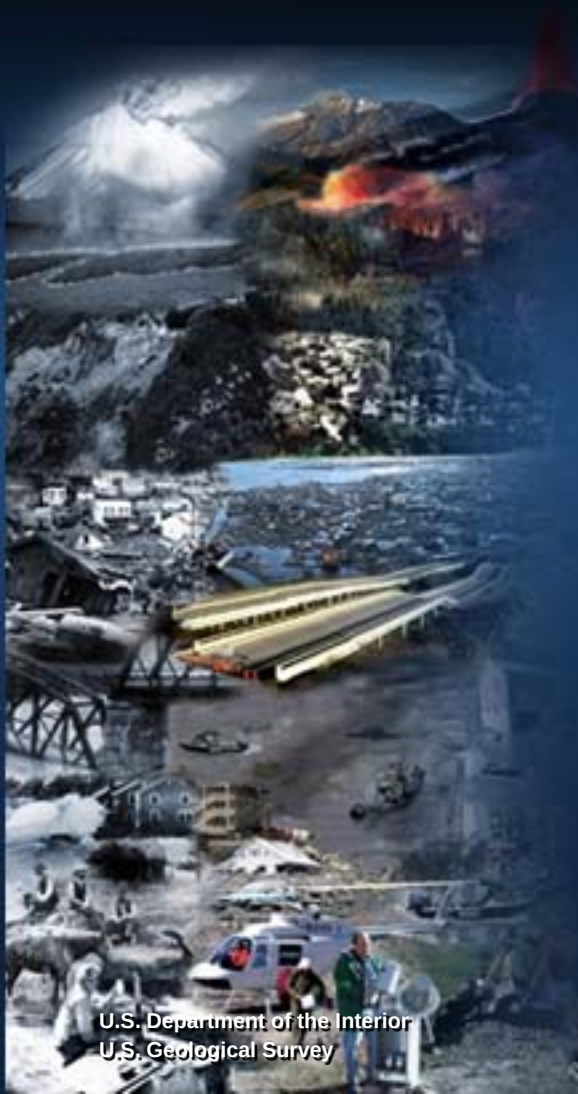
USGS
science for a changing world

Earthquakes ★ Floods ★ Hurricanes ★ Landslides ★ Tsunamis ★ Volcanoes ★ Wildfires

Update on USGS Earthquake Hazards Program

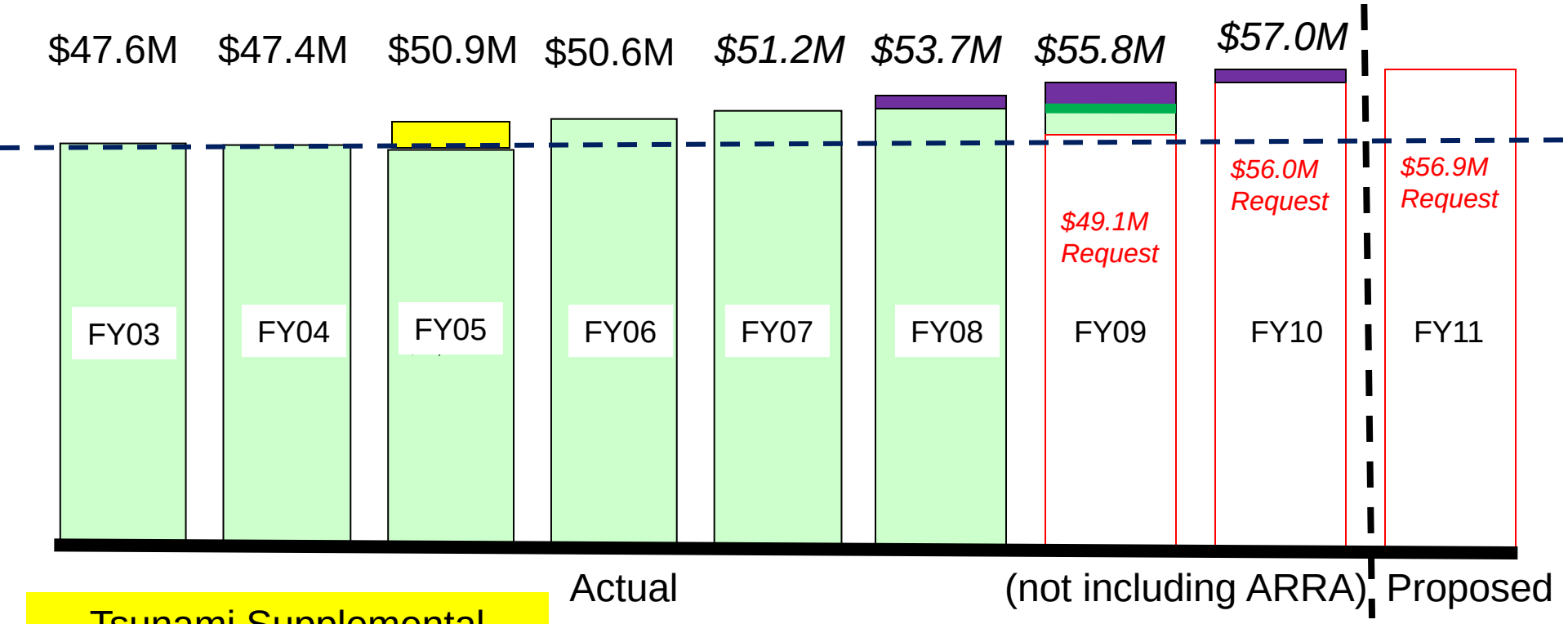
ACEHR Meeting

March 2010



U.S. Department of the Interior
U.S. Geological Survey

Recent Earthquake Hazards Program funding history and FY11 proposed request



Tsunami Supplemental
(became part of base in FY06)

Congressional adds for Multi-Hazards Initiative

Arkansas earmark

FY10 House mark added $1M above request for "critically needed LIDAR and other seismological studies of areas with high earthquake risk and community danger."

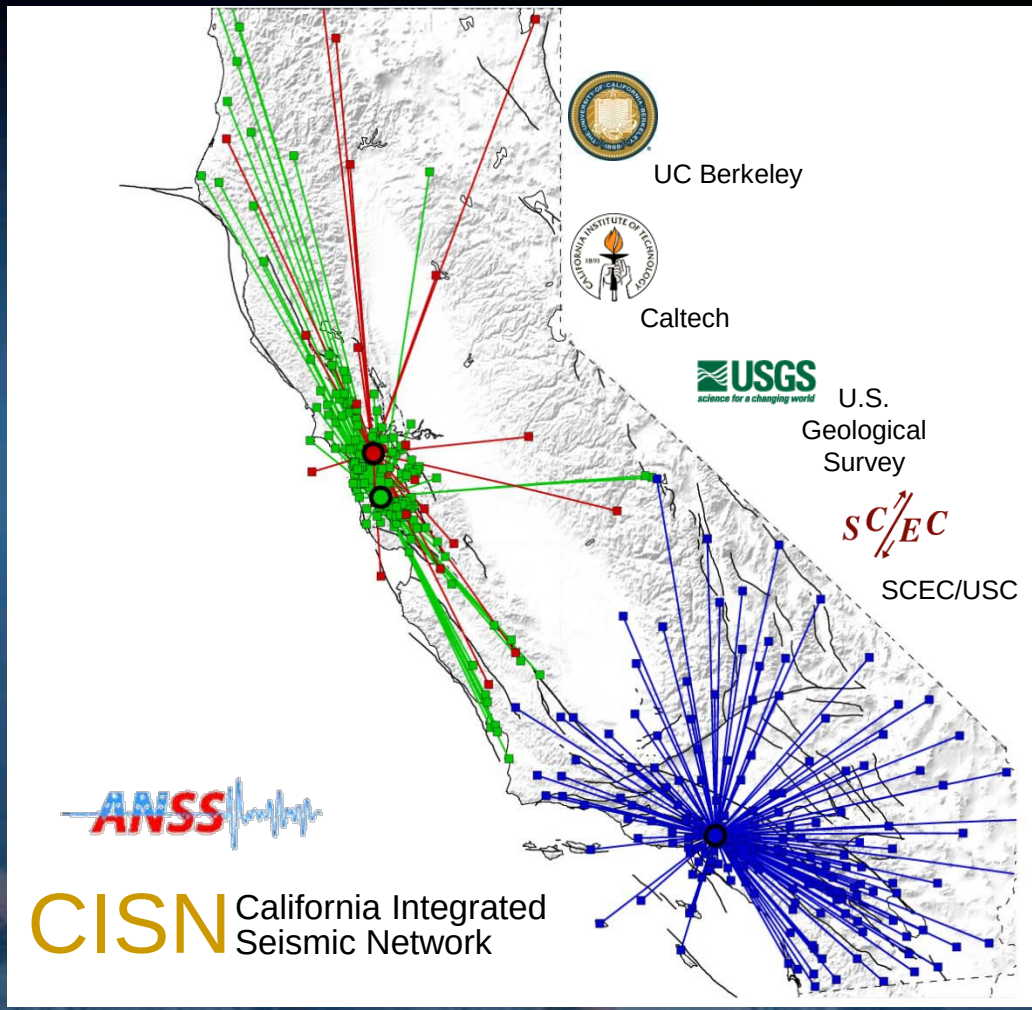
Taking the multi-hazard initiative on the road in FY11: Pacific Northwest and Alaska

- **Southern California Multi-Hazards Demonstration Project (+$1.7M)**
  - Earthquake Hazards Program for early warning and operational earthquake forecasting (+1M)
  - Mineral Resources, Ecosystem, and Geography programs for economic, environmental and ecosystem impact analysis (+$0.7M)
- **Pacific Northwest (+$0.9M)**
  - EHP for Netquake deployment and EM training on USGS products (+$0.4M)
  - Volcano Hazards Program for improved forecasting of volcanic events, implementing National Volcano Early Warning System (+$0.5M)
- **Alaska (+$1.1M)**
  - EHP for assessing tsunami-generating earthquake sources (+$0.4M)
  - High-threat volcano monitoring (+$0.7M)
- **Add volcano quake detection role to NEIC 24/7 operations (+$0.3M)**

USGS nehrp

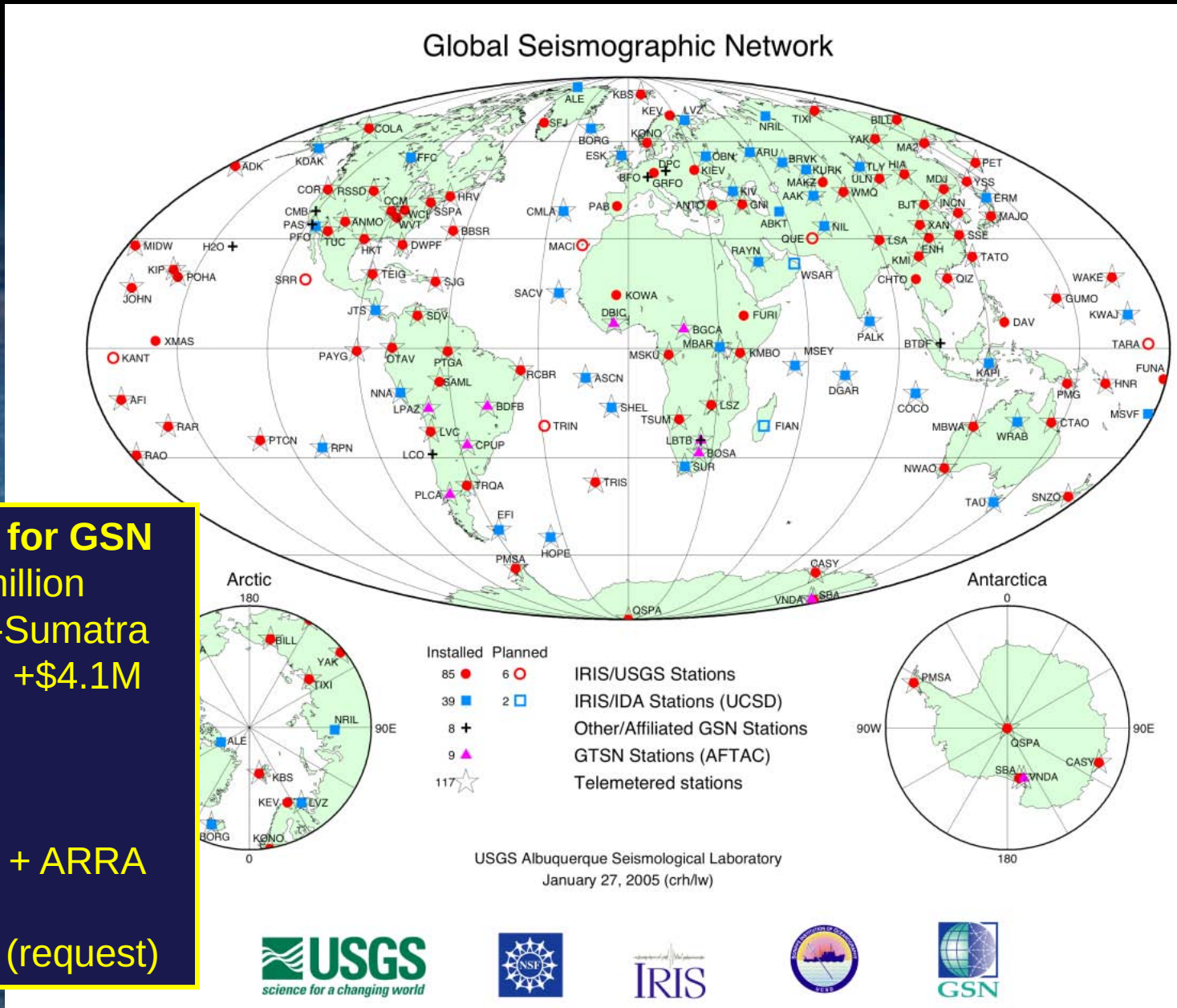
Earthquake early warning – getting ahead of strong ground shaking

- USGS/CISN Phase I (2007-2009) cooperative agreement supported algorithm testing
- Phase II (2010-2012) supports prototype development and identifies test users
- ARRA funding used to reduce datalogger delays
- EEW requirements:
  - -- rapid earthquake detection
  - -- early magnitude estimation
  - -- ground shaking prediction
  - -- robust monitoring networks
  - -- well-defined user community



USGS nehrp

Global Seismographic Network



USGS Funding for GSN

FY 2005: $3.4 million

FY 2005 post-Sumatra supplemental: +$4.1M

FY 2006: $3.9M

FY 2007: $3.9M

FY 2008: $4.4M

FY 2009: $5.5M + ARRA

FY 2010: $5.8M

FY 2011: $5.4M (request)

NEHRP Strategic Priorities

- **Fully implement the Advanced National Seismic System.**
- Improve techniques for evaluating and rehabilitating existing buildings.
- Further develop Performance-Based Seismic Design.
- Increase consideration of socioeconomic issues related to hazard mitigation implementation.
- Develop a national post-earthquake information management system.
- Develop advanced earthquake risk mitigation technologies and practices.
- Develop guidelines for earthquake-resilient lifeline components and systems.
- **Develop and conduct earthquake scenarios for effective earthquake risk reduction and response and recovery planning.**
- Facilitate improved earthquake mitigation at State and local levels.

USGS nehrp

USGS is using Recovery Act and multi-hazards funds to make progress in these two areas

Advanced National Seismic System (ANSS)

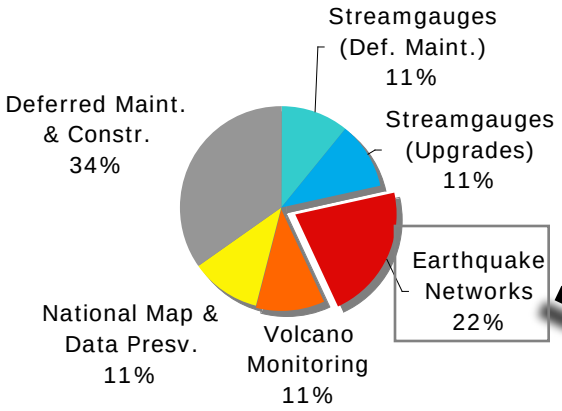
USGS nehrp

ANSS Backbone completion with support from NSF's EarthScope

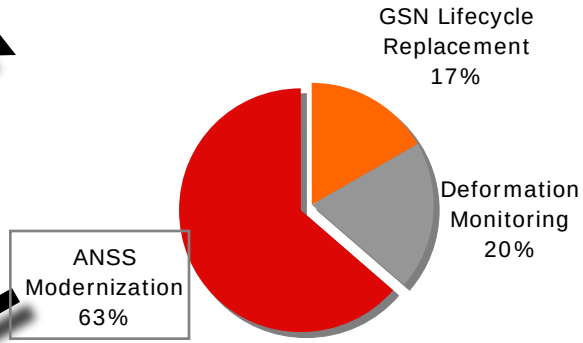
ANSS

USGS spending plan for Recovery Act (ARRA) funding

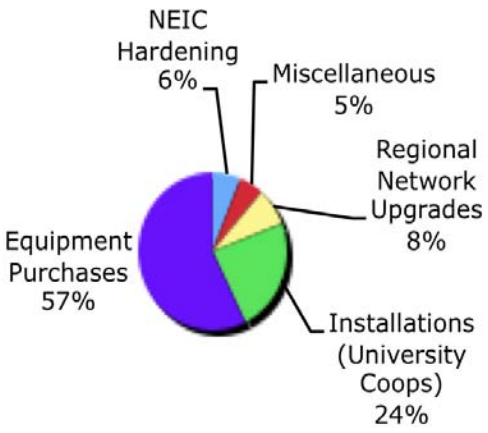
USGS Total: $140M



Earthquake Networks: $29.4M



ANSS Modernization: $19.2M



HELP for HAITI

The President speaks on the urgent situation after the earthquake in Haiti and the government's response. Read his remarks and learn how to contribute to the relief effort.

Learn More

1 2 3 4

Map courtesy of USGS

A NEW FOUNDATION

The President's Plan for Health Insurance Reform

Cut through the rhetoric on health insurance reform. Read the essentials of the President's plan, and watch a video with highlights of his speech to Congress.

Learn More

BACK | NEXT

THE BLOG

FEATURED LEGISLATION

SEARCH the SITE

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Search

PHOTO of the DAY

Situational awareness available in 20 minutes

Prompt Assessment of Global Earthquakes for Response

USGS
science for a changing world

M 7.0, HAITI REGION

Origin Time: Tue 2010-01-12 21:53:10 UTC
Location: 18.46°N 72.53°W Depth: 13 km

GSN USAID FROM THE AMERICAN PEOPLE

PAGER
Version 8
Created: 1 day, 20 hours after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		- -*	- -*	5,887k*	7,261k	1,049k	571k	314k	2,246k	332k
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
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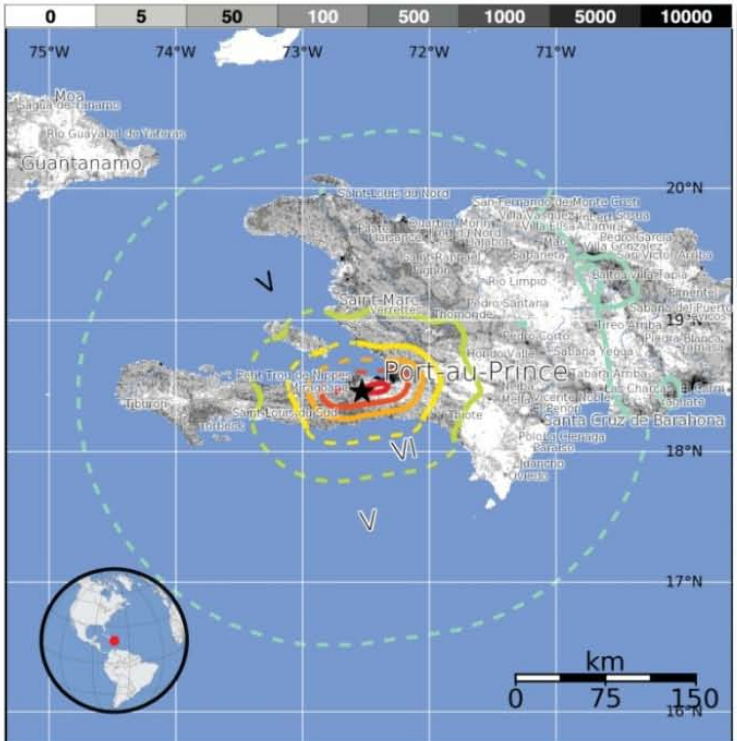
*Estimated exposure only includes population within the map area.

Population Exposure

population per ~1 sq. km from Landscan



Selected City Exposure

MMI	City	Population
X	Grand Goave	5k
IX	**Port-au-Prince**	**1,235k**
IX	Carrefour	442k
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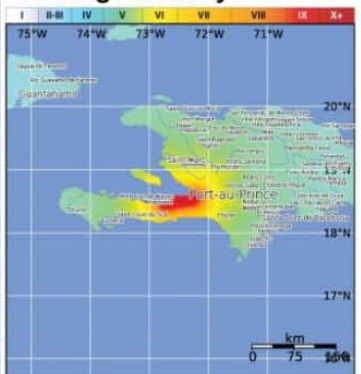
IX	Delmas 73	383k
IX	Croix des Bouquets	9k
VI	**Miragoane**	**6k**
V	**Verrettes**	**49k**
III	Santo Domingo	2,202k
III	**Guantanamo**	**273k**

bold cities appear on map (k = x1000)

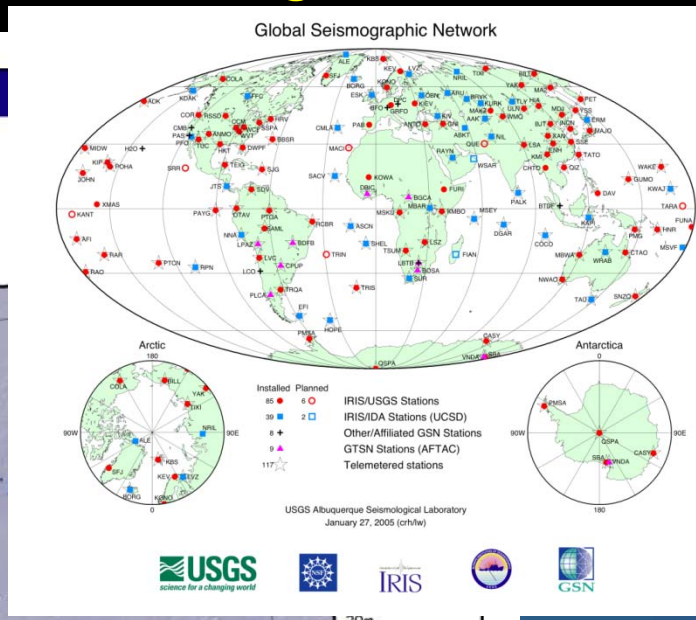
Shaking Intensity

MMI

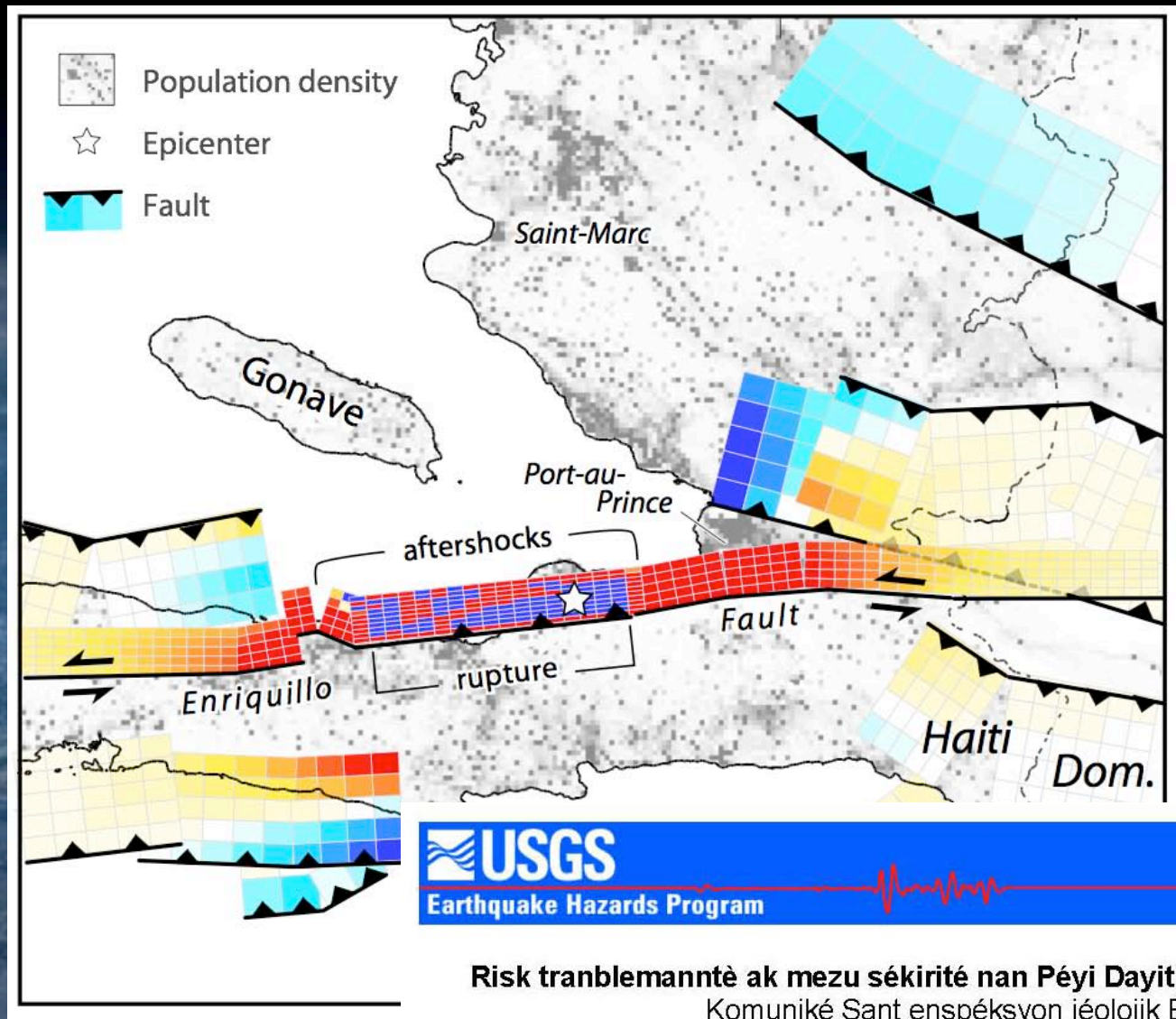


USGS

NOAA-USGS Post-Sumatra tsunami warning initiative



Stress increase on Enriquillo and adjoining faults



USGS
Earthquake Hazards Program

Risk tranblemanntè ak mezu sékirité nan Péyi Dayiti ak tout zòn Karayib-la

Komuniké Sant enspéksyon jéolojik Étazini

28 janvyé 2010

Échèl Richtè, sé yon mannyè pou mezuré puisans yon tranblemanntè.
Yon lòt mo pou di **puisans** yon tranblemanntè, sé **mayitud**.
Yon lòt mo pou di tranblemanntè, sé **séyis**, ou byen **kataklis** tou, ki pi jénéral.

USGS

USAID/USGS Earthquake Disaster Assistance Team

- USGS & USAID Participating Agency Service Agreement, to support USAID Office of Foreign Disaster Assistance (OFDA).
- USGS may assist local geological agencies with conducting rapid earthquake-related assistance, and provide training, analysis, and advice.
- Available to assist with paleoseismology, ground rupture, tsunami studies, seismology, geological engineering, strong-motion instrumentation, geodesy, seismic hazard assessment, and outreach.
- Coordination with sister NEHRP agencies (FEMA, NIST, NSF), Earthquake Engineering Research Institute (EERI), and Incorporated Research Institutions for Seismology (IRIS), among others.

USGS nehrp

EDAT deployment

- Goals of Phase-1 suite of high-priority investigations and analyses:

  1) Obtain geological and seismological information needed to assess the short-term and longer-term seismic hazards facing Haiti.

  2) Deliver an initial suite of hazard maps to underpin a building code that will guide the rebuilding of habitation and infrastructure.

- Elements:
  - Geological investigations of coast, fault and landslides
  - Aftershock recording and site-response analysis
  - Seismic hazard maps for building codes
  - Improved aftershock and triggered earthquake forecasts

USGS nehrp

Uplifted coral reef investigations

USGS nehrp

Photos by Rich Briggs, USGS

Taking sample of coral for analysis

USGS nehrp

Photos by Rich Briggs, USGS

Coral slice to be shipped home for analysis

USGS nehrp

Photos by Rich Briggs, USGS

Seismic station deployment

- Port au Prince Urban Seismic Network
  - Temporary deployment of 8 triggered K2 strong-motion sensors for site-response analysis
- Near-fault aftershock detection (5 Reftek stations)

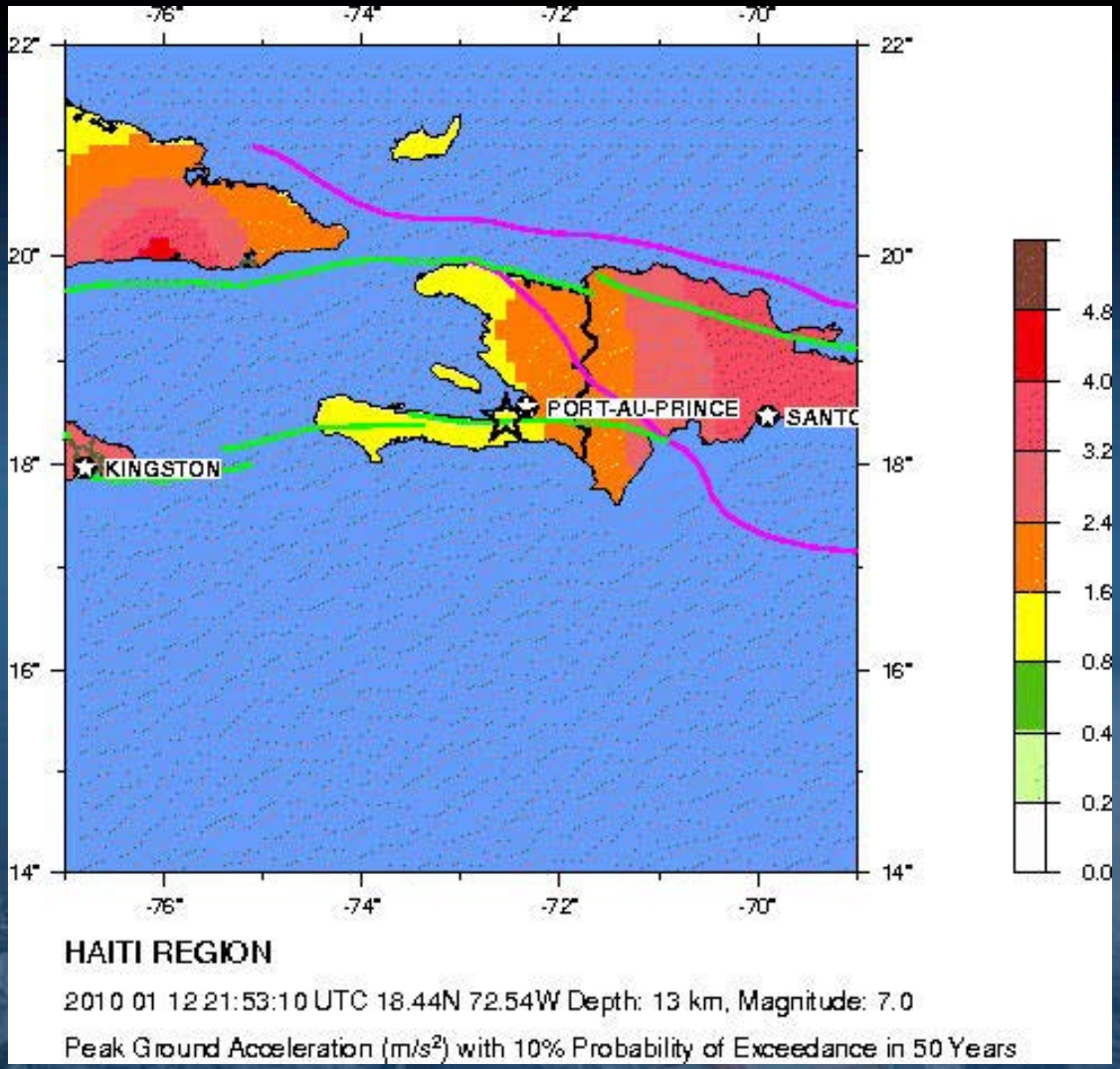
USGS seismologist Doug Given and Haitian colleagues from Bureau of Mines and Energy installing station at school

USGS nehrp

Photo from Sue Hough, USGS

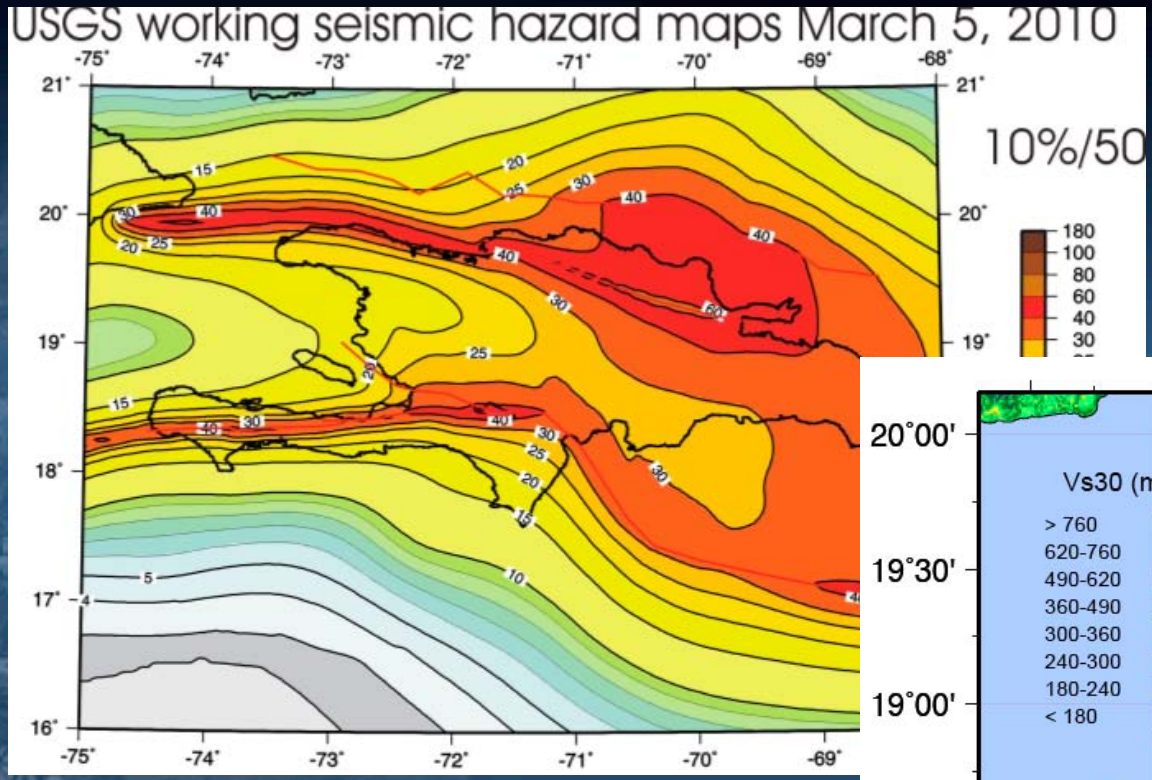
Need for improved seismic hazard analysis

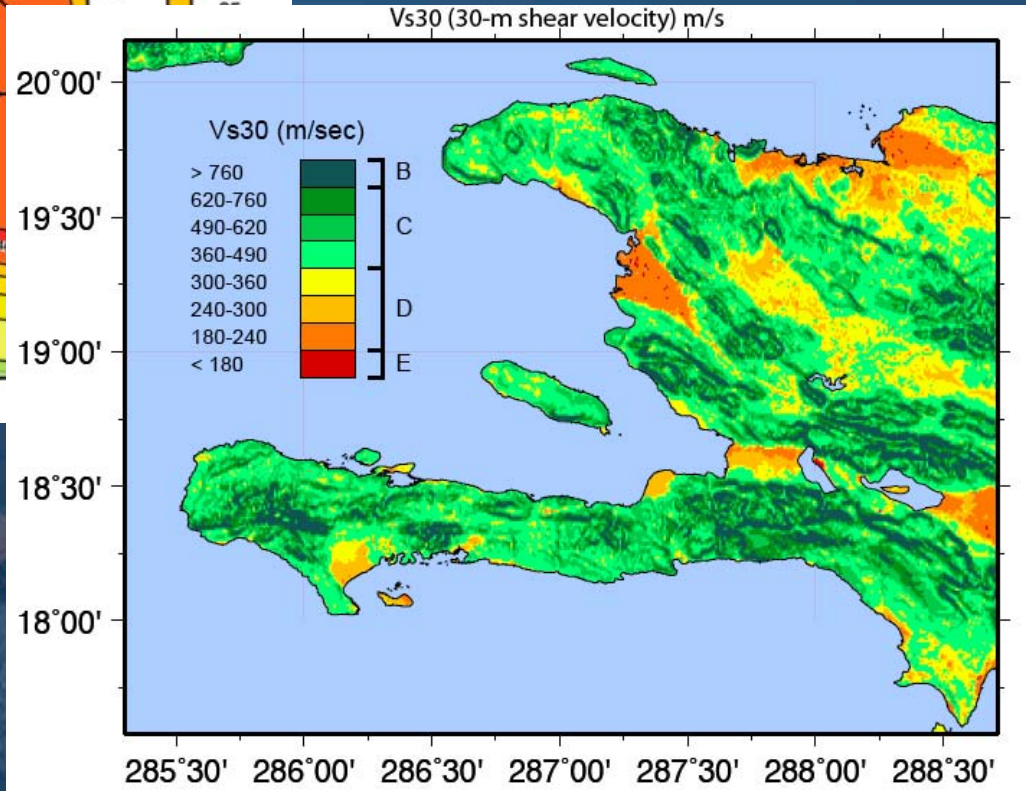
Output from Global Seismic Hazard Assessment Project (GSHAP)



USGS nehrp

Working products for improved seismic hazard analysis





Rebuilding for Resilience: How Science and Engineering Can Inform Haiti's Reconstruction

March 22 - March 23, 2010
University of Miami - Coral Gables, FL

Convened by

National Science and Technology Council
Subcommittee on Disaster Reduction

Co-sponsored by
U.S. Department of State
U.S. Agency for International Development
United Nations International Strategy for Disaster Reduction

Organized by the IRIS Consortium

With support from:
NASA
National Science Foundation
U.S. Geological Survey

USGS

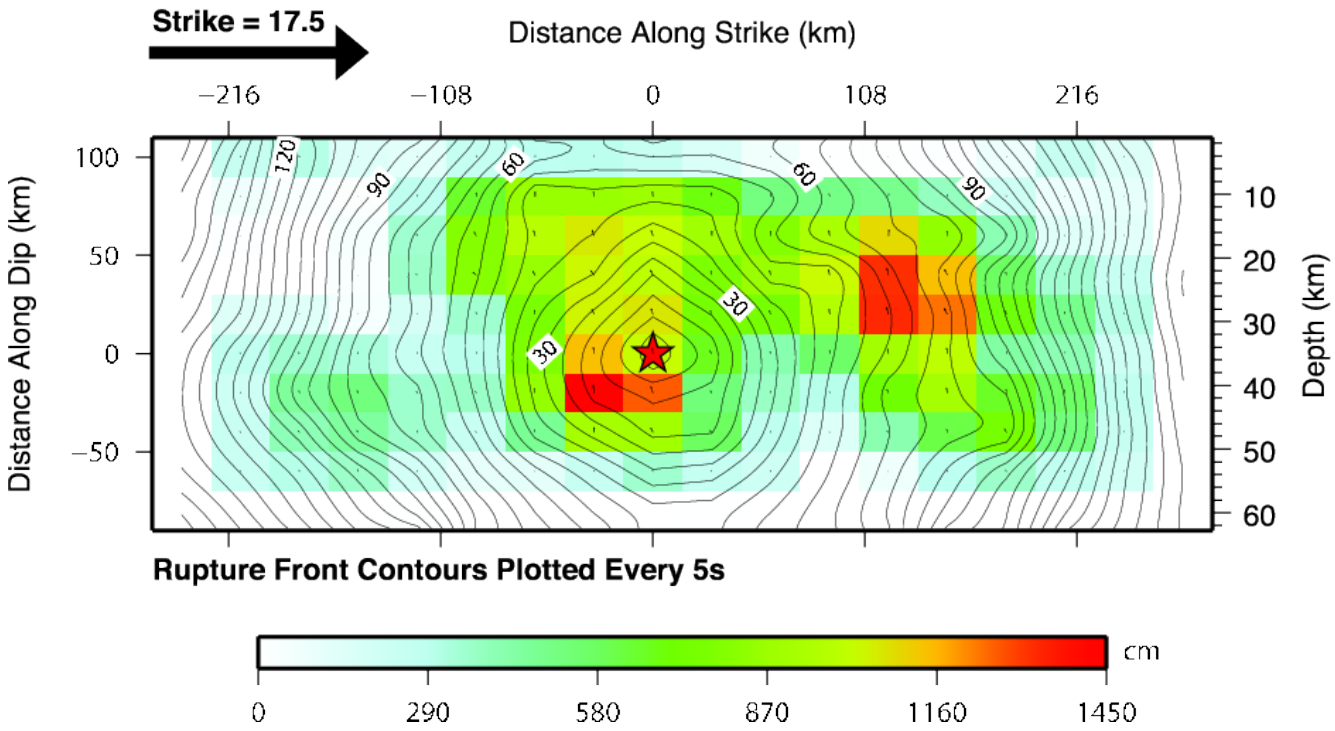
Magnitude 8.8 OFFSHORE MAULE, CHILE

Saturday, February 27, 2010 at 06:34:17 UTC

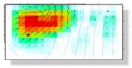
Figure modified from IRIS

Chile

Same Length Scale!

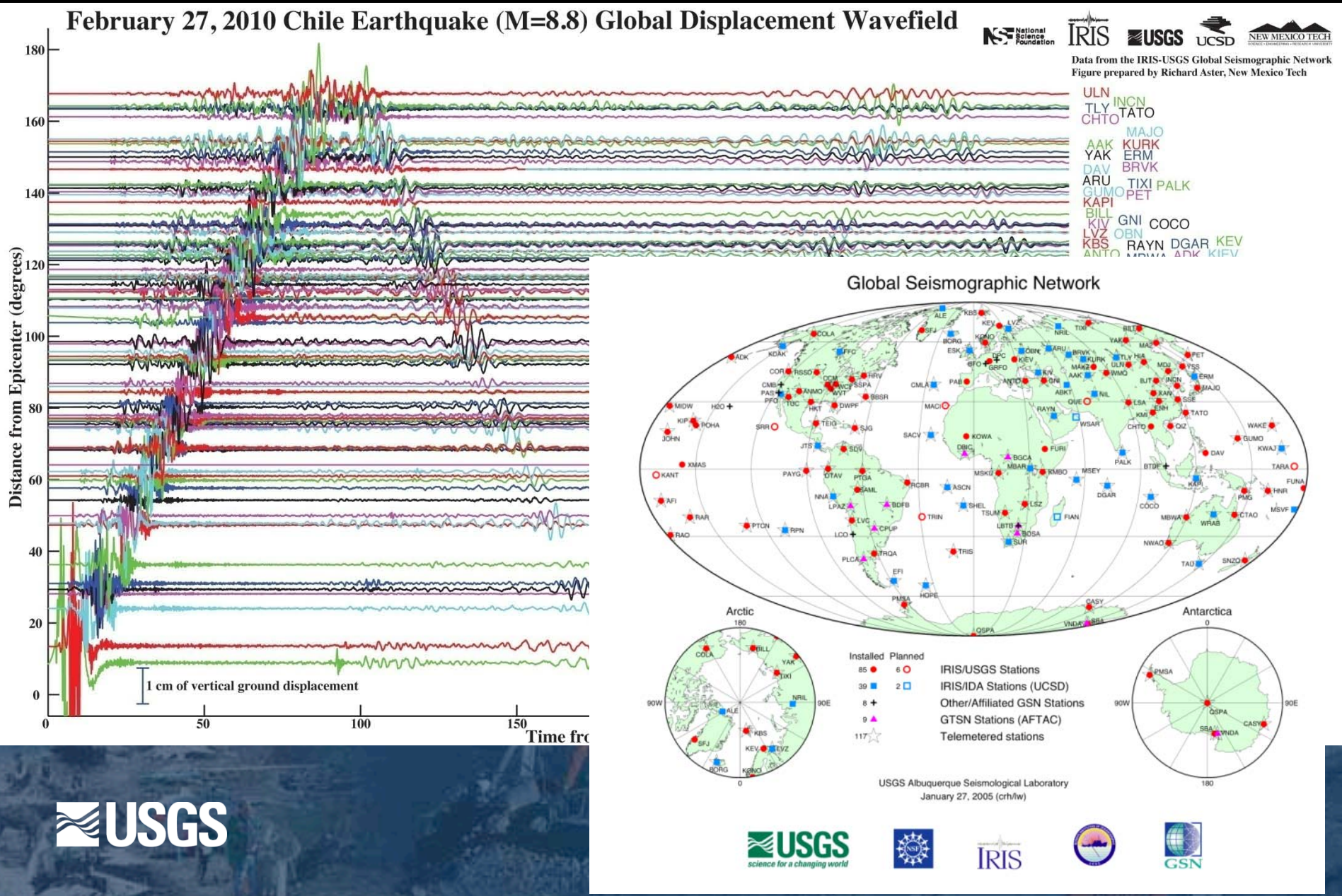


Haiti



Finite fault models by Gavin Hayes, USGS
National Earthquake Information Center

Ringing the Earth like a bell



Situational awareness available in 20 minutes

Prompt Assessment of Global Earthquakes for Response

USGS science for a changing world

GSN USAID FROM THE AMERICAN PEOPLE

M 8.8, OFFSHORE MAULE, CHILE

Origin Time: Sat 2010-02-27 06:34:14 UTC
Location: 35.85°S 72.72°W Depth: 35 km

PAGER
Version 6
Created: 9 hours, 10 minutes after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		- -*	- -*	454k*	1,667k*	527k*	7,578k	5,124k	0	0
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
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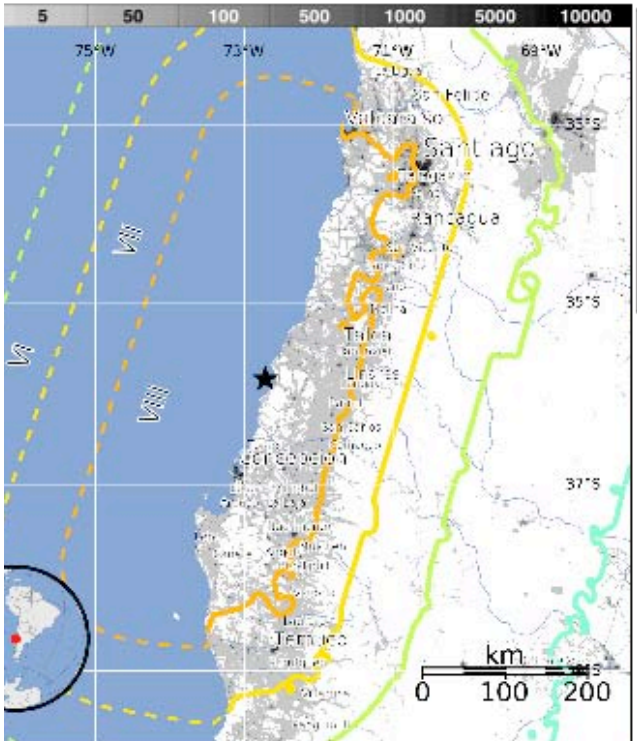

Selected City Exposure

MMI	City	Population
VIII	Arauco	25k
VIII	Lota	50k
VIII	Constitucion	38k
VIII	Concepcion	215k
VIII	Canete	20k
VII	Melipilla	63k
VII	Talca	197k
VII	Rancagua	213k
VII	Temuco	238k
VII	Santiago	4,837k
VI	Valparaiso	282k

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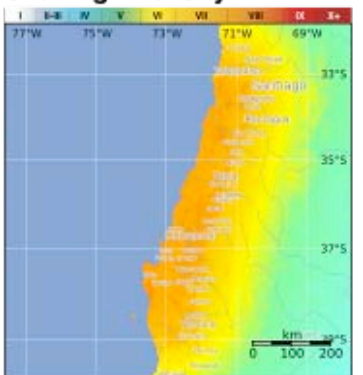
Shaking Intensity

MMI



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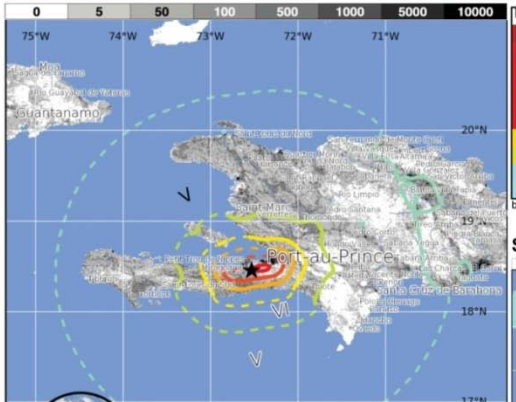

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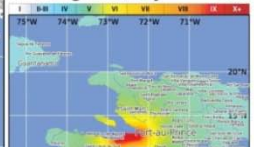

Any questions?

applegate@usgs.gov
703-648-6714