Field Report from the M7.0 Haiti Earthquake Jan 12, 2010

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USGS Menlo Park
March 4, 2010

Acknowledgements

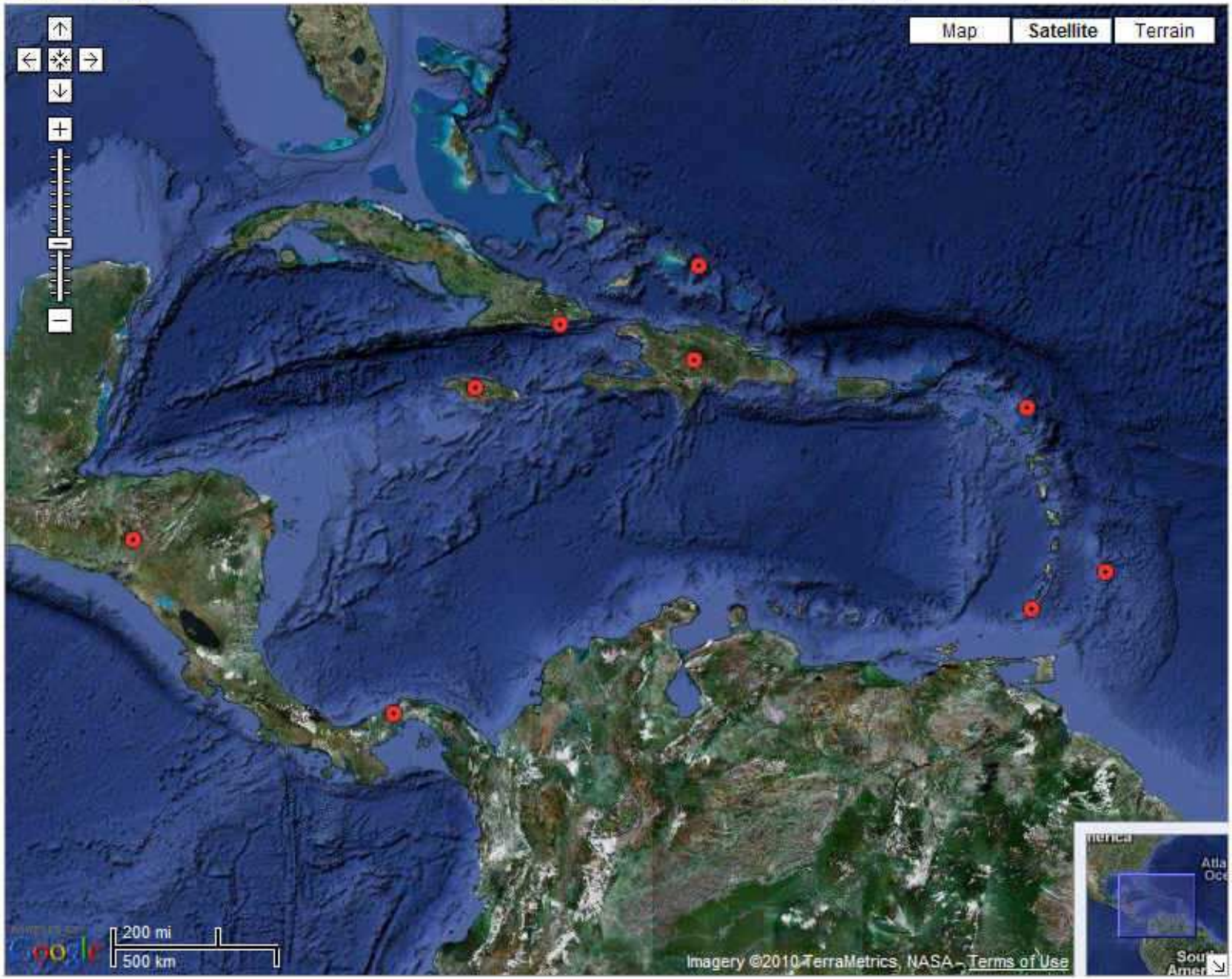
- USGS EQ Hazards Program
- USAID
- SOUTHCOM
- US Embassy
- My four co-team members
- The people of Haiti

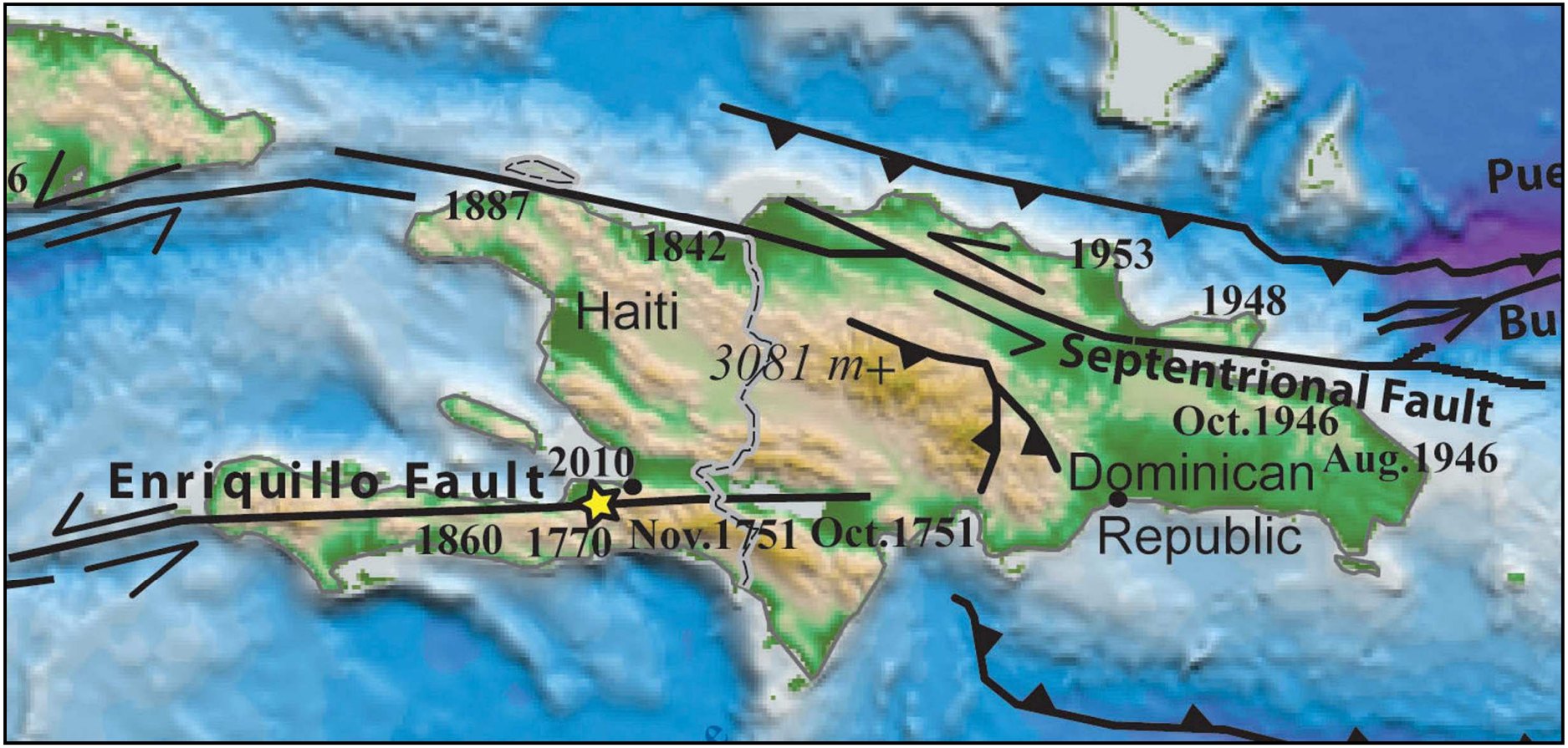
USGS/EERI Team

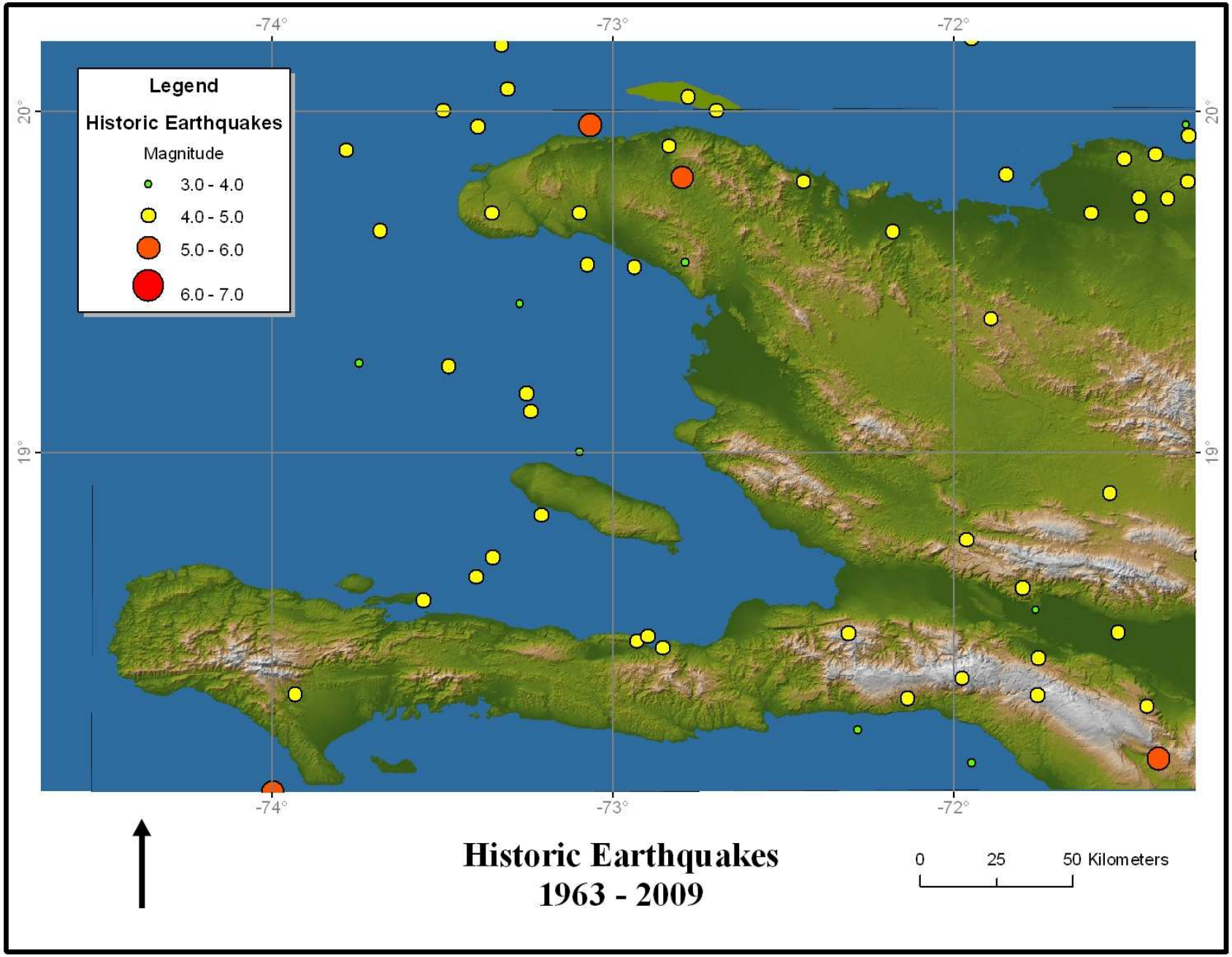
- Marc Eberhard, U. Wash (concrete)
- Steve Baldridge, private, structural design
- Justin Marshall, Auburn, (steel)
- Glenn Rix, Gatech, geotech (Port facility)
- Walter Mooney, USGS, (seismology)

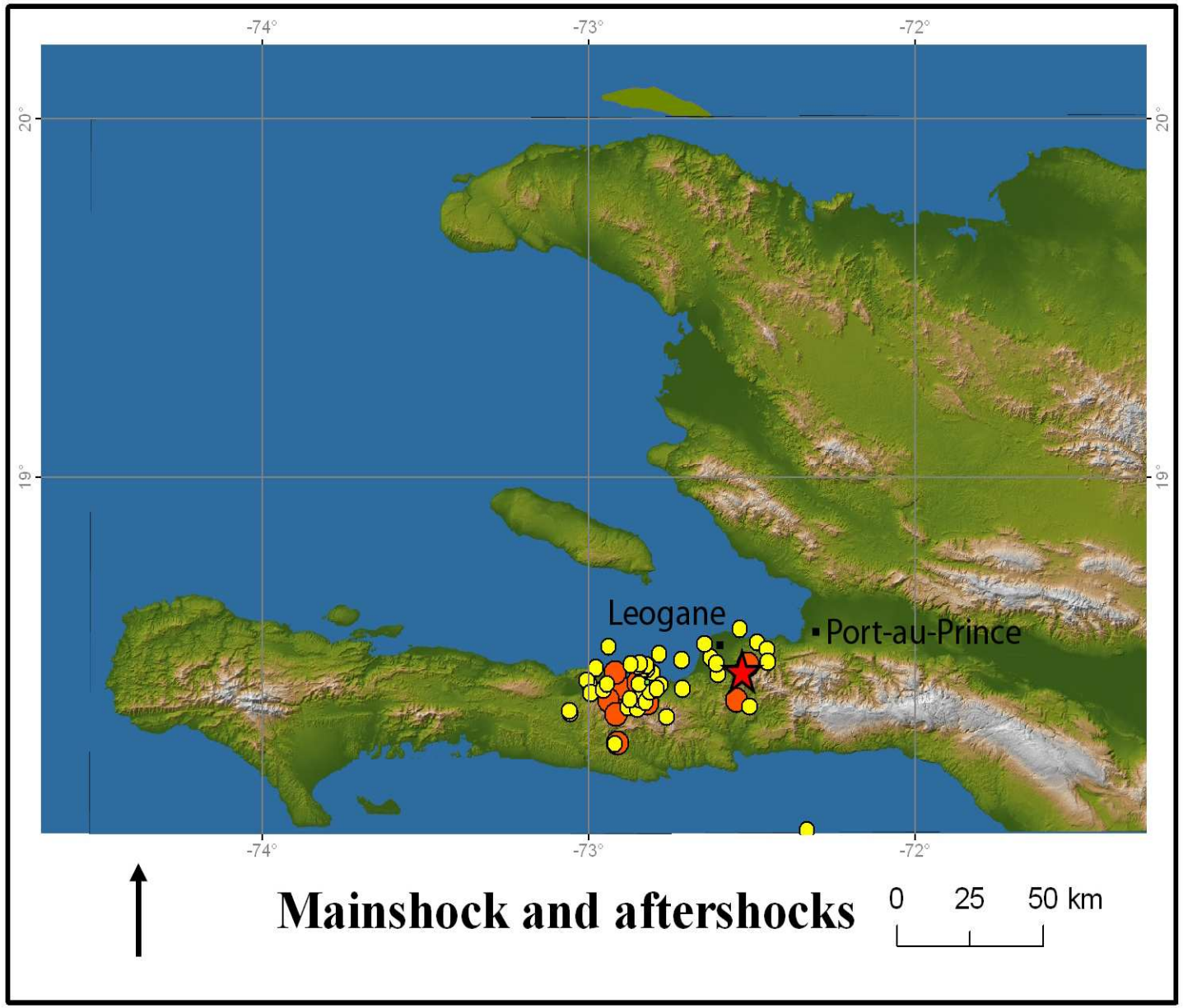
IRIS GMS Usage

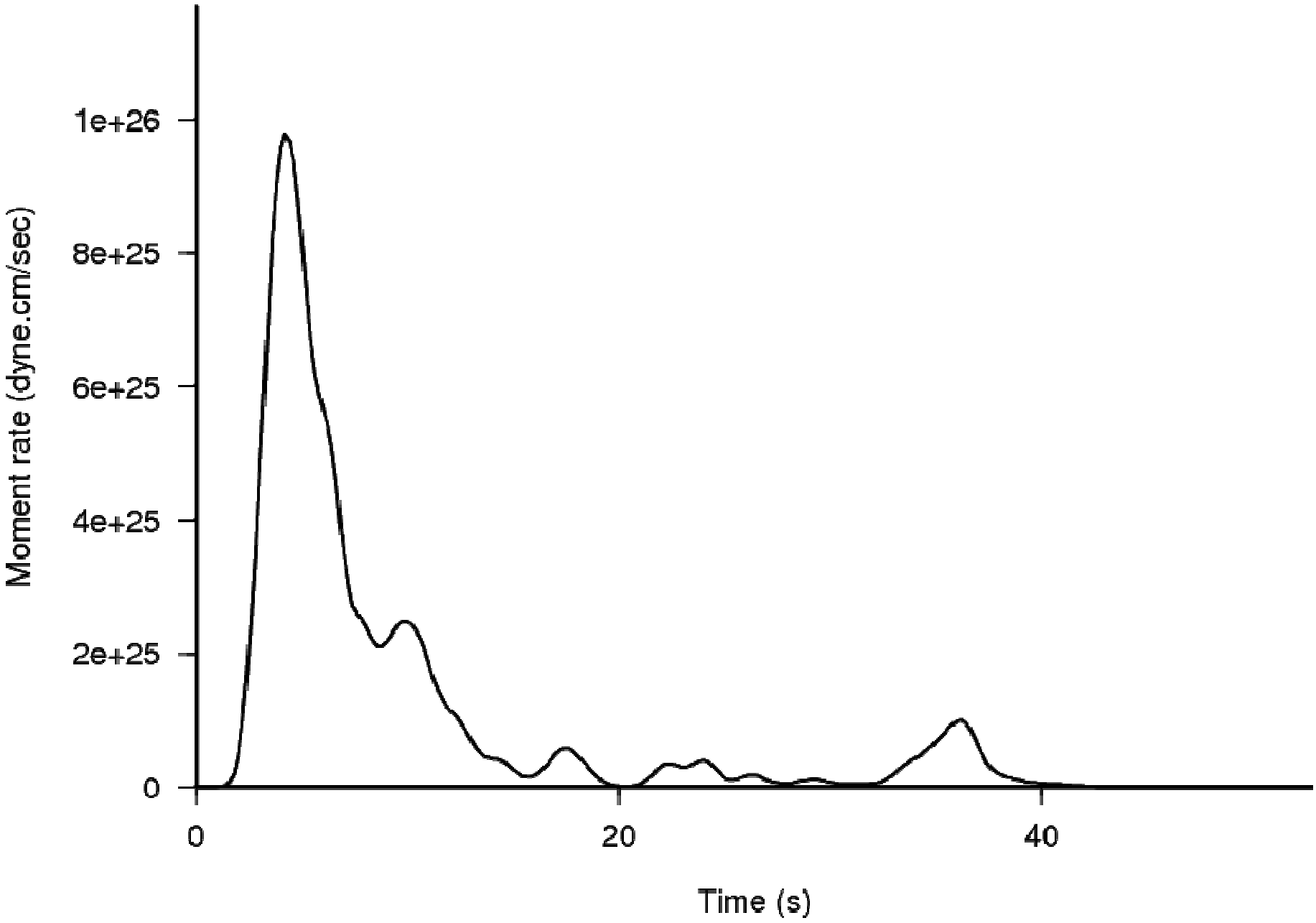
Network map for CU
Caribbean Network (USGS)

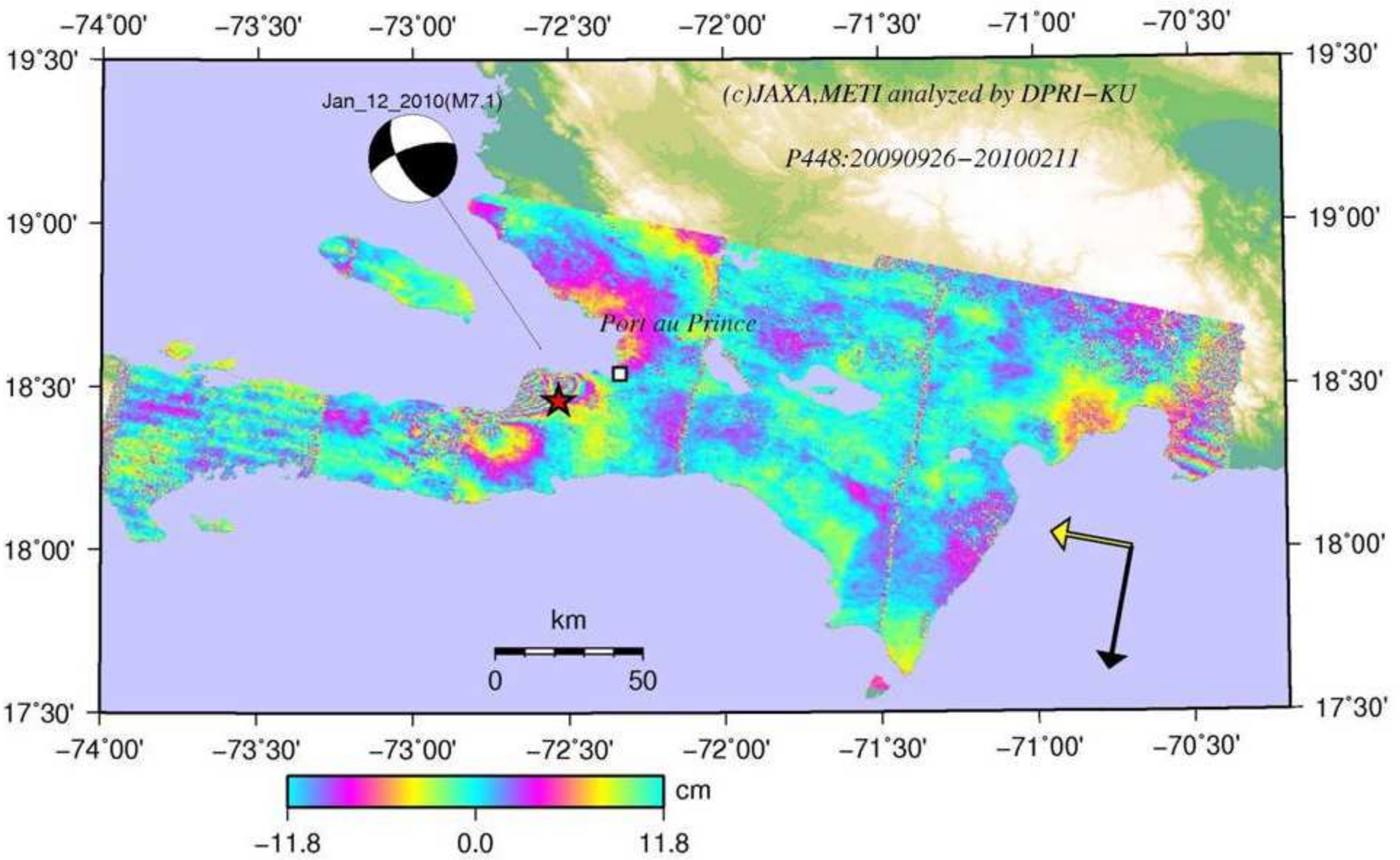



6
1887
1842
Haiti
3081 m+
1953
1948
Pue
Bu
Septentrional Fault
Oct.1946
Aug.1946
Dominican
Republic
2010
Enriquillo Fault
1860
1770
Nov.1751
Oct.1751


-74°
-73°
-72°
20°
19°
Legend
Historic Earthquakes
Magnitude
3.0 - 4.0
4.0 - 5.0
5.0 - 6.0
6.0 - 7.0
Historic Earthquakes
1963 - 2009
0
25
50 Kilometers


-74°
-73°
-72°
20°
19°
Leogane
Port-au-Prince
Mainshock and aftershocks
0
25
50 km


1e+26
8e+25
6e+25
4e+25
2e+25
0
Moment rate (dyne.cm/sec)
0
20
40
Time (s)
GMT 2010 Jan 19 09:48:03
Moment_rate_Function


−74°00'
−73°30'
−73°00'
−72°30'
−72°00'
−71°30'
−71°00'
−70°30'
19°30'
19°00'
18°30'
18°00'
17°30'
Jan_12_2010(M7.1)
(c)JAXA,METI analyzed by DPRI−KU
P448:20090926−20100211
Port au Prince
km
0
50
cm
−11.8
0.0
11.8


U.S. AIR FORCE
0008
62ND AW
446TH AW
THE SPIRIT OF THE
TOTAL FORCE
CBP
FEDERAL OFFICER
MARSHAL

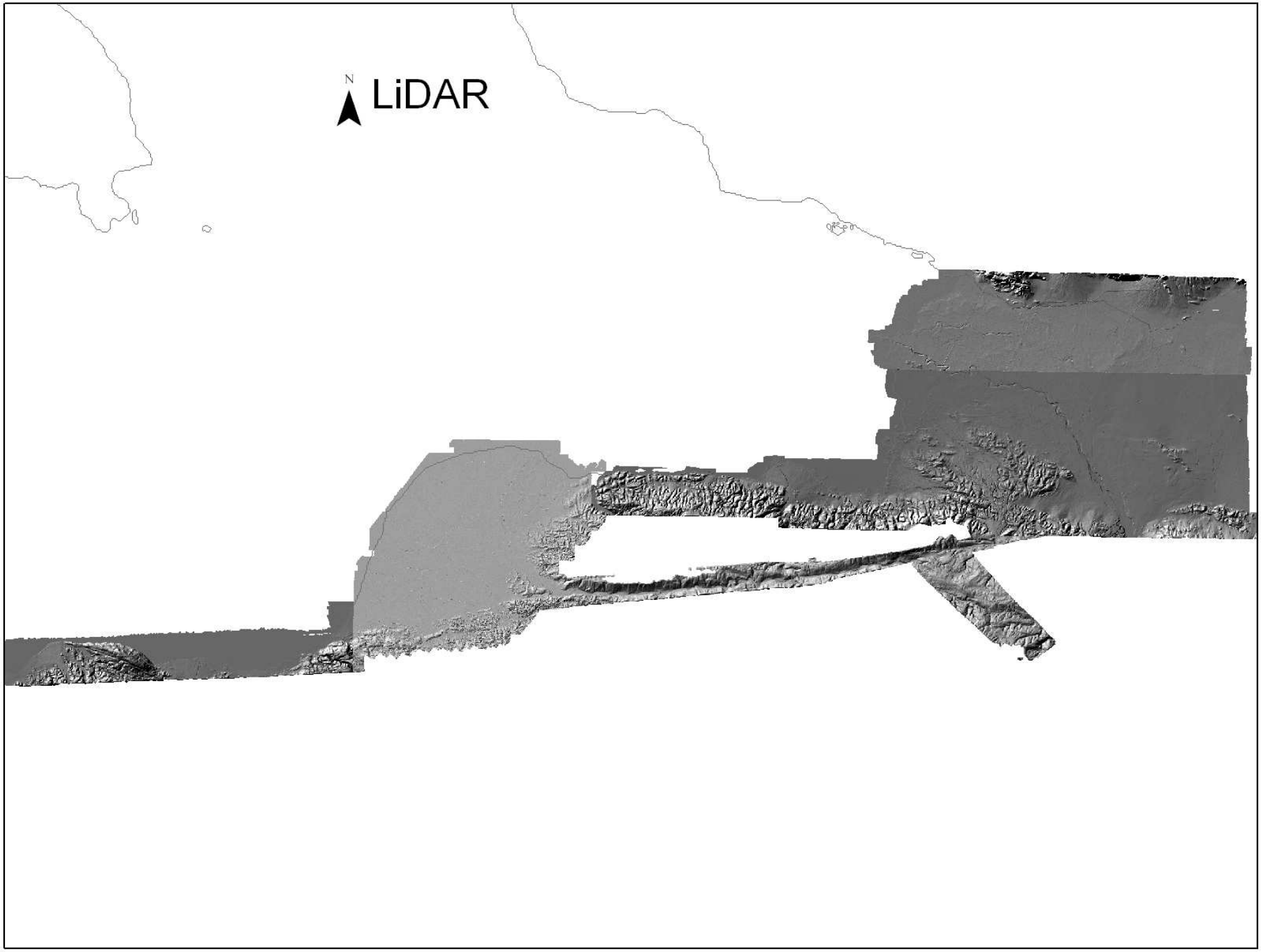

AMC
40098
U.S. GEOLOGICAL SURVEY
EARTHQUAKE HAZARDS TEAM
LABEL
HERE

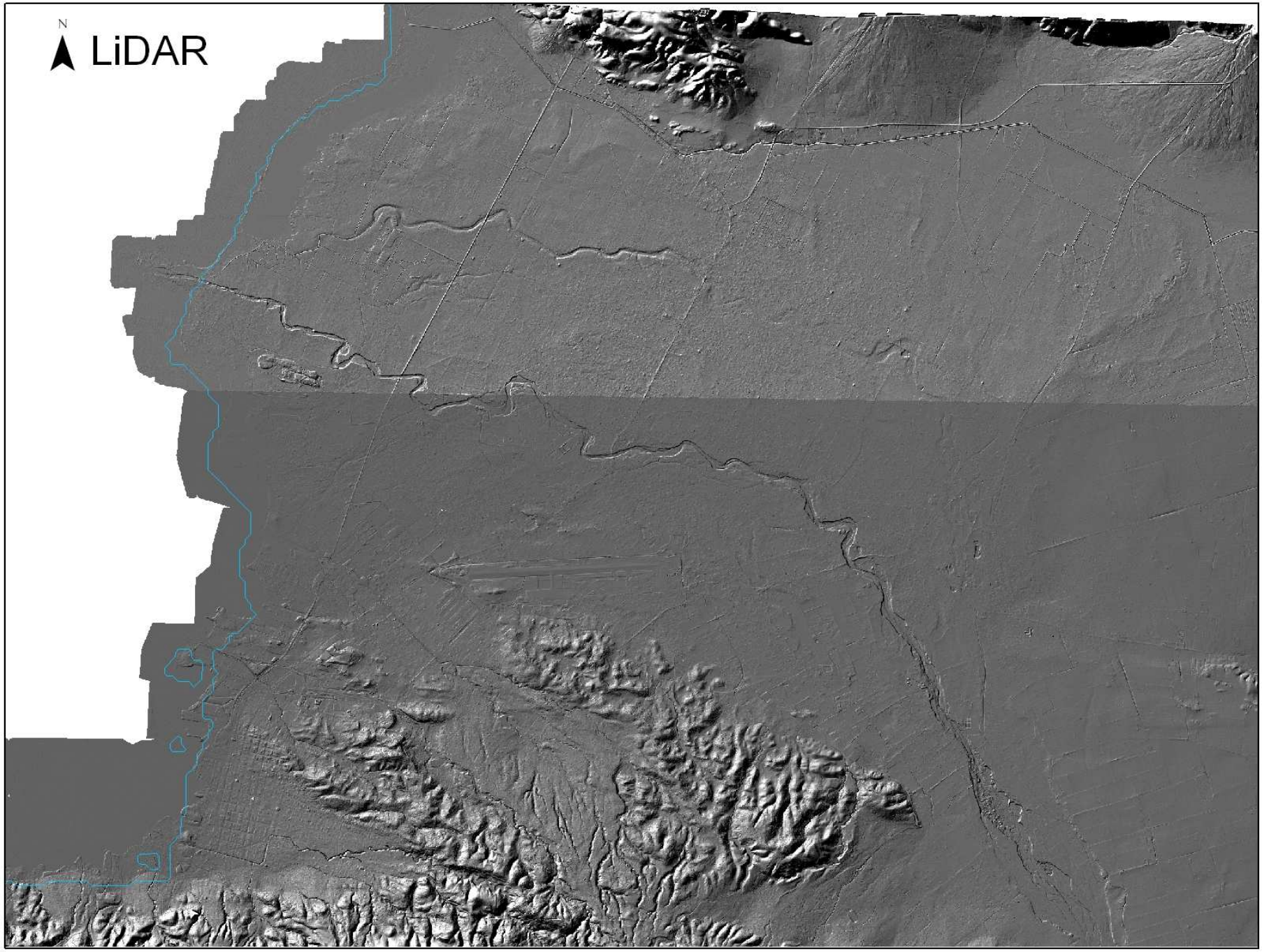
Purpose of our Trip

- Evaluate liquefaction at the Port
- Assess building damage
- Install 4 accelerometers for aftershocks
- Report results to USAID and SOUTHCOM
- Issue written report two weeks after return
- Done: EERI.ORG (it's online)


408
LOS ANGELES
COUNTY


brother
PAJAK


N
LiDAR


N
LiDAR

Port-au-Prince

- Structural damage
- Road Access
- Food and Water
- Communications/Power
- Security
- Variability of Conditions


Capital Carte
Capital Crédit
WESTERN UNION
SDMO
HONDA
UNIVERSAL
FURNITURE


AlphaElite Gel
Canon
ULTRASONIC

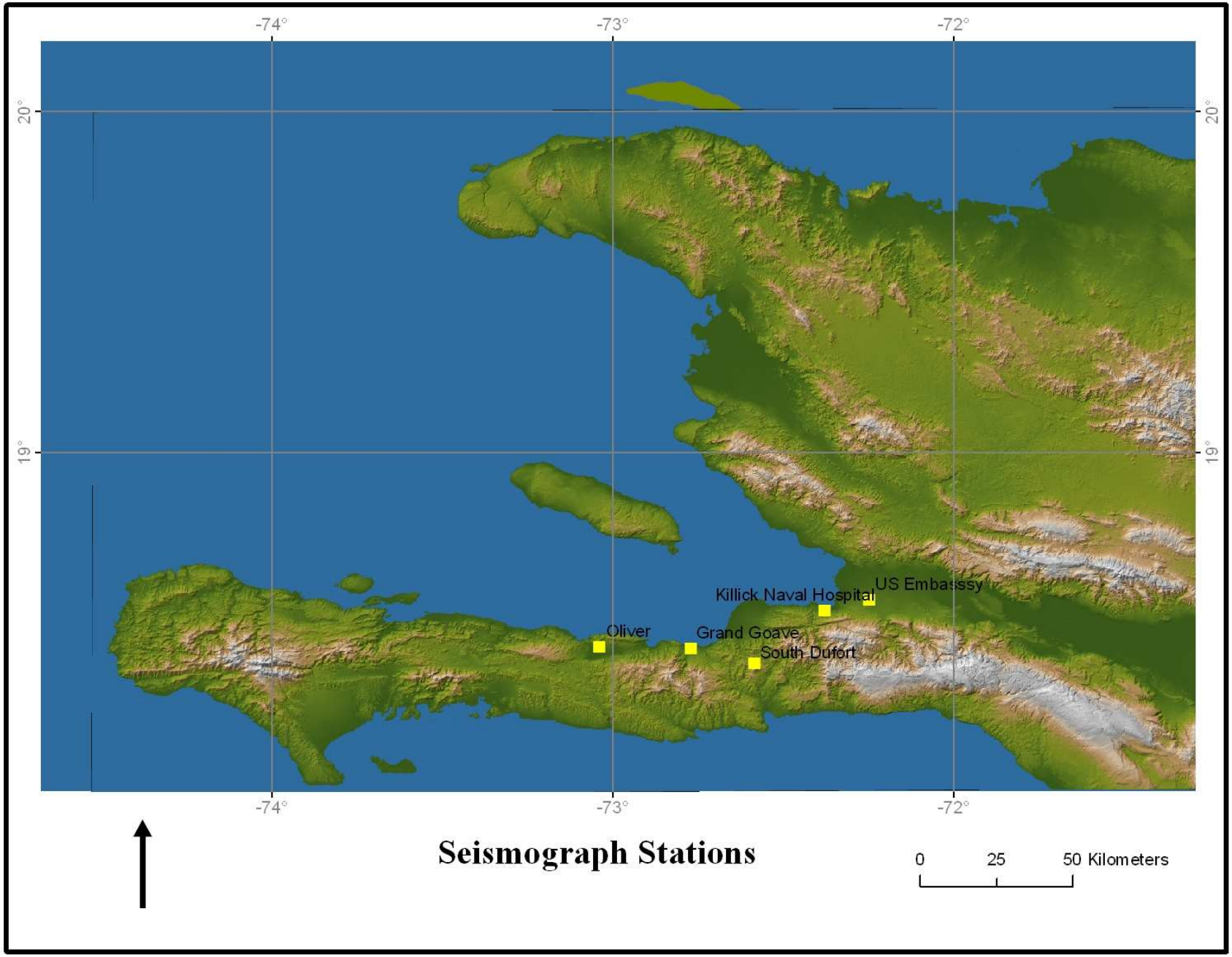

UNASS
AGENT AUTORISÉ
C.A.M.
5 COINS
Rendez-vous
Bar
Friture
Resto
#2
312

Port-au-Prince

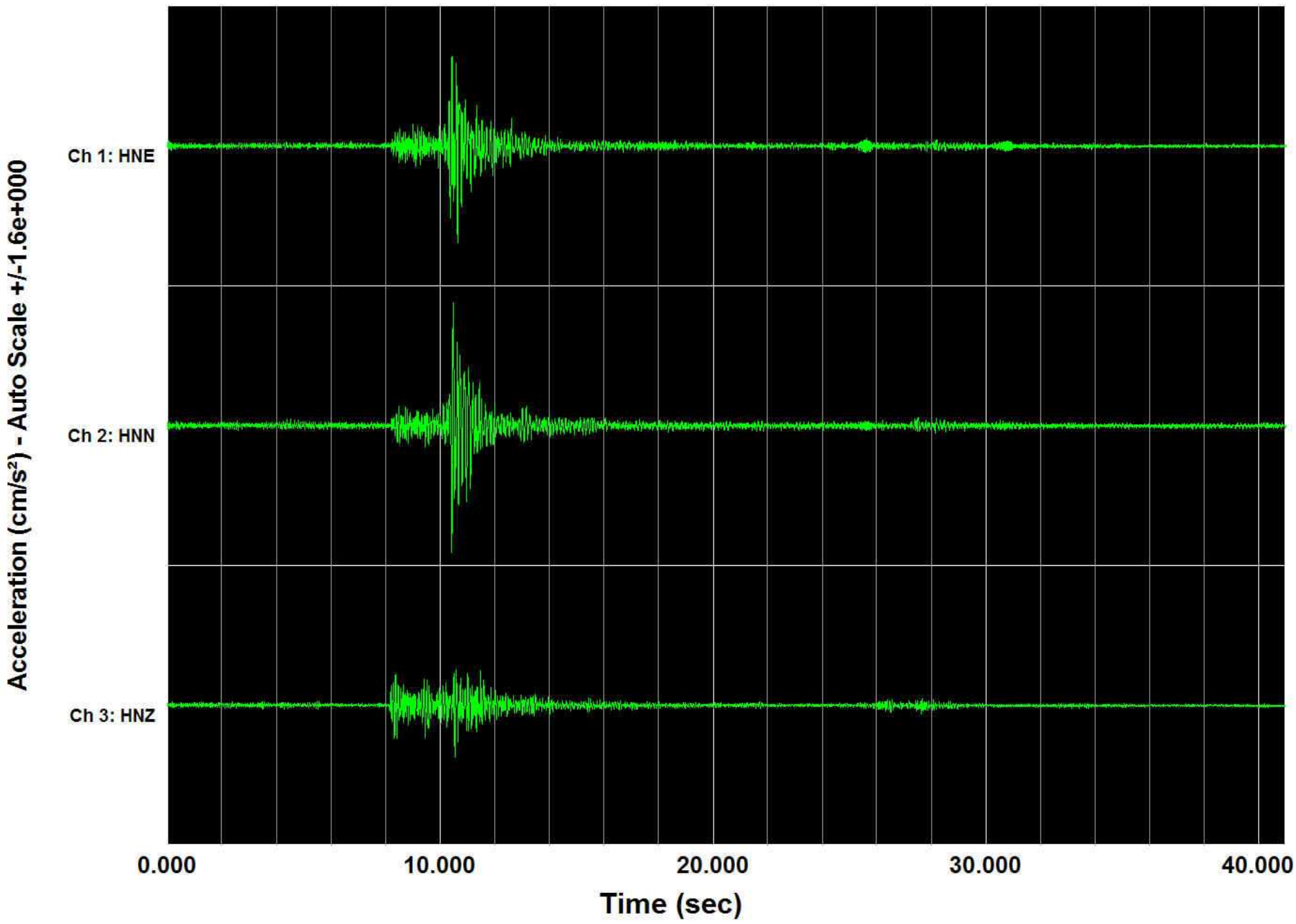
- Well build structures performed well
- Social conditions better than expected despite horrific losses of life

Installing Accelerometers

- US Embassy (still recording)
- Grande Goave (Orphanage)
- Oliver (Elementary School)
- Tomgatto (Town Building)
- Later:
- Killick Naval Hospital (still recording)


-74°
-73°
-72°
20°
19°
US Embasssy
Killick Naval Hospital
Oliver
Grand Goave
South Dufort
Seismograph Stations
0
25
50 Kilometers


SERVANTS OF ALL MINISTRY
EGLISE DE JESUS_ CHRIST SERVANTE POUR TOUS
CENTRE D'ACCUEIL SERVANTE POUR TOUS
ECOLE MIXTE SERVANTE POUR TOUS
SERVANTS OF ALL ENGLISH INSTITUTE (SEI)
KINDERGARTEN PETIT_ GENIE _ (SPT)
ECOLE PROFESSIONNELLE SERVANTE POUR TOUS
CENTRE DE FORMATION MUSICALE
CUISINE PATISSERIE COUTURE
Tel. 3771.0768 : 3448.3738


Station ID: HOES 1/29/2010 (29) 13:31:07.000
Ch 1: HNE
Ch 2: HNN
Ch 3: HNZ
Acceleration (cm/s²) - Auto Scale +/-1.6e+000
0.000
10.000
20.000
30.000
40.000
Time (sec)

Survivors

- Many thousands of orphans
- Many lost family members
- Homes destroyed or critically damaged
- Living in tents
- Food and water scarce
- Great dignity, warmth and kindness

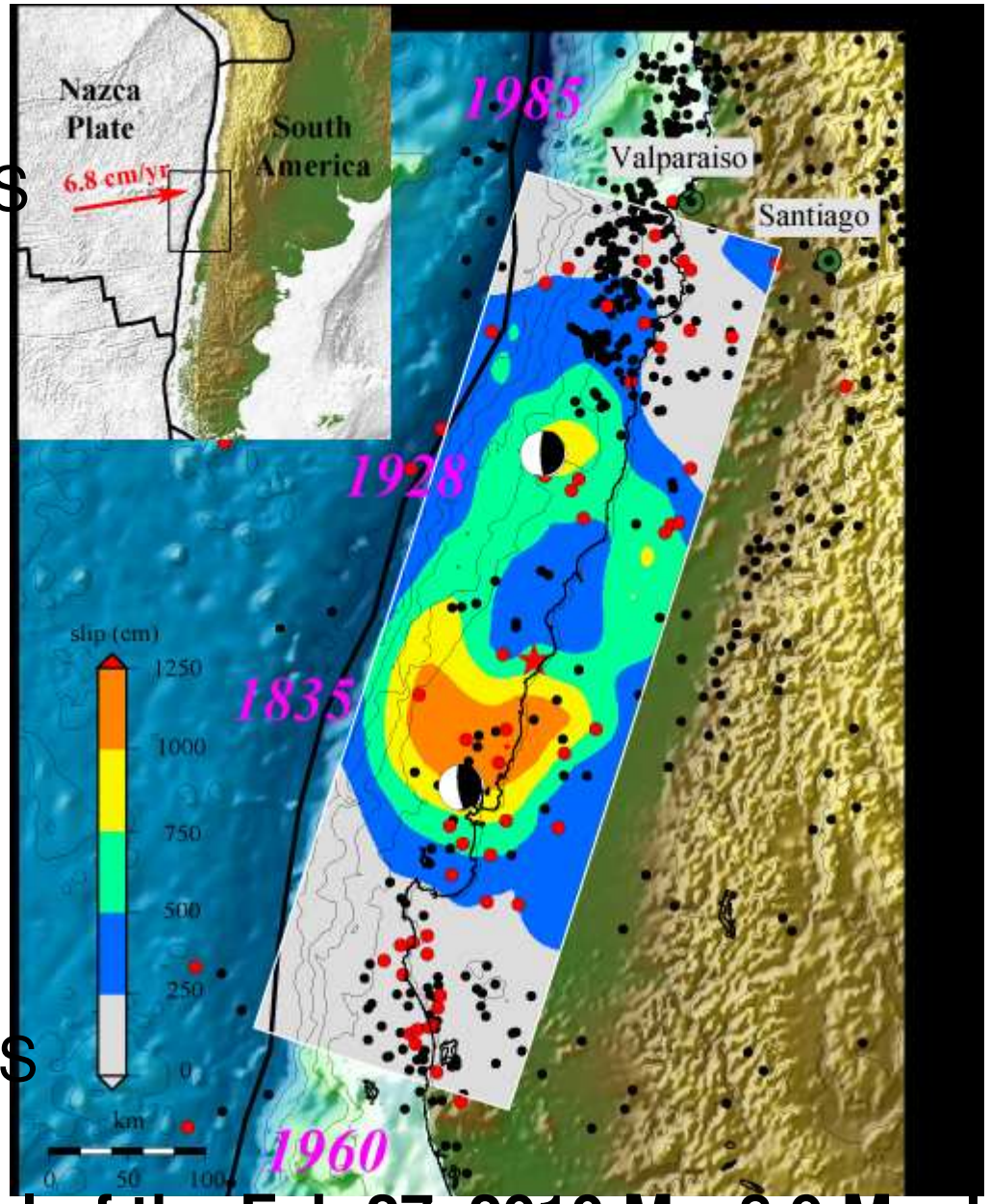
- Liquefaction (sand boils) near coast (north of Leogane)

Conclusions

- Properly engineered structures performed very well
- Total lack of knowledge of earthquake hazards (hurricanes are common)
- No surface rupture
- Liquefaction evident
- Excellent new seismic data
- Compact source in “oceanic crust” (basalt)

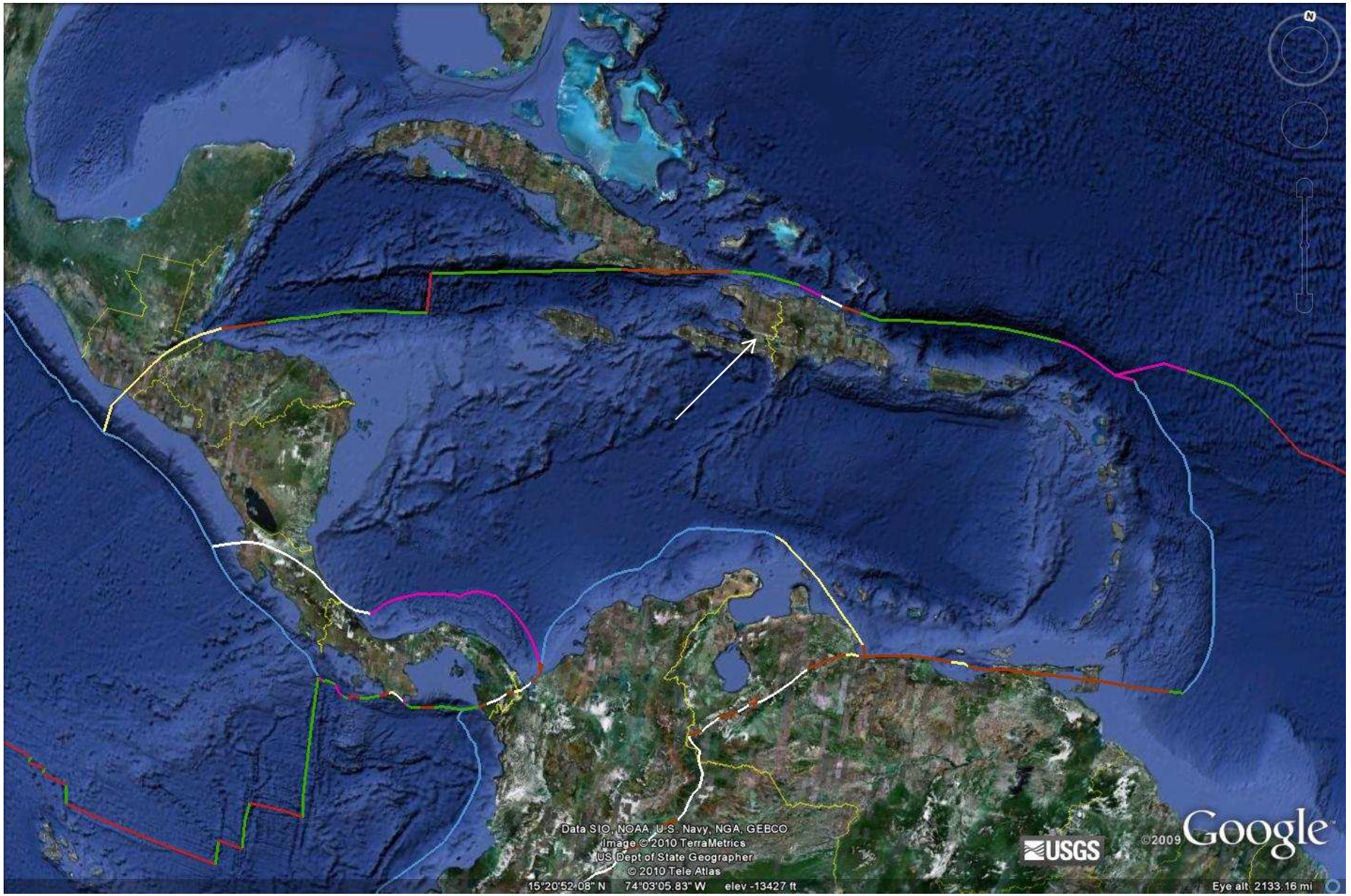
Conclusions

- Rescue and recover is over in 10-12 days, need to be in the field with a diverse team (engineers, geologists, geotechnical, geophysicists, management) by day 10.
- Need more portable, lower power instrumentation (think “iPhone”)



inary slip model of the Feb 27, 2010 Mw 8.9 Maule, Chile Earthq

ı Shao, Xiangyu Li, Qiming Liu, Xu Zhao, Tomoko Yano, Chen Ji


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 TerraMetrics
US Dept of State Geographer
© 2010 Tele Atlas
15°20'52.08" N 74°03'05.83" W elev -13427 ft
USGS
©2009 Google
Eye alt 2133.16 mi