TsuInfo Alert

prepared by the Washington State Department of Natural Resources on behalf of the

National Tsunami Hazard Mitigation Program

a state/federal partnership funded through the National Oceanic and Atmospheric Administration (NOAA)

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TsuInfo Alert begins its 10th year!

Notes from the Editor

Despite being told when we were only 6 months old, that we wouldn't last another year, *TsuInfo Alert* has survived. The exact comment made back then (1999) was, "You'll run out of material before the next year is up." In 2000 we did cut back from publishing monthly to bimonthly, for staffing reasons only.

Someone else called *TsuInfo Alert* "that scrappy li'l newsletter" and I like that. It implies the editorial style and an eagerness to hear from all 'combatants'. We like to disseminate scientific information and provide emergency management ideas but we ain't stuffy. Preferably the newsletter should be more like a conversation between colleagues….informative, contradictive, thought-provoking, and yes, sometimes, scrappy.

Last year *TsuInfo Alert* made a concerted effort to become more national in order to discuss common problems and share experience nationwide. It's wise to know what others are already doing so that plans are not unnecessarily duplicated. As tsunamis are not restricted to one area, early warning systems discussions, for example, are valuable to all coastal communities, and not restricted to any one coast. It is easy to find tsunami-related articles about the U.S. west coast; it's where I live and work. However, I beg all of you non-west coast readers to contribute articles, announcements, awards, book reviews, meetings, seminar reports, anything about tsunamis from your area of the world. In 2008 *TsuInfo Alert* will include more global tsunami information, too.

It seems to me that a librarian is a perfect newsletter editor. Librarians thrive on linking pertinent information to the people who can use it. Newsletters provide a natural platform for sharing information in an informal and brief format. Compiling *TsuInfo Alert* is not work; it's a labor of love.

Thanks to y'all for your support, comments, suggestions, and contributions to *TsuInfo Alert.*

Lee, the Librarian-Editor ♦

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Second Tsunami-Detection Station To Bolster Indian Ocean System--U.S. contributions to early warning capability safeguard coasts, lives

By Cheryl Pellerin, USINFO Staff Writer
Posted online 21 August 2007
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Areas covered by regional early warning systems for tsunamis and other coastal hazards (UNESCO IOC)

This is the third in a series about U.S. contributions to a global early warning system for tsunamis and other hazards.

Washington -- Experts from the U.S. National Oceanic and Atmospheric Administration (NOAA) will put a second tsunami-warning device in the Indian Ocean in September, as part of the U.S. government's commitment to help the region protect its communities from impending tsunamis and other coastal hazards.

After the 9.1-magnitude earthquake off Sumatra, Indonesia, in December 2004 and a tsunami whose waves inundated Indian Ocean coastlines and killed 230,000 people, the U.S. government established a two-year, $16.6 million program to help nations there begin to build an early warning system.

Experts from U.S. agencies contributed to the effort, including the U.S. Agency for International Development, which manages the program; NOAA; the U.S. Geological Survey (USGS); the U.S. Department of Agriculture Forest Service (USFS); the U.S. Trade and Development Agency (USTDA); and the State Department.

The project officially ends September 30, but U.S. involvement will continue through agreements with individual countries and participation in the World Meteorological Organization (WMO), the United Nations Educational, Scientific and Cultural Organization's Intergovernmental Oceanographic Commission (IOC) and other bodies.

"We've shared our knowledge and the approach we've learned over the past 40 years building a tsunami warning system in the United States," said Curt Barrett, director of the Indian Ocean Project at NOAA, during an August 15 *USINFO* interview.

OCEAN OBSERVATIONS

As part of the U.S. effort, in December 2006, NOAA experts and Thai government officials put a deep-ocean assessment and reporting of tsunamis (DART) station in the Indian Ocean, halfway between Thailand and Sri Lanka.

DART systems provide real-time tsunami detection as waves travel across open waters, and each station is linked to a satellite for real-time data transmission on global networks.

In September, under an agreement with the Indonesian government, NOAA will put a DART tsunameter at 0 degrees north, 89 degrees east, near Sumatra, and Indonesia will maintain the device. The U.S. State Department is providing nearly $1 million for DART training there.

But DARTs are only part of an all-hazards warning system. A complete end-to-end system includes tide gauges, communications systems, inundation (flooding) modeling, warning dissemination systems, and especially outreach and education to local communities -- what experts call "the last kilometer" -- about what to do in an emergency.

On the ocean side of the U.S. effort, NOAA, with WMO, outlined a detailed architecture for regional and national warning systems, and plans regional and national workshops in September and October.

NOAA upgraded six coastal sea-level gauges in Sri Lanka, Indonesia and the Maldives and contributed seven more gauges. The stations, which are integrated into the Global Sea-Level Observing System network, transmit data at one-minute intervals via satellite.

NOAA also upgraded Global Telecommunication System connections for the Maldives and Sri Lanka, helping those nations share critical data with other Indian Ocean countries and NOAA's Pacific Tsunami Warning Center (PTWC) and receive such data from them.

The PTWC, operational hub of the Pacific Tsunami Warning System, is providing interim tsunami notifications for the Indian Ocean until permanent regional capabilities are established.

NOAA and USAID have established an international accredited training program to be run jointly by the Asian Institute of Technology in Bangkok, Thailand, and the University of Washington to provide courses in essential aspects of tsunami science, emergency planning and operational warnings.

SEISMIC CAPACITY

Large earthquakes generate most tsunamis, and the USGS and Indonesia, Germany, Japan and China have installed 50 to 60 seismic stations spread over 4,500 kilometers along Indonesia's extended land masses.

But "sometimes the stations weren't hooked up to the warning software," said seismologist Walter Mooney, lead coordinator for the USGS Indian Ocean tsunami

warning system program, during an August 16 *USINFO* interview. “That’s what we’ve been addressing.”

With the California Institute of Technology and the Betty and Gordon Moore Foundation, USGS installed 27 global positioning system stations in high-risk Sumatra, to track ground motion during earthquakes. Combined with tide gauges and seismic sensors, the stations provide critical information for assessing earthquake location and magnitude.

USGS has conducted technical workshops in cooperation with the IOC in Sri Lanka, Thailand, Indonesia, and the Maldives and has held regional workshops. The agency also has built capacity in Thailand and Indonesia to map earthquake hazard areas.

“I’ve been amazed at the progress that’s been made” in the region, Mooney said. “There’s a huge difference in the sophistication and knowledge of the responsible people, just over two years.”

THE LAST KILOMETER

USTDA worked with the Thailand National Disaster Warning Center to develop procedures and a decision-support system for warning system operations that speeds response time for public notifications.

USFS and NOAA also supported the center to establish a Tsunami Alert Rapid Notification System, which helps get warnings from the national center to local communities. These efforts resulted in a full-scale national simulation in July with 50,000 participants along the entire Andaman coast -- the most comprehensive drill of its kind in the region.

Even if the Indian Ocean never has another tsunami, Barrett said, “we’ve given them tools and a data system and the knowledge they need to build a system that will help them deal with hurricanes, cyclones, floods and mudslides -- the threats that they face every year.”

See also "Tsunami Early Warning System Takes Shape in the Caribbean" and "Tsunami, Earthquake Detection Improved Since 2004 Disaster."

Information about the National Data Buoy Center is available on the NOAA Web site.

More information about the U.S. Indian Ocean Tsunami Warning System Program is available on the organization’s Web site.

(USINFO is produced by the Bureau of International Information Programs, U.S. Department of State. Web site: http://usinfo.state.gov)♦

New map illustrates tsunami impact on Volusia, Flagler [Florida]
By Jim Haug, Staff Writer

DAYTONA BEACH -- If a tsunami hits here, as it did in 1946, should we all head for the rugged peaks of DeLand?

A **high-resolution land elevation map** makes it appear as if Daytona Beach is bordered by a mountain range to its west, but these exaggerations in topography are needed to understand the impact of a tsunami.

Scientists with the National Oceanic and Atmospheric Administration recently prepared a digital model of Volusia and Flagler counties to forecast the magnitude and extent of coastal flooding from a tsunami or storm surge.

Because floodwaters respond to the slightest variations in sea floor and land topography, scientists purposely exaggerated the map to clarify the differences in elevation.

"A better understanding of these variables is critical to predicting how a tsunami will flood coastal communities," said Barry Eakins, a scientist with the project.

So the mountain range is actually DeLand and western Volusia County.

A red spike rising from a low-lying green area on the map is the Volusia County landfill on Tomoka Farms Road, said Lisa A. Taylor, project manager for NOAA.

The digital elevation of a model of Daytona Beach, along with models for 20 other coastal communities, were sent to the NOAA Pacific Marine Environmental Laboratory in Seattle, where they will be used in tsunami simulation exercises.

NOAA plans to prepare more than 50 models within the next several years.

While tsunamis are more commonly associated with the Pacific Ocean, they are possible here. Scientists have catalogued 40 tsunami and tsunami-like waves that have struck the East Coast since 1600. Tide gauges recorded two tsunamis that hit Daytona Beach within four days of each other on Aug. 4 and Aug. 8, 1946. Both were the result of earthquakes off the coast of the Dominican Republic. They traveled to Daytona Beach in about four hours. The impact must have been minor because The News-Journal did not report any local damages or loss of life.

More recently, a rogue wave -- which didn't meet the criteria for a tsunami -- struck Daytona Beach on July 3, 1992, injuring 75 people and damaging 36 cars.

Jim Ryan, the emergency planning manager for Volusia County, has lobbied for tsunami warning signs at the beach but the Volusia County Council must still vote on the proposal. ♦

A Fire and Rescue Service Primer on Tsunamis—Part 1
By Larry Collins

The time is 3:42 a.m., and only the typical EMS and fire responses interrupt the pre-dawn rhythm of the fire house. You have just returned to quarters after extinguishing a vehicle fire in an alley in the coastal zone bordering a major southern California city. Members of the truck company in your station are sound asleep. After filing the fire report, you make your way to bed. The only sound is the drone of window-mounted air conditioners.

Some earthquakes are preceded by a sort of freight train rumble that signals something big and very bad is coming, but this time it doesn't happen that way. There is literally no warning, only the sudden violent jolt that immediately sends everyone in the room rolling out of bed. There is no letup in the jolting, and all members are knocked off their feet. The main thought at this instant is to avoid being struck by falling items or crushed if a wall collapses in the red brick firehouse that thankfully has been built with reinforcing bars and other earthquake code-required measures.

The ground is bucking too violently to get to an exit, and there is no hope of reaching the apparatus room to open doors and pull the rigs out. You wouldn't want to be in the apparatus room now anyway, because the tower ladder and the engine are literally bouncing two or three feet in the air. You remember seeing the rubber marks *three feet up* on the wall of a fire station near the epicenter of the 1971 Sylmar earthquake. You remember listening incredulously as a captain explained that the rubber was left by the tires of the engine bouncing against the wall. And now your engine has already crashed into the ladder and is pounding against one of the walls, leaving rubber marks three feet off the floor.

At this instant your main goal is to duck and cover between the bed and a heavy reading desk that threatens to turn over, and ride it out. There is really nothing else you can do, because it's impossible to stand or crawl. Glass windows are breaking and there is the sound of furniture overturning. You are showered by glass and now there are blue flashes streaking across the walls as electrical transformers explode across the neighborhood. A firefighter yells something about this being the big one, but his point is merely academic: Everyone already knows this is by far the worst quake they have experienced, and that's saying a lot in this region.

The most intense shaking goes on for an inconceivably long time, easily exceeding a full minute. That's a long time for a building to shake so hard that the occupants are knocked off their feet every time they attempt to stand up. It seems like an eternity. You try to gauge it against the shaking of the Northridge quake, which lasted just 15 seconds and killed 68 people; against the Whittier quake, which lasted about nine seconds and collapsed large parking structures; and against the Sylmar quake that took just 25 seconds to destroy dozens of buildings and kill more than 60 people. Judging against those benchmarks, this quake is more violent and longer-lasting than those previous quakes combined. You know that buildings must be collapsing and catching fire across the entire region. The Northridge quake operations lasted more than a week; you know this one is going to be measured in weeks and perhaps even months. And the clock is starting right now.

When the intensely violent jolts finally start to drop off, there is a sense of rolling to and fro like a ship battered in a storm. There is the dull thud of buildings collapsing and dust clouds spreading out across neighborhoods against a background of car alarms. There is not yet any sound of screaming or calling for help, but you know from experience that it will begin as people emerge from their homes and fill the streets. Some will not emerge. They will require rescue from their neighbors and passersby and firefighters and police and, eventually, USAR teams.

The engineers are finally able to make their way to the truck and engine. But the apparatus room doors are hopelessly inoperable, and it takes several minutes for the firefighters to cut big squares in them with rescue saws, and finally the rigs are driven through the jagged opening. Following earthquake protocol, you take a head count, make sure your crews aren't injured, and quickly check the station for damage using a big beam flashlight. There has been a partial collapse in the back. No matter; the next course of action is to respond through the district code R to conduct a damage survey and report the findings to the battalion chief, who is already establishing battalion-level command.

On the apparatus radio, you hear the dispatcher announce that a major earthquake has struck, and for all units to utilize the modified earthquake dispatch procedures and report damage levels to the jurisdictional battalion chief and be prepared to begin triaging responses as they are reported or spotted. Already there are innumerable columns of smoke in the night sky, each emanating from a bright orange glow, some larger than others. The car alarms are still screetching and now there are the sounds of people.

Yet even before the crews can board the engine and truck to respond down the street, your fire house is besieged by people emerging from every corner of the neighborhood, bringing in the injured and telling you that so-and-so building has collapsed and there are people trapped inside. They tell you that the fires are getting close to some of the trapped, and you report this to the battalion chief via radio. You decide to leave one firefighter behind to deal with the converging victims and to organize a command post there. You instruct him to start a list of the fire and collapse reports, to organize people by their useful occupations and skills (e.g. doctors, nurses, construction workers, heavy equipment operators, engineers, carpenters, etc) and begin assigning them to con-

duct search and sweeps of the neighborhood, helping where they can, and to start treating the injured as best they can until more help arrives. You leave him with one handi-talkie and a big beam flashlight to work by, and instruct him to pull the generator and lighting out of the reserve engine behind the station and try to establish some organization.

You tell the firefighter to organize the off-duty firefighters who will be reporting, and to assign the first firefighters to take the reserve engine housed at your station and begin working the fire and rescue problems. You know that things are going to get worse before they get better. Then a sharp aftershock strikes as if to emphasize the point. The aftershock continues for another 45 seconds, bigger and longer than most "main shock" earthquakes. More buildings can be heard groaning and collapsing in the distance. Once again there are the car alarms, dogs barking, and more people streaming into the streets.

You depart the station, the engineer weaving the engine around people and vehicles clogging the streets, driving past people attempting to wave you over for help. The truck company takes its designated damage evaluation route, which allows you to split the district. You are jotting notes on the map book as you pass significant incidents: First one structure collapse, then another, then several additional buildings down; pockets of injured people scattered about; a badly damaged freeway overpass; ruptured water mains, several gas leaks that have ignited; several large multi-story residential buildings that have failed; isolated homes on fire; too many emergencies to accurately count. You finish the survey route, relieved that the major hospital in your district is still standing.

You report your findings to the Battalion Command that's been established, and request three strike teams of engines, at least five USAR Companies, and two FEMA USAR task forces to assist with the newfound fire and collapse emergencies.

Now it's time to go to work on the most pressing problems. You follow a series of smoke columns to a block of residential apartment buildings. You stop to observe a burning apartment complex with your spot light, and now you can see that the first floor has been crushed, with fire showing from the middle floors. As soon as your rig rolls to a stop, people practically climb onto the running boards begging you to help them rescue people trapped in the apartments.

You decide 'this is where we start working', and order the engineer to stretch a supply line while the crew tries to confine the fire before it gets to trapped victims. You run in for a quick look around, and you know this is much worse that the apartments that collapsed in Northridge. Now your engineer runs up to report that the hydrants are all dry; the water mains supplying this street must be ruptured.

During this entire time that last thing on your mind is the potential for a large tsunami to come sweeping ashore in the darkness, just eight to ten minutes after the quake. It's inconceivable to you that the situation can get any worse; you already have your hands full, people are dying, fires are spreading, more resources are on the way but you know they will be delayed getting to your district …. assuming that an even worse situation elsewhere requires them to be pulled away to another neighborhood. So when everyone stops to listen as an inconceivable roar comes through the darkness, the last thing you expect is to see a black frothing wall of water crashing over the homes and now it's too late even to run.

It has happened before, and according to scientists it will happen again somewhere in the United States.

Background:

Despite the potential for huge life losses and the destruction of coastal cities from them, *tsunamis* remain a little-understood phenomenon to many firefighters and fire/rescue agency leaders. Tsunamis (sometimes called *seismic sea waves*) are often low on the priority list of public safety agencies along both coasts, even in some zones long identified as being vulnerable to their effects. In nations like Japan, where entire fire departments have nearly been decimated in this century by tsunamis that struck in the night during post-earthquake firefighting and rescue operations, there is widespread appreciation for the lethal effects of these events. The goal of this article to help instill the same appreciation in vulnerable coastal areas, before a tsunami disaster kills large numbers of firefighters and rescuers needlessly…and to highlight new discoveries to encourage fire/rescue agencies in vulnerable areas to develop realistic plans to address this unusual but very lethal hazard.

Emerging research indicates many cities on the West Coast previously thought to be invulnerable to "near-source" tsunamis, are in fact prone to large tsunamis that can wipe out large coastal tracts and kill tens of thousands of people within minutes of *precipitating events* like offshore (and even onshore) earthquakes and underwater landslides. For firefighters and chief officers, the new information indicates a previously unrecognized danger when assessing post-earthquake damage along the coastlines, and while attempting to suppress fire, rescue trapped victims in collapsed structures, treat the injured, and other post-earthquake emergency operations. The danger may come in the form of one of more seismic sea waves (sometimes that second or third tsunami is larger than the first) that can strike with little warning, within minutes of an earthquake or underwater landslide, and take the lives of firefighters and rescuers sent into damaged areas.

On the Danger of Tsunamis

The closest many of us will come to actually experiencing a tsunami is the movie screen. To the casual

observer, and to many otherwise well-informed public safety officials, so-called "tidal waves" (a mismatched term often used to describe tsunamis) have been relegated to the realm of the improbable, and therefore unworthy of serious consideration. Many officials mistakenly assume they will have hours to evacuate threatened populations to high ground. This, unfortunately, is not always true.

Contrary to some common perceptions, seismic sea waves aren't simply "large waves" of the sort generated by large storms and other typical oceanographic and weather conditions. To the contrary, tsunamis are very different (and hence far more dangerous) with respect to their inertia and their ability to sweep ashore for great distances. While it's true that tsunamis may be quite large in height, the *true* danger is related to the mass of energy that propels them through the ocean at great speeds. This "thrust" is generally caused by significant vertical movement of large blocks of the earth's crust during earthquakes, or by the occurrence of large underwater landslides, or both. When such a mass of waterborne energy strikes the coast, it may suddenly raise the level of the sea and drive walls of water far inland, creating a sort of flash flood that can pick up ships and large buildings and carry them inland. This effect can be multiplied by certain topographic features of coastal zones such as bays, inlets, and river mouths.

Misunderstood Threat of "Near Source" Tsunamis

With the exception of Alaska, Washington State, Oregon, and Northern California--places long known to be at risk from *near-source* tsunamis originating in the subduction zones upon which they lie[1]--the threat of tsunamis in most U.S. coastal areas was traditionally considered to originate with distant sources, thereby providing hours of warning. In fact, the National Tsunami Warning Center was established to provide timely warning of such *far-source* events, and state and local officials have developed elaborate evacuation plans for these far-source events.

Likewise, fire/rescue officials in Southern California have long been assured that the threat of tsunamis there rests with *distant* sources like Hawaii, Peru, Japan, and the Aleutian Islands. The low incidence of damaging tsunamis during the past century has contributed to a false sense of security in Southern California. Consequently there has been little urgency to develop elaborate tsunami evacuation and response plans for *near-source* events, and this can be a devastating oversight in the event of a near-source tsunami.

For example, current fire department plans in Southern California call for fire/rescue units to respond into their jurisdictional areas to conduct "windshield surveys", rapid visual and physical assessments of damage levels and major problems (or lack thereof) conducted while these units roll "Code R" through the streets on pre-determined routes to check the status of the most obvious life-loss hazards. Fire/rescue resources will be moved into heavily damaged areas along the coast once it's determined that these places are in the greatest need of fire-fighting, EMS, haz mat, and USAR assistance. This places fire/rescue personnel in immediate danger in the event of a near-source tsunami that catches them by surprise by striking while the early and most dangerous phase of post-earthquake operations take place. The danger is that fire departments and rescue teams responding to fires, collapses, casualties, and hazardous materials releases in quake-damaged coastal zones may be wiped out by surprise tsunamis.

This exact phenomena occurred when a Japanese Island was struck by a major earthquake in the late 1990's. As residents evacuated the coastline for high ground in the dark of night, the city lit up with flames from various quake-spawned fires. As residents and film crews watched in disbelief from the hills, a black wave of water swept into the city below, destroying burning buildings and fire engines alike. Several more tsunamis followed the first, wiping out large sections of the city.

But now that approach to post-earthquake response and damage assessment must be reconsidered because of the newly-discovered threat of *near-source* tsunamis along the middle and southern California coasts (and yet another surprise location: Lake Tahoe, high in the Sierra Nevada Mountains, more than one hundred and fifty miles from the ocean).[2] To understand why near-source tsunamis should be of serious concern to fire/rescue authorities, one need look no further than the history-drenched nation of Turkey.

1999 Turkish Quake Response Complicated by Land Subsidence and Tsunami-Like Devastation

A rarely-discussed effect of the deadly earthquake

[1] It is now known that parts of the coast of Alaska and Washington have dropped as much as thirty feet in an instant during historic earthquakes related to these subduction zones. Scientists have concluded that the areas around Seattle and other densely populated coastal zones are vulnerable to this type of geologic effect, which would flood the land with a sudden and massive surge of ocean water filling the newly-lowered landscape. Although this is not a tsunami in the traditional sense, the effects would be equally devastating (if not worse). In addition to this risk, the Alaska and Washington state coastlines are also prone to "traditional" near-source and far-source tsunamis.

[2] Recently scientists announced the discovery of two thrust faults that run the length of the bottom of Lake Tahoe. They estimate than an earthquake on either fault may cause tsunami-like waves exceeding thirty feet in height. Such an event might kill thousands of people and wipe out dozens of towns that ring the lake.

that struck the Izmir region of Turkey in 1998 was the devastation caused by incursion of the Sea of Marmara, which left portions of several coastal cities under water, quite literally sunk beneath the waves. Dramatic land subsidence accompanied by large tsunamis occurred during the 7.4 *main shock,* walls of water washing across city streets just as some people emerged from their homes in the pre-dawn darkness to escape collapsed or damaged buildings.

The unsettled sea rushed inland like a flash flood in the dark. Walls of black water carried automobiles, boats, and debris, reaching up to two stories in height. As each wave receded, buildings, and people (some--including at least two police officers--still inside their automobiles) were washed into the sea. It was a cruel blow, piling more misery upon a population that had just been struck by one of the worst natural calamities of the century.

The land subsidence and waves complicated search and rescue operations by denying or delaying access to fire fighters and rescue teams. Victims who might otherwise have survived until rescue teams reached them, simply drowned as seawater swept into quake-damaged buildings. Some (including those in vehicles that sank with the land) were discovered on the sea floor by rescue divers in the days following the quake. It was mute evidence of the power of tsunami-related events. But could it happen in the United States? *Yes*, say many experts.

Newly Discovered Tsunami Problem Shakes Up Southern California

The potential for both *tele-tsunamis* and *near-source tsumanis* along the northern reaches of the West Coast has long been recognized. A few hours after the 1964 Good Friday earthquake struck Fairbanks (Alaska), remnants of quake-generated tsunamis killed people in Crescent City (Northern California), and caused serious property damage in parts of Southern California. Throughout geologic history of the Americas, the northern West Coast has been the site of tsunamis originating from earthquakes and underwater landslides in distant spots on the planet, as well as in its own back yard.

In contrast, seismologists and geologists were for decades under the mistaken impression that earthquake faults in middle and southern California were of the "strike-slip" variety.[3]

Thus, Southern Californians generally assumed that locally generated tsunamis[4] were a non-issue because the conditions precipitating seismic sea waves had never been found south of the Cascadia region. Until recently, that remained the mantra of many seismologists and earth scientists. Now, based on emerging research, it appears this view was mistaken (and perhaps over-optimistic).

In 1992 the Cape Mendocino earthquake surprised seismologists by generating a small tsunami that struck the Northern California coastline within minutes of the quake. It was the first near-source tsunami to be detected south of the Oregon border. This was a region thought to be invulnerable to near-source tsunamis. Even though the tsunami was rather small, it indicated the potential for very large tsunamis to strike the coastline within minutes under certain conditions. The Cape Mendocino event prompted a reevaluation of near-source tsunami hazards in California, one that has yielded surprising results.

However, before the Cape Mendocino quake studies could be completed, another surprise—this one far larger and more troubling--occurred in the form of the disastrous Northridge earthquake in 1994. The Northridge quake, which killed nearly 70 people, had its origins in a previously unidentified "hidden thrust fault". Scientists couldn't find the ground fault rupture from Northridge, and began to surmise that the event occurred on a thrust fault deep beneath the surface. This was eventually verified. Including the Coalinga (Central California) earthquake in the early 1980's, the state had suffered two damaging quakes on previously unidentified thrust faults. It was clear that there was a new danger afoot: If two deadly quakes occurred on hidden thrust faults within a decade, how many other hidden faults were out there?

Armed with this question, scientists began a quest to quantify the threat posed by thrust faults (hidden and otherwise). In the intervening years, a number of previously unknown thrust faults have been identified in California. Most disturbing, a number of them have been found beneath the waters of the Pacific, off the shores of Los Angeles, Ventura, and Santa Barbara Counties.

It's now recognized by scientists that these faults are capable of generating large tsunamis that can make landfall within minutes or even *seconds*. In the case of Santa Barbara, where computer modeling has been completed by a team headed by Doctor Costas Synolakis of the University of Southern California's School of Engineering, localized tsunamis approaching 36 feet high are considered to be a possibility.

Researchers have also discovered evidence that large underwater landslides in deep offshore canyons pose a major tsunami risk even *before* earthquakes are factored in. Evidence of past tsunamis from this cause have been

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[3] Generally speaking, *strike-slip* faults aren't directly associated with tsunamis because when they rupture one side moves past the other "sideways", without a significant vertical component. This is the opposite of "thrust faults" where one side is suddenly thrust upward in relation to the other when they rupture (almost assuredly generating one or more tsunamis in the process).

[4] Because they're caused by events close to land (and because they travel at the speed of a jet airplane), *near-source tsunamis* are especially dangerous because there is little warning and little time to escape the shoreward-rushing seas that accompany them.

found from Santa Barbara to Long Beach and Orange County. The recent Santa Barbara studies (commissioned by the California Office of Emergency Services, or OES) found evidence of a very large crack in the offshore coastal shelf, which appears capable of separating to cause a huge underwater landslide, which in turn would generate large tsunamis that could strike the coastline within seconds or minutes.

As new evidence continues to be uncovered, it's fast becoming clear that the previously-held assumptions were false. As a result, yet another hazard is being added to the list of things for which fire/rescue agencies must be prepared: Devastation of densely-populated coastal zones by large tsunamis striking with little or no warning, sometimes in the immediate aftermath of a catastrophic earthquake. (to be continued)

Part 2 will appear in the April 2008 issue of *TsuInfo Alert.*

The Author

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NEWS

Summer 2008 Program for Certification in Tsunami Science and Preparedness

Professional Certification in Tsunami Science and Preparedness will be awarded to graduates of a program offered June 16-27, 2008, by the University of Washington Extension (UWE) and the U.S. National Oceanic and Atmospheric Administration (NOAA). The certification program consists of three courses providing overviews of tsunami hazard assessment, tsunami warning systems, and tsunami-resilient communities.

Designed for planners, policy makers, emergency managers, scientists, and engineers, the curriculum trains professionals to develop, establish, and maintain tsunami warning and preparedness systems at national, regional, and local community levels.

Program graduates receive UWE/NOAA Professional Certification in Tsunami Science and Preparedness; a DVD of all instructional materials; templates for developing hazard assessments and community plans; and access to an alumni network, including archives of additional tsunami information and educational tools.

For more information on this certificate program visit www.extension.washington.edu/ext/certificates/tsp/tsp_gen.asp.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder

Western Australian towns assessed for tsunami risk

In October, an investigation of tsunami risk was based in Perth, Busselton, Geraldton, and Carnavon, four towns in Western Australia. The project manager Gordon Hall said these areas are considered the most likely to be at risk of a tsunami because they were the worst affected regions by the Boxing Day disaster in 2004.

From: ABC Radio Australia; http://www.radioaustralia.net.au/news/stories/s2068085.htm

Tsunami director in Mauritius

Director of the International Tsunami Information Centre (ITIC), Laura Kong, visited Mauritius in October 2007 to review the island's tsunami preparedness. Kong is helping the Mauritian meteorological services develop a national tsunami plan.

From: Afriquenligne; http://www.afriquenligne.fr/news/daily-news/tsunami-director-expected-in-mauritius-200710191.

Japan to start world's first GPS tsunami monitoring system

According to a December 9, 2007 report by Thai News Agency (MCOT English News), the Japanese government will start operating the first tsunami wave surveillance system using GPS to detect tsunamis up to 10 minutes before they hit the Japanese coast.

This system will monitor sea wave motion every second using GPS-equipped buoys floated 20 kilometers offshore of Iwate, Miyagi, and Kochi Prefectures. There are plans to install five other buoys by April 2008.

Because there have been no methods to detect near-shore tsunamis, the Japanese Meteorological Agency has issued tsunami warnings whenever an earthquake struck, not knowing if it would create a tsunami that would hit the coast. This new system should help.

From: http://enews.mcot.net/view.php?id=1721.

Taiwan's southwest, northeast coasts tsunami-prone

A study by Wu Tso-ren, assistant professor at National Central University, concludes that the southwest and northeast coasts of Taiwan are the most vulnerable should a large underwater earthquake occur in the South China Sea. Wu reported that the Luzon Trench is a high risk zone; Ryukyu trench and North Sulawest trench are medium risk zones. These subduction zones could create earthquakes which could impact the coasts of Taiwan.

Wu's study was presented at the South China Sea Tsunami Workshop 2007 held by the Academia Sinica's Institute of Earth Sciences.

From:
http://www.chinapost.com/tw/taiwan/2007/12/06/133770/Taiwan's-southwest.htm

Report on two recent partnership agreements announce recently 1) between the Business Roundtable and the American Red Cross and 2) between the US Chamber of Commerce and the Small Business Administration (SBA)

By Nuala Cowan

On August 27th, 2007 the Small Business Administration (SBA) announced a partnership agreement with the US Chamber of Commerce, a partnership intended to instigate a collaborative response to major disasters. Pooled resources from both organizations will constitute a corps of readily deployable responders, an effort aimed at faster recovery in affected communities (1, 2). According to the Executive Director of the Chambers' Business Civic Leadership Center (BCLC); the new partnership "sets a precedent for America's business community to work with the federal government to prepare for and recover from catastrophic disasters." (1) As part of the overall agreement the SBA will share information on its disaster recovery program and relevant resource partners, with the Chambers' BCLC, as well as with local chambers of commerce. The BCLC's contribution will come in the form of timely information and on-site updates, which will reinforce the disaster assistance capabilities of the SBA, through its many members and net-works (2). The BCLC will also work with SBA's resource partners, providing recovery assistance information to the local business community and details on how to prepare for disaster before it strikes. The organizations plan to work in unison to recruit volunteers, as well as to perform post-disaster analysis on the economic recovery for the affected area (1, 2).

On the 21st of September 2007 another new partnership was announced, this time between the American Red Cross, and the Business Roundtable. (3, 4, 5). The objective of the alliance is the enhancement of private/non-profit partnerships during disaster response, and to utilize the expansive resources of the business community, outside of their financial support (4). The focal point of the collaborative effort will be to determine how the business community can most effectively contribute to national disaster preparedness and response efforts. Communication is the first item on the agenda for this new partnership; new communication channels will improve the flow of information between the business community and the Red Cross, making responses more efficient and effective. Second order of business is to focus on matching the needs of affected communities with available corporate resources before and after disaster strikes (5). In addition, companies will share first-hand reports from disaster sites with the Red Cross through the Partnership for Disaster Response Web site (www.respondtodisaster.org) (3, 4, 5). Immediately following hurricane Katrina, the Business Roundtable formed a taskforce called the "Partnership for Disaster Response"; this expert team is currently working to develop better ways to prepare for, and recover from, the short and long-term effects of large-scale disasters.

Through the partnership announced in September, the Roundtable task force has pledged to work closely with the Red Cross toward the expansion of the Red Cross's "Ready When the Time Comes" program. "Ready When the Time Comes" is volunteer recruitment program gives employees of partner organizations an opportunity to become Red Cross volunteers in their community and to be able to assist during local disasters (3, 5). The crucial outcome of this partnership is the advance collaboration, enabling a more streamlined partnership during times of crisis.

References

1. US Chamber of Commerce Website; Article: SBA and U.S. Chamber of Commerce Reach Agreement To Enhance Disaster Response and Recovery (Last Accessed: November 28, 2007). http://www.uschamber.com/bclc/resources/releases/070827release_sba.htm

2. New Orleans City Business Website; Article: U.S. Small Business Administration, U.S. Chamber partner to improve (Last Accessed: November 28, 2007). http://findarticles.com/p/articles/mi_qn4200/is_20070827/ai_n19488665

3. Red Cross Website; Article: Business Community Contributes Resources to Disaster Response through Partnership with Red Cross (Last Accessed: November 28, 2007). http://www.redcross.org/article/0,1072,0_312_7081,00.html

4. PR Newswire (United Business Media) Website; Article: Leading CEOs Launch Alliance with American Red Cross to Strengthen Nation's Preparedness for Disasters (Last Accessed: November 28, 2007). http://www.prnewswire.com/mnr/americanredcross/29733

5. Philanthropy New Digest Website; Article: American Red Cross Announces Partnership with Business Roundtable (Last Accessed: November 28, 2007). http://foundationcenter.org/pnd/news/story.jhtml?id=189800035

From:
http://www.seas.gwu.edu/%7Eemse232/december2007_20.html

What has the International Strategy for Disaster Reduction Been Up to This Year?

By Alicia Bandaranayake
Institute for Crisis, Disaster, and Risk Management, Crisis and Emergency Management Newsletter Website, December 2007, v. 13, no. 3.

The International Strategy for Disaster Reduction (ISDR) encourages and promotes increased awareness of the importance of disaster reduction as a component of global sustainable development. By guiding and educating individuals and communities, they work towards their goal of reducing human, social, economic, and environmental losses due to natural hazards and related technological and environmental disasters. ISDR facilitates the implementation of disaster risk reduction measures and promotes disaster risk reduction awareness, but the disaster risk reduction work is performed by communities, cities, countries, etc., often through partnerships connected through ISDR.

The 18th annual International Day for Disaster Reduction was celebrated on October 10, 2007. This day continues to be an occasion for raising awareness and reviewing the disaster reduction progress made worldwide. The main focus of the event was the work on the 2006-2007 World Disaster Reduction Campaign, "Disaster Risk Reduction Begins at School." The campaign focuses on making school buildings safer and mainstreaming disaster risk reduction into school curricula or through school activities. These projects are executed by communities, cities, countries, partners, stakeholders, etc., in conjunction with the schools. One example of a disaster risk reduction tool is the Stop Disasters game developed by Playerthree and launched by the UN/ISDR secretariat. This game is an educational tool in the form of an online game aimed at children ages 9 to 16. The game takes children through the tasks of preparing for a tsunami, earthquake, hurricane, floods, and wildfire, giving players a budget and time limit and allowing them to decide whether to make upgrades to structures, set up warning systems, build defenses, etc. Another example of an action brought about by the campaign is Iran's plan to reconstruct and strengthen 257,945 school classrooms within five years under the country's "School Safety Law."

The Global Platform for Disaster Risk Reduction met for the first time in June of this year. The forum of stakeholders concerned with reducing disaster risk had over 1000 participants from governments, United Nations agencies, international financial institutions, regional bodies, civil society, the private sector, and scientific and academic communities. The Global Platform looked at disaster risk reduction from three different perspectives: climate change, urban settings and mega cities, and the challenges, costs, and opportunities in implementing risk reduction strategies. Key priorities identified at the forum included: increasing and optimizing investments in risk reduction at the national and international levels, integrating disaster risk reduction into sustainable frameworks and management tools, and strengthening advocacy activities throughout the ISDR system to stimulate awareness and support by all of the stakeholders.

The Hyogo Framework for Action is a ten-year plan with the goal to substantially reduce disaster losses in lives, and in social, economic, and environmental assets of communities and countries by 2015. Work has continued this year on the following priorities for action: make disaster risk reduction a priority, know the risks and take action, build understanding and awareness, reduce risk, and be prepared and ready to act.

For more information: http://www.unisdr.org/

From: http://www.seas.gwu.edu/%7Eemse232/december2007_21.html

Institute for Crisis, Disaster, and Risk Management, Crisis and Emergency Management Newsletter Website, December 2007, v. 13, no. 3.

November 29, 2007 marine earthquake north of Martinique spurs tsunami concern

The Caribbean area felt the tremors, but was spared a tsunami. However, the event reminded the area of a study, based on historical records, made recently that predicted devastating tsunamis in the Caribbean Sea off the coasts of Puerto Rico, Haiti and the Dominican Republic.

"Scientists Nancy Grindlay and Meghan Hearne, both of the University of North Carolina, and Paul Mann of the University of Texas, Austin, writing in Eos, the newspaper of the American Geophysical Union, in 2005, stated that destructive tsunamis have been generated in the past 500 years by undersea earth movements along the boundary between the Caribbean and the North American tectonic plates…That's an average of one significant tsunami every 50 years."

From: Nationnews.com: http://www.nationnews.com/story/290457146863367.php

For moreinformation about Caribbean earthquake vulnerability: http://www.newsday.co.tt/features/0,69054.html

More information about the earthquake: http://afp.google.com/article/ALeqM5gmdGcs6KFm_DqUd4KGFoJ9DpI45Q

Conference on comprehensive disaster management in the Caribbean

The Caribbean Disaster Emergency Response Agency (CDERA), together with their partners, hosted the second Caribbean Conference on Comprehensive Disaster Management (CDM), in Barbados on 10-14 December 2007. The event's motto was "The Changing Landscape of Caribbean Disaster Management—Vision Becoming Reality."

The forum was a platform for reflection, dialogue, and assessment of disaster risk management progress in the region. The objectives are to promote disaster risk management at the local level and incorporate it into key sectors of national economies, and to advance disaster recovery planning for public, private, and civil sector entities.

It will also provide an opportunity to showcase CDM tools, model products, information and education materials, and highlight CDM progress in the region through presentations and discussions othat demonstrate its penetration and institutionalization. PAHO/WHO held a course on the Safe Hospital Index within the framework of the Conference. More information is available at: http://cdm.cdera.org/cccdm/2007/.

From: Disasters—Preparedness and Mitigation in the Americas, issue 108, October 2007, p. 3

PUBLICATIONS

Proceedings from the Hazards and Disasters Researchers Meeting

The proceedings from this year's annual Hazards and Disasters Researchers Meeting are now available online. The proceedings offer a collection of short papers presented at the two-day meeting held in Boulder, Colorado, on July 11 and 12, 2007, following the annual hazards workshop. The meeting brought together more than 100 researchers who presented findings related to hazards and disasters. The research presentations addressed aspects related to vulnerable populations, risk and decision making in hurricanes, recovery and reconstruction, and multi-organizational collaboration. The proceedings are available at www.colorado.edu/hazards/workshop/researcher_meeting.html.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder.

Natural Hazards Observer

The November 2007 *Natural Hazards Observer* is now available online at www.colorado.edu/hazards/o/.

This issue's featured articles are:
-Social Vulnerability and Capacity by Maureen Fordham
-Mutual Aid and State Plans are Key to Effective Emergency Management by Henry R. Renteria
-Comments on the National Flood Insurance Program (NFIP) Evaluation Final Report by Rutherford Platt

Regular features include Washington Update, Contracts and Grants, Resources, and Conferences and Training.

From: Disaster Research 491, Nov. 29, 2007, Natural Hazards Center, Institute of Behavioral Science, University of Colorado, Boulder

Science of Tsunami Hazards

Volume 26, no. 1, 2007 of *Science of Tsunami Hazards* is online at http://tsunamisociety.org/STHVol26N1Y2007.pdf.

Volume 26, no. 2, 2007, of *Science of Tsunami Hazards* is online at http://www.tsunamisociety.org/STHVol26N2Y2007.pdf. The international journal is now published electronically-only.

Research Digest

The Natural Hazards Center is proud to announce the second issue of its new electronic publication titled *Research Digest*—a quarterly online compilation of recent research related to hazards and disaster. It provides the complete references and abstracts (when available) for current research in the field. The goal of *Research Digest* is to advance and communicate knowledge on hazard mitigation and disaster preparedness, response, and recovery within an all-hazards, interdisciplinary framework. The current issue includes more than 175 articles cataloged between August and mid-November, 2007. *Research Digest* is compiled and edited by Center staff and includes miore than 35 peer-reviewed publications. Check out the past and current issues online at www.colorado.edu/hazards/rd.

From: Natural Hazards Observer, v. 32, no. 3, p. 14. Natural Hazards Center, Institute of Behavioral Science, University of Colorado at Boulder.

Disciplines, Disasters, and Emergency Management

Editor: David A. McEntire, 2007. ISBN: 987-0-398-07743-3. 370 p. $89.95 (hardcover). Charles C. Thomas Publisher, Ltd.; (800) 258-8980; www.ccthomas.com.

Disasters such as the 9/11 terrorist attacks, the Indian Ocean tsunami, and Hurricane Katrina illustrate the salience and complexity of disasters. This books presents a review of what is known about catastrophic events from the standpoint of various academic areas of study. The introductory chapter by the editor provides a discussion of the importance and difficulties associated with multi- and interdisciplinary research on disasters and emergency management. Well-known scholars join efforts with budding students who have recently been exposed to the disaster management profession, their review of our current level of knowledge represents 23 disciplines including geography, engineering, sociology, gerontology, public administration, international relations, law, environmental management, criminal justice, and information science. In addition to comparing the similarities and differences among the findings from diverse fields of study, the book suggests that scholars may increase their comprehension of disasters by focusing attention on the unique concept of vulnerability.

From: Natural Hazards Observer, v. 32, no. 3, p. 15. Natural Hazards Center, Institute of Behavioral Science, University of Colorado at Boulder.

Importance of mangrove conservation in tsunami prone regions

(Science Daily, November 1, 2007). Agricultural expansion rather than shrimp farming is the major factor responsible for the destruction of tropical mangrove forests in the tsunami-impacted regions of Indonesia, Malaysia, Thailand, Myanmar, Bangladesh, India, and Sri Lanka, according to a new study published in the Journal of Biogeography. Full article is available: http://www.sciencedaily.com/releases/2007/10/071030100655.thm

Expect the Unexpected: Prepare Your Business for Disaster

The U.S. Small Business Administration and Nationwide Mutual Insurance Company have teamed up to launch this disaster planning guide for small business owners. The 10-page guide provides information business owners need to develop an effective plan to protect customers and employees in the event of a disaster. The guide provides key disaster preparedness strategies to help small businesses identify potential hazards, create plans to remain in operation if the office is unusable, and understand the limitations of their insurance coverage.

Available at: http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_disprep_planningguide.pdf

From: Disaster Research 492, December 13, 2007, Natural Hazards Center, University of Colorado at Boulder, p. 4.

WEBSITES

http://www.disaster-info.net/PED-Centroamerica

The Central America office for PAHO's Area on Emergency Preparedness and Disaster Relief launched this new web page, with comprehensive information about major emergencies in the region and related topics about disaster hazards and health. The page features risk and health profiles for Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama that show each country's situation in relation to risk management and health, together with socioeconomic indicators. The webpage also includes a search engine and a list of institutional contacts in each country, and has links to agencies working in emergencies and disasters.

From: From: Disasters—Preparedness and Mitigation in the Americas, issue 108, October 2007, p. 3.

www.geohaz.org/contents/projects/tsunamiguide.html

"Preparing Your Community for Tsunamis: A Guidebook for Local Advocates." Version 2 of the GeoHazards International tsunami preparedness guidebook, "Preparing Your Community for Tsunamis: A Guidebook for Local Advocates," has been released. This version has photographs and maps and a more polished presentation than previous drafts. The guidebook provides a step-by-step approach to making communities safer, and describes what to do to prepare communities for tsunamis and how to do it so that people pay attention.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder. [see page 22 for more information]

www.emforum.org/podcasts/071226.htm

EIIP Podcast: Top Ten Favorites for 2007. This podcast features the top ten favorite virtual presentations given as part of the Emergency Information Infrastructure Partnership (EIIP) Virtual Forum series during 2007. This 10-minute review is provided as a recommendation for those that may have missed them earlier in the year. All transcripts are archived and available from the EIIP Virtual Forum homepage at www.emforum.org.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder.

http://ineesite.org/page.asp?pid=1240

INEE Minimum Standards. The Inter-Agency Network for Education in Emergencies (INEE) has developed these standards that present a global framework for coordinated action to enhance the quality of educational preparedness and response, increase access to relevant learning opportunities, and ensure humanitarian accountability in providing these services. The INEE Minimum Standards can be used to enhance preparedness, and while they do not address disaster risk reduction (DRR) explicitly, the standards can also be used to enhance DRR through areas such as establishing a safe and secure learning environment and providing essential survival and life skills information.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder.

www.disaster-zone.com/

"Disaster Zone: Emergency Management in the Blogosphere" is dedicated to sharing information about the world of emergency management and homeland security. This blog presents interesting information on all aspects of disaster prevention, mitigation, preparedness, recovery, and response.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder.

www.unisdr.org/cadri/

The new Web site of the Capacity for Disaster Reduction Initiative (CADRI) is an online database of disaster risk reduction academic courses worldwide. Currently the database contains more than 70 entries and will continue to expand. CADRI is a joint initiative of the United Nations Development Program, the Office for the Coordination of Humanitarian Affairs, and the International Strategy for Disaster Reduction.

From: Natural Hazards Observer, v. 32, no. 3, p. 19. Natural Hazards Center, Institute of Behavioral Science, University of Colorado at Boulder.

www.theriskipedia.com

This Web site is a platform where anyone in the world can access information on risk and risk management, add new content, and edit existing content. The *Riskipedia* is a wiki, designed so that all information on risk and risk management is available to everyone in an easily searchable forum.

From: Natural Hazards Observer, v. 32, no. 3, p. 19. Natural Hazards Center, Institute of Behavioral Science, University of Colorado at Boulder.

http://www.govtech.com/em/articles/206128

R. David Paulison, the director of the Federal Emergency Management Agency (FEMA), is the subject of this question-and-answer style article in *Emergency Management* magazine. In the interview, Paulison addresses changes at FEMA and their potential impacts to local and state governments.

From: Disaster Research 492, December 13, 2007, Natural Hazards Center, University of Colorado at Boulder, p. 4.

http://www.fema.gov/news/newsrelease.fema?id=41816

A Disaster Pet Plan That Worked for San Diego

This press release from the Federal Emergency Management Agency (FEMA) details the success of San Diego County's disaster pet plan that was in place during the southern California wildfires.

From: Disaster Research 492, December 13, 2007, Natural Hazards Center, University of Colorado at Boulder, p. 4.

CONFERENCES

March 12-14, 2008

3rd Annual Emergency Preparedness and Service Restoration for Utilities will assemble utility executives to present and debate the latest tools, processes, insights and lessons learned in planning for, and restoring service from, major power disruptions.

Emory Conference Center, Atlanta, GA.; mail@infocastinc.com; www.infocastinc.com/prep08; Infocast, 6800 Owensmouth Ave, Suite 300, Canoga Park, cA 91303.

April 13-16, 2008

Solutions to coastal disasters, Oahu, Hawaii. Organizer: The Coasts, Oceans, Ports and Rivers Institute (COPRI) of the American Society of Civil Engineers (ASCE). This conference is designed for coastal planners, managers, social scientists, engineers, geologists, biologists, economists, oceanographers, meteorologists, property owners, elected officials, and others interested in the coast. The series was developed to provide formal and informal venues for the exchange of information, tools, and ideas related to coastal hazards. It will include plenary and technical sessions, exhibits, posters, field trips, and social events that encourage participant interactions.

For more information, contact ewatson@asce.org; http://content.asce.org/conferences/cd2008/.

From: Natural Hazards Observer, v. 32, no. 3, p. 21. Natural Hazards Center, Institute of Behavioral Science, University of Colorado at Boulder.

June 15-18, 2008

18th World Conference on Disaster Management, Toronto, Ontario. Metro Toronto Convention Centre, South Bldg. "Emergency management and business continuity working together." Register for the 2008 WCDM at www.wcdm.org and follow the "Register" link. Questions should be directed to Adrian Gordon at (905) 331-2552 ext. 221 or email at: agordon@ccep.ca.

CLASSES

FEMA Emergency Management Institute (EMI) Training

The Emergency Management Institute (EMI) serves as the national focal point for the development and delivery of emergency management training courses to enhance the capabilities of federal, state, local, and tribal government officials; volunteer organizations; and public and private sectors to minimize the impact of disasters. Course delivery includes emergency management training in areas of natural and human-caused hazards, exercise design and evaluation, and public information.

EMI offers an Integrated Emergency Management Course (IEMC) curriculum of exercise-based (tabletop and functional) training, which emphasizes the integration of emergency operations center functions performed by public officials and emergency managers in disaster preparedness, response, recovery, and mitigation phases. State and local governments may also request community-specific IEMCs tailored to their jurisdictions and specific hazard. For more information, visit the IEMC Web site at http://training.fema.gov/emiweb/IEMC or contact William Tschumy at william.tschumy@fema.gov or (301) 447-1095.

From: Disaster Research 492, December 13, 2007, Natural Hazards Center, University of Colorado at Boulder, p. 3.

CALLS FOR PAPERS

Final Call for Papers: 18th World Conference on Disaster Management

The Canadian Centre for Emergency Preparedness (CCEP) is calling for presentations for the 18th World Conference on Disaster Management (WCDM). The conference will be held at the Metro Toronto Convention Centre in Toronto, Canada, from June 15-18, 2008.

WCDM is the premier annual event that addresses issues common to all aspects of disaster/emergency management. The conference program includes speakers from many parts of the world and provides excellent opportunities for training and networking among those in the fields of emergency planning/management, business continuity, emergency response, risk management, IT disaster recovery, disaster management research, emergency communications, emergency health, security, environmental, community planning, as well as for the organizations that supply and service these professions. Paper submissions should fall into one or more of the following categories:

-Real Events/Lessons Learned
-Emerging Trends in Disaster Management
-The Human Element in Disaster Managemen
-Technical Issues/Threats -Disaster Management Principles and Practices
-Academic//Research and Development

Questions should be directed to Adrian Gordon at (905) 331-2552 Ext: 221 or agordon@ccep.ca.

From: Disaster Research 491, Nov. 29, 2007, Natural Hazards Center, Institute of Behavioral Science, University of Colorado, Boulder

Call for Papers: Annual Student Paper Competition

The Natural Hazards Center announces its fifth annual Hazards and Disasters Student Paper Competition.

Papers may present current research, literature reviews, theoretical arguments, or case studies. Paper topics may include, but are not limited to, floods or floodplain management, Hurricane Katrina, earthquakes, climate change, warning systems, hazard mitigation, emergency management, vulnerability, or other topics relevant to the social and behavioral aspects of hazards and disasters.

Papers will be judged on originality, organization, and demonstrated knowledge of the topic. One undergraduate and one graduate winner will receive $100 each; mention in the Natural Hazards Observer newsletter; publication on the Natural Hazards Center Web site; and an invitation to the Annual Hazards Workshop in Boulder, Colorado, including registration fees. The deadline for submissions is March 14, 2008.

Additional information is available at www.colorado.edu/hazards/awards/paper-competition.html.

From: Disaster Research 493, January 17, 2008, Natural Hazards Center, University of Colorado at Boulder ♦

Volunteer-Neighborhood Programs

The **Community Emergency Response Team** (CERT) educates citizens about disaster preparedness and trains them in basic disaster response skills (fire safety, light search and rescue, and disaster medical operations).

RIGHT NOW: New CERT training efforts have focused on Train-the-Trainer, Teen CERT, and Campus CERT, as well as a specialized Teen Tribal CERT train the trainer course.

Fire Corps promotes the use of citizen advocates to enhance the capacity of resource-constrained fire and rescue departments at all levels: volunteer, combination, and career.

RIGHT NOW: New Fire Corps tools include 1-800-Fire-Line tool kit with forms instructing groups on how to conduct Public Service Announcements, tips for marketing, information used to order street signs, and training/awareness campaigns using the Fire Corps curriculum.

The **Medical Reserve Corps** (MRC) strengthens communities by helping medical, public health, and other volunteers offer their expertise throughout the year, during local emergencies, and other times of community need.

RIGHT NOW: MRC and its many units are advancing the priorities of the U.S. Surgeon General by helping to promote disease prevention, improve health literacy, eliminate health disparities, and enhance public health preparedness. Other units are focusing primarily on preparedness and response activities.

Neighborhood Watch/USA on Watch incorporates terrorism awareness education into its existing crime prevention mission, while serving as a way to bring residents together to focus on emergency preparedness and emergency response training.

RIGHT NOW: USAonWatch group registrations have increased 17 percent in last six months to a total of 17,416 representatives around the US. One potential contributor to this increase is the popularity of the Apartment Neighborhood Watch program.

The **Volunteers in Police Service** (VIPS) program works to enhance the capacity of state and local law enforcement to utilize volunteers by serving as a gateway to resources and information for and about law enforcement volunteer programs.

RIGHT NOW: VIPS is re-designing its website to provide a comprehensive site search tool, anniversary

video, educational videos (and more resources). On-the-ground volunteers like those of Mesa, AZ, Police Department, staff the mobile traffic monitoring unit by keeping track of traffic, running license plates, watching for speeders, and responding to residents' speed complaint

From: *Citizen Corps newsletter*, September 2007 at http://www.citizencorps.gov/pdf/newsletter/cc-newsletter-september2007.pdf ♦

STATE EMERGENCY MANAGEMENT OFFICES
updated 3-31-2006

Alaska Dept of Military & Veteran Affairs
Division of Homeland Security & Emergency Mgmt.
PO Box 5750
Fort Richardson, AK 99505-5750
(907) 428-7000; toll-free 800-478-2337
Fax (907) 428-7009
http://www.ak-prepared.com/

California Office of Emergency Services
3650 Schriever Ave.
Mather, CA 95655
(916) 845-8510; Fax (916) 845-8910
http://www.oes.ca.gov/

Hawaii State Civil Defense, Dept. of Defense
3949 Diamond Head Road
Honolulu, HI 96816-4495
(808) 733-4300; Fax (808) 733-4287
http://www.scd.state.hi.us

Oregon Division of Emergency Management
PO Box 14370
Salem, OR 97309-50620
(503) 378-2911; Fax (503) 373-7833
http://www.oregon.gov/OOHS/OEM/

Washington State Military Dept.
Emergency Management Division
Camp Murray, WA 98430-5122
(253) 512-7067; Fax (253) 512-7207
http://emd.wa.gov

Provincial Emergency Program
455 Boleskin Road
Victoria, BC V8Z 1E7 Canada
(250) 952-4913; Fax (250) 952-4888
http://www.pep.bc.ca/

ALSO: (added November 30, 2007)
American Samoa Territorial Emergency Management Coordination (TEMCO)
American Samoa Government
P.O. Box 1086
Pago Pago, American Samoa 96799
(011)(684) 699-6415
(011)(684) 699-6414 FAX

Office of Civil Defense, Government of Guam
P.O. Box 2877
Hagatna, Guam 96932
(011)(671) 475-9600; (011)(671) 477-3727 FAX
http://ns.gov.gu/

Guam Homeland Security/Office of Civil Defense
221B Chalan Palasyo
Agana Heights, Guam 96910
Tel:(671)475-9600; Fax:(671)477-3727
www.guamhs.org

CNMI Emergency Management Office
Office of the Governor
Commonwealth of the Northern Mariana Islands
P.O. Box 10007
Saipan, Mariana Islands 96950
(670) 322-9529; (670) 322-7743 FAX
www.cnmiemo.gov.mp

National Disaster Management Office
Office of the Chief Secretary
P.O. Box 15
Majuro, Republic of the Marshall Islands 96960-0015
(011)(692) 625-5181; (011)(692) 625-6896 FAX

National Disaster Control Officer
Federated States of Micronesia
P.O. Box PS-53
Kolonia, Pohnpei - Micronesia 96941
(011)(691) 320-8815; (001)(691) 320-2785 FAX

Palau NEMO Coordinator
Office of the President
P.O. Box 100
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Material added to the NTHMP Library,
January – February 2008

Note: These, and all our tsunami materials, are included in the online (searchable) catalog at http://www.dnr.wa.gov/geology/washbib.htm. Type 'tsunamis' in the Subject field to get a full listing of all the tsunami reports and maps in the collection.

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Infrequently asked questions

Compiled by Lee Walkling

What might be more important to tsunami run-up than tsunami height?

"The fact that tsunamis respond very differently to steep and mild beaches, and that it is the flow velocity during run-up and rundown, which is the crucial parameter for the impact rather than the height itself, … The impact of waves on shorelines turns out to be a critical balance between the steepness of the beach and the wave length (or wave period).

From: Madsen, P.A.; Fuhrman, D.R., 2008, Run-up of tsunamis and long waves in terms of surf-similarity: Coastal Engineering, v. 55, no. 3, p. 209-223.

Allowing the tsunami life cycle to be divided into 3 stages, which stage is the most important, and least understood, for tsunami prediction and early warning?

"Without knowing how tsunamis form from earthquakes, it would be impossible to predict a tsunami precisely even if information on the earthquake is known. Tsunami life cycle can be divided into three stages: formation of the wave due to initial forcing, free propagation of the wave in deep oceans, and wave run-up to shallow seas and beaches. Observations have been made mainly on the third stage through tide gauges, eyewitness accounts, and after-tsunami surveys. The second stage has been thoroughly investigated as the linear wave theory that is quite suitable for long waves in deep oceans and modeled by nonlinear shallow water equations. However, the first stage of tsunami excitation by earthquakes at the ocean bottom—the interface between earthquake and ocean bottom water—has been poorly understood. Solving the tsunami formation puzzle not only has scientific values to satisfy our curiosity for searching truth, but also has practical values to issue early warnings for saving lives and reduce false alarms."

From: Madsen, Per A.; Fuhrman, David R., 2008, Run-up of tsunamis and long waves in terms of surf-similarity: Coastal Engineering, v. 55, no. 3, p. 363.

Outside of the Indian Ocean, where were the highest waves recorded for the 2004 Sumatra tsunami?

"Findings reveal that, outside the Indian Ocean, the highest waves were recorded in the South Atlantic and not in the Pacific as has been previously suggested." (p. 117)

"According to Kowalik et al. (2007), the total inflow of 2004 tsunami energy into the Pacific Ocean was approximately 75% of the total energy inflow to the Atlantic Ocean. The smaller area of the Atlantic Ocean and the wave guide effect of the Mid-Atlantic Ridge promote additional intensification of tsunami waves in parts of the Atlantic Ocean. Global numerical simulation of the 2004 tsunami by Titov et al. (2005) demonstrate that waves generated during the event traveled southwestward from the source area in the Indian Ocean, curved around the southern tip of Africa and then propagated northward along the Mid-Atlantic Ridge. Upon reaching the Tropic of Capricorn, a branch of the ridge-trapped tsunami energy flux spit from the topographic wave guide and headed toward the coast of Brazil while another branch headed toward Nova Scotia." (p. 127)

From: Candella, R. N.; Rabinovich, A. B.; Thomson, R. E., 2008, The 2004 Sumatra tsunami as recorded on the Atlantic coast of South America: Advances in Geosciences, v. 14, p. 117-128. ♦

VIDEO-CD-DVD RESERVATIONS

To reserve tsunami videos, CDs or DVDs, contact *TsuInfo Alert* Video Reservations, Lee Walkling, Division of Geology and Earth Resources Library, 1111 Washington St. SE, MS 47007, Olympia, WA 98504-7007; or e-mail lee.walkling@dnr.wa.gov

Adventures of Disaster Dudes (14 min.). Preparedness for preteens. American Red Cross.

The Alaska Earthquake, 1964 (20 min.) Includes data on the tsunamis generated by that event.

Business Survival Kit for Earthquakes & Other Disasters; What every business should know before disaster strikes (27 min.). Global Net Productions for the Cascadia Regional Earthquake Workgroup, 2003. With CD disaster planning toolkit & other data.

Cannon Beach Fire District Community Warning System (COWS) (21 min.) Explains why Cannon Beach chose their particular warning system.

Cascadia: The Hidden Fire–An Earthquake Survival Guide (10 min.). Global Net Productions, 2001. A promo for a documentary about the Cascadia subduction zone and the preparedness its existence demands of Alaska, Oregon and Washington states. Includes mention of tsunamis.

Disasters are Preventable (22 min.) Ways to reduce losses from various kinds of disasters through preparedness and prevention.

Disaster Mitigation Campaign (15 min.). American Red Cross; 2000 TV spots. Hurricanes, high winds, floods, earthquakes.

Earthquake…Drop, Cover & Hold (5 min.). Washington Emergency Management Division. 1998.

Forum: Earthquakes & Tsunamis (2 hrs.). CVTV-23, Vancouver, WA (January 24, 2000). 2 lectures: Brian Atwater describes the detective work and sources of information about the Jan. 1700 Cascadia earthquake and tsunami; Walter C. Dudley talks about Hawaiian tsunamis and warning systems.

International Tsunami Information Centre, 2004, Tsunami warning evacuation news clips and video footage, UNESCO /IOC International Tsunami Information Centre, 1 **DVD**, 12 min.

Killer Wave: Power of the Tsunami (60 min.).National Geographic video.

Mitigation: Making Families and Communities Safer (13 min.) American Red Cross.

Not Business as Usual: Emergency Planning for Small Businesses, sponsored by CREW (Cascadia Regional Earthquake Workgroup) (10 min.), 2001. Discusses disaster preparedness and business continuity. Although it was made for Utah, the multi- hazard issues remain valid for everyone. Websites are included at the end of the video for further information and for the source of a manual for emergency preparedness for businesses.

Numerical Model Aonae Tsunami–7-12-93 (animation by Dr. Vasily Titov) and Tsunami Early Warning by Glenn Farley, KING 5 News (The Glenn Farley portion cannot be rebroadcast.)

Ocean Fury--Tsunamis in Alaska (25 min.) VHS and **DVD**. Produced by Moving Images for NOAA Sea Grant College Program, 2004.

The Prediction Problem (58 min.) Episode 3 of the PBS series "Fire on the Rim." Explores earthquakes and tsunamis around the Pacific Rim

Protecting Our Kids from Disasters (15 min.) Gives good instructions to help parents and volunteers make effective but low-cost, non-structural changes to child care facilities, in preparation for natural disasters. Accompanying booklet. Does NOT address problems specifically caused by tsunamis.

The Quake Hunters (45 min.) A good mystery story, explaining how a 300-year old Cascadia earthquake was finally dated by finding records in Japan about a rogue tsunami in January 1700

Raging Planet; Tidal Wave (50 min.) Produced for the Discovery Channel in 1997, this video shows a Japanese city that builds walls against tsunamis, talks with scientists about tsunami prediction, and has incredible survival stories.

Raging Sea: KGMB-TV Tsunami Special. (23.5 min.) Aired 4-17-99, tsunami preparedness in Hawaii.

The Restless Planet (60 min.) An episode of "Savage Earth" series. About earthquakes, with examples from Japan, Mexico, and the 1989 Loma Prieta earthquake.

Run to High Ground (14 min.). Produced by Global Net Productions for Washington Emergency Management Division and Provincial Emergency Program of British Columbia, 2004. Features storyteller Viola Riebe, Hoh Tribe. For K-6 grade levels. Have video and **DVD** versions.

Tsunami and Earthquake Video (60 min.). "Tsunami: How Occur, How Protect," "Learning from Earthquakes," "Computer modeling of alternative source scenarios."

Tsunami: Killer Wave, Born of Fire (10 min.). NOAA/ PMEL. Features tsunami destruction and fires on Okushiri Island, Japan; good graphics, explanations, and safety information. Narrated by Dr. Eddie Bernard, (with Japanese subtitles).

Tsunami: Surviving the Killer Waves (13 min.). 2 versions, one with breaks inserted for discussion time.

Tsunami Chasers (52 min.). Costas Synolakis leads a research team to Papua New Guinea to study submarine landslide-induced tsunamis. Beyond Productions for the Discovery Channel.

Tsunami Evacuation PSA (30 sec.). DIS Interactive Technologies for WA Emergency Management Division. 2000.

TsunamiReady Education CD, 2005, American Geological Institute Earth Science Week kit.

Understanding Volcanic Hazards (25 min.). Includes information about volcano-induced tsunamis and landslides.

UNESCO/IOC International Tsunami Information Centre, 2005, U.S. National Tsunami Hazard Mitigation Program public information products—B-roll footage, tsunami science, warnings, and preparedness: UNESCO/IOC International Tsunami Information Centre, 1 **DVD,** 57 min.

The Wave: a Japanese Folktale (9 min.) Animated film to start discussions of tsunami preparedness for children.

Waves of Destruction (60 min.) An episode of the "Savage Earth" series. Tsunamis around the Pacific Rim.

Who Wants to be Disaster Smart? (9 min.). Washington Military Department/Emergency Management Division. 2000. A game show format, along the lines of *Who Wants to be a Millionaire*?, for teens. Questions cover a range of different hazards.

The Wild Sea: Enjoy It...Safely (7 min.) Produced by the Ocean Shores Wash. Interpretive Center, this video deals with beach safety, including tsunamis. ♦

MORE NEWS

State Preparedness Reports

The State Preparedness Report showcases the capabilities and accomplishments of each State's and Territory's all-hazards preparedness program and provides a method for States to communicate their plan to increase preparedness to Congress. The State Preparedness Report is both a measure of past capabilities and accomplishments, combined with an estimate of future capabilities. The State Preparedness Report tracks state-wide planning and incident management efforts, current preparedness capability levels, targeted levels of capability, aggregate preparedness expenditures, and estimates of the total monetary and non-monetary resources needed to support all preparedness-related activities for a three year period.

The report will focus on the eight National Priorities as an organizing framework, emphasizing the all-hazards nature of the report, reporting on State-specific priorities, selected target capabilities and consolidating overlapping requirements.

The State Preparedness Report provides a state-wide perspective, inclusive of each jurisdiction and state agency, in a collaborative development process from a variety of preparedness-related communities (e.g., law enforcement, fire, Emergency Medical Services, public health, public works, agriculture, private sector, non-governmental organizations, and information technology).

The Hawaii State Preparedness Plan will be submited to Department of Homeland Security not later than March 31, 2008. Submission into the Hawaii Preparedness Report is due to State Civil Defense by January 28, 2008.

State Preparedness Report Guidance
State Preparedness Report Template
State Preparedness Report Mock up
State Preparedness Report Working File

From: http://www.scd.state.hi.us/index.html

Kamphuan Memorial Tsunami Museum opens

Scores of local residents attended the recent opening of Asia's first community-based tsunami education museum in Thailand's Ranong province. The Kamphuan Memorial Tsunami Museum is housed in the Tambon Kamphuan Community Learning Center. The center was built to service five nearby fishing villages that were devastated by the 2004 tsunami.

The museum, created by tsunami expert Walter C. Dudley of the University of Hawaii, documents how the area's 5,000 residents responded to the disaster and are rebuilding their lives. Photographs, charts, and interactive computer displays explain how tsunamis are created and how people can prepare for future tsunami alerts.

From: USAID, Tsunami Update, June 2007, p. 6.

At the Kamphaun Memorial Tsunami Museum, a local resident studies photographs of the devastation and reconstruction.
Photo: Hal Lipper, USAID

Preparing Your Community for Tsunamis

Preparing Your Community for Tsunamis—A guidebook for local advocates (Working draft, version 2), by GeoHazards International, 2007, is available free online: http://www.geohaz.org/contents/projects/tsunamiguide.html.

The 54-page booklet "is designed to help you prepare your coastal community for tsunamis. This goes beyond preparing yourself and your loved ones. It means taking steps to educate your entire community about when and how to evacuate for tsunamis. It means helping your local government to be prepared to mobilize and coordinate evacuations, and it means working to change your community's development, so that tsunamis will cause less damage It means becoming a tsunami safety advocate" (p. 1)

Chapter headings are Learn the basics of tsunami behavior, Build a team, Make hazard and evacuation maps, Educate the community about tsunami preparedness, Learn about and improve official tsunami warning systems, Prevent tsunami damage, and Keep preparedness going over the long-term.

The booklet includes checklists, eyewitness accounts, and illustrations. The following list is from page 33. ♦

Tips for a Successful Community Evacuation Exercise

- Plan for the exercise with many community groups. Involve emergency officials from every relevant agency in the planning, as well as elected officials, the media, the business sector, the tourism industry and relevant community groups and NGOs. A large planning group will build support for the event, as well as contribute ideas that make the exercise more effective.
- Schedule the exercise when there are no other large community events. Avoid dates that will have heavy traffic or large numbers of out-of-town visitors. Use anniversaries of past disasters.
- Publicize the exercise widely. Everyone in the community should know that the event is an exercise. Work with media and community groups to inform people about it, both to encourage participation and to reduce surprise during the event. Distribute fliers, banners or posters widely advertising the event.
- Develop a plan to manage traffic. Post traffic control officers or volunteers at all busy intersections or major crossings. If evacuees need to cross busy streets, have a plan to disrupt traffic as little as possible while still conducting the exercise effectively. Traffic control officers should stay in place for awhile after the exercise ends, while people slowly return to their homes, schools or offices.
- Make the warning as real as possible. To trigger the exercise, make the alert signal as close as possible to the way it will occur in a real tsunami warning. People will expect a real evacuation to happen in the same way as the exercise did.
- Provide information about what to do in the exercise. Prior to the event, use as many methods as possible to tell people what to do in the exercise, including what time the exercise will occur, what alert signal to listen for, where to go, what routes to use, whether to go by foot or by car, what to expect when they arrive at evacuation locations, and what to do after the exercise.
- Train volunteers and emergency officials before the exercise. Volunteers and emergency officials should know what to do, what to say to the public, and should wear identifiable clothing. Have water and medical assistance available for participants.
- Actively work with the media. Media can mobilize people at the time of the exercise, can make sure people know it is a exercise and not a real emergency, and can cover the event to educate people who do not participate. Use the event to train the media in their role during a real tsunami.
- Involve local businesses. Businesses may designate a small number of employees to participate in exercises that happen during work hours. These employees can report back to their workplace about what to do.
- Involve the tourist industry. Hotels and other tourism-related businesses should have signs or employees informing visitors about the exercise to avoid confusion. Tourists need not participate.
- Distribute evacuation maps. Before and during the exercise, distribute evacuation maps widely.
- Place volunteers along the evacuation route. Volunteers or emergency officials should be stationed along major evacuation routes at regular intervals to answer questions, provide help and make sure that everything is going smoothly.
- Time how long it takes people to evacuate. Have volunteers at the end of the evacuation routes to greet people, count participants and time how long it took people to reach safety.
- Have emergency officials ready to answer questions. Emergency agencies should be ready to receive phone calls or other queries about what is happening. Have adequate staff ready to inform and reassure people.
- Ask people about their experiences in the exercise. Ask people who evacuate in the exercise to complete a written survey or to speak to a volunteer interviewer and talk about their experience. This is a great opportunity to learn how to improve emergency plans.
- Have a public discussion about the exercise after it is over. A community discussion, open to the public and media, of what was learned during the exercise is a good way to get opinions, improve emergency plans, and make the public feel that their concerns are being heard.

NOAA/NWS/West Coast/Alaska Tsunami Warning Center

Operations Manual

Section 5.2: Message Definitions, updated January 2008

West Coast/Alaska Tsunami Warning Center (WCATWC) product definitions will change to the definitions provided below on February 12, 2008. The products issued by the center are warning, watch, advisory, and information statement. Each has a distinct meaning relating to local emergency response.

In summary:

Warning	->	Inundating wave possible	->	Full evacuation suggested
Watch	->	Danger level not yet known	->	Stay alert for more info
Advisory	->	Strong currents likely	->	Stay away from the shore
Information	->	Minor waves at most	->	No action suggested

Based on seismic data analysis or forecasted amplitude (dependent on whether the center has obtained sea level data), WCATWC will issue the appropriate product. Procedural criteria are summarized in the linked bar chart. Warnings and Advisories suggest that action be taken. Watches are issued to provide an early alert for areas that are distant from the wave front, but may have danger. Once the danger level is determined, the watch is upgraded to a warning or advisory, or canceled. The full definition of each message is given below. See Section 5.1 for examples and descriptions of all WCATWC products.

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. For an example of the National Weather Service (NWS) format tsunami warning CLICK HERE. For a warning cancellation, CLICK HERE.

Tsunami Watch - a tsunami watch is issued to alert emergency management officials and the public of an event which may later impact the watch area. The watch area may be upgraded to a warning or advisory - or canceled - based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action. Watches are normally issued based on seismic information without confirmation that a destructive tsunami is underway. For an example of the NWS format tsunami watch CLICK HERE.

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. For an example of the NWS format tsunami advisory CLICK HERE.

Tsunami Information Statement - a tsunami information statement is issued to inform emergency management officials and the public that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean. In most cases, information statements are issued to indicate there is no threat of a destructive tsunami and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas.An information statement may, in appropriate situations, caution about the possibility of destructive local tsunamis. Information statements may be re-issued with additional information, though normally these messages are not updated. However, a watch, advisory or warning may be issued for the area, if necessary, after analysis and/or updated information becomes available. For an example of the NWS format information statement CLICK HERE.

From: http://wcatwc.arh.noaa.gov/Products/msgdefs.htm

CLICK commands will work in the online version of *TsuInfo Alert*: http://www.dnr.wa.gov/geology/tsuinfo/ ♦