CaribeWave and LANTEX 2011
A Caribbean Tsunami Warning Exercise

NOAA NWS Caribbean Tsunami Warning Program
Mayagüez, Puerto Rico
January 18, 2010

Christa G. von Hillebrandt–Andrade
Manager
Institutional Framework for the Exercise

- The United National Educational, Scientific, and Cultural Organization’s (UNESCO) Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE–EWS)
- Caribbean Emergency Management Agency (CDEMA)
- Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC)
- NOAA, National Weather Service, U.S. National Tsunami Hazard Mitigation Program (NTHMP) and Caribbean Tsunami Warning Program (CTWP)
Purpose of the Exercise

- Improve Tsunami Warning System effectiveness along Caribbean coasts and along the Eastern and Gulf Coast of the US and the Eastern Coast of Canada.
- Opportunity for the emergency management and response system to:
  - Exercise operational lines of communications
  - Review tsunami response operation procedures (SOP)
  - Promote tsunami preparedness
Recall that the Caribbean has a more than 500 year history of Tsunamis.
The exercise manual and circular letter from IOC is available in Spanish, English and French.

Available at:


NTHMP version of the Manual:
- [http://wcatwc.arh.noaa.gov/](http://wcatwc.arh.noaa.gov/)
Objectives of the Exercise

- Ensure message transmission from the TWCs to Tsunami Warning Focal Points (TWFP) and from these primary contacts to the EMOs.
- **Test** tsunami response plans for Caribbean EMOs that have developed plans, and provide a catalyst for countries and EMOs that have not developed plans.
- EMOs, Tsunami Warning Focal Points (TFWP) and Tsunami National Contacts review, discuss, and evaluate the various communication alternatives for receiving and disseminating tsunami messages.
- EMOs, Tsunami Warning Focal Points and Tsunami National Contacts review, discuss, and evaluate potential response actions and challenges.
- Identify processes to issue local “all-clear” notices.
The scenario based on the November 18, 1867 earthquake and tsunami for which wave heights of up to 10 meters were reported in the Eastern Caribbean.
# Tsunami amplitudes from 1867

<table>
<thead>
<tr>
<th>Island</th>
<th>Site</th>
<th>Maximum positive amplitude, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puerto Rico</td>
<td>San Juan</td>
<td>0.9</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>Yabucoa Harbor</td>
<td>2.0</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>Arroyo (near Guayama)</td>
<td>1.5</td>
</tr>
<tr>
<td>Vieques, Puerto Rico</td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Virgin Islands, Tortola</td>
<td>Road Town</td>
<td>1.5</td>
</tr>
<tr>
<td>British Virgin Islands, Peter Island</td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>US Virgin Islands, Saint Thomas</td>
<td>Charlotte Amalie</td>
<td>6.0</td>
</tr>
<tr>
<td>US Virgin Islands, Hassel Island</td>
<td></td>
<td>4.9</td>
</tr>
<tr>
<td>US Virgin Islands, Saint Croix</td>
<td>Fredericksted</td>
<td>7.6</td>
</tr>
<tr>
<td>Saba Island, Netherlands Antilles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Kitts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antigua</td>
<td>St. John’s</td>
<td>3.0</td>
</tr>
<tr>
<td>Guadeloupe</td>
<td>Deshaies</td>
<td>10.0</td>
</tr>
<tr>
<td>Guadeloupe</td>
<td>Sainte Rose</td>
<td>10.0</td>
</tr>
<tr>
<td>Guadeloupe</td>
<td>Basse Terre</td>
<td>2.0</td>
</tr>
<tr>
<td>Guadeloupe, Isles des Saintes</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>Grenadines, Bequia Island</td>
<td>Port Elizabeth</td>
<td>1.8</td>
</tr>
<tr>
<td>Grenada</td>
<td>Gouyave</td>
<td>3.0</td>
</tr>
<tr>
<td>Grenada</td>
<td>Saint George’s</td>
<td>1.5</td>
</tr>
<tr>
<td>Isle de Margarita, Venezuela</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Zahibo et al, 2003 after Reid and Taber, 1920)
Exercise Scenario–Earthquake

- **Date:** Wednesday, March 23, 2011
- **Source 1**
  - **Time:** 1300 UTC
  - **Earthquake Magnitude:** 7.6
  - **Epicenter:** 18.21N, 65.26W
  - **Depth:** 7 km
- **Source 2**
  - **Time:** 1305 UTC,
  - **Magnitude:** 7.6
  - **Epicenter:** 18.36N, 64.73W
  - **Depth:** 7 km
Exercise Scenario–Tsunami

- Maximum modeled offshore wave height 4.7 m
- The height of the wave on the shore could be double that of the model outputs.
- Travel time first wave: 1 min – 4 hours
Scenario Timeline

<table>
<thead>
<tr>
<th>Date (UTC)</th>
<th>Time (UTC)</th>
<th>WC/ATWC Message</th>
<th>PTWC Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/23/2011</td>
<td>1300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1302</td>
<td>01 Warn Yes</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1332</td>
<td>02 Warn No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1401</td>
<td>03 Warn No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1431</td>
<td>04 Warn No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1500</td>
<td>05 Warn No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1530</td>
<td>06 Warn No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1601</td>
<td>07 Adv No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1630</td>
<td>08 Adv No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1701</td>
<td>09 Can No</td>
<td></td>
</tr>
<tr>
<td>03/23/2011</td>
<td>1802</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The initial dummy message will be disseminated over all standard TWC broadcast channels. This is being issued to test communications with EMOs and Tsunami Warning Focal Points, and to start the exercise. All messages will be disseminated over a special email list to provide the messages in real time to organizations requesting this service. **To request this service, please contact Christa von Hillebrandt (christa.vonh@noaa.gov)**
### Product Types Issued for Dummy Message with Transmission Methods

<table>
<thead>
<tr>
<th>Centre</th>
<th>WMO ID</th>
<th>AWIPS ID</th>
<th>NWWS</th>
<th>GTS</th>
<th>EMWIN</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCATWC</td>
<td>WEXX20 PAAQ</td>
<td>TSUAT1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PTWC</td>
<td>WECA41 PHEB</td>
<td>TSUCAX</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **NWWS**: NOAA Weather Wire Service
- **GTS**: Global Telecommunications System
- **EMWIN**: Emergency Manager’s Weather Information Network
Tsunami Messages

West Coast & Tsunami Warning Center
Puerto Rico Seismic Network

- Danger!
- Run for High Ground!
- Follow Emergency Instructions.

WARNING

ADVISORY
- Possible Strong and Dangerous local Currents.
- Stay tuned for local Emergency guidance.

- Potential Danger.
- Stayed tuned for more information.

WATCH

INFORMATION STATEMENT

Pacific Tsunami Warning Center

Caribbean Tsunami Warning Program

- Danger for all coasts within the Caribbean Region!
- Run for High Ground!
- Follow the instructions of the emergency management officials.

CARIBBEAN SEA-WIDE TSUNAMI WATCH

- Danger for coasts within a thousand kilometers from Earthquake!
- Run for High Ground!
- Follow the instructions of the emergency management officials.

REGIONAL TSUNAMI WATCH

- Danger for coasts within a hundred kilometers from Earthquake!
- Run for High Ground!
- Follow the instructions of the emergency management officials.

LOCAL TSUNAMI WATCH

- Relax.
- No Danger.
- A more distant place may be in danger.

INFORMATION STATEMENT
Examples, excerpts from exercise messages
TEST...TSUNAMI EXERCISE MESSAGE NUMBER 1...TEST
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
902 AM AST WED MAR 23 2011

...CARIBE WAVE 11/LANTEX 11 TSUNAMI EXERCISE MESSAGE. REFER TO WCATWC MESSAGE 1 IN
THE EXERCISE HANDBOOK. THIS IS AN EXERCISE ONLY...

THIS MESSAGE IS BEING USED TO START THE CARIBE WAVE 11/LANTEX 11 CARIBBEAN TSUNAMI
EXERCISE. THIS WILL BE THE ONLY EXERCISE MESSAGE BROADCAST FROM THE WEST
COAST/ALASKA TSUNAMI WARNING CENTER EXCLUDING SPECIAL EMAIL MESSAGES DISCUSSED
IN THE HANDBOOK. THE HANDBOOK IS AVAILABLE AT THE WEB SITE WCATWC.ARH.NOAA.GOV.
THE EXERCISE PURPOSE IS TO PROVIDE EMERGENCY MANAGEMENT A REALISTIC SCENARIO TO
TEST TSUNAMI RESPONSE PLANS.

THIS IS ONLY AN EXERCISE.

$$
WECA41  PHEB  231302
TSUCAX

TEST...TSUNAMI EXERCISE MESSAGE NUMBER 1...TEST
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 1302Z 23 MAR 2011

...CARIBE WAVE 11/LANTEX 11 TSUNAMI EXERCISE MESSAGE. REFER TO PTWC MESSAGE 1 IN THE
EXERCISE HANDBOOK. THIS IS AN EXERCISE ONLY...

THIS MESSAGE IS BEING USED TO START THE CARIBE WAVE 11/LANTEX 11 CARIBBEAN TSUNAMI
EXERCISE. THIS WILL BE THE ONLY EXERCISE MESSAGE BROADCAST FROM THE PACIFIC
TSUNAMI WARNING CENTER EXCLUDING SPECIAL EMAIL MESSAGES DISCUSSED IN THE
HANDBOOK. THE HANDBOOK IS AVAILABLE AT THE WEB SITE WCATWC.ARH.NOAA.GOV. THE
EXERCISE PURPOSE IS TO PROVIDE EMERGENCY MANAGEMENT A REALISTIC SCENARIO TO TEST
TSUNAMI RESPONSE PLANS.

THIS IS ONLY AN EXERCISE.

$$
WCATWC Message #1

WEXX20 PAAQ 231302
TSUAT1

BULLETIN
TSUNAMI MESSAGE NUMBER 1
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
902 AM AST WED MAR 23 2011

...A TSUNAMI WARNING IS NOW IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

RECOMMENDED ACTIONS
PERSONS IN LOW-LYING COASTAL AREAS SHOULD BE ALERT TO INSTRUCTIONS FROM THEIR LOCAL EMERGENCY OFFICIALS. EVACUATIONS ARE ONLY ORDERED BY EMERGENCY RESPONSE AGENCIES.
- PERSONS IN TSUNAMI WARNING COASTAL AREAS SHOULD MOVE INLAND OR TO HIGHER GROUND.

PRELIMINARY EARTHQUAKE PARAMETERS
MAGNITUDE – 7.6
TIME   – 0900  EDT MAR 23 2011
        0900  AST MAR 23 2011
        0800  CDT MAR 23 2011
        1300  UTC MAR 23 2011
LOCATION  – 18.2 NORTH 65.3 WEST
           25 MILES/40 KM SE OF FAJARDO PUERTO RICO
           60 MILES/97 KM SE OF SAN JUAN PUERTO RICO
DEPTH    – 56 MILES/90 KM
TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD INUNDATION IS IMMINENT OR EXPECTED. WARNINGS INDICATE THAT WIDESPREAD DANGEROUS COASTAL FLOODING ACCOMPANIED BY POWERFUL CURRENTS IS POSSIBLE AND MAY CONTINUE FOR SEVERAL HOURS AFTER THE INITIAL WAVE ARRIVAL.

CARIBBEAN COASTAL REGIONS OUTSIDE PUERTO RICO AND THE VIRGIN ISLANDS SHOULD REFER TO THE PACIFIC TSUNAMI WARNING CENTER MESSAGES FOR INFORMATION ON THIS EVENT AT WWW.PRH.NOAA.GOV/PR/PTWC.

THIS MESSAGE IS BASED MAINLY ON EARTHQUAKE DATA. EARTHQUAKES OF THIS SIZE OFTEN GENERATE DANGEROUS TSUNAMIS. AS MORE INFORMATION BECOMES AVAILABLE THE WARNING AREAS WILL BE REFINED.

THIS MESSAGE WILL BE UPDATED IN 30 MINUTES OR SOONER IF THE SITUATION WARRANTS. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE. REFER TO THE INTERNET SITE WCATWC.ARH.NOAA.GOV FOR MORE INFORMATION.

A TSUNAMI WARNING IS NOW IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

PERSONS IN TSUNAMI WARNING COASTAL AREAS SHOULD MOVE INLAND TO HIGHER GROUND.

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD INUNDATION IS IMMINENT OR EXPECTED. TSUNAMIS ARE A SERIES OF WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL TIME. ESTIMATED TIMES OF INITIAL WAVE ARRIVAL FOR SELECTED SITES IN THE WARNING ARE PROVIDED BELOW.

CHRISTIANSTED–VI 0911 AST MAR 23 MAYAGUEZ–PR 0952 AST MAR 23
SAN JUAN–PR 0945 AST MAR 23 CHARLOT AMALI–VI 0955 AST MAR 23

FOR ARRIVAL TIMES AT ADDITIONAL LOCATIONS SEE WCATWC.ARH.NOAA.GOV

$$
PTWC Message #1

WECA41 PHEB 231302
TSUCAX

TSUNAMI MESSAGE NUMBER 1
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 1302Z 23 MAR 2011

THIS MESSAGE IS FOR ALL AREAS OF THE CARIBBEAN EXCEPT PUERTO RICO AND THE VIRGIN ISLANDS. THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR THESE AREAS.

...A REGIONAL TSUNAMI WATCH IS IN EFFECT...
A TSUNAMI WATCH IS IN EFFECT FOR
SAINT MAARTEN – ANGUILLA – SAINT KITTS –
MONTSERRAT – DOMINICAN REP – GUADELOUPE – DOMINICA – SAINT
MARTIN – BARBUDA – MARTINIQUE – SAINT LUCIA – BONAIRE –
CURACAO – TURKS N CAICOS – ST VINCENT – ANTIGUA – GRENADA –
TRINIDAD TOBAGO – COLOMBIA – JAMAICA AND GUYANA.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE

PRELIMINARY EARTHQUAKE PARAMETERS
MAGNITUDE – 7.6
TIME – 1300 UTC MAR 23 2011
LOCATION – 18.2 NORTH 65.3 WEST
25 MILES/40 KM SE OF FAJARDO PUERTO RICO
55 MILES/89 KM SE OF SAN JUAN PUERTO RICO
DEPTH – 56 MILES/90 KM
EVALUATION
EARTHQUAKES OF THIS SIZE HAVE THE POTENTIAL TO GENERATE A DESTRUCTIVE LOCAL TSUNAMI AND SOMETIMES A DESTRUCTIVE REGIONAL TSUNAMI ALONG COASTS LOCATED USUALLY NO MORE THAN A THOUSAND KILOMETERS FROM THE EARTHQUAKE EPICENTER. AREAS FURTHER FROM THE EPICENTER COULD EXPERIENCE NON-DAMAGING SEA LEVEL CHANGES AND STRONG OR UNUSUAL COASTAL CURRENTS.

HOWEVER – IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WATCH IS BASED ONLY ON EARTHQUAKE EVALUATION. AUTHORITIES IN THE REGION SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THE WATCH WILL NOT EXPAND TO OTHER AREAS UNLESS ADDITIONAL DATA ARE RECEIVED TO WARRANT SUCH AN EXPANSION.

DUE TO ONLY LIMITED SEA LEVEL DATA FROM THE REGION IT MAY NOT BE POSSIBLE FOR THIS CENTER TO RAPIDLY CONFIRM NOR EVALUATE THE STRENGTH OF A TSUNAMI IF ONE HAS BEEN GENERATED.

ESTIMATED INITIAL TSUNAMI ARRIVAL TIMES. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>COORDINATES</th>
<th>ARRIVAL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAINT MAARTEN</td>
<td>SIMPSON BAAI</td>
<td>18.0N 63.1W</td>
</tr>
<tr>
<td>SABA</td>
<td>NETH ANTILLES</td>
<td>17.6N 63.2W</td>
</tr>
<tr>
<td>ST EUSTATIUS</td>
<td>NETH ANTILLES</td>
<td>17.5N 63.0W</td>
</tr>
<tr>
<td>ANGUILLA</td>
<td>THE VALLEY</td>
<td>18.3N 63.1W</td>
</tr>
<tr>
<td>SAINT KITTS</td>
<td>BASSETERRE</td>
<td>17.3N 62.7W</td>
</tr>
<tr>
<td>MONTSERRAT</td>
<td>PLYMOUTH</td>
<td>16.7N 62.2W</td>
</tr>
<tr>
<td>DOMINICAN REP</td>
<td>CABO ENGANO</td>
<td>18.6N 68.3W</td>
</tr>
<tr>
<td>GUATEMALA</td>
<td>BASSE-TERR</td>
<td>16.0N 61.7W</td>
</tr>
<tr>
<td>DOMINICAN REP</td>
<td>SANTO DOMINGO</td>
<td>18.5N 69.9W</td>
</tr>
<tr>
<td>DOMINICA</td>
<td>ROSEAU</td>
<td>15.3N 61.4W</td>
</tr>
<tr>
<td>SAINT MARTIN</td>
<td>BAIE BLANCHE</td>
<td>18.1N 63.0W</td>
</tr>
<tr>
<td>BARBRUDA</td>
<td>PALMETTO POINT</td>
<td>17.6N 61.9W</td>
</tr>
<tr>
<td>MARTINIQUE</td>
<td>FORT-DE-FRANCE</td>
<td>14.6N 61.1W</td>
</tr>
<tr>
<td>SAINT LUCIA</td>
<td>CASTRIES</td>
<td>14.0N 61.0W</td>
</tr>
<tr>
<td>DOMINICAN REP</td>
<td>PUERTO PLATA</td>
<td>19.8N 70.7W</td>
</tr>
<tr>
<td>BONAIRE</td>
<td>ONIMA</td>
<td>12.3N 68.3W</td>
</tr>
<tr>
<td>CURACAO</td>
<td>WILLEMSTAD</td>
<td>12.1N 68.9W</td>
</tr>
<tr>
<td>TURKS N CAICOS</td>
<td>GRAND TURK</td>
<td>21.5N 71.1W</td>
</tr>
<tr>
<td>ST VINCENT</td>
<td>KINGSTOWN</td>
<td>13.1N 61.2W</td>
</tr>
<tr>
<td>ANTIGUA</td>
<td>SAINT JOHNS</td>
<td>17.1N 61.9W</td>
</tr>
<tr>
<td>GRENADA</td>
<td>SAINT GEORGES</td>
<td>12.0N 61.8W</td>
</tr>
<tr>
<td>HAITI</td>
<td>CAP-HAITEN</td>
<td>19.8N 72.2W</td>
</tr>
<tr>
<td>ARUBA</td>
<td>ORANJESTAD</td>
<td>12.5N 70.0W</td>
</tr>
<tr>
<td>TURKS N CAICOS</td>
<td>WEST CAICOS</td>
<td>21.7N 72.5W</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>MAIQUETIA</td>
<td>10.6N 67.0W</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>MAYAGUANA</td>
<td>22.3N 73.0W</td>
</tr>
<tr>
<td>BARBADOS</td>
<td>BRIDGETOWN</td>
<td>13.1N 59.6W</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>CUMANA</td>
<td>10.5N 64.2W</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>GREAT INAGUA</td>
<td>20.9N 73.7W</td>
</tr>
<tr>
<td>CUBA</td>
<td>BARACOA</td>
<td>20.4N 74.5W</td>
</tr>
<tr>
<td>HAITI</td>
<td>JEREMIE</td>
<td>18.6N 74.1W</td>
</tr>
<tr>
<td>TRINIDAD TOBAGO</td>
<td>PIRATES BAY</td>
<td>11.3N 60.6W</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>SAN SALVADOR</td>
<td>24.1N 74.5W</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>CROOKED IS</td>
<td>22.7N 74.1W</td>
</tr>
<tr>
<td>CUBA</td>
<td>SANTIAGO D CUBA</td>
<td>19.9N 75.8W</td>
</tr>
</tbody>
</table>
PTWC Message #1 (cont)

<table>
<thead>
<tr>
<th>Country</th>
<th>Location</th>
<th>Lat/Long</th>
<th>Time</th>
<th>Location Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOMBIA</td>
<td>SANTA MARTA</td>
<td>11.2N 74.2W</td>
<td>1501Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>COLOMBIA</td>
<td>RIOHACHA</td>
<td>11.6N 72.9W</td>
<td>1501Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>COLOMBIA</td>
<td>BARRANQUILLA</td>
<td>11.1N 74.9W</td>
<td>1504Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>ELEUTHERA IS</td>
<td>25.2N 76.1W</td>
<td>1507Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>CUBA</td>
<td>GIBARA</td>
<td>21.1N 76.1W</td>
<td>1508Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>JAMAICA</td>
<td>MONTEGO BAY</td>
<td>18.5N 77.9W</td>
<td>1516Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>COLOMBIA</td>
<td>CARTEGENA</td>
<td>10.4N 75.6W</td>
<td>1516Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>NASSAU</td>
<td>25.1N 77.4W</td>
<td>1519Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>PUNTO FIJO</td>
<td>11.7N 70.2W</td>
<td>1521Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>JAMAICA</td>
<td>KINGSTON</td>
<td>17.9N 76.9W</td>
<td>1525Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>ABACO IS</td>
<td>26.6N 77.1W</td>
<td>1525Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>HAITI</td>
<td>PORT-AU-PRINCE</td>
<td>18.5N 72.4W</td>
<td>1527Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>PORLAMAR</td>
<td>10.9N 63.8W</td>
<td>1529Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>TRINIDAD TOBAGO</td>
<td>PORT-OF-SPAIN</td>
<td>10.6N 61.5W</td>
<td>1541Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>BAHAMAS</td>
<td>FREEPORT</td>
<td>26.5N 78.8W</td>
<td>1542Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>CUBA</td>
<td>CIENFUEGOS</td>
<td>22.0N 80.5W</td>
<td>1552Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>GOLFO VENEZUELA</td>
<td>11.4N 71.2W</td>
<td>1554Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>COLOMBIA</td>
<td>PUNTA CARIBANA</td>
<td>8.6N 76.9W</td>
<td>1600Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>CUBA</td>
<td>SANTA CRZ D SUR</td>
<td>20.7N 78.0W</td>
<td>1703Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>CUBA</td>
<td>LA HABANA</td>
<td>23.2N 82.4W</td>
<td>1703Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>CUBA</td>
<td>NUEVA GERONA</td>
<td>21.9N 82.8W</td>
<td>1806Z</td>
<td>MAR23</td>
</tr>
<tr>
<td>GUYANA</td>
<td>GEORGETOWN</td>
<td>6.8N 58.2W</td>
<td>1812Z</td>
<td>MAR23</td>
</tr>
</tbody>
</table>

Additional bulletins will be issued by the Pacific Tsunami Warning Center for this event as more information becomes available.
PTWC Message #2 Special Information

SEVERE DAMAGE HAS BEEN REPORTED IN CHRISTIANSTED VI WITH NOTED FLOODING AS FAR INLAND AS ROUTE 70. HOTEL ON THE CAY LOCATED WITHIN THE HARBOR IS REPORTED AS TOTALLY DESTROYED WITH SEVERAL PEOPLE REPORTED AS MISSING. WITNESSES NEAR LIMETREE BAY VI REPORT A 15+ FOOT WAVE INUNDATING THE TANK FARM AT JERUSALEM AND FIGTREE HILL RESULTING IN LEAKING FUEL. AN OIL SLICK HAS BEEN NOTED IN THE AREA THAT IS 3-MILES LONG BY 500-FEET WIDE. TWO TANKS AT THE FARM ARE CURRENTLY ON FIRE AND MANY EMPLOYEES AT THE FACILITY ARE REPORTED MISSING. THE WAVE IN THIS AREA IS REPORTED TO HAVE GONE PAST ROUTE 66 AND AS FAR INLAND AS ROUTE 707. THE HENRY E. ROHLSEN AIRPORT REPORTS FLOODING ON THE RUNWAY AND IS CURRENTLY NOT OPERATING. COMMUNICATIONS WITH COUNTRIES IN THE NORTHEASTERN CARIBBEAN IS VERY SPORADIC AND DAMAGE AND INUNDATION REPORTS ARE NOW JUST COMING IN.
WCATWC Message #4 Special Information

A 15.0-FOOT/4.6-METER TSUNAMI IN LIMETREE BAY VI HAS TORN BOARDS FROM A PIER AND PUSHED THREE BOATS ASHORE. TWO PEOPLE ARE REPORTED DEAD FROM DROWNING IN CHRISTIANSTED VI AND TWO SEASIDE HOMES IN LAMESHUR BAY VI HAVE BEEN TORN FROM THE FOUNDATIONS.
REPORTS NOTE THE OIL SLICK FROM THE JERUSALEM AND FIGTREE HILL TANK FARM IN USVI TO BE SPREADING. THE TANK FARM HAS REPORTED 23 EMPLOYEES DEAD AND 8 MISSING. RUNUPS IN SAINT JOHN ANTIGUA ARE REPORTED TO EXCEED 2 METERS. SEVERAL PEOPLE ARE REPORTED MISSING THERE. THE WEST COAST OF BARBUDA REPORTS TSUNAMI RUNUPS NEAR 1.5 METER. A NEAR 3 METER RUNUP IN ROSEAU DOMINICA IS REPORTED TO HAVE SEVERLY FLOODED SECTIONS OF TOWN. RUNUPS MEASURING APPROXIMATELY 5 METERS ARE REPORTED IN SECTIONS OF GUADELOUPE WITH LARGE CURRENT AND FLOODING INDUCED DAMAGE. HARBORS IN MARTINIQUE HAVE EXPERIENCED STRONG SURGES WHICH HAVE PRODUCED DAMAGE TO MANY STRUCTURES AND BOATS. MINOR INUNDATION HAS BEEN REPORTED SANTO DOMINGO AND 23 PEOPLE WHO WERE CURIOUS ABOUT THE RECEDING TIDE AND WALKED OUT TO SEE THE STRANDED SEALIFE ARE REPORTED DEAD.
WCATWC Cancellation Message
1701 UTC (1:01 PM AST)

WEXX20 PAAQ 231701
TSUAT1

BULLETIN
TSUNAMI MESSAGE NUMBER 9
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
101 PM AST WED MAR 23 2011

...THE TSUNAMI ADVISORY IS CANCELED FOR PUERTO RICO AND THE VIRGIN ISLANDS...

EVALUATION
DAMAGING TSUNAMIS ARE NO LONGER EXPECTED ALONG THE COASTS OF PUERTO RICO AND THE VIRGIN ISLANDS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATIONS MUST BE MADE BY LOCAL AUTHORITIES.

TSUNAMI AMPHITUDES HAVE DROPPED BELOW DANGEROUS LEVELS AT MOST LOCATIONS ALONG THE COASTS OF PUERTO RICO AND THE VIRGIN ISLANDS. SEA LEVEL CONDITIONS STILL VARY GREATLY FROM LOCATION TO LOCATION ALONG THE COAST. DECISIONS RELATING TO REOCUPATION OF COASTAL ZONES MUST BE MADE BY LOCAL AUTHORITIES.

WAVES THROUGHOUT THE PUERTO RICO AND THE VIRGIN ISLANDS ARE ALL PRESENTLY BELOW 0.5 METERS IN HEIGHT. THE DEATH TOLL HAS NOW CLIMBED TO 500 PEOPLE TOTAL FOR PUERTO RICO... THE VIRGIN ISLANDS AND GUADELOUPE. DAMAGE TO COASTAL STRUCTURES THROUGHOUT THESE ISLANDS IS EXTENSIVE... INCLUDING RESORTS AND CRUISE SHIPS.

PRELIMINARY EARTHQUAKE PARAMETERS
MAGNITUDE - 7.6
TIME - 0900 EDT MAR 23 2011
0900 AST MAR 23 2011
0800 CDT MAR 23 2011
1300 UTC MAR 23 2011
LOCATION - 18.2 NORTH 65.3 WEST
25 MILES/40 KM SE OF FAJARDO PUERTO RICO
60 MILES/97 KM SE OF SAN JUAN PUERTO RICO
DEPTH - 56 MILES/90 KM

CARIBBEAN COASTAL REGIONS OUTSIDE PUERTO RICO AND THE VIRGIN ISLANDS SHOULD REFER TO THE PACIFIC TSUNAMI WARNING CENTER MESSAGES FOR INFORMATION ON THIS EVENT AT www.prh.noaa.gov/pr/ptwc.
WCATWC Cancellation Message (cont)

THIS WILL BE THE LAST WEST COAST/ALASKA TSUNAMI WARNING CENTER MESSAGE ISSUED FOR THIS EVENT. THIS INFORMATION IS ALSO POSTED AT WCATWC.ARH.NOAA.GOV.

AMZ712-715-725-735-742-745-PRZ001>003-005-007-008-010-011-VIZ001-002-231901-/T.CAN.PAAQ.TS.Y.0003.000000T0000Z-000000T0000Z/
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.
101 PM AST WED MAR 23 2011

...THE TSUNAMI ADVISORY IS CANCELED FOR PUERTO RICO AND THE VIRGIN ISLANDS...

$$
WECA41 PHEB 231802
TSUCAX

TSUNAMI MESSAGE NUMBER 6
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 1802Z 23 MAR 2011

THIS MESSAGE IS FOR ALL AREAS OF THE CARIBBEAN EXCEPT
PUERTO RICO AND THE VIRGIN ISLANDS. THE WEST COAST/
ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR
THESE AREAS.

... THE TSUNAMI WATCH IS CANCELLED ...

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE

PRELIMINARY EARTHQUAKE PARAMETERS
MAGNITUDE - 7.6
TIME - 1300 UTC MAR 23 2011
LOCATION - 18.2 NORTH 65.3 WEST
          - 25 MILES/40 KM SE OF FAJARDO PUERTO RICO
          - 55 MILES/89 KM SE OF SAN JUAN PUERTO RICO
DEPTH - 56 MILES/90 KM

500 PEOPLE HAVE BEEN REPORTED DEAD DUE TO THIS EVENT AND
NUMEROUS REPORTED MISSING. DAMAGE CAUSED BY THE FIRE IN LIMETREE
BAY, VI AND THE TSUNAMI’S INUNDATION IN THE CARIBBEAN IS ESTIMATED
TO BE MORE THAN $350M USD THUS FAR. THE FIRE AND OIL SLICK AT
LIMETREE BAY VI HAS BEEN CONTAINED BUT INLAND FIRES WEST OF
LIMETREE BAY CONTINUE TO BE FAUGHT. STRONG CURRENTS ARE ONGOING
IN HARBORS THROUGHOUT THE EASTERN CARIBBEAN REGION.
SIGNIFICANT FLOODING HAS CEASED HOWEVER DANGER IN THE
WATER PERSISTS. FOOD AND PERSONNEL AID IS CURRENTLY BEING
FLOWN FROM NAVAL AIR STATION KEY WEST TO SEVERAL COMMUNITIES THROUGHOUT THE
CARIBBEAN.
EVALUATION
A DAMAGING TSUNAMI WAS OBSERVED IN THE NE CARIBBEAN SEA. MANY REPORTS OF DAMAGE HAVE BEEN RECEIVED BY THE CENTER. SEA LEVEL GAGES AND FORECAST MODELS INDICATE THAT THREAT LEVELS IN AFFECTED REGIONS SHOULD NOW AT LOW LEVELS.

FOR ANY AFFECTED AREAS – WHEN NO MAJOR WAVES HAVE OCCURRED FOR AT LEAST TWO HOURS AFTER THE ESTIMATED ARRIVAL TIME OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

THIS WILL BE THE FINAL BULLETIN ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.
Decide what type of exercise will be conducted in your jurisdiction
Types of Exercises

- **Orientation Exercise (Seminar)**
  - An Orientation Exercise
  - Bring together individuals and officials with a role or interest in multi-hazard response planning, problem solving, development of standard operational procedures (SOPs), and resource integration and coordination.
  - An Orientation Exercise will have a specific goal and written objectives and result in an agreed upon Plan of Action.
  - Planning Period: 2 weeks
  - Duration: Several Hours/Full Day

- **Drill**
  - Tests, develops, and/or maintains skills in a single or limited emergency response procedure.
  - Generally involve operational response of single departments or agencies.
  - Can involve internal notifications and/or field activities.
  - Planning Period: 2 weeks
  - Duration: Full Day
Tabletop Exercise

- Local officials, key staff, and organizations with disaster management responsibilities are presented with simulated emergency situations.
- Conference room environment,
- Participants will examine and attempt to resolve problems, based on plans and procedures
- Discuss decisions in depth with emphasis on slow-paced problem solving, rather than rapid, real-time decision-making.
- A Tabletop Exercise should have specific goals, objectives, and a scenario narrative (Appendix A for a Sample Tabletop Exercise Outline).
- Planning Period: 2 weeks
- Duration: 1–3 days
Types of Exercises (cont.)

- **Functional Exercise**
  - Test and evaluate organizational capacities.
  - Evaluate the capability of a community’s emergency management system by testing the Emergency Standard Operations Procedures (SOP’s)
  - Fully simulated experience of being in a major disaster event
  - Activate all the appropriate members designated by the plan.
  - Internal and external agencies (government, private sector, and volunteer agencies) should be involved. It requires players, controllers, simulators, and evaluators. Message traffic will be simulated and inserted by the control team for player response/actions, under real time constraints.
  - It may or may not include public evacuations.
  - Planning Period: 1–2 months
  - Duration 1–5 days
Full-scale Exercise:

- Encompasses a majority of the emergency management functions.
- Actual mobilization and deployment of the appropriate personnel and resources needed to demonstrate operational capabilities.
- EOCs and other command centers are required to be activated.
- It may or may not include public evacuations.
- Planning Period: 2–6 months
- Duration: 1 day/week
Communities may wish to invite their local media to the exercise to promote local awareness of the tsunami hazard. Appendix F contains a sample press release which can be adapted as necessary.

NOAA will issue a press release several days before the exercise describing the exercise and its purpose.
Special Provisions

- **In the case of a real event**
  - TWCs will issue their normal messages for the event. Such messages will be given full priority and a decision will be made by the TWCs whether to issue the dummy message and to send email messages to selected recipients. Smaller earthquakes that only trigger a Tsunami Information Statement will not disrupt the exercise. All documentation and correspondence relating to this exercise is to be clearly identified as “CARIBE WAVE 11/LANTEX 11” and “Exercise.”

- **Procedure for false alarm**
  - Procedures should be set up by all participating entities to address public or media concerns involving this exercise in case of mis-interpretation by media or the public.
For questions, please contact

<table>
<thead>
<tr>
<th>Person</th>
<th>Telephone #</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorna Inniss, Chair</td>
<td>246-228-5950</td>
<td><a href="mailto:linniss@coastal.gov">linniss@coastal.gov</a> bb</td>
</tr>
<tr>
<td>Frederique Martini, Vice Chair</td>
<td></td>
<td>Frederique_MARTINI@developpement-durable_gouv_fr</td>
</tr>
<tr>
<td>Christa von Hillebrandt, Vice Chair, NWS CTWP Manager</td>
<td>787-833-8433</td>
<td><a href="mailto:christa_vonh@noaa.gov">christa_vonh@noaa.gov</a></td>
</tr>
<tr>
<td>Emilio Talavera, Chair WG1</td>
<td>505-22492761</td>
<td>emilio_talavera@gf_ineter_gob_ni</td>
</tr>
<tr>
<td>Aurelio Mercado, Chair WG2</td>
<td>787-265-5461</td>
<td><a href="mailto:aurelio_mercado@upr.edu">aurelio_mercado@upr.edu</a></td>
</tr>
<tr>
<td>Rafael Mojica, Chair WG3</td>
<td>787-253-4586</td>
<td><a href="mailto:rafael.mojica@noaa.gov">rafael.mojica@noaa.gov</a></td>
</tr>
<tr>
<td>Dimas Alonso, Chair WG4</td>
<td>504-2290606 x401</td>
<td>alonzoaguadesastres@yahoo_com</td>
</tr>
<tr>
<td>Bernardo Aliaga, Technical Secretary</td>
<td>33-1-45683980</td>
<td><a href="mailto:b.aliaga@unesco.org">b.aliaga@unesco.org</a></td>
</tr>
<tr>
<td>Jeremy Collymore, Ex. Director</td>
<td>246-425-0386</td>
<td><a href="mailto:Jeremy_Collymore@cdema.org">Jeremy_Collymore@cdema.org</a></td>
</tr>
<tr>
<td>CDEMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walter Wintzer, CEPREDENAC</td>
<td>502-2362-1981-83</td>
<td><a href="mailto:wwitzer@sica.int">wwitzer@sica.int</a></td>
</tr>
<tr>
<td>Ivan Morales, CEPREDENAC</td>
<td>502-2362-1981-83</td>
<td><a href="mailto:imorales@sica.int">imorales@sica.int</a></td>
</tr>
<tr>
<td>Melinda Bailey, NWS Southern Region</td>
<td>817-978-1100x107</td>
<td><a href="mailto:melinda.bailey@noaa.gov">melinda.bailey@noaa.gov</a></td>
</tr>
<tr>
<td>Wilfredo Ramos, PREMA Rep.</td>
<td>787-724-0124</td>
<td>wramos@aemead_gobierno_pr</td>
</tr>
<tr>
<td>Elton Lewis VITEMA</td>
<td>340-774-2244</td>
<td><a href="mailto:elton.lewis@vitema_vi.gov">elton.lewis@vitema_vi.gov</a></td>
</tr>
<tr>
<td>Paul Whitmore WCATWC Director</td>
<td>907-745-4212</td>
<td><a href="mailto:paul.whitmore@noaa.gov">paul.whitmore@noaa.gov</a></td>
</tr>
<tr>
<td>Bill Knight WCATWC TWSO</td>
<td>907-745-4212</td>
<td><a href="mailto:william.knight@noaa.gov">william.knight@noaa.gov</a></td>
</tr>
<tr>
<td>James Waddell WCATWC Rep.</td>
<td>907-745-4212</td>
<td><a href="mailto:james.waddell@noaa.gov">james.waddell@noaa.gov</a></td>
</tr>
<tr>
<td>Charles McCreery PTWC Director</td>
<td>808-689-8207</td>
<td><a href="mailto:charles.mccreery@noaa.gov">charles.mccreery@noaa.gov</a></td>
</tr>
<tr>
<td>Stuart Weinstein PTWC TWSO</td>
<td>808-689-8207</td>
<td><a href="mailto:stuart.weinstein@noaa.gov">stuart.weinstein@noaa.gov</a></td>
</tr>
<tr>
<td>Gerard Fryer PTWC Rep.</td>
<td>808-689-8207</td>
<td><a href="mailto:gerard.fryer@noaa.gov">gerard.fryer@noaa.gov</a></td>
</tr>
<tr>
<td>Victor Huerfano PRSN Director</td>
<td>787-833-8433</td>
<td><a href="mailto:victor@prsn.uprm.edu">victor@prsn.uprm.edu</a></td>
</tr>
</tbody>
</table>
An online questionnaire will be available for the participants to provide feedback on the exercise.

Deadline for feedback: April 11, 2011

Results of the exercise will be presented at Session VI of the ICG CARIBE EWS to be held in the Dominican Republic April 26–29, 2011.
Next Webinars

- January 20, 2011 (Spanish) at 12:00 PM – 1:00 PM CST. Reserve your Webinar seat for this date/time now at: https://www1.gotomeeting.com/register/506701465
- March 1, 2011 (English) at 12:00 PM – 1:00 PM CST. Reserve your Webinar seat for this date/time now at: https://www1.gotomeeting.com/register/822696993
- March 3, 2011 (Spanish) at 12:00 PM – 1:00 PM CST. Reserve your Webinar seat for this date/time now at: https://www1.gotomeeting.com/register/700124201
Thank you very much

- For updates on the exercise please refer to: http://www.srh.noaa.gov/srh/ctwp/?n=caribwave2011
- For past experiences in the region with tsunami warning exercises
  - British Virgin Islands Department of Disaster Management
    http://www.bviddm.com/index.php