NAME

mbotps – Predicts tides using the OSU Tidal Prediction Software (OTPS) distribution.

VERSION

Version 5.0

SYNOPSIS

mbotps [**–A***tideformat* **–B***year/month/day/hour/minute/second* **–D***interval* **–E***year/month/day/hour/minute/second* **–F***format* **–I***datalist.mb-1* **–M** **–O***output* **–R***lon/lat* **–V***]*

DESCRIPTION

MBotps is a utility that predicts tides using the OTPS (OSU Tidal Prediction Software) package that can be downloaded at:

http://www.coas.oregonstate.edu/research/po/research/tide/ The OTPS utilities are operated in a batch mode using command files with a fairly arcane format. **MBotps** provides a command line interface that allows **MB-System** users to easily obtain tide models for specified locations and times. **MBotps** is built during a normal installation of **MB-System**, but will work only if the OTPS package has been installed separately and the OTPS location has been specified. See the INSTALL file in the **MB-System** top directory for guidance on the build process.

There are actually three variants of the OTPS package available for download and installation: OTPS, OTPSnc, and OTPS2. The three versions use different tide model formats, but otherwise are used in the same way. OTPS uses tide models stored in a native binary format, OTPSnc uses tide models in a netCDF format, and OTPS2 uses hybrid tide models combining a low resolution global model with higher resolution representation of many coastal regions.

The local OTPSnc installation can include more than one tidal model; several global and local models are available from the Oregon State tide group. By default, **mbotps** attempts to use a global tide model named tpxo7.2. Users can use the **-T***model* option to specify the desired model. If no model is specified, and tpxo7.2 is not available, then **mbotps** will use the first valid model found. It is the user's responsibility to ensure that the positions of requested tide values lie within the specified tide model's domain.

The OTPSnc models generally take the form of four files, all of which should be placed in a directory named "DATA" in the OTPSnc installation. For a model named ES2008, the files are:

Model_ES2008
gridES2008.nc
hf.ES2008.nc
uv.ES2008.nc

Here the first file is a text file that references the other three; for **mbotps** the model name consists of the text that follows "Model_" in the first file's name. Most of the models one can obtain from the OSU tide group are intended to be used by running the OTPSnc program **predict_tide** from the OTPSnc installation directory, and thus reference the data files using relative paths. For example, the original contents of Model_ES2008 are:

DATA/gridES2008.nc
DATA/hf.ES2008.nc
DATA/uv.ES2008.nc

In order for the OTPSnc to work when called by **mbotps**, the model data file paths must be global rather than relative. If the OTPSnc package has been installed in /usr/local/OTPSnc, then the model file Model_ES2008 should be edited to have the following contents:

/usr/local/OTPSnc/DATA/gridES2008.nc
/usr/local/OTPSnc/DATA/DATA/hf.ES2008.nc
/usr/local/OTPSnc/DATA/DATA/uv.ES2008.nc

MBotps can be operated in two modes. First, users may use the **−R**, **−B**, and **−E** options to specify a location and the beginning and end times of a tidal model for that location. The **−D** option sets the time interval of values in the output tidal model, and the **−O** option sets the output tidal model filename.

Alternatively, instead of specifying a place and time range, the user may specify one or more swath data files using the **−I** option. A tidal model is produced for each swath file in which tidal values are calculated using the sonar navigation locations at intervals specified with the **−D** option, and if the **−M** option is specified, the swath file's processing parameter file is modified so that **mbprocess** applies the tidal model during processing.

AUTHORSHIP

David W. Caress (caress@mbari.org)
Monterey Bay Aquarium Research Institute
Dale N. Chayes (dale@ldeo.columbia.edu)
Lamont-Doherty Earth Observatory

OPTIONS

−A *tideformat*
This option sets the tide format of the output text tide model files. If *tideformat* = 2 (the default), the tide is output in this format:
    year month day hour minute second tide
where the tide value is in meters. If *tideformat* = 1, then the output format is:
    time_d tide
where time_d is in seconds since January 1, 1970 and tide is in meters.

−B *yr/mo/da/hr/mn/sc*
This option sets the starting time for for the output tidal model.

−D *interval*
This option sets the time interval between tidal model values in seconds. Default: 60 seconds.

−E *yr/mo/da/hr/mn/sc*
This option sets the ending time for the output tidal model

−F *format*
Sets the data format of the input swath data file specified with the **−I** option. If *format* < 0, then the input file specified with the **−I** option will actually contain a list of input swath sonar data files. This program uses the **MBIO** library and will read any swath sonar format with timestamps 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. The default format is set using **mbdefaults**.

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

−I *filename*
Sets the input filename. If *format* > 0 (set with the **−f** option) then the swath sonar data contained in *infile* is read and processed. If *format* < 0, then *infile* 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 *infile* 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. Default: *infile* = "stdin".

−M
If the **−I** option has been used so that tidal models are created for swath files, then this option causes each swath file's parameter file to be modified so that **mbprocess** will read and apply the

ancilliary tidal model file created by **mbotps**.

–O *filename*
Sets the filename of the tidal model output.

–R *longitude/latitude*
Sets the longitude and latitude position at which the tidal model will be calculated.

–T *filename*
Sets the name of the OTPSnc tidal model to be used. This model must be part of the local OTPSnc installation.

–V Increases the verbosity of **mbotps**.

EXAMPLES

Suppose one wishes to obtain a tidal model for the location 121W 36N extending at 60 second intervals over the day February 21, 2009. The following will suffice:

```
mbotps –R-125/36 –B2009/02/21/00/00/00 –E2009/02/21/23/59/59 –V
```

The shell output looks like:

```
Program mbotps
Version $Id: mbotps.ps 2191 2014-06-05 00:59:01Z caress $
MB-system Version 5.4.2137

Checking for available OTPS tide models
OTPS location: /usr/local/OTPSnc
Valid OTPS tidal models:
    tpxo7.2
Number of available OTPS tide models: 1

Using OTPS tide model:          tpxo7.2

Lat/Lon/Time file:tmp_mbotps_llt_10311.txt
Predict OCEAN tide
Interpolate minor constituents

Model:       OTPSnc/DATA/Model_tpxo7.2
Model is on grid uniform in lat,lon
Lat limits:     -90.1250000       90.1250000
Lon limits:     0.125000000       360.125000
Constituents: m2  s2  n2  k2  k1  o1  p1  q1  mf  mm  m4  ms4 mn4
Predict elevations (m)
Constituents to include: m2  s2  n2  k2  k1  o1  p1  q1  mf  mm  m4  ms4 mn4
Reading model... done
Results are in tmp_mbotps_llttd_10311.txt

Results are really in tide_model.txt
```

The output tidal model is in the file tide_model.txt, which includes data that look like:

```
# Tide model generated by program mbotps
# Version: $Id: mbotps.ps 2191 2014-06-05 00:59:01Z caress $
# MB-System Version: 5.4.2137
# Tide model generated by program mbotps
# which in turn calls OTPS program predict_tide obtained from:
#     http://www.coas.oregonstate.edu/research/po/research/tide/
#
# OTPSnc tide model:
```

```
#      tpxo7.2
# Output format:
#      year month day hour minute second tide
# where tide is in meters
# Run by user <caress> on cpu <deitz> at <Thu Aug 15 17:53:22 2013>
# Model:        OTPSnc/DATA/Model_tpxo7.2
# Constituents included: m2  s2  n2  k2  k1  o1  p1  q1  mf  mm  m4  ms4 mn4
2009 02 21 00 00 00   -0.6840
2009 02 21 00 01 00   -0.6820
2009 02 21 00 02 00   -0.6790
2009 02 21 00 03 00   -0.6770
2009 02 21 00 04 00   -0.6740
2009 02 21 00 05 00   -0.6720
2009 02 21 00 06 00   -0.6690
2009 02 21 00 07 00   -0.6660
2009 02 21 00 08 00   -0.6640
2009 02 21 00 09 00   -0.6610
2009 02 21 00 10 00   -0.6580
2009 02 21 00 11 00   -0.6560
2009 02 21 00 12 00   -0.6530
2009 02 21 00 13 00   -0.6500
................
2009 02 21 23 54 00   -0.7980
2009 02 21 23 55 00   -0.7970
2009 02 21 23 56 00   -0.7950
2009 02 21 23 57 00   -0.7940
2009 02 21 23 58 00   -0.7920
2009 02 21 23 59 00   -0.7900
```

Now, suppose that one wants to apply tide corrections directly to a set of EM3002 data in GSF format. First, execute **mbotps** with the datalist for the swath data specified as input:

```
mbotps –Idatalist.mb-1 –V
```

The resulting shell output looks like:

```
Program mbotps
Version $Id: mbotps.ps 2191 2014-06-05 00:59:01Z caress $
MB-system Version 5.4.2137

Checking for available OTPS tide models
OTPS location: /usr/local/OTPSnc
Valid OTPS tidal models:
    tpxo7.2
Number of available OTPS tide models: 1

Using OTPS tide model:          tpxo7.2

---------------------------------------

Processing tides for himbb05291.d23.mb121

35602 records read from himbb05291.d23.mb121.fnv

 Lat/Lon/Time file:tmp_mbotps_llt_7413.txt
 Constituents to include: m2  s2  n2  k2  k1  o1  p1  q1
 Predict OCEAN tide
 Interpolate minor constituents
```

```
Model:        ss/sandbox/tides/OTPSnc/DATA/Model_tpxo7.2
Model is on grid uniform in lat,lon
Lat limits:    -90.125 90.125
Lon limits:    0.125 360.125
Constituents: m2  s2  n2  k2  k1  o1  p1  q1  mf  mm  m4  ms4 mn4
Predict elevations (m)
Constituents to include: m2  s2  n2  k2  k1  o1  p1  q1
Reading model... done
Results are in tmp_mbotps_llttd_7413.txt

Results are really in himbb05291.d23.mb121.tde
```

The output tide files have the same structure shown above:

```
# Tide model generated by program mbotps
# Version: $Id: mbotps.ps 2191 2014-06-05 00:59:01Z caress $
# MB-System Version: 5.4.2137
# Tide model generated by program mbotps
# which in turn calls OTPS program predict_tide obtained from:
#     http://www.coas.oregonstate.edu/research/po/research/tide/
#
# OTPSnc tide model:
#      tpxo7.2
# Output format:
#      year month day hour minute second tide
# where tide is in meters
# Run by user <caress> on cpu <deitz> at <Thu Aug 15 17:53:22 2013>
# Model:        OTPSnc/DATA/Model_tpxo7.2
# Constituents included: m2  s2  n2  k2  k1  o1  p1  q1  mf  mm  m4  ms4 mn4
2005 10 18 19 01 36    0.0800
2005 10 18 19 02 36    0.0790
2005 10 18 19 03 36    0.0770
2005 10 18 19 04 36    0.0760
2005 10 18 19 05 37    0.0750
2005 10 18 19 06 37    0.0730
2005 10 18 19 07 37    0.0720
2005 10 18 19 08 37    0.0710
2005 10 18 19 09 37    0.0700
```

In addition to generating *.tde files for each swath file referenced by the input datalist structure, **mbotps** modifies the parameter file associated with each swath file (creating it if necessary) so that tide correction is enabled using the *.tde file and tide format 2. When **mbprocess** is run on the same datalist, the files will be reprocessed, and the processing will include the application of the tide correction to all bathymetry.

SEE ALSO

mbsystem(1), **mbprocess**, **mbset**

BUGS

Installing the Fortran90 OTPSnc package from Oregon State is not particularly easy.