Monitor / Recommend Improvements to PTWS and other tsunami warning systems – communications, data networks, evaluations, dissemination

Assist in establishing regional and national tsunami systems – comprehensive risk reduction

Serve as technology transfer resource; Encourage research to improve evaluations; Conduct trainings to build capacity

Serve as an information resource for preparedness / education; Develop, publish, distribute materials

Serve as an information resource on historical tsunamis – database, post-event surveys
PACIFIC TSUNAMI WARNING & MITIGATION SYSTEM
FOUNDATIONAL ELEMENTS

- Country TWS
- US NTWC
- JMA NWPTAC
- PTWC (IOC Tsunami Service Provider)
- International Tsunami Information Centre (ITIC)
IOC Tsunami Information Centers

- **PTWS**
  - USA NOAA – IOC Partnership 1965

- **IOTWS**
  - Indonesia – IOC Partnership 2012 (formerly JTIC since 2006)

- **CARIBE-EWS**
  - Barbados– IOC Partnership 2015 (approved 2007)

- **NEAMTWS**
  - EC DG ECHO
  - France, Greece, Italy, Portugal 2011-13
ITIC – ITIC and CTWP

- **ITIC**: 1965 – established IOC-IV.6 USA agreed to host
  US NOAA NWS *(2 vacant)*
  - Director – Laura Kong (Geophysicist, seismology)
  - Senior Science Staff, Office Manager – **Brian Yanagi** (Oceanographer/Geophysicist)
  - Technical Information Specialist – **Nic Arcos** (Community Preparedness, Outreach, Training Coord)
  - Information Technology Specialist – Tammy Fukuji
  - Admin Support Assistant – Art Sonen
  1974 - Associate Director (non-USA)
  - Lt. Cdr. Carlos Zuniga (Chile, SHOA Navy), 2013 (Chile since 1998)

- **CTWP**: 2010 – US NOAA NWS
  Christa von Hillebrandt-Andrade, 1 student, 1 student volunteer
CTWP – Meetings, Trainings

1. Support IOC (CARIBE EWS, IOCARIBE, GLOSS) and CTIC
2. Support Earthquake and Sea Level Monitoring
   1. Monthly reports on data availability
   2. Support installation of new sea level stations
3. Support Training - SOP
4. Support Tsunami Ready and TsunamiReady
   1. Grenada
   2. Haiti
   3. Honduras
   4. New Pilots to be decided (2018)
5. CARIBE WAVE – Coordinator
6. Website
ITIC-IOC – Meetings, Trainings

1. Support IOC and Regional WGs - TOWS, UNISDR, Central America (TEMP, maps); PICT (mtg, train); SCS (materials), CARIBE-EWS & IOTWMS (CTIC/IOTIC, train, materials)

2. Train: PTWC products – SOPs, decision support tools
   ITP-International (in-country) – 12 SOP training, 5 TEMPP
   - Pacific Is – Tonga, Solomons, Cook, Vanuatu, Fiji, Samoa, Kiribati
   - Southeast Pacific – Colombia, Peru (2)
   - Regional: South China Sea, Caribbean
   - 3 requests pending funds (Tuvalu, Niue, PNG)

ITP-Hawaii Sept 2016: 5 countries (China, Mexico, Nauru, Tonga, USA)

ITP-Hawaii in Chile (1-10 Aug 2018) – SHOA coordinating
   - Deadline 15 June, Indonesia => France, max 30 participants

Projects:
   TEMPP (CA Pilot, IO TTT), Tsunami Ready (3 PTWS), School Drills (UNDP, 2017-2018 – 5 schools/country, 18 countries)
ITIC-IOC Activities – Trainings, Other

1. NEW Train: Tsu Evac Maps, Plans, Proc (TEMPP)
   - 5 linked trainings – Reliable Tsunami Evac Maps
   - Modeling, Tsunami Seismic Sources, Inundation Maps, Evac Maps, Response Plans, Comm Exercises
   - Achievement: Tsunami Ready recognition Honduras
   - IOTWS TEMPP and TR TTT – Nov 2017
   - 2018 IOC Publication: Quick Guide and Supplement

2. Tsunami Ready International – PTWS piloting
   - Honduras (Feb 2017), Costa Rica (May 2017), Samoa (June 2017) Meso-America, South America, Pacific Island Countries

3. Post-Event Assessments
   15 September 2015 (ITIC), 11 March 2011 (IOC)

4. Routine
   - Decision Support Tools
   - Awareness Materials
   - Information Services
Tsunami Warning Decision Support Tools
ITIC distributed, supported

- **Heads-up SMS TW Alert Bull Board** *(NOAA USAID RANET, ITIC, PTWC, 2005-2014)*— Stopped 2014, Plan 2018 restart – 2 yr trial

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

- **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** v3.3 *(ITIC, NGDC, 2007)*

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

- **Tsunami Hazard Assessment Tools** *(PMEL/NCTR, ITIC, 2017)*
  - ComMIT/MOST inundation modeling
  - Tsunami Coastal Assessment Tool v2.2 *(TsuCAT)*
Hazard Assessment Tools: ComMIT, TsuCAT

Dr. Diego Arcas
Director NCTR

Dr. Laura Kong
Director, ITIC
Community Model Interface for Tsunami (ComMIT)

- **Hazard Assessment for Evacuation**
- **Why / What:** Provide analysis tool with GUI for propagation and inundation modeling
- **Tool Uses:**
  - Coastal Hazard Assessment and Inundation for evacuation mapping (TEMPP tool)
  - Easy-to-understand hazard products (maps, animations) for awareness, education, esp decision-makers

- **Features:**
  - MOST numerical model – benchmarked
  - Comprehensive database of unit sources based on USGS earthquake archive
  - Customized earthquake sources (non-thrust)
TsuCAT: Tsunami Coastal Assessment Tool (NCTR, ITIC) – V2.2, V3.1 (Aug 2018)

- Exercises – Warning Decision Support
- **Why / What:** Requested by PICs, Give Country capacity to assess threat / issue warnings
- **Tool Uses:**
  - Planning tool - assess threat before – ‘energy beams’
  - Decision-support impact tool – Customize country sub-regions (polygons), Quick assessment DB lookup
  - Exercise tool – develop scenarios to use

- **Features:**
  - Pacific, Caribbean, IO EQ scenarios from M6.5 – M9.5
    - Results from validated models (MOST, RIFT)
      - Deep-ocean / coastal wave ampl (Green’s Law)
      - Threat by PTWC / User custom forecast polygons
  - **2018:** global map (no seam SCS), high-resolution runs for all scenarios, security, PTWC Products for exercises
Awareness

ITIC, NCEI
TSUNAMI WARNING CHAIN (M9.5 Chile)
UNESCO IOC – NOAA outreach video, 2015

Pacific Tsunami Warning & Mitigation System

Tsunami Warning!

English: https://vimeo.com/124650777
Spanish: https://vimeo.com/125109150
French: https://vimeo.com/125109148
Building Tsunami Preparedness: an educated and aware public
ITIC Activities - Awareness materials

- Distribution – on Request (email itic.tsunami@noaa.gov)
- Highlights – updated or new materials
  - Tsunami, Great Waves 2014 (Spanish), ITIC, IOC, rev 2016
  - Tsunami Glossary 2016, ITIC, IOC, rev 2016 (OUT OF STOCK)
  - Tsunami Warning! comic, Am Samoa custom, ITIC, 2017 (draft)
  - Posters (NCEI, ITIC) – English mostly

- Global Tsunami Sources, 1610 B.C. to A.D. 2016, rev 2017
- Sign Volcanic Eruptions 4360 B.C. to A.D. 2017, rev 2017
- Sign Earthquakes, 2150 B.C. to A.D. 2017, rev 2017
- Am Samoa, Samoa, Tonga Historical Tsu Effects 1837-2015, 2017
- Meso-America Historical Tsunamis 1692-2016, Engl, Sp, 2017

- Videos
  - ITIC ‘explainer’ video (2 min), 2016

- Event damage photo summaries – post-tsunami or ITST surveys
  - Planned: 1992 Flores Sea, 2004 Indonesia, 2009 Samoa-American Samoa-Tonga, 2010 Chile
ITIC Activities – Awareness - Maps

- Maps (WDS/NCEI) – Historical Hazards
  - Global Tsunami, EQ, Volcano – update e-doc
  - Central American and Adjacent Regions
- Maps (WDS/NCEI) - Tsunami Effects
  - American Samoa, Samoa, Tonga; Hawaii
ITIC Awareness – Family Emergency card

- Update US NTHMP from early 2000s
- Create Spanish to support TEMPP/Tsunami Ready Honduras

**AFTER A STRONG OR LONG EARTHQUAKE, A TSUNAMI MAY FOLLOW**

**HOW TO ESCAPE A TSUNAMI**

1. Drop, cover and hold on during earthquake
2. Evacuate quickly to high ground or far inland
3. Wait for local officials to advise on cautionary re-entry

**FAMILY EMERGENCY PLAN**

Assembly Point

Assembly Point Location

Family Contact

E-mail

Phone ( )  Phone ( )

**DESPUÉS DE UN TERREMOTO FUERTE O PROLONGADO, SE PUEDE GENERAR UN TSUNAMI**

**PARA ESCAPAR A UN TSUNAMI**

1. Águese, cúbrase y sujetese durante el terremoto
2. Salga rápidamente de la zona de evacuación por tsunami
3. Espere por información oficial

**PLAN DE EMERGENCIA FAMILIAR**

En Caso de Emergencia, llame al 911

Punto de Reunión Acordado

Ubicación del Punto de Reunión

Contacto Fuera de la Comunidad

Correo Electrónico

Teléfono ( )  Teléfono ( )
Coloring Book – Word Search

- Coloring Book
- Word Search (Hard, Easy)

after Guam Office of Civil Defense
ITIC - IOC Awareness materials

- **IOC pubs:** Customize OK, TICs coordinate for consistency
- **Translations:** 5 supported (UNESCO official - Arabic, Chinese, English, French, Spanish). Others national initiative
- **Tsunami Glossary 2016** (English, Spanish, French) – other natl efforts from older versions
- **Tsunami Warning!** comic book – customized globally since early 2000s, many customization of original IOC pub – TO BE UPDATED 2018
- => TOWS WG (2017) – ITIC and IOTIC to ensure consistency

2017 – Amer Samoa
New drawings
Same words
ITIC Activities – Information Services

- **Events** – List from 1968 – PTWC (NWPTAC, US NTWC)
- **Library** – mostly historic docs, event data, reports
- **ITIC Tsunami Newsletter** – quarterly, event focus (dormant)
- **Web site (hosted by IOC IODE):**
  [www.tsunamiwave.info](http://www.tsunamiwave.info), [http://itic.ioc-unesco.org](http://itic.ioc-unesco.org)
- **Facebook (hosted by NOAA NWS):**
  Informal information, ITIC activities, Good practices
  [https://www.facebook.com/US.NOAA.ITIC.gov](https://www.facebook.com/US.NOAA.ITIC.gov)
- **Updates slow dues to staffing shortage**
ITIC Activities – Event Information

- Global Authoritative Historical Database
  - Work with ICSU – World Data Service / NCEI

- Event Information Services
  - Significant Tsunami Event Site – technical info, incl.
    messages, observations, simulations, media
  - List of Events – PTWC, JMA, US NTWC
  - Tsunami Bulletin Board list serve (450 intl) –
    science, no public, PTWC, US NTWC events
    @infolist.nws.noaa.gov
  - Post-Tsu Field Surveys: Intl Tsu Surv Team
    ITST Field Guide (IOC TS 37, 2nd ed, 2014
  - US Protocols – NTHMP, Federal Agency Plan
Historical Tsunamis

ITIC, NCEI
Hawaii‘i Historical Tsunami Photos

- Motivated by
  - Ongoing info requests
  - No QC repository with permission-free photos

- Collect, make available
  [https://www.flickr.com/photos/itic_tsunamis/collections](https://www.flickr.com/photos/itic_tsunamis/collections)

- Photo Sources
  - NOAA / ITIC Archives
  - State / County Archives
  - Public

- Collection Drive
  - Libraries / Community Scan & Drop Online submission
  - 2017 - Oahu, 2018 – Kauai or Maui
ITST Legacy Data Set – 23 surveys

- ITST Legacy Data Set – 23 surveys
  - USC Tsunami Research Center
  - > 50 video tapes of varying formats
  - > 3,000 35 mm slides.
  - International - major tsunamis 1946 – 2013
- NOAA NCEI – Global Historical DB photos
ITST Legacy Data Set + Summary Video

- 1946, Easter Island, Chile
- 1992, Nicaragua, Flores Sea
- 1994, South of Java
- 1994, South Kuril Is, Philippine Is, California
- 1995, South Mexico
- 1996, North Peru; Biak, Indonesia, Central Java
- 1998, Papua New Guinea
- 1999, Kocaeli, Turkey, Fatu Hiva, Vanuatu Is
- 2001, South Peru
- 2002, Bismark Sea, PNG
- 2004, Sumatra *
- 2007, Solomon Is
- 2009, Samoa
- 2010, Chile, Solomon Is
- 2011, Japan
- 2013, Solomon Islands
- 1946-2011, Hawaii (Oahu, Maui, Kauai, Hawaii island)
ITIC ACTIVITIES – PRIORITIES FEEDBACK

**Routine:**
Training, Decision Support Tools, Awareness Materials, Information Services

- Training Requests (what topics – SOP, competency, delivery modes – in-person regional / country, distance learning)
- Awareness materials – request to ITIC
  - Tsunami/EQ/Volcano posters (2017), Great Waves, Surviving Tsunami, Where the First Wave Arrives in Minutes, 2009 Niutatoputapu Tsunami
  - Out of stock: Glossary 2016, Tsunami Warning! comic book

**New / Projects:**
- Support PTWS SC actions for ITIC e.g., WG and TT, Framework, Guidelines and Manuals (TEMPP, Tsunami Ready, Vert Evac, Marine)
- Tools: Tsunami Coastal Assessment Tool (TsuCAT)
Thank You

Laura Kong
Director, USA NOAA

Lt. Cdr. Carlos Zuniga
Associate Director, Chile SHOA