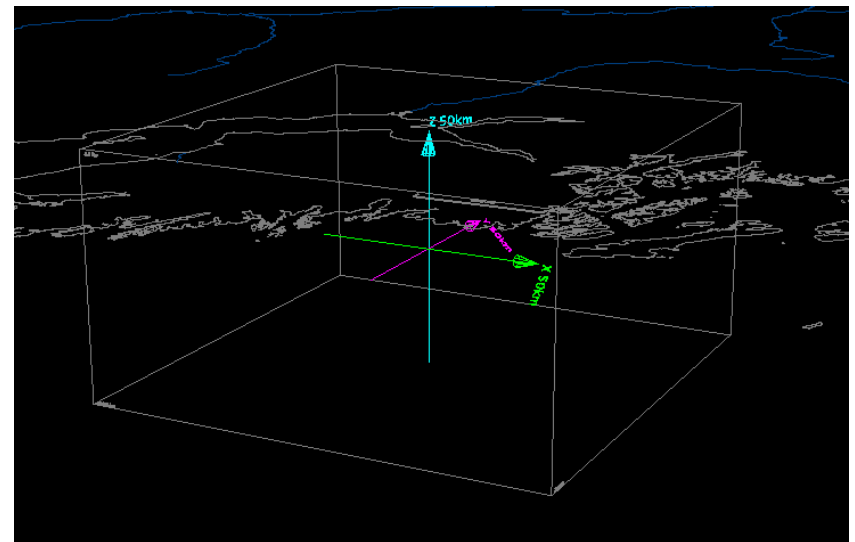
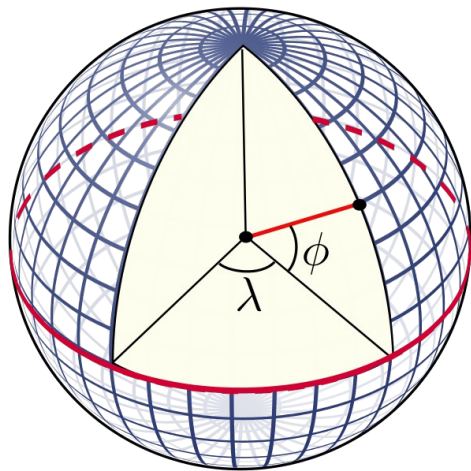
Sets geographic to working coordinates transformation parameters.

Syntax 1: TRANS GLOBAL

Syntax 2: TRANS LAMBERT refEllipsoid latOrig longOrig firstStdParal secondStdParal rotAngle

Also: NONE SIMPLE SDC TRANS_MERC AZIMUTHAL_EQUIDIST

TRANS LAMBERT Clarke-1880 61.0 -150.0 60.0 62.0 0.0



NonLinLoc Control File - Vel2Grid

Vel2Grid Control Statements

***Used by Vel2Grid in the NonLinLoc package
convert velocity model specification into a velocity or slowness 3D Grid***

***VGOUT - VGTYPE - VGGRID - LAYER - 2DTO3DTRANS - VERTEX - EDGE -
POLYGON2***

NonLinLoc Control File - Vel2Grid

VGOUT

Specifies the file root name for the output velocity grid.

Syntax: VGOUT fileRoot

VGOUT ./model/layer

```
> ls -lt ./model/layer*  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./model/layer.P.mod.buf  
-rw-r--r--@ 1 anthony  staff    235  4 Dec 12:04 ./model/layer.P.mod.hdr
```

NonLinLoc Control File - Vel2Grid

VGTYPE

Specifies the physical wave type for a velocity grid.

Syntax: VGTYPE waveType

VGTYPE P

VGTYPE S

```
> ls -lt ./model/layer*  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./model/layer.P.mod.buf  
-rw-r--r--@ 1 anthony  staff    235  4 Dec 12:04 ./model/layer.P.mod.hdr  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./model/layer.S.mod.buf  
-rw-r--r--@ 1 anthony  staff    235  4 Dec 12:04 ./model/layer.S.mod.hdr
```

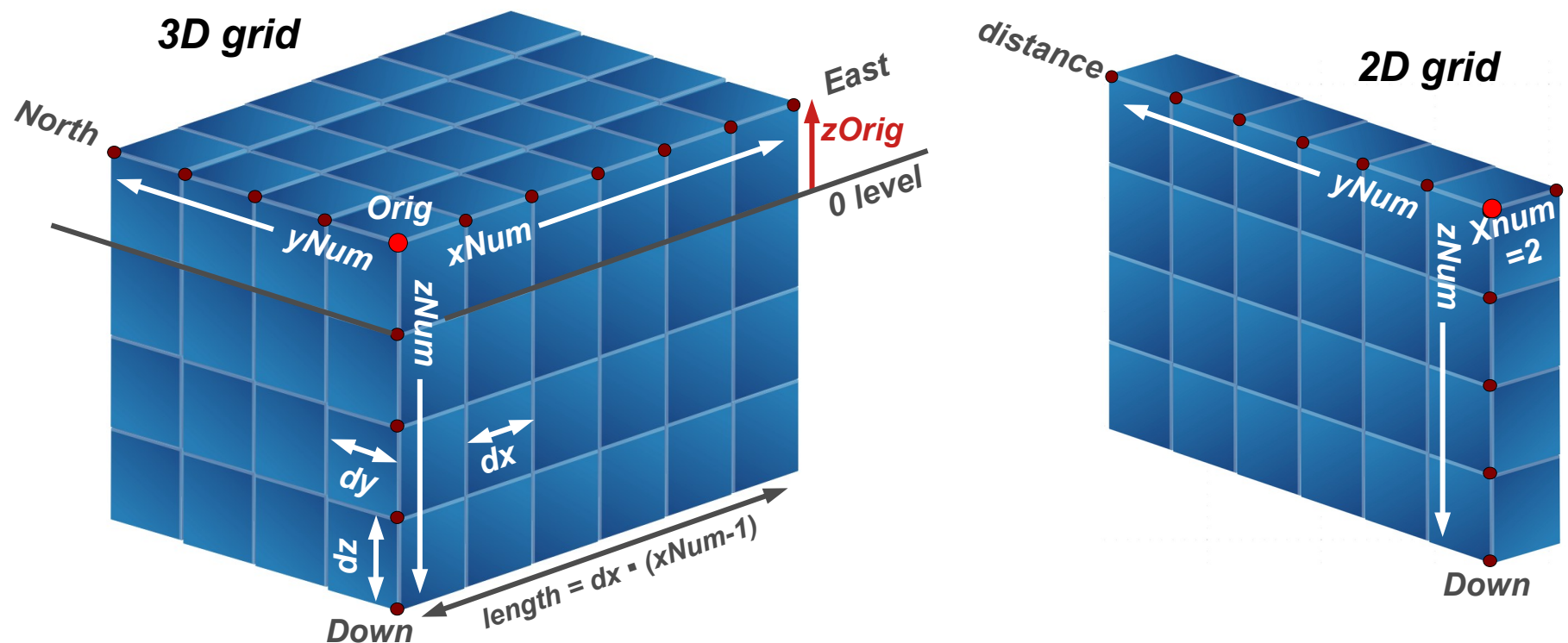

NonLinLoc Control File - Vel2Grid

VGGRID

Specifies the size and type of the 3D velocity grid.

Syntax: *VGGRID xNum yNum zNum xOrig yOrig zOrig dx dy dz gridType*

VGGRID 2 401 106 0.0 0.0 -1.0 1.0 1.0 1.0 SLOW_LEN



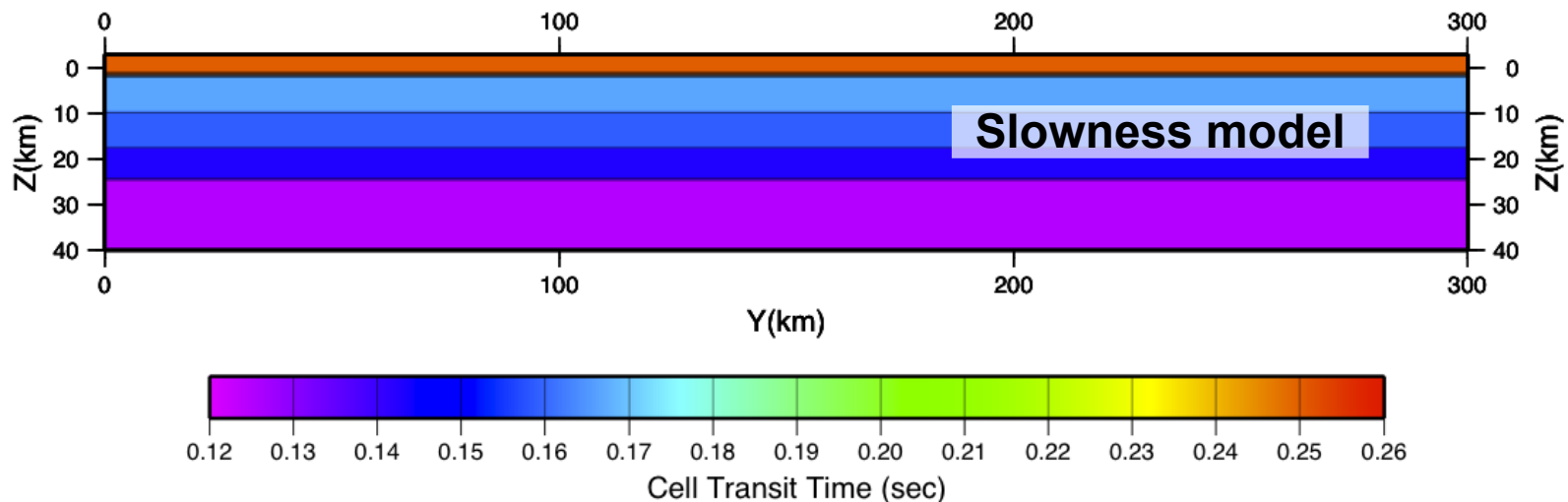
NonLinLoc Control File - Vel2Grid

LAYER

Specifies a constant or gradient velocity layer.

*Syntax: **LAYER** depth VpTop VpGrad VsTop VsGrad rhoTop rhoGrad*

LAYER	0.0	5.30	0	3.01	0	2.52	0
LAYER	4.0	5.60	0	3.18	0	2.61	0
LAYER	9.0	6.20	0	3.52	0	2.78	0
...							



NonLinLoc Control File - Grid2Time

Grid2Time Control Statements

***Used by Grid2Time in the NonLinLoc package
calculates travel-times between a station and all nodes of a 3D x,y,z grid***

GTFILES - GTMODE - GTSRCE - GT_PLFD

NonLinLoc Control File - Grid2Time

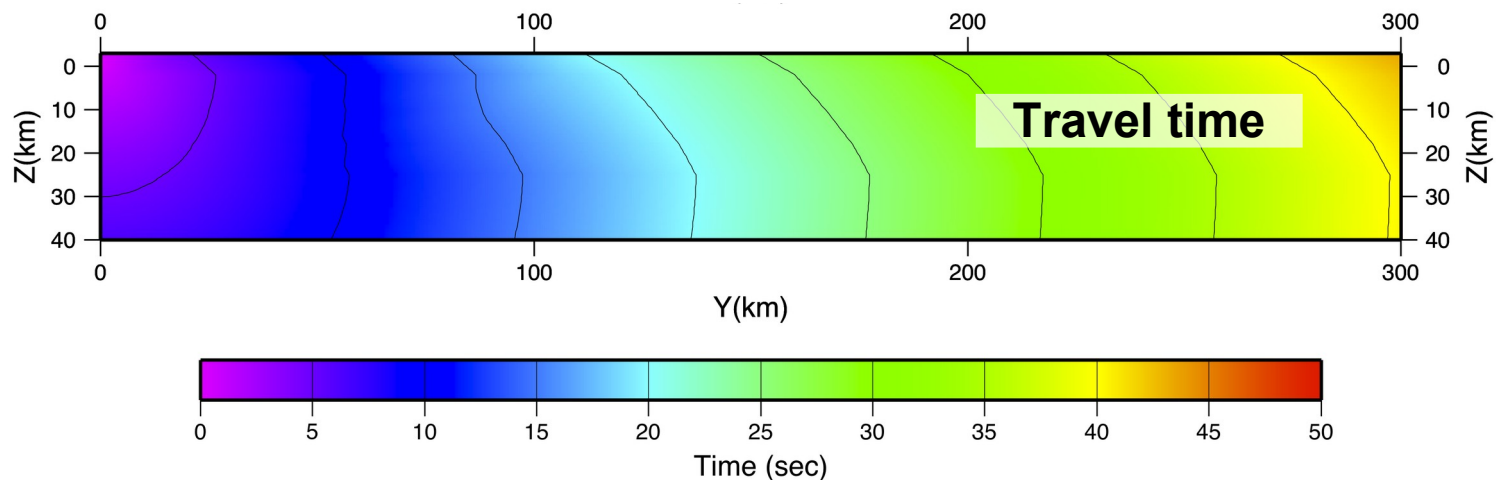
GTFILES

Specifies file root name for velocity grid and output time grids, and wave type.

Syntax: GTFILES ttimeFileRoot outputFileRoot waveType iSwapBytesOnInput

GTFILES **./model/layer** **./time/layer** **P**

```
> ls -lt ./time/layer*  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./time/layer.P.AK_BMR_--.angle.buf  
-rw-r--r--@ 1 anthony  staff    274  4 Dec 12:04 ./time/layer.P.AK_BMR_--.angle.hdr  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./time/layer.P.AK_BMR_--.time.buf  
-rw-r--r--@ 1 anthony  staff    273  4 Dec 12:04 ./time/layer.P.AK_BMR_--.time.hdr  
-rw-r--r--@ 1 anthony  staff  340048  4 Dec 12:04 ./time/layer.P.AK_BPAW_--.angle.buf
```



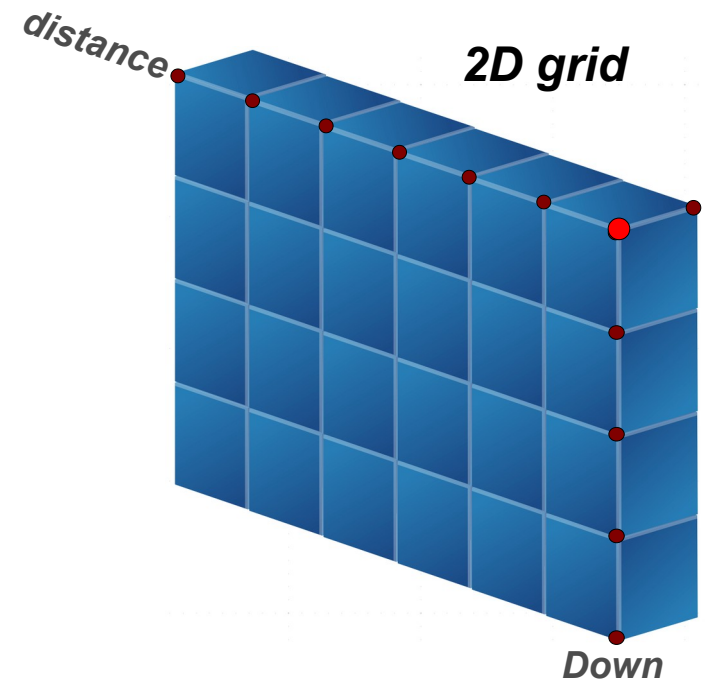
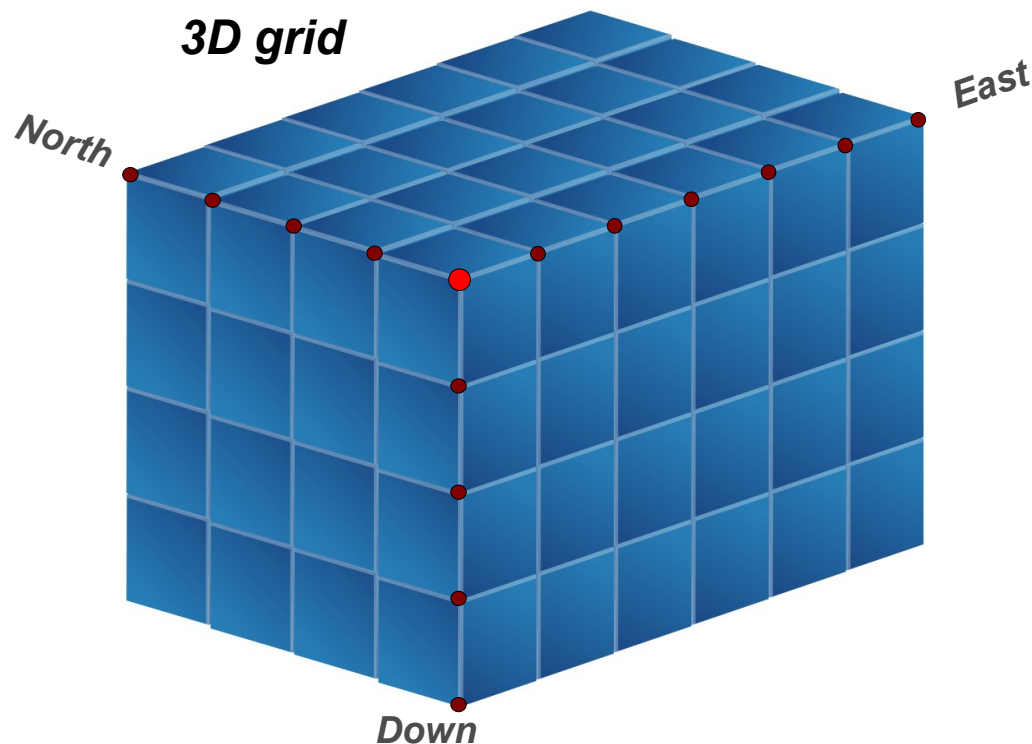
NonLinLoc Control File - Grid2Time

GTMODE

Specifies several program run modes.

Syntax: GTMODE gridMode angleMode

GTMODE GRID2D ANGLES_YES



NonLinLoc Control File - GTSRCE

GTSRCE

Specifies a source location for time grid angles grid creation.

Syntax 1: GTSRCE label XYZ xSrc ySrc zSrc elev

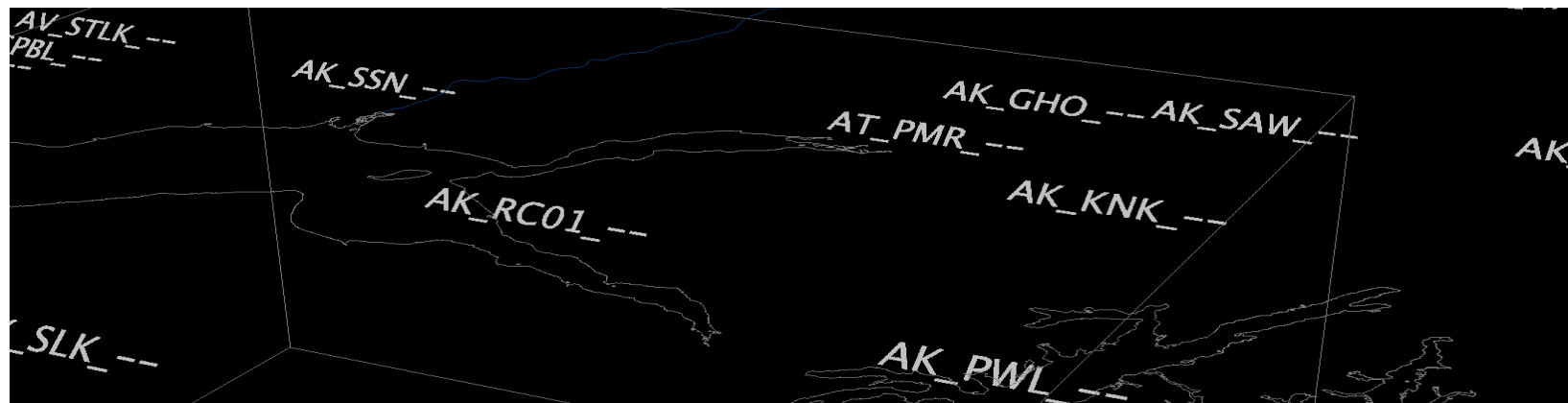
Syntax 2: GTSRCE label LATLON latSrc longSrc zSrc elev

Syntax 3: GTSRCE label LATLONDM latDegSrc latMinSrc latDir longDegSrc longMinSrc longDir zSrc elev

Syntax 4: GTSRCE label LATLONDS latDegSrc latMinSrc latSecSrc latDir longDegSrc longMinSrc longSecSrc longDir zSrc elev

```
GTSRCE  AK_RC01_--  LATLON  61.088902  -149.738998  0  0.39
GTSRCE  AT_PMR_--  LATLON  61.592201  -149.130798  0  0.1
...
```

$z = zSrc - elev$



NonLinLoc Control File - NLLoc

NLLoc Control Statements

*Used by NLLoc in the NonLinLoc package
probabilistic, non-Linear, global-search earthquake location*

***LOCSIG - LOCCOM - LOCSRCE - LOCFILES - LOCHYPOUT - LOCSEARCH - LOCMETH -
LOGGAU - LOGGAU2 - LOCPHASEID - LOCQUAL2ERR - LOCGRID - LOCPHSTAT -
LOCANGLES - LOCMAG - LOCCMP - LOCALIAS - LOCEXCLUDE - LOCDELAY -
LOCELEV CORR - LOCTOPO_SURFACE - LOCSTAWT***

NonLinLoc Control File - NLLoc

LOCFILES

Specifies the observation file(s), and file root names for time grids and output.

Syntax: LOCFILES obsFiles obsFileType ttimeFileRoot outputFileRoot iSwapBytes

LOCFILES ./obs/alaska.obs NLLOC_OBS ./time/layer ./loc/alaska

```
> ls -lt ./loc/alaska*
-rw-r--r--@ 1 anthony  staff      247  4 Dec 14:02 ./loc/alaska.20181130.182148.grid0.loc.hdr
-rw-r--r--@ 1 anthony  staff    10662  4 Dec 14:02 ./loc/alaska.20181130.182148.grid0.loc.hyp
-rw-r--r--@ 1 anthony  staff   79536  4 Dec 14:02 ./loc/alaska.20181130.182148.grid0.loc.scat
-rw-r--r--@ 1 anthony  staff      247  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.hdr
-rw-r--r--@ 1 anthony  staff    12970  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.hyp
-rw-r--r--@ 1 anthony  staff    14833  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.hypo_inv
-rw-r--r--@ 1 anthony  staff    19460  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.stat
-rw-r--r--@ 1 anthony  staff     3967  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.stat_totcorr
-rw-r--r--@ 1 anthony  staff     3215  4 Dec 14:02 ./loc/alaska.sum.grid0.loc.stations
-rw-r--r--@ 1 anthony  staff      247  4 Dec 14:02 ./loc/alaska.20181130.180013.grid0.loc.hdr
-rw-r--r--@ 1 anthony  staff    16464  4 Dec 14:02 ./loc/alaska.20181130.180013.grid0.loc.hyp
-rw-r--r--@ 1 anthony  staff    78560  4 Dec 14:02 ./loc/alaska.20181130.180013.grid0.loc.scat
```

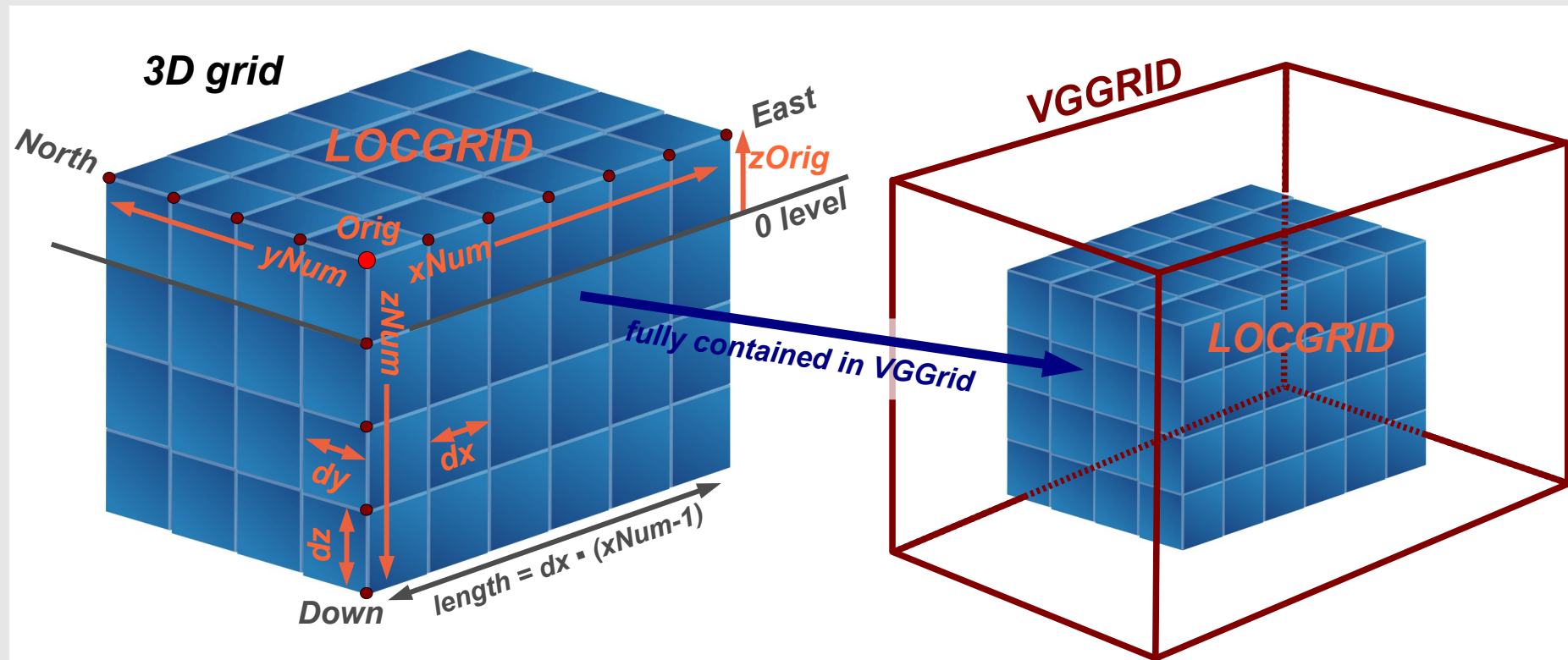

NonLinLoc Control File - NLLoc

LOCGRID

Specifies the size of the 3D location search grid.

Syntax: LOCGRID xNum yNum zNum xOrig yOrig zOrig dx dy dz gridType saveFlag

LOCGRID 201 201 106 -100.0 -100.0 -5.0 1.0 1.0 1.0 PROB_DENSITY SAVE



NonLinLoc Control File - NLLoc

LOCSEARCH

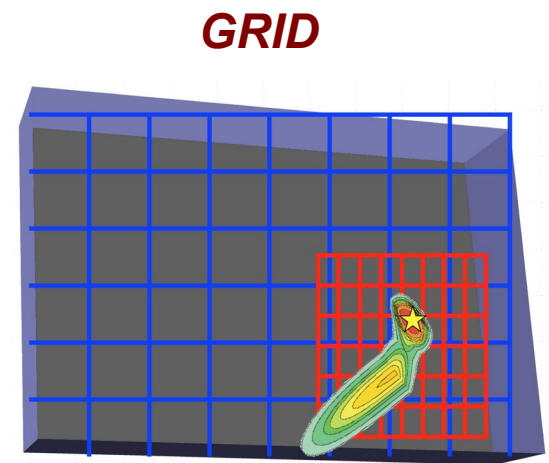
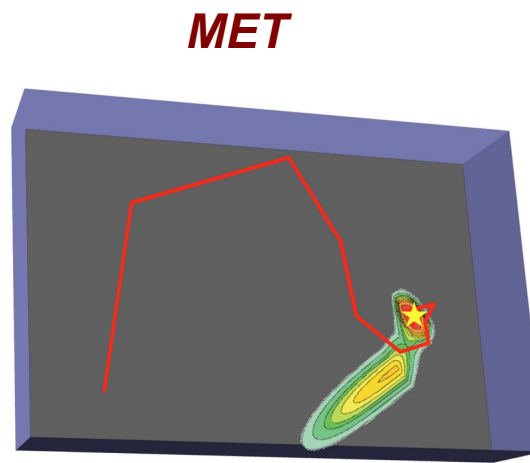
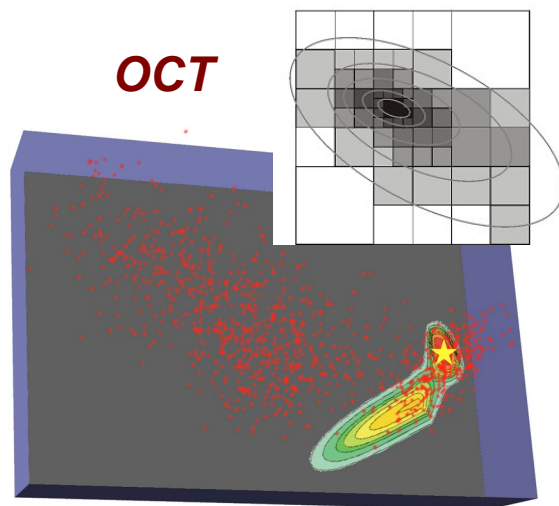
Specifies the search type and search parameters.

Syntax 1: LOCSEARCH GRID numSamplesDraw

*Syntax 2: LOCSEARCH MET numSamples numLearn numEquil numBeginSave numSkip stepInit
stepMin stepFact probMin*

*Syntax 3: LOCSEARCH OCT initNumCells_x initNumCells_y initNumCells_z minNodeSize
maxNumNodes numScatter useStationsDensity stopOnMinNodeSize*

LOCSEARCH OCT 10 10 4 0.01 20000 5000 0 1



NonLinLoc Control File - NLLoc

LOCSEARCH

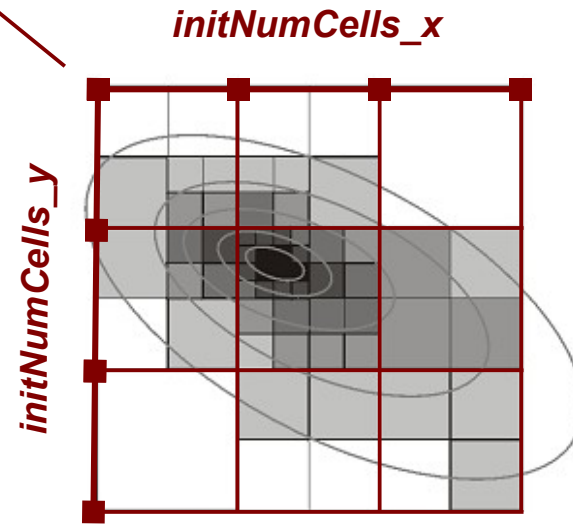
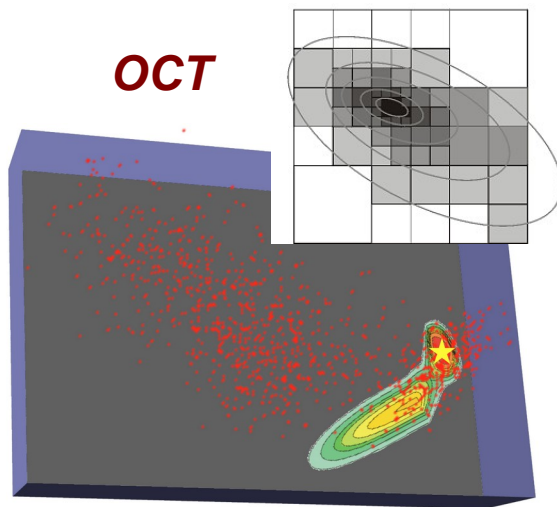
Specifies the search type and search parameters.

Syntax 1: LOCSEARCH GRID numSamplesDraw

*Syntax 2: LOCSEARCH MET numSamples numLearn numEquil numBeginSave numSkip stepInit
stepMin stepFact probMin*

*Syntax 3: LOCSEARCH OCT initNumCells_x initNumCells_y initNumCells_z minNodeSize
maxNumNodes numScatter useStationsDensity stopOnMinNodeSize*

LOCSEARCH OCT 10 10 4 0.01 20000 5000 0 1



NonLinLoc Control File - NLLoc

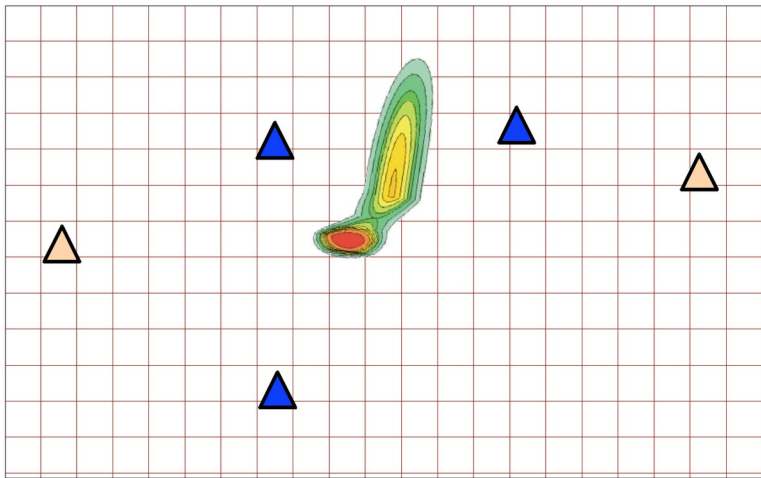
LOCMETH

Specifies the location method (algorithm) and parameters.

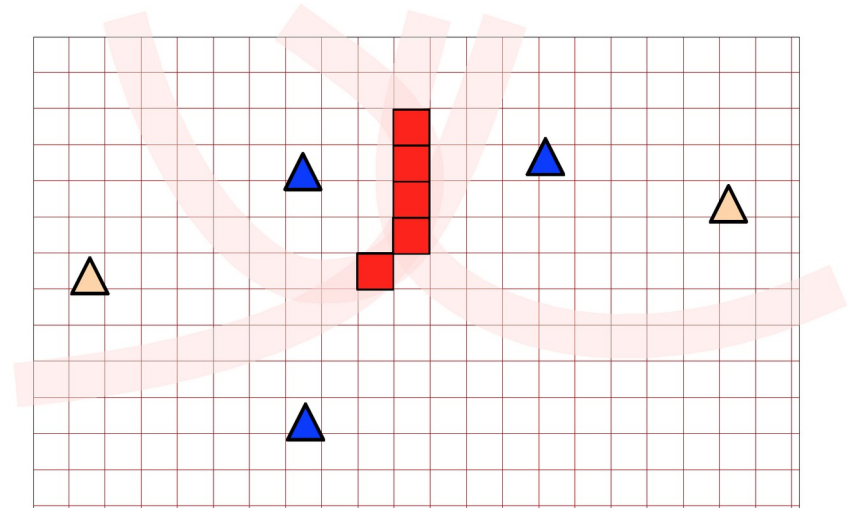
*Syntax: LOCMETH method maxDistStaGrid minNumberPhases maxNumberPhases
minNumberSphases VpVsRatio maxNum3DGridMemory minDistStaGrid iRejectDuplicateArrivals*

LOCMETH EDT_OT_WT 9999.0 4 -1 -1 1.68 6 -1.0 1

GAU_ANALYTIC



EDT



NonLinLoc Control File - NLLoc

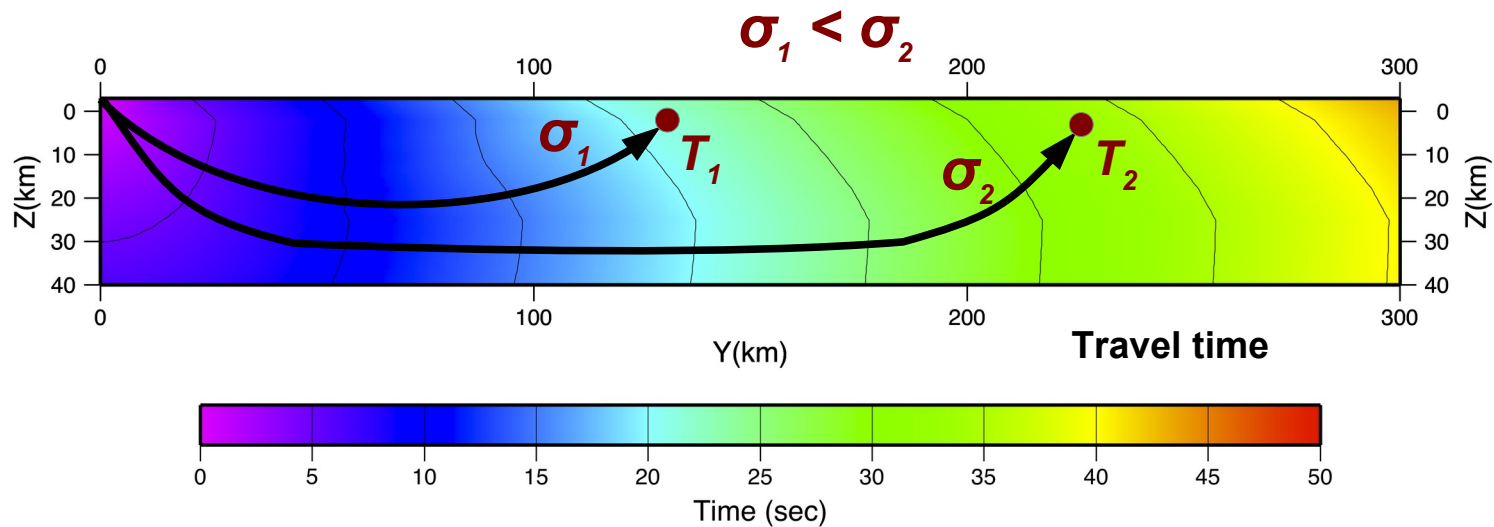
LOGGAU2

Specifies parameters for travel-time error in proportion to travel-time.

Syntax: LOGGAU2 SigmaTfraction SigmaTmin SigmaTmax

LOGGAU2 0.02 0.05 2.0

$$\sigma = \text{SigmaTfraction} \cdot T \quad 0.02 \rightarrow 2\%$$



setup of screloc for NonLinLoc

screloc builds NonLinLoc
LOCFILES statement and obsFile

Path to NLL input files →

Path to NLL output files (**LOCFILES** outputFileRoot) →

NLL control file with fixed control statements →

NLL pick uncertainty (**Phase: ErrMag GAU**) →

screloc profile selection →

SC3 / QuakeML id →

Path to NLL output files (**LOCFILES** ttimeFileRoot) →

screloc profile geographic region →

NLL control file with fixed control statements for profile →

Config for additional profiles

```
plugins = ${plugins}, locnll
```

```
# Define the locator algorithm to use
reloc.locator = NonLinLoc
```

```
# Define a suffix appended to the publicID of the origin to be relocated
# to form the new publicID.
# This helps to identify pairs of origins before and after relocation.
# However, new publicIDs are unrelated to the time of creation.
# If not defined, a new publicID will be generated automatically.
reloc.originIDSuffix = "#relocated"
```

```
#####
##### NonLinLoc configuration#####
#####
NLLROOT = ${HOME}/nll/data
```

```
NonLinLoc.outputPath = ${NLLROOT}/output/
```

```
# Define the default control file if no profile specific
# control file is defined.
```

```
NonLinLoc.controlFile = ${NLLROOT}/NLL.default.conf
```

```
# Set the default pick error in seconds passed to NonLinLoc
# if no SC3 pick uncertainty is available.
NonLinLoc.defaultPickError = 0.1
```

```
# Define the available NonLinLoc location profiles. The order
# implicitly defines the priority for overlapping regions
NonLinLoc.profiles = swiss_3d, swiss_1d, global
NonLinLoc.profiles = swiss_3d, global
```

```
# The earthModelID is copied to earthModelID attribute of the
# resulting origin
NonLinLoc.profile.swiss_1d.earthModelID = "swiss regional 1D"
```

```
# Specify the velocity model table path as used by NonLinLoc
NonLinLoc.profile.swiss_1d.tablePath = ${NLLROOT}/time_1d_regio/regio
```

```
# Specify the region valid for this profile
NonLinLoc.profile.swiss_1d.region = 41.2, 3.8, 50.1, 16.8
```

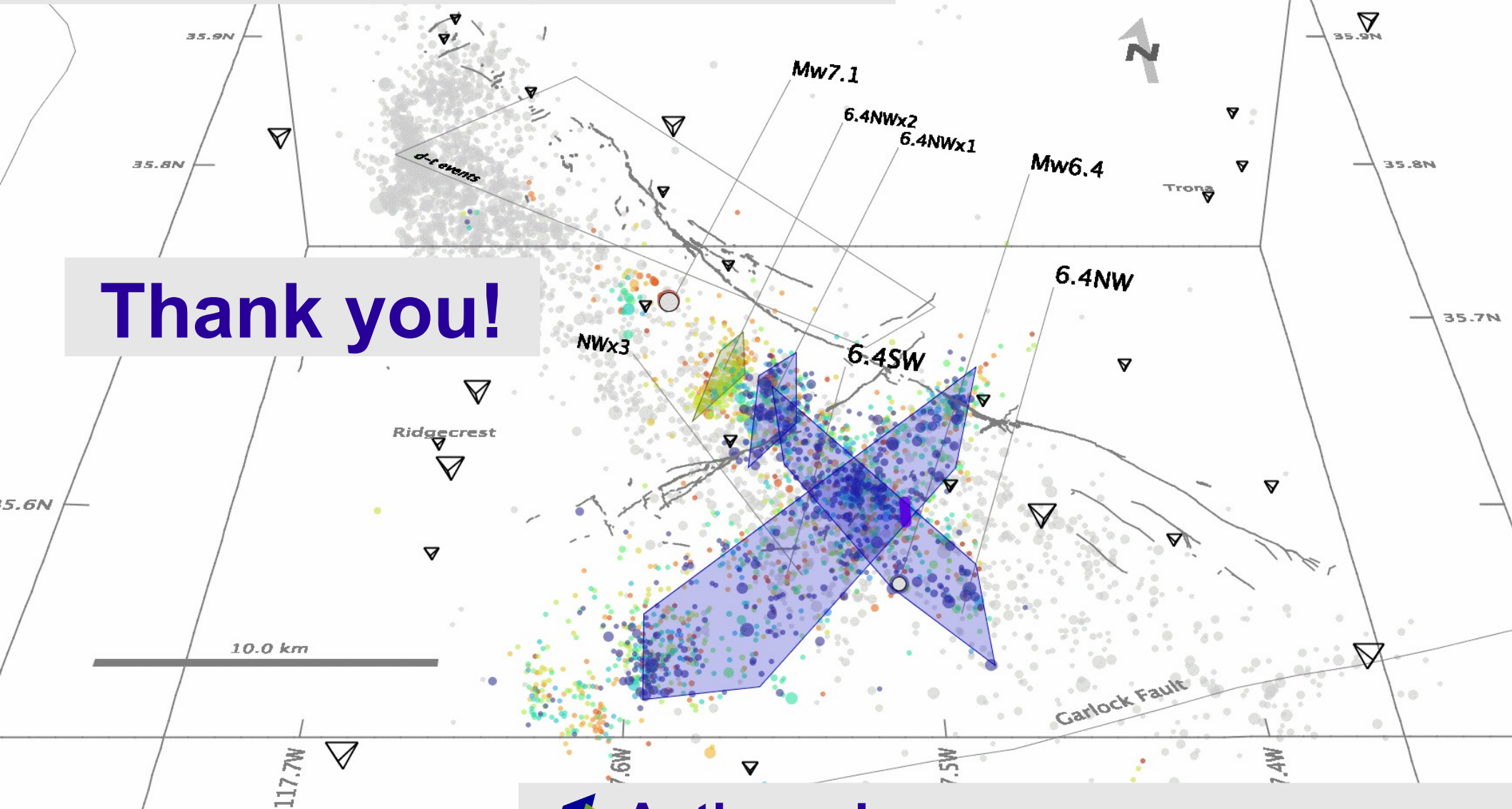
```
# The NonLinLoc default control file to use for this profile
NonLinLoc.profile.swiss_1d.controlFile = ${NLLROOT}/NLL.swiss_1d.conf
```

```
# Configure the swiss_3d profile
NonLinLoc.profile.swiss_3d.earthModelID = "swiss regional 3D"
NonLinLoc.profile.swiss_3d.tablePath = ${NLLROOT}/time_3d/ch
NonLinLoc.profile.swiss_3d.region = 45.15, 5.7, 48.3, 11.0
NonLinLoc.profile.swiss_3d.controlFile = ${NLLROOT}/NLL.swiss_3d.conf
```

```
# And the global profile
NonLinLoc.profile.global.earthModelID = iaspei91
NonLinLoc.profile.global.tablePath = ${NLLROOT}/iasp91/iasp91
NonLinLoc.profile.global.controlFile = ${NLLROOT}/NLL.global.conf
```


NonLinLoc Control File

Thank you!



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NonLinLoc Software Guide (<http://alomax.net/nlloc>)

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