NAME

mbm_grdplot – Create an executable shellscript which will generate a GMT map of gridded data in a GMT grd file.

VERSION

Version 5.0

SYNOPSIS

mbm_grdplot **–I***file* [**–A**[*magnitude*[*/azimuth/elevation*] **–C**[*contour_control*] **–D**[*flipcolor/flipshade*] **–G***color_mode* **–H** **–K***intensity_file* **–O***root* **–P***pagesize* **–S***[color/shade]* **–T** **–U***orientation* **–V** **–W***[color_style*[*/palette*[*ncolors*]] | *cptfile]*]

Additional Options:
[**–B***tickinfo* **–F***contour_file* **–J***projection[/scale* | *width]* **–L***title[:scale_label]* **–M***misc* **–Q** **–R***w/e/s/n* **–X** **–Y** **–Z***min/max[/mode]]*

Miscellaneous Options:
*[***–MGD***gmtdef/value* **–MGF***scale_loc* **–MGL***[f][x]lon0/lat0/slat/length[units][+llabel]* **–MGQ***dpi* **–MGS***scalefactor* **–MGT***x/y/size/angle/font/just/text* **–MGU**[*/dx/dy/*][*label*] **–MCA***anot_int/*[*ffont_size*][*aangle*][*/r/g/b*][*o*]] **–MCG***gap/width* **–MCQ***cut* **–MCT**[+|-][*gap/length*][*:LH*] **–MCW***type*[*pen*] **–MNA***[nhgt[/P]* | *P]* **–MNF***format* **–MNI***swathdata* **–MNN**[*ttick/tannot/dannot/tlen*[*/nhgt*] | *F* | *FP*] **–MNP**[*pingnumber_tick/pingnumber_annot/pingnumber_tick_len*] **–MTC***fill* **–MTD***resolution* **–MTG***fill* **–MTI***river[/pen]* **–MTN***border[/pen]* **–MTS***fill* **–MTW***pen* **–MXG***fill* **–MXI***xy_file* **–MXM** **–MXS***symbol/size* **–MXW***pen*]

DESCRIPTION

mbm_grdplot is a macro that generates a shellscript of **GMT** commands which, when executed, will generate a Postscript plot of gridded data. Several styles of plots can be generated, including color fill maps, contour maps, color fill maps overlaid with contours, shaded relief color maps, slope magnitude maps, coastline maps, text labels, and xy data in lines or symbols. Five different color schemes are included. The plot will be scaled to fit on the specified page size or, if the scale is user defined, the page size will be chosen in accordance with the plot size. The primary purpose of this macro is to allow the simple, semi-automated production of nice looking maps with a few command line arguments. For users seeking more control over the plot appearance, a number of additional optional arguments are provided. Truly ambitious users may edit the plot shellscript to take advantage of **GMT** capabilities not supported by this macro. A companion macro **mbm_grd3dplot** can be used similarly to generate 3D perspective views of gridded data.

The plot scripts generated by this macro will work with GMT version 5.0 and later, and are not compatible with earlier versions of GMT.

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SIMPLE DESCRIPTION OF BASIC OPTIONS

–A *magnitude[/azimuth/elevation]*
Sets the parameters which control the synthetic illumination of the gridded data (shaded relief). The value *magnitude* is an effective vertical exageration which modulates the intensity of the shading; typical values are in the 0.1 to 10 range. The value *azimuth* is the azimuth in degrees from north from which the data is illuminated. The value *elevation* is the elevation of the illumination

in degrees from horizontal. Defaults: *magnitude* = 0.2; *azimuth* = 0.0; *elevation* = 30.0;

–C *contour_control*
If **–C** is given alone, it causes unannotated contours to be drawn using a contour interval calculated from the data. The user may also use *contour_control* to specify the contour interval. See the COMPLETE DESCRIPTION OF OPTIONS section below for a more complete discussion.

–D *[flipcolor/flipshade]*
Normally, the color or grayscale tables used for color maps run from cool colors (or dark grays) for low grid values to hot colors (or light grays) for high grid values. This option reverses the color table so that cool colors (dark grays) correspond to high values and hot colors (light grays) to low values. If **–D** is given alone, it applies to the color table used for color or gray fill plots, shaded or unshaded. If the plot is to be shaded, either by synthetic illumination (**–G***2*) or using an intensity file (**–K** and **–G***3* options), then setting *flipshade* = 1 will cause the shading convention to be reversed (e.g. high intensities overlaid as light shading). Using **–D***0/1* will flip the shading convention but leave the default color convention.

–G *color_mode*
Turns on color fill plot and sets the style of the plot.
color_mode = 1: Color/gray fill.
color_mode = 2: Color/gray fill shaded by
synthetic illumination.
color_mode = 3: Color/gray fill shaded by
an intensity file. The **–K**
option must be used to specify
the intensity file.
color_mode = 4: Color/gray fill of slope
magnitude.
color_mode = 5: Color/gray fill shaded by
slope magnitude.

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

–I *grdfile*
Sets the name of the gridded data file to be plotted. Alternatively, *grdfile* may be a list of grid files (one filename on each line) to be plotted together.

–K *intensity_file*
Sets the name of the gridded data file containing intensity values to be used for shading the map. Alternatively, *grdfile* may be a list of grid files (one filename on each line) to be used together. If a list of file is supplied, the intensity files must conform in order to the data grid files they will shade.

–O *root*
Sets the root used to construct the filename of the output shellscript (*root*.cmd) and names of files created when the shellscript is run. Normally the name of the input grid file or grid file list is used as the *root*.

–P *pagesize*
This option sets the size of the page the plot will be centered on. If the user does not set the plot scale, the plot will be sized as large as will fit on the designated page. If the user sets the plot scale such that the plot will not fit on the designated page, a larger page will be used. The supported page sizes include ANSI A, B, C, D, E, F, and E1, as well as most metric page sizes. See the COMPLETE DESCRIPTION OF OPTIONS section below for a complete list of the supported page sizes. The default page size is A.

–S *[color/shade]*
This option enables effective histogram equalization of the color and/or shading of the gridded data. The equalization is not achieved by changing the data values, but rather by constructing the

color or shading tables so that the boundaries in the tables encompass equal fractions of the datapoints. This serves to focus color or shading contrasts in value ranges corresponding to the bulk of the data values. If **–S** is given alone or with *color* = 1, it enables equalization of the color table used for color or gray fill plots, shaded or unshaded. If the plot is to be shaded, either by synthetic illumination (**–G***2*) or using an intensity file (**–K** and **–G***3* options), then setting *shade* = 1 will cause the shading to be equalized. Using **–S***0/1* will equalize the shading without equalizing the color table.

–T If **–T** is given, it causes a coastline to be drawn on the map. The default is to draw the coastline as the thinnest possible line. To exercise greater control of the coastline plotting, including color fill of "dry" areas and display of lakes, rivers, and political boundaries, use the **–MTC**, **–MTD**, **–MTG**, **–MTI**, **–MTN**, **–MTS**, and **–MTW** options described in the COMPLETE DESCRIPTION OF OPTIONS section below.

–U *orientation*
Normally the orientation of the plot (portrait or landscape) is selected automatically so as to maximize the plot scale. The **–U** option allows the user to set the plot orientation. If *orientation* = 1, a portrait plot will be produced; if *orientation* = 2, a landscape plot will be produced.

–V Causes **mbm_grdplot** to operate in "verbose" mode so that it outputs more information than usual.

–W *[color_style*[*/palette*[*ncolors*]] | cptfile]
This option controls the color scheme used for color fill plots.

If *color_style* = 1 [default], then the color scheme used will be a continuous grading of colors. If *color_style* = 2, the color scheme will be a set of discrete color intervals. The color palette used is set using *palette*. Five palettes are available:

palette = 1: Haxby colors [default]
palette = 2: high Intensity colors
palette = 3: low Intensity colors
palette = 4: grayscale
palette = 5: uniform grayscale

A complete description of the color palettes is given in the COMPLETE DESCRIPTION OF OPTIONS section below.

The *ncolors* parameter sets the number of color values used in plotting, whether the colors are represented in a continuous color scale or a stepped, discrete color scale [default is 11].

If the option argument is the path to an existing **GMT** color palette (CPT) file, then that CPT file and its color scheme will be used for the plot

COMPLETE DESCRIPTION OF OPTIONS

–A *magnitude[/azimuth]*
Sets the parameters which control the synthetic illumination of the gridded data (shaded relief). The value *magnitude* is an effective vertical exageration which modulates the intensity of the shading; typical values are in the 0.1 to 0.5 range. The value *azimuth* is the azimuth from which the data is illuminated. Defaults: *magnitude* = 0.2; *azimuth* = 0.0;

–B *tickinfo*
Sets map boundary tickmark intervals. See the **psbasemap** manual page for details. By default the program chooses basemap annotations based on the map boundaries.

–C *contour_control*
If **–C** is given alone, it causes unannotated contours to be drawn using a contour interval calculated from the data. If *contour_control* is given, it specifies the contours to be drawn in one of three possible ways:

If *contour_control* has the suffix ".cpt" and can be opened as a file, it is assumed to be a color palette table. The color boundaries are then used as contour levels. If the cpt-file has anotation flags in the last column then those contours will be anotated. By default no contours are labeled; use **–MCA** to anotate all contours.

If *contour_control* is a file but not a cpt-file, it is expected to contain contour levels in column 1 and a C(ontour) OR A(nnotate) in col 2. The levels marked C (or c) are contoured, the levels marked A (or a) are contoured and annotated. Optionally, a third column may be present and contain the fixed anotation angle for this contour level.

If no file is found, then *contour_control* is interpreted as a constant contour interval.

If a file is given and **–MCT** is set, then only contours marked with upper case C or A will have tickmarks.

–D *[flipcolor/flipshade]*
Normally, the color or grayscale tables used for color maps run from cool colors (or dark grays) for low grid values to hot colors (or light grays) for high grid values. This option reverses the color table so that cool colors (dark grays) correspond to high values and hot colors (light grays) to low values. If **–D** is given alone, it applies to the color table used for color or gray fill plots, shaded or unshaded. If the plot is to be shaded, either by synthetic illumination (**–G***2*) or using an intensity file (**–K** and **–G***3* options), then setting *flipshade* = 1 will cause the shading convention to be reversed (e.g. high intensities overlaid as light shading). Using **–D***0/1* will flip the shading convention but leave the default color convention.

–F *contour_file*
Sets the name of the file to use for generating contour lines. The default is to use the file being plotted, but in some situations, it can be useful to specify a separate file for contouring. For example, one might wish to overlay a backscatter mosaic with bathymetry contours, or a shaded bathymetry map with gravity anomaly contours.

–G *color_mode*
Turns on color fill plot and sets the style of the plot.
color_mode = 1: Color/gray fill.
color_mode = 2: Color/gray fill shaded by
synthetic illumination.
color_mode = 3: Color/gray fill shaded by
an intensity file. The **–K**
option must be used to specify
the intensity file.
color_mode = 4: Color/gray fill of slope
magnitude.
color_mode = 5: Color/gray fill shaded by
slope magnitude.
See the **grdimage** manual page for information on shading with intensity files

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

–I *grdfile*
Sets the name of the gridded data file to be plotted. The data must be in a form acceptable to **GMT** version 3 programs (see the **GMT** Cookbook & Technical Reference). Alternatively, *grdfile* may be a list of grid files (one filename on each line) to be plotted together. This is useful when data from a region is broken up into several grid files rather than a single very large grid file.

–J *projection*[*/scale* | */width*]
Selects the map projection. By default the map projection is Mercator and the plot scale is chosen to fit on the selected page size (see **–P** option). The user may specify a different projection to be

used, in which case the plot scale is still automatically chosen to fit the page. The user may also specify both the projection and the plot scale. If the projection specifying character is upper case, a plot width rather than a plot scale is used. The scale values are specified in inch/degree or in 1:xxxxx ratios. Plot widths are specified in inches. If the user specifies a plot scale such that the plot will not fit on the default A size page, a appropriately larger page size will be chosen.

CYLINDRICAL PROJECTIONS:

–Jc*lon0/lat0/scale* (Cassini)
–Jm*scale* (Mercator)
–Joa*lon0/lat0/azimuth/scale* (Oblique Mercator – point and azimuth)
–Job*lon0/lat0/lon1/lat1/scale* (Oblique Mercator – two points)
–Joc*lon0/lat0/lonp/latp/scale* (Oblique Mercator – point and pole)
–Jq*lon0/scale* (Equidistant Cylindrical Projection (Plate Carree))
–Jt*lon0/scale* (TM – Transverse Mercator)
–Ju*zone/scale* (UTM – Universal Transverse Mercator)
–Jy*lon0/lats/scale* (Basic Cylindrical Projection)

AZIMUTHAL PROJECTIONS:

–Ja*lon0/lat0/scale* (Lambert).
–Je*lon0/lat0/scale* (Equidistant).
–Jg*lon0/lat0/scale* (Orthographic).
–Js*lon0/lat0/scale* (General Stereographic)

CONIC PROJECTIONS:

–Jb*lon0/lat0/lat1/lat2/scale* (Albers)
–Jl*lon0/lat0/lat1/lat2/scale* (Lambert)

MISCELLANEOUS PROJECTIONS:

–Jh*lon0/scale* (Hammer)
–Ji*lon0/scale* (Sinusoidal)
–Jk*lon0/scale* (Eckert VI)
–Jn*lon0/scale* (Robinson)
–Jr*lon0/scale* (Winkel Tripel)
–Jw*lon0/scale* (Mollweide)

NON-GEOGRAPHICAL PROJECTIONS:

–Jp*scale* (Linear projection for polar (theta,r) coordinates)
–Jx*x-scale*[**l|p***pow*][*/y-scale*[**l|p***pow*]] (Linear, log, and power scaling)
More details can be found in the **psbasemap** manpages.

–K *intensity_file*
Sets the name of the gridded data file containing intensity values to be used for shading the map. Alternatively, *grdfile* may be a list of grid files (one filename on each line) to be used together. If a list of files is supplied, the intensity files must conform in order to the list of data grid files they will shade.

–L *title:scalelabel*
Sets the title and the label for the colorscale (if used) of the plot. Note that a colon (:) rather than a slash (/) is used to separate the labels. Colons cannot be used in the labels themselves. If this option is not used, then a default title and colorscale label are provided. If the title is supplied alone, a default colorscale label will be provided. To force no title use **–L**" "; to force no title or

colorscale label use **–L**" : ".

–M A series of "miscellaneous" options are provided which are given as **–M** followed by a two character identifier, followed by any other parameters associated with that option. The **–M** options may be strung together separated by colons, e.g. "-MGQ100:GU:CA200/10", which is equivalent to "-MGQ –MGU –MCA200/10".

–MGD *gmtdef/value*
Allows the user to set the **GMT** default values used as the plot is constructed. This command may be given repeatedly to set as many **GMT** defaults as required. For example, to set the basemap annotation font to Courier, use "-MGDANOT_FONT/Courier".

–MGF *scale_loc*
Sets the location of the color scale. The possible values of *scale_loc* are:

scale_loc = b: bottom of plot
scale_loc = t: top of plot
scale_loc = l: left of plot
scale_loc = r: right of plot

[Default *scale_loc* = b]

–MGL [*f*][*x*]*lon0/lat0/slat/length*[*units*][+*llabel*]
Draws a simple map scale centered on *lon0/lat0*. Use **–Lf** to get a "fancy" scale [Default is plain]. Use **–Lx** to specify the position in inches instead of map units. The scale is calculated at latitude *slat*; if the string "center" is used instead of a numerical value for *slat*, then the macro will set the scaling according to the center of the plot bounds. The scale length value *length* is in km by default, but the units can be specified as one of e|f|k|M|n|u, where e = meters, f = feet, k = kilometers, M = statue miles, n = nautical miles, and u = US survey feet. Append *+l* to label the scale with the relevant units, or append *+l"label"* to set a different label string.

–MGQ *dpi*
Sets the resolution in dots per inch of the raster image used for color fill maps. Larger values of *dpi* produce larger Postscript plot files. [Default is 100].

–MGS *scalefactor*
The gridded data is multiplied by *scalefactor*. This option is most often used flip the sign of the data (*scalefactor* = –1). [Default no scaling]

–MGT *x/y/size/angle/font/just/text*
Causes a text label to plotted on the map. *size* is text size in points, *angle* is measured in degrees counter-clockwise from horizontal, *fontno* sets the font type, *justify* sets the alignment. If *fontno* starts with a leading hyphen, then the remainder of *fontno* is taken to be a textstring with the desired fontname. See the **gmtdefaults** man page for names and numbers of available fonts (or run **pstext –L**). The alignment number refers to the part of the textstring that will be mapped onto the (*x,y*) point: 1 = Lower Left corner, 2 = Lower Center, 3 = Lower Right, 5 = Mid Left, 6 = Mid Center, 7 = Mid Right, 9 = Upper Left, 10 = Upper Center, 11 = Upper Right. This option may be given as many times as needed.

–MGU [*/dx/dy/*][*label*]
Draw Unix System time stamp on plot. User may specify where the lower left corner of the stamp should fall on the page relative to lower left corner of plot in inch [Default is (-0.75,-0.75)]. Optionally, append a label, or **c** (which will plot the command string.)

–MCA *anot_int/*[*ffont_size*][*aangle*][*/r/g/b*][*o*]]
anot_int is annotation interval in data units. Ignored if contour levels are given in a file. [Default is no annotations]. Several options can be set to modify the form of the annotation. Append f*font_size* to change font size [9], append */r/g/b* to change color of text fill box [PAGE_COLOR], append a*angle* to fix annotation angle [Default follows contour], and append 'o' to draw the outline of the surrounding text box [Default is no outline].

–MCG *gap/width* **–MCQ***cut*
gap is distance in inch between each annotation along the same contour. *width* is number of points over which to estimate the best fitting slope for contour labels [Default is 4/10].

–MCQ *cut*
Do not draw contours with less than *cut* number of points [Draw all contours].

–MCT [+|-][*gap/length*][*:LH*]
Will draw tickmarks pointing in the downward direction every *gap* along the innermost closed contours. Append *gap* and tickmark length (in inch) or use defaults [0.2/0.05]. User may choose to tick only local highs or local lows by specifying **–T+** or **–T-**, respectively. Appending :LH will plot the characters L and H at the center of closed innermost contours (local lows and highs). L and H can be any single character (e.g., LH, –+, etc.) If a file is given by **–C** and **–T** is set, then only contours marked with upper case C or A will have tickmarks [and anotation].

–MCW
type[*pen*]
type, if present, can be 'a' for annotated contours or 'c' for regular contours [Default]. *pen* sets the attributes for the particular line. Default values for annotated contours: width = 3, color = black, texture = solid. Regular contours have default width = 1.

–MNA *[nhgt[/P] | P]*
Turns on filename annotation of navigation tracks. If **–MNA** is given without specifying any controlling parameters, then the lettering height *nhgt* is 0.15 and the filenames are plotted parallel to the navigation track from the start of the track. The lettering height can be specified using either **–MNA***nhgt* or **–MNA***nhgt/P*. If **–MNA***P* or **–MNA***nhgt/P* is specified, the filename will be plotted perpendicular to the navigation track. Filename annotation can also be specified using the **–N** option. Defaults: Filename annotation off.

–MNF *format*
Sets the data format for the input swath data specified with the **–MNI** option. If *format* < 0, then the input file specified with the **–MNI** option will actually contain a list of input swath sonar data files. This program uses the **MBIO** library and will read or write any swath sonar format supported by **MBIO**. A list of the swath sonar data formats currently supported by **MBIO** and their identifier values is given in the **MBIO** manual page. Default: *format* = –1.

–MNI *swathdata*
This option causes the navigation track of swath data to be plotted. Here *swathdata* is the input file, and may be either a single swath file or a list of swath files. If *format* > 0 (set with the **–MNF** option) then the swath sonar data contained in *swathdata* is read and processed. If *format* < 0 (the default), then *swathdata* is assumed to be an ascii file containing a list of the input swath sonar data files to be processed and their formats. The program will read the data in each one of these files. In the *swathdata* file, each data file should be followed by a data format identifier, e.g.:

datafile1 11
datafile2 24

This program uses the **MBIO** library and will read or write any swath sonar format supported by **MBIO**. A list of the swath sonar data formats currently supported by **MBIO** and their identifier values is given in the **MBIO** manual page.

–MNN [*ttick/tannot/dannot/tlen*[*/nhgt/nperp*] | *F* | *FP*]
This option sets the annotation of the swath file navigation plot specified using the **–MNI** option. Time marks are made with "X" marks along the shiptrack; annotated time marks show the time in HH:MM format next to the time mark and annotated date marks show the time and julian day in HH:MM/DDD format. The "X" marks are *tlen* inches high for normal time marks and 1.5 times *tlen* inches high for annotated time or date marks. The interval of time ticks, annotated time ticks, and annotated date ticks are given in hours by *ttick*, *tannot*, and *dannot*, respectively. If the *nhgt* parameter is not given when the other parameters are specified, then no filename annotation will be done. If given, *nhgt* sets the height in inches of the filename annotation and turns that annotation on. If given as 1, *nperp* causes the filename annotation to be perpendicular to the shiptrack

rather than parallel (the default). If the **–MNN***F* is given, then a navigation track will be generated using the default parameters and also with filename annotation along the shiptrack. If the **–MNN***FP* is given, then a navigation track will be generated with the default parameters and also with filename annotation perpendicular to the shiptrack. Defaults: *ttick* = 0.25; *tannot* = 1.0; *dannot* = 4.0; *tlen* = 0.1; *nhgt* = 0.1; *nperp* = 0.

–MNP *[pingnumber_tick/pingnumber_annot/pingnumber_tick_len]*
Turns on ping number (or shot number) annotation of navigation tracks. Tick marks are made along the shiptrack at *pingnumber_tick* intervals; these are *tlen* inches long. Longer tick marks are made along the shiptrack at *pingnumber_annot* intervals; these are 1.5 times *tlen* inches long. Defaults: Pingnumber annotation off. If the **–MNP** option is given without specifying the controlling parameters, then *pingnumber_tick* = 50, *pingnumber_annot* = 100, and *pingnumber_tick_len* = 0.1.

–MTC *fill*
Coastline plotting option. Set the shade (0-255), color (r/g/b), or pattern (p|Pdpi/pattern; see **–MTG**) for lakes [Default is the fill chosen for "wet" areas (-S)].

–MTD *resolution*
Coastline plotting option. Selects the resolution of the coastline data set to use ((f)ull, (h)igh, (i)ntermediate, (1)ow, and (c)rude). The resolution drops off by 80% between data sets. [Default is l].

–MTG *fill*
Coastline plotting option. Select painting or clipping of "dry" areas. Append a shade, color, pattern, or c for clipping. Specify the shade (0-255) or color (r/g/b), or **–MTG***pdpi/pattern*, where pattern gives the number of the built-in pattern (1-90) OR the name of a Sun 1-, 8-, or 24-bit raster file. dpi sets the resolution of the image. See **GMT** Cookbook & Technical Reference Appendix E for information on individual patterns.

–MTI *river[/pen]*
Coastline plotting option. Draw rivers. Specify the type of rivers and [optionally] append pen attributes [Default pen: width = 1, color = 0/0/0, texture = solid]. Choose from the list of river types below. Repeat option –I as often as necessary.
1 = Permanent major rivers
2 = Additional major rivers
3 = Additional rivers
4 = Minor rivers
5 = Intermittent rivers – major
6 = Intermittent rivers – additional
7 = Intermittent rivers – minor
8 = Major canals
9 = Minor canals
10 = Irrigation canals
a = All rivers and canals (1-10)
r = All permanent rivers (1-4)
i = All intermittent rivers (5-7)
c = All canals (8-10)

–MTN *border[/pen]*
Coastline plotting option. Draw political boundaries. Specify the type of boundary and [optionally] append pen attributes [Default pen: width = 1, color = 0/0/0, texture = solid]. Choose from the list of boundaries below. Repeat option **–MTN** as often as necessary.
1 = National boundaries
2 = State boundaries within the Americas
3 = Marine boundaries
a = All boundaries (1-3)

–MTS *fill*
Coastline plotting option. Select painting or clipping of "wet" areas. Append the shade (0-255), color (r/g/b), pattern (see **–MTG**), or c for clipping.

–MTW
pen
Coastline plotting option. Append pen attributes [Defaults: width = 1, color = 0/0/0, texture = solid].

–MXG *fill*
Select filling of symbols for xy plotting. Set the shade (0-255) or color (r/g/b) [Default is no fill]. To reset no fill, use *fill* = "N". For polygons, you may optionally specify **–Gp***icon_size/pattern*, where *pattern* gives the number of the image pattern (1-32) OR the name of a icon-format file. *icon_size* sets the unit size in inch. To invert black and white pixels, use **–GP** instead of **–Gp**. See **GMTs** Cookbook & Technical Reference Appendix E for information on individual patterns.

–MXI *xy_file*
Specifies a file containing (x,y) pairs to be plotted as lines or symbols. The line and symbol characteristics are set using the last **–MXG**, **–MXS**, and **–MXW** options used. All of the **–MX** commands can be given multiple times, so by stringing series of these commands together the user can plot different files using different line or symbol characteristics. [Default is a solid black line].

–MXM
Toggles expectation for xy data files having multiple segments, in which each segment is to be plotted separately. Segments are separated by a record whose first character is '>'. By default, unsegmented files are expected. Users may give this command multiple times, allowing some input files to be handled as segmented and others not.

–MXS *symbol/size*
Selects symbol to be used for plotting the next xy data file. Setting *symbol* = "N" causes line plotting. Choose between:

–MXSa
st**a**r. *size* is radius of circumscribing circle.

–MXSb
bar extending from *base* to y. *size* is bar width. By default, *base* = 0. Append /*base* to change this value. Append **u** if *size* is in x-units [Default is inch].

–MXSc
circle. *size* is diameter of circle.

–MXSd
diamond. *size* is side of diamond.

–MXSe
ellipse. Direction (in degrees counterclockwise from horizontal), major_axis (in inch), and minor_axis (in inch) must be found in columns 3, 4, and 5.

–MXSf
fault. Give distance gap between ticks and ticklength in inch. If gap is negative, it is interpreted to mean number of ticks instead. Append **l** or **r** to draw tick on the left or right side of line [Default is centered]. Upper case **L** or **R** draws a triangle instead of line segment.

–MXSh
hexagon. Give side in inch.

–MXSi **i**nverted triangle. Give side in inch.

–MXSl **l**etter or text string. Give size in inch, and append /*string* after the size. Note that the size is only approximate; no individual scaling is done for different characters. Remember to escape special characters like *.

–MXSp
point. No size needs to be specified (1 pixel is used).

–MXSs
square. Give side in inch.

–MXSt
triangle. Give side in inch.

–MXSv
vector. Direction (in degrees counterclockwise from horizontal) and length (in inch) must be found in columns 3 and 4. *size*, if present, will be interpreted as arrowwidth/headlength/headwidth (in inch) [Default is 0.03/0.12/0.1 inch]. By default arrow attributes remains invariant to the length of the arrow. To have the size of the vector scale down with decreasing size, append n*norm*, where vectors shorter than *norm* will have their attributes scaled by length/*norm*.

–MXSV
Same as **–MXSv**, except azimuth (in degrees east of north) should be given instead of direction. The azimuth will be mapped into an angle based on the chosen map projection (**–MXSv** leaves the directions unchanged.)

–MXSx
cross. Give length in inch.

–MXW
pen
Set pen attributes for xy plotting. See chapter 4.12 in the GMT Technical reference for a discussion of GMT pen values. [Defaults: width = 1, color = 0/0/0, texture = solid].

–O *root*
Sets the root used to construct the filename of the output shellscript (*root*.cmd) and names of files created when the shellscript is run. Normally the name of the input grid file or grid file list is used as the *root*.

–P *pagesize*
This option sets the size of the page the plot will be centered on. If the user does not set the plot scale, the plot will be sized as large as will fit on the designated page. If the user sets the plot scale such that the plot will not fit on the designated page, a larger page will be used. The supported page sizes are:

```
American ANSI sizes:
A     8.5 x 11.0 in.    ( 215.9 x  279.4 mm)
B    11.0 x 17.0 in.    ( 279.4 x  431.8 mm)
C    17.0 x 22.0 in.    ( 431.8 x  558.8 mm)
D    22.0 x 34.0 in.    ( 558.8 x  863.6 mm)
E    34.0 x 44.0 in.    ( 863.6 x 1117.6 mm)
F    28.0 x 40.0 in.    ( 711.2 x 1016.0 mm)
E1   44.0 x 68.0 in.    (1117.6 x 1727.2 mm)

Metric ISO A sizes:
A0   841.0 x 1189.0 mm  (33.11 x 46.81 in.)
A1   594.0 x  841.0 mm  (23.39 x 33.11 in.)
A2   420.0 x  594.0 mm  (16.54 x 23.39 in.)
A3   297.0 x  420.0 mm  (11.69 x 16.54 in.)
A4   210.0 x  297.0 mm  ( 8.27 x 11.69 in.)
A5   148.0 x  210.0 mm  ( 5.83 x  8.27 in.)
A6   105.0 x  148.0 mm  ( 4.13 x  5.83 in.)
A7    74.0 x  105.0 mm  ( 2.91 x  4.13 in.)
A8    52.0 x   74.0 mm  ( 2.05 x  2.91 in.)
```

```
A9    37.0 x   52.0 mm  ( 1.46 x  2.05 in.)
A10   26.0 x   37.0 mm  ( 1.02 x  1.46 in.)

Metric ISO B sizes:
B0   1000.0x 1414.0 mm  (39.37 x 55.67 in.)
B1   707.0 x 1000.0 mm  (27.83 x 39.37 in.)
B2   500.0 x  707.0 mm  (19.68 x 27.83 in.)
B3   353.0 x  500.0 mm  (13.90 x 19.68 in.)
B4   250.0 x  353.0 mm  ( 9.84 x 13.90 in.)
B5   176.0 x  250.0 mm  ( 6.93 x  9.84 in.)
B6   125.0 x  176.0 mm  ( 4.92 x  6.93 in.)
B7    88.0 x  125.0 mm  ( 3.46 x  4.92 in.)
B8    62.0 x   88.0 mm  ( 2.44 x  3.46 in.)
B9    44.0 x   62.0 mm  ( 1.73 x  2.44 in.)
B10   31.0 x   44.0 mm  ( 1.22 x  1.73 in.)

Metric ISO C sizes:
C0   914.4 x 1300.5 mm  (36.00 x 51.20 in.)
C1   650.2 x  914.4 mm  (25.60 x 36.00 in.)
C2   457.2 x  650.2 mm  (18.00 x 25.60 in.)
C3   325.1 x  457.2 mm  (12.80 x 18.00 in.)
C4   228.6 x  325.1 mm  ( 9.00 x 12.80 in.)
C5   162.6 x  228.6 mm  ( 6.40 x  9.00 in.)
C6   114.3 x  162.6 mm  ( 4.50 x  6.40 in.)
C7    81.3 x  114.3 mm  ( 3.20 x  4.50 in.)

     MB-System large format sizes:
m1  1371.6 x 1828.8 mm  (54.00 x 72.00 in.)
m2  1371.6 x 2133.6 mm  (54.00 x 84.00 in.)
m3  1371.6 x 2438.4 mm  (54.00 x 96.00 in.)
m4  1524.0 x 1828.8 mm  (60.00 x 72.00 in.)
m5  1524.0 x 2133.6 mm  (60.00 x 84.00 in.)
m6  1524.0 x 2438.4 mm  (60.00 x 96.00 in.)
```

The default page size is A.

–Q Normally, the output plot generation shellscript includes lines which execute a program to display the Postscript image on the screen. This option causes those lines to be commented out so that executing the shellscript produces a Postscript plot but does not attempt to display it on the screen. The program to be used to display the Postscript is set using **mbdefaults**; the default value can be overridden by setting the environment variable $MB_PS_VIEWER.

–R *west/east/south/north*
west, east, south, and *north* specify the Region of interest. To specify boundaries in degrees and minutes [and seconds], use the dd:mm[:ss] format. Append **r** if lower left and upper right map coordinates are given instead of wesn. You may ask for a larger *w/e/s/n* region to have more room between the image and the axes. A smaller region than specified in the grdfile will result in a subset of the grid [Default is region given by the grdfile].

–S *[color/shade]*
This option enables effective histogram equalization of the color and/or shading of the gridded data. The equalization is not achieved by changing the data values, but rather by constructing the color or shading tables so that the boundaries in the tables encompass equal fractions of the datapoints. This serves to focus color or shading contrasts in value ranges corresponding to the bulk of the data values. If **–S** is given alone or with *color* = 1, it enables equalization of the color table used for color or gray fill plots, shaded or unshaded. If the plot is to be shaded, either by

synthetic illumination (**–G***2*) or using an intensity file (**–K** and **–G***3* options), then setting *shade* = 1 will cause the shading to be equalized. Using **–S***0/1* will equalize the shading without equalizing the color table.

–T If **–T** is given, it causes a coastline to be drawn on the map. The default is to draw the coastline as the thinnest possible line. To exercise greater control of the coastline plotting, including color fill of "dry" areas and display of lakes, rivers, and political boundaries, use the **–MTC**, **–MTD**, **–MTG**, **–MTI**, **–MTN**, **–MTS**, and **–MTW** options.

–U *orientation*
Normally the orientation of the plot (portrait or landscape) is selected automatically so as to maximize the plot scale. The **–U** option allows the user to set the plot orientation. If *orientation* = 1, a portrait plot will be produced; if *orientation* = 2, a landscape plot will be produced.

–V Causes **mbm_grdplot** to operate in "verbose" mode so that it outputs more information than usual.

–W *[color_style*[*/palette*[*ncolors*]] | cptfile]
This option controls the color scheme used for color fill plots.

If *color_style* = 1 [default], then the color scheme used will be a continuous grading of colors. If *color_style* = 2, the color scheme will be a set of discrete color intervals. The color palette used is set using *palette*. Seven palettes are available:

palette = 1: Haxby colors [default]
palette = 2: high Intensity colors
palette = 3: low Intensity colors
palette = 4: grayscale
palette = 5: uniform grayscale
palette = 6: uniform black
palette = 7: uniform white
palette = 8: sealevel 1
palette = 9: sealevel 2

The RGB definitions of the color palettes are:

```
color palette 1 – Haxby Color Table
  red:   255 255 255 255 240 205 138 106  50  40  37
  green: 255 186 161 189 236 255 236 235 190 127  57
  blue:  255 133  68  87 121 162 174 255 255 251 175

color palette 2 – High Intensity Colors
  red:   255 255 255 255 128   0   0   0   0 128 255
  green:   0  64 128 255 255 255 255 128   0   0   0
  blue:    0   0   0   0   0   0 255 255 255 255 255

color palette 3 – Low Intensity Colors
  red:   200 194 179 141  90   0   0   0   0  90 141
  green:   0  49  90 141 179 200 141  90   0   0   0
  blue:    0   0   0   0   0   0 141 179 200 179 141

color palette 4 – Grayscale
  red:   255 230 204 179 153 128 102  77  51  26   0
  green: 255 230 204 179 153 128 102  77  51  26   0
  blue:  255 230 204 179 153 128 102  77  51  26   0

color palette 5 – Uniform Grayscale
  red:   128 128 128 128 128 128 128 128 128 128 128
```

```
 green: 128 128 128 128 128 128 128 128 128 128 128
 blue:  128 128 128 128 128 128 128 128 128 128 128

color palette 6 – Uniform Black
 red:    0  0  0  0  0  0  0  0  0  0  0
 green:  0  0  0  0  0  0  0  0  0  0  0
 blue:   0  0  0  0  0  0  0  0  0  0  0

color palette 7 – Uniform White
 red:   255 255 255 255 255 255 255 255 255 255 255
 green: 255 255 255 255 255 255 255 255 255 255 255
 blue:  255 255 255 255 255 255 255 255 255 255 255

color pallette 8 – Sealevel 1
 (colors here used above zero Haxby colors below)
 red:   250 245 240 235 230 221 212 211 210 205 200
 green: 250 240 230 221 212 201 190 180 170 160 150
 blue:  120 112 104  96  88  80  72  64  56  48  40

color pallette 9 – Sealevel 2
 (colors here used above zero Haxby colors below)
 red:   255 210 170 145 120 120 104  67  33   0   0
 green: 255 200 160 145 130 100 107 123 140 160 230
 blue:  100  75  50  45  40  30  24   7   0   0   0
```

The Haxby colors have been adapted from a palette developed by Dr. William Haxby of the Lamont-Doherty Earth Observatory; this palette is pleasing to the eye and well suited for shading. The high intensity colors describe linear paths through RGB space from red to blue to green to purple; because the colors are high intensity they are not well suited to shading. The low intensity colors are similar to the high intensity, but muted and thus well suited to shading. The grayscale palette runs linearly from white to black and is commonly used for plots of sidescan and amplitude data. The uniform grayscale is useful for non-color shaded relief plots.

The *ncolors* parameter sets the number of color values used in plotting, whether the colors are represented in a continuous color scale or a stepped, discrete color scale [default is 11].

If the option argument is the path to an existing **GMT** color palette (CPT) file, then that CPT file and its color scheme will be used for the plot

–X Normally, **mbm_grdplot** creates an executable shellscript and then exits. This option will cause the shellscript to be executed in the background before **mbm_grdplot** exits.

–Y Normally, **mbm_grdplot** generates nicely rounded numbers for the boundaries of the color palette. Often, the resulting color bounds extend well outside the range of the gridded data. This option causes the minimum and maximum color boundaries to exactly conform to the minimum and maximum values of the grid, or, if the **–Z** option is used, the minimum and maximum values specified by the user.

–Z *min/max[/mode]*
This option overrides the minimum and maximum values of the gridded data, affecting the color palette and the contour interval if those parameters are not specified by the user. By default (i.e. *mode* is omitted or equal to 0), the macro selects the color palette bounds so that they encompass *min* and *max* while using nicely rounded numbers. If *mode* is omitted or equal to 0, then the color palette will end near *min* and *max* whether it is linear stretched or histogram equalized. If *mode* = 1, then the color stretching calculations will be done using *min* and *max*, but then the first and last values in the color palette will be set to the actual minimum and maximum values.so that all the

data are displayed.

EXAMPLES

Suppose we have obtained two GRD files with dimensions of 127 by 194, one containing gridded bathymetry (grd_sb2112_example_bath) and the other gridded sidescan (grd_sb2112_example_ss). In order to generate a shellscript which will in turn generate a contour plot of the bathymetry, the following will suffice:

```
mbm_grdplot −Igrd_sb2112_example_bath −C \
   −V −Ogrd_sb2112_example_bathcont
```

In order to generate a color fill plot overlaid by contours, we use both the −G1 and −C options. Because the data has been gridded as bathymetry (positive down) rather than as topography (positive up), the default plot will have "hot" colors for deep regions and "cold" colors for shallow regions; this is the opposite of the convention we usually use. In order to fix the colors, we have to either rescale the data by multiplying the bathymetry by −1 (accomplished with −MGS-1), or flip the color palette (accomplished with −D). We use the latter approach:

```
mbm_grdplot −Igrd_sb2112_example_bath −G1 −C −D \
   −V −Ogrd_sb2112_example_bathfill
```

In order to generate a grayscale plot of the sidescan grid, we use −G1 and −W1/4. We also use −D so that high sidescan amplitudes are shown as dark.

```
mbm_grdplot −Igrd_sb2112_example_ss −G1 −D \
   −V −Ogrd_sb2112_example_ssfill
```

Now consider generating a shaded relief view of the gridded bathymetry. We choose to illuminate the bathymetry from the northeast (azimuth of 45 degrees) and to use a shading magnitude of 0.4 (-A0.4/45). Because this grid is so small, the default shaded relief image is likely to be grainy. To fix this problem, we specify a dots per inch resolution of 72 (-MGQ72); this will take longer and generate a larger plotfile, but the plot will look better. We also use the −L option to specify the title and color scale label for the plot. We also use the −X flag this so that the plot generation shellscript is executed immediately. Here is the command:

```
mbm_grdplot −Igrd_sb2112_example_bath \
   −G2 −A0.4/45 −D −MGQ72 −X −V \
   −L"Shaded Relief Bathymetry":"Depth (meters)" \
   −Osb2112_example_bathshade
```

Now, consider generating a plot of the bathymetry overlaid with the gridded sidescan. The sidescan overlay is specified using the −K option. We want the colors for the bathymetry to be chosen without histogram equalization, but we also want histogram equalization to be applied to the sidescan data used for shading. To do this, we use −S0/1, where the first number (0) specifies no histogram equalization of the color scale and the second number (1) causes histogram equalization of the shading sidescan data to be implemented. In order to maintain the convention that high sidescan amplitudes are black, we flip both the color palette (as in the previous example) and the shading scale with −D1/1. We could also flip the shading by specifying a negative shading magnitude (-A-0.4). In this case, we forgo specifying the image resolution, resulting in a grainy plot:

```
mbm_grdplot −Igrd_sb2112_example_bath \
   −G3 −Kgrd_sb2112_example_ss \
   −S0/1 −D1/1 −A0.4 −X −V \
   −L"Bathymetry Overlaid With Sidescan":"Depth (meters)" \
   −Osb2112_example_bathss
```

As an example, the contents of the plotting shellscript "grd_sb2112_example_bathfill.cmd" are:

```
#
# Shellscript to create Postscript plot of data in grd file
# Created by macro mbm_grdplot
#
# This shellscript created by following command line:
# mbm_grdplot −Igrd_sb2112_example_bath −G1 −C −D \
#          -V −Ogrd_sb2112_example_bathfill
#
# Save existing GMT defaults
echo Saving GMT defaults...
gmtdefaults −L > gmtdefaults$$
#
# Set new GMT defaults
echo Setting new GMT defaults...
gmtset ANOT_FONT Helvetica
gmtset LABEL_FONT Helvetica
gmtset HEADER_FONT Helvetica
gmtset ANOT_FONT_SIZE 8
gmtset LABEL_FONT_SIZE 8
gmtset HEADER_FONT_SIZE 10
gmtset FRAME_WIDTH 0.074999999999999997
gmtset TICK_LENGTH 0.074999999999999997
gmtset PAGE_ORIENTATION LANDSCAPE
gmtset COLOR_BACKGROUND 0/0/0
gmtset COLOR_FOREGROUND 255/255/255
gmtset COLOR_NAN 255/255/255
#
# Make color palette table file
echo Making color palette table file...
echo   3000 255 255 255   3150 255 186 133 > \     grd_sb2112_example_bathfill.cpt
echo   3150 255 186 133   3300 255 161  68 >> \    grd_sb2112_example_bathfill.cpt
echo   3300 255 161  68   3450 255 189  87 >> \    grd_sb2112_example_bathfill.cpt
echo   3450 255 189  87   3600 240 236 121 >> \    grd_sb2112_example_bathfill.cpt
echo   3600 240 236 121   3750 205 255 162 >> \    grd_sb2112_example_bathfill.cpt
echo   3750 205 255 162   3900 138 236 174 >> \    grd_sb2112_example_bathfill.cpt
echo   3900 138 236 174   4050 106 235 255 >> \    grd_sb2112_example_bathfill.cpt
echo   4050 106 235 255   4200  50 190 255 >> \    grd_sb2112_example_bathfill.cpt
echo   4200  50 190 255   4350  40 127 251 >> \    grd_sb2112_example_bathfill.cpt
echo   4350  40 127 251   4500  37  57 175 >> \    grd_sb2112_example_bathfill.cpt
#
# Make color image
echo Running grdimage...
grdimage grd_sb2112_example_bath −Jm24.418434289993325 \
      −R114.221/114.421/-31.9001/-31.6377 \
      −Cgrd_sb2112_example_bathfill.cpt \
      −P −X1.8081565710006675 −Y2 −K −V \
      > grd_sb2112_example_bathfill.ps
#
# Make contour plot
echo Running grdcontour...
grdcontour grd_sb2112_example_bath −Jm24.418434289993325 \
      −R114.221/114.421/-31.9001/-31.6377 \
```

```
        −C50 \
        −L3144.51/4499.44 −Wc1p \
        −P −K −O −V >> grd_sb2112_example_bathfill.ps
#
# Make color scale
echo Running psscale...
psscale −Cgrd_sb2112_example_bathfill.cpt \
        −D2.4418/-0.5000/4.8837/0.1500h \
        −B":.Data Values:" \
        −P −K −O −V >> grd_sb2112_example_bathfill.ps
#
# Make basemap
echo Running psbasemap...
psbasemap −Jm24.418434289993325 \
        −R114.221/114.421/-31.9001/-31.6377 \
        −B5m/5m:."Data File grd_sb2112_example_bath": \
        −P −O −V >> grd_sb2112_example_bathfill.ps
#
# Delete surplus files
echo Deleting surplus files...
rm −f grd_sb2112_example_bathfill.cpt
#
# Reset GMT default fonts
echo Resetting GMT fonts...
mv gmtdefaults$$ .gmtdefaults
#
# Run xpsview
echo Running xpsview in background...
xpsview −ps a −maxp 4m grd_sb2112_example_bathfill.ps &
#
# All done!
echo All done!
```

SEE ALSO

grdimage(1), **grdcontour**(1), **mbdefaults**(1), **mbgrid**(1), **mbsystem**(1), **mbm_grd3dplot**(1), **mbm_plot**(1), **psbasemap**(1), **pstext**(1), **psxy**(1)

BUGS

By making this macro more useful, we have also made it more complex.