

# Exercise CARIBE WAVE 11/ LANTEX11 Participant Handbook

A Caribbean Tsunami Warning Exercise  
March 23, 2011

UNESCO IOC Intergovernmental Coordination  
Group for the Tsunami and other Coastal  
Hazards Warning System for the Caribbean  
Sea and Adjacent Regions

US National Tsunami Hazard Mitigation  
Program  
Warning Coordination Subcommittee



NOTE: The contents of this handbook are patterned after the Exercise Pacific Wave 08 manual published by the Intergovernmental Oceanographic Commission. Citation: *Exercise Pacific Wave 08. A Pacific-wide Tsunami Warning and Communication Exercise, 28-30 October 2008*. IOC Technical Series No. 82. Paris, UNESCO, 2008, and the LANTEX 9 and 10 handbooks.

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## 1. Background

This tsunami exercise is being conducted to assist tsunami preparedness efforts throughout the Caribbean region. Recent events, such as the 2004 Indian Ocean, 2009 Samoa, and 2010 Haiti and Chile earthquakes and tsunamis, attest to the importance of proper planning for tsunami response.

Historical tsunami records from sources such as the National Oceanic and Atmospheric Administration's (NOAA) National Geophysical Data Center (NGDC) show that over 75 tsunamis with validity greater than 1 have been observed in the Caribbean over the past 500 years (Figure 1). These represent approximately 7-10% of the world's oceanic tsunamis. Earthquake, landslide, and volcanic tsunami sources have all impacted the region. Since 1842 at least 3510 people have lost their lives to tsunamis in the Caribbean. Over the past years there has been an explosive population growth and influx of tourists along the Caribbean coasts increasing the tsunami vulnerability. In addition to the tsunamis, the region also has a long history of destructive earthquakes. Historical records show that major earthquakes have struck the Caribbean region many times during the past 500 years

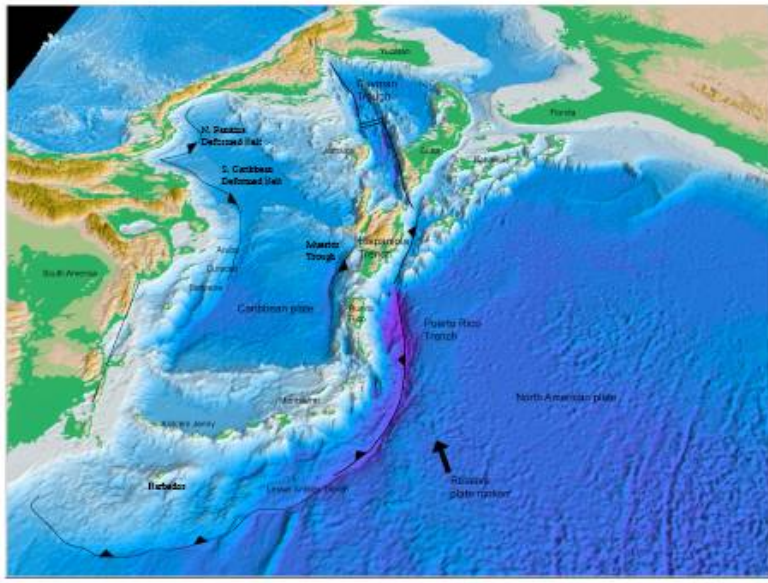


**Figure 1. Map of tsunami runups in the Caribbean 1493-2010 (National Geophysical Data Center, <http://www.ngdc.noaa.gov/hazards/tsu.shtml>)**

Within the region there are multiple fault segments and submarine features that could be the source of earthquake and landslide generated tsunamis (Figure 2). The perimeter of the Caribbean plate is bordered by no fewer than four major plates (North America, South America, Nazca, and Cocos). Subduction occurs along the eastern and northeastern Atlantic margins of the Caribbean plate. Normal, transform and strike slip faulting characterize northern South America, eastern Central America, the Cayman Ridge and Trench and the northern plate boundary (Tarr et al, 2007).

In the northeastern Caribbean, the Puerto Rico Trench, roughly parallel to and about 75 miles off the northern coast of Puerto Rico, is about 900 kilometers (560 miles) long and 100 kilometers (60 miles) wide (Figure 3). The deepest

point in the Atlantic Ocean, the trench is 8,340 meters (27,362 feet) below the sea surface. The Hispaniola Trench parallels the north coast of the Dominican Republic and Haiti, and is 550 kilometers (344 miles) long and only 4,500 meters (14,764 feet) deep. The Virgin Islands and Anegada troughs cut across the Antilles arc between the northern Virgin Islands and St. Croix and the Lesser Antilles. Tsunamis could be generated along these different structures, but the direction and size of the waves would depend on many factors, including where the earthquake occurred. In 1867 a M 7.3 earthquake occurred within the basin which generated a tsunamis whose wave heights reached 7.6 meters in St. Croix., 10 m in Deshaies, Guadeloupe and was observed across the Northeastern and Eastern Caribbean (Reid and Taber, 1920; Watlington, 1997). This event will be used as the basis for this exercise.



**Figure 2. Tectonic features in the Caribbean (ten Brink, USGS).**

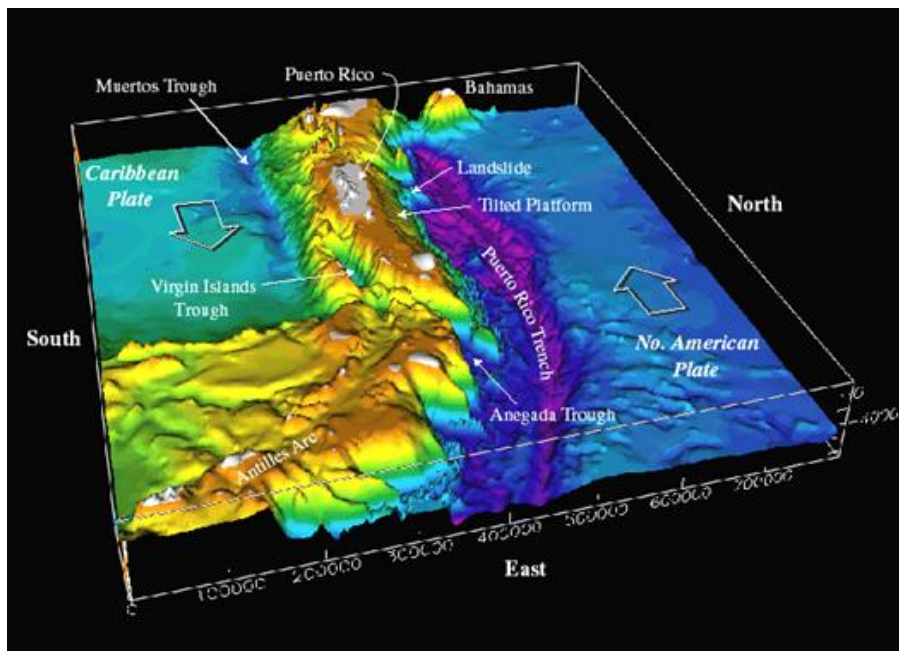


Figure 3 Tectonic features in the northeastern Caribbean (ten Brink, USGS, 2005).

Tsunami warning services for the Caribbean are currently provided by the West Coast/Alaska Tsunami Warning Center (WCATWC) in Palmer, Alaska for Puerto Rico and the Virgin Islands, while the Pacific Tsunami Warning Center (PTWC) in Ewa Beach, Hawaii is providing services for the non-US Caribbean. These Centers issue tsunami products to the region approximately two to fifteen minutes after an earthquake's occurrence. The WCATWC products include warnings, advisories, watches, and information statements, while the PTWC products include tsunami information and watch messages. Primary recipients of Tsunami Warning Center (TWC) messages include national tsunami warning focal points, Weather Forecast Offices (WFO), state/territory warning points/emergency operation centers, national Coast Guards, and military contacts. These agencies disseminate the messages to people potentially impacted by a tsunami. The Puerto Rico Seismic Network (PRSN) of the University of Puerto Rico at Mayagüez, INETER in Nicaragua, FUNVISIS in Venezuela and other national and regional institutions also provide earthquake and tsunami information in their areas of responsibilities.

The UNESCO/IOC Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), the Caribbean Emergency Management Agency (CDEMA), the Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPRENAC), NOAA, and the U.S. National Tsunami Hazard Mitigation Program (NTHMP) are providing the framework for this exercise as a means for emergency responders throughout the Caribbean to test and update tsunami response plans. High levels of

vulnerability and threat in many Caribbean nations should provide a strong incentive for local jurisdictions to prepare for a tsunami.

This exercise will provide simulated tsunami warning, watch, and advisory messages from the TWCs based on a hypothetical magnitude 7.6 earthquake located near the U.S. Virgin Islands at 18.2°N, 65.3°W. Exercises like this will help ensure that Caribbean coasts are ready to respond in the event of a dangerous tsunami. Similar recent exercises in the Pacific and Atlantic Basins have proven effective in strengthening preparedness levels of emergency management organizations.

## **2. Exercise Concept**

### **2.1 Purpose**

The purpose of the exercise is to improve Tsunami Warning System effectiveness along the Caribbean coasts. The exercise provides an opportunity for emergency management organizations throughout the Caribbean to exercise their operational lines of communications, review their tsunami response procedures, and promote tsunami preparedness. Regular exercising of response plans is critical to maintain readiness for an emergency. This is particularly true for tsunamis, which are infrequent but high impact events. Every Caribbean emergency management organization (EMO) is encouraged to participate.

### **2.2 Objectives**

Each organization can develop their objectives for the exercise depending on their level of involvement in the scenario. The following are the exercise's overarching objectives.

- Ensure message transmission from TWCs to Tsunami Warning Focal Points (TWFP) and from these primary contacts to the EMOs.
- Test tsunami response plans for those 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.

### **2.3 Type of Exercise**

The exercise should be carried out such that communications and decision making at various organizational levels are exercised and conducted without



disrupting or alarming the general public. Individual localities, however, may at their discretion elect to extend the exercise down to the level of testing local notification systems such as the Emergency Alert System (EAS), sirens or loudspeakers.

Exercises stimulate the development, training, testing, and evaluation of Disaster Plans and Standard Operating Procedures. Exercise participants may use their own past multi-hazard drills (e.g. flood, hurricane, tsunami, earthquake, etc.) as a framework to conduct CARIBE WAVE 11/LANTEX 11.

Exercises can be conducted at various scales of magnitude and sophistication. The following are examples of types of exercises conducted by EMOs.

1. **Orientation Exercise (Seminar):** An Orientation Exercise lays the groundwork for a comprehensive exercise program. It is a planned event, developed to 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.
2. **Drill:** The Drill is a planned activity that tests, develops, and/or maintains skills in a single or limited emergency response procedure. Drills generally involve operational response of single departments or agencies. Drills can involve internal notifications and/or field activities.
3. **Tabletop Exercise:** The Tabletop Exercise is a planned activity in which local officials, key staff, and organizations with disaster management responsibilities are presented with simulated emergency situations. It is usually informal, in a conference room environment, and is designed to elicit constructive discussion from the participants. Participants will examine and attempt to resolve problems, based on plans and procedures, if they exist. Individuals are encouraged to 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 (see Appendix A for a Sample Tabletop Exercise Outline).
4. **Functional Exercise:** A Functional Exercise is a planned activity designed to test and evaluate organizational capacities. It is also utilized to evaluate the capability of a community's emergency management system by testing the Emergency Operations Plan (EOP). It is based on a simulation of a realistic emergency situation that includes a description of the situation (narrative) with communications between players and simulators. The Functional Exercise gives the players (decision-makers) a fully simulated experience of being in a major disaster event. It should take place at the appropriate coordination location (i.e. emergency operations center, emergency command center, command post, master control center, etc.) and activate all the appropriate members designated

by the plan. Both 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. A Functional Exercise should have specific goals, objectives, and scenario narrative.

5. **Full-scale Exercise:** A Full-scale Exercise is the culmination of a progressive exercise program that has grown with the capacity of the community to conduct exercises. A Full-Scale exercise is a planned activity in a “challenging” environment that encompasses a majority of the emergency management functions. This type of exercise involves the 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. A Full-scale Exercise is the largest, costliest, and most complex exercise type. It may or may not include public evacuations.

#### Example Time Frames for Different Exercise Types

Style	Planning Period	Duration	Comments
Orientation Exercise	2 wks	1 day	Individual or mixed groups
Drill	2 days	1 day	Individual technical groups generally
Tabletop Exercise	2 weeks	1-3 days	Single or multiple agency
Functional Exercise	1-2 months	1-5 days	Multiple Agency participation
Full-scale Exercise	2-6 months	1 day/ week	Multiple Agency participation

### 3. Exercise Outline

#### 3.1 General

The tsunami source is based roughly on observations of the 1867 Virgin Islands earthquake and tsunami. Background information on the 1867 event was obtained from: “Disaster and Disruption in 1867: Hurricane, Earthquake, and Tsunami in the Danish West Indies” (Watlington and Lincoln, 1997), “Caribbean Tsunamis” (O’Laughlin & Lander, 2003), the USC tsunami website (see below), “The 1867 Virgin Island Tsunami” (Zahibo, 2003), the USGS report for the Nuclear Regulatory Commission: “Evaluation of Tsunami

Sources with the Potential to Impact the U.S. Atlantic and Gulf of Mexico Coasts” (ten Brink et al, 2008) and Tsunami Simulations of the 1867 Virgin Island Earthquake: Constraints on Epicenter Location and Fault Parameters (Barkan and ten Brink, 2010). The tsunami inundation maps for Puerto Rico included Virgin Islands/Anegada trough scenarios based on “Mode of Faulting in the Local Zone of Puerto Rico (LZPR) by Huérfino Moreno (2003). A brief summary of the 1867 event can be found at the University of Southern California’s (USC) Tsunami Research Group’s website at <http://www.usc.edu/dept/tsunamis/caribbean/webpages/1867viindex.html>. The approximate historic epicenter (based on USC information) is shown in the figure 4 below.

A tsunami model was computed using the Alaska Tsunami Forecast Model (ATFM) to generate expected impacts throughout the region. The model indicated a significant tsunami in the eastern Caribbean with little impact outside the Caribbean. Based on the model, the exercise was limited to the Caribbean region, and does not include other TWC areas-of-responsibility in the Atlantic. The tsunami model is based on the 1867 event as a double quake source in the Virgin Islands Trough with approximately 60 km between epicenters and 5 minutes between origin times. The earthquake source parameters are:

*Souce1:*

time = 1300 UTC, Mw 7.6, epicenter at {18.21N, 65.26W}, strike = 71°, dip, 8°, slip 90°.

*Souce2:*

time = 1305 UTC, Mw 7.6, epicenter at {18.36N, 64.73W}, strike = 71°, dip, 8°, slip 90°.

Sea floor displacement formulae were used to generate the two initial uplifts, and the ATFM computed tsunami propagation from those sources to produce forecast amplitudes along the US Atlantic coast and throughout the Caribbean. Appendix B provides model results.



Figure 4. Approximate location of November 18, 1867 earthquake and tsunami.

Initially, a tsunami warning is issued by WCATWC which includes Puerto Rico and the Virgin Islands, while PTWC issues a Regional Tsunami Watch. The U.S. east coast and the Gulf of Mexico is included in the WCATWC message as information only since the tsunami threat there is minimal. Definitions of the products as issued by the TWCs are provided below:

#### **West Coast Alaska Tsunami Warning Center:**

**Tsunami Warning** - A tsunami warning is issued when a potential tsunami with significant widespread inundation is imminent or expected. Warnings alert the public that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded, or canceled. To provide the earliest possible alert, initial warnings are normally based only on seismic information.

**Tsunami Advisory** - A tsunami advisory is issued due to the threat of a potential tsunami which may produce strong currents or waves dangerous to those in or near the water. Coastal regions historically prone to damage due to strong currents induced by tsunamis are at the greatest risk. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under an advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas, and the repositioning of ships to deep waters when there is time to safely do so. Advisories are normally updated to continue the advisory, expand/contract affected areas, upgrade to a warning, or cancel the advisory.

#### **Pacific Tsunami Warning Center:**

**Tsunami Watch** – Watches are issued by the TWCs based on seismic information without confirmation that a destructive tsunami is underway. It is issued as a means of providing an advance alert to areas that could be impacted by destructive tsunami waves. Watches are updated at least hourly to continue them, expand their coverage, upgrade them to a Warning, or end the alert. A Watch for a particular area may be included in the text of the message that disseminates a Warning for another area..

**Tsunami Information Bulletin (TIB)** – A text product issued to inform that an earthquake has occurred and to advise regarding its potential to generate a tsunami. In most cases, a Tsunami Information Bulletin indicates there is no threat of a destructive tsunami, and are used to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas. A Tsunami Information Bulletin may, in appropriate situations, caution about the possibility of a destructive local tsunami. A supplemental Tsunami Information Bulletin may be issued if important additional information is received such as

a sea level reading showing a tsunami signal. A Tsunami Information Bulletin may also be upgraded to a watch or warning if appropriate.

The TWCs will not issue live messages over broadcast dissemination channels other than to issue an initial dummy message to start the exercise at 1302 UTC on March 23, 2011. However, messages from the TWCs will be emailed and faxed to specific recipients who have requested live dissemination throughout the event. The content of the dummy message is given in Appendix C. The dummy message will indicate that exercise participants should refer to the first message provided in this handbook. From then on, participants should follow the schedule in Table 1 to look at new messages if they are not receiving them via email or fax. Table 1 is the timeline for when messages would be issued by the TWCs if this were a real event and can be used by EMOs to drive the exercise timing. The warning messages (as shown in Appendix D) cover a 5-hour period, though in an actual event they would likely continue longer. World Meteorological Organization (WMO) and Advanced Weather Interactive Processing System (AWIPS) headers used in the dummy message are listed in Table 2.

During real events, the WCATWC issues two official products each time a message is issued. The first, and the ones provided in Appendix D, are known as the standard message. This message is a segmented message which includes encoded NWS zones, Valid Time Event Codes (VTEC), and their level of threat in the lower section of the message. The segmentation is used for automated processing systems which parse NWS products. The standard product also lists expected arrival times. The second product is known as the public message. This message has no segmentation and is written in a non-tabular, easier-to-read format. The products contain the same basic information. EMOs generally use the standard product for warning response as it has more complete information. WCATWC also issues additional graphical and web-based products to its web site. Examples of these are shown in Appendix E.

Participants may elect to exercise using their own timelines in order to achieve their particular objectives. For example, a particular EMO's exercise control may choose to feed the TWC bulletins into the exercise at times of their own choosing, or alternatively put them in envelopes with the time they must be opened written on each, with each key participant agency having their own set of envelopes. The messages, provided in Appendix D, will facilitate this approach. For this exercise, in addition to the first dummy message, the WCATWC and the PTWC will email and fax the messages to the participants who have requested this service.

EMOs are welcome to modify estimated arrival times and/or wave amplitudes to suit their exercise – for example, to have the tsunami arrive sooner and with larger amplitude. Other exercise injects, such as tsunami damage reports, are also encouraged.

### 3.2 Master Schedule (Exercise Script)

**Table 1: Scenario Timeline**

Tsunami generated by a magnitude 7.6 earthquake with epicenter at 18.2°N, 65.3°W occurring on March 23, 2011 at 1300 UTC and a second nearby earthquake which occurs 5 minutes later. The initial warning is being disseminated at 1302 UTC.

Date (UTC)	Time (UTC)	WCATWC Message				PTWC Message				
		#	Type	Dummy	Email	#	Type	Dummy	Email	
03/23/2011	1300		----- Earthquake Occurs -----							
03/23/2011	1302	01	Warn	Yes	Yes	01	Watch	Yes	Yes	
03/23/2011	1332	02	Warn	No	Yes					
03/23/2011	1401	03	Warn	No	Yes	02	Watch	No	Yes	
03/23/2011	1431	04	Warn	No	Yes					
03/23/2011	1500	05	Warn	No	Yes	03	Watch	No	Yes	
03/23/2011	1530	06	Warn	No	Yes					
03/23/2011	1601	07	Adv	No	Yes	04	Watch	No	Yes	
03/23/2011	1630	08	Adv	No	Yes					
03/23/2011	1701	09	Can	No	Yes	05	Watch	No	Yes	
03/23/2011	1802					06	Can	No	Yes	

The initial dummy message will be disseminated over all standard TWC broadcast channels as listed in Table 2. 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 (address listed in 3.4) with your organization name and email address.

**TWC Message Types:**

Warn      Tsunami Warning  
 Advisory      Tsunami Advisory  
 Watch      Tsunami Watch  
 Can      Cancellation

**Dummy:**

Yes      Dummy Issued  
 No      Dummy Not Issued

**Email:**

Yes      Message disseminated via special email list  
 No      Message not disseminated via special email list

**Table 2: Product Types**

Product Types Issued for Dummy Message with Transmission Methods

Center	WMO ID	AWIPS ID	NWWS	GTS	EMWIN	Fax	Email
WCATWC	WEXX20 PAAQ	TSUAT1	Yes	Yes	Yes	Yes	Yes
PTWC	WECA41 PHEB	TSUCAX	Yes	Yes	Yes	Yes	Yes

NWWS	NOAA Weather Wire Service
GTS	Global Telecommunications System
EMWIN	Emergency Manager's Weather Information Network

### 3.3 Actions in Case of a Real Event

In the case of a real event occurring during the exercise, the 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.**”

### 3.4 Resources

Although EMOs will have advance notice of the exercise and may elect to stand up a special dedicated shift to allow normal core business to continue uninterrupted, it is requested that realistic resource levels be deployed in order to reflect some of the issues that are likely to be faced in a real event.

Questions on the exercise can be addressed to:

Lorna Inniss, Chair	246 228 5950	<a href="mailto:linniss@coastal.gov.bb">linniss@coastal.gov.bb</a>
Francisco Garcés, Vice Chair	58-212-2575153	<a href="mailto:fgarcés@funvisis.gob.ve">fgarcés@funvisis.gob.ve</a>
Frederique Martini, Vice Chair	<a href="mailto:Frederique.MARTINI@developpement-durable.gouv.fr">Frederique.MARTINI@developpement-durable.gouv.fr</a>	
Christa von Hillebrandt, Vice Chair; NWS CTWP Manager	787-833-8433	<a href="mailto:christa.vonh@noaa.gov">christa.vonh@noaa.gov</a>
Emilio Talavera, Chair WG1	505-22492761	<a href="mailto:emilio.talavera@gf.ineter.gob.ni">emilio.talavera@gf.ineter.gob.ni</a>
Aurelio Mercado, Chair WG2	787-265-5461	<a href="mailto:aurelio.mercado@upr.edu">aurelio.mercado@upr.edu</a>
Rafael Mojica, Chair WG3	787-253-4586	<a href="mailto:rafael.mojica@noaa.gov">rafael.mojica@noaa.gov</a>
Dimas Alonso, Chair WG4	504-2290606 x401	<a href="mailto:alonzoaguadesastres@yahoo.com">alonzoaguadesastres@yahoo.com</a>
Bernardo Aliaga, Technical Secretary	33-1-45683980	<a href="mailto:b.aliaga@unesco.org">b.aliaga@unesco.org</a>
Jeremy Collymore, Ex. Director CDEMA	246-425-0386	<a href="mailto:Jeremy.Collymore@cdema.org">Jeremy.Collymore@cdema.org</a>
Walter Wintzer, CEPREDENAC	502-2362-1981-83	<a href="mailto:wwintzer@sica.int">wwintzer@sica.int</a>
Ivan Morales, CEPREDENAC	502-2362-1981-83	<a href="mailto:imorales@sica.int">imorales@sica.int</a>
Melinda Bailey NWS Southern Region	817-978-1100x107	<a href="mailto:melinda.bailey@noaa.gov">melinda.bailey@noaa.gov</a>
Wilfredo Ramos, PREMA Rep.	787-724-0124	<a href="mailto:wramos@aemead.gobierno.pr">wramos@aemead.gobierno.pr</a>
Jacqueline Heyliger VITEMA Rep.	340-773-2244	<a href="mailto:jjheyliiger@yahoo.com">jjheyliiger@yahoo.com</a>
Paul Whitmore WCATWC Director	907-745-4212	<a href="mailto:paul.whitmore@noaa.gov">paul.whitmore@noaa.gov</a>
Bill Knight WCATWC TWSO	907-745-4212	<a href="mailto:william.knight@noaa.gov">william.knight@noaa.gov</a>
James Waddell WCATWC Rep.	907-745-4212	<a href="mailto:james.waddell@noaa.gov">james.waddell@noaa.gov</a>
Charles McCreery PTWC Director	808-689-8207	<a href="mailto:charles.mccreery@noaa.gov">charles.mccreery@noaa.gov</a>
Stuart Weinstein PTWC TWSO	808-689-8207	<a href="mailto:stuart.weinstein@noaa.gov">stuart.weinstein@noaa.gov</a>
Gerard Fryer PTWC Rep.	808-689-8207	<a href="mailto:gerard.fryer@noaa.gov">gerard.fryer@noaa.gov</a>
Victor Huerfano PRSN Director	787-833-8433	<a href="mailto:victor@prsn.uprm.edu">victor@prsn.uprm.edu</a>

### 3.5 Media Arrangements

One advantage in conducting exercises is that it provides a venue to promote awareness of the exercise topic. Many residents along the Caribbean coasts may not realize that a tsunami warning system exists for their region, let alone the proper response. 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.

## 4 Post-Exercise Evaluation

All participating agencies are requested to provide brief feedback on the exercise. This feedback will assist the ICG/CARIBE-EWS, NTHMP, and NOAA in the evaluation of CARIBE WAVE 11/LANTEX 11 and the development of subsequent exercises, and help response agencies document lessons learned.

Please provide feedback at the NTHMP internet web site (this web site is under construction): <http://nthmp.tsunami.gov/exercise2011.php>.

## 5 References

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## Appendix A. Example Table Top Exercise

### Tabletop Exercise Development Steps

Source: California Office of Emergency Services

A Tabletop Exercise is a planned activity in which local officials, key staff, and organizations with disaster management responsibilities are presented with simulated emergency situations. It is usually informal and slow paced, in a conference room environment, and is designed to elicit constructive discussion from the participants to assess plans, policies, and procedures. Participants will examine and attempt to resolve problems, based on plans and procedures, if they exist. Individuals are encouraged to discuss decisions in depth based on their organization's Standard Operating Procedures (SOPs), with emphasis on slow-paced problem solving, rather than rapid, real time decision-making. An Exercise Controller (moderator) introduces a simulated tsunami scenario to participants via written message, simulated telephone or radio call, or by other means. Exercise problems and activities (injects) are further introduced. Participants conduct group discussions, and resolution is generally agreed upon, and then summarized by a group leader. A Tabletop Exercise should have specific goals, objectives, and a scenario narrative.

The following provides a Tabletop Exercise structure with sample text and example.

#### 1. Vulnerability Analysis: Problem Statement

*An example for a hurricane might be:*

*Due to the recent Hurricane incidents that the Southeast region of the United States, an awareness of the threat risk involved in these disasters has become more apparent, therefore the need for evacuation system is vital. The state of Louisiana continues its ongoing tasks of planning, preparing, and training for Hurricane preparedness.*

#### 2. Purpose (Mission): Intent, what you plan to accomplish (Policy Statement)

*An example for a hurricane might be:*

*The State of Louisiana has realized and recognizes the need for a more efficient and effective evacuation system, and is responding with this Comprehensive Exercise Plan. These events will include seminars, workshops, tabletop exercise, functional and full-scale exercises within an 18-month time frame, under the State Homeland Security grant program.*

#### 3. Scope:

<b>Exercise Activities</b>
<b>Agencies Involved</b>
<b>Hazard Type</b>
<b>Geographic Impact Area</b>

*An example might be:*

*Emergency Services coordinators at local levels of government will identify representative jurisdictions from each of the six mutual aid regions located throughout the State to participate as host jurisdictions in a series of disaster preparedness exercises. These host jurisdictions will develop a progressive series of exercises each type building upon the previous type of exercise. The process will begin with a vulnerability analysis for each jurisdiction and continue through a progression of exercise activities including; orientation seminars,*

*workshops, tabletop and functional exercises. The eventual objective of these activities will be to reduce disaster impacts to their populations and city infrastructure. All events will be evaluated utilizing US Homeland Security Exercise Evaluation Program (HSEEP) after action reporting (AAR) standards. Steps for corrective actions will be made a part of the after action process and report. Surrounding jurisdictions in the mutual aid area will act as exercise design team members, exercise evaluators, or exercise observers for the purpose of information transfer to increase their operational readiness. Jurisdictions will participate on a rotational basis every two years to provide the opportunity for multiple jurisdiction participation.*

**4. Goals and Objectives:**

**Criteria for good objectives: Think SMART**

- Simple (concise)
- Measurable
- Achievable (can this be done during the exercise?)
- Realistic (and challenging)
- Task Oriented (oriented to functions)

**An example might be:**

*Comprehensive Exercise Program (CEP) Objectives*

- *To improve operational readiness*
- *To improve multi-agency coordination and response capabilities for effective disaster response*
- *To identify communication pathways and problem areas pre-event between local jurisdictions and operational area, regional and state emergency operations centers*
- *To establish uniform methods for resource ordering, tracking and supply for agencies involved at all levels of government.*

**5. Narrative:**

The Narrative should describe the following:

- Triggering emergency/disaster event
- Describe the environment at the time the exercise begins
- Provides necessary background information
- Prepares participants for the exercise
- Discovery, report: how do you find out?
- Advance notice?
- Time, location, extent or level of damage

**6. Evaluation:**

The Evaluation should describe the following:

- Objectives Based
- Train Evaluation Teams
- Develop Evaluation Forms

**7. After Action Report (AAR):** The AAR should be compiled using the evaluation reports

**8. Improvement Plan (IP):** The IP should reduce vulnerabilities.

## Appendix B. Scenario Description

The tsunami source is based roughly on observations of the 1867 Virgin Islands earthquake and tsunami. Background information on the 1867 event was obtained from: "Disaster and Disruption in 1867: Hurricane, Earthquake, and Tsunami in the Danish West Indies" (Watlington and Lincoln, 1997), "Caribbean Tsunamis" (O'Laughlin & Lander, 2003), the USC tsunami website (see below), "The 1867 Virgin Island Tsunami" (Zahibo, 2003), the USGS report for the Nuclear Regulatory Commission: "Evaluation of Tsunami Sources with the Potential to Impact the U.S. Atlantic and Gulf of Mexico Coasts" (ten Brink et al, 2008) and Tsunami Simulations of the 1867 Virgin Island Earthquake: Constraints on Epicenter Location and Fault Parameters (Barkan and ten Brink, 2010). A brief summary of the 1867 event can be found at the University of Southern California's (USC) Tsunami Research Group's website at <http://www.usc.edu/dept/tsunamis/caribbean/webpages/1867viindex.html>.

Tsunami models were computed using the Alaska Tsunami Forecast Model (ATFM) and the PTWC RIFT model to generate expected impacts throughout the region. The models indicated a significant tsunami in the eastern Caribbean with little impact outside the Caribbean. Based on the models, the exercise was limited to the Caribbean region, and does not include other TWC areas-of-responsibility in the Atlantic. The models are based on a double quake source in the Virgin Islands Trough with approximately 60 km between epicenters and 5 minutes between origin times. The earthquake source parameters are:

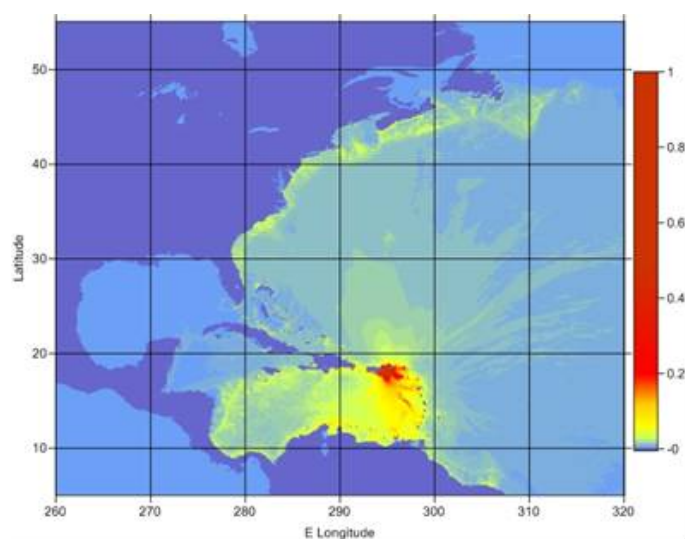
*Source1:* time = 1300 UTC, Mw 7.6, epicenter at {18.21N, 65.26W}.

*Source2:* time = 1305 UTC, Mw 7.6, epicenter at {18.36N, 64.73W}.

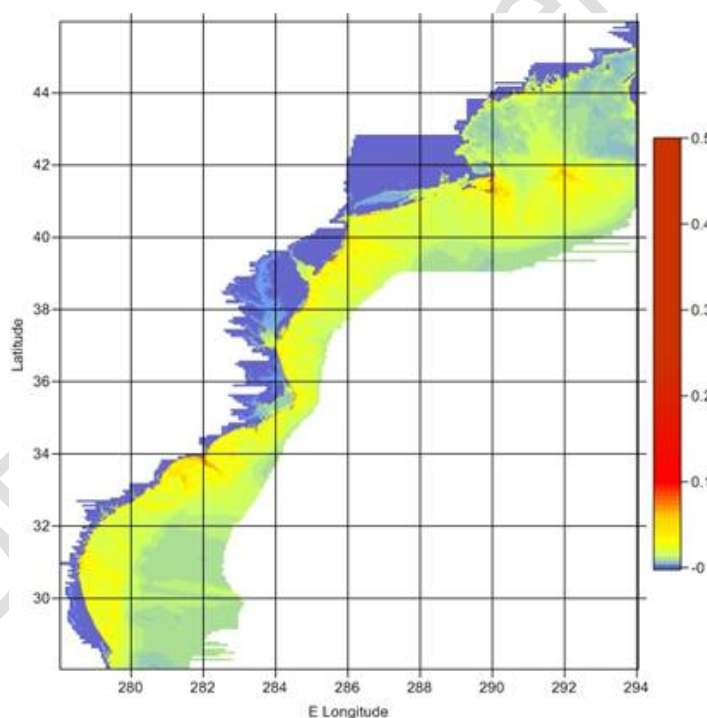
For both events the following parameters were used:

Strike: 71°  
 Dip: 8°  
 Slip: 90°  
 Length: 70km  
 Width: 35km  
 Depth: 7km  
 Moment:  $7.5 \times 10^{27}$  dyne-cm

Sea floor displacement formulae were used to generate the two initial uplifts, and the models computed tsunami propagation from those sources to produce forecast amplitudes along the US Atlantic coast and throughout the Caribbean. Model output are shown in the Figures below with forecast coastal amplitudes provided in the Table. The forecast amplitudes are calculated for points offshore. The height of the wave on the shore could be double that of the model outputs.



**Figure B1.** Maximum modeled tsunami amplitude throughout the northern Atlantic (scale in meters - ATFM).



**Figure B2.** Maximum modeled tsunami amplitude in the finer grids near the U.S. Atlantic coast (scale in meters - ATFM).

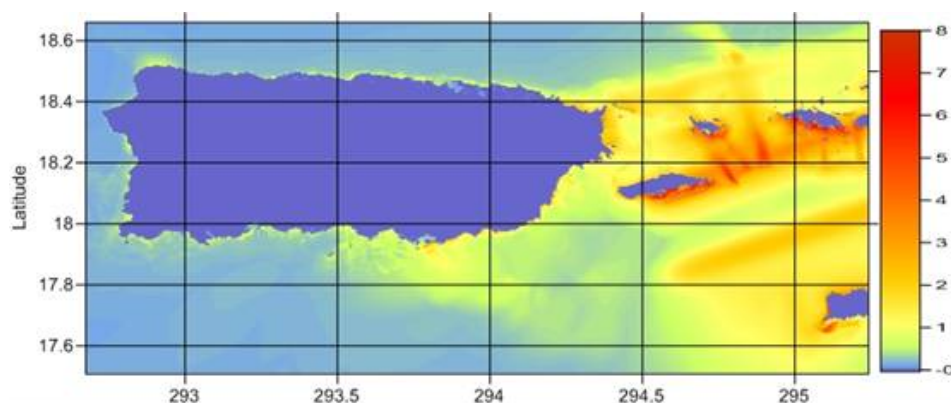


Figure B3. Maximum modeled tsunami amplitude in the finer grids near Puerto Rico and the Virgin Islands (scale in meters - ATFM).

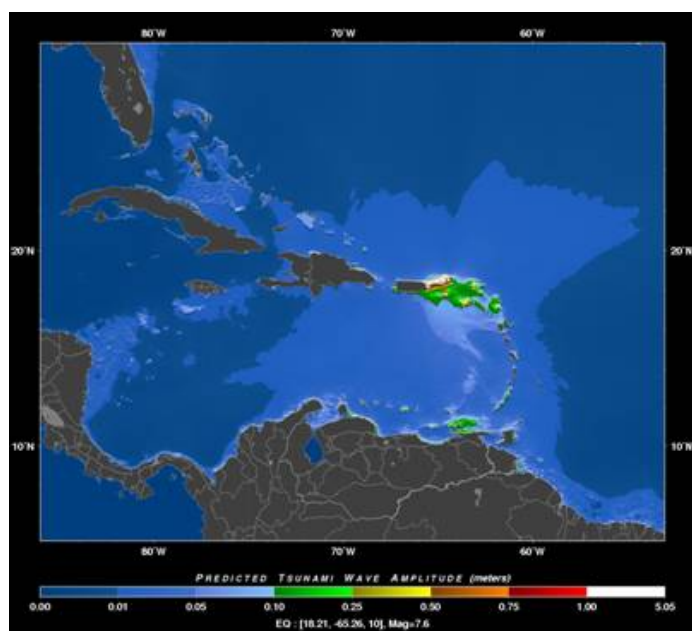


Figure B4. Maximum modeled tsunami amplitude in the Caribbean (scale in meters - RIFT).

Location	Travel time (hr:min)	Max Amp. (meters)	Leading Edge
Charlotte Amalie, VI	0:01	2.7	elevation
Christiansted, VI	0:01	2.5	recession
Fajardo, PR	0:01	0.95	recession
Lameshur Bay, VI	0:02	2.85	recession
Limetree Bay, VI	0:02	4.7	recession
Virgin Gorda, BVI	0:03	1.4	recession
Culebra, PR	0:05	2.0	elevation
St. John, VI	0:07	0.26	elevation
Tortola, BVI	0:07	0.47	elevation
San Juan, PR	0:12	0.59	elevation

Mona Island, PR	0:25	0.26	recession
Magueyes Island, PR	0:28	0.75	recession
D42407	0:32	.025	recession
Aquadilla, PR	0:36	0.50	recession
Saint Kitts	0:44	1.07	recession
Anguilla	0:45	1.23	
Montserrat	0:45	0.18	recession
Mayaguez, PR	0:47	0.50	recession
Basse Terre, Guadeloupe	0:51	0.19	recession
Cabo Engano, DR	0:54	0.12	recession
Barbuda	0:55	0.13	recession
Bonaire	0:55	0.07	recession
Roseau, Dominica	0:55	0.23	recession
Saint Maarten,	1:01	0.25	recession
Santo Domingo	1:02	0.18	
Fort-de-France, Martinique	1:03	0.21	recession
St Johns, Antigua	1:03	0.24	recession
Saint Lucia	1:05	0.11	recession
Saint Vincent	1:14	0.78	recession

Curacao	1:11	0.27	recession
Aruba	1:16	0.13	recession
Grand Turk, Turks and Caicos	1:18	0.05	
St. Georges, Grenada	1:24	0.54	recession
Maiquetia, VE	1:30	0.12	recession
Puerto Plata, DR	1:30	0.04	elevation
La Guaira, VE	1:31	0.15	recession
Bridgetown, Barbados	1:38	0.05	recession
Santa Marta, CO	1:57	0.095	recession
Barranquilla, CO	2:01	0.11	recession
Bermuda	2:05	0.09	repression
Cumana, VE	2:05	0.14	elevation
Cartagena, CO	2:18	0.02	recession
Kingston, JA	2:26	0.08	recession
Porlamar, VE	2:29	0.26	
Myrtle Beach, FL	3:02	0.08	elevation
Gibara, Cuba	3:08	0.02	
Puerto Limon, CR	3:11	0.04	recession
Riohacha, CO	3:18	0.10	recession
Punta Fijo, VE	3:42	0.085	elevation
Port Au Prince, Haiti	3:57	0.04	recession
Guantanamo Bay, Cuba	3:58	0.035	elevation
Golfo_de_Venezuela, VE	4:20	0.02	recession
Porlamar, VE	4:21	0.04	elevation
Duck, NC	4:26	0.07	recession
Trident Pier, FL	4:29	0.06	elevation
Montego Bay, JA	4:35	~0.01	?
Ocean City, MD	4:54	0.11	recession
Wrightsville, NC	5:05	0.06	elevation
Flagler Beach, FL	5:06	0.075	elevation
Key West, FL		< 0.01	
Georgetown, Guyana	5:12	0.04	
Atlantic City, NJ	5:14	0.19	recession

Sunset Beach, NC	5:24	0.14	recession
Port-O-Spain	5:24	~0.01	recession
Springmaid Pier, SC	5:36	0.06	recession
Oregon Inlet, SC	5:44	0.02	elevation
Charleston, SC	5:48	0.03	elevation
Nantucket Is., MA	6:24	0.085	elevation
Providence, RI	7:03	0.055	elevation

**Table B1: Coastal amplitude forecast for event (ATFM and RIFT). The amplitude is the elevation of the tsunami above sea level. The amplitude does not take into account uplift or subsidence of the location due to the earthquake. Also the amplitude is measure offshore, the onshore heights could be double those of the forecast models.**

Tsunami Event																	
Date					Tsunami Cause		Tsunami Source Location				Tsunami Parameters						
Year	Mo	Da	Ho	Sec	Val	Code	Country	Name	Latitude	Longitude	Max Water Height	Magnitude	Abs	Info	Tot	Warn States	
1867	11	18	18	45	4	1	USA TERRITORY	VIRGIN ISLANDS	18.100	-65.100	10.00				2.30		
Tsunami Runups																	
Addl Info	Depth Full Range	Tsunami Runup Location				Tsunami Runup Measurements				Tsunami Runup Location Effects							
		Country	State/Province/Prefecture	Name	Latitude	Longitude	Distance from Source	Travel Time Hrs Min	Max Water Height	Max Inundation Distance	Type	Per	Deaths Num	Injuries Num	Damages \$Mls	Houses Destroyed Num	Houses Damaged Num
*		ANTIGUA AND BARBUDA		ANTIGUA: ST. JOHN'S	17.193	-62.416	202		2.40								
*		ANTIGUA AND BARBUDA		BARBUDA: WEST COAST	17.717	-61.817	350		1.40								
*		BRITISH VIRGIN ISLANDS		PETER'S ISLAND	18.367	-64.623	58		1.20								
*		BRITISH VIRGIN ISLANDS		TORTOLA ISLAND: ROAD TOWN	18.414	-64.616	62		1.50	9.00	1	F			1	2	
*		DOMINICA		RUFERT'S BAY	15.500	-61.333	494		3.00								
*		GRENADA		GOUVAYE (CHARLOTTE TOWN)	12.167	-61.733	752		3.00						1		
*		GRENADA		SAINT GEORGE'S	12.015	-61.778	765		1.50								
*		GUADELOUPE		BASSE TERRE	16.000	-61.717	429		1.00								
*		GUADELOUPE		DESHAIES	16.317	-61.783	404		10.00			1	F		2		
*		GUADELOUPE		LES DES SAINTES: FOND-DU-CIRE	15.867	-61.617	446		1.00						2		
*		GUADELOUPE		POINTE-A-PITRE	16.233	-61.533	432										
*		GUADELOUPE		SAINT BARTHELEMY ISLAND	17.900	-62.833	241								1	1	
*		GUADELOUPE		SAINT MARTIN	18.670	-63.067	224								1	1	
*		GUADELOUPE		SAINT-ROSE	16.333	-61.700	411		10.00			1	F		2		
*		MARTINIQUE		MARTINIQUE	14.667	-61.000	581										
*		NETHERLANDS ANTILLES		SABA ISLAND	17.633	-63.233	204										
*		SAINT KITTS AND NEVIS		SAINT KITTS: BASSETERRE	17.200	-62.717	268			2.40	1	F					
*		SAINT LUCIA		LAYON, ANSE-LA-RAVE	13.883	-60.967	644		.90								
*		SAINT VINCENT AND THE GRENADINES		BEQUA ISLAND: ADMIRALTY BAY	13.280	-61.250	676		1.80	146.00	1				1	2	
*		SAINT VINCENT AND THE GRENADINES		SAINT VINCENT	13.130	-61.200	693										
*		USA TERRITORY	PR	PUERTO RICO: ARROYO	17.983	-66.250	101		.90	40.00	1						
*		USA TERRITORY	PR	PUERTO RICO: BAHIA DE SAN JUAN	18.450	-66.117	114		.90			1	F				
*		USA TERRITORY	PR	PUERTO RICO: PLAYA DE FAJARDO	18.333	-65.633	62					1	F				
*		USA TERRITORY	PR	PUERTO RICO: VIEQUES	18.150	-65.450	37					1	F				
*		USA TERRITORY	PR	PUERTO RICO: YABUCOA	18.033	-65.583	83		1.37			1	F				
*		USA TERRITORY	VI	VIRGIN ISLANDS: ALTONA	18.341	-64.949	31			76.20	1				2	2	
*		USA TERRITORY	VI	VIRGIN ISLANDS: CHARLOTTE AMALIE	18.333	-64.917	32		6.00			1	10	F	12	1	
*		USA TERRITORY	VI	VIRGIN ISLANDS: CHRISTIANSTED	17.767	-64.733	54			91.00	1	F	1				
*		USA TERRITORY	VI	VIRGIN ISLANDS: FREDERIKSTED	17.717	-64.883	48	0	12	76.00	1	F	5	1	1	20	1
*		USA TERRITORY	VI	VIRGIN ISLANDS: GALLOW'S BAY	17.600	-64.700	70					1			1	20	1
*		USA TERRITORY	VI	VIRGIN ISLANDS: HASSEL ISLAND	16.300	-64.960	27		4.90			1		3	1		
*		USA TERRITORY	VI	VIRGIN ISLANDS: SABA ISLAND	18.341	-64.982	30					1		10	1		
*		USA TERRITORY	VI	VIRGIN ISLANDS: SAINT CROIX	17.750	-64.750	54		7.00			1					

**Figure B5. Historical Tsunami Data for the 1867 Event (NGDC)**

Deleted: ¶



## Appendix C. TWC Dummy Messages

### WCATWC

WEXX20 PAAQ 231302  
TSUAT1

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.

\$\$

### PTWC

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.

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## Appendix D. TWC Exercise Messages

The following messages, created for the CARIBE WAVE 11/LANTEX 11 tsunami exercise, are representative of the official standard products issued by the WCATWC and PTWC during a large magnitude 7.6 earthquake and tsunami originating 25 miles southeast of Fajardo, Puerto Rico and 60 miles southeast of San Juan, Puerto Rico at 18.2°N, 65.3°W. During a real event, the TWCs would also issue graphical and html-based products to their web sites and via RSS.

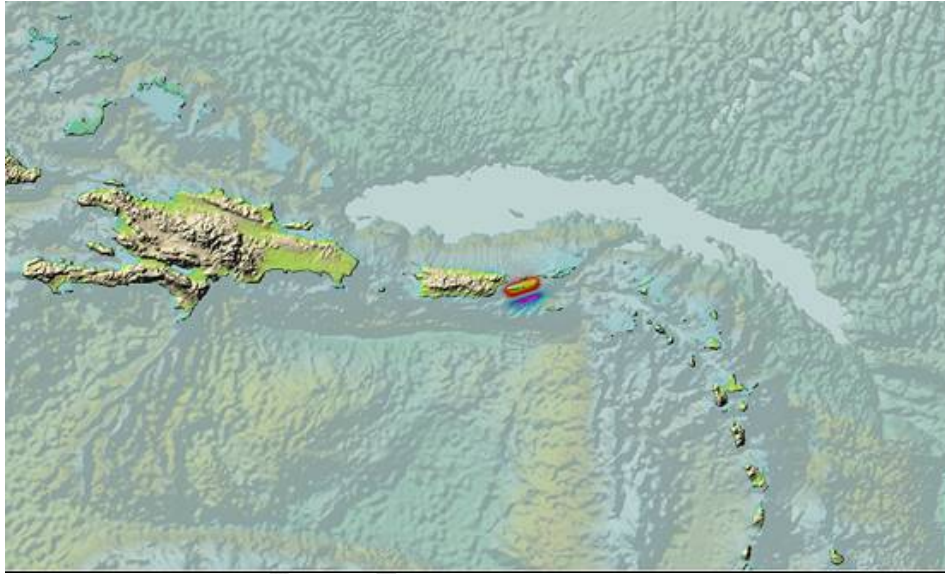


Figure D1: Tsunami source at zero minutes.

### 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...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF  
TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -  
GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

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 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.

AMZ712-715-725-735-742-745-PRZ001>003-005-007-008-010-011-VIZ001-002-231402-  
 /T.NEW.PAAQ.TS.W.0003.110323T1302Z-000000T0000Z/  
 COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.  
 902 AM AST WED MAR 23 2011

...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

# CARIBE WAVE 11/LANTEX 11 Handbook

MARTIN - BARBUDA - MARTINIQUE - SAINT LUCIA - BONAIRE -  
CURACAO - TURKS N CAICOS - ST VINCENT - ANTIGUA - GRENADA -  
HAITI - ARUBA - VENEZUELA - BAHAMAS - BARBADOS - CUBA -  
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.

LOCATION		COORDINATES	ARRIVAL TIME
SAINT MAARTEN	SIMPSON BAAI	18.0N 63.1W	1336Z MAR23
ANGUILLA	THE VALLEY	18.3N 63.1W	1345Z MAR23
SAINT KITTS	BASSETERRE	17.3N 62.7W	1352Z MAR23
MONTserrat	PLYMOUTH	16.7N 62.2W	1354Z MAR23
DOMINICAN REP	CABO ENGANO	18.6N 68.3W	1354Z MAR23
GUADELOUPE	BASSE-TERRE	16.0N 61.7W	1401Z MAR23
DOMINICAN REP	SANTO DOMINGO	18.5N 69.9W	1402Z MAR23
DOMINICA	ROSEAU	15.3N 61.4W	1404Z MAR23
SAINT MARTIN	BAIE BLANCHE	18.1N 63.0W	1405Z MAR23
BARBUDA	PALMETTO POINT	17.6N 61.9W	1410Z MAR23
MARTINIQUE	FORT-DE-FRANCE	14.6N 61.1W	1411Z MAR23
SAINT LUCIA	CASTRIES	14.0N 61.0W	1412Z MAR23
DOMINICAN REP	PUERTO PLATA	19.8N 70.7W	1413Z MAR23
BONAIRE	ONIMA	12.3N 68.3W	1414Z MAR23
CURACAO	WILLEMSTAD	12.1N 68.9W	1418Z MAR23
TURKS N CAICOS	GRAND TURK	21.5N 71.1W	1418Z MAR23
ST VINCENT	KINGSTOWN	13.1N 61.2W	1419Z MAR23
ANTIGUA	SAINT JOHNS	17.1N 61.9W	1425Z MAR23
GRENADA	SAINT GEORGES	12.0N 61.8W	1428Z MAR23
HAITI	CAP-HAITEN	19.8N 72.2W	1430Z MAR23
ARUBA	ORANJESTAD	12.5N 70.0W	1433Z MAR23
TURKS N CAICOS	WEST CAICOS	21.7N 72.5W	1434Z MAR23
VENEZUELA	MAIQUETIA	10.6N 67.0W	1436Z MAR23
BAHAMAS	MAYAGUANA	22.3N 73.0W	1437Z MAR23
BARBADOS	BRIDGETOWN	13.1N 59.6W	1439Z MAR23
VENEZUELA	CUMANA	10.5N 64.2W	1442Z MAR23
BAHAMAS	GREAT INAGUA	20.9N 73.7W	1444Z MAR23
CUBA	BARACOA	20.4N 74.5W	1448Z MAR23
HAITI	JEREMIE	18.6N 74.1W	1450Z MAR23
TRINIDAD TOBAGO	PIRATES BAY	11.3N 60.6W	1451Z MAR23
BAHAMAS	SAN SALVADOR	24.1N 74.5W	1452Z MAR23
BAHAMAS	CROOKED IS	22.7N 74.1W	1455Z MAR23
CUBA	SANTIAGO D CUBA	19.9N 75.8W	1458Z MAR23
COLOMBIA	SANTA MARTA	11.2N 74.2W	1501Z MAR23
COLOMBIA	RIOHACHA	11.6N 72.9W	1501Z MAR23

## CARIBE WAVE 11/LANTEX 11 Handbook

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

ADDITIONAL BULLETINS WILL BE ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT AS MORE INFORMATION BECOMES AVAILABLE.



Figure D2: Tsunami at ten minutes.

### WCATWC Message #2

WEXX20 PAAQ 231332  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 2  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
932 AM AST WED MAR 23 2011

THIS MESSAGE CONTAINS NEW OBSERVATIONS AND INFORMATION ON AN AFTERSHOCK.

## CARIBE WAVE 11/LANTEX 11 Handbook

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR PUERTO RICO  
AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF  
TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -  
GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

### RECOMMENDED ACTIONS

A TSUNAMI HAS BEEN GENERATED WHICH IS EXPECTED TO DAMAGE THE  
WARNING REGIONS LISTED IN THE HEADLINE. 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 TO  
HIGHER GROUND.

A 7.6 MW AFTERSHOCK WAS RECORDED AT 1305 UTC - 5 MINUTES AFTER THE INITIAL  
QUAKE. ITS EPICENTER WAS POSITIONED AT 18.36N 64.73W. FIGURES WITHIN  
WCATWC MESSAGES REFLECT THE IMPACT OF BOTH QUAKE ON THE EVENT.

### A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	906 AST	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	909 AST	15.41 FT/4.70 M
CHARLOTTE AMALIE VI	18.3N	65.0W	909 AST	8.83 FT/2.69 M
LAMESHUR BAY VI	18.3N	64.7W	918 AST	9.37 FT/2.86 M
CULEBRA PR	18.3N	65.3W	921 AST	6.79 FT/2.07 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

WAVES OF THIS SIZE ARE KNOWN TO CAUSE INUNDATION AND DAMAGE TO  
COASTAL STRUCTURES. TSUNAMIS ARE EXPECTED TO CONTINUE AT DANGEROUS  
LEVELS FOR AT LEAST TWO HOURS. A 15.0-FOOT/4.6-METER TSUNAMI IN  
LIMETREE BAY VI WAS WITNESSED TEARING THE BOARDS FROM A LOCAL  
PIER AND PUSHING THREE BOATS ASHORE.

### 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](http://WWW.PRH.NOAA.GOV/PR/PTWC).

THIS MESSAGE IS BASED ON EARTHQUAKE DATA... OBSERVED TSUNAMI  
AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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](http://WCATWC.ARH.NOAA.GOV) FOR MORE INFORMATION.

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VIZ001-002-231432-  
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COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.

## CARIBE WAVE 11/LANTEX 11 Handbook

932 AM AST WED MAR 23 2011

...THE TSUNAMI WARNING CONTINUES 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

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### WCATWC Message #3

WEXX20 PAAQ 231401  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 3  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1001 AM AST WED MAR 23 2011

THIS MESSAGE CONTAINS MORE OBSERVED TSUNAMI AMPLITUDES AND  
DAMAGE INFORMATION.

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR PUERTO RICO  
AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF  
TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -  
GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

#### RECOMMENDED ACTIONS

- A TSUNAMI HAS BEEN GENERATED WHICH IS EXPECTED TO DAMAGE THE  
WARNING REGIONS LISTED IN THE HEADLINE. 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 TO  
HIGHER GROUND.

#### A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	906 AST	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	909 AST	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	918 AST	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	919 AST	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	921 AST	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	945 AST	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	948 AST	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	951 AST	2.48 FT/0.76 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

INITIAL DAMAGE REPORTS NOTE FLOODED STREETS IN CHRISTIANSTED VI

## CARIBE WAVE 11/LANTEX 11 Handbook

AND MANY HOMES TORN FROM THE FOUNDATIONS IN LIMETREE BAY VI.

### 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 ON EARTHQUAKE DATA... OBSERVED TSUNAMI AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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.

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VIZ001-002-231501-  
/T.CON.PAAQ.TS.W.0003.000000T0000Z-000000T0000Z/  
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.  
1001 AM AST WED MAR 23 2011

...THE TSUNAMI WARNING CONTINUES 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

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### **PTWC Message #2**

WECA41 PHEB 231401  
TSUCAX

TSUNAMI MESSAGE NUMBER 2  
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS  
ISSUED AT 1401Z 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 -



# CARIBE WAVE 11/LANTEX 11 Handbook

CURACAO - TURKS N CAICOS - ST VINCENT - ANTIGUA - GRENADA -  
HAITI - ARUBA - VENEZUELA - BAHAMAS - BARBADOS - CUBA -  
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

## MEASUREMENTS OR REPORTS OF TSUNAMI ACTIVITY

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	1306Z	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	1309Z	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	1318Z	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	1319Z	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	1321Z	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	1345Z	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	1348Z	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	1351Z	2.48 FT/0.76 M
BASSETERRE SAINT KITTS	17.3N	62.7W	1352Z	3.21 FT/1.00 M
PLYMOUTH MONTSEERRAT	16.7N	62.2W	1355Z	1.66 FT/0.51 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.  
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.  
VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT) .

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.

## EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE  
BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER.

THE THREAT MAY CONTINUE FOR COASTAL AREAS LOCATED WITHIN ABOUT A  
THOUSAND KILOMETERS OF THE EARTHQUAKE EPICENTER. FOR THOSE 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.

DUE TO ONLY LIMITED SEA LEVEL DATA FROM THE REGION IT IS NOT  
POSSIBLE FOR THIS CENTER TO RAPIDLY NOR ACCURATELY 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.

LOCATION		COORDINATES	ARRIVAL TIME
SAINT MAARTEN	SIMPSON BAAI	18.0N 63.1W	1336Z MAR23
ANGUILLA	THE VALLEY	18.3N 63.1W	1345Z MAR23

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SAINT KITTS	BASSETERRE	17.3N	62.7W	1352Z	MAR23
MONTserrat	PLYMOUTH	16.7N	62.2W	1354Z	MAR23
DOMINICAN REP	CABO ENGANO	18.6N	68.3W	1354Z	MAR23
GUADELOUPE	BASSE-TERRE	16.0N	61.7W	1401Z	MAR23
DOMINICAN REP	SANTO DOMINGO	18.5N	69.9W	1402Z	MAR23
DOMINICA	ROSEAU	15.3N	61.4W	1404Z	MAR23
SAINT MARTIN	BAIE BLANCHE	18.1N	63.0W	1405Z	MAR23
BARBUDA	PALMETTO POINT	17.6N	61.9W	1410Z	MAR23
MARTINIQUE	FORT-DE-FRANCE	14.6N	61.1W	1411Z	MAR23
SAINT LUCIA	CASTRIES	14.0N	61.0W	1412Z	MAR23
DOMINICAN REP	PUERTO PLATA	19.8N	70.7W	1413Z	MAR23
BONAIRE	ONIMA	12.3N	68.3W	1414Z	MAR23
CURACAO	WILLEMSTAD	12.1N	68.9W	1418Z	MAR23
TURKS N CAICOS	GRAND TURK	21.5N	71.1W	1418Z	MAR23
ST VINCENT	KINGSTOWN	13.1N	61.2W	1419Z	MAR23
ANTIGUA	SAINT JOHNS	17.1N	61.9W	1425Z	MAR23
GRENADA	SAINT GEORGES	12.0N	61.8W	1428Z	MAR23
HAITI	CAP-HAITEN	19.8N	72.2W	1430Z	MAR23
ARUBA	ORANJESTAD	12.5N	70.0W	1433Z	MAR23
TURKS N CAICOS	WEST CAICOS	21.7N	72.5W	1434Z	MAR23
VENEZUELA	MAIQUETIA	10.6N	67.0W	1436Z	MAR23
BAHAMAS	MAYAGUANA	22.3N	73.0W	1437Z	MAR23
BARBADOS	BRIDGETOWN	13.1N	59.6W	1439Z	MAR23
VENEZUELA	CUMANA	10.5N	64.2W	1442Z	MAR23
BAHAMAS	GREAT INAGUA	20.9N	73.7W	1444Z	MAR23
CUBA	BARACOA	20.4N	74.5W	1448Z	MAR23
HAITI	JEREMIE	18.6N	74.1W	1450Z	MAR23
TRINIDAD TOBAGO	PIRATES BAY	11.3N	60.6W	1451Z	MAR23
BAHAMAS	SAN SALVADOR	24.1N	74.5W	1452Z	MAR23
BAHAMAS	CROOKED IS	22.7N	74.1W	1455Z	MAR23
CUBA	SANTIAGO D CUBA	19.9N	75.8W	1458Z	MAR23
COLOMBIA	SANTA MARTA	11.2N	74.2W	1501Z	MAR23
COLOMBIA	RIOHACHA	11.6N	72.9W	1501Z	MAR23
COLOMBIA	BARRANQUILLA	11.1N	74.9W	1504Z	MAR23
BAHAMAS	ELEUTHERA IS	25.2N	76.1W	1507Z	MAR23
CUBA	GIBARA	21.1N	76.1W	1508Z	MAR23
JAMAICA	MONTEGO BAY	18.5N	77.9W	1516Z	MAR23
COLOMBIA	CARTEGENA	10.4N	75.6W	1516Z	MAR23
BAHAMAS	NASSAU	25.1N	77.4E	1519Z	MAR23
VENEZUELA	PUNTO FIJO	11.7N	70.2W	1521Z	MAR23
JAMAICA	KINGSTON	17.9N	76.9W	1525Z	MAR23
BAHAMAS	ABACO IS	26.6N	77.1W	1525Z	MAR23
HAITI	PORT-AU-PRINCE	18.5N	72.4W	1527Z	MAR23
VENEZUELA	PORLAMAR	10.9N	63.8W	1529Z	MAR23
TRINIDAD TOBAGO	PORT-OF-SPAIN	10.6N	61.5W	1541Z	MAR23
BAHAMAS	FREEMPORT	26.5N	78.8W	1542Z	MAR23
CUBA	CIENFUEGOS	22.0N	80.5W	1552Z	MAR23
VENEZUELA	GOLFO VENEZUELA	11.4N	71.2W	1554Z	MAR23
COLOMBIA	PUNTA CARIBANA	8.6N	76.9W	1600Z	MAR23
CUBA	SANTA CRZ D SUR	20.7N	78.0W	1703Z	MAR23
CUBA	LA HABANA	23.2N	82.4W	1703Z	MAR23
CUBA	NUEVA GERONA	21.9N	82.8W	1806Z	MAR23
GUYANA	GEORGETOWN	6.8N	58.2W	1812Z	MAR23

ADDITIONAL BULLETINS WILL BE ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT AS MORE INFORMATION BECOMES AVAILABLE.

## **WCATWC Message #4**

WEXX20 PAAQ 231431  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 4  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1031 AM AST WED MAR 23 2011

THIS MESSAGE CONTAINS UPDATED TSUNAMI OBSERVATIONS AND DAMAGE INFORMATION.

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -

# CARIBE WAVE 11/LANTEX 11 Handbook

GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

## RECOMMENDED ACTIONS

A TSUNAMI HAS BEEN GENERATED WHICH IS EXPECTED TO DAMAGE THE  
WARNING REGIONS LISTED IN THE HEADLINE. 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 TO  
HIGHER GROUND.

## A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	906 AST	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	909 AST	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	918 AST	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	919 AST	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	921 AST	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	945 AST	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	948 AST	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	951 AST	2.48 FT/0.76 M
SAN JUAN PR	18.5N	66.1W	1005 AST	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1008 AST	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1027 AST	4.82 FT/1.47 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT).

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.

## 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](http://WWW.PRH.NOAA.GOV/PR/PTWC).

THIS MESSAGE IS BASED ON EARTHQUAKE DATA... OBSERVED TSUNAMI  
AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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](http://WCATWC.ARH.NOAA.GOV) FOR MORE INFORMATION.

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COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.

1031 AM AST WED MAR 23 2011

...THE TSUNAMI WARNING CONTINUES 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.

SAN JUAN-PR 0945 AST MAR 23 CHARLOT AMALI-VI 0955 AST MAR 23  
MAYAGUEZ-PR 0952 AST MAR 23  
FOR ARRIVAL TIMES AT ADDITIONAL LOCATIONS SEE  
WCATWC.ARH.NOAA.GOV

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### **WCATWC Message #5**

WEXX20 PAAQ 231500  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 5  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1100 AM AST WED MAR 23 2011

THIS MESSAGE CONTAINS UPDATED TSUNAMI OBSERVATIONS AND DAMAGE INFORMATION.

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA - GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA - MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT - RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

#### RECOMMENDED ACTIONS

A TSUNAMI HAS BEEN GENERATED WHICH IS EXPECTED TO DAMAGE THE WARNING REGIONS LISTED IN THE HEADLINE. 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 TO HIGHER GROUND.

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	906 AST	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	909 AST	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	918 AST	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	919 AST	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	921 AST	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	945 AST	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	948 AST	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	951 AST	2.48 FT/0.76 M
SAN JUAN PR	18.5N	66.1W	1005 AST	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1008 AST	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1027 AST	4.82 FT/1.47 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.  
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.  
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

THREE PIERS AND MULTIPLE BOATS ARE REPORTEDLY DAMAGED IN SAN JUAN PR. LARGE WAVES CONTINUE TO BE REPORTED IN ALL AFFECTED AREAS OF PUERTO RICO... U.S. VIRGIN ISLANDS AND BRITISH VIRGIN ISLANDS.

PRELIMINARY EARTHQUAKE PARAMETERS  
MAGNITUDE - 7.6

## CARIBE WAVE 11/LANTEX 11 Handbook

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 ON EARTHQUAKE DATA... OBSERVED TSUNAMI AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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.

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/T.CON.PAAQ.TS.W.0003.000000T0000Z-000000T0000Z/  
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.  
1100 AM AST WED MAR 23 2011

...THE TSUNAMI WARNING CONTINUES 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.

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### **PTWC Message #3**

WECA41 PHEB 231500  
TSUCAX

TSUNAMI MESSAGE NUMBER 3  
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS  
ISSUED AT 1500Z 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 -  
MONTSEERRAT - DOMINICAN REP - GUADELOUPE - DOMINICA - SAINT  
MARTIN - BARBUDA - MARTINIQUE - SAINT LUCIA - BONAIRE -  
CURACAO - TURKS N CAICOS - ST VINCENT - ANTIGUA - GRENADA -  
HAITI - ARUBA - VENEZUELA - BAHAMAS - BARBADOS - CUBA -  
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

# CARIBE WAVE 11/LANTEX 11 Handbook

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

## MEASUREMENTS OR REPORTS OF TSUNAMI ACTIVITY

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	1306Z	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	1309Z	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	1318Z	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	1319Z	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	1321Z	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	1345Z	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	1348Z	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	1351Z	2.48 FT/0.76 M
SAN JUAN PR	18.5N	66.1W	1405Z	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1408Z	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1427Z	4.82 FT/1.47 M
BASSETTERRE SAINT KITTS	17.3N	62.7W	1425Z	4.41 FT/1.34 M
PLYMOUTH MONTSEERRAT	16.7N	62.2W	1440Z	2.11 FT/0.64 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT).

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.

## EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER.

THE THREAT MAY CONTINUE FOR COASTAL AREAS LOCATED WITHIN ABOUT A THOUSAND KILOMETERS OF THE EARTHQUAKE EPICENTER. FOR THOSE 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.

DUE TO ONLY LIMITED SEA LEVEL DATA FROM THE REGION IT IS NOT POSSIBLE FOR THIS CENTER TO RAPIDLY NOR ACCURATELY 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.

LOCATION		COORDINATES	ARRIVAL TIME
DOMINICA	ROSEAU	15.3N 61.4W	1404Z MAR23
SAINT MARTIN	BAIE BLANCHE	18.1N 63.0W	1405Z MAR23
BARBUDA	PALMETTO POINT	17.6N 61.9W	1410Z MAR23
MARTINIQUE	FORT-DE-FRANCE	14.6N 61.1W	1411Z MAR23
SAINT LUCIA	CASTRIES	14.0N 61.0W	1412Z MAR23
DOMINICAN REP	PUERTO PLATA	19.8N 70.7W	1413Z MAR23
BONAIRE	ONIMA	12.3N 68.3W	1414Z MAR23
CURACAO	WILLEMSTAD	12.1N 68.9W	1418Z MAR23
TURKS N CAICOS	GRAND TURK	21.5N 71.1W	1418Z MAR23
ST VINCENT	KINGSTOWN	13.1N 61.2W	1419Z MAR23

# CARIBE WAVE 11/LANTEX 11 Handbook

ANTIGUA	SAINT JOHNS	17.1N	61.9W	1425Z	MAR23
GRENADA	SAINT GEORGES	12.0N	61.8W	1428Z	MAR23
HAITI	CAP-HAITEN	19.8N	72.2W	1430Z	MAR23
ARUBA	ORANJESTAD	12.5N	70.0W	1433Z	MAR23
TURKS N CAICOS	WEST CAICOS	21.7N	72.5W	1434Z	MAR23
VENEZUELA	MAIQUETIA	10.6N	67.0W	1436Z	MAR23
BAHAMAS	MAYAGUANA	22.3N	73.0W	1437Z	MAR23
BARBADOS	BRIDGETOWN	13.1N	59.6W	1439Z	MAR23
VENEZUELA	CUMANA	10.5N	64.2W	1442Z	MAR23
BAHAMAS	GREAT INAGUA	20.9N	73.7W	1444Z	MAR23
CUBA	BARACOA	20.4N	74.5W	1448Z	MAR23
HAITI	JEREMIE	18.6N	74.1W	1450Z	MAR23
TRINIDAD TOBAGO	PIRATES BAY	11.3N	60.6W	1451Z	MAR23
BAHAMAS	SAN SALVADOR	24.1N	74.5W	1452Z	MAR23
BAHAMAS	CROOKED IS	22.7N	74.1W	1455Z	MAR23
CUBA	SANTIAGO D CUBA	19.9N	75.8W	1458Z	MAR23
COLOMBIA	SANTA MARTA	11.2N	74.2W	1501Z	MAR23
COLOMBIA	RIOHACHA	11.6N	72.9W	1501Z	MAR23
COLOMBIA	BARRANQUILLA	11.1N	74.9W	1504Z	MAR23
BAHAMAS	ELEUTHERA IS	25.2N	76.1W	1507Z	MAR23
CUBA	GIBARA	21.1N	76.1W	1508Z	MAR23
JAMAICA	MONTEGO BAY	18.5N	77.9E	1516Z	MAR23
COLOMBIA	CARTEGENA	10.4N	75.6W	1516Z	MAR23
BAHAMAS	NASSAU	25.1N	77.4W	1519Z	MAR23
VENEZUELA	PUNTO FIJO	11.7N	70.2W	1521Z	MAR23
JAMAICA	KINGSTON	17.9N	76.9W	1525Z	MAR23
BAHAMAS	ABACO IS	26.6N	77.1W	1525Z	MAR23
HAITI	PORT-AU-PRINCE	18.5N	72.4W	1527Z	MAR23
VENEZUELA	PORTLAMAR	10.9N	63.8W	1529Z	MAR23
TRINIDAD TOBAGO	PORT-OF-SPAIN	10.6N	61.5W	1541Z	MAR23
BAHAMAS	FREEPORT	26.5N	78.8W	1542Z	MAR23
CUBA	CIENFUEGOS	22.0N	80.5W	1552Z	MAR23
VENEZUELA	GOLFO VENEZUELA	11.4N	71.2W	1554Z	MAR23
COLOMBIA	PUNTA CARIBANA	8.6N	76.9W	1600Z	MAR23
CUBA	SANTA CRZ D SUR	20.7N	78.0W	1703Z	MAR23
CUBA	LA HABANA	23.2N	82.4W	1703Z	MAR23
CUBA	NUEVA GERONA	21.9N	82.8W	1806Z	MAR23
GUYANA	GEORGETOWN	6.8N	58.2W	1812Z	MAR23

ADDITIONAL BULLETINS WILL BE ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT AS MORE INFORMATION BECOMES AVAILABLE.

## WCATWC Message #6

WEXX20 PAAQ 231530  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 6  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1130 AM AST WED MAR 23 2011

THIS MESSAGE CONTAINS UPDATED TSUNAMI OBSERVATIONS AND DAMAGE INFORMATION.

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA - GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA - MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT - RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

### RECOMMENDED ACTIONS

A TSUNAMI HAS BEEN GENERATED WHICH IS EXPECTED TO DAMAGE THE WARNING REGIONS LISTED IN THE HEADLINE. 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 TO HIGHER GROUND.

## CARIBE WAVE 11/LANTEX 11 Handbook

LOCATION	LAT	LONG	TIME	AMPL
CHARLOTTE AMALIE VI	18.4N	64.9W	945 AST	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	948 AST	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	951 AST	2.48 FT/0.76 M
SAN JUAN PR	18.5N	66.1W	1005 AST	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1008 AST	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1027 AST	4.82 FT/1.47 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT) .

A WITNESS REPORTED THAT FOUR PEOPLE WATCHING THE TIDE SUDDENLY RECEDE ON MAGUEYES ISLAND PR WERE SWEPTED OUT TO SEA WHEN THE SURGE OF WATER CAME BACK TOWARDS LAND. THE WITNESS WAS SAFELY WATCHING THE VICTIMS FROM A NEARBY HILL.

### 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](http://WWW.PRH.NOAA.GOV/PR/PTWC).

THIS MESSAGE IS BASED ON EARTHQUAKE DATA... OBSERVED TSUNAMI AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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](http://WCATWC.ARH.NOAA.GOV) FOR MORE INFORMATION.

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VIZ001-002-231630-  
/T.CON.PAAQ.TS.W.0003.000000T0000Z-000000T0000Z/  
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.  
1130 AM AST WED MAR 23 2011

...THE TSUNAMI WARNING CONTINUES 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.

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### **WCATWC Message #7**

WEXX20 PAAQ 231601  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 7



## CARIBE WAVE 11/LANTEX 11 Handbook

NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1201 PM AST WED MAR 23 2011

THIS MESSAGE DOWNGRADES THE WARNING TO AN ADVISORY FOR  
PUERTO RICO AND THE VIRGIN ISLANDS.

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

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF  
TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -  
GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

### 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 ADVISORY AREAS SHOULD MOVE OUT OF THE  
WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

### A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
SAN JUAN PR	18.5N	66.1W	1005 AST	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1008 AST	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1027 AST	4.82 FT/1.47 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.  
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.  
VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT).

TSUNAMI HEIGHTS THROUGHOUT PUERTO RICO ARE DECREASING IN SIZE. 150  
PEOPLE HAVE REPORTEDLY BEEN KILLED BY THE TSUNAMI IN PUERTO RICO...  
U.S. VIRGIN ISLANDS... AND BRITISH VIRGIN ISLANDS.

### 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 ADVISORIES MEAN THAT A TSUNAMI CAPABLE OF PRODUCING  
STRONG CURRENTS OR WAVES DANGEROUS TO PERSONS IN OR VERY NEAR THE  
WATER IS EXPECTED. SIGNIFICANT WIDESPREAD INUNDATION  
IS NOT EXPECTED FOR AREAS UNDER AN ADVISORY. CURRENTS MAY BE  
HAZARDOUS TO SWIMMERS... BOATS... AND COASTAL STRUCTURES 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 ON EARTHQUAKE DATA... OBSERVED TSUNAMI  
AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

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

AMZ712-715-725-735-742-745-PRZ001>003-005-007-008-010-011-  
VIZ001-002-231701-  
/T.CAN.PAAQ.TS.W.0003.000000T0000Z-000000T0000Z/  
/T.NEW.PAAQ.TS.Y.0003.110323T1601Z-000000T0000Z/  
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.  
1201 PM AST WED MAR 23 2011

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

PERSONS IN TSUNAMI ADVISORY AREAS SHOULD MOVE OUT OF THE WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

TSUNAMI ADVISORIES MEAN THAT A TSUNAMI CAPABLE OF PRODUCING STRONG CURRENTS OR WAVES DANGEROUS TO PERSONS IN OR VERY NEAR WATER IS IMMINENT OR EXPECTED. SIGNIFICANT WIDESPREAD INUNDATION IS NOT EXPECTED FOR AREAS IN AN ADVISORY. TSUNAMIS ARE A SERIES OF WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL TIME.

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#### **PTWC Message #4**

WECA41 PHEB 231601  
TSUCAX

TSUNAMI MESSAGE NUMBER 4  
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS  
ISSUED AT 1601Z 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 -  
MONTSEERRAT - DOMINICAN REP - GUADELOUPE - DOMINICA - SAINT  
MARTIN - BARBUDA - MARTINIQUE - SAINT LUCIA - BONAIRE -  
CURACAO - TURKS N CAICOS - ST VINCENT - ANTIGUA - GRENADA -  
HAITI - ARUBA - VENEZUELA - BAHAMAS - BARBADOS - CUBA -  
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

#### MEASUREMENTS OR REPORTS OF TSUNAMI ACTIVITY

LOCATION	LAT	LO	TIME	AMPL
SAN JUAN PR	18.5N	66.1W	1405Z	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1408Z	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1427Z	4.82 FT/1.47 M
BASSETERRE SAINT KITTS	17.3N	62.7W	1425Z	4.41 FT/1.34 M
PLYMOUTH MONTSEERRAT	16.7N	62.2W	1440Z	2.11 FT/0.64 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS (M) AND FEET (FT).

THE LARGE INUNDATION ALONG THE GUADELOUPE COAST HAS REPORTEDLY KILLED 75 PEOPLE. TSUNAMI RUNUP IN SAINT GEORGE GRENADA IS REPORTED TO BE NEAR 2 METERS. MINOR FLOODING OF THE WATERFRONT HAS BEEN REPORTED WITH LARGE AMOUNTS OF DAMAGE TO BOATS AND BARBOR FACILITIES. MUCH OF THE OIL SLICK NEAR LIMETREE BAY VI IS REPORTED TO BE ON FIRE. THIS FIRE HAS SPREAD SHOREWARD TO THE VEGETATION AND THE 25-KT SOUTHEAST WIND CONTINUES TO FAN IT INLAND. CHRISTIANSTED VI NOW REPORTS 120 DEAD AND AN ESTIMATED \$63M USD IN DAMAGE. SAINT VINCENT REPORTS A WAVE APPROXIMATELY 1 METER IN HEIGHT COMING INTO THE SHORE. THE SAINT VINCENT NATIONAL CONTACT REPORTS THE

MOORINGS FROM TWO VESSELS BROKE DUE TO TENSION. THREE SAILORS DIED FROM THE RECOIL OF THE MOORING LINES. EXTENSIVE DAMAGE WAS REPORTEDLY DONE TO A CRUISE SHIP AT SAINT VINCENT WHEN A GANGWAY COLLAPSED AFTER THE SHIP WAS SUDDENLY LIFTED BY THE 1 METER WAVE. THE SHIP'S GANGWAY COLLAPSED CAUSING THREE PASSENGERS TO FALL INTO THE WATER. ONE OF THE PASSENGERS IS REPORTED DEAD. STRONG CURRENTS ALONG SHORES OF CURACAO AND ARUBA HAVE BEEN REPORTED TO CAUSE DAMAGE TO SEVERAL SHIPS.

#### EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER.

THE THREAT MAY CONTINUE FOR COASTAL AREAS LOCATED WITHIN ABOUT A THOUSAND KILOMETERS OF THE EARTHQUAKE EPICENTER. FOR THOSE 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.

DUE TO ONLY LIMITED SEA LEVEL DATA FROM THE REGION IT IS NOT POSSIBLE FOR THIS CENTER TO RAPIDLY NOR ACCURATELY 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.

LOCATION		COORDINATES	ARRIVAL TIME
COLOMBIA	BARRANQUILLA	11.1N 74.9W	1504Z MAR23
BAHAMAS	ELEUTHERA IS	25.2N 76.1W	1507Z MAR23
CUBA	GIBARA	21.1N 76.1W	1508Z MAR23
JAMAICA	MONTEGO BAY	18.5N 77.9W	1516Z MAR23
COLOMBIA	CARTEGENA	10.4N 75.6W	1516Z MAR23
BAHAMAS	NASSAU	25.1N 77.4W	1519Z MAR23
VENEZUELA	PUNTO FIJO	11.7N 70.2W	1521Z MAR23
JAMAICA	KINGSTON	17.9N 76.9W	1525Z MAR23
BAHAMAS	ABACO IS	26.6N 77.1W	1525Z MAR23
HAITI	PORT-AU-PRINCE	18.5N 72.4W	1527Z MAR23
VENEZUELA	PORLAMAR	10.9N 63.8W	1529Z MAR23
TRINIDAD TOBAGO	PORT-OF-SPAIN	10.6N 61.5W	1541Z MAR23
BAHAMAS	FREEPORT	26.5N 78.8W	1542Z MAR23
CUBA	CIENFUEGOS	22.0N 80.5W	1552Z MAR23
VENEZUELA	GOLFO VENEZUELA	11.4N 71.2W	1554Z MAR23
COLOMBIA	PUNTA CARIBANA	8.6N 76.9W	1600Z MAR23
CUBA	SANTA CRZ D SUR	20.7N 78.0W	1703Z MAR23
CUBA	LA HABANA	23.2N 82.4W	1703Z MAR23
CUBA	NUEVA GERONA	21.9N 82.8W	1806Z MAR23
GUYANA	GEORGETOWN	6.8N 58.2W	1812Z MAR23

ADDITIONAL BULLETINS WILL BE ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT AS MORE INFORMATION BECOMES AVAILABLE.

#### **WCATWC Message #8**

WEXX20 PAAQ 231630  
TSUAT1

BULLETIN  
TSUNAMI MESSAGE NUMBER 8  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
1230 PM AST WED MAR 23 2011

THIS MESSAGE CONTAINS NEW INFORMATION ON TSUNAMI OBSERVATIONS AND CASUALTIES.

...THE TSUNAMI ADVISORY CONTINUES IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -

## CARIBE WAVE 11/LANTEX 11 Handbook

GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -  
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -  
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW  
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM  
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

### 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 ADVISORY AREAS SHOULD MOVE OUT OF THE  
WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
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AGUADILLA PR	18.4N	67.1W	1027 AST	4.82 FT/1.47 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

TSUNAMI HEIGHTS THROUGHOUT PUERTO RICO CONTINUE TO DECREASE IN SIZE.  
150 PEOPLE HAVE REPORTEDLY BEEN KILLED BY THE TSUNAMI IN PUERTO RICO...  
U.S. VIRGIN ISLANDS... AND BRITISH VIRGIN ISLANDS. ANOTHER 75 ARE  
REPORTED DROWNED IN GUADELOUPE.

### 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 ADVISORIES MEAN THAT A TSUNAMI CAPABLE OF PRODUCING  
STRONG CURRENTS OR WAVES DANGEROUS TO PERSONS IN OR VERY NEAR THE  
WATER IS EXPECTED. SIGNIFICANT WIDESPREAD INUNDATION  
IS NOT EXPECTED FOR AREAS UNDER AN ADVISORY. CURRENTS MAY BE  
HAZARDOUS TO SWIMMERS... BOATS... AND COASTAL STRUCTURES 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](http://WWW.PRH.NOAA.GOV/PR/PTWC).

THIS MESSAGE IS BASED ON EARTHQUAKE DATA... OBSERVED TSUNAMI  
AMPLITUDES... HISTORICAL INFORMATION AND FORECAST MODELS.

THIS MESSAGE WILL BE UPDATED IN 30 MINUTES OR SOONER IF  
THE SITUATION WARRANTS. THE TSUNAMI ADVISORY WILL REMAIN IN EFFECT  
UNTIL FURTHER NOTICE. REFER TO THE INTERNET SITE  
[WCATWC.ARH.NOAA.GOV](http://WCATWC.ARH.NOAA.GOV) FOR MORE INFORMATION.

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COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.

1230 PM AST WED MAR 23 2011

...THE TSUNAMI ADVISORY CONTINUES IN EFFECT FOR PUERTO RICO  
AND THE VIRGIN ISLANDS...

PERSONS IN TSUNAMI ADVISORY AREAS SHOULD MOVE OUT OF THE  
WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

TSUNAMI ADVISORIES MEAN THAT A TSUNAMI CAPABLE OF PRODUCING  
STRONG CURRENTS OR WAVES DANGEROUS TO PERSONS IN OR VERY NEAR  
WATER IS IMMINENT OR EXPECTED. SIGNIFICANT WIDESPREAD INUNDATION  
IS NOT EXPECTED FOR AREAS IN AN ADVISORY. TSUNAMIS ARE A SERIES OF  
WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL  
TIME.

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**WCATWC Message #9**

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 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 AMPLITUDES 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 REOCCUPATION 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](http://WWW.PRH.NOAA.GOV/PR/PTWC).

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](http://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...

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**PTWC Message #5**

WECA41 PHEB 231701  
TSUCAX

TSUNAMI MESSAGE NUMBER 5  
NWS PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS  
ISSUED AT 1702Z 23 MAR 2011

THIS MESSAGE IS FOR ALL AREAS OF THE CARIBBEAN EXCEPT

## CARIBE WAVE 11/LANTEX 11 Handbook

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 -  
MONTSEERRAT - DOMINICAN REP - GUADELOUPE - DOMINICA - SAINT  
MARTIN - BARBUDA - MARTINIQUE - SAINT LUCIA - BONAIRE -  
CURACAO - TURKS N CAICOS - ST VINCENT - ANTIGUA - GRENADA -  
HAITI - ARUBA - VENEZUELA - BAHAMAS - BARBADOS - CUBA -  
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

### MEASUREMENTS OR REPORTS OF TSUNAMI ACTIVITY

LOCATION	LAT	LON	TIME	AMPL
CHRISTIANSTED VI	17.7N	64.7W	1306Z	8.23 FT/2.51 M
LIMETREE BAY VI	17.6N	64.6W	1309Z	15.41 FT/4.70 M
LAMESHUR BAY VI	18.3N	64.7W	1318Z	9.37 FT/2.86 M
VIRGIN GORDA BVI	18.5N	64.5W	1319Z	4.59 FT/1.40 M
CULEBRA PR	18.3N	65.3W	1321Z	6.79 FT/2.07 M
CHARLOTTE AMALIE VI	18.4N	64.9W	1345Z	8.27 FT/2.52 M
MONA ISLAND PR	18.1N	67.9W	1348Z	0.85 FT/0.26 M
MAGUEYES ISLAND PR	18.2N	67.2W	1351Z	2.48 FT/0.76 M
SAN JUAN PR	18.5N	66.1W	1405Z	1.94 FT/0.59 M
MAYAGUEZ PR	18.2N	67.1W	1408Z	0.66 FT/0.20 M
AGUADILLA PR	18.4N	67.1W	1427Z	4.82 FT/1.47 M
BASSETTERRE SAINT KITTS	17.3N	62.7W	1425Z	4.41 FT/1.34 M
PLYMOUTH MONTSEERRAT	16.7N	62.2W	1440Z	2.11 FT/0.64 M

TIME - TIME OF MEASUREMENT

AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.

IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

STRONG CURRENTS INDUCED BY APPROXIMATELY 1 METER AMPLITUDE WAVES  
IN SAINT LUCIA REPORTED HAVE DESTROYED MOORINGS AND DOCKS IN  
THE REGION. BASSETTERRE ST. KITTS REPORTS A 4+ FOOT WAVE THAT HAS  
INUNDATED ITS SHORELINE AS FAR INLAND AS CANYON STREET. A DOCKED  
FERRY WAS TORN FROM ITS MOORINGS IN BASSETTERRE BAY AND WAS CARRIED  
INLAND TO THE BUS TERMINAL LOCATED NEAR THE DOCK. THE VANCE W.  
AMORY INTERNATIONAL AIRPORT AT PLYMOUTH MONTSEERRAT REPORTS FLOODING  
ON THE RUNWAY AND HAS TEMPORARILY SHUTDOWN FLIGHT OPERATIONS.

### EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE  
BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER.

THE THREAT MAY CONTINUE FOR COASTAL AREAS LOCATED WITHIN ABOUT A  
THOUSAND KILOMETERS OF THE EARTHQUAKE EPICENTER. FOR THOSE 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.

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

ADDITIONAL BULLETINS WILL BE ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR THIS EVENT AS MORE INFORMATION BECOMES AVAILABLE.

**PTWC Message #6**

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 NAS 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.

## Appendix E. Web-based Products

Graphical and web-based products are posted to the WCATWC web site during an event. This Appendix contains examples of several. The first is the html-based text message with embedded links.

**To:** U.S. and Canadian Atlantic, and Gulf of Mexico coastal regions  
**From:** [NOAA/NWS/West Coast and Alaska Tsunami Warning Center](#)  
**Subject:** [Tsunami Warning](#) #1 issued 3/23/2011 at 9:02AM AST

A [Tsunami Warning](#) is now in effect for Puerto Rico and the Virgin Islands.

This message is for **Information Only** for coastal areas of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Maine, New Brunswick, Nova Scotia, Newfoundland and Labrador from Brownsville, Texas to Cape Chidley, Labrador.

A **Tsunami Warning** means that all coastal residents in the [warning area](#) who are near the beach or in low-lying regions should move immediately inland to higher ground and away from all harbors and inlets including those sheltered directly from the sea. Those feeling the earth shake, seeing unusual wave action, or the water level rising or receding may have only a few minutes before the tsunami arrival and should move immediately. Homes and small buildings are not designed to withstand tsunami impacts. Do not stay in these structures.

All residents within the warned area should be alert for instructions broadcast from their local civil authorities. This tsunami warning is based solely on earthquake information - the tsunami has not yet been confirmed.

At 9:00 AM Atlantic Standard Time on March 23, an [earthquake](#) with preliminary magnitude 7.6 [occurred 25 miles/40 Km southeast of Fajardo, Puerto Rico](#). (Refer to the [United States Geological Survey](#) for official earthquake parameters.) This earthquake **may have** generated a tsunami. If a tsunami has been generated, the waves will first reach Christiansted, USVI at 9:11 AM AST on March 23. Estimated [tsunami arrival times](#) and [maps](#) along with [safety rules](#) and [other information](#) can be found on the [WCATWC](#) web site.

[Tsunamis](#) can be dangerous waves that are not survivable. Wave heights are amplified by irregular shoreline and are difficult to forecast. Tsunamis often appear as a strong surge and may be preceded by a receding water level. Mariners in water deeper than 600 feet should not be affected by a tsunami. Wave heights will increase rapidly as water shallows. Tsunamis are a series of ocean waves which can be dangerous for several hours after the initial wave arrival. DO NOT return to evacuated areas until an all clear is given by local civil authorities.

Caribbean coastal regions outside Puerto Rico and the Virgin Islands should refer to the [Pacific Tsunami Warning Center](#) messages for information on the event.

This message will be updated in 30 minutes or sooner if the situation warrants. The tsunami warning will remain in effect until further notice. For further information stay tuned to NOAA Weather Radio, your local TV or radio stations, or see the [WCATWC](#) web site.

[Link to Standard Warning Message](#)  
[Link to Public Warning Message](#)  
[Link to XML/CAP Message](#)  
[Link to Printable Message](#)



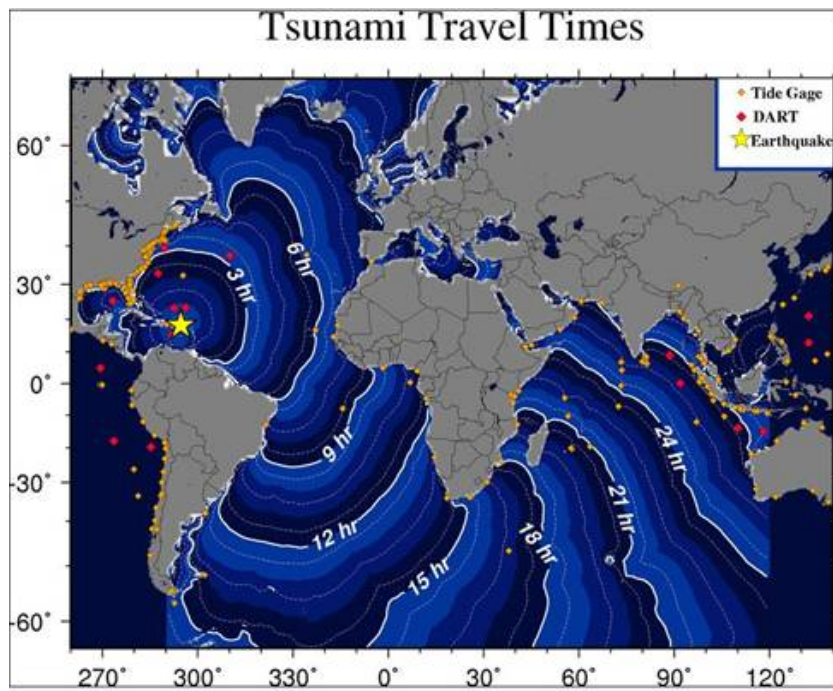


Figure E1: Example of a travel time map that would be issued with event.

Tsunami travel time list example below.

The following list gives estimated times of arrival for locations along the U.S. and Canadian Atlantic coast from a tsunami generated at the given source location. The list is ordered chronologically. Since tsunami speed is directly related to water depth, tsunami ETAs can be computed independent of tsunami amplitude. THE LISTING OF A TSUNAMI ARRIVAL TIME BELOW DOES NOT INDICATE A WAVE IS IMMINENT. The listed arrival time is the initial wave arrival. Tsunamis can be dangerous for many hours after arrival, and the initial wave is not necessarily the largest.

Source:

Lat: 18.2N  
 Lng: 65.3W  
 Mag: 7.6  
 O-time: 1300UTC  
 Date: MAR 23

Estimated times of initial tsunami arrival:

Christiansted, U.S. Virgin Is	0911 AST MAR 23	1311 UTC MAR 23
Vieques Is., Puerto Rico	0911 AST MAR 23	1311 UTC MAR 23
Limetree Bay, U.S. Virgin Is.	0919 AST MAR 23	1319 UTC MAR 23
Lameshur Bay, U.S. Virgin Islands	0921 AST MAR 23	1321 UTC MAR 23
Culebra, Puerto Rico	0922 AST MAR 23	1322 UTC MAR 23
Mona Island, Puerto Rico	0937 AST MAR 23	1337 UTC MAR 23
Virgin Gorda, British Virgin Islands	0939 EDT MAR 23	1339 UTC MAR 23
Magueyes Island, Puerto Rico	0941 AST MAR 23	1341 UTC MAR 23
San Juan, Puerto Rico	0945 AST MAR 23	1345 UTC MAR 23

Aguadilla, Puerto Rico	0948 AST MAR 23	1348 UTC MAR 23
Mayaguez, Puerto Rico	0952 AST MAR 23	1352 UTC MAR 23
Charlotte Amalie, U.S. Virgin Is	0955 AST MAR 23	1355 UTC MAR 23
DART 41421	0959 EDT MAR 23	1359 UTC MAR 23
DART 41420	1004 EDT MAR 23	1404 UTC MAR 23
Samana Cay, Bahamas	1039 EDT MAR 23	1439 UTC MAR 23
Guantanamo Bay, Cuba	1055 EDT MAR 23	1455 UTC MAR 23
Bermuda	1121 EDT MAR 23	1521 UTC MAR 23
DART 41424	1128 EDT MAR 23	1528 UTC MAR 23
Settlement Point, Bahamas	1150 EDT MAR 23	1550 UTC MAR 23
Virginia Key, Florida	1217 EDT MAR 23	1617 UTC MAR 23
DART 44401	1218 EDT MAR 23	1618 UTC MAR 23
Jupiter Inlet, Florida	1220 EDT MAR 23	1620 UTC MAR 23
DART 44402	1223 EDT MAR 23	1623 UTC MAR 23
Ocean Reef, Florida	1229 EDT MAR 23	1629 UTC MAR 23
Miami, Florida	1233 EDT MAR 23	1633 UTC MAR 23
Cape Hatteras, North Carolina	1234 EDT MAR 23	1634 UTC MAR 23
Cancun, Mexico	1141 CDT MAR 23	1641 UTC MAR 23
Oregon Inlet, North Carolina	1258 EDT MAR 23	1658 UTC MAR 23
Key West, Florida	1315 EDT MAR 23	1715 UTC MAR 23
Beaufort, North Carolina	1320 EDT MAR 23	1720 UTC MAR 23
Vaca Key, Florida	1322 EDT MAR 23	1722 UTC MAR 23
Duck, North Carolina	1329 EDT MAR 23	1729 UTC MAR 23
Port Canaveral, Florida	1329 EDT MAR 23	1729 UTC MAR 23
DART 42409	1330 EDT MAR 23	1730 UTC MAR 23
Currituck Beach Lighthouse, North Carolina	1334 EDT MAR 23	1734 UTC MAR 23
Ocean City, Maryland	1347 EDT MAR 23	1747 UTC MAR 23
Melbourne, Florida	1347 EDT MAR 23	1747 UTC MAR 23
Lockeport, Nova Scotia	1453 ADT MAR 23	1753 UTC MAR 23
Surf City, North Carolina	1356 EDT MAR 23	1756 UTC MAR 23
Wrightsville Beach, North Carolina	1356 EDT MAR 23	1756 UTC MAR 23
Pilots Station East, Louisiana	1301 CDT MAR 23	1801 UTC MAR 23
Montauk Point, New York	1404 EDT MAR 23	1804 UTC MAR 23
South Santee River, South Carolina	1405 EDT MAR 23	1805 UTC MAR 23
Virginia Beach, Virginia	1408 EDT MAR 23	1808 UTC MAR 23
Flagler Beach, Florida	1413 EDT MAR 23	1813 UTC MAR 23
Cape Henlopen, Delaware	1414 EDT MAR 23	1814 UTC MAR 23
Atlantic City, New Jersey	1414 EDT MAR 23	1814 UTC MAR 23
Fire Island Light, New York	1415 EDT MAR 23	1815 UTC MAR 23
Watch Hill, Rhode Island	1417 EDT MAR 23	1817 UTC MAR 23
Lewes, Delaware	1417 EDT MAR 23	1817 UTC MAR 23
Jacksonville Beach, Florida	1421 EDT MAR 23	1821 UTC MAR 23
Chesapeake Bridge, Virginia	1427 EDT MAR 23	1827 UTC MAR 23
Newport, Rhode Island	1428 EDT MAR 23	1828 UTC MAR 23
Woods Hole, Massachusetts	1429 EDT MAR 23	1829 UTC MAR 23
Myrtle Beach, South Carolina	1432 EDT MAR 23	1832 UTC MAR 23
Charlesville, Nova Scotia	1534 ADT MAR 23	1834 UTC MAR 23
Springmaid Pier, South Carolina	1434 EDT MAR 23	1834 UTC MAR 23
Sandy Hook, New Jersey	1436 EDT MAR 23	1836 UTC MAR 23
Chezzetcook, Nova Scotia	1538 ADT MAR 23	1838 UTC MAR 23
New London, Connecticut	1439 EDT MAR 23	1839 UTC MAR 23
Port Aux Basque, Newfoundland	1609 NDT MAR 23	1839 UTC MAR 23
Nantucket Island, Massachusetts	1440 EDT MAR 23	1840 UTC MAR 23
Yarmouth, Nova Scotia	1540 ADT MAR 23	1840 UTC MAR 23
Halifax, Nova Scotia	1540 ADT MAR 23	1840 UTC MAR 23
Charleston, South Carolina	1441 EDT MAR 23	1841 UTC MAR 23
Fernandina Beach, Florida	1441 EDT MAR 23	1841 UTC MAR 23
Cape Ray, Newfoundland	1613 NDT MAR 23	1843 UTC MAR 23
Savannah, Georgia	1443 EDT MAR 23	1843 UTC MAR 23
Scatarie Island, Nova Scotia	1544 ADT MAR 23	1844 UTC MAR 23

Cape May, New Jersey	1444 EDT MAR 23	1844 UTC MAR 23
St Lawrence, Newfoundland	1615 NDT MAR 23	1845 UTC MAR 23
Flamingo, Florida	1446 EDT MAR 23	1846 UTC MAR 23
Kiptopeke, Virginia	1450 EDT MAR 23	1850 UTC MAR 23
Cutler NAS, Maine	1452 EDT MAR 23	1852 UTC MAR 23
Saint Pierre/Miquelon	1622 NDT MAR 23	1852 UTC MAR 23
Grand Isle, Louisiana	1354 CDT MAR 23	1854 UTC MAR 23
Money Point, Virginia	1456 EDT MAR 23	1856 UTC MAR 23
Meat Cove, Nova Scotia	1557 ADT MAR 23	1857 UTC MAR 23
Altamaha Sound, Georgia	1459 EDT MAR 23	1859 UTC MAR 23
Quonset Point, Rhode Island	1500 EDT MAR 23	1900 UTC MAR 23
Destin, Florida	1403 CDT MAR 23	1903 UTC MAR 23
Argentia, Newfoundland	1634 NDT MAR 23	1904 UTC MAR 23
St. Simons Is., Georgia	1506 EDT MAR 23	1906 UTC MAR 23
Bar Harbor, Maine	1507 EDT MAR 23	1907 UTC MAR 23
Grand Manan Is., New Brunswick	1608 ADT MAR 23	1908 UTC MAR 23
Windmill Point, Virginia	1509 EDT MAR 23	1909 UTC MAR 23
the U.S.-Canada border	1511 EDT MAR 23	1911 UTC MAR 23
North Sydney, Nova Scotia	1612 ADT MAR 23	1912 UTC MAR 23
Port Fourchon, Louisiana	1413 CDT MAR 23	1913 UTC MAR 23
Alvarado, Mexico	1416 CDT MAR 23	1916 UTC MAR 23
Panama City, Florida	1417 CDT MAR 23	1917 UTC MAR 23
New Point Comfort, Virginia	1519 EDT MAR 23	1919 UTC MAR 23
La Manche, Newfoundland	1649 NDT MAR 23	1919 UTC MAR 23
Fort Point, New Hampshire	1523 EDT MAR 23	1923 UTC MAR 23
Stonington, Maine	1525 EDT MAR 23	1925 UTC MAR 23
Merrimack River, Massachusetts	1527 EDT MAR 23	1927 UTC MAR 23
Manhattan, New York	1530 EDT MAR 23	1930 UTC MAR 23
Saint John, New Brunswick	1631 ADT MAR 23	1931 UTC MAR 23
Tampico, Mexico	1431 CDT MAR 23	1931 UTC MAR 23
Brownsville, Texas	1433 CDT MAR 23	1933 UTC MAR 23
Ship John Shoal, New Jersey	1534 EDT MAR 23	1934 UTC MAR 23
Bergen Point, New Jersey	1535 EDT MAR 23	1935 UTC MAR 23
New Haven, Connecticut	1537 EDT MAR 23	1937 UTC MAR 23
Saint Johns, Newfoundland	1708 NDT MAR 23	1938 UTC MAR 23
Portland, Maine	1541 EDT MAR 23	1941 UTC MAR 23
Apalachicola, Florida	1442 CDT MAR 23	1942 UTC MAR 23
Port Isabel, Texas	1447 CDT MAR 23	1947 UTC MAR 23
Yorktown, Virginia	1552 EDT MAR 23	1952 UTC MAR 23
Corpus Christi, Texas	1454 CDT MAR 23	1954 UTC MAR 23
the Mississippi-Alabama border	1457 CDT MAR 23	1957 UTC MAR 23
Bridgeport, Connecticut	1600 EDT MAR 23	2000 UTC MAR 23
Lewisetta, Virginia	1601 EDT MAR 23	2001 UTC MAR 23
Boston, Massachusetts	1601 EDT MAR 23	2001 UTC MAR 23
Baffin Bay, Texas	1506 CDT MAR 23	2006 UTC MAR 23
Clearwater Beach, Florida	1607 EDT MAR 23	2007 UTC MAR 23
Providence, Rhode Island	1619 EDT MAR 23	2019 UTC MAR 23
Bonavista, Newfoundland	1753 NDT MAR 23	2023 UTC MAR 23
Port O'connor, Texas	1530 CDT MAR 23	2030 UTC MAR 23
Harrington Harbour, Quebec	1732 ADT MAR 23	2032 UTC MAR 23
Rock Port, Texas	1533 CDT MAR 23	2033 UTC MAR 23
Waveland, Mississippi	1534 CDT MAR 23	2034 UTC MAR 23
Freeport, Texas	1535 CDT MAR 23	2035 UTC MAR 23
Pointe Saint Pierre, Quebec	1738 ADT MAR 23	2038 UTC MAR 23
Battle Harbour, Labrador	1815 NDT MAR 23	2045 UTC MAR 23
Kings Point, New York	1655 EDT MAR 23	2055 UTC MAR 23
Naples, Florida	1657 EDT MAR 23	2057 UTC MAR 23
Holton Harbour, Newfoundland	1833 NDT MAR 23	2103 UTC MAR 23
Champton, Mexico	1605 CDT MAR 23	2105 UTC MAR 23
Port Manatee, Florida	1706 EDT MAR 23	2106 UTC MAR 23

Bonita Beach, Florida	1709 EDT MAR 23	2109 UTC MAR 23
Galveston, Texas	1610 CDT MAR 23	2110 UTC MAR 23
Fort Myers, Florida	1712 EDT MAR 23	2112 UTC MAR 23
St. Petersburg, Florida	1712 EDT MAR 23	2112 UTC MAR 23
Biloxi, Mississippi	1614 CDT MAR 23	2114 UTC MAR 23
Suwannee River, Florida	1717 EDT MAR 23	2117 UTC MAR 23
Eugene Is., Louisiana	1618 CDT MAR 23	2118 UTC MAR 23
Boat Harbour, Newfoundland	1850 NDT MAR 23	2120 UTC MAR 23
Morgan City, Louisiana	1630 CDT MAR 23	2130 UTC MAR 23
Lanse au Clair, Newfoundland	1904 NDT MAR 23	2134 UTC MAR 23
Wood Islands, Prince Edward Is.	1835 ADT MAR 23	2135 UTC MAR 23
Sept Iles, Quebec	1836 ADT MAR 23	2136 UTC MAR 23
Cape Chidley, Labrador	1742 AST MAR 23	2142 UTC MAR 23
Nuuk, Greenland	1751 EDT MAR 23	2151 UTC MAR 23
Cedar Key, Florida	1754 EDT MAR 23	2154 UTC MAR 23
Sabine Pass, Texas	1655 CDT MAR 23	2155 UTC MAR 23
High Island, Texas	1656 CDT MAR 23	2156 UTC MAR 23
Hebron, Newfoundland	1906 ADT MAR 23	2206 UTC MAR 23
Escuminac, New Brunswick	1913 ADT MAR 23	2213 UTC MAR 23
Charlottetown, Prince Edward Is.	1918 ADT MAR 23	2218 UTC MAR 23
Nain, Newfoundland	1920 ADT MAR 23	2220 UTC MAR 23
Brevoort Harbour, Nunavut	1821 EDT MAR 23	2221 UTC MAR 23
Belledune, New Brunswick	1922 ADT MAR 23	2222 UTC MAR 23
Cape Dyer, Nunavut	1831 EDT MAR 23	2231 UTC MAR 23
Shediac, New Brunswick	2030 ADT MAR 23	2330 UTC MAR 23
Clyde River, Nunavut	1954 EDT MAR 23	2354 UTC MAR 23
Thule AFB, Greenland	2101 EDT MAR 23	0101 UTC MAR 24
Dundas Harbor, Nunavut	2110 EDT MAR 23	0110 UTC MAR 24

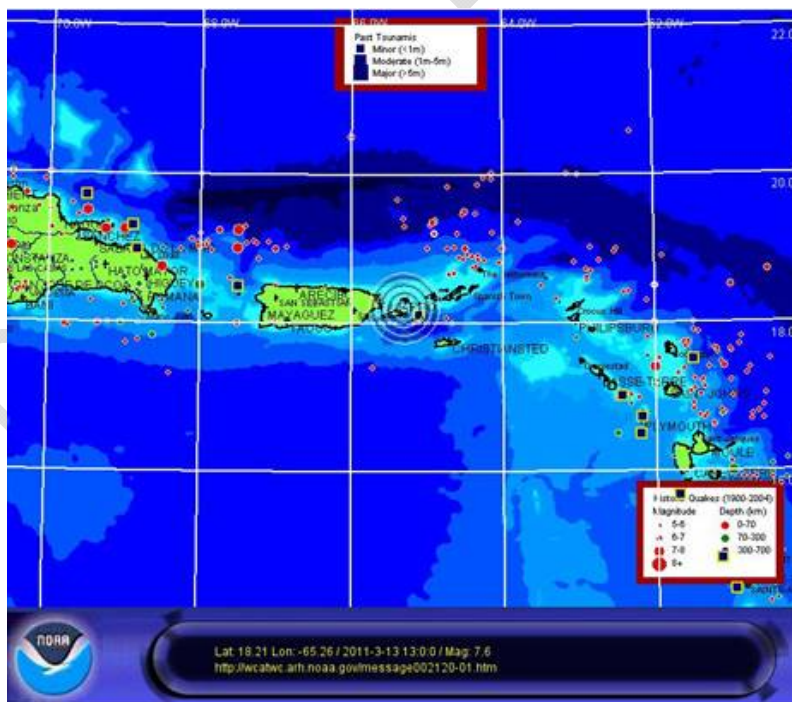


Figure E2: Example of large scale map that would be issued with bulletin 1.



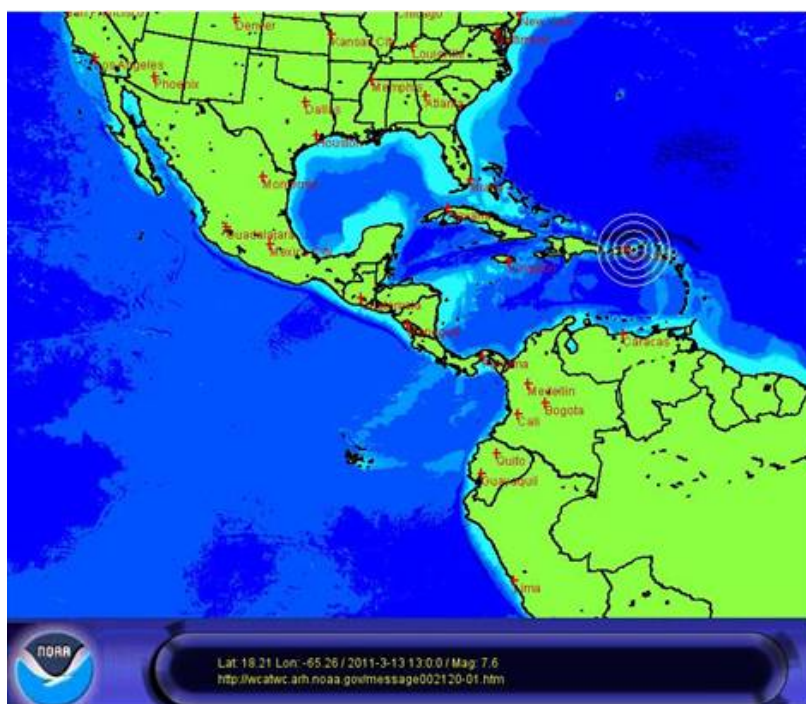


Figure E3: Example of a source zone map issued with bulletin 1



Figure E4: Example of a warning zones map issued with bulletin 1.

## Appendix F. Sample Press Release for Local Media

### TEMPLATE FOR NEWS RELEASE

#### USE AGENCY MASTHEAD

Contact: (insert name)  
(insert phone number)  
(insert email address)

**FOR IMMEDIATE RELEASE**  
(insert date)

#### **CARRIBEAN TSUNAMI EXERCISE TO BE CONDUCTED March 23, 2011**

(insert community/county/state name) will join other localities in the Caribbean as a participant in a tsunami response exercise on March 23, 2011. The purpose of this exercise is to evaluate local tsunami response plans, increase tsunami preparedness, and improve coordination throughout the region.

(insert a promotional comment from a local official, such as "The 2010 Haiti and Chile earthquakes and tsunamis have reminded the world again of the urgent need to be more prepared for such events," said (insert name of appropriate official). "This important exercise will test the current procedures of the Tsunami Warning System and help identify operational strengths and weaknesses in each community." (Please modify for uniqueness.))

The exercise, titled CARIBE WAVE 11/LANTEX 11, will simulate a widespread Tsunami Warning and Watch situation throughout the Caribbean which requires implementation of local tsunami response plans. It is the first such international exercise in the Caribbean region. The exercise will (insert "include" or "not include") public notification.

The exercise will simulate a major earthquake and tsunami generated 25 miles southeast of Fajardo, Puerto Rico and 55 miles southeast of San Juan, Puerto Rico at 9:00am Atlantic Standard Time (or appropriate local time) on March 23, 2011. Exercise participants will be provided with a handbook which describes the scenario and contains tsunami messages from the West Coast/Alaska Tsunami Warning Center (WCATWC) and the Pacific Tsunami Warning Center (PTWC). The WCATWC is currently responsible for providing tsunami information to the Atlantic coasts of U.S. and Canada, the Gulf of Mexico coast, Puerto Rico, and the Virgin Islands while the PTWC is the interim Regional Tsunami Watch Provider for the other countries in the Caribbean Sea and Adjacent Regions.

*Insert paragraph tailored for specific community. Could identify participating agencies and specific plans. Could describe current early warning program, past tsunami exercises (if any), ongoing mitigation and public education programs, etc. Could describe tsunami threat, history of tsunami hazards, if any.*

If any real tsunami threat occurs during the time period of the exercise, the exercise will be terminated.

The exercise is sponsored by the UNESCO/IOC Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), the Caribbean Emergency Management Agency (CDEMA), the Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC), the U.S. National Oceanic and Atmospheric Administration (NOAA) and by the U.S. National Tsunami Hazard Mitigation Program (NTHMP – a partnership of 28 states and territories and three federal agencies). For more information on the U.S. tsunami warning system, see [www.tsunami.gov](http://www.tsunami.gov). For more information on the NTHMP, see [nthmp.tsunami.gov](http://nthmp.tsunami.gov). For more information on the ICG/CARIBE-EWS, see <http://www.ioc-tsunami.org/content/view/36/1036/>.

###

On the Web:

West Coast/Alaska Tsunami Warning Center <http://wcatwc.arh.noaa.gov>  
Pacific Tsunami Warning Center <http://www.prh.noaa.gov/ptwc>  
NOAA Tsunami Program <http://www.tsunami.gov>

NTHMP:

*Insert state/local emergency response URLs*

<http://tsunami.noaa.gov>  
<http://nthmp.tsunami.gov>