Gulf of Mexico Tsunami Source Information Needs

USGS-NTHMP Workshop

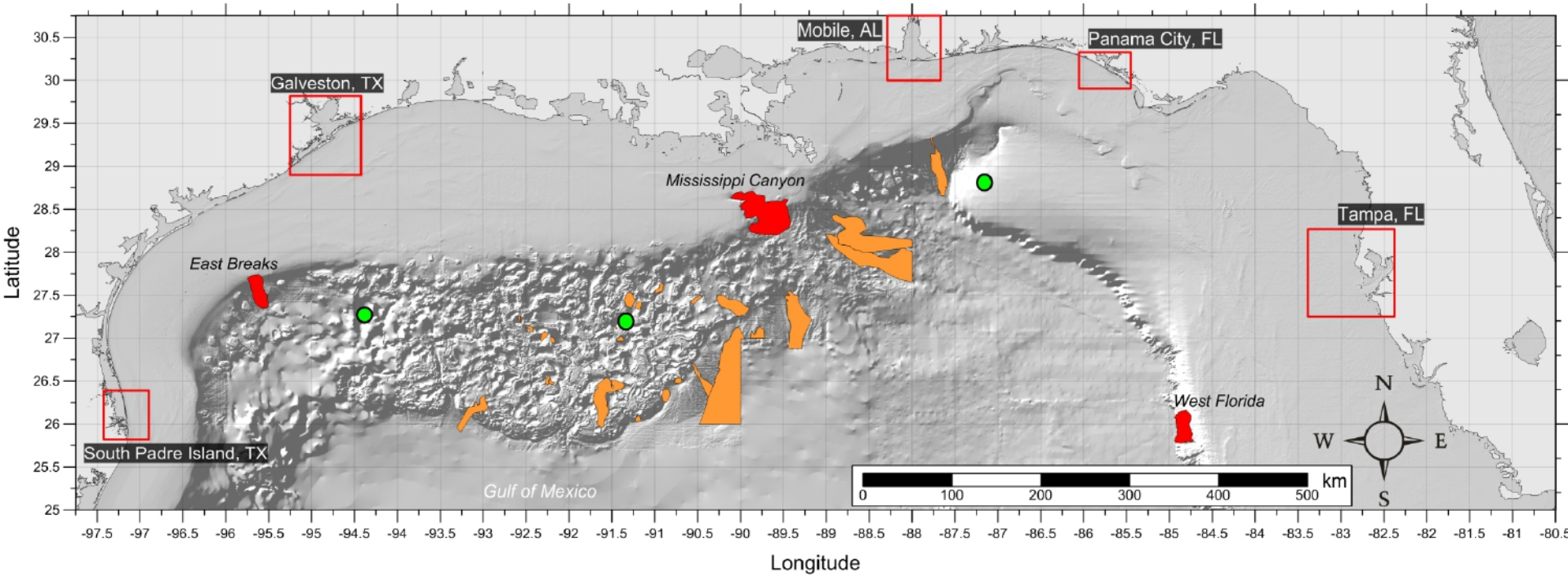
Feb. 1-2, 2016

Boulder, CO

GOM Tsunami Sources

- Local submarine landslides are most likely tsunami source within GOM
- 7 "worst-case" landslide tsunami sources currently identified:
  - 3 historical (ancient)
    - East Breaks
    - Mississippi Canyon
    - West Florida shelf
  - 4 probabilistic
    - Developed using Monte Carlo simulation (MCS) methodology
    - MCS method requires information for previous submarine landslides (size, depth, slope) and sediment data (bulk density, undrained shear strength)

Current Submarine Landslide Information

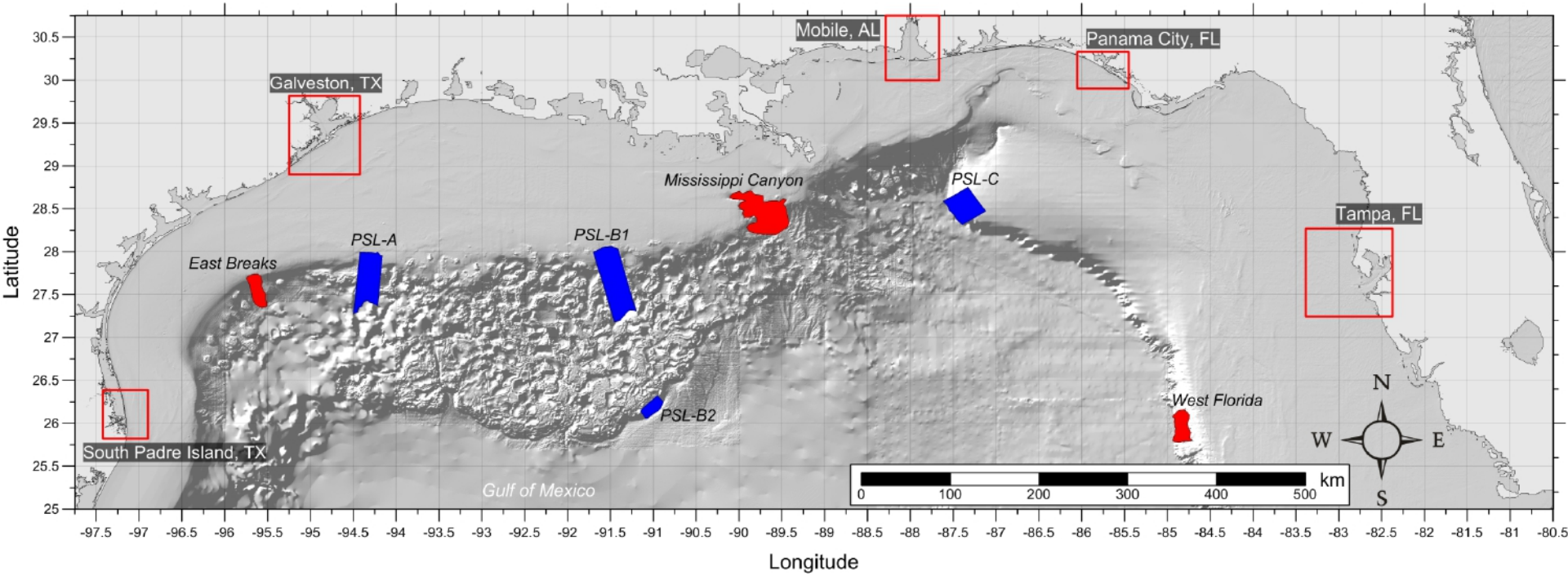


historical (ancient) submarine landslides described in ten Brink et al. (2009), Regional Assessment of tsunami potential in the Gulf of Mexico, U. S. Geol. Surv. Admin. Rep.

landslides from McAdoo et al. (2000), Submarine landslide geomorphology, US continental slope, *Mar. Geol.*, *169*, 103-136.

sediment data locations (publicly available offshore drilling programs data)

GOM Worst-Case Tsunami Sources



- historical (ancient) sources
- probabilistic sources

GOM Needs/Requests

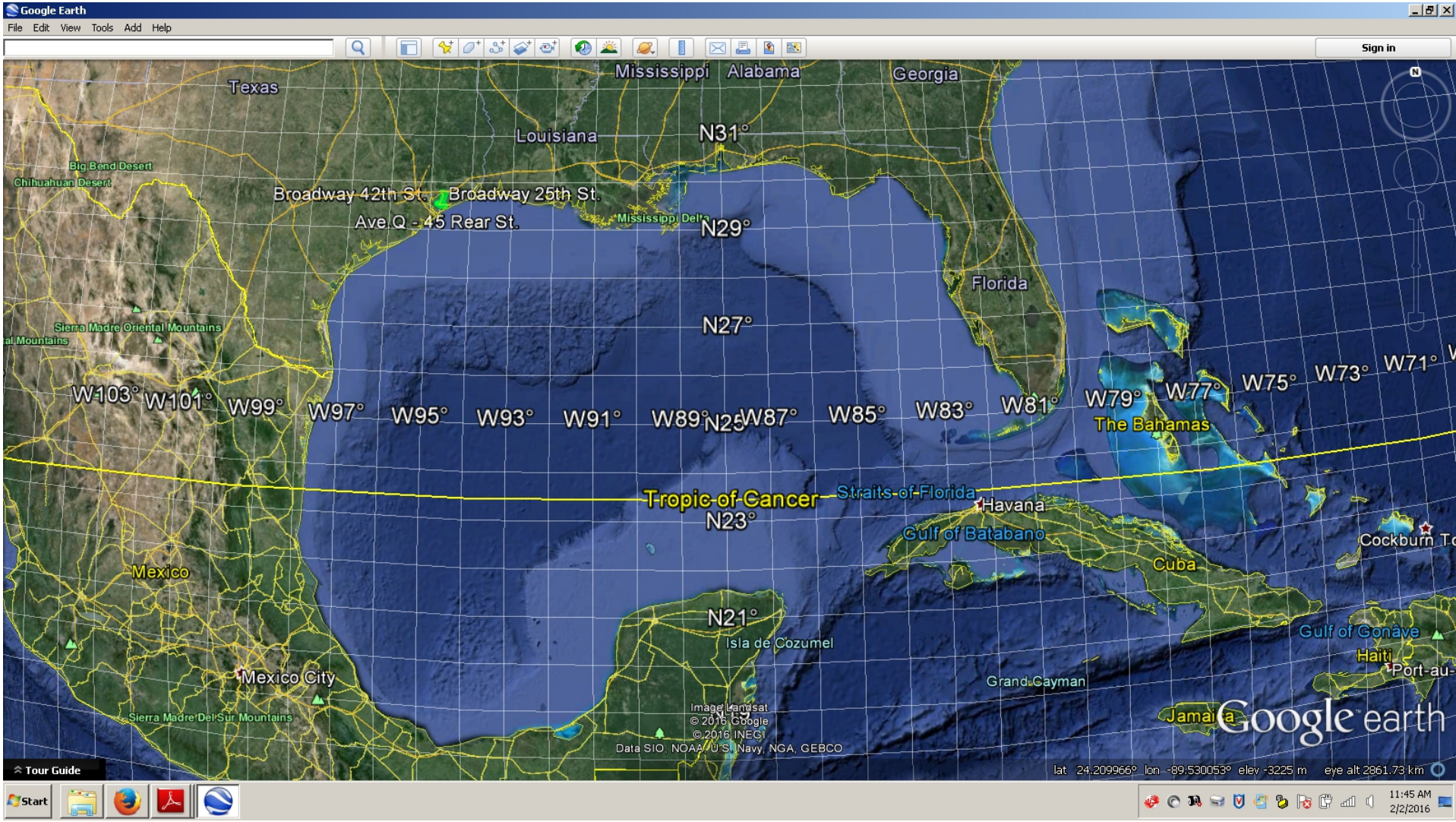
- Additional sediment data throughout GOM to identify more probabilistic sources by MCS method
- Provide guidance on sources
  - Location, size, frequency of submarine failures
  - Online database of submarine landslides (similar to earthquake and landslide databases)
  - Particularly for newly identified failures along southern GOM/Campeche Escarpment

Probabilistic Results

Table 2. Probabilistic Maximum Credible Submarine Landslide Tsunami Events[a]

Transect	A	B1	B2	C
Number of events	64	34	2	4
$\lambda_{S_{100}}$ (years)	7700–7800	5400–5500	4700–4800	550–650
λ (years)	3940–4570	3460–3790	340–350	130–160
Depth (m)	85	130	2323	1098
Area (km^2)	1686	3118	282	1529
Volume (km^3)	57	69	45	315
Length (km)	68	96	13	34
Width (km)	25	32	22	46
Thickness (m)	67	44	323	404
η (m)	61	36	3.0	19

[a]Return period range $\lambda_{S_{100}}$ is the first 100 years of return periods for tsunamigenic SMFs generated by the MCS method, and λ is the corresponding return period range of the triggering earthquake. Single values of landslide depth and size parameters and maximum tsunami amplitude η are those for the PMCE, calculated as the mean values across all extreme-amplitude (η_{max}) tsunami events with return periods in $\lambda_{S_{100}}$.


Google Earth
File Edit View Tools Add Help
Sign in
Texas
Mississippi
Alabama
Georgia
Louisiana
N31°
Big Bend Desert
Chihuahuan Desert
Broadway 42th St.
Broadway 25th St.
Ave Q - 45 Rear St.
Mississippi Del'a
N29°
Florida
N27°
Sierra Madre Oriental Mountains
W103°
W101°
W99°
W97°
W95°
W93°
W91°
W89°
N25
W87°
W85°
W83°
W81°
W79°
W77°
W75°
W73°
W71°
The Bahamas
Tropic of Cancer
N23°
Straits of Florida
Havana
Gulf of Batabano
Cuba
Cockburn T
Mexico
N21°
Isla de Cozumel
Gulf of Gonâve
Haiti
Port-au-
Mexico City
Grand Cayman
Sierra Madre Del Sur Mountains
Jamaica
Image Landsat
© 2016 Google
© 2016 INEGI
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth
Tour Guide
lat 24.209966° lon -89.530053° elev -3225 m eye alt 2861.73 km
Start
11:45 AM
2/2/2016