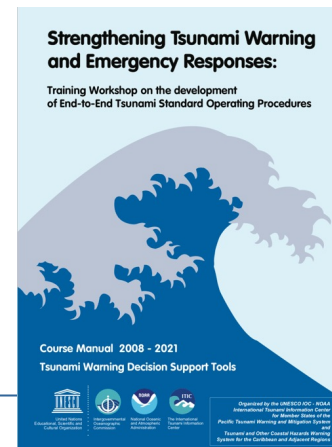




UNESCO/IOC – NOAA/ITIC  
Tsunami Early Warning and Mitigation Systems  
August 2024

# Keeping Authorities Informed: Available TW Decision Support Tools

## Earthquakes, Sea Level, Historical Events, Travel Times, Hazard Assessment



Laura Kong

UNESCO/IOC – NOAA International Tsunami Information Center

ITIC, IOC, USGS, PTWC, NCEI, WDS-Geophysics, PMEL/NCTR

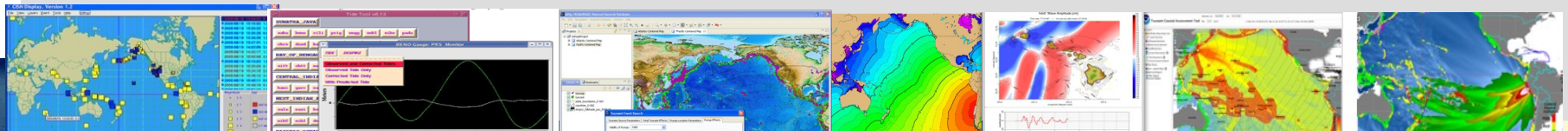


# Tsunami Warning Decision Support Tools



ITIC-distributed, supported

- ❑ **Tsunami Bull Board Listserv (ITIC, 1995) 464 science/tsu/govt (Aug 2024)**  
ADDR FOR POSTING: [tsunami\\_bb@list.woc.noaa.gov](mailto:tsunami_bb@list.woc.noaa.gov)
- ❑ **Real time EQ Display (CISN, USGS / NTHMP, 2005), 346+ v3.13.227 (Aug 2024)**  
**NO PTWS EQ Observatory message. NO registration code required so cannot track nbr users**
- ❑ **Real-time Sea Level monitoring**
  - Tide Tool – TWC operations monitoring (PTWC, 2005) v10.71
  - IOC Sea Level Monitoring web site (IOC, 2008)
- ❑ **Tsunami Travel Time Software (ITIC, NGDC, 2007) – SDK4.0.1, with GUI for PC**
- ❑ **Tsunami Historical Database Online (WDS-NCEI), Offline (TsuDig, NCEI, ITIC, 2009)**
- ❑ **Tsunami Hazard Assessment Tools (2017) – PMEL, ITIC**
  - ❑ **ComMIT/MOST inundation modeling => OTGA TEMPP hybrid late 2025**
  - ❑ **Tsu Coastal Assessment Tool (TsuCAT v4.4, Aug 2024) => PTWC messages from multiple countries, with community exercise injects, near-real time USGS earthquake ingest**





# Tsunami Bulletin Board

**Email List-serve, Currently, ~464 (Aug 2024)**

**Membership: Scientists, Tsunami prof, govt,  
NO MEDIA - NO PUBLIC**

## Features

- 1. Immediate delivery**
- 2. No censureship**
- 3. Forum for sharing science and early results -  
NOT peer-reviewed**
- 4. PTWC, US NTWC tsunami messages**

Contact: [itic.tsunami@noaa.gov](mailto:itic.tsunami@noaa.gov)

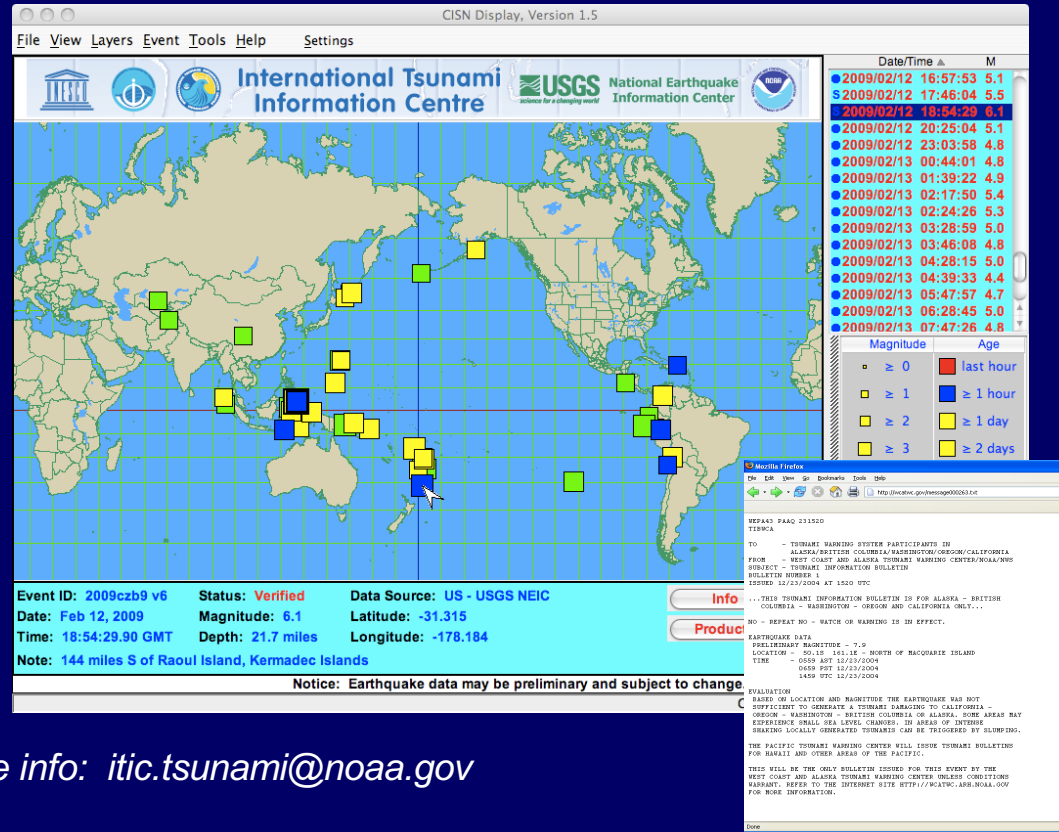
# CISN – Quick Info

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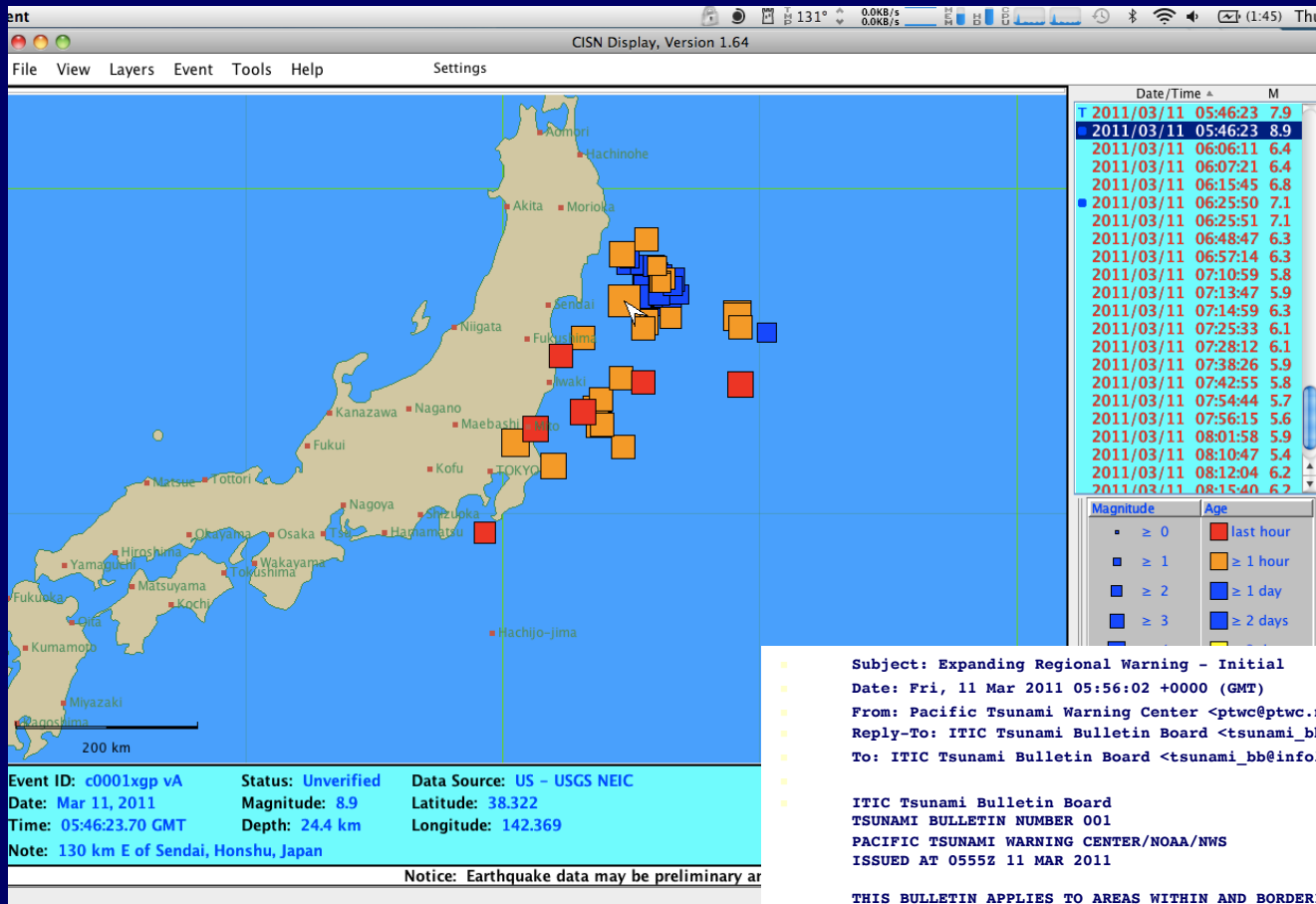
- **CISN earthquake information displayed is that of US Geological Survey**
  - Updates as more information received (iterates)
  - Authoritative agency for earthquakes in the US.
  - USGS hypocenter / magnitude will likely differ (by small amt) from PTWC / US NTWC.
  - During tsunami event, PTWC / US NTWC work together, but independently from USGS. PTWC / US NTWC use their own locations in their tsunami products.
  
- ***ITIC and PTWC recommend CISN for displaying real-time EQ info, and for alerting duty staff that PTWC has issued a tsunami message.***

# 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



For more info: [itic.tsunami@noaa.gov](mailto:itic.tsunami@noaa.gov)



# CISN: 11 March 2011

Subject: Expanding Regional Warning - Initial  
 Date: Fri, 11 Mar 2011 05:56:02 +0000 (GMT)  
 From: Pacific Tsunami Warning Center <ptwc@ptwc.noaa.gov>  
 Reply-To: ITIC Tsunami Bulletin Board <tsunami\_bb@infolist.nws.noaa.gov>  
 To: ITIC Tsunami Bulletin Board <tsunami\_bb@infolist.nws.noaa.gov>

ITIC Tsunami Bulletin Board  
 TSUNAMI BULLETIN NUMBER 001  
 PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS  
 ISSUED AT 0555Z 11 MAR 2011

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A TSUNAMI WARNING AND WATCH ARE IN EFFECT ...

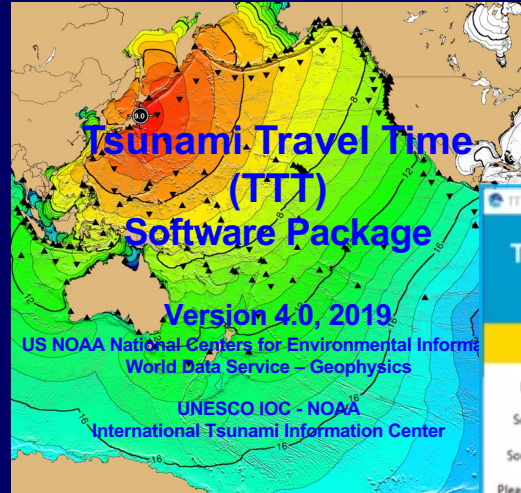
A TSUNAMI WARNING IS IN EFFECT FOR

JAPAN / RUSSIA / MARCUS IS. / N. MARIANAS

# Tsunami Travel Time Calculation and Map Display



- PC-Windows, Linux, Unix, Mac OSX
- Calculation
- Map display (GMT)
- Used by PTWC
- Examples, Simple scripts
- Accuracy on bathymetry Etopo1 (1-min) and coarser grids
- Available to TWFP / govt agencies
- TTT GUI for easy use (2021)

A screenshot of the TTT CALC 09/2020 software interface. The window title is "TTT CALC 09/2020". The main heading is "Tsunami Travel Time Calculator" with the ITIC logo. Below the heading, it states "Input information stored in TTT\_input.txt" and "Output stored in C:\TTT Package\Examples". The form contains several input fields and dropdown menus:

- "Please Enter Title You Would Like For Map:" with a text box containing "Pago Pago".
- "Source Latitude (decimal degrees, N(+), S(-)):" with a text box containing "-14.33333".
- "Source Longitude (decimal degrees, E(+), W(-)):" with a text box containing "-170.71667".
- "Please Select Region the Ocean Event is Occurring in:" with a dropdown menu set to "Pacific".
- "Please Select Zoomed PO Region to Plot:" with a dropdown menu set to "SW Pacific".
- A note: "Please Note: Output times at locations arrival times are calculated correctly only for events years 1970-2038)".
- "Select What You Would Like Outputted" with a dropdown menu set to "Tsunami Travel Time".
- "Select bathymetry grid file to use, 15min recommended for fast run." with a dropdown menu set to "20".
- "Options are (arc min): 60, 30, 20, 15, 10, 5, 2, 1:" with a dropdown menu set to "20".
- "Plot Sea Level Stations?" with a dropdown menu set to "Yes".
- "Plot Historical Earthquakes? (Centennial List)" with a dropdown menu set to "No".

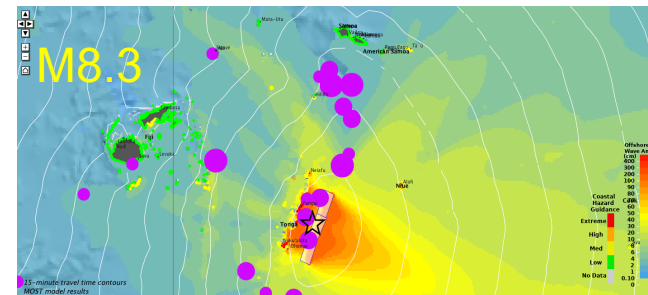
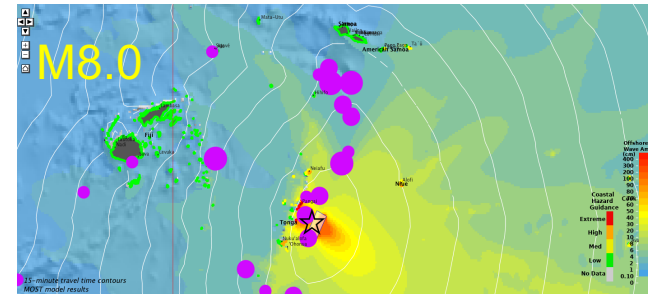
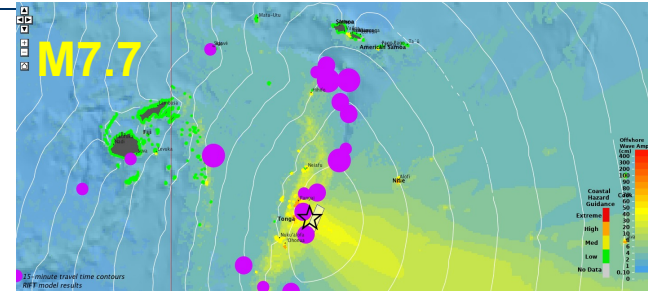
At the bottom, there are two buttons: "Reset Inputs" and "Generate Image".

Contact: [itic.tsunami@noaa.gov](mailto:itic.tsunami@noaa.gov)

# Tsunami Coastal Assessment Tool (TsuCAT) - Uses



- ❑ **Hazard Assessment** - worst case, likely impact
- ❑ **Exercise development** – scenario development, PTWC exercise messages
- ❑ **Response Planning** – use scenarios to develop tsunami response plans, procedures (SOPs)
- ❑ **Warning decision making** – estimate tsunami impact with nearest similar scenario (early assessment prior to receiving PTWC forecast)
- ❑ **Features:**
  - Database: ~5400 earthquake scenarios from active subduction zones - Pacific, Caribbean, Indian Ocean (M6.5-9.5)
  - NOAA models (MOST/SIFT (M8+), RIFT (M6.5-7.9))



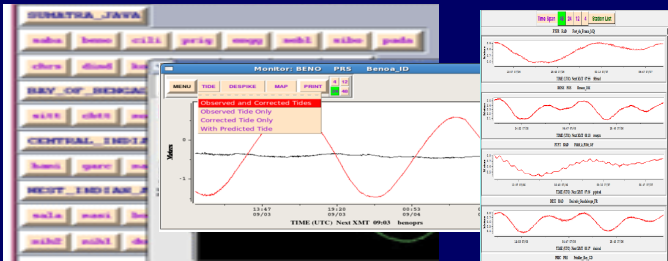
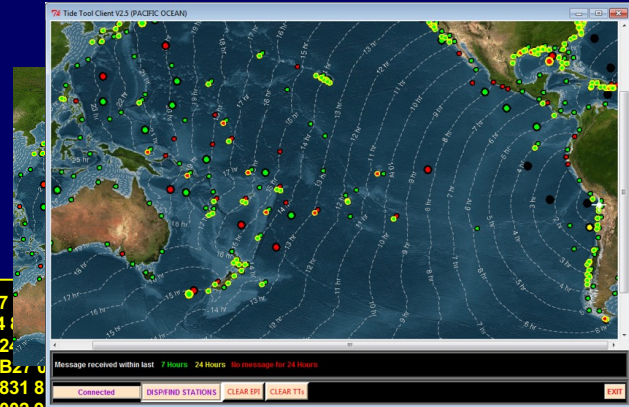
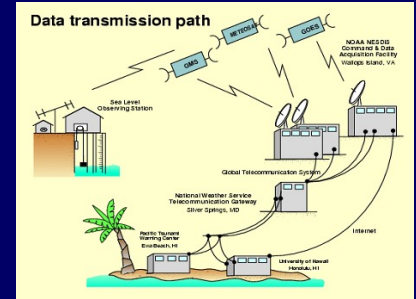


# TideTool - Interactive Sea Level Monitoring

(OPERATIONAL Tool for Tsunami Warning Centres)

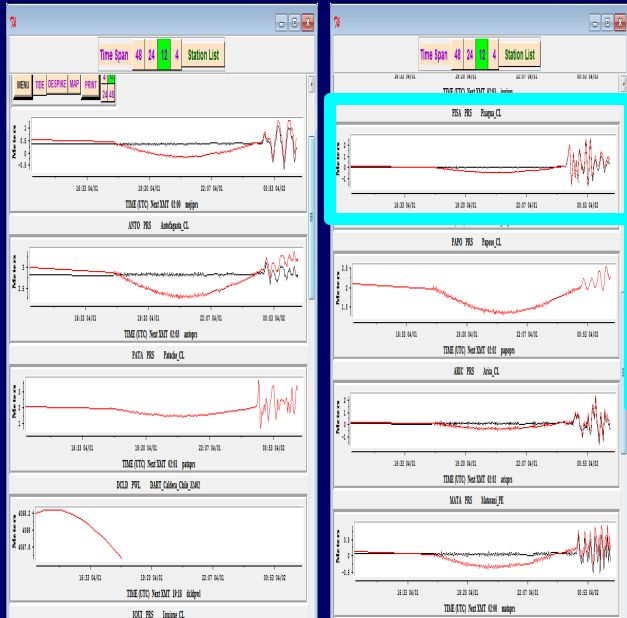


- **PTWC-received sea level stations (GLOSS, non-GLOSS)**
- **Decode, Display, Manipulate** (expand, measure period/amplitude) satellite-transmitted sea level data
- **Open-source** shell programming, graphics (Tcl/Tk, BLT extension), PC, Linux, Unix
- **Continuously decodes:** expand time series, remove tide, pick amplitude, metadata, msg Downloads data from GTS (Met Svc) Also by ftp from NOAA NWS gateway
- **Runs locally (data, software)**
- **Dynamic, interactive, customize**

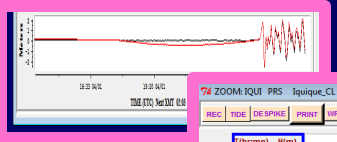
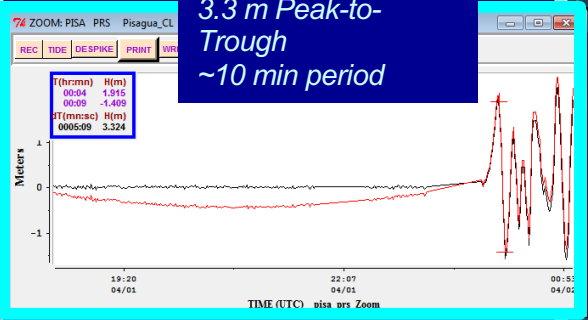


```
91642 4611 /1205 10296 40080 22200 00287
555 77744 A0102 516 3 60029 6315B 03024
24520 2400A 13025 90036 00297 317B1 502
B2102 37103 100A2 50266 50330 02973 18B Z1 0
8318B 33022 92026 00A37 02736 03401 29831 8
00299 319B4 50222 50230 0A490 27960 34002 95519 03102 19202 3017A3 30202
20380 02983 19B57 02163 03200 BV289 134S1 41249 C0501 22080 00070 23677 44777=
AA32A87559
```

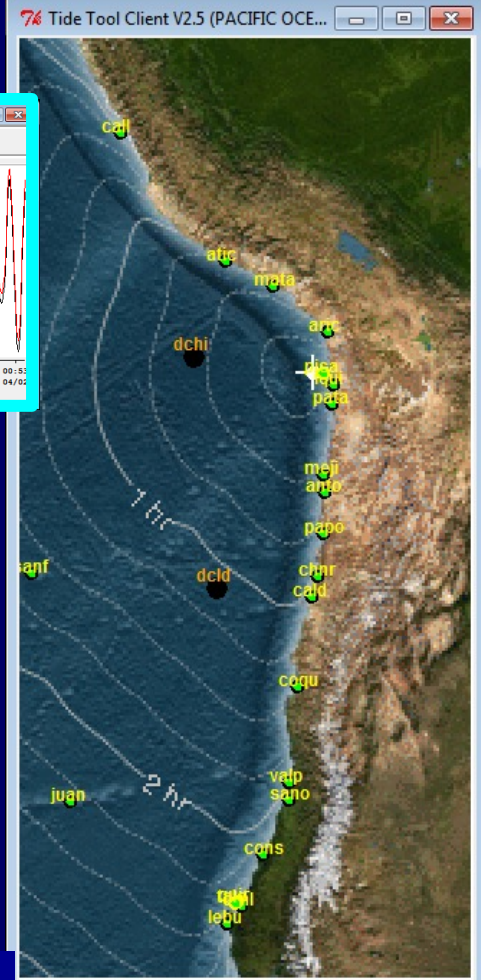
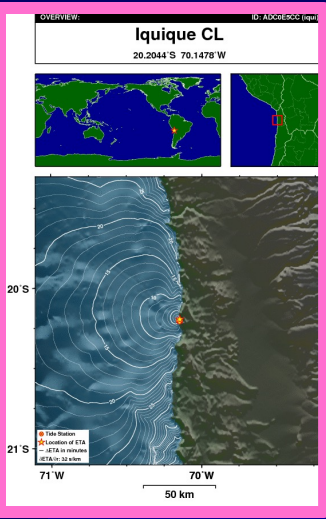
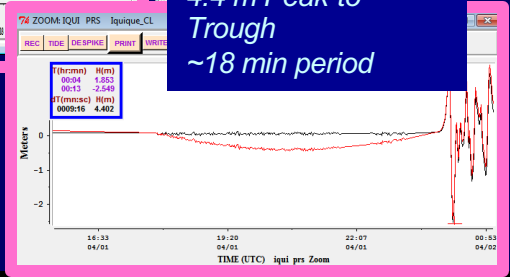
Contact: [stuart.weinstein@noaa.gov](mailto:stuart.weinstein@noaa.gov), [laura.kong@noaa.gov](mailto:laura.kong@noaa.gov)



**Pisagua, Chile**  
 3.3 m Peak-to-Trough  
 ~10 min period



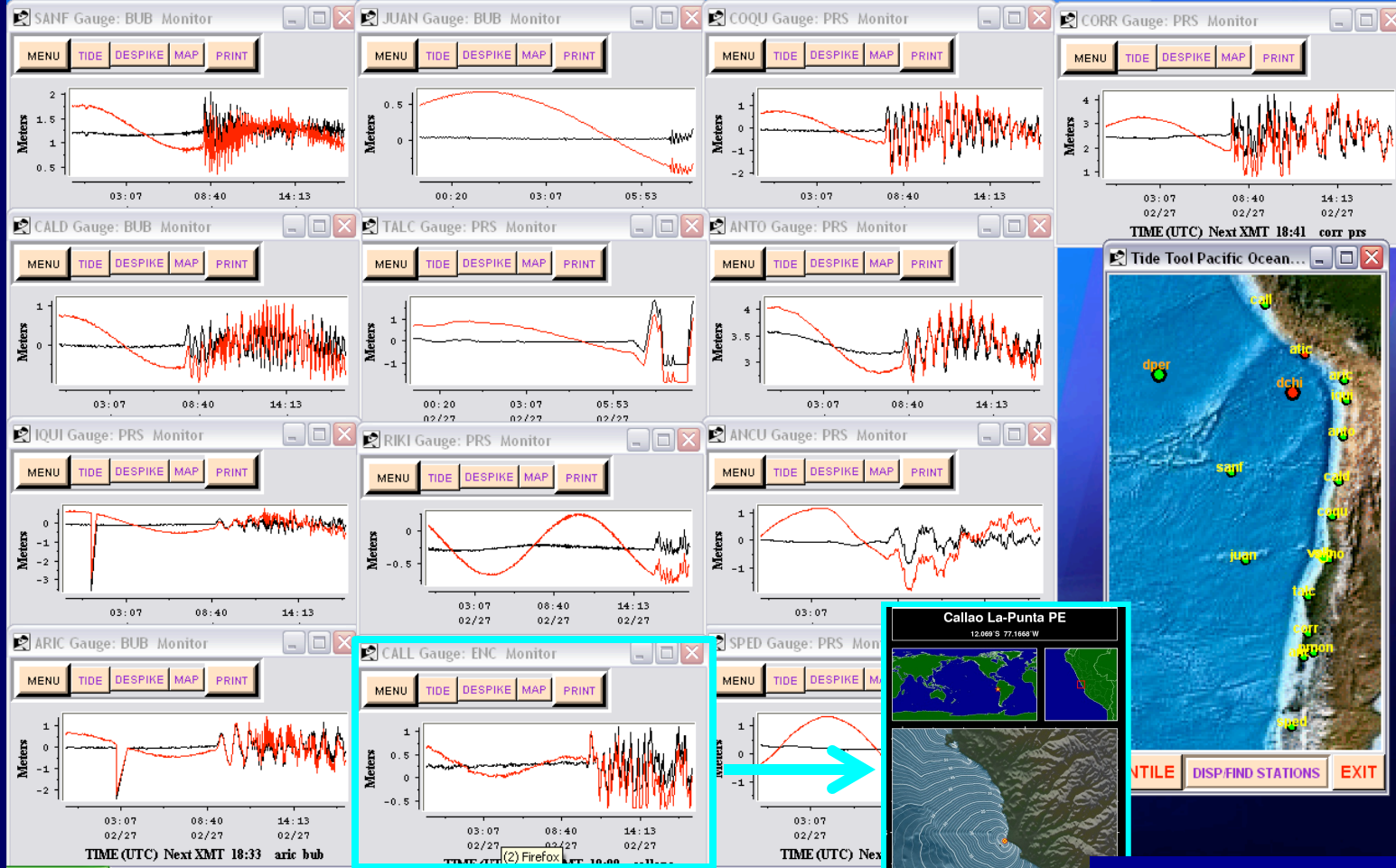
**Iquique, Chile**  
 4.4 m Peak-to-Trough  
 ~18 min period



SHOW DISP/FIND STATIONS EXIT

# Tide Tool: 1 April 2014

TTT to Iquique, Chile



# Tide Tool: 27 February 2010

TTT to Callao, Peru

# Tide Tool Quick Info

## Update Widget

### Tide Tool Update Widget

To facilitate the easy update of Tide Tool, a Widget is available.

The Update folder must be placed in the directory C:\Tcl\TideTool\

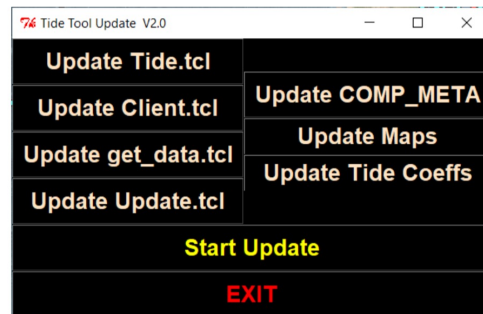
Steps:

1. Open the Update folder and create a shortcut to the Update\_Tide\_Tool.vbs file and move it to the Desktop.
2. Before performing an Update, stop Tide Tool and any of the Map Clients that are running. The get\_data.tcl process does not need to be stopped unless it is being updated.
3. After the Tide Tool processes have been killed, you can start updating. Click the shortcut to start the Update widget:

4. To update the software, click the button with the name of the file that is to be updated. It will turn green.

Tide.tcl – script that decodes binary data  
Client.tcl – script that enables maps  
get\_data.tcl – script that retrieves binary data  
Update.tcl – script that retrieves latest Update widget  
COMP\_META – station data  
Maps – sea level station travel time maps  
Tide Coeffs – Tide coefficients for detiding sea level stations

5. Click the “Start Update” button and the update will commence. The “Start Update” will change to “Update Starting.” When it is finished, that will change to “Update Finished.” At this point, the Update(s) is complete. Click the “EXIT” button to quit the Update widget and then restart Tide Tool.

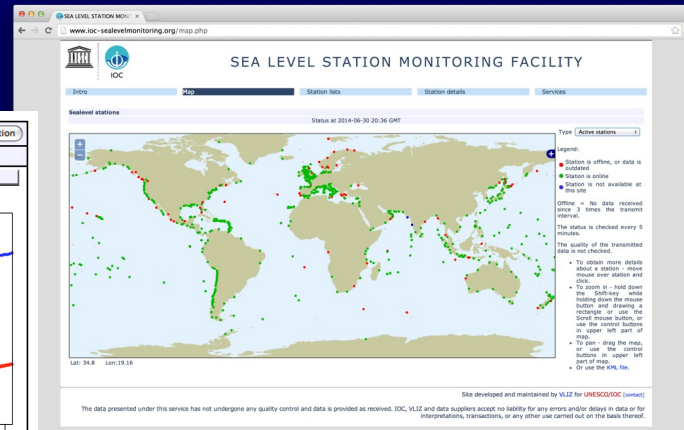
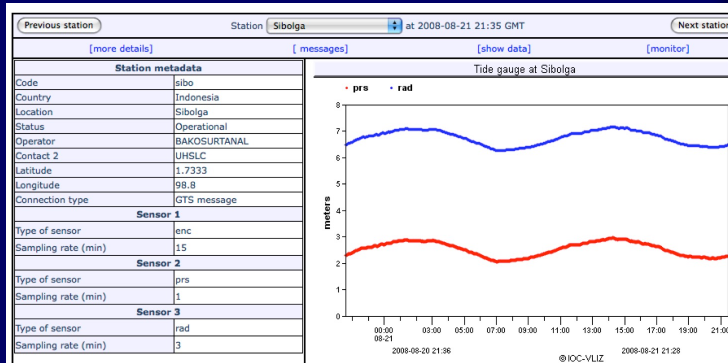




# IOC Sea Level Monitoring Facility

<http://www.ioc-sealevelmonitoring.org/map.php>

- **Global Monitoring** of satellite-transmitted data (Station health)
- **Easy-to-use Web tool** (runs in Belgium, not locally)  
Uses Internet (could become clogged during real event)
- **Continuously downloads to site:** from GTS and other sites
- **Continuously decodes:** displays / expand time series, station metadata, messages
- **Data download** manually



# Global Historical Databases

- **WDS-Geophysics/NCEI**  
online - Web online  
offline – TsuDig (2009)
- **ITDB** – Russia  
offline (1990s)

## Features:

- GIS display
- EQ, Tsunamis, Run-ups
- Seismic, Sea Level networks
- Event sorting
- Travel Times

Contact: [itic.tsunami@noaa.gov](mailto:itic.tsunami@noaa.gov)

