The Tsunami and Other Coastal Hazards for the Caribbean and Adjacent Regions (CARIBE EWS): 11 Years Advancing Readiness

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Sea Level Operators Training, October 17-21, 2016
Over the past 500 years more than 75 tsunamis have killed 4484 people

Then and Now

1867 - US Virgin Islands
30 deaths

1918 - Puerto Rico
140 deaths

1946 - Dominican Republic
1790 deaths
UNESCO IOC Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards for the Caribbean and Adjacent Regions (CARIBE EWS)

32 MS and 16 Territories (6 Associate MS of UNESCO); 16 SIDS
Caribe EWS Officers WG and TT

- Chair – Christa von Hillebrandt-Andrade (USA)
- Vice Chairs
  - Gerard Metayer (Haiti)
  - Milton Puentes (Colombia)
  - Paul Martens (Sint Maarten-Kingdom of Netherlands)
- WG 1 - Tsunami Monitoring and Detection Systems – Jean Marie Saurel (France), Marcelino Hernandez (Vice Chair for Sea Level)
- WG 2 - Tsunami Hazard Assessment – Silvia Chacón (Costa Rica)
- WG 3 - Tsunami Related Services – Antonio Aguilar (Venezuela)
- WG 4 – Preparedness, Readiness and Resilience – Patrick Tyburn (Martinique – France)
- TT CTIC Business and Sustainability Plan – Pedzi Grigori (Curacao, Kingdom of Netherlands)
- TT CARIBE WAVE 17 - Patrick Tyburn (Martinique – France)
- TT Volcanic Activity and potential Tsunamis - Paul Martens (Sint Maarten-Kingdom of Netherlands)
- Group of Experts for Other coastal hazards - TOR and composition to be determined
UNESCO IOC Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards for the Caribbean and Adjacent Regions (CARIBE EWS)

ICG XI – Cartagena, Colombia, April 5-7, 2016

Next Meetings
2017: San Jose, Costa Rica and 2018: TBD
CARIBE EWS Service Model - Community Centered
US NWS Caribbean Tsunami Warning Program

- Established by NOAA NWS in 2010
- Located in Mayagüez, Puerto Rico
- Supports sea level, seismic and GNSS monitoring efforts, Tsunami Operational Procedures training, CARIBE WAVE exercises, TsunamiReady Program
- Provides local and regional support for PTWC and PTWC products
Seismic and Sea Level Data Contributions

Seismic Stations – increase from 10 to 126—tsunami bulletins can be issued in 5 minutes

Sea Level Stations – 5 to 77 stations – tsunami detection dropped from 3 hours to 5-30 minutes

Need for continuous training and capacity building for sea level and seismic network operators.
M $\geq$4.5 Earthquake Detection Time as of 2016 (Source: USGS)
Sea level network

- Total of 79 contributing stations in real-time, mainly on GOES satellite 5 and 6 minutes slots
- Follow up by CTWP of data availability and improvements in the number of contributing stations
- The DART buoy of the Caribbean had been declared lost in December 2014 was recovered in early 2015. Currently the mid Atlantic DART is adrift
Sea level network from IOC sea-level website (all near real-time stations)
CPACC and MACC were Projects executed by the Caribbean Community Center for Climate Change.
Sea level network

- 2016 capability reports show improvements in the network since 2014
- Improvements include:
  - Costa Rica/Panama/Colombia coast
  - Jamaica region
  - Yucatan peninsula
  - Saint Lucia
- Other sea level stations should be contributing soon (Anguilla and Turks and Caicos)
- CTWP in dialogue with the US TWC, PRSN and IOC monitors the network (data availability/ latency, real-time capability maps....)
US PTWC (Hawaii) is the CARIBE EWS Tsunami Service Provider

- Serving the region since 2005
- Began the issuance of the Enhanced Products as of March 1, 2016, official RTSP as of June, 2016
- Countries are responsible for issuing Warning, Advisories, Watches, etc...
- PTWC will also begin covering the domestic service for Puerto Rico and Virgin Islands – becoming sole CARIBE EWS provider.
Critical National Connection

- Tsunami National Contact and Warning Focal Point(s), all but 1 country has made designations.
- Many countries still in process of designating National Tsunami Warning Centers
- It is the responsibility of the Countries to issue the Tsunami Warnings, Watches, Advisories, NOT the PTWC
Tsunami Ready:
51 Communities Recognized to Date in the CARIBE EWS Region

<table>
<thead>
<tr>
<th>Categories</th>
<th>Completed</th>
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<tbody>
<tr>
<td><strong>MITIGATION</strong></td>
<td></td>
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<tr>
<td>Mit-1. Have designated and mapped tsunami hazard zones</td>
<td>✔</td>
</tr>
<tr>
<td>Mit-2. Have a public display of tsunami information</td>
<td>✔</td>
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<tr>
<td><strong>PREPAREDNESS</strong></td>
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<tr>
<td>Prep-1. Produce easily understood tsunami evacuation maps as determined to be appropriate by local authorities in collaboration with communities</td>
<td>✔</td>
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<tr>
<td>Prep-2. Develop and distribute outreach and public education materials</td>
<td>✔</td>
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<tr>
<td>Prep-3. Hold at least three outreach or educational activities <strong>annually</strong></td>
<td>✔</td>
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<tr>
<td>Prep-4: Conduct an annual tsunami community exercise</td>
<td>✔</td>
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<tr>
<td><strong>RESPONSE</strong></td>
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<tr>
<td>Resp-1. Address tsunami hazards in the community’s emergency operations plan (EOP)</td>
<td>✔</td>
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<tr>
<td>Resp-2. Commit to supporting the emergency operations center (EOC) during a tsunami incident if an EOC is opened and activated</td>
<td>✔</td>
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<tr>
<td>Resp-3. Have redundant and reliable means for a 24-hour warning point (and EOC if activated) to receive official tsunami threats</td>
<td>✔</td>
</tr>
<tr>
<td>Resp-4. Have redundant and reliable means for 24-hour warning point and/or EOC to disseminate official tsunami alerts to the public</td>
<td>✔</td>
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1. Define Tsunami Hazard Zone
   • No tsunami inundation modeling was available due to lack of bathymetry, ComMIT was run but results are of limited use.
   • *Baseline tsunami zone was used* (30 m/1.6 km inland)

2. Public Display of Tsunami Information
   • 70 signs were procured for SKN
Preparedness

3. Tsunami Evacuation Map

• 1200 maps of Saint Kitts
• 400 maps Basseterre, Saint Kitts
• 1200 maps of Nevis
• 400 maps of Charlestown
Preparedness

4. Public Education and Outreach Materials
Public Awareness

- Radio Program: From Danger to Safety
- Tsunami Smart Campaigns
- Jingles, Songs, Poetry, Drama,
- Puppetry
- Posters, Pamphlets
- Public Service Announcements (PSA’s)
- Social Media
- Local Knowledge
Preparedness

5. Educational Outreach Activities (3 per year)

6. Annual Participation in Exercise – CARIBE WAVE
A Regional Tsunami Exercise, CARIBE WAVE, is held every March. Most Recent, March 17, 2016

• **331,000** participants,

• In 2016 **every MS** participated

• Scenarios developed with Local experts

• Communications and response plans tested
Scenarios (Earthquakes and Submarine Landslides)
Screen shot showing Tide Tool data for the CARIBE WAVE 16 Venezuela Scenario.

Screen shot showing Tide Tool data for the CARIBE WAVE 16 Northern Hispaniola Scenario.
Next CARIBE WAVE exercise
March 21, 2017

Cuba Scenario

Coordinated by the Caribbean Tsunami Warning Program with the Caribbean Tsunami Information Center with oversight from a CARIBE EWS Task Team

Costa Rica Scenario

Northeastern Antilles Scenario
Caribbean Tsunami Information Center

- Established in 2013 thru an MOU between UNESCO and Govt. of Barbados
- Organization and conduct of training and capacity building activities as well as facilitating preparedness and awareness projects
- Has had some fiscal challenges, but thanks to funding from UNESCO and Kingdom of Netherlands, secured thru 2017, in the process of reopening.
Closing Remarks

- 100’s of thousands of lives and billions of dollars at risk in the Caribbean and Adjacent Regions from Tsunamis

- Sea level data is critical for the monitoring, detection and forecasting component of the warning system

- CARIBE WAVE is proving to be one of the main platforms to engage the 48 Countries and Territories and an excellent opportunity to review sea level operations

- As of 2016, the UN has recognized November 5 as World Tsunami Awareness Day and for the Americas the UN ISDR has selected the Caribbean for its focus activities.