

Instruction for the usage of `ttt_calc32.exe` / `ttt_calc64.exe` and customizing `ttt_auto32.bat` / `ttt_auto64.bat`

*The International Tsunami Information Center
A UNESCO/IOC-NOAA Partnership
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General Information:

NOAA's National Centers for Environmental Research (NCEI, formerly National Geophysical Data Center, as the World Data Service for Geophysics (WDS-Geophysics), and the International Tsunami Information Center (ITIC), a NOAA-UNESCO/IOC Partnership, are collaborating to provide, free of charge, tsunami travel time calculation and display software to government organizations involved in providing tsunami warning and mitigation services.

The Tsunami Travel Time software (TTT SDK v 4.0.1) was developed by Dr. Paul Wessel (Geoware, <http://www.geoware-online.com>), and is used by the NOAA Pacific Tsunami Warning Center. The ITIC and NGDC have purchased the TTT license to permit widespread free distribution. The public domain mapping software Generic Mapping Tools (GMT) was developed by Drs. Paul Wessel and Walter Smith.

To provide for easier calculation and map-making, the ITIC has provided a user-friendly Graphical User Interface (GUI) named `ttt_calc32.exe` and `ttt_calc64.exe` (referred to as `ttt_calcXX.exe` from here on) which uses `ttt_autoXX.bat` and simplifies and automates the process. `ttt_calcXX.exe` creates a travel time data file and two maps (ocean-wide and zoomed-in) using user-input information on the tsunami source location (latitude and longitude), source origin time, and map region. `ttt_autoXX.bat` and its associated .bat scripts can be edited, thereby creating maps customized according to a user's needs. Information on the various parameters that can be changed is provided.

Preparation:

Run `Setup_TTT_vx.x_xxbit_YYYYMMDD.exe` to install the TTT software, examples, GMT, Ghostscript and ImageMagick.

Directory Structure related to `ttt_autoXX.bat`:

Directory: `C:\TTT Package\Software\TTT\bin`

TTT calculation: `ttt_clientXX.exe`

TTT mapmaking (using GMT):

 Fixed region: `ttt_fancy_atl/ind/pac/world.bat`

 User-specified: `ttt_fancy.bat`

Examples using above scripts:

`C:\TTT Package\Examples\EXAMPLE_CARIBBEAN` or `IO_SCS/MAKRAN/PACIFIC`

Main Scripts for `ttt_calcXX`

`ttt_autoXX.bat`

`ttt_fancy_atl/ind/pac_auto.bat`

Output files from running `ttt_calcXX.exe` will be put in sub-directory:

`C:\TTT Package\Examples\TTT_AUTO_XXXXXX`,

where `XXXXXX` equals computer clock HRMNSC

Data files:

Historical earthquakes (USGS Centennial List):

 GMT-plot format: `centennial6_ed.txt`

 Reference files: `centennial6.txt`, `centennial.xyzm`

Sea level stations (as received by PTWC):

Data files: stations.txt, stations_tidetool.txt (Feb 2022)
Maps: PTWC_AtlanticMediterranean/Caribbean/IndianOcean/Pacific
_SL_Stations_YYYYMMDD.pdf (Feb 2022)
Color pallets (as read by scripts): CPT\ttt1-30.cpt, centennial.cpt

Simple Usage:

1. Open ttt_calcXX.exe

Start *ttt_calc32.exe* or *ttt_calc64.exe*, double click the *TTT_CALC32* or *TTT_CALC64* icon on desktop, or *ttt_calcXX.exe* within the *TTT_bin* folder

Enter **map title** in the textbox

Enter **latitude** and **longitude** in text box

Select **region** from dropdown menu (Atlantic/Caribbean, Indian or Pacific)

An option is included for 3rd zoomed plot, or a plot specified by the user.

Select **area for 3rd zoomed plot for Indian Ocean** from dropdown menu (Mauritius, Mozambique or Other)

Enter **area for 3rd zoomed plot for Pacific Ocean** from dropdown menu (SW Pacific, S America, S China Sea / Philippines or Other)

Select whether to plot a **3rd user-selected zoomed plot (Other) for Caribbean** from dropdown menu (Yes or No)

If Other, then user inputs map boundaries in text box.

Select **output** from the dropdown menu (travel time or tsunami arrival time)

If tsunami arrival time is selected, enter the tsunami '**origin time**' in text box with format YYYY/MM/DD/HH/MN/SS

Select **bathymetry grid** file to use (arc min) from dropdown menu (60, 30, 20, 15, 10, 5, 2 or 1)

Select whether to plot **sea level stations**, from dropdown menu (Yes or No)

Select whether to plot **historical earthquakes** (M > 6.0 in the past 100 years) from dropdown menu (Yes or No)

Example

The following example is for the 26 Dec 2004 Indian Ocean tsunami. Source parameters are from USGS.

Parameters to use:

-- Title, 26 Dec 2004 Indian Ocean tsunami

-- Latitude 3.316 (if it were 4.521**S** for another example, it would be -4.521)

-- Longitude 95.854 (if it were 64.3**W** for another example, it would be 295.7 or -64.3)

-- Region, select Indian

-- For user-specified zoomed plot for Indian Ocean region, select Other

-- Input map range, Southern edge = 0, Northern edge = 35, Western edge = 40, Eastern edge = 70

-- Output, select Tsunami Arrival Times

-- Tsunami 'origin time,' 2004/12/26/00/58/53 (origin time was 00:58:53)

-- Bathymetry grid file, select 15


-- For plotting stations, select yes

-- For plotting earthquakes, select yes

-- Click Generate Image button

TTT CALC 09/2020

Tsunami Travel Time Calculator



Input information stored in TTT_Input.txt
 Output stored in C:\TTT Package\Examples

Please Enter Title You Would Like For Map:

Source Latitude (decimal degrees, N(+), S(-)):

Source Longitude (decimal degrees, E(+), W(-)):

Please Select Region the Ocean Event is Occurring in:

Indian Ocean Selected,
Please Select Zoomed IO Region to Plot:

For user-selected zoomed map, input the map range:

Southern Edge of Map (decimal degrees, S(+)):

Northern Edge of Map (decimal degrees, N(+)):

Western Edge of Map (decimal degrees, W(-)):

Eastern Edge of Map (decimal degrees, E(+)):

Please Note: Output times at locations
 arrival times are calculated correctly only for events years 1970-2038)

Select What You Would Like Outputted:

If Calculating Tsunami Arrival Time:

EQ origin time as YYYY/MM/DD/HH/MI/SS
(2004/12/26/00/58/53)

Select bathymetry grid file to use,
15min recommended for fast run.

Options are (arc min): 60, 30, 20, 15, 10, 5, 2, 1:

Plot Sea Level Stations?

Plot Historical Earthquakes? (Centennial List)

Notes:

- **ttt_calcXX.exe** can be run manually from any directory, but output files are placed, by default, in the “Examples” directory (see below). Shortcut called TTT_examples should be created on your desktop when TTT is installed. You may double click on this icon to access the output directory.
- **ttt_calcXX.exe can also be run from the TTT\bin.**
 Double click on the *TTT_CALC32* or *TTT_CALC64* icon on desktop. Alternatively, enter the TTT_bin folder using the shortcut icon on desktop, and find *ttt_calc32.exe* or *ttt_calc64.exe*. Command Prompt will open, however when using *ttt_calcXX.exe* the command window will disappear after the process finishes and you will not be able to check the log for error messages if they occur.

Output Files:

After running `ttt_calcXX.exe`, a [travel time or ETA data file](#) and [plots](#) are placed in a new sub-directory `C:\TTT Package\Examples\TTT_AUTO_XXXXXX`, where `XXXXXX` is the computer clock time (hr, min, sec) at the time the script is run.

To change the directory where files are output (“Examples”), edit each `ttt_fancy_atl/ind/pac_auto.bat` to rename the default directory path (located at the end of the script).

Travel Time or Estimate Time of Arrival (ETA)

The travel time or ETA data file (`travel_time_atl/ind/pac.txt` or `ETA_atl/ind/pac.txt`) gives the station location (lat, lon), tsunami travel/arrival time, distance from the nearest point on the grid to the station, uncertainty rates in sec/km, station name (or other descriptor from input file), and station type (DART or SL) for each location. Output lines are ordered from shortest to longest travel time, or earliest to last estimated arrival. Information after the longitude, latitude in the input file is also output to the output file.

Note that tsunami arrival times are presently correctly calculated only for event years 1970-2038.

The 1st line in the output file gives the epicenter or the epicenter and origin time,

< **travel_time_ind.txt** >

```
Epicenter: LAT 3.316, LON 95.854
---LAT---||---LON---||--ARRIVAL--||---OFF---||---ERR---
 4.1275  96.1319  0h 40m 34s  19.302  28.45      #meul  SL
 0.0605  91.8872  0h 57m 59s  14.233   3.35      #53401 DART
 5.8333  95.3333   0h 59m 55s  13.066  11.77      #saba  SL
```

< **ETA_ind.txt** >

```
Epicenter: LAT 3.316, LON 95.854
Origin Time: 2004/12/26/00/58/53
---LAT---||---LON---||-----ARRIVAL-----||--OFF-km-||-ERR-s/km-
 4.1275  96.1319  Sun Dec 26 01:39:28 2004  19.302      28.45      #meul  SL
 0.0605  91.8872  Sun Dec 26 01:56:53 2004  14.233       3.35      #53401 DART
 5.8333  95.3333  Sun Dec 26 01:58:48 2004  13.066      11.77      #saba  SL
```

Station locations are from the input file (`stations.txt`) which are stations received by the PTWC. *You may edit and create your own list of points to plot (they can be any points, such as forecast points or important coastal towns, etc.) However, keep the 4th column DART or SL. If you write another keyword for the 4th column, the station will not be plotted unless you edit the `ttt_fancy...bat` scripts to identify this keyword.*

Input file: < **stations_ind.txt** >

```
88.5369  8.9050  #23401 DART
 91.9     0.05    #53401 DART
110.0039 -13.9614 #56001 DART
```

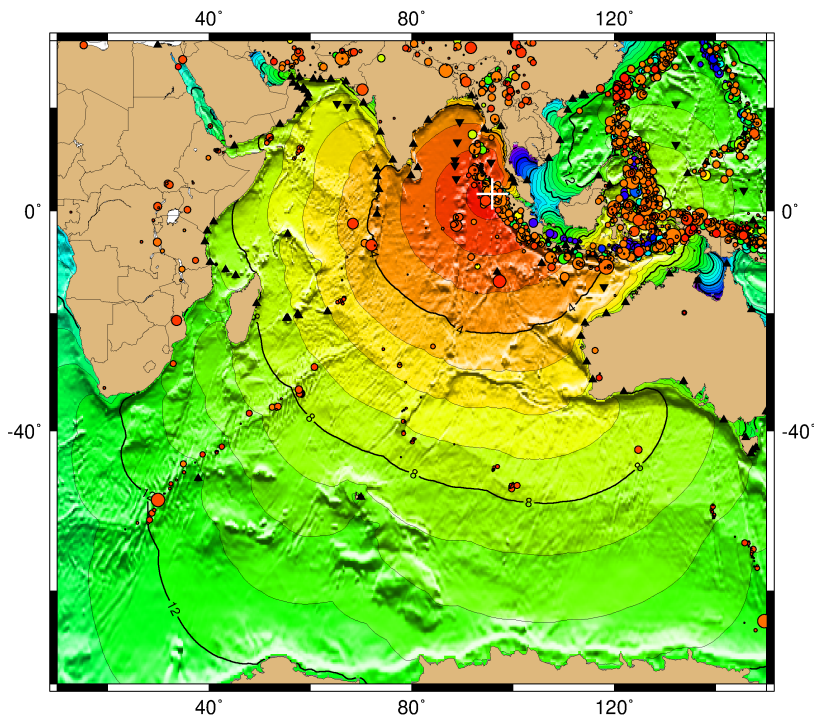
Plots

Depending on the region, several maps are automatically made.

If Atlantic/Caribbean is selected, two plots are created; one is covering larger area and the other is zoomed-in around the source. If region Indian or Pacific is selected, one additional zoomed plot around a selected region is created, or the user may specify the boundaries for the additional plot.

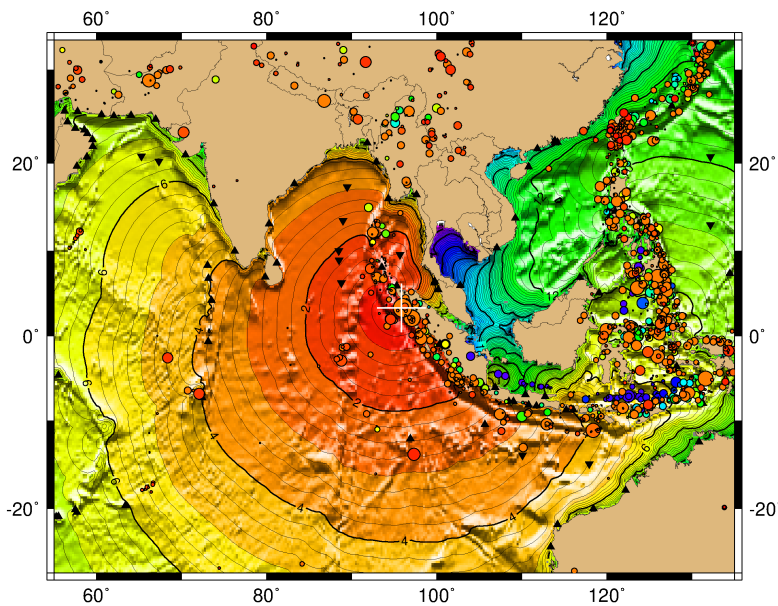
Example Maps

The following are plots with sea level stations (black triangles), DART stations (black upside-down triangle) and historical earthquakes (colored dots) for the Sumatra event on 26 Dec 2004. Different symbols or symbol colors are possible by editing the .bat scripts (see later section)



ttt_auto_15m.ps
ttt_auto_15m.png

plot covering
larger area

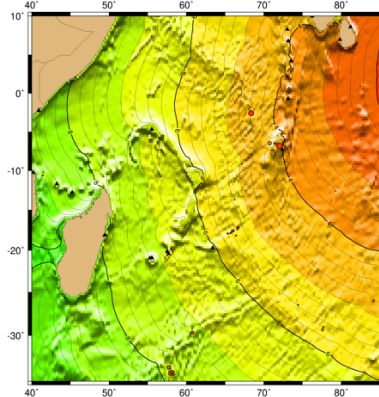


ttt_auto_15m_zoom.ps
ttt_auto_15m_zoom.png

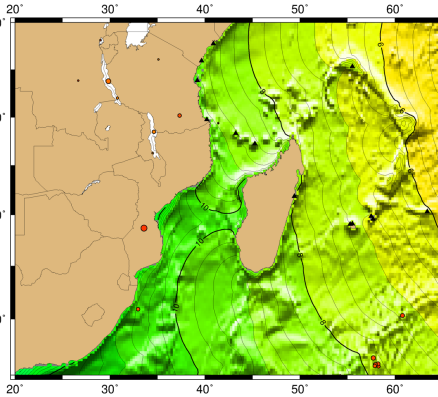
zoomed-in plot
around source

default range
lat ± 30 , lon ± 40

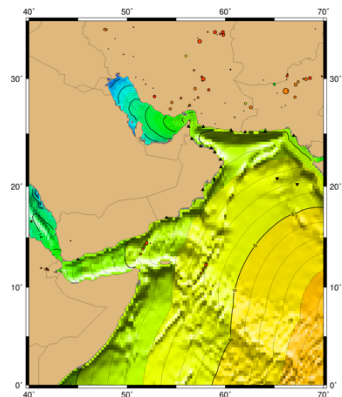
```
ttt_auto_15m_zoom_wIO.ps
ttt_auto_15m_zoom_wIO.png
zoomed-in plot of western Indian Ocean for each option (option 3 for this example)
```



option1: Mauritius



option2: Mozambique



option3: Other (this example)

Note: You may see some messages such as “Missing Operator”, “Warning”, etc. in the Command Window terminal. These messages are not actually errors, so just ignore them.

```
C:\>ECHO OFF
Source latitude (decimal degrees):3.316
Source longitude (decimal degrees):95.854

Region to plot: Atlantic (1), Indian (2), Pacific (3) 2
Output Tsunami Travel Time (0) or Tsunami Arrival Time (1) ?1
Missing operator.
Missing operator.
Missing operator.
Missing operator.
"Indian Ocean"
Type origin time YYYY/MM/DD/HH/MI/SS e.g. 2004/12/26/00/58/53:2004/12/26/00/58/53
ttt_client: Initialize tttOPI
grdcontour: Warning: Your -Gd!D option produced no contour labels for z = 8
grdcontour: Warning: Your -Gd!D option produced no contour labels for z = 8
grdcontour: Warning: Your -Gd!D option produced no contour labels for z = 8
grdcontour: Warning: Your -Gd!D option produced no contour labels for z = 8
grdcontour: Tracing the 8.25 contour
grdcontour: Tracing the 8.5 contour
```

To further customize the automatically-made plots, you may edit the `ttt_autoXX.bat` and `ttt_fancy_atl/ind/pac_auto.bat` files to change the map boundaries, symbols plotted, and contouring or color shading done.

The following pages provide a brief summary on the various parameters.

Further information and documentation on GMT can be found in

`C:\TTT Package\TTT_GMT_otherdocs\GMT_Manuals`, or at <https://www.generic-mapping-tools.org/>.

Customizing ttt_autoXX.bat and ttt_fancy_atl/ind/pac_auto.bat

The following pages provide a brief summary on the various parameters.

ttt_autoXX.bat ... change ranges of a zoomed map and grid of topography.

ECHO OFF

----- omitted the lines with REM here (lines beginning with REM are ignored by command processor). -----

```
cd "C:\TTT Package\Software\TTT\bin"
```

```
echo TSUNAMI TRAVEL TIME CALCULATION AND MAP MAKING
```

```
cd "C:\TTT Package\Examples\"
```

```
set LAT=
```

```
for /f "skip=1 delims=" %%S IN (TTT_input.txt) DO if not defined Build set "Build=%%S"
```

```
set LAT=%Build%
```

```
set latitudeMessage =
```

```
set latitudeMessage=Source latitude (decimal degrees, N(+), S(-)) is %Build%
```

```
echo %latitudeMessage%
```

Set latitude input.

Set path for TTT_Input.txt

Set longitude input.

```
set FilePath=C:\TTT
```

```
set FilePath2= Package\Examples\TTT_Input.txt
```

```
set FilePath3="%FilePath%%FilePath2%"
```

```
cd "C:\TTT Package\Examples\"
```

```
for /f "skip=2 delims=" %%G IN (TTT_Input.txt) DO if not defined line set "line=%%G"
```

```
set LongitudeMessage=
```

```
set LongitudeMessage=Source longitude (decimal degrees, E(+), W(-)) is %line%
```

```
set LON=%line%
```

```
echo %LongitudeMessage%
```

```
for /f "skip=3 delims=" %%i IN (TTT_Input.txt) DO if not defined line2 set "line2=%%i"
```

```
set RegionText =
```

```
if "%line2%"=="1" set RegionText=Atlantic/Caribbean Ocean
```

```
if "%line2%"=="2" set RegionText=Indian Ocean
```

```
if "%line2%"=="3" set RegionText=Pacific Ocean
```

Set region input.

```
set RegionMessage=
```

```
set RegionMessage=Region to plot Tsunami is: %RegionText%
```

```
set REGION=%line2%
```

```
echo %RegionMessage%
```

```
for /f "skip=4 delims=" %%J IN (TTT_Input.txt) DO if not defined line3 set "line3=%%J"
```

```
set OptionType =
```

```
if "%line3%"=="0" set OptionType=Tsunami Travel Time
```

```
if "%line3%"=="1" set OptionType=Tsunami Arrival Time
```

Set option input,
tsunami travel time or arrival time.

```
set OptionMessage=
```

```
echo Please note that output times at locations are calculated correctly only for events years 1970-2038).
```

```
set OptionMessage=Output is calculated for %OptionType%
```

```
set OPTION=%line3%
```

```
echo %OptionMessage%
```

```
for /f "skip=5 delims=" %%X IN (TTT_Input.txt) DO if not defined line4 set "line4=%%X"
```

```
set BathyMessage=Bathymetry grid will use %line4% arc minutes.
```

```
set BATHY=%line4%
```

```
echo %BathyMessage%
```

Set bathymetry inputs.

Choose bathymetry grid file: smaller means more detail, and takes longer for calculation – it is a trade-off of time for calculation and accuracy needed.

```
cd "C:\TTT Package\Software\TTT\bin"
```

```
echo %LON% %LAT% > epicenter_auto.txt
```

Add epicenter to text file.

```
set /a ZLONmin_tmp=%LON%/1
set /a ZLONmax_tmp=%LON%/1
set /a ZLATmin_tmp=%LAT%/1
set /a ZLATmax_tmp=%LAT%/1
```

Round down parameters since DOS can't calculate floats.

```
set /a ZLONmin=%ZLONmin_tmp%-40
set /a ZLONmax=%ZLONmax_tmp%+40
set /a ZLATmin=%ZLATmin_tmp%-30
set /a ZLATmax=%ZLATmax_tmp%+30
```

Set ranges for zoomed map. You can change ranges by changing values highlighted in yellow. You can create a map without an epicenter but another way is recommended (see later). **INTEGER ONLY!**

```
if %REGION%==1 if %OPTION%==0 goto TASK1
if %REGION%==2 if %OPTION%==0 goto TASK2
if %REGION%==3 if %OPTION%==0 goto TASK3
if %REGION%==1 if %OPTION%==1 goto TASK4
if %REGION%==2 if %OPTION%==1 goto TASK5
if %REGION%==3 if %OPTION%==1 goto TASK6
```

Choose task depending on the region and your option choice. Each task calculates travel time, creates travel time or arrival time data file and plots the results.

```
:TASK1
```

```
echo "Atlantic Ocean"
```

Add epicenter info at the top of travel time file.

```
echo Epicenter: LAT %LAT%, LON %LON% > travel_time_atl.txt
ttd_clientXX ttd_topo_%BATHY%m -cepicenter_auto.txt -Tttd_auto_%BATHY%m.b -Astations_atl.txt -VL >>
travel_time_atl.txt
ttd_fancy_atl_auto ttd_auto_%BATHY%m.b ttd_topo_%BATHY%m epicenter_auto.txt ttd_auto_%BATHY%m.ps
ttd_auto_%BATHY%m zoom.ps ttd_auto_%BATHY%m_zoom_AO.ps
```

```
:TASK2
```

```
echo "Indian Ocean"
```

The file highlighted in blue is output and input file for the first and second procedure, respectively.

```
echo Epicenter: LAT %LAT%, LON %LON% > travel_time_ind.txt
ttd_clientXX ttd_topo_%BATHY%m -cepicenter_auto.txt -Tttd_auto_%BATHY%m.b -Astations_ind.txt -VL >>
travel_time_ind.txt
ttd_fancy_ind_auto ttd_auto_%BATHY%m.b ttd_topo_%BATHY%m epicenter_auto.txt ttd_auto_%BATHY%m.ps
ttd_auto_%BATHY%m zoom.ps ttd_auto_%BATHY%m_zoom_wIO.ps
```

Files highlighted in purple are plots and you can put whatever names.

```
:TASK3
```

```
echo "Pacific Ocean"
```

```
echo Epicenter: LAT %LAT%, LON %LON% > travel_time_pac.txt
ttd_clientXX ttd_topo_%BATHY%m -cepicenter_auto.txt -Tttd_auto_%BATHY%m.b -Astations_pac.txt -VL >>
travel_time_pac.txt
ttd_fancy_pac_auto ttd_auto_%BATHY%m.b ttd_topo_%BATHY%m epicenter_auto.txt ttd_auto_%BATHY%m.ps
ttd_auto_%BATHY%m_zoom.ps ttd_auto_%BATHY%m_zoom_PO.ps
```

```
:TASK4
```

```
echo "Atlantic Ocean / Caribbean"
```

Set origin time for ETA data file.

```
cd "C:\TTT Package\Examples\"
```

```
for /f "skip=9 delims=" %%K IN (TTT_Input.txt) DO if not defined OriginTime set "OriginTime=%%K"
```

```
set ORIGIN=%OriginTime%
```

```
cd "C:\TTT Package\Software\TTT\bin"
```

```
echo Epicenter: LAT %LAT%, LON %LON% > ETA_atl.txt
```

```
echo Origin Time: %ORIGIN% >> ETA_atl.txt
```

Add origin time and epicenter info at the top of ETA file.

```
ttd_clientXX ttd_topo_%BATHY%m -cepicenter_auto.txt -S -Tttd_auto_%BATHY%m.b -Astations_atl.txt -O%ORIGIN% -VL
>> ETA_atl.txt
ttd_fancy_atl_auto ttd_auto_%BATHY%m.b ttd_topo_%BATHY%m epicenter_auto.txt ttd_auto_%BATHY%m.ps
ttd_auto_%BATHY%m_zoom.ps ttd_auto_%BATHY%m_zoom_AO.ps
```



```

:TASK5
echo "Indian Ocean"
cd "C:\TTT Package\Examples\"
for /f "skip=9 delims=" %%K IN (TTT_Input.txt) DO if not defined OriginTime set "OriginTime=%%K"
set ORIGIN=%%OriginTime%
cd "C:\TTT Package\Software\TTT\bin"
echo Epicenter: LAT %LAT%, LON %LON% > ETA_ind.txt
echo Origin Time: %%ORIGIN% >> ETA_ind.txt
ttd_clientXX ttd_topo_%%BATHY%%m -cepcenter_auto.txt -S -Tttd_auto_%%BATHY%%m.b -Astations_ind.txt -O%%ORIGIN% -VL >>
ETA_ind.txt
ttd_fancy_ind_auto ttd_auto_%%BATHY%%m.b ttd_topo_%%BATHY%%m epicenter_auto.txt ttd_auto_%%BATHY%%m.ps
ttd_auto_%%BATHY%%m_zoom.ps ttd_auto_%%BATHY%%m_zoom_wIO.ps

```

```

:TASK6
echo "Pacific Ocean"
cd "C:\TTT Package\Examples\"
for /f "skip=9 delims=" %%K IN (TTT_Input.txt) DO if not defined OriginTime set "OriginTime=%%K"
set ORIGIN=%%OriginTime%
cd "C:\TTT Package\Software\TTT\bin" echo Epicenter: LAT %LAT%, LON %LON% > ETA_pac.txt
echo Origin Time: %%ORIGIN% >> ETA_pac.txt
ttd_clientXX ttd_topo_%%BATHY%%m -cepcenter_auto.txt -S -Tttd_auto_%%BATHY%%m.b -Astations_pac.txt -O%%ORIGIN% -VL >>
ETA_pac.txt
ttd_fancy_pac_auto ttd_auto_%%BATHY%%m.b ttd_topo_%%BATHY%%m epicenter_auto.txt ttd_auto_%%BATHY%%m.ps
ttd_auto_%%BATHY%%m_zoom.ps ttd_auto_%%BATHY%%m_zoom_PO.ps

```

ECHO ON

ttt_fancy_atl / ind / pac_auto.bat ... change strokes, map boundaries, contouring, etc

For the following description, %1 %2 %3 %4 %5 %6 in ttt_fancy_atl / ind / pac_auto.bat correspond to underlined files in this order:

ttt_fancy_atl_auto ttt_auto_###.b ttt_topo_###m_epicenter_auto.txt ttt_auto_###m.ps ttt_auto_###m_zoom.ps
ttt_auto_###m_zoom_AO.ps

The following script is ttt_fancy_ind_auto.bat

ECHO OFF

----- omitted the lines with REM here (lines beginning with REM are ignored by command processor). -----

```
set time2=%time: =0%
set hr=%time2:~0,2%
set min=%time2:~3,2%
set sec=%time2:~6,2%
set dirname=TTT_AUTO_%hr%%min%%sec%
mkdir %dirname%
```

Automatically create folder for each calculation.
Folders named with time (hour, min, sec) based on
computer clock time

```
cd "C:\TTT Package\Examples\"
```

Set options whether or not to plot sea level stations
and historical earthquakes on the output maps.

```
set plotChoice=
set SL-OPTION=
for /f "skip=6 delims=" %%P IN (TTT_Input.txt) DO if not defined plotChoice set "plotChoice=%%P"
if "%plotChoice%"=="Yes" echo User has selected that Sea Level Stations will be plotted.
if "%plotChoice%"=="Yes" set SL-OPTION=1
if "%plotChoice%"=="No" echo User has selected that Sea Level Stations will NOT be plotted.
if "%plotChoice%"=="No" set SL-OPTION=0
```

```
set historyChoice=
set EQ-OPTION=
for /f "skip=7 delims=" %%Q IN (TTT_Input.txt) DO if not defined historyChoice set "historyChoice=%%Q"
if "%historyChoice%"=="Yes" echo User has selected to plot historical earthquakes.
if "%historyChoice%"=="Yes" set EQ-OPTION=1
if "%historyChoice%"=="No" echo User has selected to NOT plot historical earthquakes.
if "%historyChoice%"=="No" set EQ-OPTION=0
```

```
set ZoomChoice=
set WIO-OPTION=
for /f "skip=11 delims=" %%O IN (TTT_Input.txt) DO if not defined ZoomChoice set "ZoomChoice=%%O"
if "%ZoomChoice%"=="Mauritius" set WIO-OPTION=1
if "%ZoomChoice%"=="Mozambique" set WIO-OPTION=2
if "%ZoomChoice%"=="Other" set WIO-OPTION=3
echo The Zoomed IO Region to Plot is %ZoomChoice%
```

```
set SouthChoice=
set NorthChoice=
set WestChoice=
set EastChoice=
for /f "skip=12 delims=" %%C IN (TTT_Input.txt) DO if not defined SouthChoice set "SouthChoice=%%C"
for /f "skip=13 delims=" %%X IN (TTT_Input.txt) DO if not defined NorthChoice set "NorthChoice=%%X"
for /f "skip=14 delims=" %%M IN (TTT_Input.txt) DO if not defined WestChoice set "WestChoice=%%M"
for /f "skip=15 delims=" %%N IN (TTT_Input.txt) DO if not defined EastChoice set "EastChoice=%%N"
echo For user-selected zoomed map, inputted map range is:
```

```
cd "C:\TTT Package\Software\TTT\bin\"
```

```
if %WIO-OPTION% == 1 goto SKIP99
if %WIO-OPTION% == 2 goto SKIP99
```

```
set SouthMessage=
set NorthMessage=
set WestMessage=
set EastMessage=
```

ttd_ autoXX creates three plots for the Indian Ocean. The third plot has an option for the region (1: Mauritius, 2: Mozambique, 3: Other = need to set the map range.) This part sets the option and the map range for option 3.

```
echo For user-selected zoomed map, inputted map range is:
```

```
set S=%SouthChoice%
set SouthMessage=Southern Edge of map: %SouthChoice%
set N=%NorthChoice%
set NorthMessage=Northern Edge of map: %NorthChoice%
set W=%WestChoice%
set WestMessage=Western Edge of map: %WestChoice%
set E=%EastChoice%
set EastMessage=Eastern Edge of map: %EastChoice%
echo %SouthMessage%
echo %NorthMessage%
echo %WestMessage%
echo %EastMessage%
```

```
:SKIP99
```

```
REM -----
REM   create a plot
REM -----
```

Color pallet file highlighted in red controls hours to plot contours in color. ttt30.cpt plots 30 hours with color and later hours with lines only (no color). ttt1.cpt~ttt30.cpt are available: each of them plots 1~30 hours in color, respectively.

```
Gmtset HEADER_FONT_SIZE 20
gdgradient "%TTT_DIR%\%2.i2"=bs/1/0/32767 -A0 -Nt1.2-Gintens.grd
grdimage %1=1 -lintens.grd -R-10/150/-68/32 -JM7i -CCPT ttt30.cpt -P -K -V -X0.75i > %4
grdcontour %1=1 -R -JM -O -K -A4 -C1 -Gd3c -V >> %4
pscoast -R -JM -O -B40f20NSEW -G222/184/125 -C255/255/255 -W0.25p -Di -N1/0.5 -A2000 -U"TSUNAMI
TRAVEL TIMES USING POINT SOURCE (EPICENTER), @%%34%%\154@%% = Past EQ,
@%%34%%\163@%% = Coastal Gauge, @%%34%%\164@%% = Deep-ocean Gauge" -K >> %4
```

```
findstr DART stations_ind.txt > DART_ind_tmp.txt
findstr SL stations_ind.txt > SL_ind_tmp.txt
```

From the station list, a list for only DART stations and for only SL stations are created, to plot in different symbols.

```
if %SL-OPTION% == 0 goto SKIP1
psxy DART_ind_tmp.txt -R -JM -Si0.1 -G0 -O -K -V >> %4
psxy SL_ind_tmp.txt -R -JM -St0.1 -G0 -O -K -V >> %4
```

When you chose not to plot the sea level stations, skip the command line for station plotting.

```
:SKIP1
```

Also, when you chose not to plot the historical events, skip a command line for EQ plotting.

```
if %EQ-OPTION% == 0 goto SKIP2
psxy centennial6_ed.txt -R -JM -Sc -W0.5p/0/0/0 -CCPT\centennial.cpt -O -K -V >> %4
```

```
:SKIP2
```

```
REM white cross
psxy %3 -R -JM -Sx22p -W1.5p/255 -O -K -V >> %4
pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %4
```

Numbers highlighted in green are strokes, and numbers highlighted in purple are symbol sizes. Larger means thicker and bigger, respectively. Letters after S (x, c, etc.) control shapes, e.g. x is cross.

```
REM -----
REM create a zoomed map around the source
REM -----
```

Numbers and parameters highlighted in light blue are ranges of maps; they are western, eastern, southern and northern edges from left to right. Recommend to leave the values for first 2 maps; change only bottom part “W/E/S/N” for the last plot.

```
grdimage %1=1 -lintens.grd -R%ZLONmin%/ZLONmax%/ZLATmin%/ZLATmax% -JM7i -CCPT\itt30.cpt -P -K -V -X0.75i > %5
grdcontour %1=1 -R -JM -O -K -A2 -C0.25 -Gd3c -V >> %5
pscoast -R -JM -O -B20f10NSEW -G222/184/125 -C255/255/255 -W0.25p -Di -N1/0.5 -A2000 -U”TSUNAMI TRAVEL TIMES USING POINT SOURCE (EPICENTER), @%%34%%\154@%% = Past EQ, @%%34%%\163@%% = Coastal Gauge, @%%34%%\164@%% = Deep-ocean Gauge” -K >> %5
```

```
if %SL-OPTION% == 0 goto SKIP3
psxy DART_ind_tmp.txt -R -JM -Si0.1 -G0 -O -K -V >> %5
psxy SL_ind_tmp.txt -R -JM -St0.1 -G0 -O -K -V >> %5
```

```
:SKIP3
```

```
if %EQ-OPTION% == 0 goto SKIP4
psxy centennial6_ed.txt -R -JM -Sc -W0.5p/0/0/0 -CCPT\centennial.cpt -O -K -V >> %5
```

```
:SKIP4
```

```
REM white cross
psxy %3 -R -JM -Sx36p -W1p/255 -O -K -V >> %5
pstext epi_auto_symbol_z.txt -R -JM -G255 -O -V >> %5
```

```
REM -----
REM create a zoomed map of west IO or other region
REM -----
```

Numbers highlighted in yellow are contour intervals. Each means hour so 1 is 1 hour and 0.25 is 15 minutes. -A is for labeled contours and -C is for regular ones.

```
if %WIO-OPTION% == 2 goto SKIP12
if %WIO-OPTION% == 3 goto SKIP13
```

```
REM zoomed map around Mauritius
```

Map range differs depending on the choice which region to plot. This part reads the option and jumps to the appropriate part in the script.

```
grdimage %1=1 -lintens.grd -R40/85/-35/10 -JM7i -CCPT\itt30.cpt -P -K -V -X0.75i > %6
grdcontour %1=1 -R -JM -O -K -A2 -C0.25 -Gd3c -V >> %6
pscoast -R -JM -O -B10f5NSEW:”Mauritius”: -G222/184/125 -C255/255/255 -W0.25p -Di -N1/0.5 -A2000 -U”TSUNAMI TRAVEL TIMES USING POINT SOURCE (EPICENTER), @%%34%%\154@%% = Past EQ, @%%34%%\163@%% = Coastal Gauge, @%%34%%\164@%% = Deep-ocean Gauge” -K >> %6
```

```
if %SL-OPTION% == 0 goto SKIP5
psxy DART_ind_tmp.txt -R -JM -Si0.1 -G0 -O -K -V >> %6
psxy SL_ind_tmp.txt -R -JM -St0.1 -G0 -O -K -V >> %6
```

Numbers and letters highlighted in gray control the labeling and scaling of the axis of maps. B10 sets label in 10-degree interval and f5 sets bars to change color at 5-degree intervals. NSEW will label 4 axes. Capital is for labelling and small letter is for not labelling, e.g. nSEw will label only right and bottom axes.

```
:SKIP5
```

```
if %EQ-OPTION% == 0 goto SKIP6
psxy centennial6_ed.txt -R -JM -Sc -W0.5p/0/0/0 -CCPT\centennial.cpt -O -K -V >> %6
```

:SKIP6

REM white cross

```
psxy %3 -R -JM -Sx36p -W1p/255 -O -K -V >> %6  
pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %6
```

goto TASK99

goto TASK99 means “jump to (= ignore lines till) TASK99”.

This part is for option 1 (Mauritius), so after plotting a map around Mauritius, ignore the command lines for option 2 and 3 and read the lines after TASK99.

REM zoomed map off Mozambique

:SKIP12

```
grdimage %1=1 -lintens.grd -R20/65/-35/0 -JM7i -CCPT\ttt30.cpt -P -K -V -X0.75i > %6
```

```
grdcontour %1=1 -R -JM -O -K -A2 -C0.25 -Gd3c -V >> %6
```

```
pscoast -R -JM -O -B10f5NSEW:.”Mozambique”: -G222/184/125 -C255/255/255 -W0.25p -Di -N1/0.5 -A2000 -  
U”TSUNAMI TRAVEL TIMES USING POINT SOURCE (EPICENTER), @%%34%%\154@%% = Past EQ,  
@%%34%%\163@%% = Coastal Gauge, @%%34%%\164@%% = Deep-ocean Gauge” -K >> %6
```

```
if %SL-OPTION% == 0 goto SKIP5
```

```
psxy DART_ind_tmp.txt -R -JM -Si0.1 -G0 -O -K -V >> %6
```

```
psxy SL_ind_tmp.txt -R -JM -St0.1 -G0 -O -K -V >> %6
```

:SKIP5

```
if %EQ-OPTION% == 0 goto SKIP6
```

```
psxy centennial6_ed.txt -R -JM -Sc -W0.5p/0/0/0 -CCPT\centennial.cpt -O -K -V >> %6
```

:SKIP6

REM white cross

```
psxy %3 -R -JM -Sx36p -W1p/255 -O -K -V >> %6
```

```
pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %6
```

goto TASK99

REM zoomed map – user-input boundaries

:SKIP13

```
grdimage %1=1 -lintens.grd -R%W%/%E%/%S%/%N% -JM7i -CCPT\ttt30.cpt -P -K -V -X0.75i > %6
```

```
grdcontour %1=1 -R -JM -O -K -A2 -C0.25 -Gd3c -V >> %6
```

```
pscoast -R -JM -O -B10f5NSEW -G222/184/125 -C255/255/255 -W0.25p -Di -N1/0.5 -A2000 -U”TSUNAMI  
TRAVEL TIMES USING POINT SOURCE (EPICENTER), @%%34%%\154@%% = Past EQ,  
@%%34%%\163@%% = Coastal Gauge, @%%34%%\164@%% = Deep-ocean Gauge” -K >> %6
```

```
if %SL-OPTION% == 0 goto SKIP5
```

```
psxy DART_ind_tmp.txt -R -JM -Si0.1 -G0 -O -K -V >> %6
```

```
psxy SL_ind_tmp.txt -R -JM -St0.1 -G0 -O -K -V >> %6
```

:SKIP5

```
if %EQ-OPTION% == 0 goto SKIP6
```

```
psxy centennial6_ed.txt -R -JM -Sc -W0.5p/0/0/0 -CCPT\centennial.cpt -O -K -V >> %6
```

:SKIP6

REM white cross

```
psxy %3 -R -JM -Sx36p -W1p/255 -O -K -V >> %6
```

```
pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %6
```

SKIP 12 is for option 2 (Mozambique) and SKIP 13 is for option 3 (Other). Same as for the option 1, after plotting a map, it jumps to TASK99 and continues operation after TASK99.

goto TASK99

REM move files to TTT_AUTO_timestamp directory

:TASK99

echo .

echo .

echo PLOTTING FINISHED SUCCESSFULLY.

echo MOVING output files, if available, to EXAMPLES directory.

echo .

del intens.grd

del epi_auto_symbol.txt

del epi_auto_symbol_z.txt

del DART_ind_tmp.txt

del SL_ind_tmp.txt

move %1 %dirname%

move epicenter_auto.txt %dirname%

move travel_time_atl.txt %dirname%

move ETA_atl.txt %dirname%

REM convert ps file to png for convenience; other options possible

ps2raster2 %4 -A -Tg

ps2raster2 %5 -A -Tg

ps2raster2 %6 -A -Tg

move ttt_auto_*.png %dirname%

move %4 %dirname%

move %5 %dirname%

move %6 %dirname%

All files created in one simulation using ttt_autoXX are moved to a folder, which is automatically created with name TTT_AUTO_**(time)**.

The last move command moves the whole folder under “C:\TTT Package\Examples”, so when you check your output files, go to “Examples” folder. You can change the output directory by editing this line.

REM moves files to Examples directory.

REM Edit this next line to change the directory where output files will be moved.

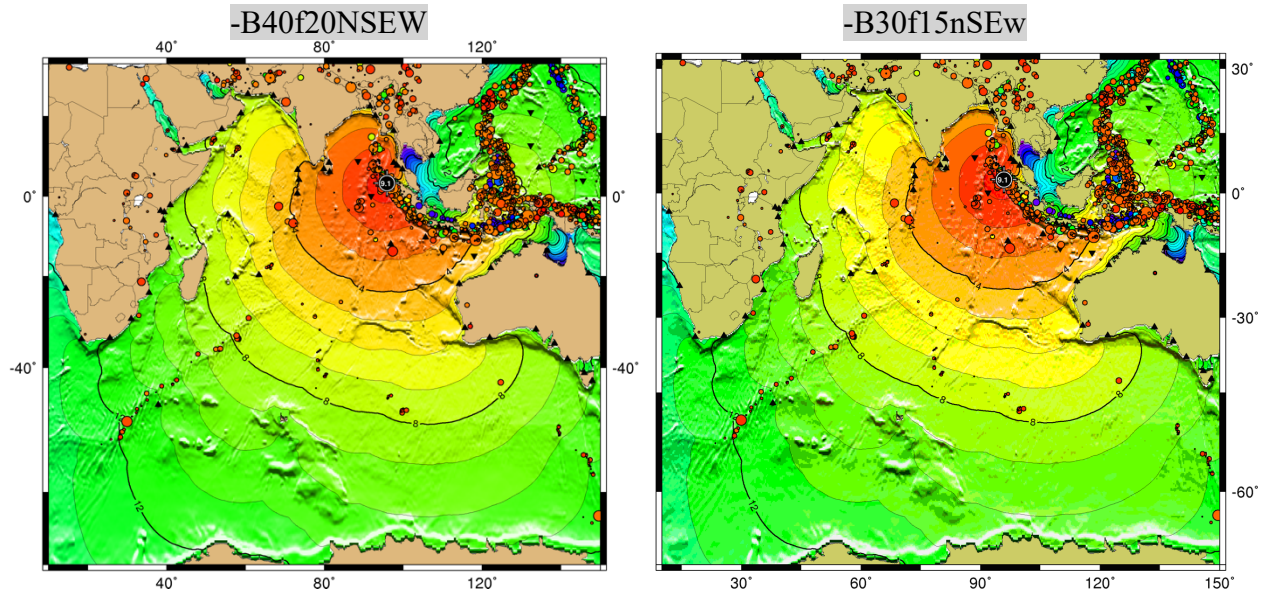
move %dirname% "C:\TTT Package\Examples\%dirname%"

START "" "C:\TTT Package\Examples\%dirname%"

ECHO ON

Example of customization ~comparison of maps~

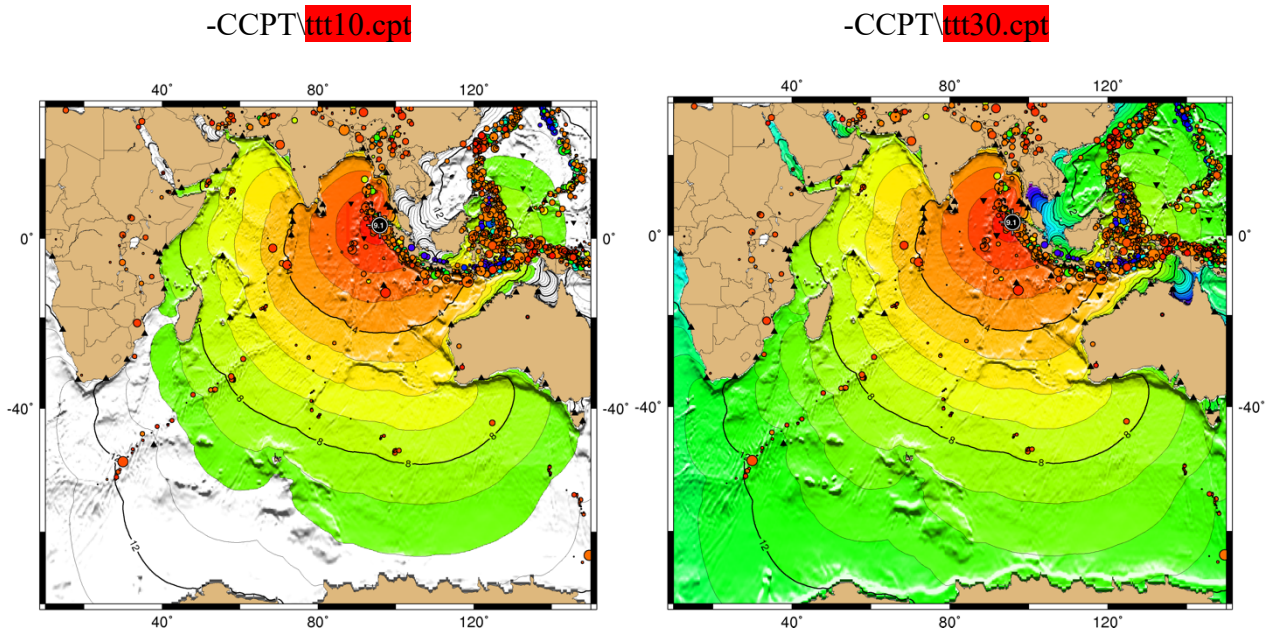
1. Labelling and scaling of axis: *Change the values and letters highlighted in gray*



Change the values and letters (capital or small) of the part highlighted in gray in each script. Two figures are given as examples; the values change the labelling and scaling intervals of axes, and letters controls which axes to be label. These examples plot the sea level stations and historical earthquakes.

2. Hours to plot contour with color: *Change color pallet filename highlighted in red (1 – 30, integer only)*

These examples are with the sea level stations and historical earthquakes.



ttt_fancy_atl / ind / pac_auto.bat Other Customization

1. Change sizes of symbols of historical events: *Edit centennial6_ed.txt (last column of each line)*

```
122.000 -7.000 720.000 0.058
145.066 19.134 692.500 0.064
-179.014 -20.039 691.400 0.010
: : : :
```

centennial6_ed.txt format: longitude, latitude, depth (km) and size (corresponds to magnitude) This input file was originally given as longitude, latitude, depth (km) and magnitude:

```
122.000 -7.000 720.0 6.8
145.066 19.134 692.5 6.9
-179.014 -20.039 691.4 6.0
: : : :
```

but the magnitude like 6.8 results in a symbol size that is too large, so the values are made smaller using the formula $\frac{M - 6.0}{10 - 6.0} \times 0.24 + 0.01$.

This formula can be modified if a different size is preferred (e.g. magnitude $\times 0.01$ to all events).

2. Change criteria of historical events: *Edit centennial6_ed.txt*

centennial6_ed.txt lists events of magnitude 6.0 or greater in the past 100 years. The master list is maintained by the US Geological Survey. To plot other events, such as those of magnitude 5.0 or greater, those in the past 50 years, etc., edit this input file. For reference, centennial.xyzm (provided by PTWC using the USGS dataset) is provided, which lists events of magnitude 5.0 or greater in the past 100 years.

3. Change station list: *Edit stations.txt*

If you need to add or omit some stations to / from the travel time data file, edit stations.txt, which contains longitude, latitude and station name. Any words can be used for the station names.

You can also plot other data (e.g., not just stations, but cities, forecast points, etc). Symbol types and colors are customizable. The keyword *SL* or *DART* in column 4 is used to specify the type of symbol to plot. See also 4. below for adding lines to plot other specific data.

4. Plot some other information: *Add one line as follows*

For example, if you need to plot cities on the map, create a city list with longitude and latitude (here, name cities_add.txt), add the highlighted line in the script between the lines of

```
psxy %3 -R -JM -Sc14p -W0.5p/255 -O -K -V >> %4 and pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %4
```

```
psxy %3 -R -JM -Sc14p -W0.5p/255 -O -K -V >> %4
psxy cities_add.txt -R -JM -Si0.5 -G0 -O -K -V >> %4
pstext epi_auto_symbol.txt -R -JM -G255 -O -V >> %4
```

Example information on symbols and sizes:

-Si0.5 set the shape (I is an upside-down triangle) and size (0.5)

-G controls color. "0" is black. If you add the -W option, only the outline of the shape is drawn.

Addition of any lines that overlay another plot command to the existing plot need to include the option -K.

The last plot command line of the script (before ECHO ON) should not have the option -K in it.

For example,

```
pstext epi_auto_symbol z.txt -R -JM -G255 -O -K -V >> %4
psxy cities_add.txt -R -JM -Si0.5 -G0 -O -V >> %4
```

In this case, the pstext line has to be added "-K" but psxy need not "-K"