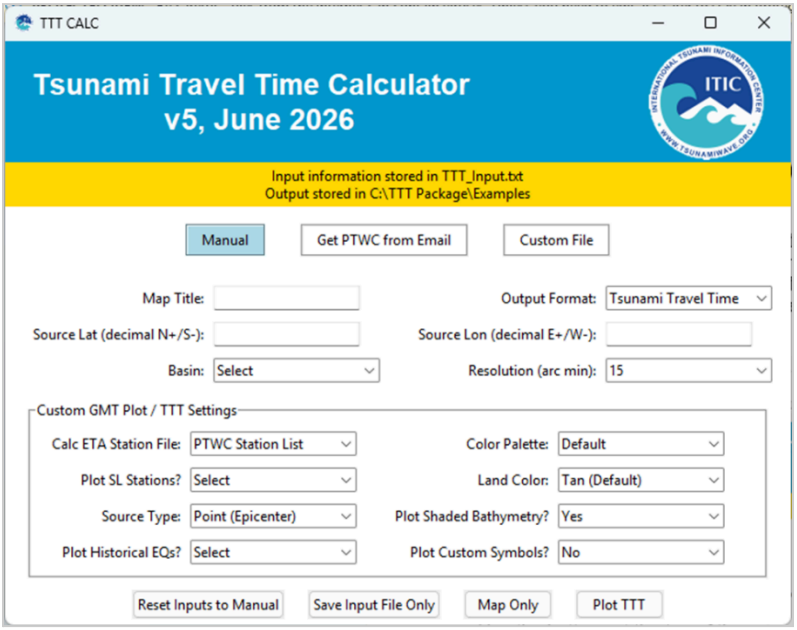
Tsunami Travel Time (TTT) Calculator Users Guide v5.0, June 2026

The TTT Calculator Graphical User Interface (GUI) provides an interface for configuring and calculating tsunami travel time. The GUI allows users to quickly and easily calculate tsunami travel or arrival times from different tsunami source models, and to generate customized tsunami time maps that can be overlayed by sea level stations, historical seismicity or other user-specific data.

The TTT GUI is accessed by double-clicking on the TTT_CALC5 desktop icon, or by running ttt_calc5.exe



1. Data Ingestion Methods

Use the buttons at the top of the interface to select your data ingestion method:

- **Manual:** The Default. Clears all input fields, allowing you to manually type the exact coordinates and event parameters.
- **Get PTWC from Email:** Connects to an operational Google Apps Script API to parse the latest Pacific Tsunami Warning Center (PTWC) message, and automatically populates this TTT GUI with the scraped origin time, coordinates, and magnitude
- **Custom File:** Loads a text file (extent .txt) to populate the dashboard.

  The file format, using comma delimiter, is:
  Latitude, Longitude, Origin Time (YYYY-MO-DA HH:MM:SS), RegionName, Magnitude.

  Example, file: Custom_hypocenter_example.txt:
  -20, -170, 2026-05-26 20:30:00, Tonga, 8.0

2. Core Parameters

Configure the standard TTT calculation settings within the main frame:

- **Map Title:** Enter a descriptive title for the output map. To ensure proper formatting, keep this under 50 characters.
- **Output Format:** Choose between **Tsunami Travel Time** (duration, hours/minutes) or **Tsunami Arrival Time** (clock time). Selecting Arrival Time will prompt you to input the Origin Time.

The format is: `YYYY-MM-DD HH:MM:SS`
Example: `2026-05-26 20:30:00`

- **Source Coordinates:** Enter the Latitude (Decimal N+/S-) and Longitude (Decimal E+/W-).
- **Select Basin:** Choose the primary ocean basin (Atlantic/Caribbean, Indian, Pacific) for the TTT calculation. This selection will dynamically adjust regional map zoom options, such as Southwest Pacific or Samoa or South China Sea, etc
- **Resolution (arc min):** This controls the spatial resolution of the bathymetry grid used for the TTT calculation and the resulting map. Small grid spacing increases calculation accuracy but requires significantly more computation time. It is recommended to the 15 arc minute grid for rapid calculations, or 1-2 arc minute (or 30 arc sec) grids for detailed post-event scientific analysis.

3. Customized TTT and Map Settings

The interface enables further customization of the TTT calculation using more complex source models, and also customization of the plotting.

Source Types

Point Source. By default, the TTT calculator models tsunamis originating from a single point (the epicenter).

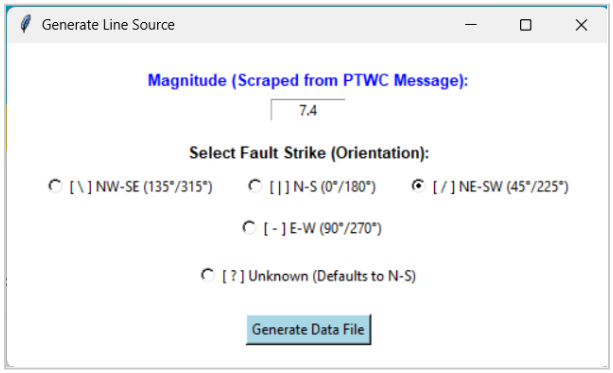
Line Source. For major earthquakes, it is often more accurate to model the rupture along a fault line.

You may manually enter a line or the Line Source Generator can do this automatically. The line source can be a line, a polygon, or the shape of a country or island.

Example file: Custom_linesource_example.txt

Line Source Generator. To use this tool, change the **Source Type** drop-down to **Line (Generate for me)**. A prompt will ask for the earthquake's Magnitude and Fault Strike (orientation). The system will automatically calculate the estimated fault length based on the magnitude, generate the necessary coordinate array, and save it as an

epicenter.dat file for the calculation. The magnitude will be automatically populated if in PTWC Mode, but can be manually input or changed.



TTT or ETA Calculations to Sea-Level Stations

The Calc ETA Station File drop-down has two options for providing station data:

- PTWC Station List: The software will use as its default, the PTWC global sea level monitoring network stations list.
- User-supplied: This option asks the user to upload a custom text file (extent must be `.txt`) containing a list of locations where the TTT is calculated.

Custom Station or Location File Format: If you choose to upload your list, each record must use a specific format for the coordinates and station types to be correctly parsed.

The format consists of four space-separated columns:

```
[Longitude] [Latitude] [#StationName] [SL or DART]
```

Example file: Custom_calcETAstationlist_example.txt:

```
-129.6219 48.8128 #dsea DART
```

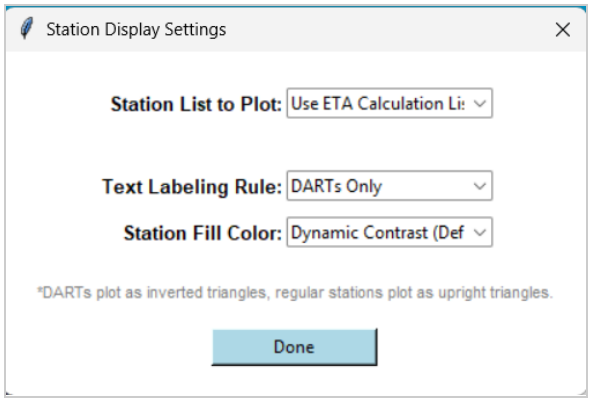
The output file is titled `ETA_xxx.txt`, or `travel_time_xxx.txt`

Note: If you upload an older formatted file that only contains three columns (missing the final "SL or DART" designation), the software utilizes an automatic fallback rule. It will scan the station names and assume any station starting with the letter 'd' or 'D' is a DART buoy, while all others are classified as standard Sea-Level (SL) stations. The program will also automatically “cleans” your text file upon upload, ignoring any unreadable text headers or weird gaps.

Station Display Settings

To plot the locations of tsunameter / DART systems and coastal sea level gauges, select **Yes** next to **Plot SL Stations?**.

This will open the Station Display Settings menu, which allows you to manage visual clutter on the final map. You can choose to label only DART buoys, all stations, or no stations. You can also assign a custom fill color to the station markers to ensure they are visible against the map background. Note that DARTs plot as inverted triangles, while regular sea-level stations plot as triangles.



You may upload a custom file for plotting stations:

Example file: Custom_plotstationlist_example.txt

This is the same format at the Custom_calcETAstationlist_example.txt

```
-129.6219 48.8128 #dsea DART
```

Historical Seismicity

This option plots the USGS Centennial Earthquake List (M6+, 1900-2000) as circles sized proportionately to the earthquake's magnitude, and in color according to the earthquake's depth (shallow to deep).

The format of the seismicity file consists of four space-sparated columns

```
[Longitude] [Latitude] [Depth] [Magnitude]

143.346    40.903     25.8  8.3
```

4. Map Customization

The **Customized GMT / TTT Settings** section allows you to customize the visual output generated by the Generic Mapping Tools (GMT) plotting routines.

- **Color Palette:** Select the thermal contour mapping colors for the wave travel times. Standard options include Jet, Rainbow, Viridis, and GrayC.
- **Land Color:** Modify the color of the landmasses. You can select standard options like Tan or Light Gray, or use the **Custom...** color picker for specific color requirements!

- **Shaded & Plot Bathymetry:** Toggle 3D topographic shading and underwater bathymetry rendering on or off to adjust the texture and clarity of the map.
- **Map Only Feature:** If you only need a customized base map without running the tsunami calculations, select **Map Only (Custom Ocean)** in the Color Palette drop-down to select a water color, if you do not select this specific option and choose your own color, the ocean will automatically be blue. Finally use the **Map Only** execution button at the bottom of the screen.

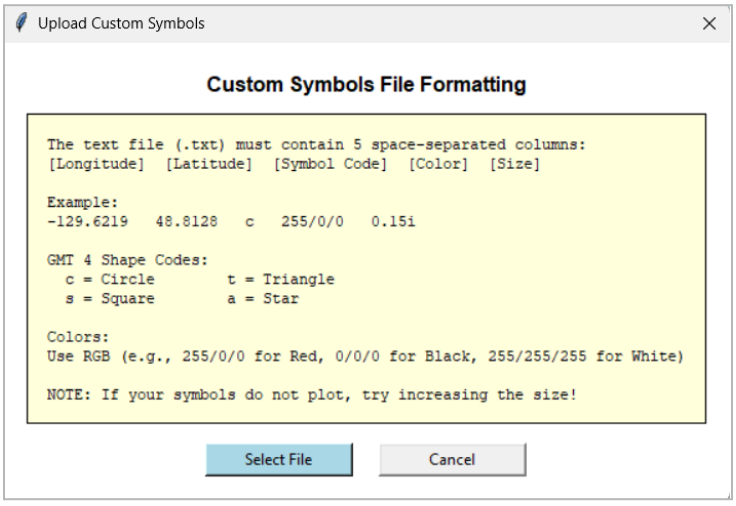
  This feature can be used to

  - Plot sea level stations (**Plot SL Stations** must be 'Yes')
  - Draw a blank map
  - Plot user-supplied symbols on map. This option asks the user to upload a custom text file (extent must be .txt) containing a list of locations to plot, the symbol type, and symbol color.

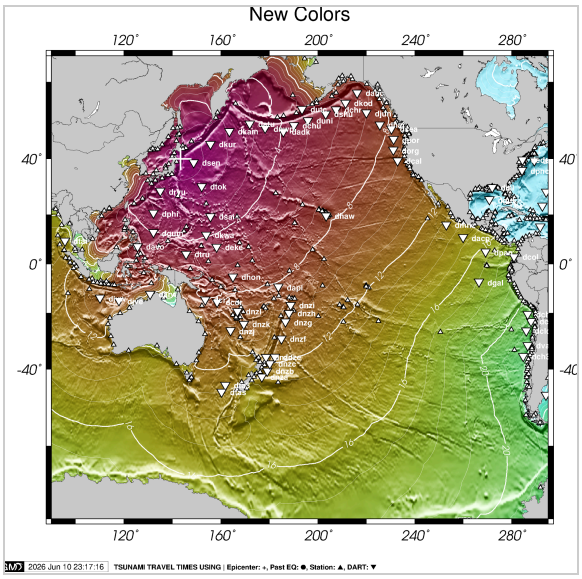
  Example file: Custom_plotsymbols_example.txt

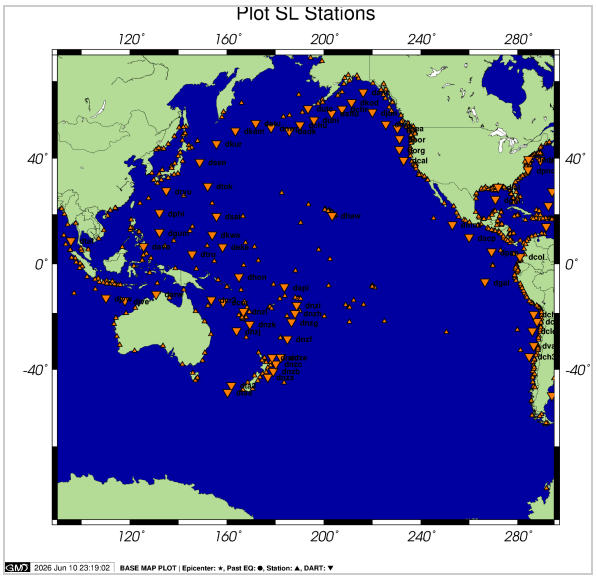
  The format consists of four space-separated columns:

  `[Longitude] [Latitude] [Symbol Type] [Symbol Color] [Symbol size]`



  Example: `-129.6219 48.8128 type color size`





5. Execution and Outputs

Use the action buttons at the bottom of the interface to start the TTT calculation and generate the plots:

- **Reset Inputs to Manual:** Restores all settings and fields to their default states.
- **Save Input File Only:** Writes your current configurations to a TTT_Input.txt file without triggering the backend calculation script. This is useful for staging runs.
- **Map Only:** Bypasses TTT plotting to generate a customized regional base map.
- **Plot TTT:** Saves your configuration and triggers the backend calculator to begin processing.

Output Directory Structure

Upon clicking **Plot TTT**, the backend script processes the data. All outputs are automatically compiled into a timestamped folder within your configured directory. The folder will contain:

- **TTT_Input.txt:** Formatted parameters file written to C:\TTT Package\Examples\.
- Custom **input files** can be found in the sub-folder 'Custom_files_examples':
  - `Custom_epicenter_example.txt`
  - `Custom_calcETAstationlist_example.txt`
  - `Custom_plotstationlist_example.txt`
  - `Custom_linesource_example.txt`
  - `Custom_plotsymbols_example.txt`
- **Binary Travel Time Grids:** The compiled calculation files of the wave velocities.
- **Travel Time or ETA file:** A text-based list of calculated travel time or arrival times for your selected stations.

- **Proportional PNG Maps:** At least three finalized map layouts (Local, Regional, Basin-wide) formatted according to your GUI settings.

Other Notes

- If you have to uninstall TTT and reinstall please make sure you delete the TTT Package folder first for a clean install. If you need maps you previously plotted copy or move them from the Examples folder before delete TTT Package folder.
    - C:\TTT Package
- If you have another version of GMT installed TTT may not work properly.