

TIDE TOOL: SOFTWARE TO ANALYZE GTS SEA-LEVEL DATA

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WMO GTS – Global Telecommunications System:

- Comprised of a network of surface / satellite-based telecommunications links and centers.
- System for global exchange of meteorological, climatic, seismic, other data to support early warning / forecast *.
- TWCs (Tsunami Warning Centers) rely on GTS for near-real time sea-level data from ~400 stations globally and to transmit Tsunami Bulletins.

*Source: <http://www.wmo.ch/pages/prog/drr/events/humanitarian/Documents/HumanitarianBackground%20document.pdf>




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GOESW

CHANNEL 32

Hiva Oa

Downloaded at Wallops Island VA/USA and forwarded to the US TWCs and Met. Offices.



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GTS Sea-Level Data is structured in different formats. ~12 basic formats

UHSLC format (Manzanillo, MX) Readable ASCII (XMT 5min)
 SEPA40 KWAL 050000 (WMO HEADER Origin Mdhmm)
 ^^3541502E (Platform ID#) 186000003 :PRS 0 #1 9140 9139
 9139 9068 8284 8446 (Readings in mm):RAD 1 #1 6494 6483 6483
 :BAT 4 #5 13.3 :NAME 3541502E 38+0NN 216W (GOESW Chan 216)

NOS "Tsunami Expert" Station (Nawiliwili, Hawaii USA)
 SXXX03 KWAL 050000 Base 64 Encoding (XMT 6min)
 ^^336015FC 186000041"P16114001@[]~[@@v0KwW1@il@WADWDM>
 @ij5DY<U`2@Rs@T@"@Rt kTWyJBQBeBcB^BqBo 41+0NN 148W
 (one minute data)

NTF (Australia) Station (Port Vila, Vanuatu)
 SXPS85 RJTD 042300 (RJTD indicates origin is Tokyo, Japan)
 AAXX 04234
 91559 46/// /9901 10257 40128 22200 00260
 555 77744 A0103 44200 30031 1265B 03017 74002 00A07

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**For a TWC to use GTS Sea-Level Data,
the TWC needs (at minimum):**

- 1. Access to GTS Data!**
(Easier said than done in many cases)
- 2. Decoder to translate Sea-Level
messages into sea-level data (Tide Tool)**
- 3. MetaData Database (used by decoder).**



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Tide Tool – history, use

- Originally developed in Nov 2005 to give BMKG (Indonesia) new capability to decode GTS sea-level messages from Indian / Pacific sea-level stations.
- Since 2005, Tide Tool has grown in sophistication
- Now, operational sea-level processing system at PTWC and other centers (Indonesia, Malaysia, Singapore, Mauritius, Chile, Ecuador, El Salvador, ... Installed /to be installed in Samoa, Solomons, Vanuatu, Tonga, Tuvalu, Fiji, PNG Met Offices)



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Tide Tool – how it works

Tide Tool continuously decodes sea-level messages in real-time and displays time series using open source, platform independent, graphical scripting language Tcl/Tk.

Tide Tool consists of two main parts:

1. Decoder which reads log files of GTS sea-level messages and a sea-level station metadata base.
2. Dynamic map based clients that allow the user to select a single station or a group of stations to display and analyze.



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Tide Tool Requirements

In order to decode GTS messages, run dynamic map clients and display time series, the following are required :

- Computer running Tcl/Tk software with BLT extension.
- GTS Sea level messages that are continuously archived into log file. Link to data via country's Met Service
- Tide.tcl and client Tcl/Tk scripts.
(contains decoder and creates marigram displays)
- Sea-level Station metadata.



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Tide Tool

COMP_META metadata database*

- PTWC actively maintains database (COMP_META) of all GTS-transmitted sea-level stations.
- Tide Tool reads database to understand how messages are structured so that it can properly decode.

```
manz      Manzanillo_MX    3541502E SEPA40 prs  1  10  M  3-1  1.0000
005 0000  19.0558 -104.3176  1  UHSLC  163
manz      Manzanillo_MX    3541502E SEPA40 rad  1  10  M  3-1  1.0000
005 0000  19.0558 -104.3176  1  UHSLC  163
```

The COMP_META database has ~1000 entries

*A googleearth kml representation of the COMP_META Database is available at www.sealevelstations.org

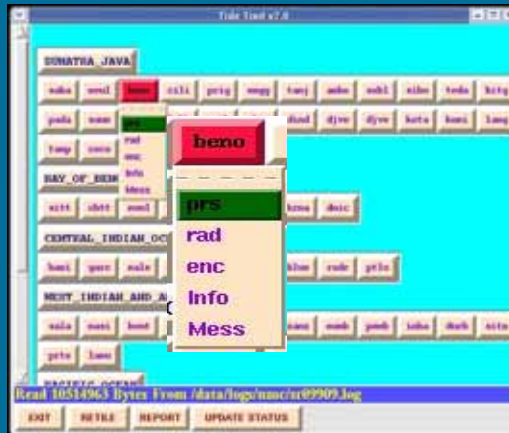


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Tide Tool Decoder (Tide.tcl script)



- Reads and decodes GTS sea-level messages from the logfile.
- Constructs main GUI which responds to mouse clicks.
- Sends / services Instructions to / from clients respectively.
- Supports multiple clients via sockets.
- Creates transmission report and determines status of stations.
- Scrollable.



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Tide Tool Monitor Widget



• Can display up to three different time series:

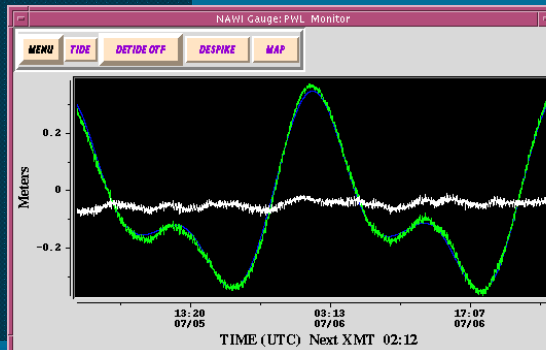
- Green – Actual time series
- White – De-tided time series
- Blue – Predicted time series

• Two de-tiding options: permanent or on-the-fly coefficients.

• Despiking option based on three point median.

• Station location map option showing reverse travel-time contours.

• Rubber banding zoom option to expand time series.



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Tide Tool Zoom Widget



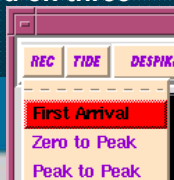
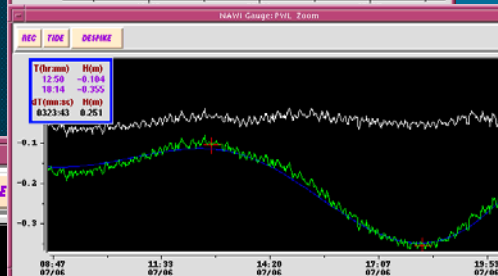
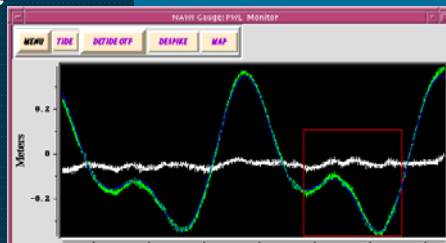
• Used to measure tsunami wave arrival time, amplitude, and period with mouse clicks and record measurements in a file.

• Can display up to three different time series:

- Green – Actual time series
- White – De-tided time series
- Blue – Predicted time series

• Two de-tiding options: permanent or on-the-fly coefficients.

• De-spike option based on three point median.



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Tide Tool Map Clients

Caribbean Client

Pacific Client

Indian Client

- Scrollable.
- Indicates station status (color).

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Tide Tool Map Clients

Tide Tool Caribbean Client v1.1

- Double click on a station
- Menu to display sensor time series, station info, recent GTS messages, Geographic map with Tsunami travel-times.

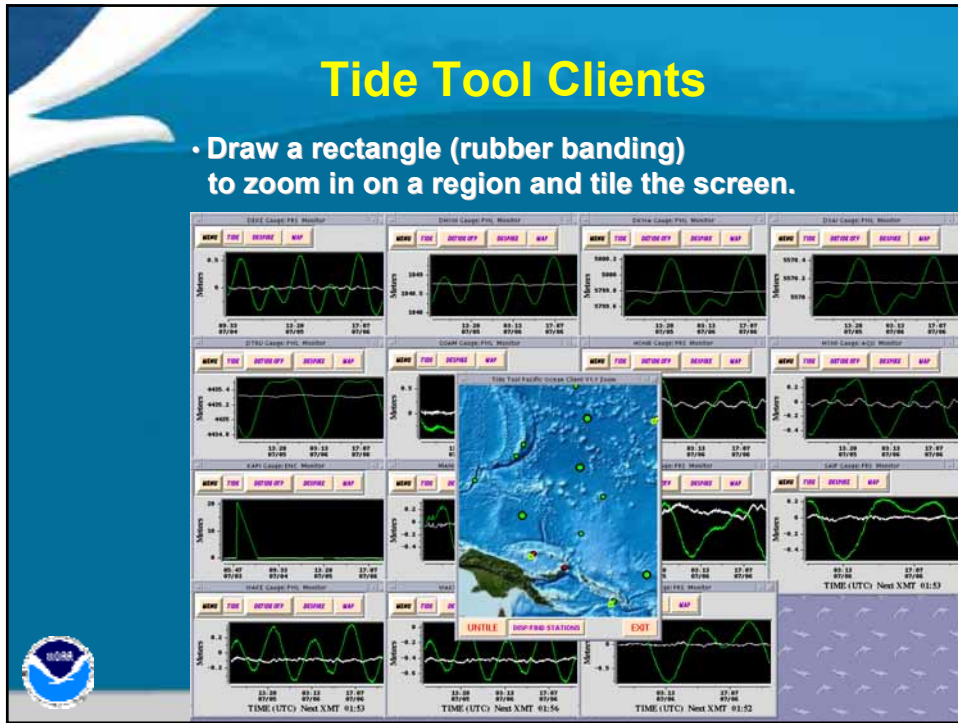
Station Data For NAWI

Location: Nawiliwili, Kauai
 WMO Header: SXXX03
 Platform ID: 336015FC
 Transmission Interval: 6mins
 SENSORS:
 Sensor Type: pwl Sample Rate: 1mins Unit: .001M
 Sensor Type: bwl Sample Rate: 6mins Unit: .001M
 DETIDE: PERM, OTF
 Lat: 21.957 Long: -159.36

EXIT

Tide Tool Clients

- Draw a rectangle (rubber banding) to zoom in on a region and tile the screen.



The screenshot shows the 'SEA LEVEL STATION MONITORING FACILITY' web interface. It includes a world map for station selection, a data table, and a detailed view of a specific station's data. The data table is as follows:

Station	Coordinates	Station Data	Status	Notes
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	
Alaska	60.0000, 150.0000	1999-08-01 00:00:00	OK	

Additional text: 'selectable time windows are also available.'

IOC SL Station Monitoring Facility (web public access)

<http://www.vliz.be/gauges/map.php>

Real-Time Earthquake Display and Alert System (CISN)

- Internet
- Passive (automatic receive)
- Multi-platform
- EQ broadcast
- Alert system (SMS, email)
- GIS layers
- Tsunami Warning msgs



Sign-up - Contact:
itic.tsunami@unesco.org

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