



Department of
Family Medicine



Haiti's Earthquake

Lessons You Can Use At Home



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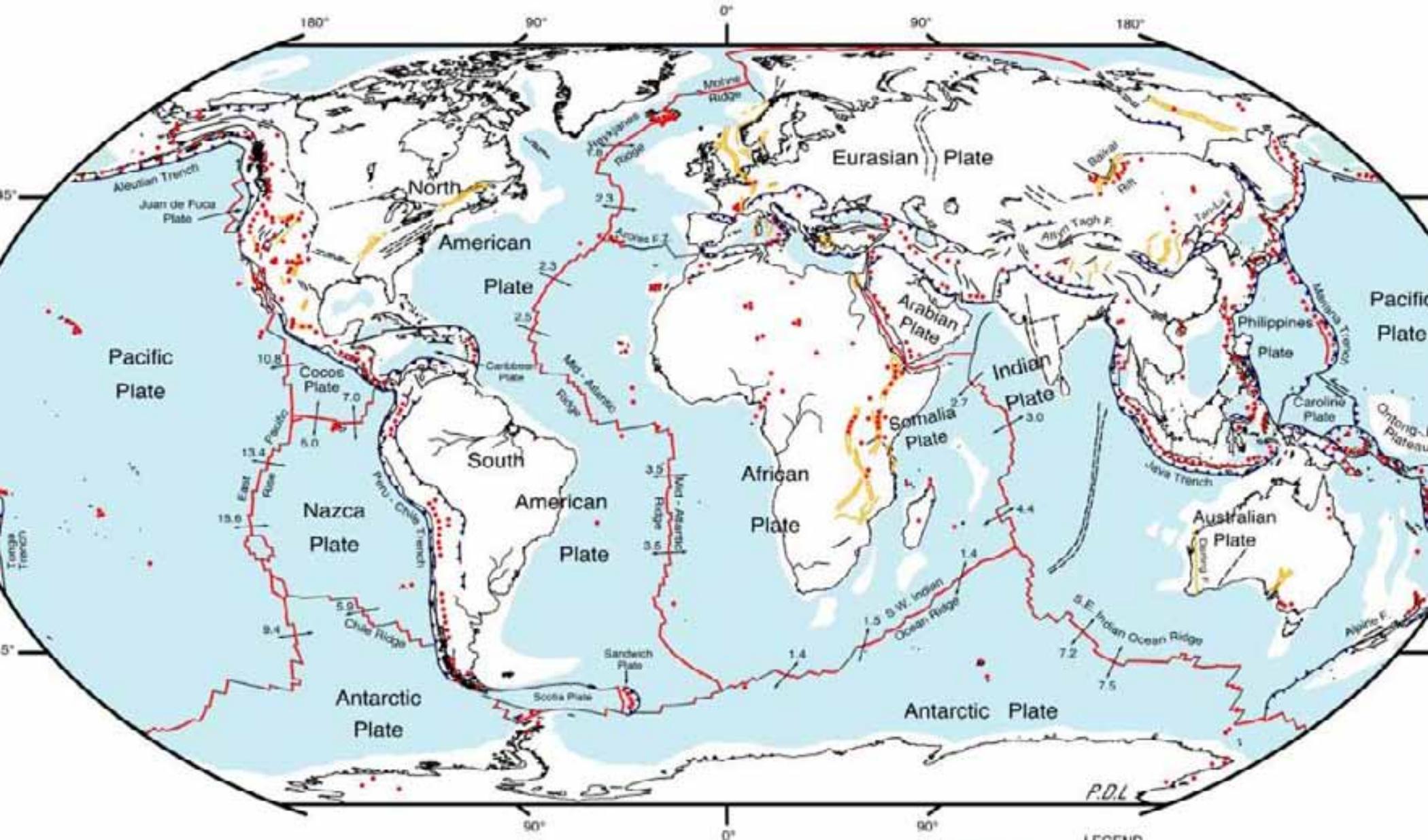
Immediate Past Chair, American Board of Disaster Medicine

Objectives

- ❖ To discuss the Haiti earthquake response by the United States in the immediate aftermath of the disaster
- ❖ To discuss the dangers posed by earthquakes in general, especially with regard to Occupational Health & Safety
- ❖ To understand how to maintain personal and team safety and security during and after a major seismic event
- ❖ To understand an ALL HAZARDS approach to disaster preparedness

Conflicts of Interest?

NONE



DIGITAL TECTONIC ACTIVITY MAP OF THE EARTH
Tectonism and Volcanism of the Last One Million Years

DTAM



NASA/Goddard Space Flight Center
Greenbelt, Maryland 20771

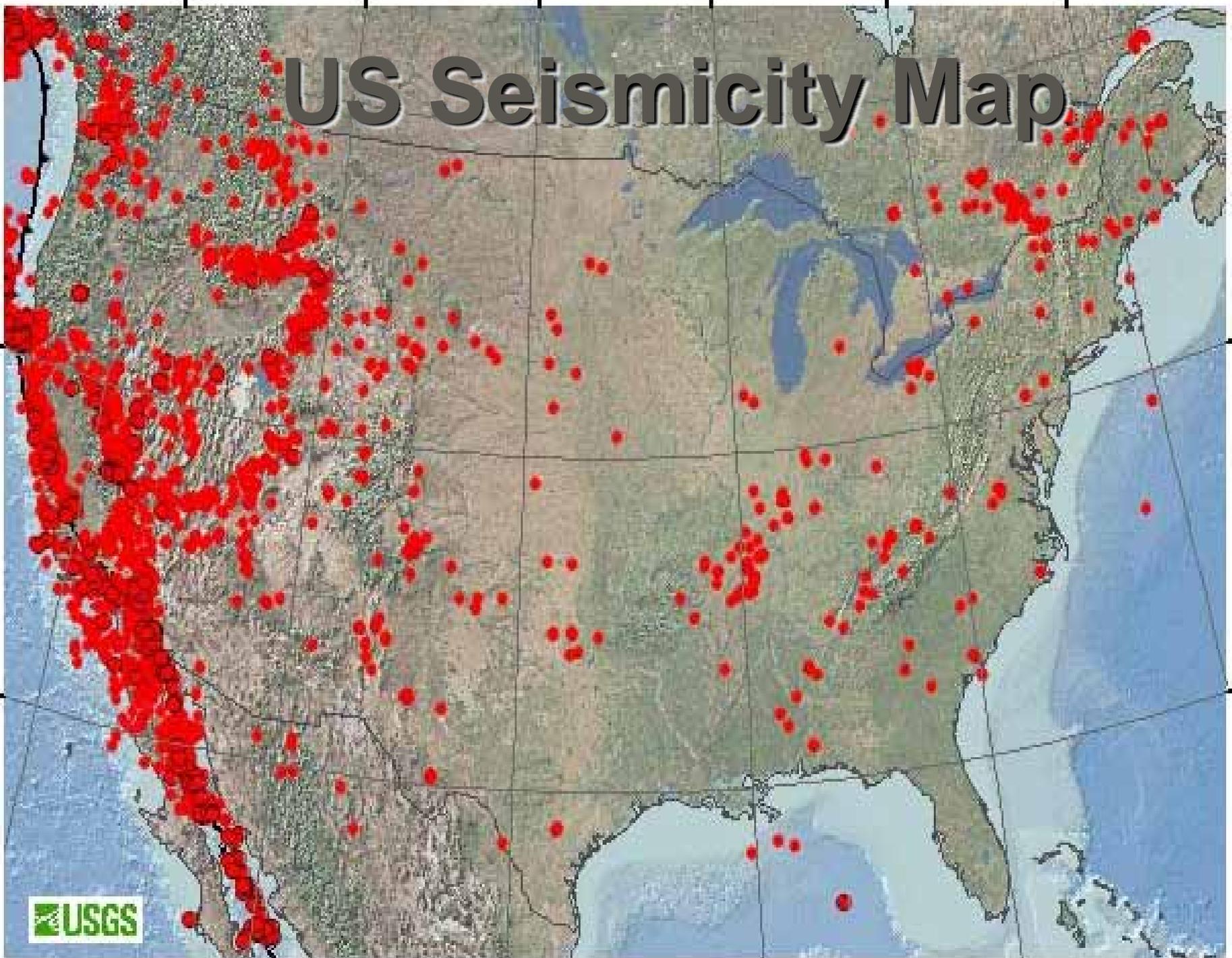
Robinson Projection
Mainly oceanic crust

October 1998

LEGEND

- Actively-spreading ridges and transform faults
- Total spreading rate, cm/year, NUVEL-1 model (DeMets et al., Geophys. J. International, 101, 425, 1990)
- Major active fault or fault zone: dashed where nature, location, or activity uncertain
- Normal fault or rift: hachures on downthrown side
- Reverse fault (overthrust, subduction zones): generalized: bars on upthrown side
- Volcanic centers active within the last one million years; generalized. Minor basaltic centers and seamounts omitted.

US Seismicity Map

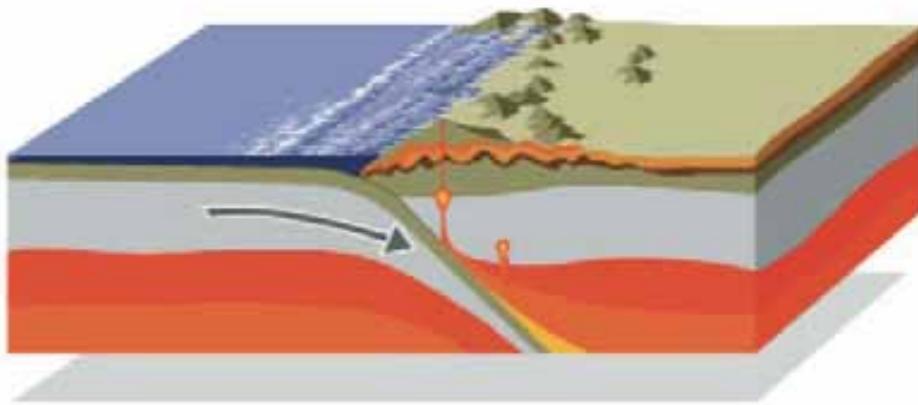


NASA Facilities & Centers

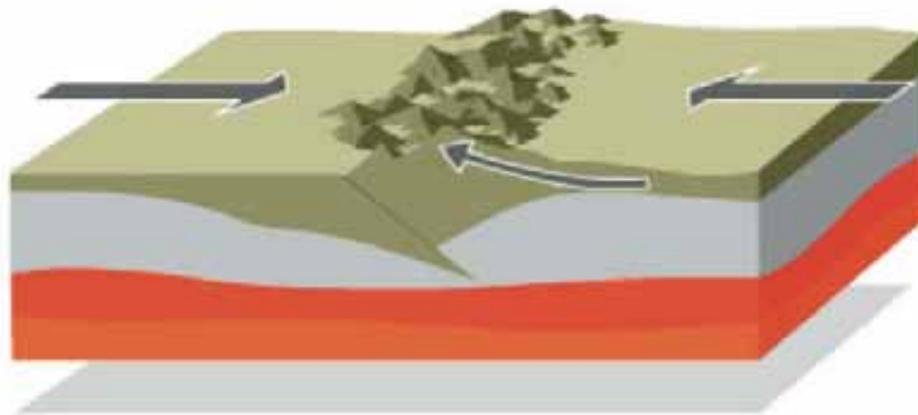


Earthquake

- A sudden rapid shaking of the ground caused by movement of tectonic plates relative to one another
- Can cause buildings and bridges to collapse
- Can trigger landslides, avalanches, flash floods, fires and tsunamis
- Buildings on unconsolidated landfill, old waterways or other unstable soil are most at risk



Where plates collide, rock layers are forced upwards creating mountains.

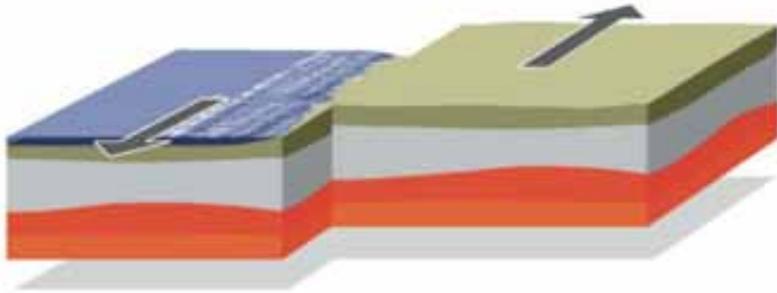


Where plates diverge, lava emerges from the mantle and cools to form new sections of crust. Diverging plate boundaries are often found underwater.

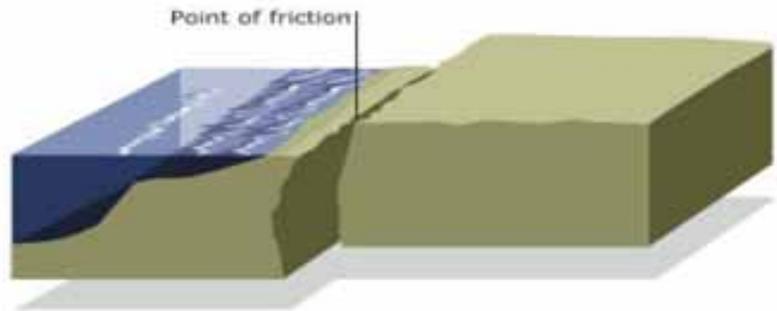
Basic Plate Tectonics

(Courtesy of the BBC)

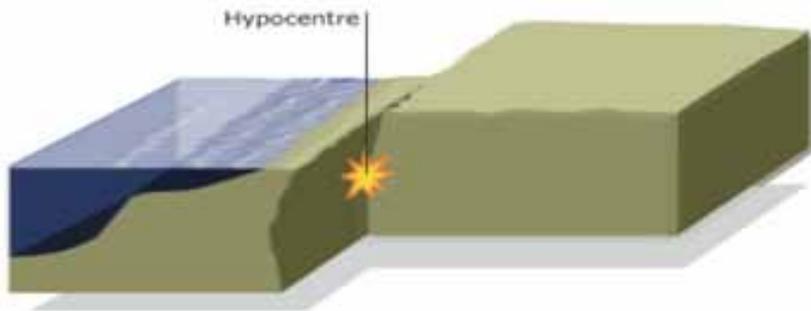
Other plates move very slowly alongside each other. Faults are found at the edges of the plates where the crust is moving in different directions.



In some places the plates become locked together. Kinetic energy builds up in the locked plates.



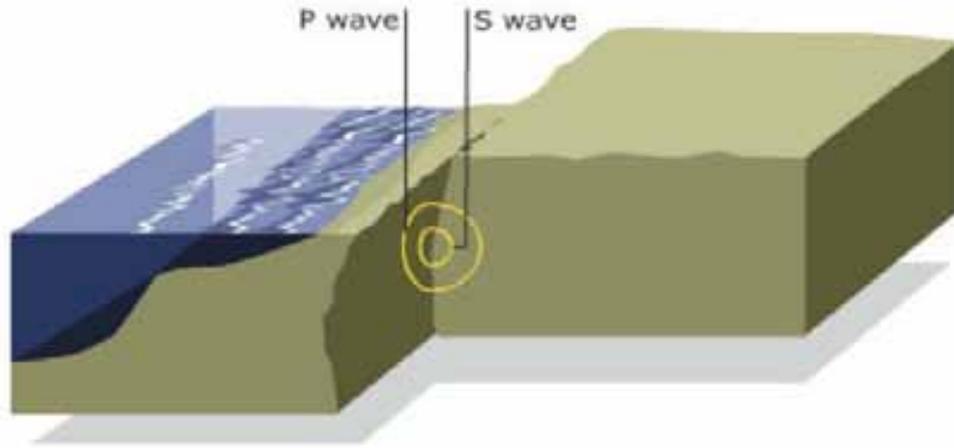
When the plates give, the stored energy is released in the form of an earthquake. The point of the earthquake's origin beneath the surface is called the hypocentre.



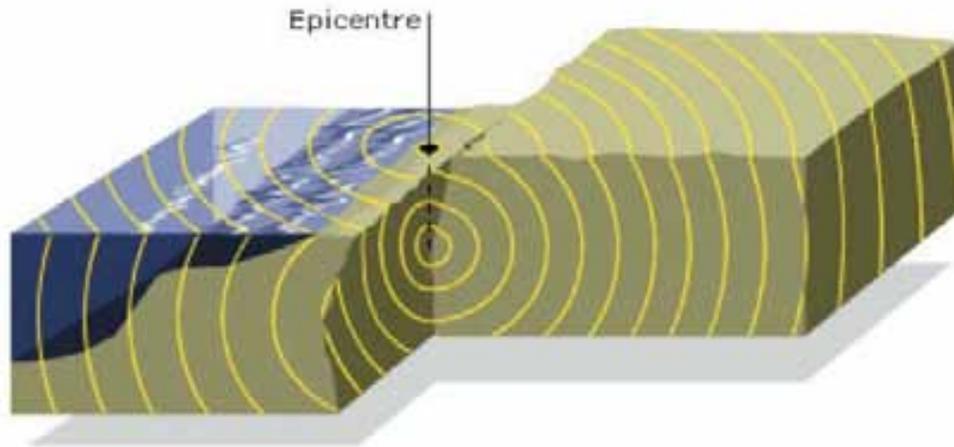
Basic Plate Tectonics

(Courtesy of the BBC)

An earthquake emits its power as three waves of energy. Primary, or P-waves are felt as a sudden jolt. Secondary, or S-waves arrive a few seconds later and are felt as a more sustained side-to-side shaking.



Surface waves radiate outwards from the epicentre - the point on the surface directly above the hypocentre - and arrive after the main P and S waves.

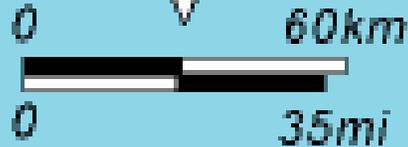


Basic Plate Tectonics

(Courtesy of the BBC)

HAITI

© Lonely Planet



DOMINICAN
REPUBLIC

HAITI

CARIBBEAN SEA

ATLANTIC
OCEAN

Golfe de la
Gonâve

Île de la
Gonâve

Île de la
Tortue

Montagnes du
Nord-Ouest

ATLANTIC
OCEAN

Cap-Haïtien

Parc National
La Citadelle

Gonaïves

Ouanaminthe

Montagnes
Noires

Hinche

Cap de
St-Marc

Côte
des
Arcadins

Plain du
Cul
de Sac

Port-au-Prince

Pétionville

Parc
National
La Viste

Parc
National
Forêt
des Pins

Parc
National
Macaya

Petite
Rivières
de Nippes

Dame
Marie

Jérémie

Les Cayes

Île-à-Vache

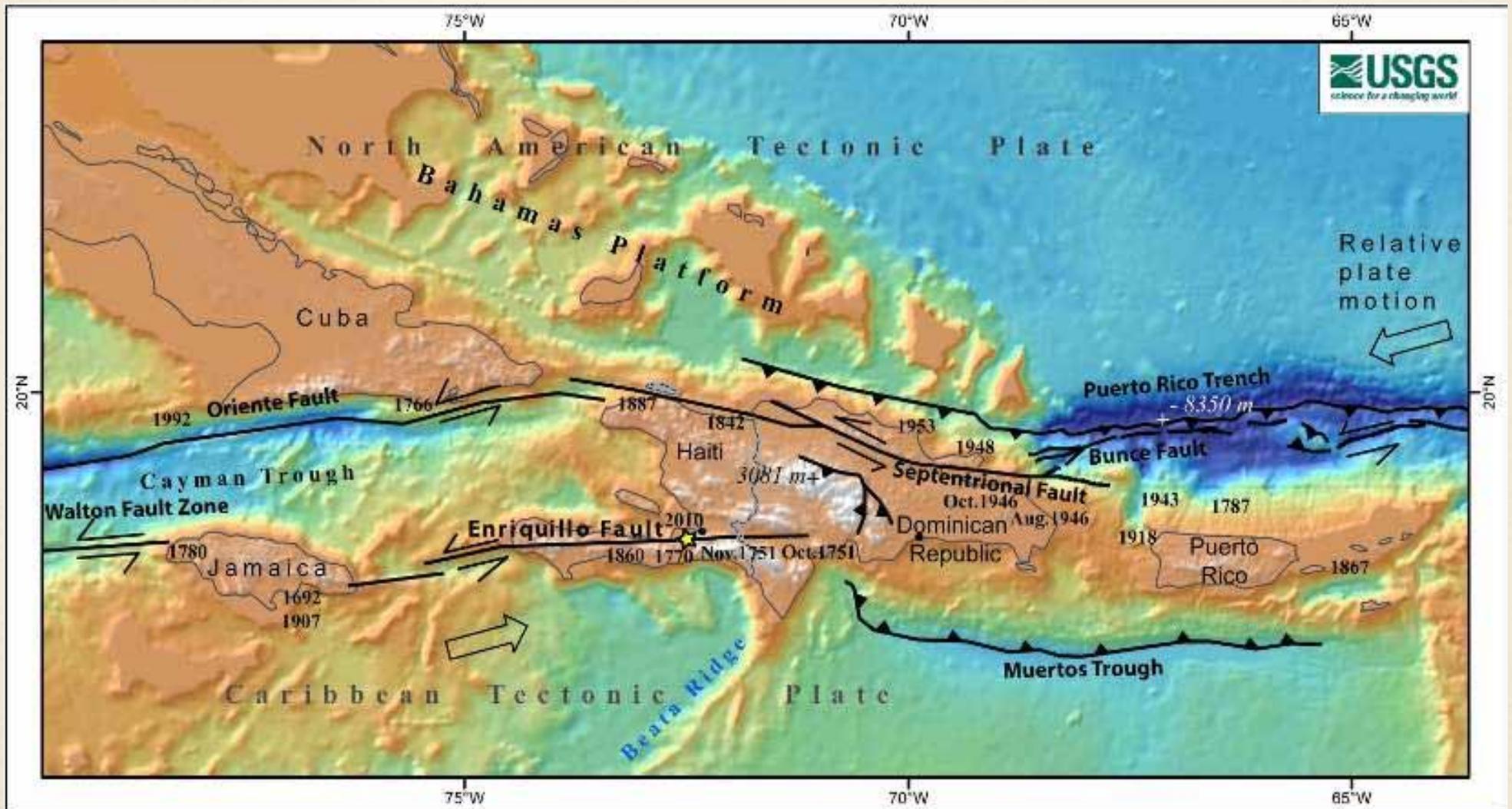
Côtes
de Fer

Jacmel

Jimani

Port Salut

Haiti Seismic Fault Lines



Port-au-Prince Earthquake

- ❖ January 12, 2010 a 7.0 earthquake occurred in the Enriquillo Fault in the mountains outside Port-au-Prince
- ❖ 230,000 dead
- ❖ >300,000 injured with hundreds of amputees
- ❖ 1.3 million displaced
- ❖ A “complex humanitarian disaster”
- ❖ And now the rainy season with mudslides...

Port-au-Prince on January 15





FLORIDA ONE DMAT OPERATIONS



Terminal Varreux

International Airport Port Au Prince

Mais Gate

U.S. Embassy in Port-au-Prince

Image © 2010 DigitalGlobe
Image © 2010 GeoEye

Google

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

18°35'56.11" N 72°24'15.89" W elev 0 ft

Eye alt 48.49 mi

Our Mission--Haiti by the Numbers

- ❖ US Embassy: 120 GREEN, 44 YELLOW, 13 RED and 3266 refugee relief in 9 days
- ❖ Toussaint L'Ouverture Airport: 15 GREEN, 9 YELLOW, 6 RED, 1 BLACK and 4064 refugee relief in 9 days
- ❖ Terminal Varreux Triage Station for USNS Comfort: 67 GREEN, 24 YELLOW, 34 RED, 4 BLACK and 129 refugee relief in 3 days
- ❖ Total: 7454 patients for our 31 person team

The US Embassy

EMBASSY OF THE
UNITED STATES OF AMERICA



AMBASSADOR
TERRY J. BRIDGES











The Orphans (or were they?)







The Streets of Port-au-Prince

What's Left....





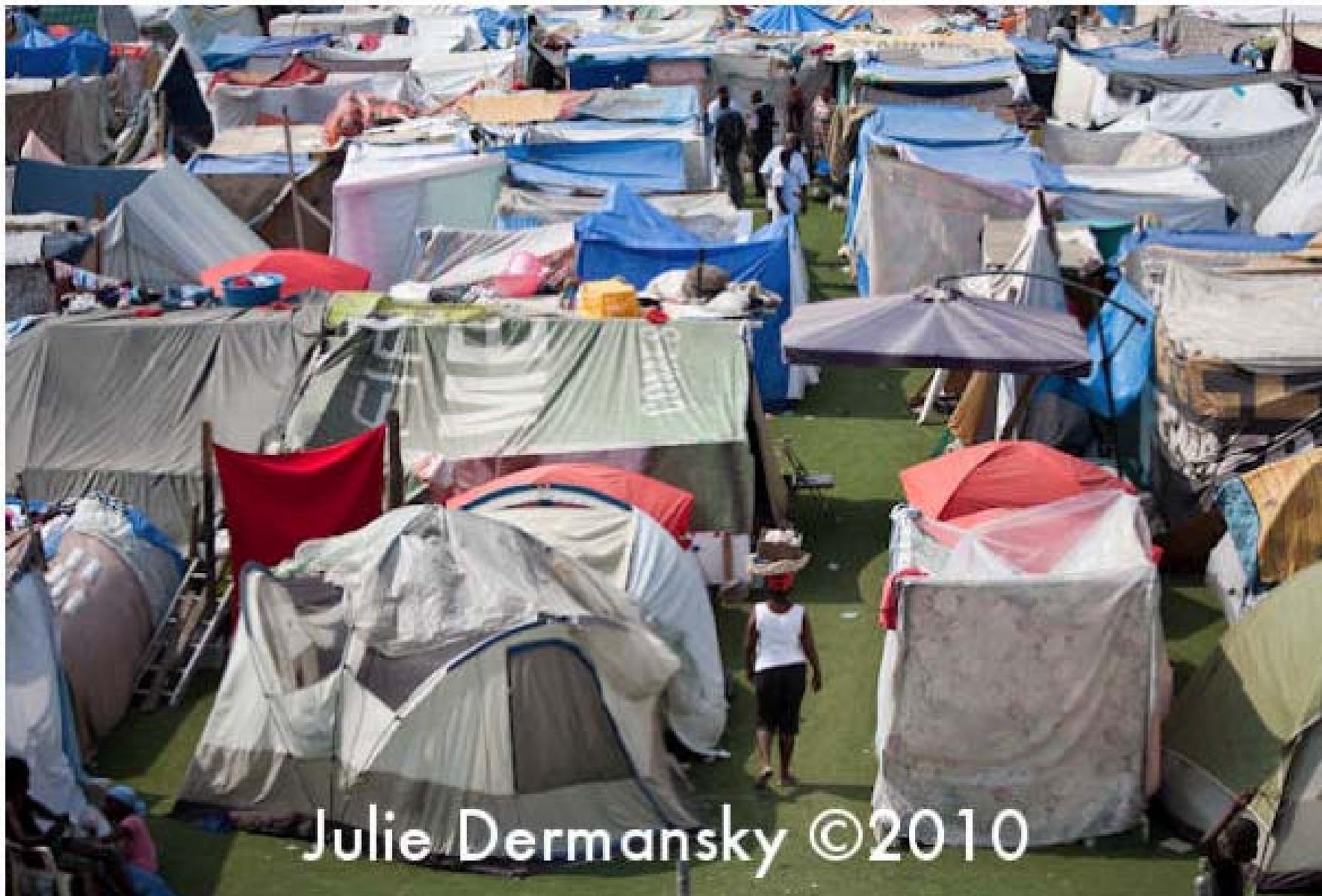




Aerial View of Tent City in Port-au-Prince



Tent Cities in Port-au-Prince



Julie Dermansky ©2010

Airport Operations



AEROPORT INTERNATIO







Chilean AF Sent Relief to Haiti—
Foreshadowing?

Triage Station

Terminal Varreux

Triage Station Terminal Varreux

- Casualty Collection point for patients being transferred to USNS Comfort
- Helicopters would ferry patients to us from all over Port-au-Prince and from us out to the Comfort
- Patients discharged by the Comfort brought to us for further disposition
- A very busy M*A*S*H unit

ATTENTION à la Drogue!
Drugs are PROHIBITED
Drogăe sînt PROHIBITE



INTERNATIONAL
VALENTIN



MASH



USNS Comfort in Port-au-Prince



Converted supertanker with 1000 beds, 10 Operating Suites,
and a CT Scanner









**Lots of child
amputees--
What will their
lives be like?**

















What Went Right in Haiti

- Lots of highly talented, dedicated healthcare workers
- Lots of desire to help
- Personnel safe within Embassy
- Lots of people helped/saved--7500 in 2 weeks by our 31 person team

What Went Wrong in Haiti

- Lack of security outside the Embassy (“fortress mentality”)
- Lack of SOPs for international response (DMATs are CONUS assets usually)
- Poor communication
- Rushed in without adequate planning--”Don’t just do something, stand there!”
- Much done for benefit of media/political theater

What Went Wrong in Haiti

- Inadequate food & water
- Lack of Unified Command
- Too much micro-management with crossed wires
- Some Haitians perceived US as occupying force

So How Do I Prepare?

- Pick “safe places” around the workplace --a sturdy table or desk AWAY from windows, bookcases or tall furniture that could fall
- Distance to safety should be <<10 feet--the greater the distance, the greater the chance of injury
- Practice “Drop, Cover, Hold On” until it is second nature
- Door frames are not as safe as you think



Earthquake

- If inside--stay inside. If outside, stay outside
- Get away from anything that could fall on you (outside--a wall, trees, power poles, light poles)
- Curl up and protect your head (especially eyes)
- Wait in safe place until shaking stops
- Watch for fires--most common earthquake-related hazard due to broken gas lines, damaged power lines, sparks, etc.

Collapsed Structure Hazards

- Water line breaks--flooding (basements)
- Pathogen exposure from sewer breaks
- Shock hazard--downed power lines
- Smoke and dust (asbestos?)
- Natural gas leaks
- HAZMAT (ammonia, leaking fuel, etc)

Collapsed Structure Hazards

- Structural instability
- Lack of oxygen
- Slip/Trip/Fall hazards
- Being struck by falling debris
- Fire
- Sharp objects (glass, etc)
- Disorientation in unfamiliar surroundings

If Trapped Under Debris...

- DON'T LIGHT A MATCH (gas??)
- Don't move around or kick up dust
- Cover your mouth/nose with handkerchief or clothing
- Tap on a pipe or wall so rescuers can locate you--shout only as a last resort as it can cause you to inhale dangerous amounts of dust

Earthquake

- Don't forget aftershocks--can be severe
- If you have to leave building after quake--use stairs
NOT elevators
- Have workplace disaster plan and practice it!
- Make sure all employees know where to go and
what to do
- Get training especially CPR and First Aid

All Hazards

- An approach to disaster preparedness in general
- No matter what the hazard, an all hazards approach allows a common sense response
- Cannot have a separate disaster plan for each possible disaster
- Make your disaster plan generic and simple
- Train! Practice the plan until it breaks, fix it and practice again! (*a never ending iterative process*)

NASA Earthquake Preparedness

- Ames conducted Great Worden Quake II November 5-6, 2008
- Dryden conducted Great California Shakeout November 13, 2008
- Ames has DART
- Keep practicing!

Questions?



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