Tsunami Warning Decision Support Tools
ITIC-distributed, supported

- **Heads-up SMS TW Alert Bull Board** *(NOAA USAID RANET, ITIC, PTWC, 2005-2014)* - Plan 2018 restart – 2 yr trial Pacific, Caribbean to official up to 3 contacts

- **Tsunami Bull Board** *(ITIC, 1995)* ~450 science/tsu/govt

- **Real time EQ Display** *(v1.7+ (CISN, USGS / NTHMP, 2005), ~250*

- **Real-time Sea Level monitoring**
  - Tide Tool v10.55 – TWC operations monitoring *(PTWC, 2005)*
  - IOC Sea Level Monitoring web site *(IOC, 2008)*

- **Tsunami Travel Time Software** v4.0 *(ITIC, NGDC, 2007)* – upgrade 2018 to TTSDK4.0

- **Tsunami Historical Database** Online *(WDS-NCEI)*, Offline *(TsuDig, NCEI, ITIC, 2009)*

- **Tsunami Hazard Assessment Tools** *(2017)*
  - **ComMIT/MOST inundation modeling** *(PMEL, 2000, update for evac map support 2015)*
  - **Tsunami Coastal Assessment Tool** v4.0 Apr 2019 *(TsuCAT, PMEL, ITIC)*
Why / What: Request by Pacific Islands for warning DSS
Gives country capacity to assess tsunami hazard

Tool use:
- Planning tool - assess threat before – ‘energy beams’
- Decision system support tool – Customize country sub-regions (polygons), Quick, early assessment through DB lookup
- Exercise tool – develop scenarios to use (v4.0, April 2019)

Features:
- Database: ~5000 earthquake scenarios from along active subduction zones, Pacific, Caribbean, Indian Ocean (M6.5-9.5)
- Results from NOAA models (MOST/SIFT (M8+), RIFT (M6.5-7.9)
  - Offshore max amplitude / coastal wave amplitude (Green’s Law)
  - PTWC or User custom forecast polygons
TsuCAT - Background

**Requirements:**
- Offline (no internet required) - portable
  - Online (internet, adds geographic map tiles (OpenStreet, ESRI)
- Platform: Windows, Linux, Macintosh; Java v1.8
- Storage: 27 GB; No installation - run from flash drive
- Bathymetric grid resolution: MOST (compute 4 arc-min), RIFT (compute 4 arc-min decr to 30 arc-sec)

**Layers**
- Offshore Wave Amplitude, Coastal Hazard Guidance, Travel Time
- PTWC coastal polygons, or user-customized
- Results export – model, regional report
- Reference information: Historical Seismicity (USGS, NOAA NCEI Significant), Tsunami Observations (NOAA NCEI), USGS Plate boundaries, Place names
- User-supplied maps (polygon shape files), Quick guide tutorial
- PTWC Enhanced Products Exercise messages
TsuCAT: Coastal Impact DB Tool

Deep-Ocean Offshore Ampl – Historical seismicity

Coastal Hazard Guidance Ampl (CHG)

Offshore – CHG – Tsunami Travel Times

CHG – PTWC Coastal Polygons
TsuCAT – Tool Applications

- **Hazard Assessment** - conduct study to determine worst case, or likely impact, to a country’s coast from different scenarios

- **Exercise development** - decide which scenario to use for a tsunami exercise, generate PTWC exercise messages

- **Response Planning** – use scenarios to develop tsunami response plans, protocol and procedures (SOPs)

- **Warning decision making** – estimate tsunami impact using the nearest similar scenario during a real event (early assessment prior to receiving PTWC forecast products)
What size earthquake is most dangerous to Tonga?

Central Tonga source M7.7, 8.0, 8.3
What size earthquake is most dangerous?
Aleutian Trench source: M7.8, 8.5, 9.0
TsuCAT – Generate Exercise messages

- PTWC Public Text and Enhanced Products for events in TsuCAT pre-computed database

- Select Menu - “Export Exercise Messages”
  - Set Event (historical database or by mouse, origin time, magnitude)
  - Choose Generate (PTWC Text Messages, Enhanced Products (graphical, polygon table, kmz file)
  - Output folder, e.g., message/2019-04-02_0000_M9.0_Russia_PTWCproducts
GUI – Export Exercise Messages
PTWC Messages – Test - Exercise only
Summary Information

- **2018-19 improvements (v3 and v4):**
  - 2018 (v3.0) – security, global bathymetric DB (remove seam), higher-resolution SIFT/RIFT runs
  - 2019 (v4.0) - PTWC messages (text and enhanced graphical products) so countries able to conduct exercises on their own
  - 2019 (v4.x) – Include Scenarios from Expert Meetings (Caribbean, Pacific); input addtl data layers (such as ComMIT layer/inundation)

- **Information, questions, feedback:**
  - **Web site**
  - **Email ITIC, NCTR:**
    itic.tsunami@noaa.gov, laura.kong@noaa.gov
    Christopher.Moore@noaa.gov, Marie.C.Eble@noaa.gov
Thank You

Christopher Moore, Dr. Diego Arcas, Marie Eble
NOAA Center for Tsunami Research (NCTR)

Dr. Laura Kong
ITIC

Dr. Charles McCreery
PTWC
How to use

- Run from flash drive (or can copy to hard disk, 29 GB)
- Requirement – Java 1.8x installed
  [Link to download](https://java.com/en/download/)
- Click on application (Window, Mac, Linux)
  - On 1st time opening, set password (unique to user)
  - Default is ‘No Internet’
  - With Internet, will
    - Seek updates EQ & Tsunami database files (not needed often)
    - Use additional online map databases (more detailed but requires bandwidth)
  - Enter ‘start’ password, Set ’personal’ password
TsuCAT hands-on activity

- Open TsuCAT v3, set your password
- Explore TsuCAT features
  2. Selection and variation of source using menu and mouse
  3. PTWC polygons and Customized polygons
  4. Understand what is (and what is not) in regional reports
- Hazard Assessment – Country response planning
  1. Create a summary of what distant or regional source region is most hazardous to your country
- Tsunami Warning – Country TWC Warning Criteria
  Based on the database assessment and your country’s warning criteria, what will you place your country in for the following:
  1. MX1 earthquake in Y1 trench (or off Z1 country)
  2. MX2 earthquake in Y2 trench (of off Z2 country)
- Generate PTWC messages for exercise - Choose scenario, create messages