NAME

mbprocess − this program performs a variety of swath data processing functions in a single step (producing a single output swath data file), including merging navigation, recalculating bathymetry from travel time and angle data by raytracing through a layered water sound velocity model, applying changes to ship draft, roll bias and pitch bias, applying tides, and applying bathymetry edits from edit save files.

VERSION

Version 5.0

SYNOPSIS

mbprocess −I*infile* [**−F***format* **−N −O***outfile* **−P −S −T −V −H**]

DESCRIPTION

The program **mbprocess** is a tool for processing swath sonar bathymetry data. This program can perform a variety of swath data processing functions in a single step (producing a single output swath data file), including:

− Merge edited navigation generated by **mbnavedit**.
− Apply bathymetry edit flags from **mbedit**
 and **mbclean**
− Recalculate bathymetry from raw travel time and
 angle data by raytracing through water sound speed
 models from **mbvelocitytool** or **mbsvplist**.
− Apply changes to roll bias, pitch bias, heading
 bias, and draft values.
− Recalculate sidescan from raw backscatter samples
 (Simrad multibeam data only).
− Apply corrections to sidescan based on amplitude vs
 grazing angle tables obtained with **mbbackangle**.
− Apply tides to bathymetry.
− Insert metadata.

The actions of **mbprocess** are controlled by text parameter files. Each **mbprocess** parameter file contains single line commands that set processing modes and parameters. The program **mbset** can be used to create and modify **mbprocess** parameter files. Other programs such as **mbedit**, **mbnavedit**, **mbvelocitytool**, **mbnavadjust**, and **mbclean** modify or create (if needed) **mbprocess** parameter files.

The input file "infile" must be specified with the **−I** option. If "infile" is a datalist, then **mbprocess** will attempt to process each swath data file identified by recursively reading the datalist. Otherwise, **mbprocess** will attempt to process "infile" directly.

For any swath data file "datafile", the program will look for and use a parameter file with the name "datafile.par". If no parameter file exists, **mbprocess** will infer a reasonable processing path by looking for navigation and mbedit edit save files.The data format can also be specified, though the program can infer the format if the standard MB−System suffix convention is used (*.mbXX where XX is the MB−System format id number).

The processed output swath files produced by **mbprocess** are named using a convention based on the data format id. **MB−System** data formats are specified using two−digit or three−digit numbers (see the **MBIO** manual page). If an input swath data file is named "root.mbXX", where XX is the format id, then the default processed output file will be "rootp.mbXX" (e.g. mydata.mb71 −> mydatap.mb71). The "p" inserted before the ".mbXX" suffix indicates the output file has been created by **mbprocess**. If the input file does not follow the *.mbXX naming convention, then the output filename will just consist of the input name with "p.mbXX" added as a suffix (e.g. mydata −> mydatap.mb71)

By default, **mbprocess** will only process a swath data file if the processed output file is either missing or out of date relative to the input swath data file, the parameter file, or any of the ancillary data files referred to in the parameter file (e.g. navigation files, edit save files, svp files). If the **−P** option is specified, **mbprocess** will process every file, whether it needs it or not.

MBPROCESS PARAMETER FILE COMMANDS

The **mbprocess** commands found in parameter files are:

```
 GENERAL PARAMETERS:
  EXPLICIT
       causes mbprocess to set modes implicitely
       − e.g. the SVPFILE command will also set
         raytracing on even if the RAYTRACE command
         is not given [explicit mode commands required]
  FORMAT constant
       sets format id [no default]
  INFILE filename
       sets input file path [no default]
  OUTFILE filename
       sets output file path [no default]

 NAVIGATION MERGING:
  NAVMODE boolean
       sets navigation merging [0]
         0: navigation merge off
         1: navigation merge on
  NAVFILE filename
       sets navigation file path [no default]
  NAVFORMAT constant
       sets navigation file format [9]
             see below for documentation of the
             supported navigation formats
  NAVHEADING boolean
       sets heading to be merged from navigation file
       − note: heading merged from navigation before
         heading correction applied
         0: heading not changed
         1: heading merged from navigation file
  NAVSPEED boolean
       sets speed to be merged from navigation file
         0: speed not changed
         1: speed merged from navigation file
  NAVDRAFT boolean
       sets draft to be merged from navigation file
       − note: draft merged from navigation before
         draft correction applied
         0: draft not changed
         1: draft merged from navigation file
  NAVATTITUDE boolean
       sets roll, pitch and heave to be merged from
       navigation file
       − note: roll, pitch, and heave merged from
         navigation before roll bias and pitch bias
         corrections applied
```

0: roll, pitch, and heave not changed
1: roll, pitch, and heave merged from
navigation file
NAVINTERP boolean
sets navigation interpolation algorithm [0]
0: linear interpolation (recommended)
1: spline interpolation
NAVTIMESHIFT constant
sets navigation time shift (seconds) [0.0]
– note: time shift added to timestamps of
navigation fixes read in from NAVFILE
prior to merging

NAVIGATION OFFSETS AND SHIFTS:
– These offsets and shifts will be applied to the
original navigation and to any merged navigation,
but will not be applied to adjusted navigation
(because generally adjusted navigation generated
by mbnavadjust already has offsets and shifts
applied).
NAVSHIFT boolean
sets navigation offset [0]
– note: offsets and shifts are applied to navigation
values from both survey and navigation records, and
are applied to navigation read in from
NAVFILE prior to merging
– note: offsets and shifts are NOT applied to adjusted
navigation values from NAVADJFILE
NAVOFFSETX constant
sets navigation athwartship offset (meters) [0.0]
– note: the effective navigation shift is
(NAVOFFSETX − SONAROFFSETX), and the
navigation is corrected by subtracting
this effective shift.
– note: athwartship shift is positive to
starboard.
NAVOFFSETY constant
sets navigation fore−aft offset (meters) [0.0]
– note: the effective navigation shift is
(NAVOFFSETY − SONAROFFSETY), and the
navigation is corrected by subtracting
this effective shift.
– note: fore−aft shift is positive forward.
NAVOFFSETZ constant
sets navigation vertical offset (meters) [0.0]
– note: this value is not yet used for
anything.
– note: vertical shift is positive down.
NAVSHIFTLON constant
sets navigation longitude shift (degrees) [0.0]
NAVSHIFTLAT constant
sets navigation latitude shift (degrees) [0.0]

ADJUSTED NAVIGATION MERGING:

NAVADJMODE mode
sets navigation merging from mbnavadjust [0]
– can apply to longitude and latitude only
or longitude, latitude, and depth offset
0: adjusted navigation merge off
1: adjusted navigation merge on
2: adjusted navigation and depth offset merge on
NAVADJFILE filename
sets adjusted navigation file path
– this file supercedes navigation file for
lon and lat only
– uses mbnavadjust output
NAVADJINTERP boolean
sets adjusted navigation interpolation algorithm [0]
0: linear interpolation (recommended)
1: spline interpolation

ATTITUDE MERGING:
ATTITUDEMODE mode
sets attitude (roll, pitch, and heave) merging [0]
– roll, pitch, and heave merged before
roll bias and pitch bias corrections applied
– attitude merging from a separate file supersedes
attitude merging from a navigation file
0: attitude merging off
1: attitude merging on
ATTITUDEFILE filename
sets attitude file path
ATTITUDEFORMAT constant
sets attitude file format [1]
– attitude files can be in one of four ASCII
table formats
1: format is <time_d roll pitch heave>
2: format is <yr mon day hour min sec roll pitch heave>
3: format is <yr jday hour min sec roll pitch heave>
4: format is <yr jday daymin sec roll pitch heave>
– time_d = decimal seconds since 1/1/1970
– daymin = decimal minutes start of day
– roll = positive starboard up, degrees
– pitch = positive forward up, degrees
– heave = positive up, meters

SONARDEPTH MERGING:
SONARDEPTHMODE mode
sets sonardepth merging [0]
– sonardepth merged before
draft corrections applied
– sonardepth merging from a separate file supersedes
draft merging from a navigation file
0: sonardepth merging off
1: sonardepth merging on
SONARDEPTHFILE filename
sets sonardepth file path
SONARDEPTHFORMAT constant

sets sonardepth file format [1]
– sonardepth files can be in one of four ASCII
table formats
1: format is <time_d sonardepth>
2: format is <yr mon day hour min sec sonardepth>
3: format is <yr jday hour min sec sonardepth>
4: format is <yr jday daymin sec sonardepth>
– time_d = decimal seconds since 1/1/1970
– daymin = decimal minutes start of day
– sonardepth = sonar depth positive down, meters

DATA CUTTING:
DATACUTCLEAR
removes all existing data cutting commands
DATACUT kind mode min max
adds new data cutting command, where:
kind = 0 : cut applied to bathymetry data
kind = 1 : cut applied to amplitude data
kind = 2 : cut applied to sidescan data
mode = 0 : min and max indicate start and end
beam/pixel numbers between which data
are flagged or zeroed
mode = 1 : min and max indicate start and end
acrosstrack distance (m) between which
data are flagged or zeroed
BATHCUTNUMBER min max
adds new bathymetry data cutting command where
min and max are the start and end beam numbers
between which data are flagged (note that
flagging bathymetry also flags amplitude data)
BATHCUTDISTANCE min max
adds new bathymetry data cutting command where
min and max are the start and end acrosstrack
distance (m) between which data are flagged
(note that flagging bathymetry also flags
amplitude data)
BATHCUTSPEED min max
adds new bathymetry data cutting command where
all beams are flagged for pings with a ship
or vehicle speed less than min or greater than
max (note that flagging bathymetry also flags
amplitude data)
AMPCUTNUMBER min max
adds new amplitude data cutting command where
min and max are the start and end beam numbers
between which amplitude data are zeroed (note
that zeroing amplitude data has no impact on
bathymetry data)
AMPCUTDISTANCE min max
adds new amplitude data cutting command where
min and max are the start and end acrosstrack
distance (m) between which amplitude data are
zeroed (note that zeroing amplitude data has
no impact on bathymetry data)

AMPCUTSPEED min max
adds new amplitude data cutting command where
all amplitude values are zeroed for pings with
a ship or vehicle speed less than min or greater
than max (note that zeroing amplitude data has
no impact on bathymetry data)
SSCUTNUMBER min max
adds new sidescan data cutting command where
min and max are the start and end pixel numbers
between which sidescan data are zeroed (note
that zeroing sidescan data has no impact on
bathymetry data)
SSCUTDISTANCE min max
adds new sidescan data cutting command where
min and max are the start and end acrosstrack
distance (m) between which sidescan data are
zeroed (note that zeroing sidescan data has
no impact on bathymetry data)
SSCUTSPEED min max
adds new sidescan data cutting command where
all sidescan values are zeroed for pings with
a ship or vehicle speed less than min or greater
than max (note that zeroing sidescan data has
no impact on bathymetry data)

BATHYMETRY EDITING:
EDITSAVEMODE boolean
turns on reading edit save file (from mbedit) [0]
EDITSAVEFILE filename
sets edit save file path (from mbedit) [none]

BATHYMETRY RECALCULATION:
SVPMODE mode
sets usage of a water sound speed model (sound
velocity profile, or SVP) [0]
0: bathymetry recalculation by raytracing off
1: bathymetry recalculation by raytracing on
2: translate depths from corrected to uncorrected
or vice versa depending on SOUNDSPEEDREF
command
SVPFILE filename
sets SVP file path [no default]
SSVMODE boolean
sets surface sound velocity (SSV) mode [0]
0: use SSV from file
1: offset SSV from file (set by SSV command)
2: use constant SSV (set by SSV command)
SSV constant/offset
sets SSV value or offset (m/s) [1500.0]
ANGLEMODE mode
sets handling of beam angles during
raytracing [1]
0: angles not changed before raytracing
1: angles adjusted using Snell's Law for

the difference between the surface sound
velocity (SSV) and the sound speed at
the sonar depth in the SVP.
2: angles adjusted using Snell's Law and
the sonar array geometry for the
difference between the surface sound
velocity (SSV) and the sound speed at
the sonar depth in the SVP.
TTMULTIPLY multiplier
sets value multiplied by travel times [1.0]
SOUNDSPEEDREF boolean
determines the handling of the sound
speed reference for bathymetry [1]
– note: if raytracing is turned off then
this command implies correcting or
uncorrecting using the SVP specified
with the SVPFILE command
0: produce "uncorrected" bathymetry
referenced to a uniform 1500 m/s
water sound speed model.
1: produce "corrected" bathymetry
referenced to a realistic water
sound speed model.

STATIC BEAM BATHYMETRY OFFSETS:
STATICMODE mode
sets offsetting of bathymetry by
per-beam statics [0]
0: static correction off
1: static correction by beam number
2: static correction by acrosstrack beam angle
STATICFILE filename
sets static per-beam file path [no default]
– static files are two-column ascii tables
– if correction is by beam number then
the beam # is in column 1 and
the depth offset is in m in column 2
– if correction is by beam angle then
the beam angle (starboard positive)
is in column 1 and
the depth offset is in m in column 2

DRAFT CORRECTION:
DRAFTMODE mode
sets draft correction [0]
– note: draft merged from navigation before
draft correction applied
0: no draft correction
1: draft correction by offset
2: draft correction by multiply
3: draft correction by offset and multiply
4: draft set to constant
DRAFT constant
sets draft value (m) [0.0]

DRAFTOFFSET offset
sets value added to draft (m) [0.0]
DRAFTMULTIPLY multiplier
sets value multiplied by draft [1.0]

HEAVE CORRECTION:
HEAVEMODE mode
sets heave correction [0]
– note: heave correction by offset and/or
multiplication is added to any lever
heave correction, and then either used in
bathymetry recalculation or added to
existing bathymetry
0: no heave correction
1: heave correction by offset
2: heave correction by multiply
3: heave correction by offset and multiply
HEAVEOFFSET offset
sets value added to heave (m)
HEAVEMULTIPLY multiplier
sets value multiplied by heave

LEVER CORRECTION:
LEVERMODE mode
sets heave correction by lever calculation [0]
– note: lever heave correction is added to
any heave correction by offset and/or
multiplication, and then either used in
bathymetry recalculation or added to
existing bathymetry
0: no lever calculation
1: heave correction by lever calculation
VRUOFFSETX constant
sets athwartships offset of attitude sensor (m)
– note: positive to starboard
VRUOFFSETY constant
sets fore−aft offset of attitude sensor (m)
– note: positive forward
VRUOFFSETZ constant
sets vertical offset of attitude sensor (m)
– note: positive down
SONAROFFSETX constant
sets athwartships offset of sonar receive array (m)
– note: positive to starboard
SONAROFFSETY constant
sets fore−aft offset of sonar receive array (m)
– note: positive forward
SONAROFFSETZ constant
sets vertical offset of sonar receive array (m)
– note: positive down

ROLL CORRECTION:
ROLLBIASMODE mode
sets roll correction [0]

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          0: no roll correction
          1: roll correction by single roll bias
          2: roll correction by separate port and
             starboard roll bias
  ROLLBIAS offset
       sets roll bias (degrees)
  ROLLBIASPORT offset
       sets port roll bias (degrees)
  ROLLBIASSTBD offset
       sets starboard roll bias (degrees)

PITCH CORRECTION:
  PITCHBIASMODE mode
       sets pitch correction [0]
          0: no pitch correction
          1: pitch correction by pitch bias
  PITCHBIAS offset
       sets pitch bias (degrees)

HEADING CORRECTION:
  HEADINGMODE mode
       sets heading correction [no heading correction]
       – note: heading merged from navigation before
          heading correction applied
          0: no heading correction
          1: heading correction using course
             made good
          2: heading correction by offset
          3: heading correction using course
             made good and offset
  HEADINGOFFSET offset
       sets value added to heading (degrees)

TIDE CORRECTION:
  TIDEMODE mode
       sets tide correction [0]
       – note: tide added to bathymetry after
          all other calculations and corrections
          0: tide correction off
          1: tide correction on
  TIDEFILE filename
       sets tide file path
  TIDEFORMAT constan
       sets tide file format [1]
       – tide files can be in one of four ASCII
          table formats
          1: format is <time_d tide>
          2: format is <yr mon day hour min sec tide>
          3: format is <yr jday hour min sec tide>
          4: format is <yr jday daymin sec tide>
       – time_d = decimal seconds since 1/1/1970
       – daymin = decimal minutes start of day

AMPLITUDE CORRECTION:
```

```
  AMPCORRMODE  boolean
      sets correction of amplitude for
      amplitude vs grazing angle function
        0: amplitude correction off
        1: amplitude correction on
  AMPCORRFILE filename
      sets amplitude correction file path
      [no default]
  AMPCORRTYPE mode
      sets sidescan correction type [0]
        0: correction by subtraction (dB scale)
        1: correction by division (linear scale)
  AMPCORRSYMMETRY boolean
      forces correction function to be symmetric [1]
  AMPCORRANGLE constant
      sets amplitude correction reference angle
      (deg) [30.0]
  AMPCORRSLOPE mode
      sets amplitude correction slope mode [0]
        0: local slope ignored in calculating correction
        1: local slope used in calculating correction
        2: topography grid used in calculating correction
                     but slope ignored
        3: local slope from topography grid used in
                      calculating correction

SIDESCAN CORRECTION:
  SSCORRMODE  boolean
      sets correction of sidescan for
      amplitude vs grazing angle function
        0: sidescan correction off
        1: sidescan correction on
  SSCORRFILE filename
      sets sidescan correction file path
      [no default]
  SSCORRTYPE mode
      sets sidescan correction type [0]
        0: correction by subtraction (dB scale)
        1: correction by division (linear scale)
  SSCORRSYMMETRY boolean
      forces correction function to be symmetric [1]
  SSCORRANGLE constant
      sets sidescan correction reference angle
      (deg) [30.0]
  SSCORRSLOPE mode
      sets sidescan correction slope mode [0]
        0: local slope ignored in calculating correction
        1: local slope used in calculating correction
        2: topography grid used in calculating correction
                     but slope ignored
        3: local slope from topography grid used in
                      calculating correction
  AMPSSCORRTOPOFILE
      Sets topography grid used for correcting amplitude
```

```
      and sidescan

  SIDESCAN RECALCULATION:
    SSRECALCMODE  boolean
      sets recalculation of sidescan for
      Simrad multibeam data
        0: sidescan recalculation off
        1: sidescan recalculation on
    SSPIXELSIZE constant
      sets recalculated sidescan pixel size (m) [0.0]
      – a zero value causes the pixel size to
        be recalculated for every data record
    SSSWATHWIDTH  constant
      sets sidescan swath width (degrees) [0.0]
      – a zero value causes the swath width
        to be recalculated for every data record
    SSINTERPOLATE  constant
      sets sidescan interpolation distance
      (number of pixels)

  METADATA INSERTION:
    METAVESSEL string
      sets mbinfo metadata string for vessel
    METAINSTITUTION string
      sets mbinfo metadata string for vessel
      operator institution or company
    METAPLATFORM string
      sets mbinfo metadata string for sonar
      platform (ship or vehicle)
    METASONAR string
      sets mbinfo metadata string for sonar
      model name
    METASONARVERSION string
      sets mbinfo metadata string for sonar
      version (usually software version)
    METACRUISEID string
      sets mbinfo metadata string for institutional
      cruise id
    METACRUISENAME string
      sets mbinfo metadata string for descriptive
      cruise name
    METAPI string
      sets mbinfo metadata string for principal
      investigator
    METAPIINSTITUTION string
      sets mbinfo metadata string for principal
      investigator
    METACLIENT string
      sets mbinfo metadata string fo data owner
      (usually PI institution)
    METASVCORRECTED boolean
      sets mbinfo metadata boolean for sound
      velocity corrected depths
    METATIDECORRECTED boolean
```

sets mbinfo metadata boolean for tide
corrected bathymetry
METABATHEDITMANUAL boolean
sets mbinfo metadata boolean for manually
edited bathymetry
METABATHEDITAUTO boolean
sets mbinfo metadata boolean for automatically
edited bathymetry
METAROLLBIAS constant
sets mbinfo metadata constant for roll bias
(degrees + to starboard)
METAPITCHBIAS constant
sets mbinfo metadata constant for pitch bias
(degrees + forward)
METAHEADINGBIAS constant
sets mbinfo metadata constant for heading bias
METADRAFT constant
sets mbinfo metadata constant for vessel draft (m)

PROCESSING KLUGES:
KLUGE001 boolean
enables correction of travel times in
Hydrosweep DS2 data from the R/V Maurice
Ewing in 2001 and 2002.
KLUGE002 boolean
enables correction of draft values in
Simrad data
– some Simrad multibeam data has had an
error in which the heave has bee added
to the sonar depth (draft for hull
mounted sonars)
– this correction subtracts the heave
value from the sonar depth
KLUGE003 boolean
enables correction of beam angles in
SeaBeam 2112 data
– a data sample from the SeaBeam 2112 on
the USCG Icebreaker Healy (collected on
23 July 2003) was found to have an error
in which the beam angles had 0.25 times
the roll added
– this correction subtracts 0.25 * roll
from the beam angles before the bathymetry
is recalculated by raytracing through a
water sound velocity profile
– the mbprocess parameter files must be
set to enable bathymetry recalculation
by raytracing in order to apply this
correction
KLUGE004 boolean
deletes survey data associated with duplicate
or reversed time tags
– if survey data records are encountered
with time tags less than or equal to the

last good time tag, an error is set and
the data record is not output to the
processed data file.

KLUGE005 boolean
replaces survey record timestamps with
timestamps of corresponding merged navigation
records
– this feature allows users to fix
timestamp errors using MBnavedit and
then insert the corrected timestamps
into processed data

KLUGE006 boolean
changes sonar depth / draft values without
changing bathymetry values

KLUGE007 boolean
processing kluge 007 (not yet defined)
– occasionaly odd processing problems will
occur that are specific to a particular
survey or sonar version
– mbprocess will allow one−time fixes to
be defined as "kluges" that can be turned
on through the parameter files.

ANCILLARY DATA FILES

MB−System also uses a number of ancillary data files, most of which relate to **mbprocess** in some way. By default, these ancillary data files are named by adding a short suffix to the primary data file name (e.g. ".par", ".svp", ".esf", ".nve")

The common ancillary files are listed below. The example names given here follow from an input swath data file name of mydata.mb71.

The processing parameter file used by **mbprocess** has an ".par" suffix. These files are generated or modified by **mbset**, **mbedit**, **mbnavedit**, **mbvelocitytool**, **mbnavadjust**, and **mbclean**.

mydata.mb71.par

The most prominent ancillary files are metadata or "inf" files (created from the output of **mbinfo**). Programs such as **mbgrid** and **mbm_plot** try to check "inf" files to see if the corresponding data files include data within desired areas. The program **mbprocess** automatically generates an "inf" file for any processed output swath file. Also, the program **mbdatalist** is often used to create or update "inf" files for large groups of swath data files.

mydata.mb71.inf

The "fast bath" or "fbt" files are generated by copying the swath bathymetry to a sparse, quickly read format (format 71). Programs such as **mbgrid**, **mbswath**, and **mbcontour** will try to read "fbt" files instead of the full data files whenever only bathymetry information are required. The program **mbprocess** automatically generates an "fbt" file for any processed output swath file. Also, the program **mbdatalist** is often used to create or update "fbt" files for large groups of swath data files. These files are not generated or used when the original swath data is already in a compact bathymetry−only data format.

mydata.mb71.fbt

The "fast nav" or "fnv" files are just ASCII lists of navigation generated using **mblist** with a **−O***tMXYHSc* option. Programs such as **mbgrid**, **mbswath**, and **mbcontour** will try to read "fnv" files instead of the full data files whenever only navigation information are required. These files are not generated or used when the original data is already in a single−beam or navigation data format.

mydata.mb71.fnv

The bathymetry edit save file generated by **mbedit** and **mbclean** has an ".esf" suffix.
mydata.mb71.esf

A water sound velocity profile (SVP) file generated by **mbvelocitytool** has an ".svp" suffix unless the user specifies otherwise.
mydata.mb71.svp

Water sound velocity profile (SVP) files generated by **mbsvplist** also use the ".svp" suffix. However, multiple SVP files may be extracted from each input swath file, so the files are numbered using a "_YYY.svp" suffix, where YYY increments from 001.
mydata.mb71_001.svp
mydata.mb71_002.svp
mydata.mb71_003.svp

Edited navigation files generated by **mbnavedit** have an ".nve" suffix:
mydata.mb71.nve
These navigation files can be read independently using format 166.

Adjusted navigation files generated by **mbnavadjust** have an ".naY" suffix, where "Y" is a number between 0−9. The **mbnavadjust** package may be used multiple times for a survey; the adjustments are numbered sequentially from "0":
mydata.mb71.na0
mydata.mb71.na1
mydata.mb71.na2
and so on. These navigation files can be read independently using format 166.

AUTHORSHIP

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OPTIONS

−F *format*
Sets the **MBIO** integer format identifier for the input file specified with the **−I** option. By default, **mbprocess** derives the format id from the **mbprocess** parameter file associated with the input file (**−I** option) or, if necessary, infers the format from the "*.mbXX" **MB−System** suffix convention.

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

−I *infile*
Swath data file from which the input data will be read, or a datalist file containing a list of input swath data files and/or other datalist files. If *infile* is a datalist file, then **mbprocess** will attempt to process all data files identified by recursively reading *infile*.

−N
By default, **mbprocess** passes any comment records it encounters in the input data to the output data file and additionally embeds new comment records detailing the processing parameters used by **mbprocess**. This option causes **mbprocess** to not pass new or old comment records to the output data file.

−O *outfile*
Data file to which the output data will be written. If no output file is specified, the output filename

is set automatically. If an input swath data file is named "root.mbXX", where XX is the format id, then the default processed output file will be "rootp.mbXX". The "p" inserted before the ".mbXX" suffix indicates the output file has been created by **mbprocess**. If the input file does not follow the *.mbXX naming convention, then the output filename will just consist of the input name with "p.mbXX" added as a suffix.

−P

By default, **mbprocess** will only process a swath data file if the processed output file is either missing or out of date relative to the input swath data file, the parameter file, or any of the ancillary data files referred to in the parameter file (e.g. navigation files, edit save files, svp files). If the **−P** option is specified, **mbprocess** will process every file, whether it needs it or not.

−T

This option puts **mbprocess** into a test mode. The program will report whether or not it would process a file, but it will not actually process the data or produce an output processed file.

−S

This option causes **mbprocess** to print out the status of each file (e.g. up to date, out of date, locked, unlocked) along with the file modification times used to determine if the output file is out of date.

−V Normally, **mbprocess** works "silently" without outputting anything to the stderr stream. If the **−V** flag is given, then **mbprocess** works in a "verbose" mode and outputs the program version being used, the processing parameters being use, and some statistics regarding the processing accomplished.

NAVIGATION FORMATS

The navigation formats that are supported for merging by **mbprocess** include the following:

MBprocess ID	Name
1	Simple Decimal Time
2	Simple Date 1
3	Simple Date 2
4	Simple Date 3
5	L−DEO Processed Nav
6	NMEA 0183 − GLL
7	NMEA 0183 − GGA
8	Simrad 90 Nav
9	MBPRONAV (*.nve Files)
10	R2RNAV (*_hires.r2rnav Files)

Format 1 (Simple Decimal Time):

− text
− fields separated by white space
− each line contains the following fields:
    time_d lon lat
− time_d : decimal seconds since 1970 Jan 1 00:00:00.00
− lon: decimal longitude (deg)
− lat: decimal latitude (deg)

Format 2 (Simple Date 1):

− text
− fields separated by white space
− each line contains the following fields:
    yr mon day hour min sec lon lat
− yr: four−digit year

– mon: integer month of year
– day: integer day of month
– hour: integer hour of day
– min: integer minute of hour
– sec: decimal second of minute
– lon: decimal longitude (deg)
– lat: decimal latitude (deg)

Format 3 (Simple Date 2):
– text
– fields separated by white space
– each line contains the following fields:
    yr jday hour min sec lon lat
– yr: four−digit year
– jday: integer julian day of year
– hour: integer hour of day
– min: integer minute of hour
– sec: decimal second of minute
– lon: decimal longitude (deg)
– lat: decimal latitude (deg)

Format 4 (Simple Date 3):
– text
– fields separated by white space
– each line contains the following fields:
    yr jday daymin sec lon lat
– yr: four−digit year
– jday: integer julian day of year
– daymin: integer minute of day
– sec: decimal second of minute
– lon: decimal longitude (deg)
– lat: decimal latitude (deg)

Format 5 (L−DEO Processed Nav):
– text
– fields separated by white space
– each line contains the following fields:
    timetag NorS latd latm EorW lond lonm src dr1 dr2
– timetag: comes in two forms
    form 1: yy+jjj:hh:mm:ss.sss
    form 2: yyyy+jjj:hh:mm:ss.sss
– yy: either two−digit or four−digit year
– jjj: integer julian day of year
– hh: integer hour of day
– mm: integer minute of hour
– ss.sss: decimal second of minute
– NorS: ’S’ for southern hemisphere
  ’N’ for northern hemisphere
– latd: integer latitude degrees
– latm: decimal latitude minutes
– EorW: ’E’ for eastern hemisphere
  ’W’ for western hemisphere
– lond: integer longitude degrees
– lonm: decimal longitude minutes

– src: nav source (e.g. gp1, dr, satl)
’gp1’ – GPS receiver 1
’dr’ – dead reckoning
’satl’ – transit satellite
– dr1: nonzero when src is ’dr’
– dr2: nonzero when src is ’dr’

Format 6 (NMEA 0183 – GLL):
– text
– fields separated by commas
– nav derived from GLL strings

Format 7 (NMEA 0183 – GGA):
– text
– fields separated by commas
– nav derived from GGA strings

Format 8 (Simrad 90 Nav):
– text
– fields not separated by white space
– each line contains the following fields:
ddmmyy_hhmmss.ss_LLllllN_LLLllllE – dd: day of month
– mm: integer month of year – yy: two−digit year
– hh: integer hour of day
– mm: integer minute of hour
– ss.ss: decimal second of minute
– LL: integer latitude degrees
– lllll: integer latitude minutes X 1000
– N: ’S’ for southern hemisphere
’N’ for northern hemisphere
– LLL: integer longitude degrees
– lllll: integer longitude minutes X 1000
– E: ’E’ for eastern hemisphere
’W’ for western hemisphere

Format 9 (MBPRONAV (*.nve Files)):
– text
– fields separated by white space
– each line contains at least 9, and possibly as many as 19, of the following fields:
yr mn dy hr mi se td ln lt hg sp dr rl pt hv pln plt sln slt
– yr: four−digit year
– mn: integer month of year
– dy: integer day of month
– hr: integer hour of day
– mi: integer minute of hour
– se: decimal second of minute
– td : decimal seconds since 1970 Jan 1 00:00:00.00
– ln: decimal longitude (deg)
– lt: decimal latitude (deg)
– hg: decimal heading (deg)
– sp: decimal speed (km/hr)
– dr: decimal draft (m)
– rl: decimal roll (deg)
– pt: decimal pitch (deg)

– hv: decimal heave (m)
– pln: decimal longitude of portmost sounding (deg)
– plt: decimal latitude of portmost sounding (deg)
– sln: decimal longitude of starboardmost sounding (deg)
– slt: decimal latitude of starboardmost sounding (deg)

Format 10 (R2RNAV (*_hires.r2rnav Files)):
– text – also works with *_1min.r2rnav and *_control.r2rnav files
– these lack the GPS parameters
– defined by SIO GDC as part of the R2R project
– columns separated by tabs
– each line contains the following fields
yyyy−mm−ddThh:mm:ss.sssZ lon lat q n d h
– yyyy: four−digit year
– mm: integer month of year
– dd: integer day of month
– T: the letter "T" is always between the date and the time
– hh: integer hour of day
– mm: integer minute of hour
– ss.sss: decimal second of minute
– Z: the letter "Z" is always there to specify UTC time zone
– lo: decimal longitude (deg) (−180 to +180
– la: decimal latitude (deg) (−90 to +90)
– q: GPS quality
– n: number of GPS satellites
– d: GPS dilution
– h: GPS antenna height (m)

EXAMPLES

Suppose the user has a Simrad EM120 data file called "0051_20010829_223755.mb57" that requires processing.

Editing the bathymetry data in this file with mbedit will generate an edit save file "0051_20010829_223755.mb57.esf" and an mbprocess parameter file "0051_20010829_223755.mb57.par". The contents of the parameter file are:

```
## MB−System processing parameter file
## Written by mb_pr_writepar version $Id: mbprocess.ps 2234 2015-03-05 07:41:54Z caress $
## MB−system Version 5.0.beta22
## Generated by user <caress> on cpu <menard> at <Fri Sep  6 21:27:41 2002>
##
##
## Forces explicit reading of parameter modes.
EXPLICIT
##
## General Parameters:
FORMAT 57
INFILE /data/0051_20010829_223755.mb57
OUTFILE /data/0051_20010829_223755p.mb57
##
## Navigation Merging:
NAVMODE 0
NAVFILE /data/0051_20010829_223755.mb57.nve
NAVFORMAT 0
```

```
NAVHEADING 0
NAVSPEED 0
NAVDRAFT 0
NAVATTITUDE 0
NAVINTERP 0
NAVTIMESHIFT 0.000000
##
## Navigation Offsets and Shifts:
NAVSHIFT 0
NAVOFFSETX 0.000000
NAVOFFSETY 0.000000
NAVOFFSETZ 0.000000
NAVSHIFTLON 0.000000
NAVSHIFTLAT 0.000000
##
## Adjusted Navigation Merging:
NAVADJMODE 0
NAVADJFILE
NAVADJINTERP 0
##
## Attitude Merging:
ATTITUDEMODE 0
ATTITUDEFILE
ATTITUDEFORMAT 1
##
## Sonardepth Merging:
SONARDEPTHMODE 0
SONARDEPTHFILE
SONARDEPTHFORMAT 1
##
## Data cutting:
DATACUTCLEAR
##
## Bathymetry Flagging:
EDITSAVEMODE 1
EDITSAVEFILE /data/0051_20010829_223755.mb57.esf
##
## Bathymetry Recalculation:
SVPMODE 0
SVPFILE
SSVMODE 0
SSV 0.000000
TTMODE 0
TTMULTIPLY 1.000000
ANGLEMODE 0
SOUNDSPEEDREF 1
##
## Draft Correction:
DRAFTMODE 0
DRAFT 0.000000
DRAFTOFFSET 0.000000
DRAFTMULTIPLY 1.000000
##
## Heave Correction:
```

HEAVEMODE 0
HEAVEOFFSET 0.000000
HEAVEMULTIPLY 1.000000
##
Lever Correction:
LEVERMODE 0
VRUOFFSETX 0.000000
VRUOFFSETY 0.000000
VRUOFFSETZ 0.000000
SONAROFFSETX 0.000000
SONAROFFSETY 0.000000
SONAROFFSETZ 0.000000
##
Roll Correction:
ROLLBIASMODE 0
ROLLBIAS 0.000000
ROLLBIASPORT 0.000000
ROLLBIASSTBD 0.000000
##
Pitch Correction:
PITCHBIASMODE 0
PITCHBIAS 0.000000
##
Heading Correction:
HEADINGMODE 0
HEADINGOFFSET 0.000000
##
Tide Correction:
TIDEMODE 0
TIDEFILE
TIDEFORMAT 1
##
Amplitude Correction:
AMPCORRMODE 0
AMPCORRFILE
AMPCORRTYPE 0
AMPCORRSYMMETRY 1
AMPCORRANGLE 30.000000
AMPCORRSLOPE 0
##
Sidescan Correction:
SSCORRMODE 0
SSCORRFILE
SSCORRTYPE 0
SSCORRSYMMETRY 1
SSCORRANGLE 30.000000
SSCORRSLOPE 0
##
Sidescan Recalculation:
SSRECALCMODE 0
SSPIXELSIZE 0.000000
SSSWATHWIDTH 0.000000
SSINTERPOLATE 0
##

```
## Metadata Insertion:
METAVESSEL
METAINSTITUTION
METAPLATFORM
METASONAR
METASONARVERSION
METACRUISEID
METACRUISENAME
METAPI
METAPIINSTITUTION
METACLIENT
METASVCORRECTED −1
METATIDECORRECTED −1
METABATHEDITMANUAL −1
METABATHEDITAUTO −1
METAROLLBIAS 0.000000
METAPITCHBIAS 0.000000
METAHEADINGBIAS 0.000000
METADRAFT 0.000000
##
## Processing Kluges
```

Editing the navigation with mbnavedit will generate a navigation file named "0051_20010829_223755.mb57.nve" and will modify the parameter file. The changed lines in "0051_20010829_223755.mb57.par" are:

```
## Navigation Merging:
NAVMODE 1
NAVFILE /data/0051_20010829_223755.mb57.nve
NAVFORMAT 9
NAVHEADING 1
NAVSPEED 1
NAVDRAFT 1
NAVATTITUDE 1
```

At this point, running **mbprocess** on "0051_20010829_223755.mb57" will apply the bathymetry flags from **mbedit** and merge the navigation from **mbnavedit**, but will not modify the data in any other way.

If the user wants to recalculate the bathymetry using an SVP file "0051_20010829_223755.mb57.svp" and a roll bias correction of +0.5 degrees, the following will suffice:

mbset −I 0051_20010829_223755.mb57 −PSVPFILE:0051_20010829_223755.mb57.svp −PROLLBIAS:0.5 −PDRAFT:1.95 −V

The affected lines in "0051_20010829_223755.mb57.par" are:

```
##
## Bathymetry Recalculation:
SVPMODE 1
SVPFILE 0051_20010829_223755.mb57.svp
SSVMODE 0
SSV 0.000000
TTMODE 0
TTMULTIPLY 1.000000
```

```
ANGLEMODE 0
SOUNDSPEEDREF 1
##
## Draft Correction:
DRAFTMODE 4
DRAFT 1.950000
DRAFTOFFSET 0.000000
DRAFTMULTIPLY 1.000000
##
## Roll Correction:
ROLLBIASMODE 1
ROLLBIAS 0.500000
ROLLBIASPORT 0.000000
ROLLBIASSTBD 0.000000
```

To process the data, run mbprocess:

```
mbprocess −I0051_20010829_223755.mb57 −V
```

The output to the terminal is:

```
Program mbprocess
Version $Id: mbprocess.ps 2234 2015-03-05 07:41:54Z caress $
MB−System Version 5.0.beta07

Program <mbprocess>
Version $Id: mbprocess.ps 2234 2015-03-05 07:41:54Z caress $
MB−system Version 5.0.beta07

Program Operation:
  Input file:      0051_20010829_223755.mb57
  Format:          57
  Files processed only if out of date.
  Comments embedded in output.

Data processed − out of date:
 Input:  0051_20010829_223755.mb57
 Output: /u/mbuser/survey/0051_20010829_223755p.mb57

Input and Output Files:
  Format:                  57
  Input file:              0051_20010829_223755.mb57
  Output file:             /u/mbuser/survey/0051_20010829_223755p.mb57
  Comments in output: ON

Navigation Merging:
  Navigation merged from navigation file.
  Heading merged from navigation file.
  Speed merged from navigation file.
  Draft merged from navigation file.
  Navigation file:             /u/mbuser/survey/0051_20010829_223755.mb57.nve
  Navigation algorithm:        linear interpolation
  Navigation time shift:       0.000000

Navigation Offsets and Shifts:
```

Navigation positions not shifted.

Adjusted Navigation Merging:
Navigation not merged from adjusted navigation file.
Adjusted navigation file:
Adjusted navigation algorithm: linear interpolation

Data Cutting:
Data cutting disabled.

Bathymetry Editing:
Bathymetry edits applied from file.
Bathymetry edit file: 0051_20010829_223755.mb57.esf

Bathymetry Recalculation:
Bathymetry recalculated by raytracing.
SVP file: 0051_20010829_223755.mb57.svp
SSV not modified.
SSV offset/constant: 0.000000 m/s
Travel time multiplier: 1.000000 m

Bathymetry Water Sound Speed Reference:
Output bathymetry reference: CORRECTED
Depths recalculated as corrected

Draft Correction:
Draft set to constant.
Draft constant: 1.950000 m
Draft offset: 0.000000 m
Draft multiplier: 1.000000 m

Heave Correction:
Heave not modified.
Heave offset: 0.000000 m
Heave multiplier: 1.000000 m

Lever Correction:
Lever calculation off.

Tide Correction:
Tide calculation off.

Roll Correction:
Roll offset by bias.
Roll bias: 0.500000 deg
Port roll bias: 0.000000 deg
Starboard roll bias: 0.000000 deg

Pitch Correction:
Pitch not modified.
Pitch bias: 0.000000 deg

Heading Correction:
Heading not modified.

```
  Heading offset:               0.000000 deg

Amplitude Corrections:
  Amplitude correction off.

Sidescan Corrections:
  Sidescan correction off.

Sidescan Recalculation:
  Sidescan not recalculated.
  Sidescan pixel size:          0.000000
  Sidescan swath width:         0.000000
  Sidescan interpolation:       0

Metadata Insertion:
  Metadata vessel:
  Metadata institution:
  Metadata platform:
  Metadata sonar:
  Metadata sonarversion:
  Metadata cruiseid:
  Metadata cruisename:
  Metadata pi:
  Metadata piinstitution:
  Metadata client:
  Metadata svcorrected:         -1
  Metadata tidecorrected        -1
  Metadata batheditmanual       -1
  Metadata batheditauto:        -1
  Metadata rollbias:            0.000000
  Metadata pitchbias:           0.000000
  Metadata headingbias:         0.000000
  Metadata draft:               0.000000

236 navigation records read
Nav start time: 2001 08 29 22:38:02.082999
Nav end time:   2001 08 29 23:37:22.322000

47 bathymetry edits read

236 input data records
3587 input nav records
17 input comment records
6617 input other records
236 output data records
3587 output nav records
64 output comment records
6617 output other records

Generating inf file for /u/mbuser/survey/0051_20010829_223755p.mb57
Generating fbt file for /u/mbuser/survey/0051_20010829_223755p.mb57
Generating fnv file for /u/mbuser/survey/0051_20010829_223755p.mb57
```

SEE ALSO

mbsystem(1), **mbset**(1), **mbedit**(1), **mbnavedit**(1), **mbvelocitytool**(1)

BUGS

You tell me.