NAME

mbsegygrid – Generate time vs. trace number grids of seismic data from segy files.

VERSION

Version 5.0

SYNOPSIS

mbsegygrid **–I***segyfile* **–O***gridfile* **[–A***shotscale/timescale* **–B***maxvalue/window* **–D***decimatex/decimatey* **–G***mode/gain[/window]* **–S***mode[/start/end[/schan/echan]]* **–T***sweep[/delay]* **–W***mode/start/end* **–H** **–V]";**

DESCRIPTION

MBsegygrid generates grids of seismic data from segy files. The program works by inserting trace data into a grid in which the y-axis is some measure of trace number, range, or distance along a profile, and the y-axis is time. The output files are **GMT** netCDF format grid files.

By default or with use of the **–A** option, the x-dimension of the grid is determined by the number of traces specified by the **–S** option and any decimation specified with option **–D**. If the **–R** option is used, then the profile will represent a line between specified start and end positions divided into binning cells according to a specified cell size, and the x-dimension of the grid will be the distance along the line (in meters) divided by the cell size and any decimation specified with option **–D**.

The y-dimension of the grid is determined by the sample spacing, any decimation specified with option **–D**, and the time sweep specified by the **–T** option.

If the **–S** option is not specified, then all of the traces in the segy file will be gridded. If the time sweep and delay (if any) are not specified using the **–T** option, then the sweep and delay will be set so that all trace samples are incorporated into the grid.

A simple time-varying gain can be applied to the traces before gridding using the **–G** option. The start time for the gain may be either the start of the trace or the seafloor arrival time.

Simple time-domain low-pass filtering can be applied to the traces before gridding using the **–F** option.

Regions of the grid without data are indicated in the output by NaN values.

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OPTIONS

–A *shotscale/timescale*
This option causes the x-axis to be rescaled from shot number to distance in meters and the y-axis to be rescaled from time in seconds to depth in meters. The *shotscale* value represents the shot spacing in meters and the *timescale* value is the scaling from time to depth (typically 750 m/s for the water column).

–B *maxvalue[/window]*
This option causes the application of automatic gain control (AGC). At each sample, a time interval *window* seconds long centered on the sample is considered. The sample value is multiplied by a scaling factor calculated as *maxvalue* divided by the maximum original value in the time

interval. This approach can emphasize coherent arrivals regardless of amplitude level. If *window* is not specified, then the *window is taken to be the trace length in time so that the entire trace is normalized using the same scale factor, and all traces has the same maximum value of maxvalue.*

–D *decimatex/decimatey*
Sets the decimation of traces (*decimatex*) and samples (*decimatey*) used in generating the output grid. The downsampling of the data is actually accomplished by averaging the values within each grid bin rather than omitting traces or samples.

–F *mode/window*
Sets the application of low-pass filtering to the trace data. The filtering is applied by convolving a filter function of length *window* seconds with the trace. Currently the only available filter is a cosine taper, set using *mode* = 1.

–G *mode/gain[/window]*
Sets the application of gain to the trace data. The *mode* value determines how the gain is applied. If *mode* = 0, no gain is applied.If *mode* = 1, the gain is applied starting from the beginning of the trace. If *mode* = 2, the gain is applied starting at the seafloor (assuming that a seafloor pick has been defined in the segy data file). The *gain* value sets the gain applied as follows. If G = *gain* and t is the time in seconds since the start of gain application, then each sample is multiplied by a factor of (1 + (G * t)). The parameter *window*, if given, sets the length of the time interval in seconds that gain is applied. When the gain is windowed, trace values after the end of the gain window are zeroed.

–H This "help" flag cause the program to print out a description of its operation and then exit immediately.

–I *segyfile*
Sets the filename of the input segy seismic data file to be gridded.

–O *gridfile*
Sets the filename for the output GMT netCDF format grid.

–R *cellsize/startlon/endlon/startlat/endlat*
If the **–R** option is used, then the profile will represent a line between start and end positions specified using longitude and latitude values in decimal degrees. This line segment is divided into binning cells according to *cellsize* in meters, and the x-dimension of the grid will be the distance along the line (in meters) divided by the cell size and any decimation specified with option **–D**. Effectively, the location of each trace will be projected onto the line segment and the segment added to the appropriate cell. Where cells have multiple traces, the traces will be averaged.

–S *mode[/start/end[/schan/echan]]*
This option sets the range of traces that are gridded, and thus determines the x-dimension of the output grid (also impacted by any decimation specified with **–D**). If *mode* = 0, then *start* and *end* refer to shot numbers. This typically is useful for subbottom data or seismic data in shot gather form. If *mode* = 1, then *start* and *end* refer to CMP (or RP or CDP) numbers. This typically is useful for seismic reflection data in stacked or CMP gather forms. If the data are multichannel seismic reflection or seismic refraction in either shot or CMP gathers, the start and end of the channels selected for gridding is set using the optional *schan* and *echan*, respectively. The x-dimension of the output grid is determined by (*end* – *start* + 1) * (*echan* – *schan* + 1) / *decimatex*.

–T *sweep[/delay]*
Sets the time range of seismic data to be gridded. The *sweep* specifies the number of seconds of data comprising the y-axis of the grid. The number of samples follows from the sample interval of the data, and any decimation applied using **–D**. The optional *delay* value sets the sweep start time, again in seconds. The y-dimension of the output grid is determined by *sweep* / sampleinterval / *decimatey*, where the sampleinterval is a parameter read with the seismic data.

–V Normally, **mbsegygrid** prints out information regarding its controlling parameters during execution; the **–V** option causes the program to also print out statements indicating its progress.

−W *mode/start/end*
This option can be used to limit the data being gridded to a particular time window in various ways. This option does not impact the definition of the overall grid bounds, but does restrict the data gridded to samples within particular times of interest. If *mode* = 1, then *start* and *end* are simply start and end times of good data in seconds. If *mode* = 2, then *start* and *end* are relative to the time of the bottom return. In this case *start* is often negative so that the grid shows data above the seafloor, and then down into the subsurface. Finally, if *mode* = 3, then *start* and *end* are relative to the time corresponding to the sonar depth.

EXAMPLES

Suppose that we have a Reson 7k format file (format 88) called 20040722_152111.s7k that contains subbottom profiler data. Further suppose that we have used **mbextractsegy** to extract the subbottom profiler data into a segy format file called 20040722_152111.s7k.segy. **MBextractsegy** also generates a "sinf" file containing statistics about the data in the segy file. In this case, the contents of the sinf file 20040722_152111.s7k.segy.sinf are:

```
SEGY Data File:      20040722_152111.s7k.segy

File Header Info:
  Channels:                        1
  Auxiliary Channels:              0
  Sample Interval (usec):          64
  Number of Samples in Trace:      8330
  Trace length (sec):        0.533120
  Data Format:               IEEE 32 bit integer
  CDP Fold:                        0

Data Totals:
  Number of Traces:             2527
  Min Max Delta:
    Shot number:                  56      2582      2527
    Shot trace:                    1         1         1
    RP number:                    56      2582      2527
    RP trace:                      1         1         1
    Delay (sec):           0.000000 0.000000 0.000000
    Range (m):             0.000000 0.000000 0.000000
    Receiver Elevation (m):   −224.030000 −2.860000 −221.170000
    Source Elevation (m):     −224.030000 −2.860000 −221.170000
    Source Depth (m):         2.860000 224.030000 −221.170000
    Receiver Water Depth (m): 51.510000 487.670000 −436.160000
    Source Water Depth (m):   51.510000 487.670000 −436.160000

Navigation Totals:

  Start of Data:
    Time:  07 22 2004 15:20:37.029000  JD204
    Lon: −121.8573     Lat:   36.7755

  End of Data:
    Time:  07 22 2004 15:44:15.438000  JD204
    Lon: −121.8572     Lat:   36.7952

Limits:
  Minimum Longitude:    −121.8574   Maximum Longitude:    −121.8572
  Minimum Latitude:       36.7755   Maximum Latitude:       36.7952
```

In order to generate a time vs. trace number grid of all traces in the segy file, with a column for each trace and a row for each time sample, one can simply invoke **mbsegygrid** without specifying a range of desired traces or the desired time sweep. The program automatically sizes the grid to include all traces and samples, taking into account trace start delays if necessary. The root of the output grid filename is specified with the **–O** option; if "SubbottomGrid" is specified then the output grid will be named SubbottomGrid.grd. The command is:

```
mbsegygrid –I 20040722_152111.s7k.segy      -O SubbottomGrid
```

and the output to the terminal looks like:

```
MBsegygrid Parameters:
Input segy file:      20040722_152111.s7k.segy
Output fileroot:      SubbottomGrid
Input Parameters:
     trace mode:      1
     trace start:     56
     trace end:       2582
     channel start:   1
     channel end:     1
     trace decimation:   1
     time sweep:      0.533120 seconds
     time delay:      0.000000 seconds
     sample interval:    0.000064 seconds
     sample decimation:  1
     window mode:     0
     window start:    0.000000 seconds
     window end:      0.000000 seconds
     gain mode:       0
     gain:            0.000000
Output Parameters:
     grid filename:      SubbottomGrid.grd
     x grid dimension:   2527
     y grid dimension:   8331
     grid xmin:       55.500000
     grid xmax:       2582.500000
     grid ymin:       –0.533152
     grid ymax:       0.000032
     NaN values used to flag regions with no data
PROCESS read:0 position:0 rp:56 channel:1 2004/204 15:20:37.029 samples:8330 interval:64 usec minmax: 0.000000 2425.784912
PROCESS read:25 position:25 rp:81 channel:1 2004/204 15:20:51.068 samples:8330 interval:64 usec minmax: 0.000000 3832.087402
PROCESS read:50 position:50 rp:106 channel:1 2004/204 15:21:05.106 samples:8330 interval:64 usec minmax: 0.000000 1590.149658
...................
PROCESS read:2475 position:2475 rp:2531 channel:1 2004/204 15:43:46.800 samples:8330 interval:64 usec minmax: 0.000000 991.466064
PROCESS read:2500 position:2500 rp:2556 channel:1 2004/204 15:44:00.838 samples:8330 interval:64 usec minmax: 0.000000 838.286926
PROCESS read:2525 position:2525 rp:2581 channel:1 2004/204 15:44:14.877 samples:8330 interval:64 usec minmax: 0.000000 985.870667

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Plot generation shellscript <SubbottomGrid.grd.cmd> created.
```

Instructions:
Execute <SubbottomGrid.grd.cmd> to generate Postscript plot <SubbottomGrid.grd.ps>.
Executing <SubbottomGrid.grd.cmd> also invokes gv to view the plot on the screen.

The size of the the output grid can be checked using the **GMT** program **grdinfo**. The results of the command:

grdinfo SubbottomGrid.grd

look like:

SubbottomGrid.grd: Title: Seismic Grid from 20040722_152111.s7k.segy
SubbottomGrid.grd: Command:
SubbottomGrid.grd: Remark:
Projection: SeismicProfile
Grid created by MBsegygrid
MB-system Version 5.0.4
Run by <caress> on <hess> at <Thu Sep 23 16:24:39 2004>
SubbottomGrid.grd: Pixel node registration used
SubbottomGrid.grd: grdfile format # 0
SubbottomGrid.grd: x_min: 55.5 x_max: 2582.5 x_inc: 1 units: Trace Number nx: 2527
SubbottomGrid.grd: y_min: −0.533152 y_max: 3.2e-05 y_inc: 6.4e-05 units: Time (seconds) ny: 8331
SubbottomGrid.grd: z_min: 0 z_max: 2623.34 units: Trace Signal
SubbottomGrid.grd: scale_factor: 1 add_offset: 0

MBsegygrid also uses the macro **mbm_grdplot** to generate a shellscript called SubbottomGrid.grd.cmd that, when executed, will use **GMT** commands to generate a Postscript plot of the grid.

In order to generate a grid of a subset of the subbottom data (for instance, shots 1500 − 2000 and the time sweep from 0.25 to 0.35 seconds), use the **−S** and **−T** options:

mbsegygrid −I 20040722_152111.s7k.segy -O SubbottomGrid2 -S0/1500/2000 −T0.1/0.25

This time the **grdinfo** output looks like:

SubbottomGrid2.grd: Title: Seismic Grid from 20040722_152111.s7k.segy
SubbottomGrid2.grd: Command:
SubbottomGrid2.grd: Remark:
Projection: SeismicProfile
Grid created by MBsegygrid
MB-system Version 5.0.4
Run by <caress> on <hess> at <Thu Sep 23 16:40:34 2004>
SubbottomGrid2.grd: Pixel node registration used
SubbottomGrid2.grd: grdfile format # 0
SubbottomGrid2.grd: x_min: 1499.5 x_max: 2000.5 x_inc: 1 units: Trace Number nx: 501
SubbottomGrid2.grd: y_min: −0.35 y_max: −0.249968 y_inc: 6.4e-05 units: Time (seconds) ny: 1563
SubbottomGrid2.grd: z_min: 0 z_max: 558.42 units: Trace Signal
SubbottomGrid2.grd: scale_factor: 1 add_offset: 0

SEE ALSO

mbsystem(1), **mbm_grdplot**(1), **mbmosaic**(1), **mbm_grid**(1)

BUGS

This tool isn't close to being complete...