

12 January 2010 Haiti Earthquake

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style
4 February 2010 EERI Annual Meeting

Current Statistics

(CNN & Wikipedia as of Jan 28th)

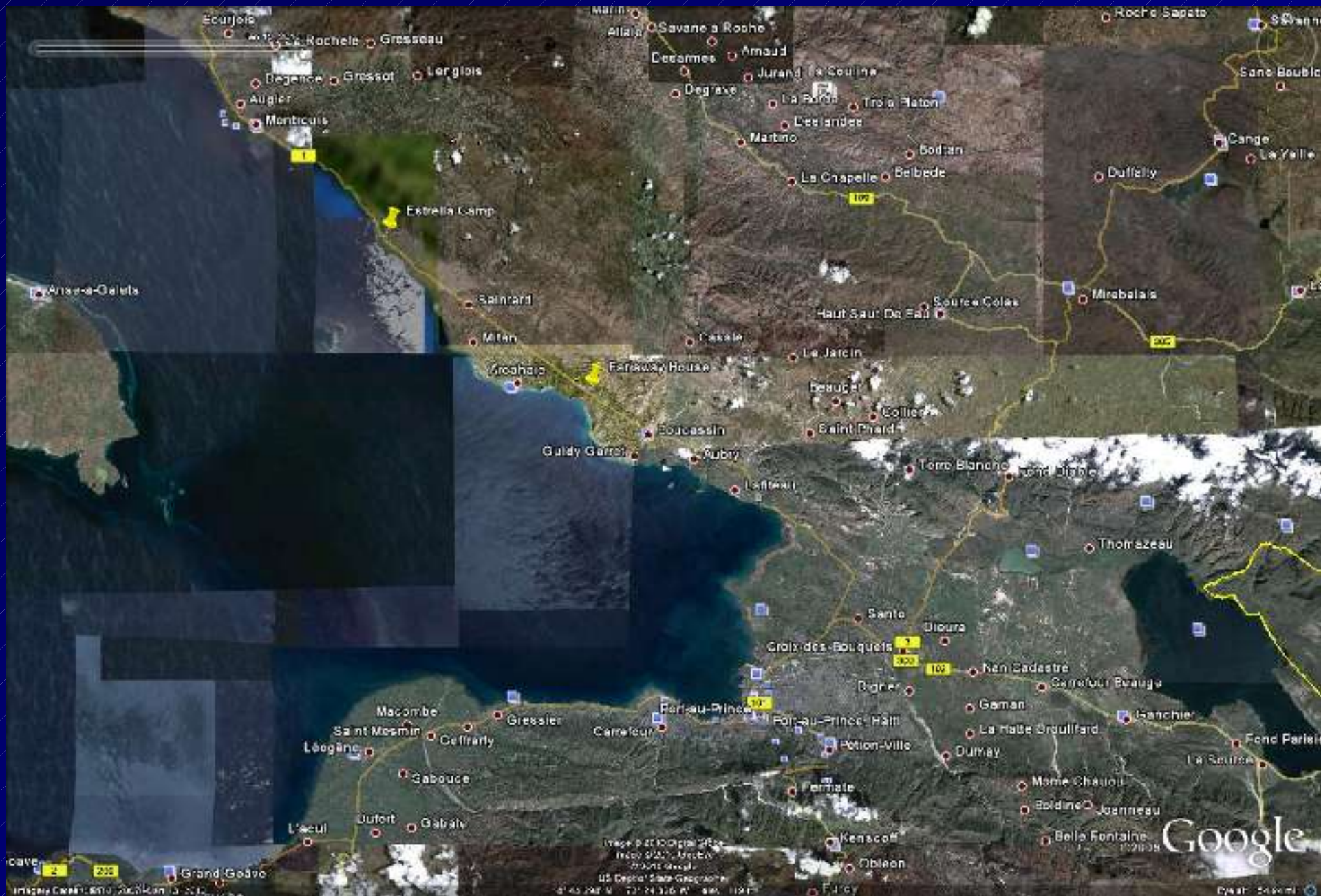
- **170,000+:** Confirmed deaths
- **250,000:** Est. number of injured
- **3 million:** Est. number of people affected
- **1 million:** Est. number of displaced people
- **225,000:** Residences destroyed (?)
- **20,000:** Commercial structures destroyed (?)
- **90%:** Schools in Port-au-Prince destroyed
- **11 of 13:** Haitian ministry buildings damaged

Reconnaissance Itinerary

- Jan 12: Received call from DR while ground still shaking (long before USGS email arrived); left SFO to Santiago, DR
- Jan 13: Arrive Santiago DR; make preparations
- Jan 14: Flew to Port-au-Prince early; Petion Ville, Port-au-Prince; return to DR at night
- Jan 15: Planning, collected supplies for travel by car (extra gas, food, water, first aid supplies, batteries, etc.)
- Jan 16: Drive 6 hours to Haitian border; stayed in hotel in DR
- Jan 17: Port-au-Prince, Carrefour, Petion Ville: main port, buildings, bridges, steel factory, abandoned electrical plant, clinic; drive north to Camp
- Jan 18: Drive west in search of fault trace, Leogane, US Embassy; Camp
- Jan 19: Port-au-Prince: fuel port, fuel tank farm, 2 electric plants, cement factory, water treatment plant, water tank; return to Camp Estrella
- Jan 20: 21-hour bus adventure back to Santiago DR; bus held at border and later broke down at side of road!

Hispaniola





Earthquake Data

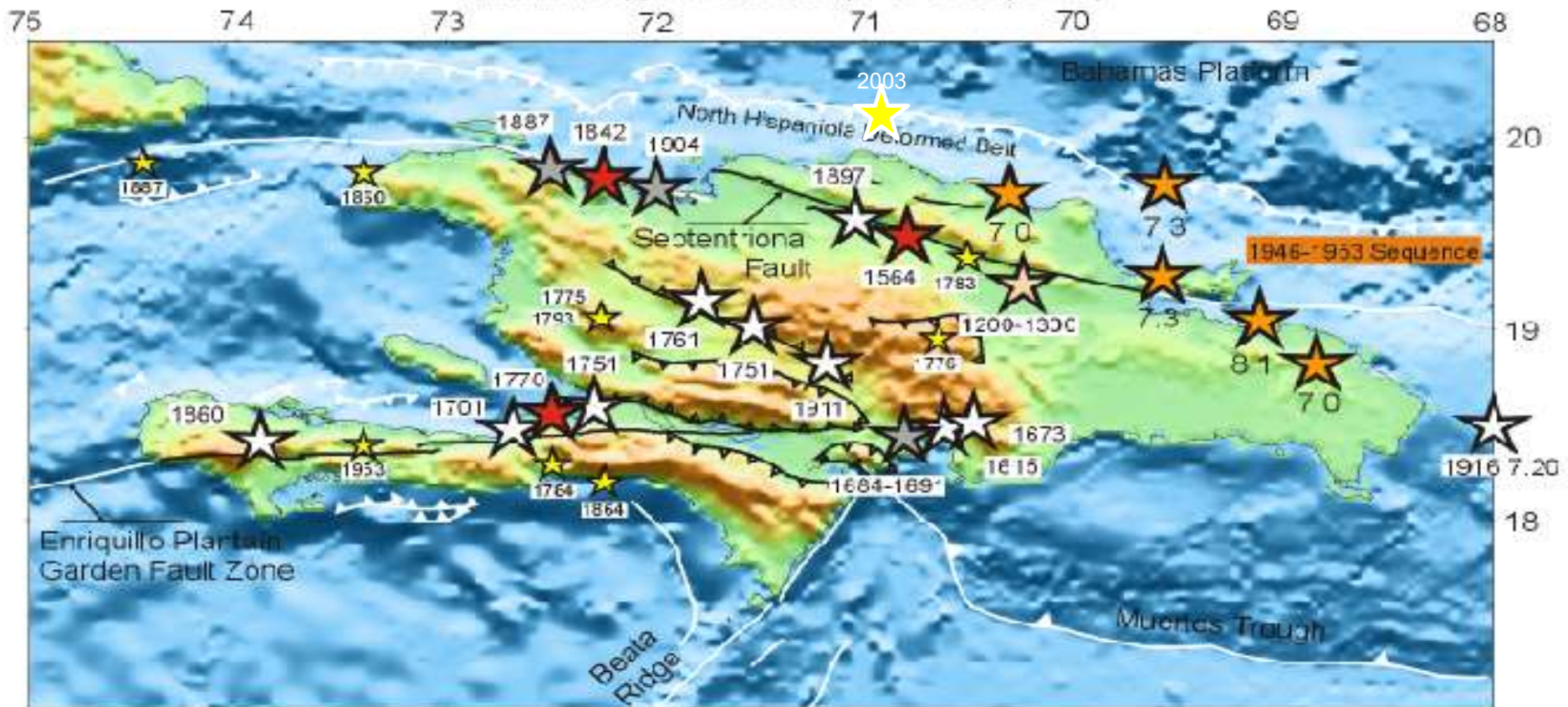
<u>Magnitude</u>	7.0
<u>Date-Time</u>	Tuesday, January 12, 2010 at 21:53:10 UTC Tuesday, January 12, 2010 at 04:53:10 PM at epicenter Time of Earthquake in other Time Zones
<u>Location</u>	18.457°N, 72.533°W
<u>Depth</u>	13 km (8.1 miles) set by location program
<u>Region</u>	HAITI REGION
<u>Distances</u>	25 km (15 miles) WSW of PORT-AU-PRINCE, Haiti 130 km (80 miles) E of Les Cayes, Haiti 150 km (95 miles) S of Cap-Haitien, Haiti 1125 km (700 miles) SE of Miami, Florida
<u>Location Uncertainty</u>	horizontal +/- 3.4 km (2.1 miles); depth fixed by location program
<u>Parameters</u>	NST=312, Nph=312, Dmin=143.7 km, Rmss=0.93 sec, Gp= 25°, M-type=teleseismic moment magnitude (Mw), Version=9
<u>Source</u>	USGS NEIC (WDCS-D)
<u>Event ID</u>	us2010rja6







LOCATION



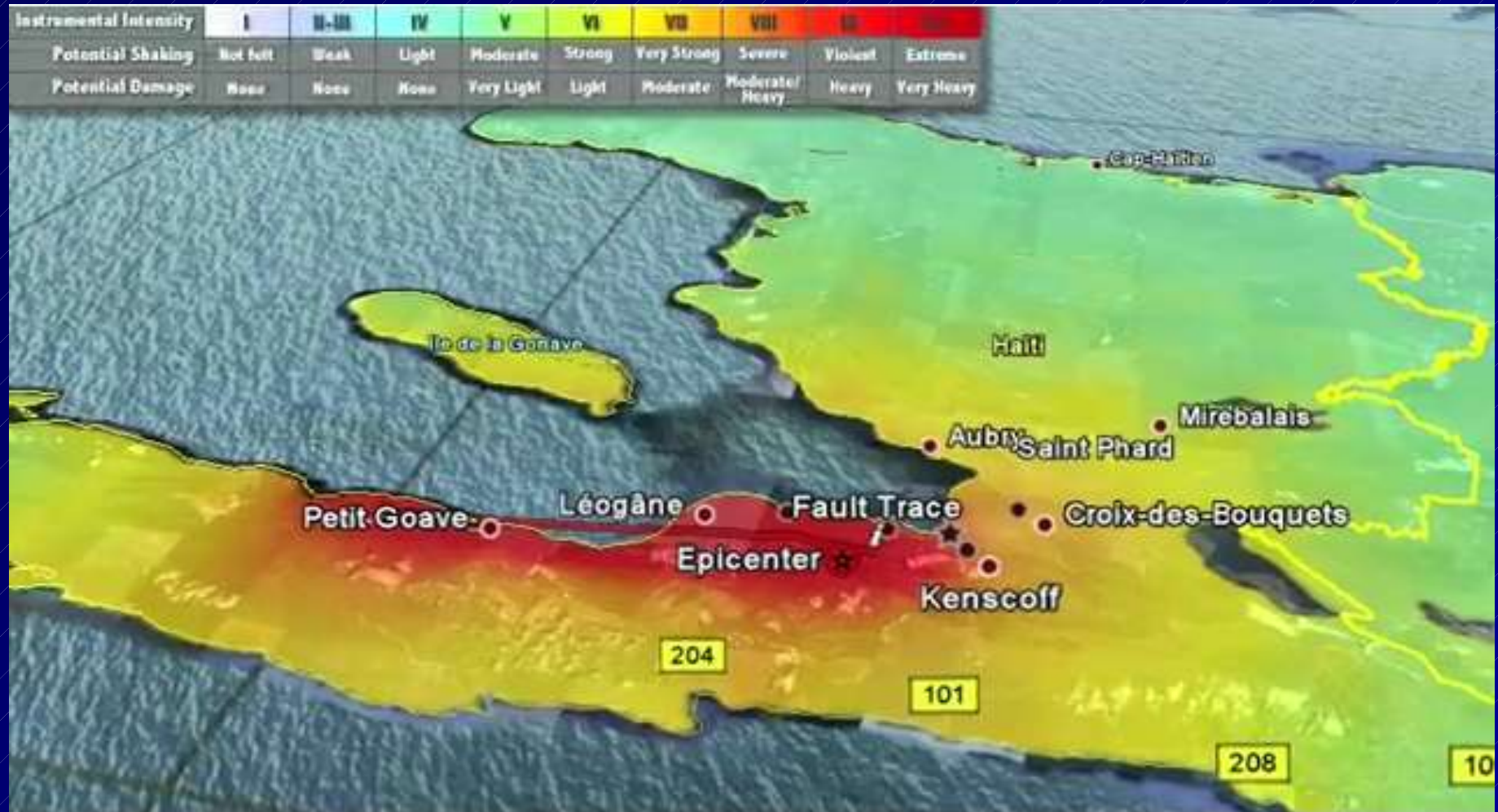
Historic Earthquakes in La Hispaniola

Historical seismicity in Hispaniola (before 1960)
(locations approximate except 46-53 sequence)



-  Major earthquakes
-  Other EQ
-  Paleo-earthquakes
-  Large EQ, city destroyed
-  1946 sequence
-  Moderate EQ (NOAA DB)

INTENSITY

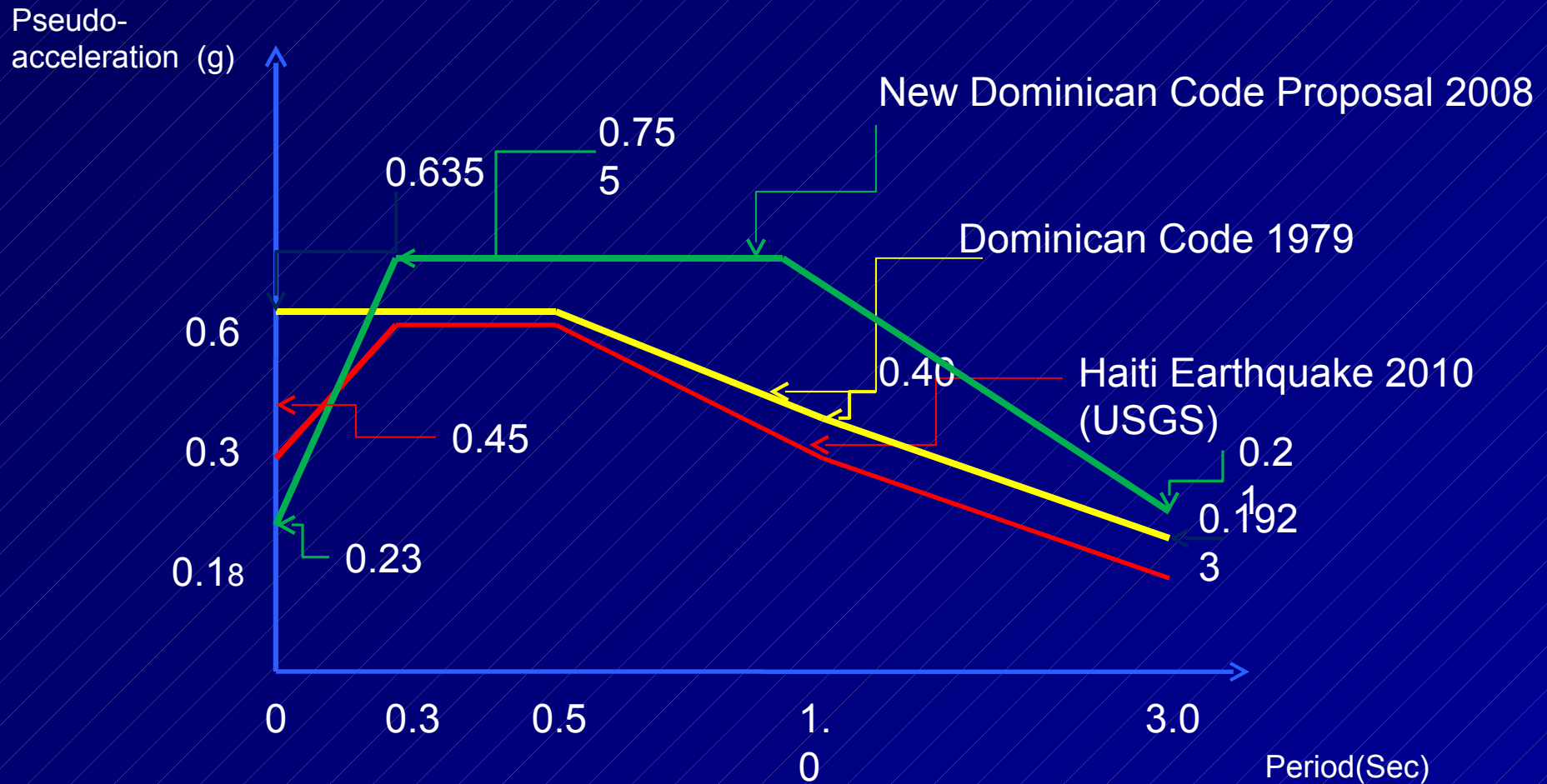


GROUND ACCELERATIONS AS PER USGS



Acceleration Response Spectra HAITI 01/12/2010

(Haitian EQ compared to Dominican Code)



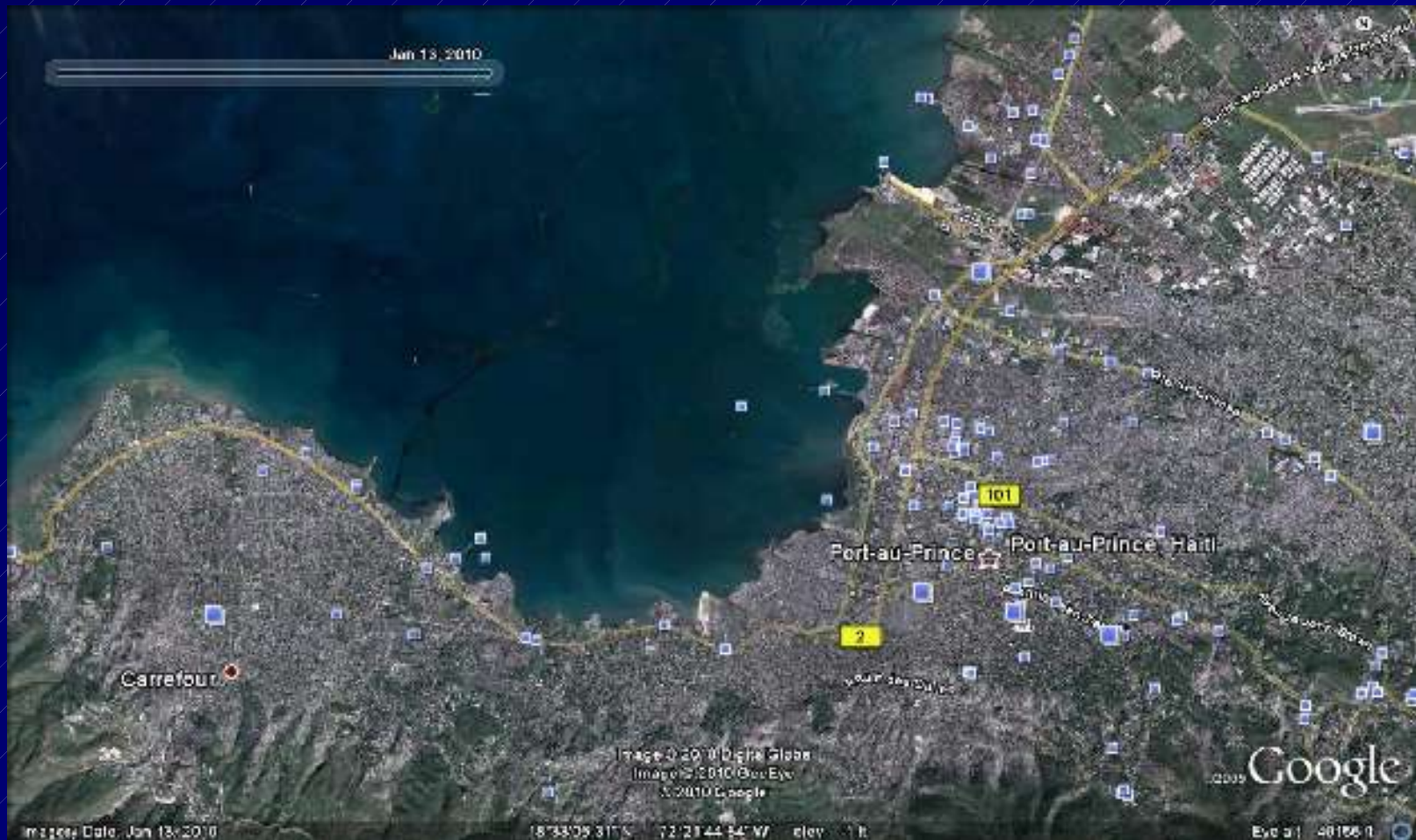
Landslides







Overview, Port-au-Prince



























Typical Concrete Details















Leogane, 2-story school



Leogane, 3-story university building under construction



Airport



Main Port

■ Before



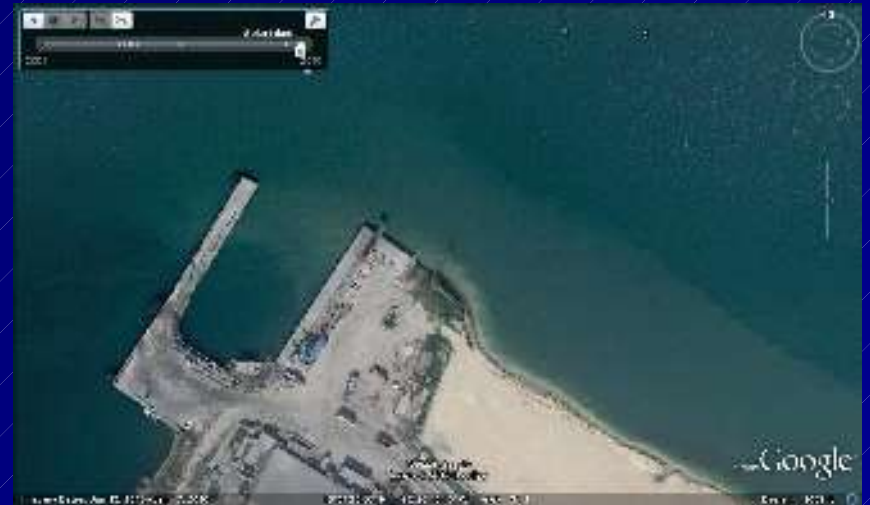






Fuel Port

■ Before







2 Electric Power Plants, both out of service







Fuel Tank Farm





Conclusions

- Tall structures with long periods suffered little damage suggesting low spectral accelerations in the long period range
- Pockets of heavy damage or little damage in Port-au-Prince suggest amplification of the accelerations due to soft soils
- Maximum acceleration higher than 0.3g estimated by USGS, probably 0.4g to 0.5g
- Structures very brittle; complete absence of seismic detailing; quality of construction poor; observed failures of wood, reinforced concrete, confined masonry, and unreinforced masonry
- Prevalent use of heavy unreinforced block walls and concrete slabs
- Haiti had no building code, no seismic code, no seismic engineering curriculum. Procedures for permits and inspections on the books but not enforced.

Additional Info

- **Eduardo Fierro, 2-hour webcast & pdf**

http://peer.berkeley.edu/publications/haiti_2010/related_events_haiti.html

http://peer.berkeley.edu/publications/haiti_2010/documents/Haiti_Earthquake_20100127_UC_Berkeley.pdf

- **Photo collection (3,000+ photos)**

http://peer.berkeley.edu/publications/haiti_2010/photo_gallery_haiti.html

- Subset posted at EERI eqclearinghouse

<http://www.eqclearinghouse.org/20100112-haiti/category/structural>

- **PEER Preliminary Reconnaissance Report**

http://peer.berkeley.edu/publications/haiti_2010/documents/Haiti_Reconnaissance.pdf

Acknowledgments

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 - Palito (security), Daniel & Ronald (drivers and companions)
 - Cecelia (Cook)

Thanks!

