

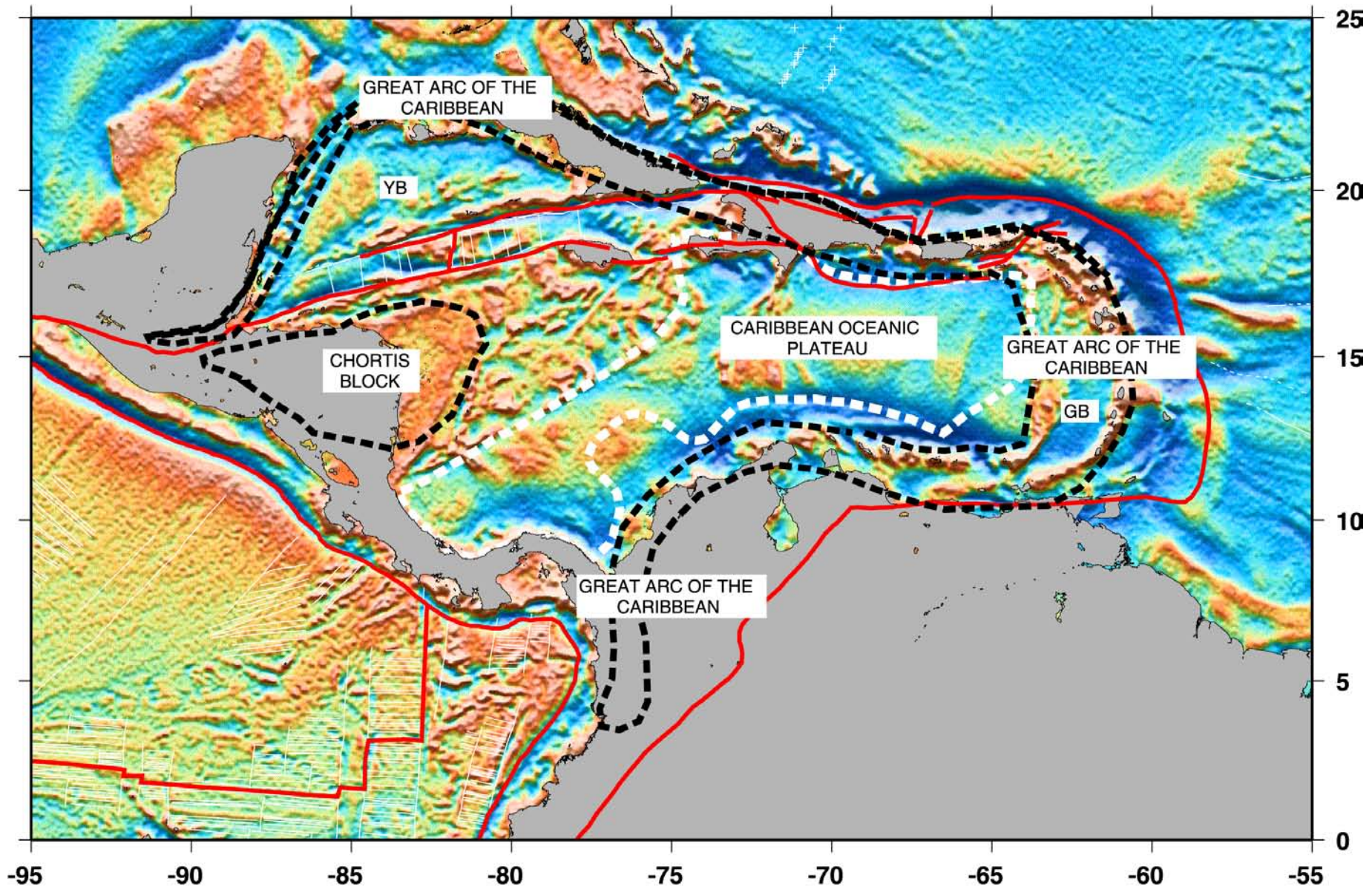
Caribbean Plate Boundary Deformation - A Seismologist's View

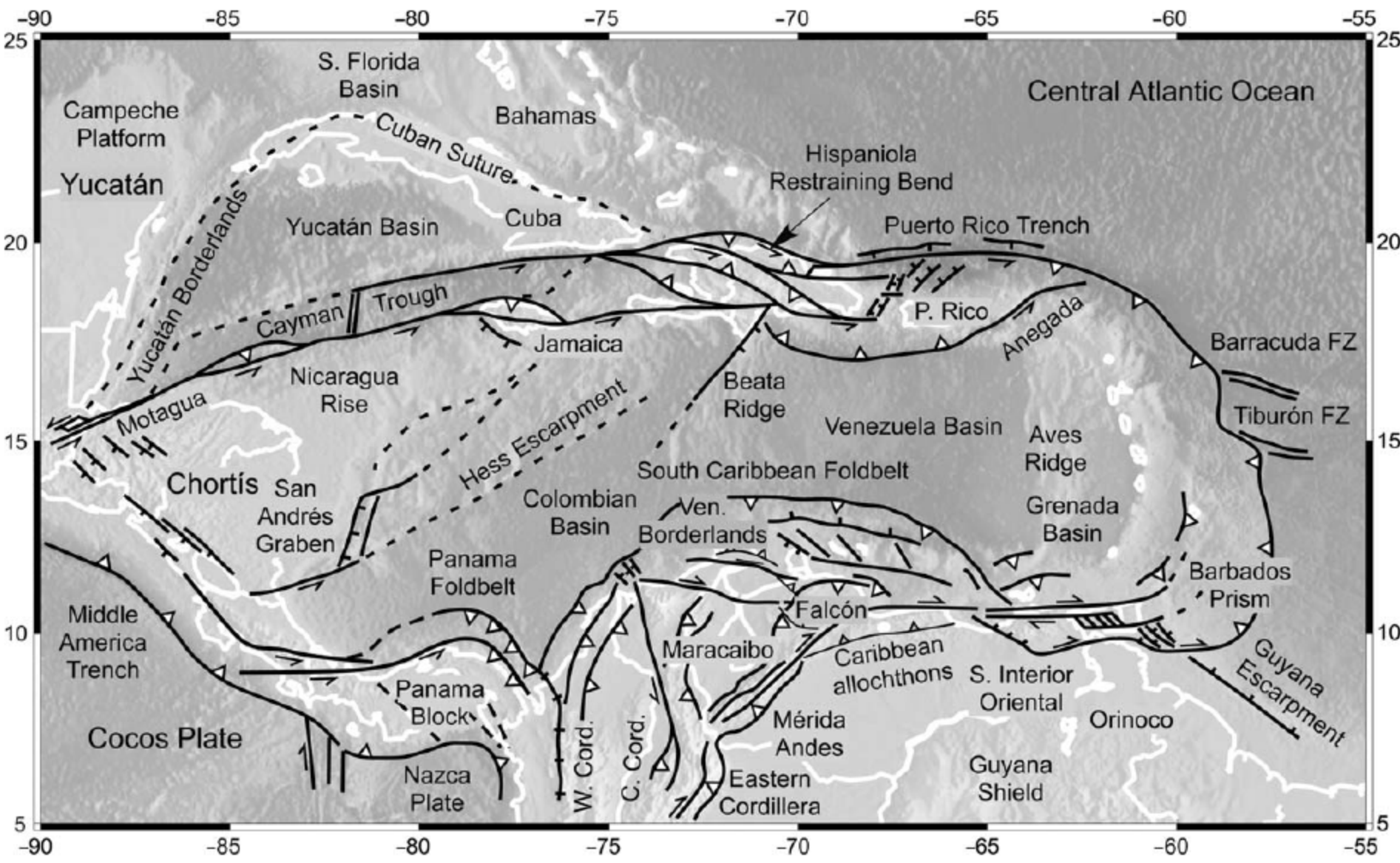
Jay Pulliam
Baylor University

Relative plate motion

Yucatan
Florida
Cayman Trough
Jamaica
Cuba
Bahamas
Hispaniola Trench
Aruba
Curacao
Bonaire
Caribbean plate
Puerto Rico
Puerto Rico Trench
North American plate
Montserrat
Kick'em Jenny
Lesser Antilles Trench

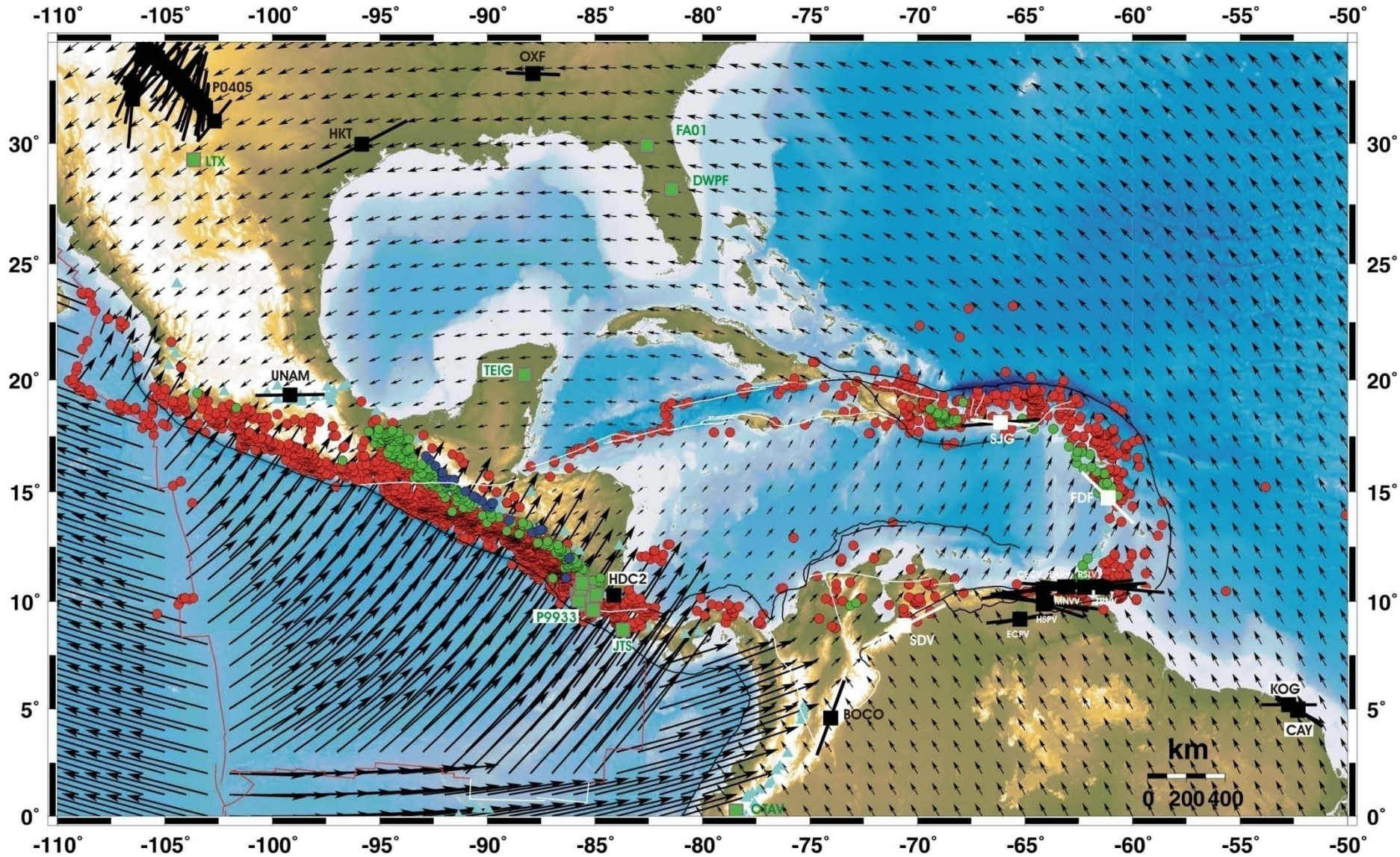
Caribbean Crustal Provinces

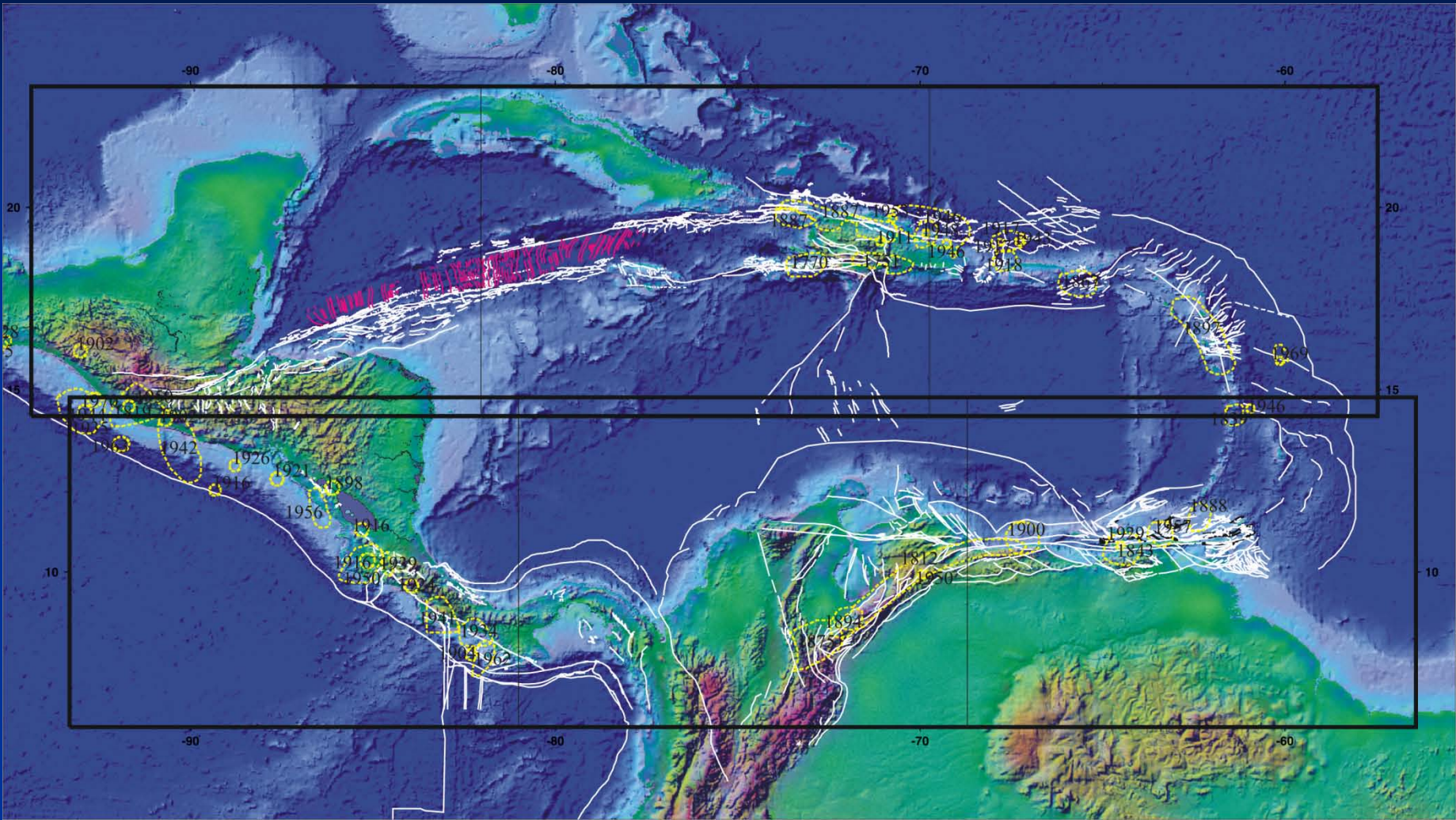


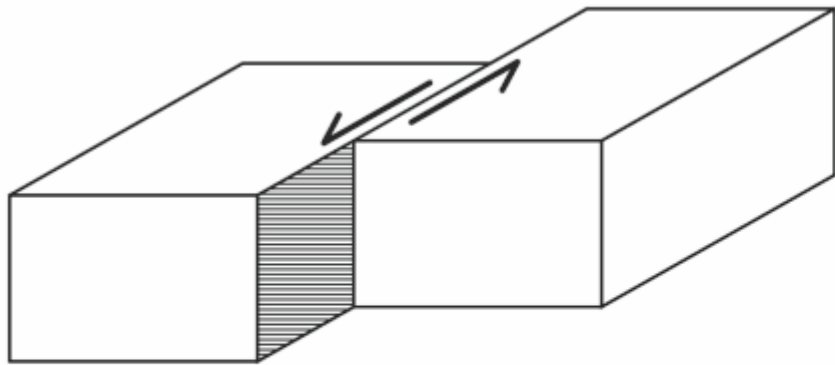


From Pindell and Kennan, *Geological Society, London, 2009; v. 328; p. 1-55*

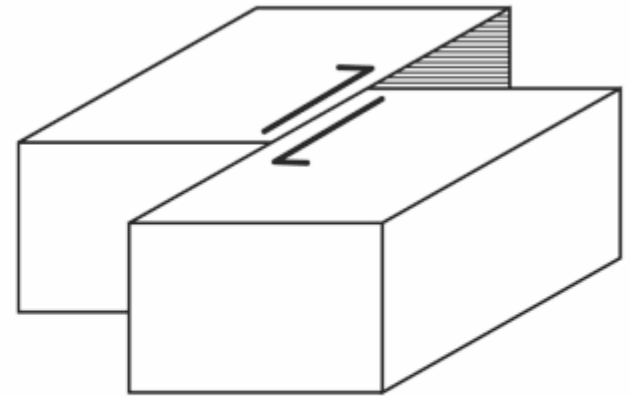
NUVEL Plate Velocities





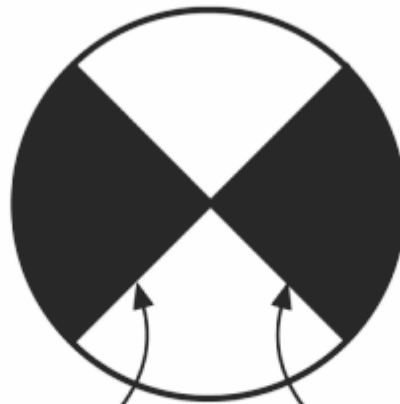


Left-lateral strike-slip fault
($\lambda = 0^\circ$)



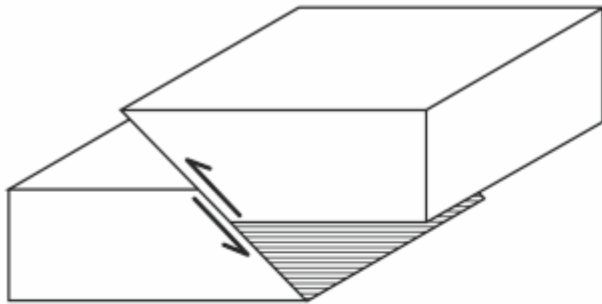
Right-lateral strike-slip fault
($\lambda = 180^\circ$)

Strike-slip fault



Left-lateral on
this plane

Right-lateral on
this plane

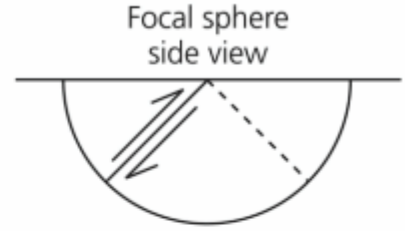


Reverse dip-slip fault
($\lambda = 90^\circ$)

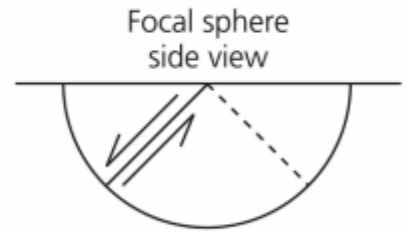


Dip-slip faults

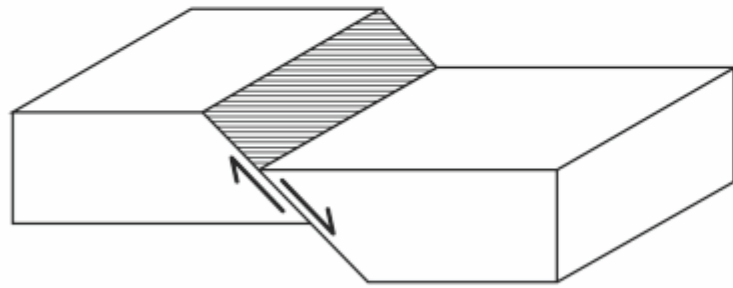
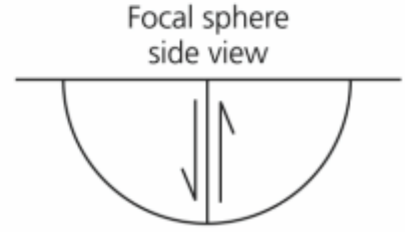
Thrust
fault



Normal
fault



Vertical
dip-slip

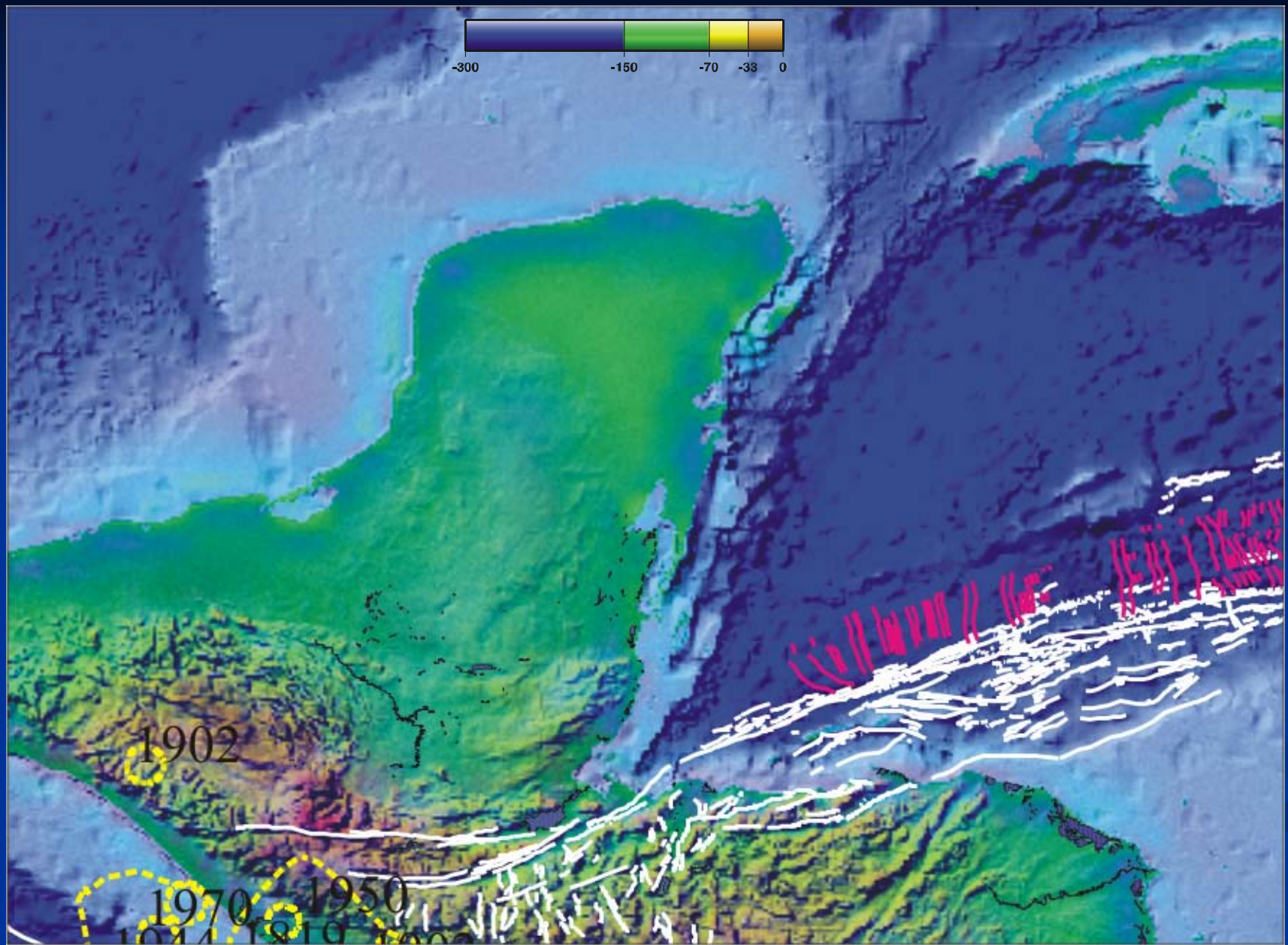


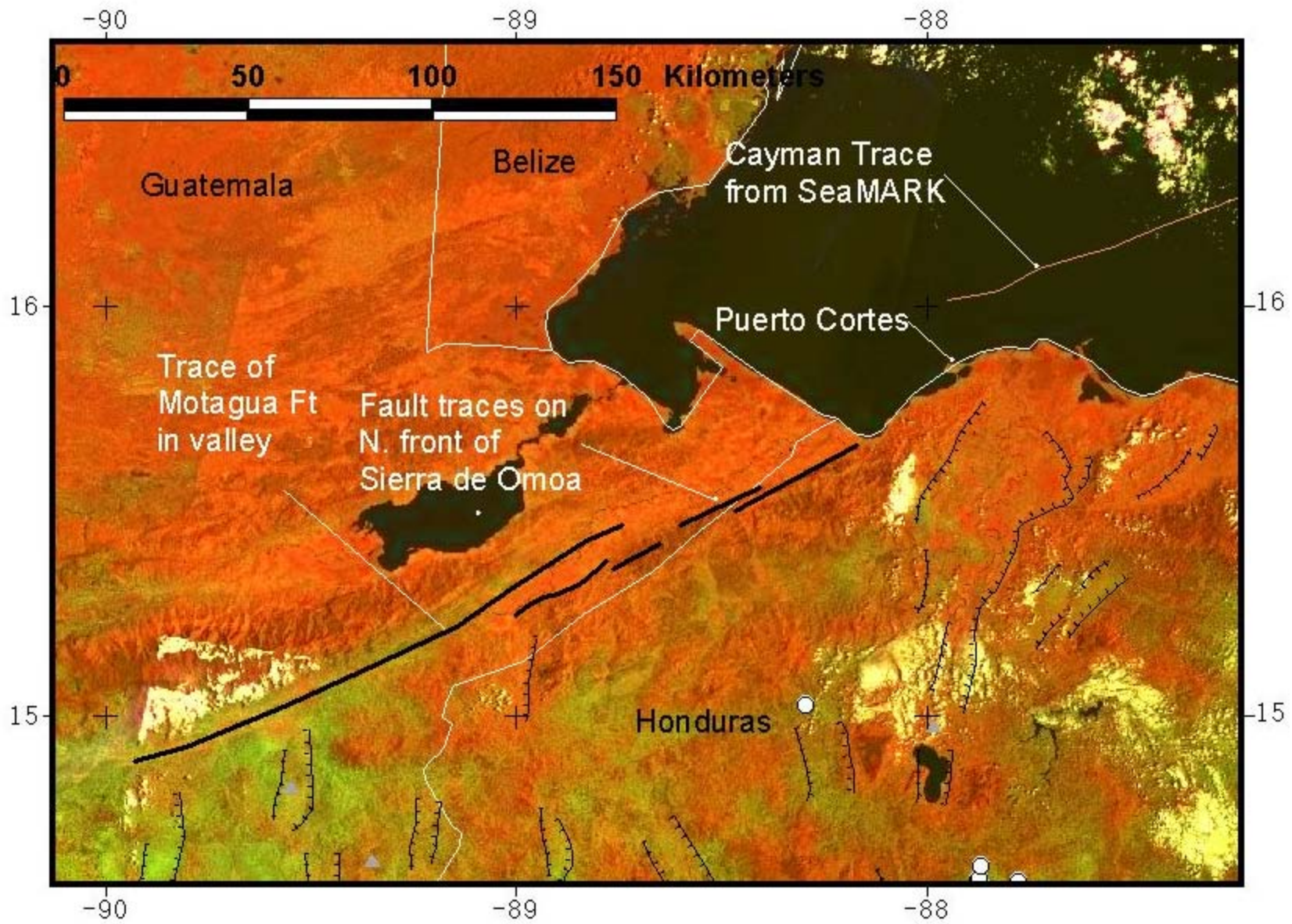
Normal dip-slip fault
($\lambda = -90^\circ$)

Focal sphere
side view

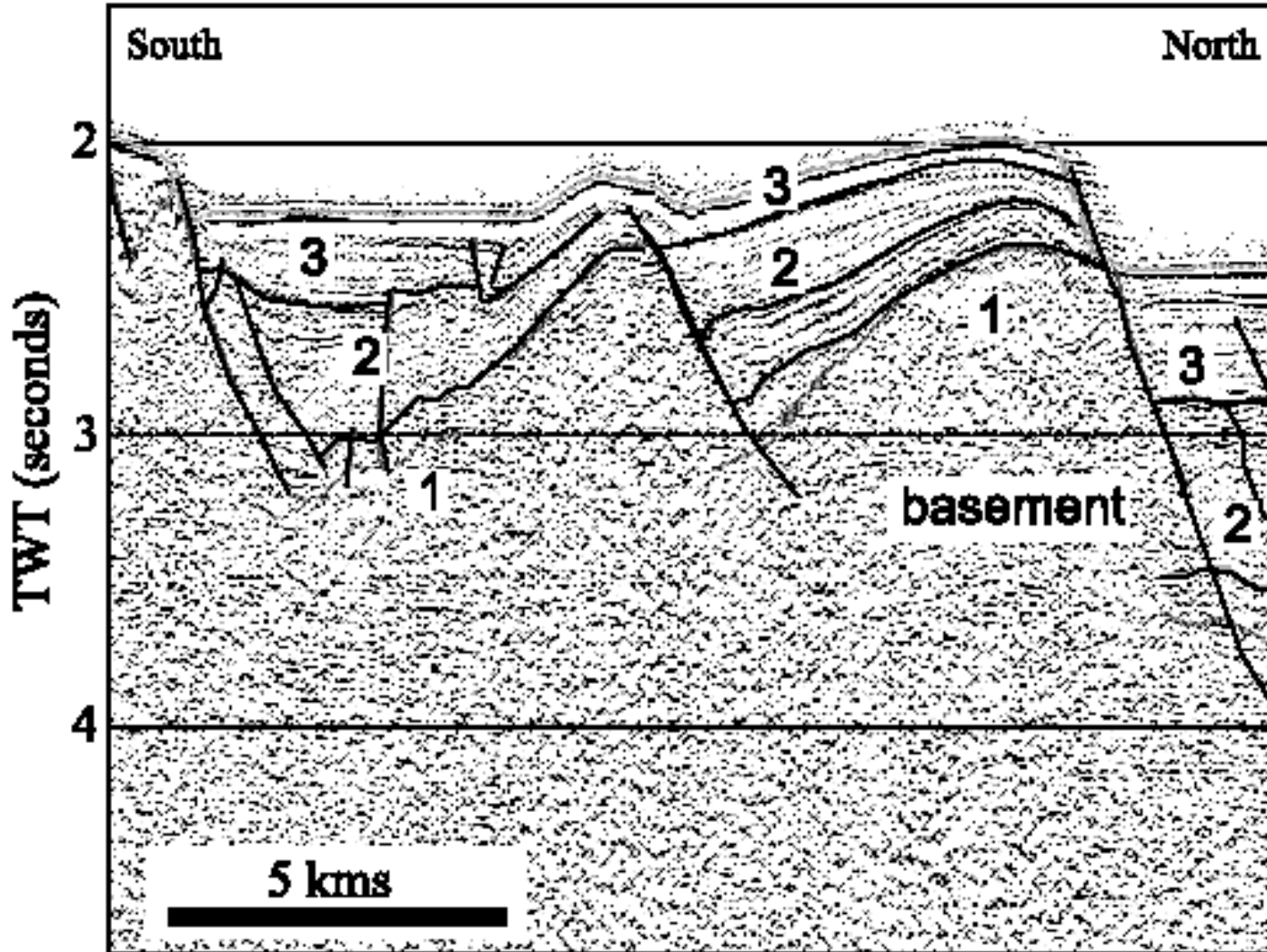
Focal sphere
side view

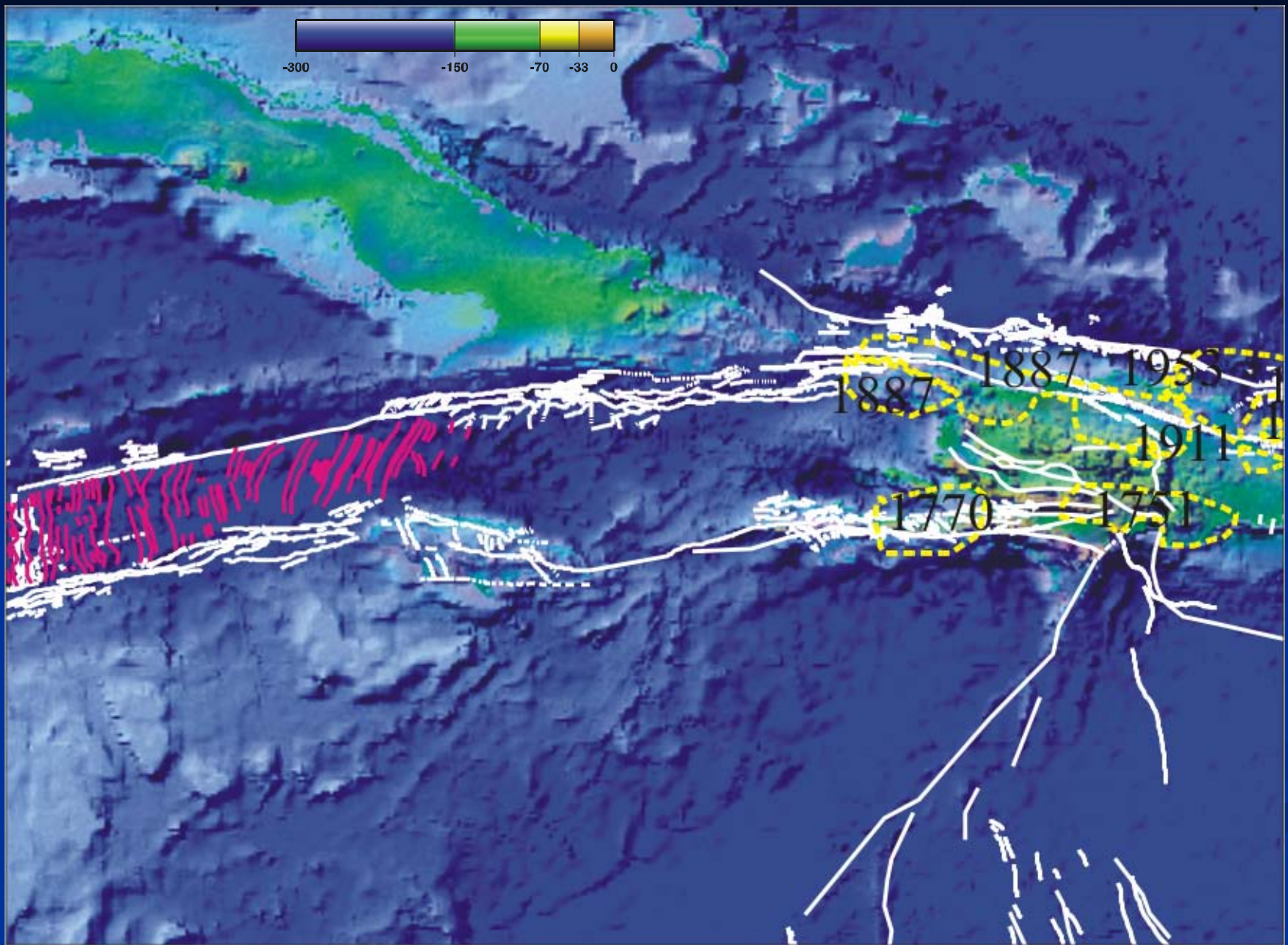
Focal sphere
side view





Honduran transtensional borderlands





FREE-AIR GRAVITY (mGals)

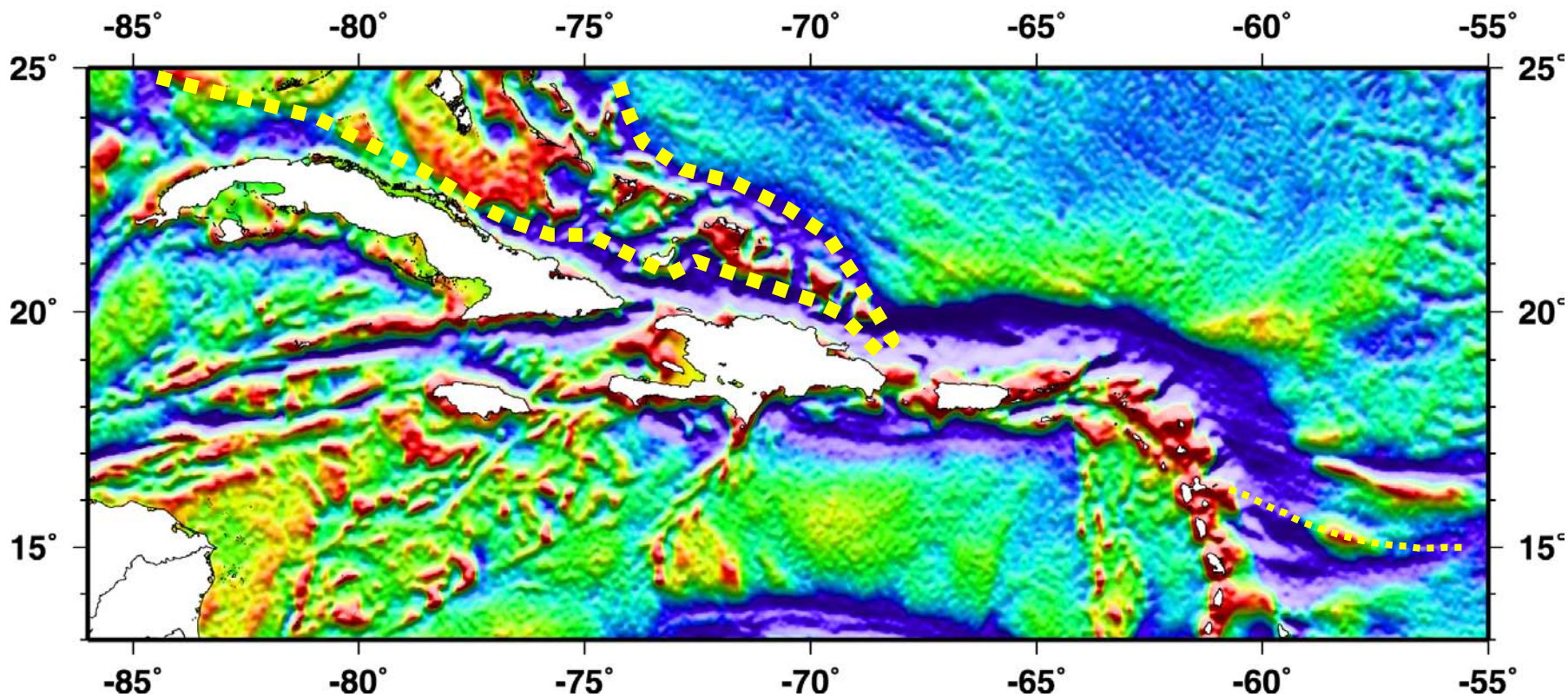
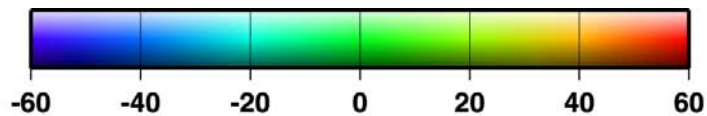


Figure from Paul Mann, pers. comm.

TOPOGRAPHY AND PREDICTED BATHYMETRY (km)

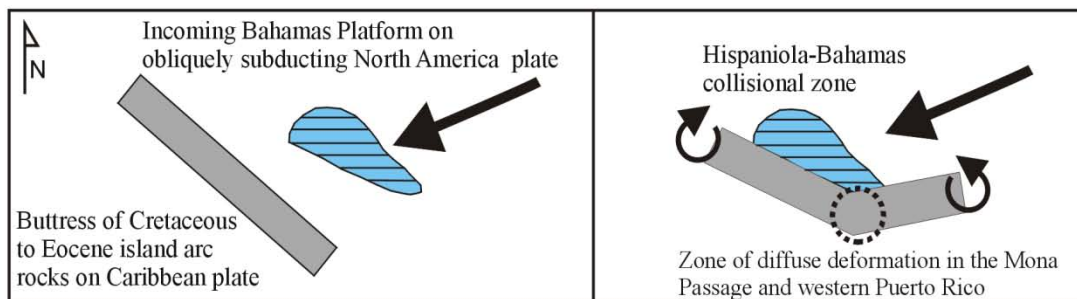
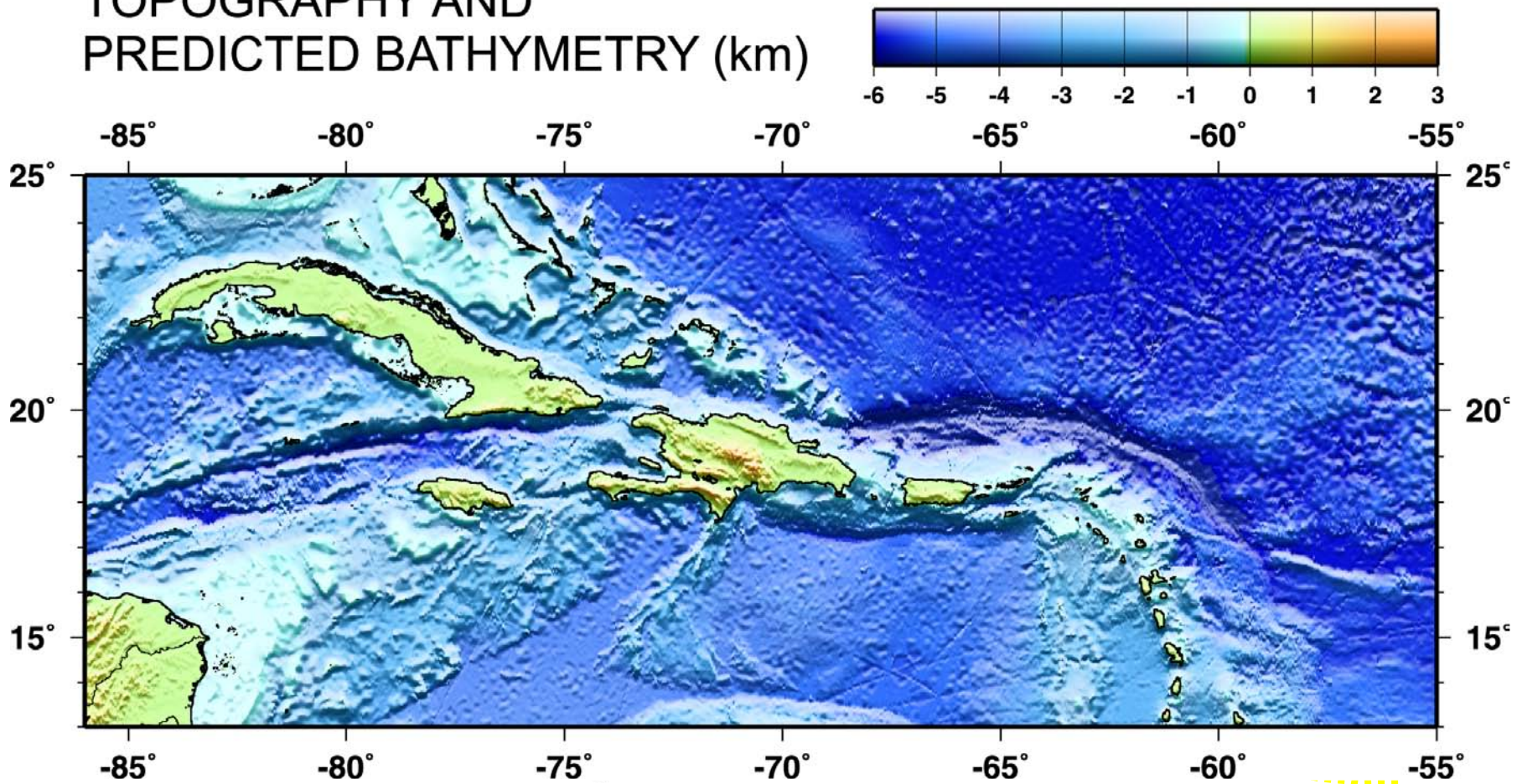
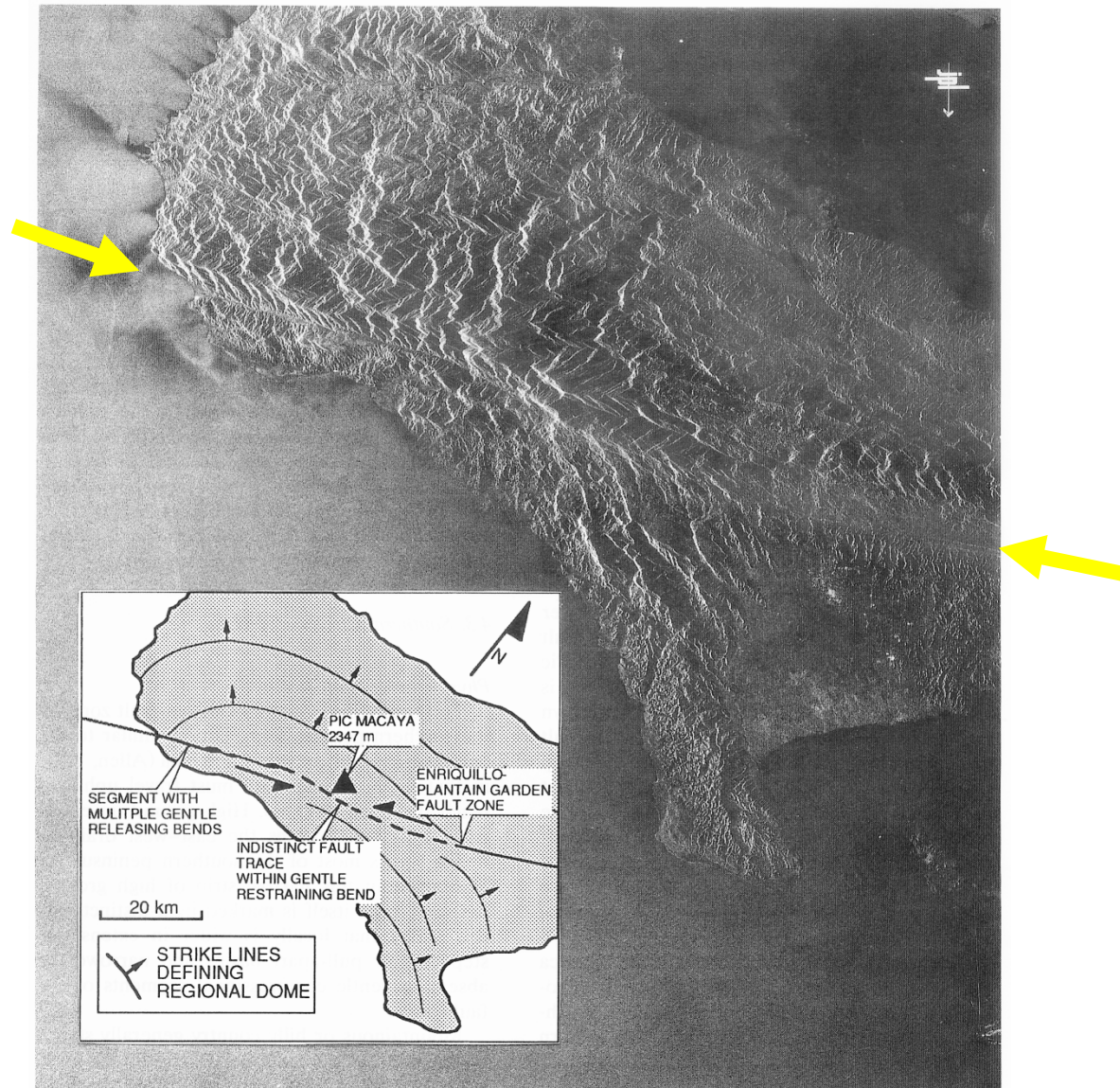
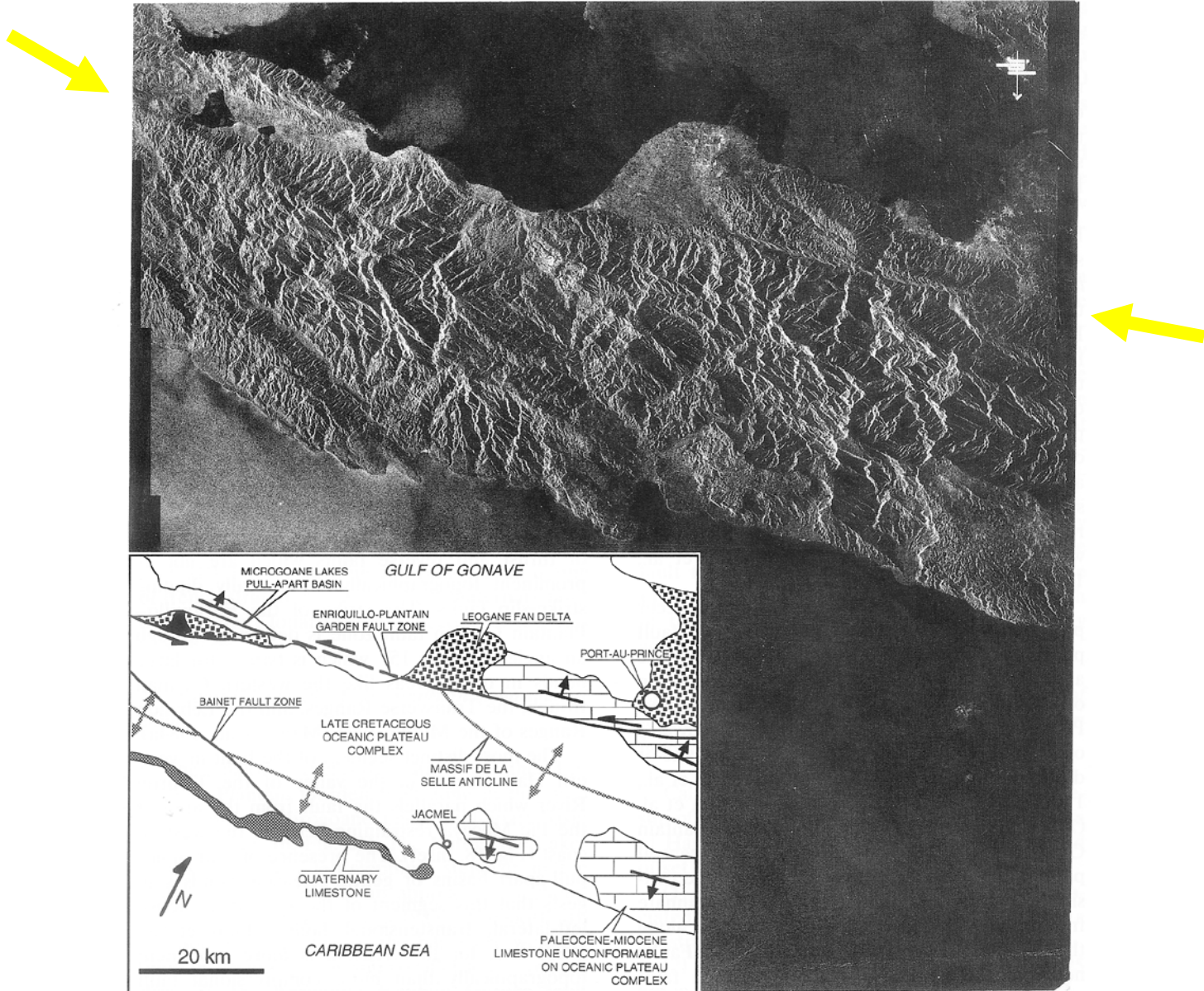


Figure from Mann et al., 2002

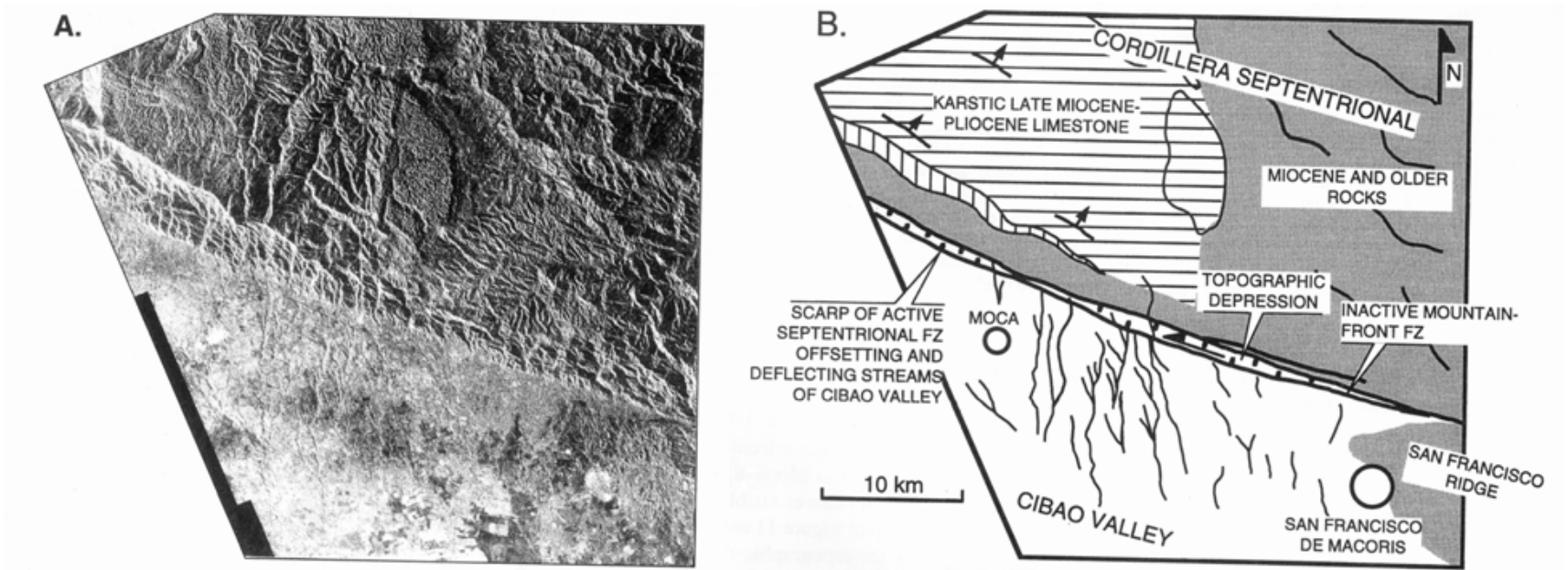
Enriquillo fault zone in southern Haiti



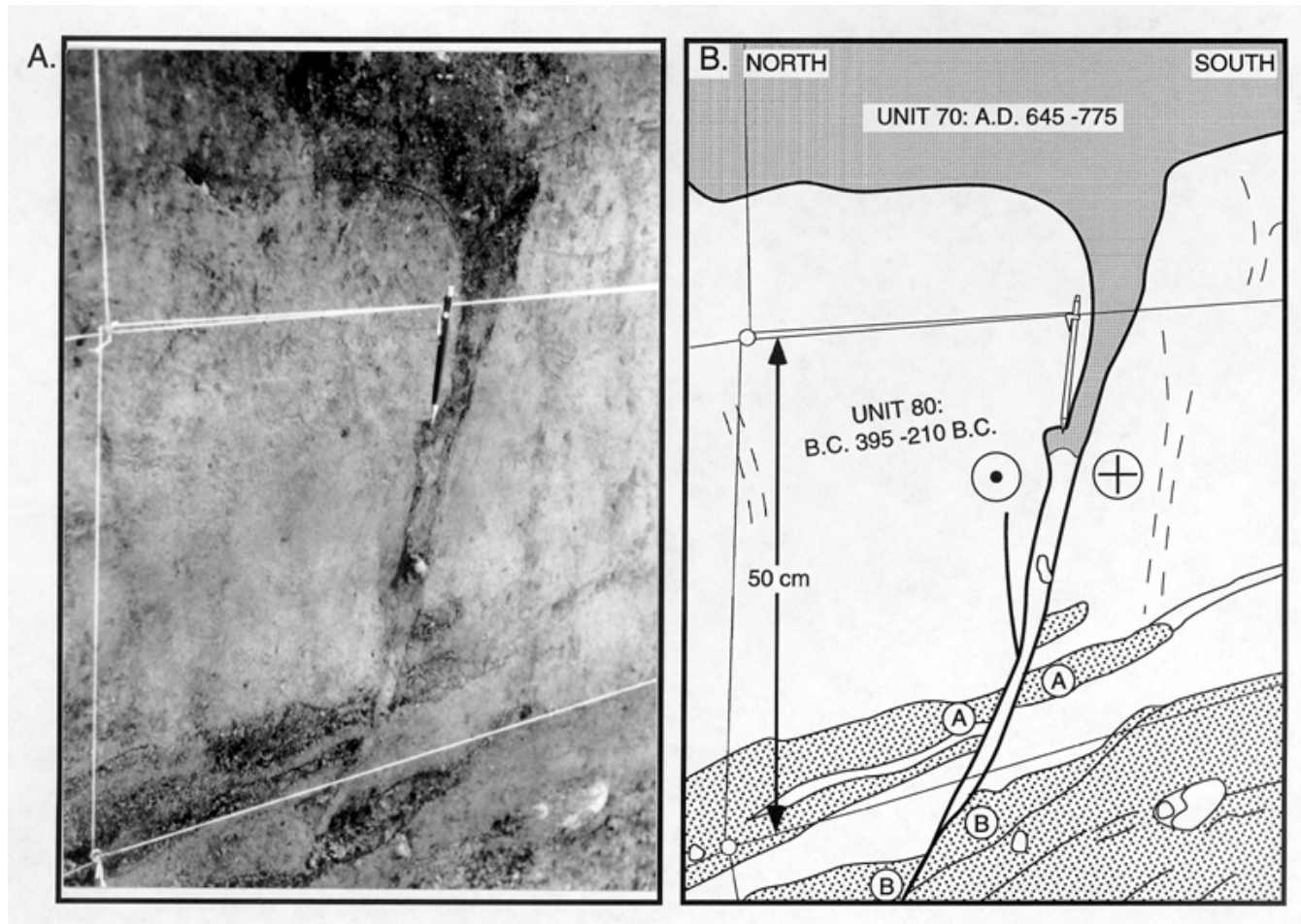
Enriquillo fault zone in southern Haiti

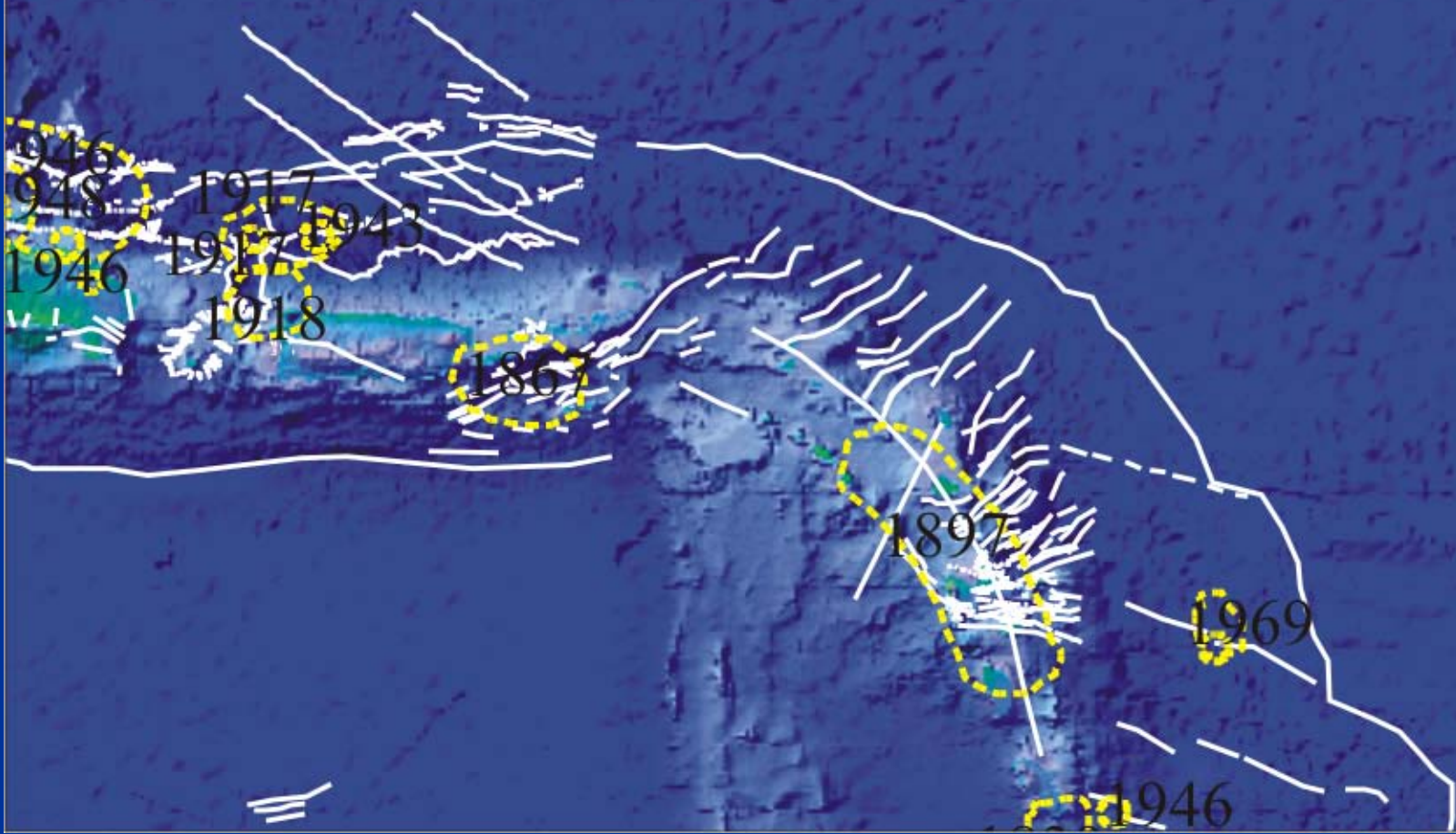


Septentrional fault zone, Dominican Republic: 8-9 mm/yr of left-lateral slip



Most recent fault break, Septentrional fault zone, Cibao Valley





Oblique underthrusting in the Puerto Rico trench

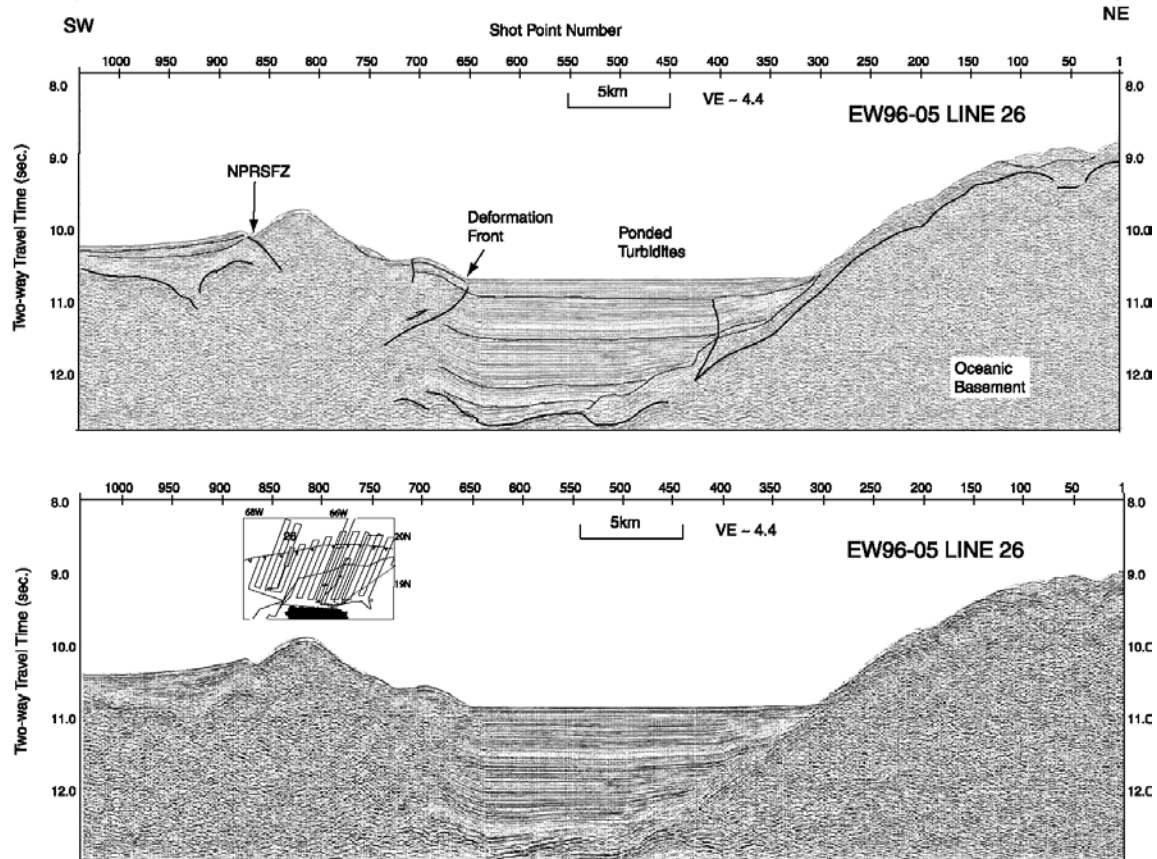


Figure 13, Grindlay et al.

Collapse of the northern carbonate margin of Puerto Rico

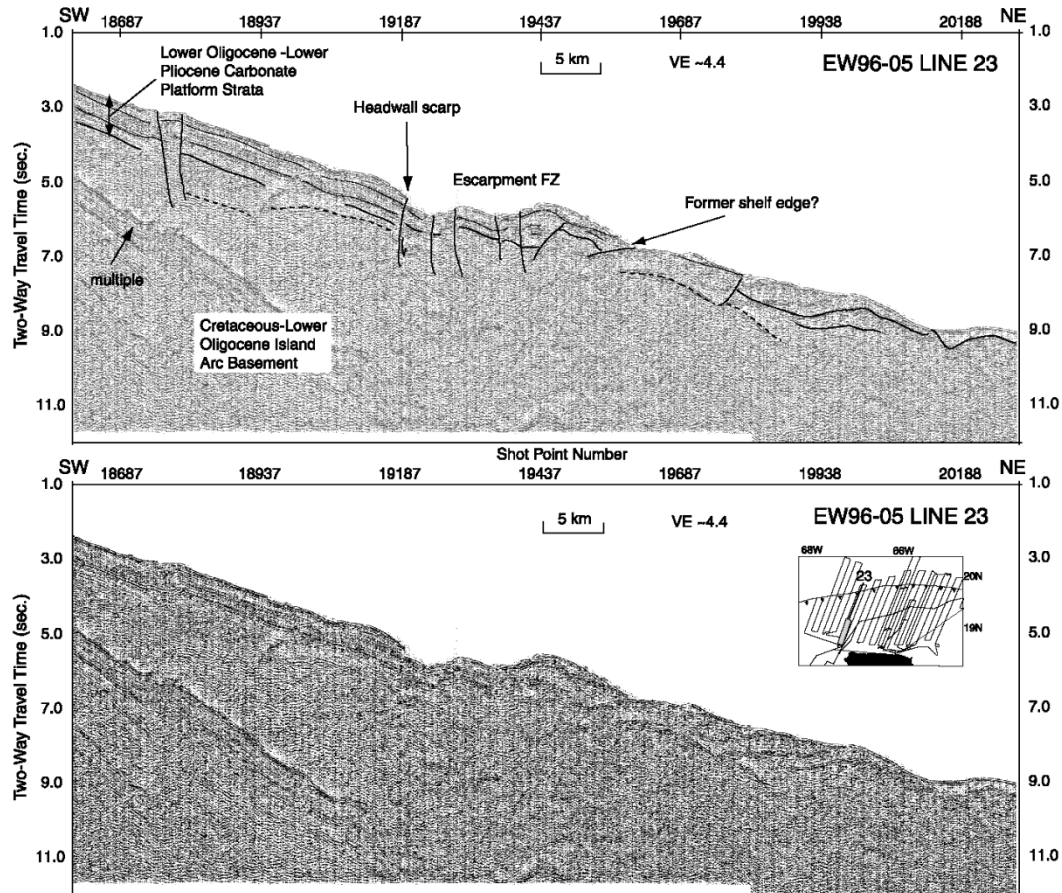
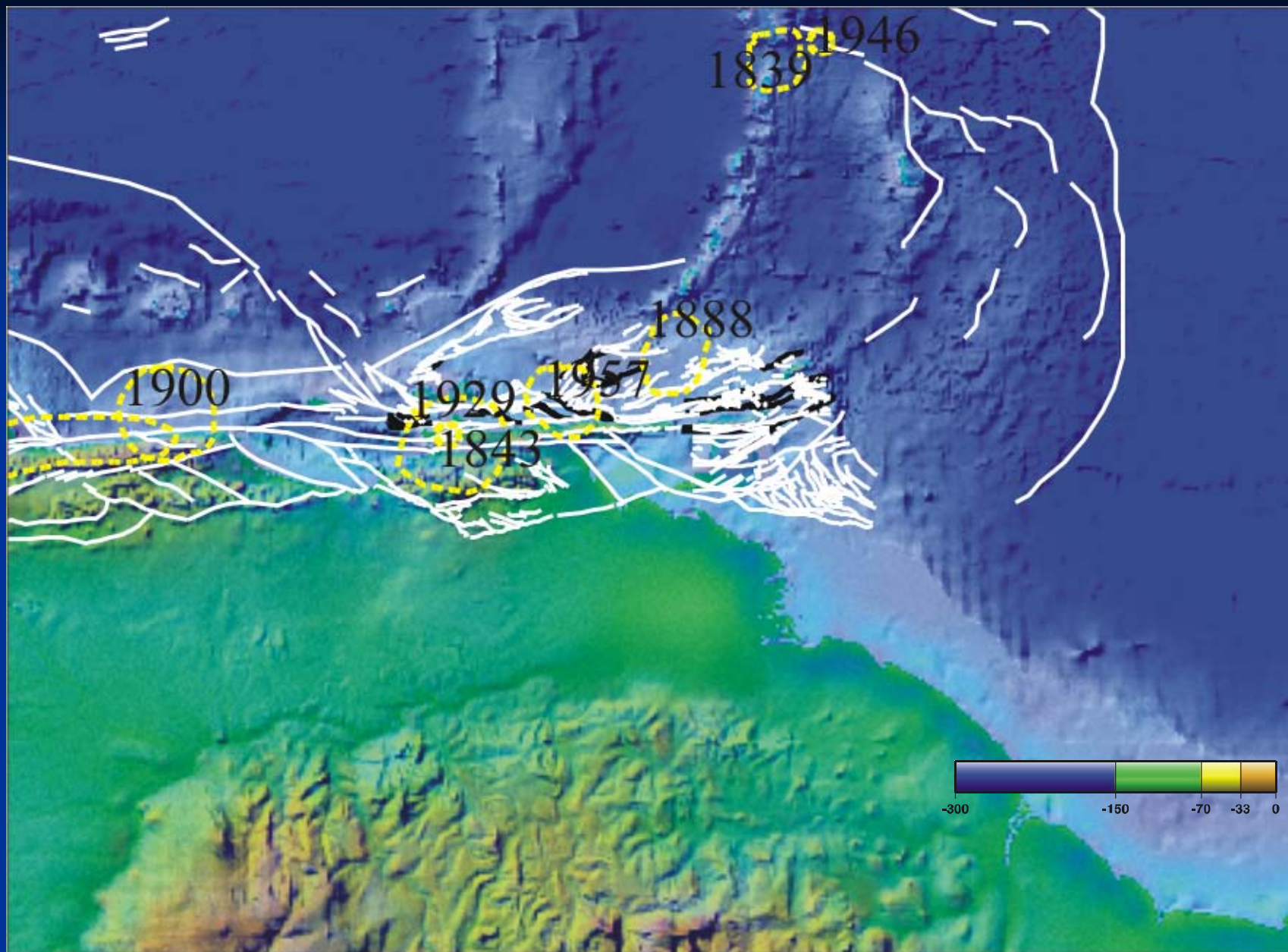
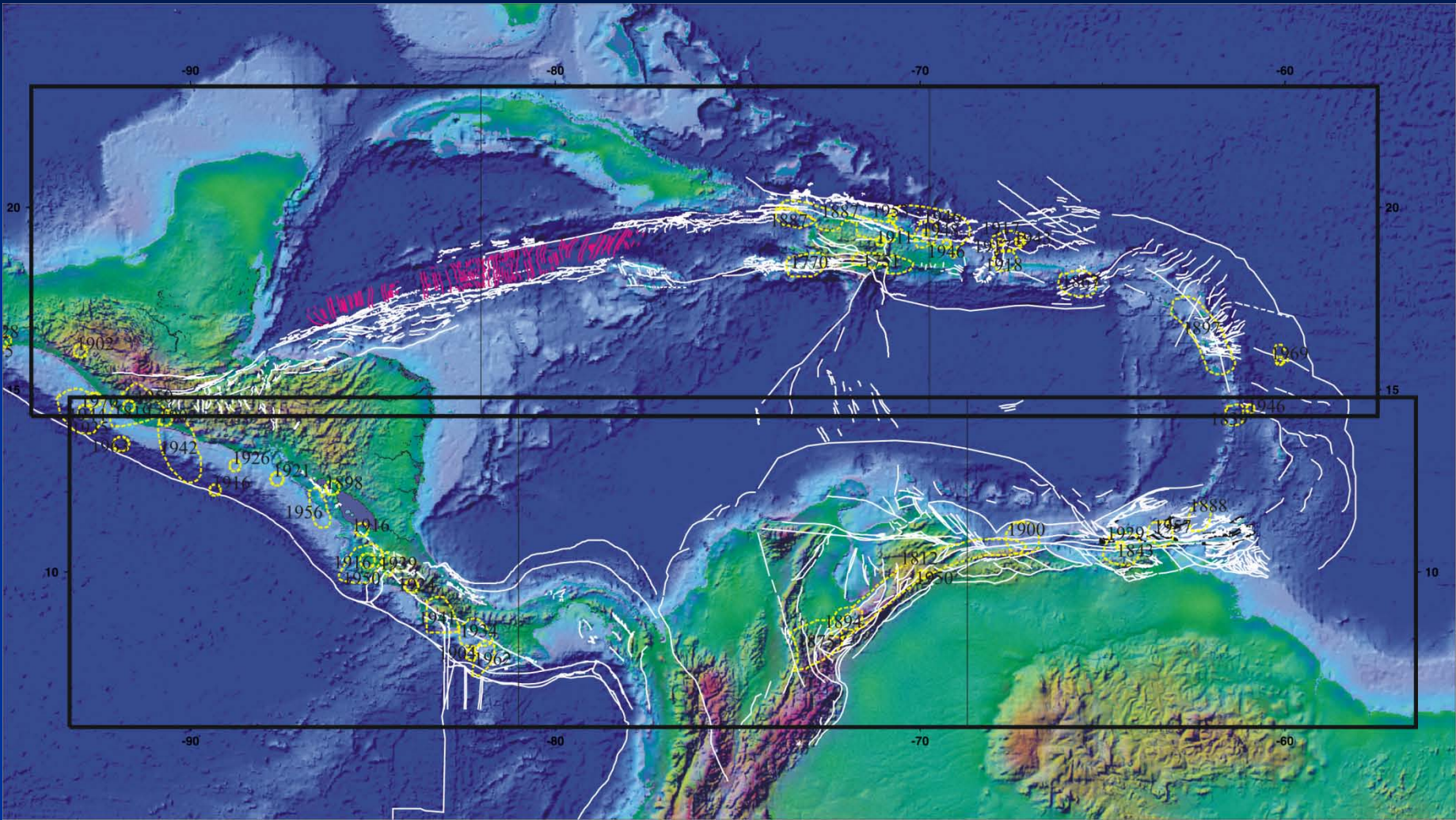
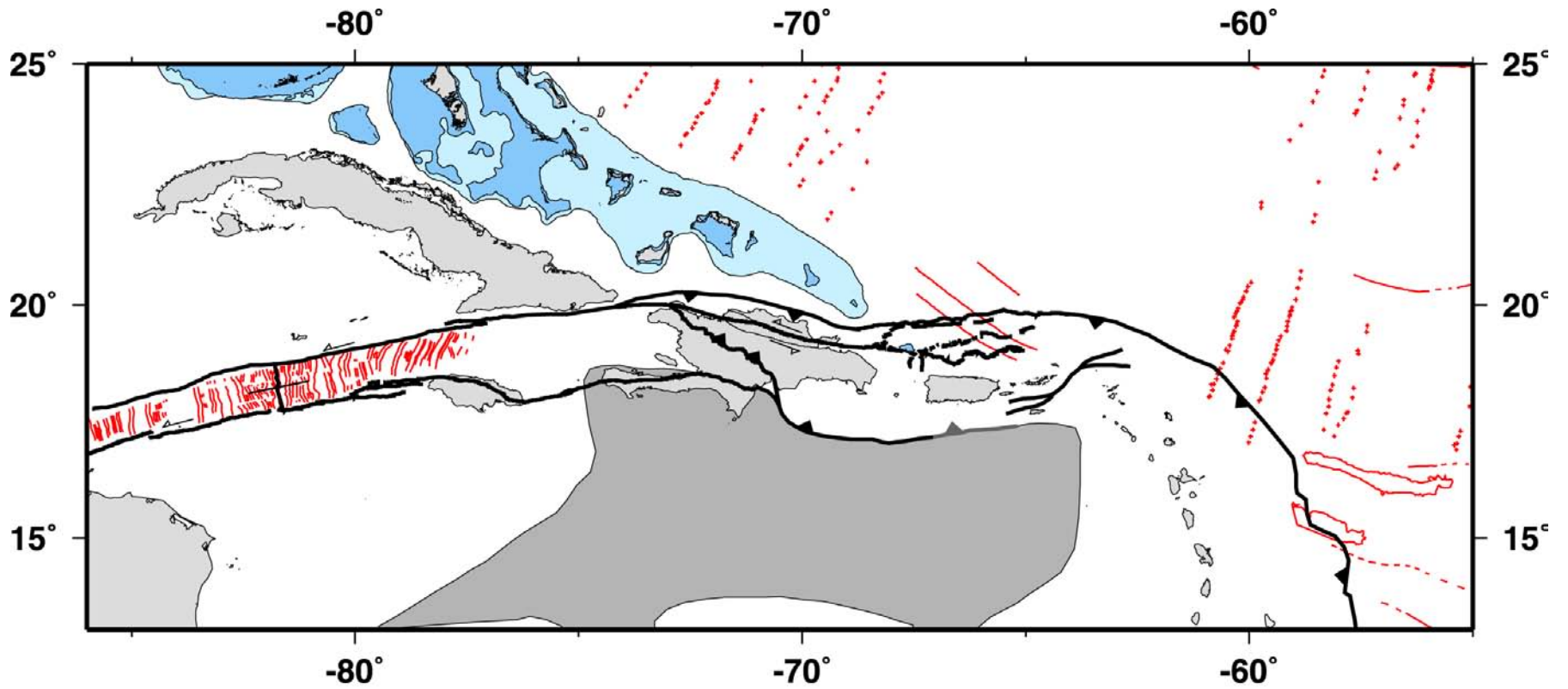


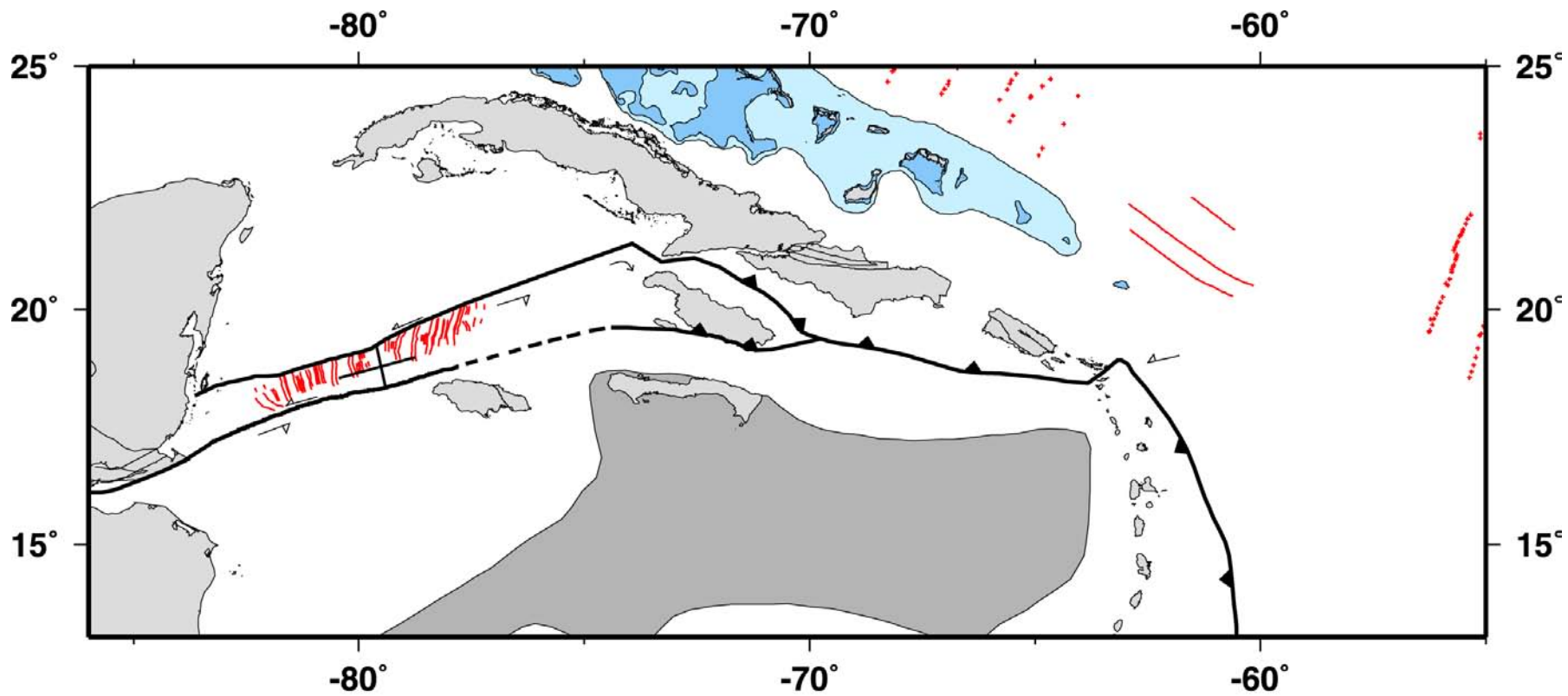
Figure 7, Grindley et al.



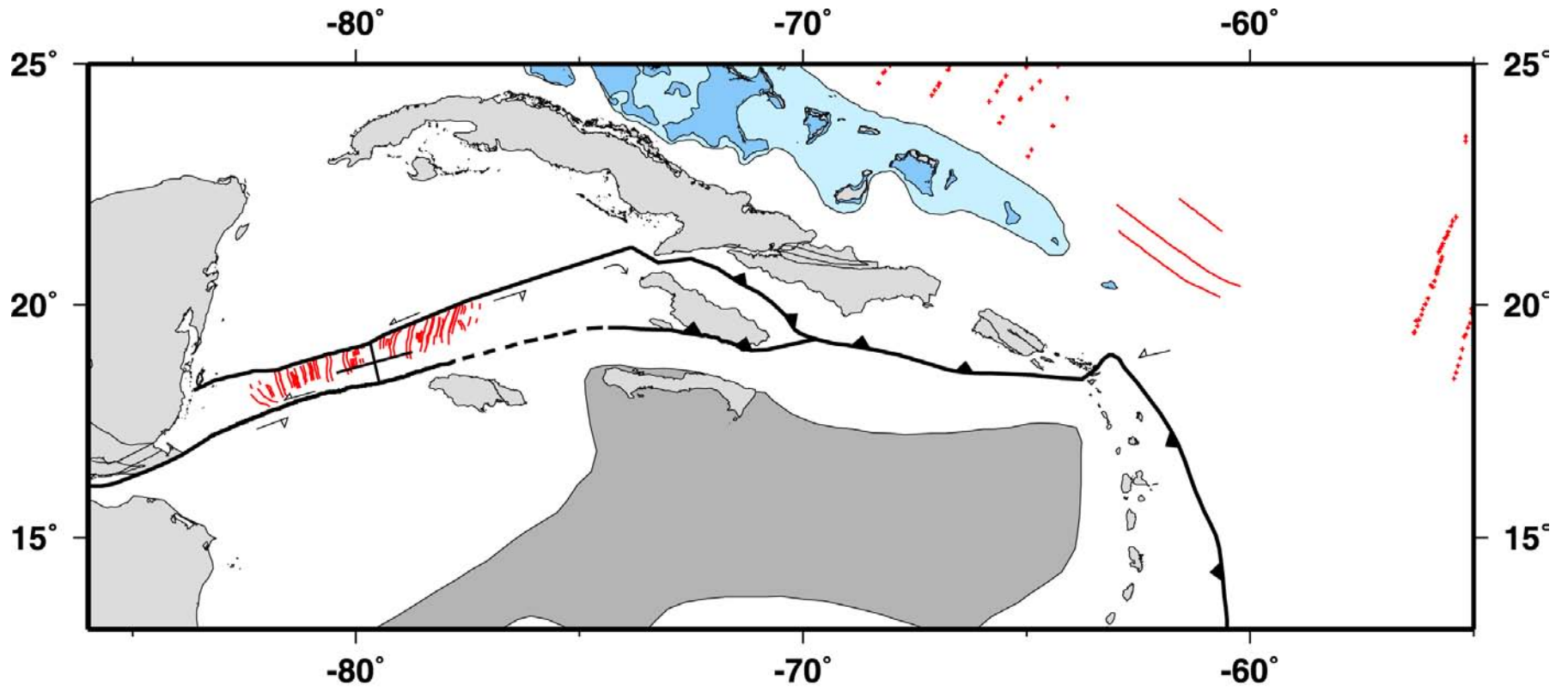




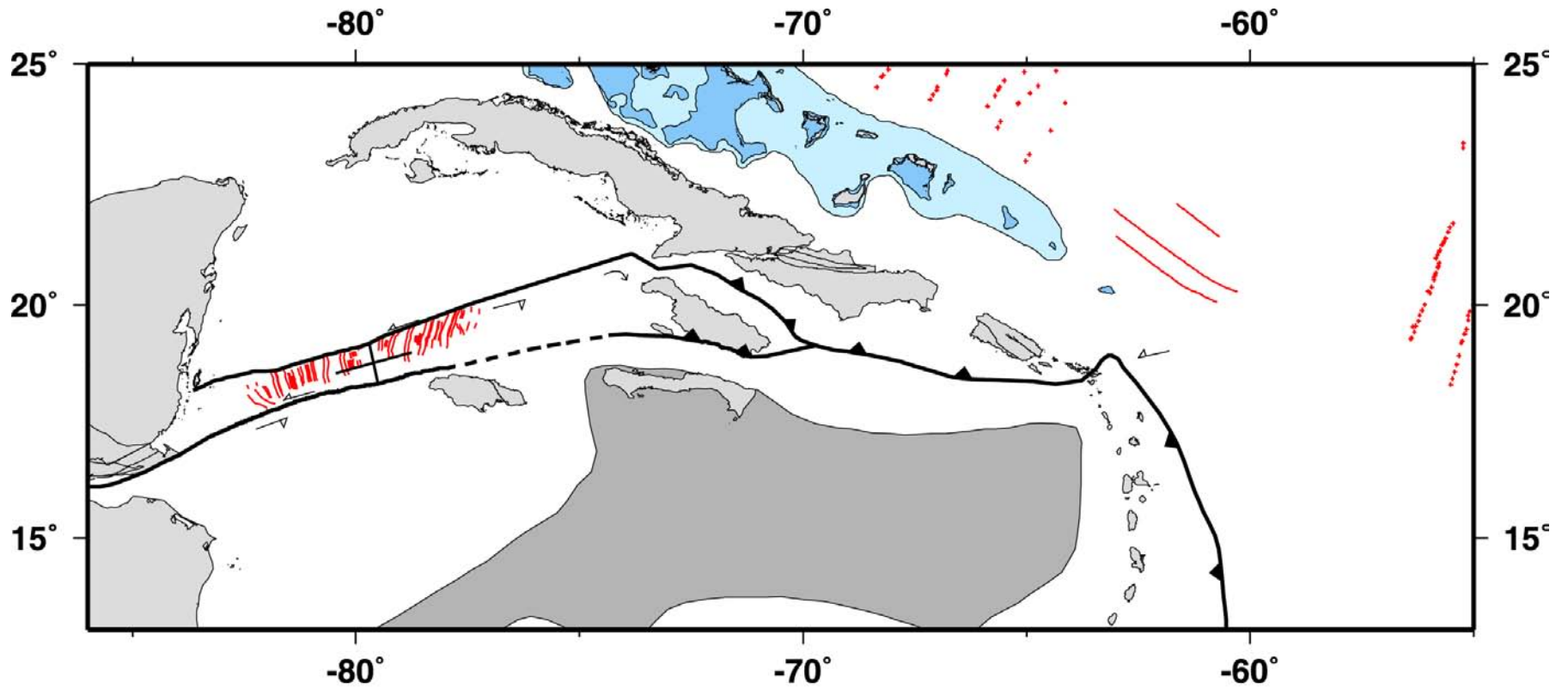
Present Day
00.0 Ma



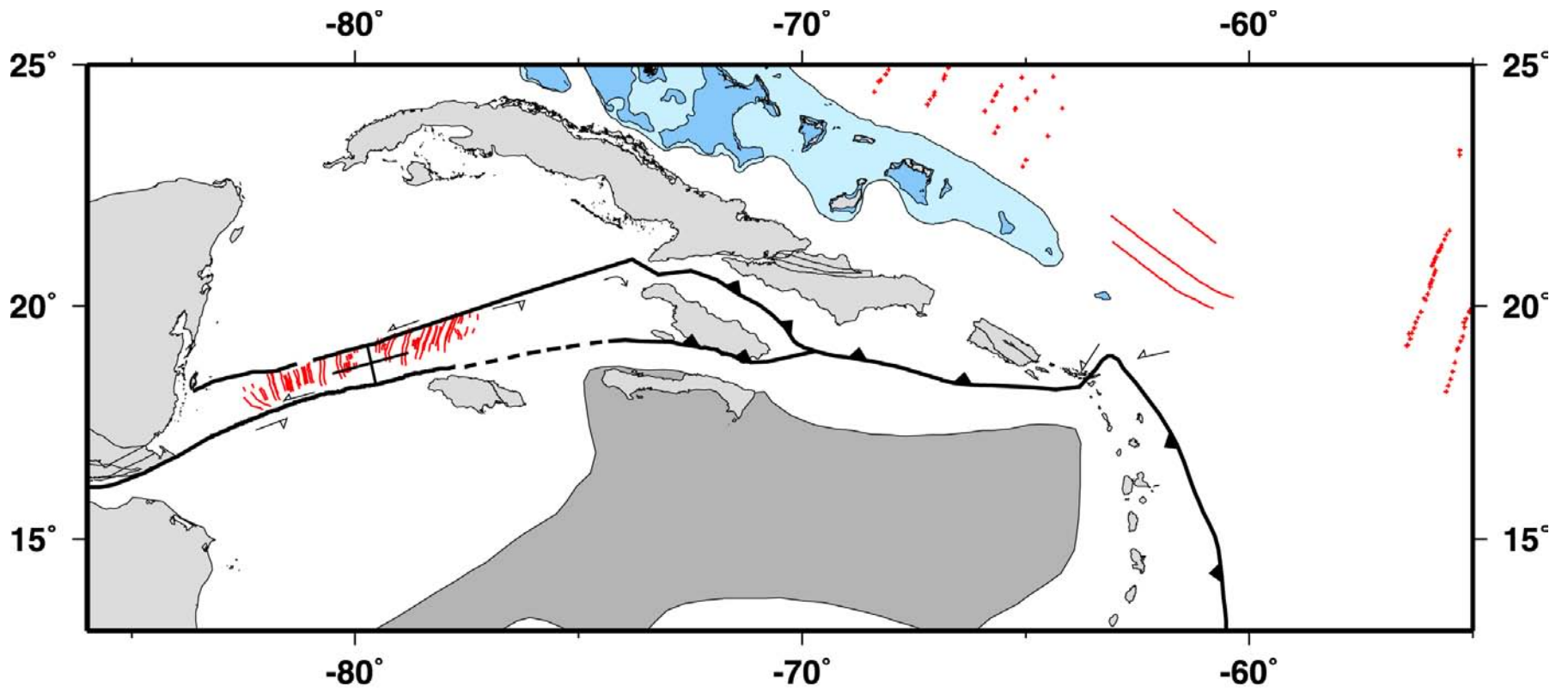
Late Oligocene
24.0 Ma



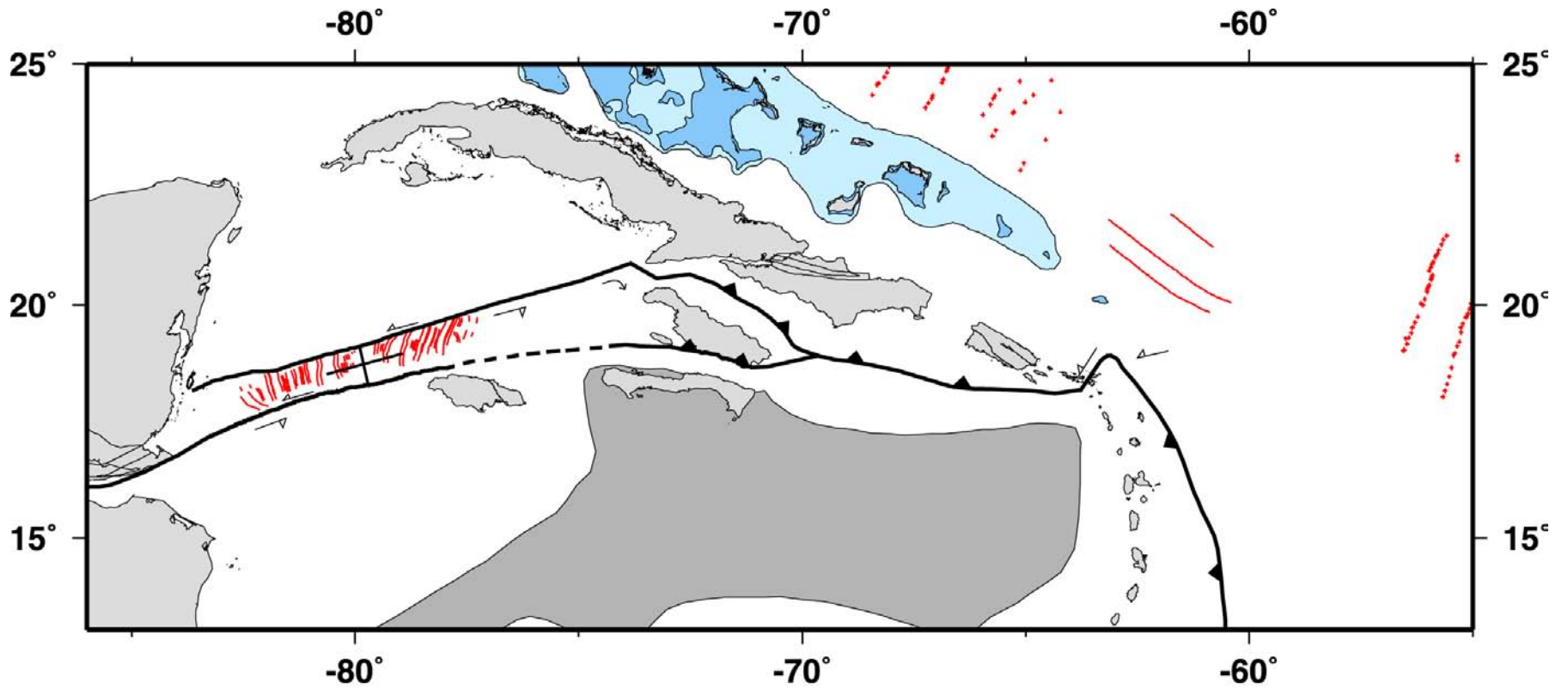
Early Miocene
23.5 Ma



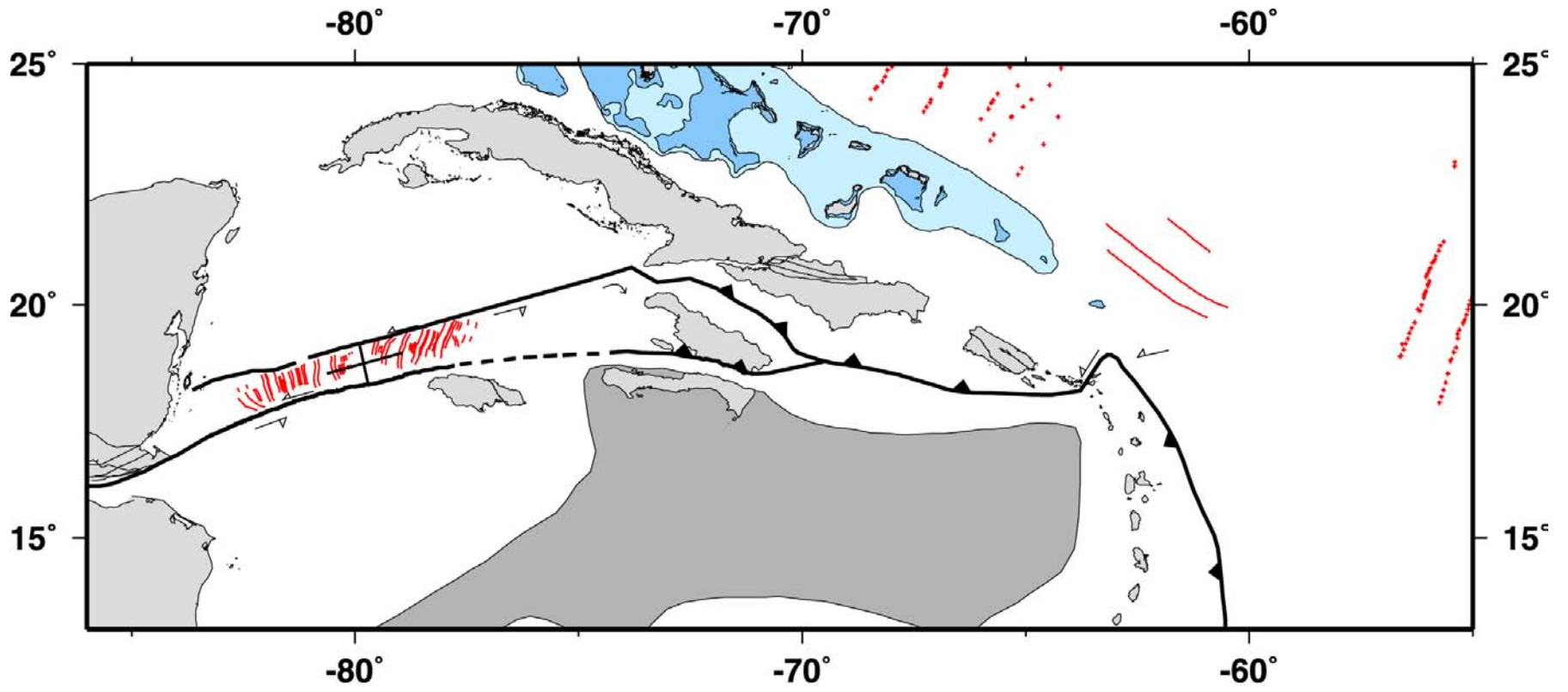
Early Miocene
23.0 Ma



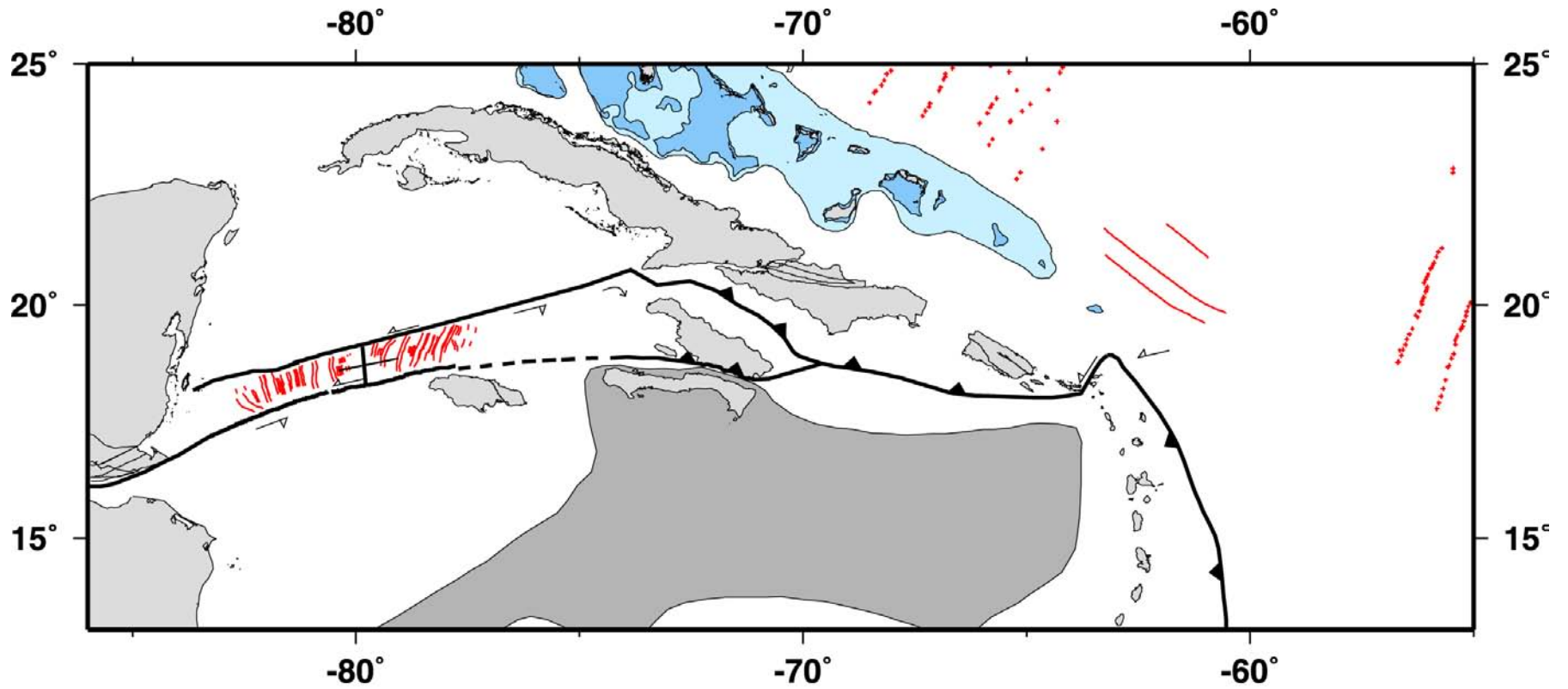
Early Miocene
22.5 Ma



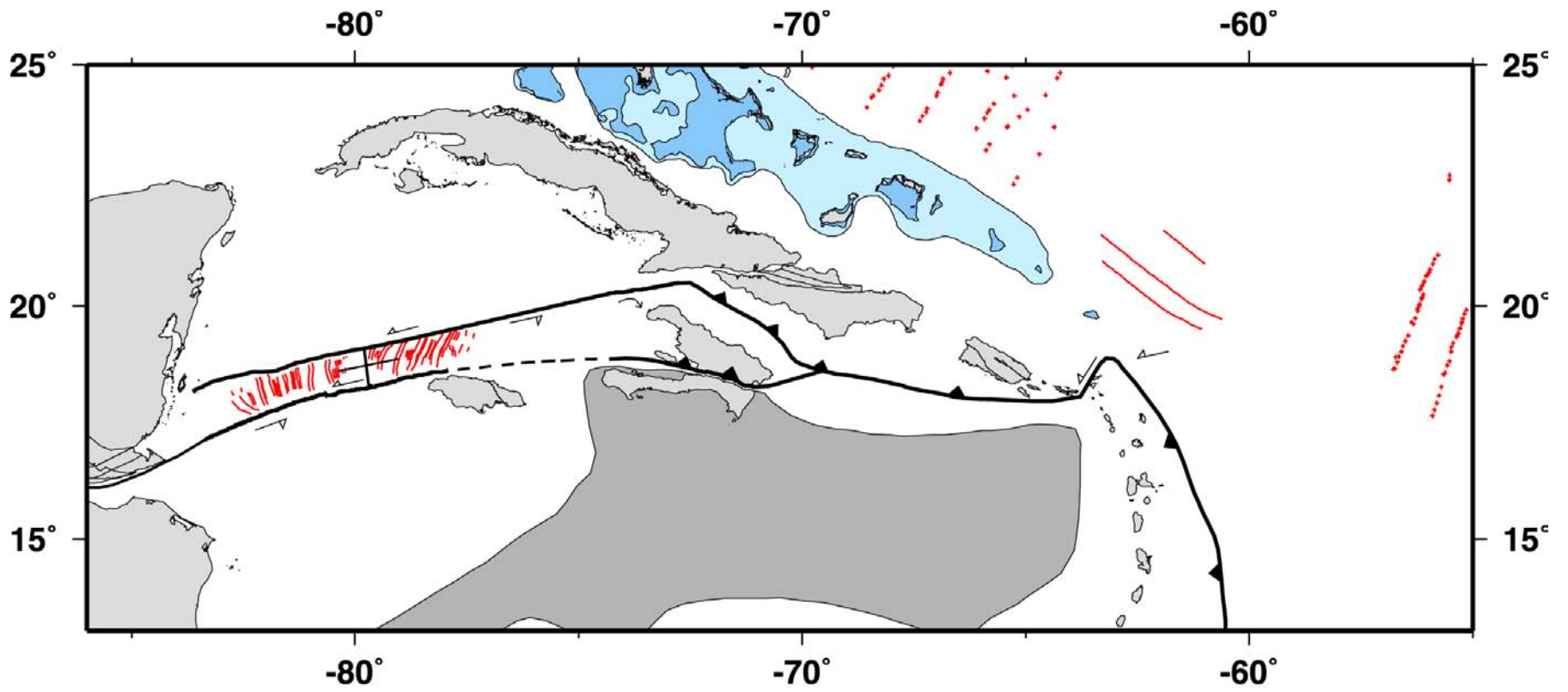
Early Miocene
22.0 Ma



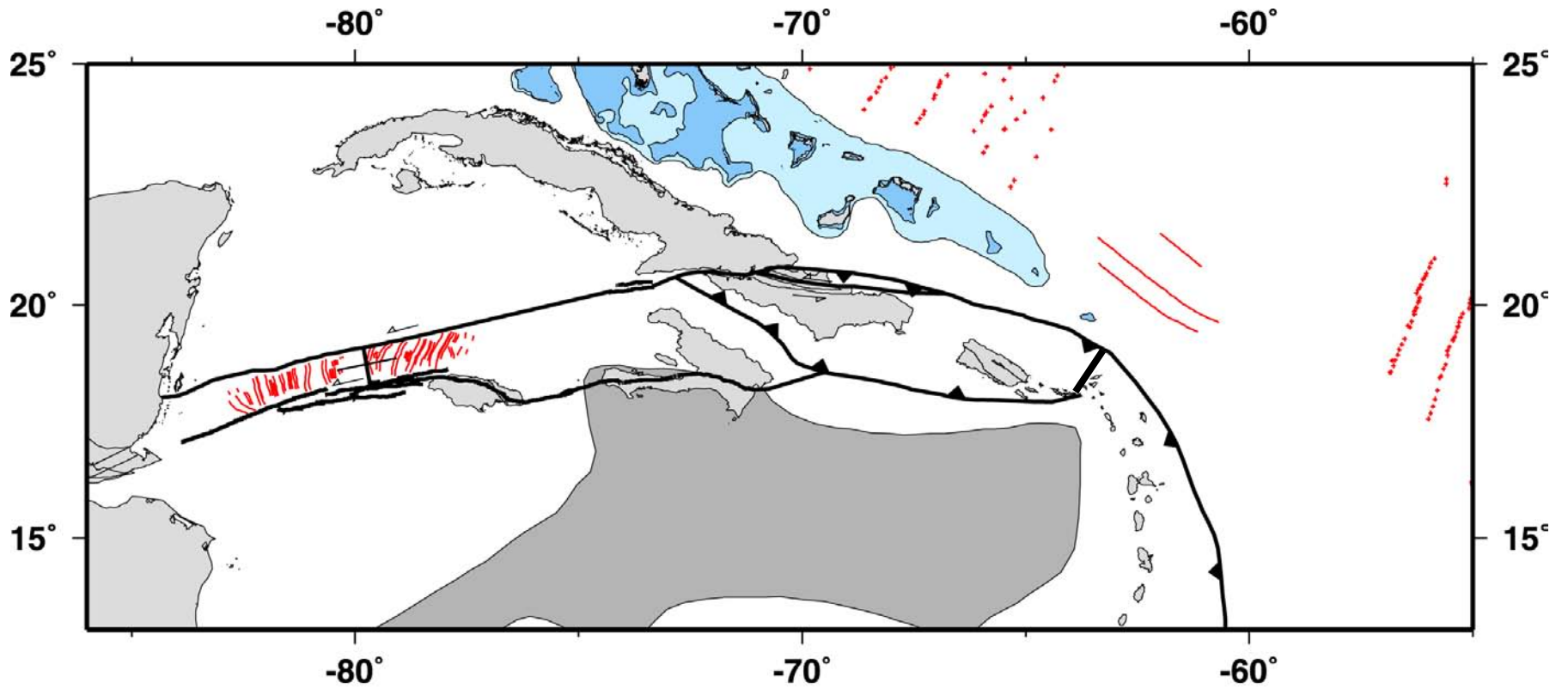
Early Miocene
21.5 Ma



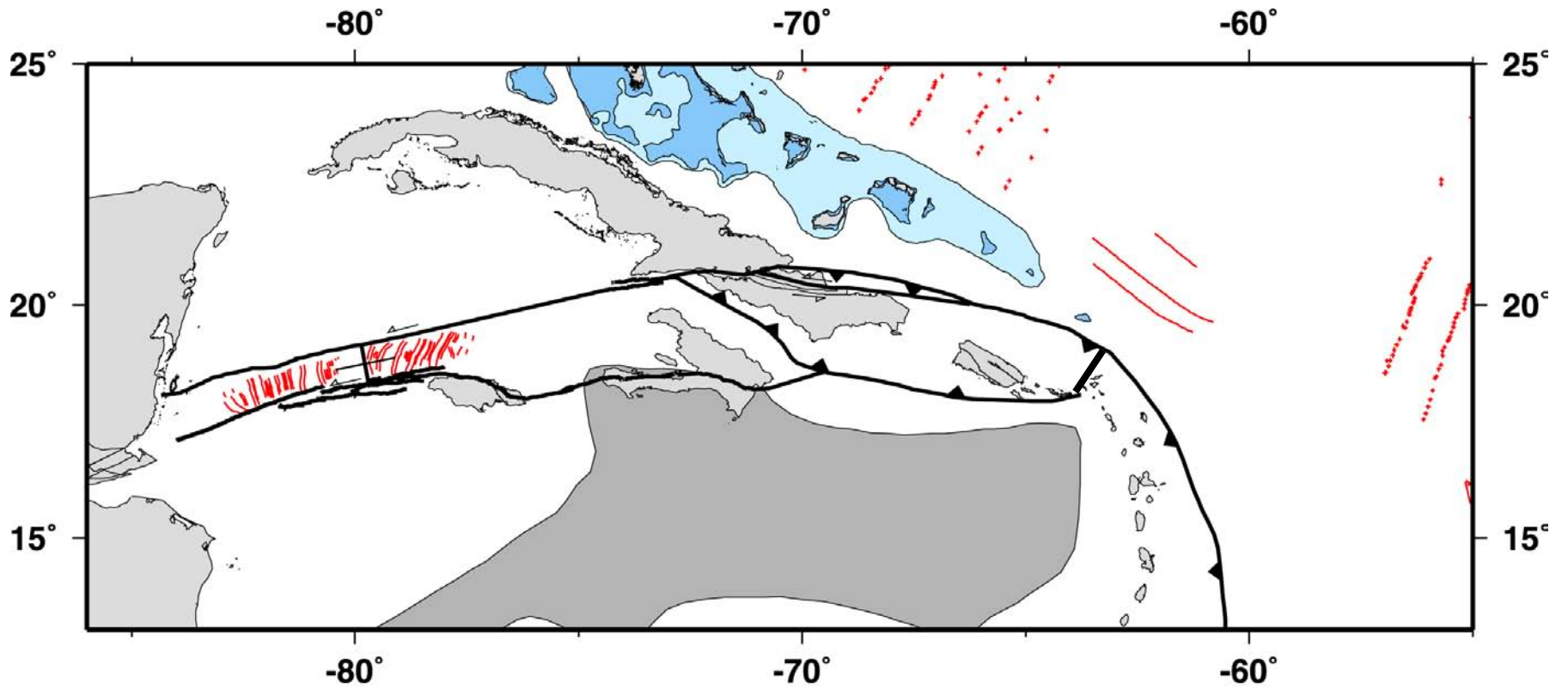
Early Miocene
21.0 Ma



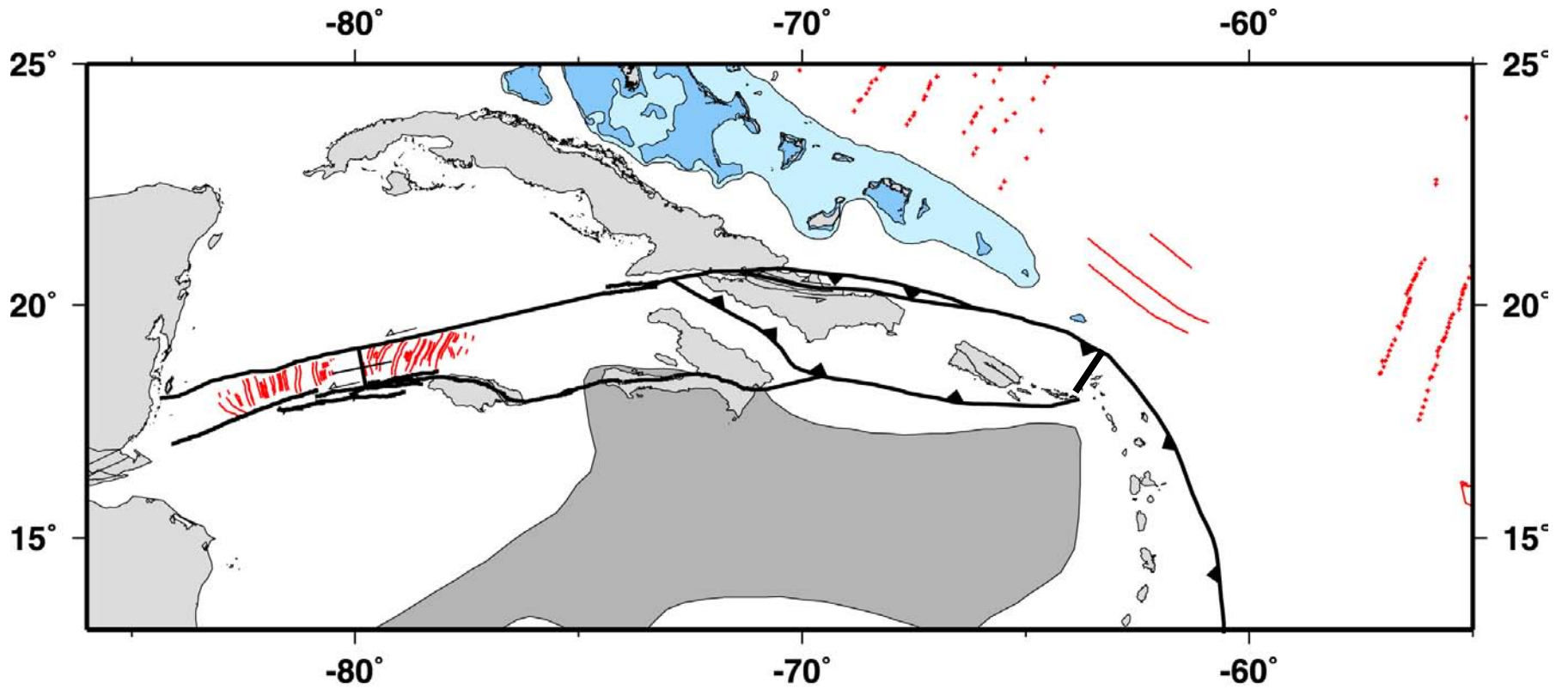
Early Miocene
20.5 Ma



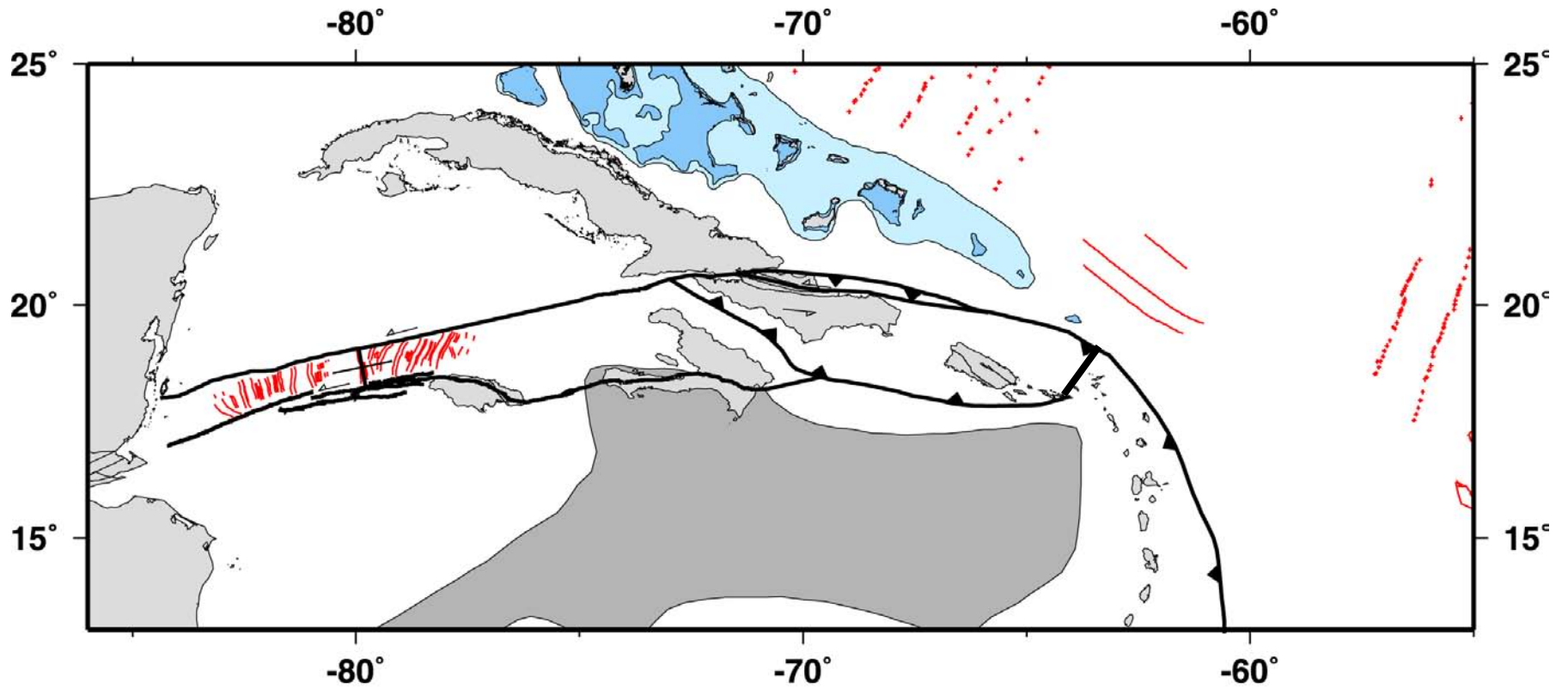
Early Miocene
20.0 Ma



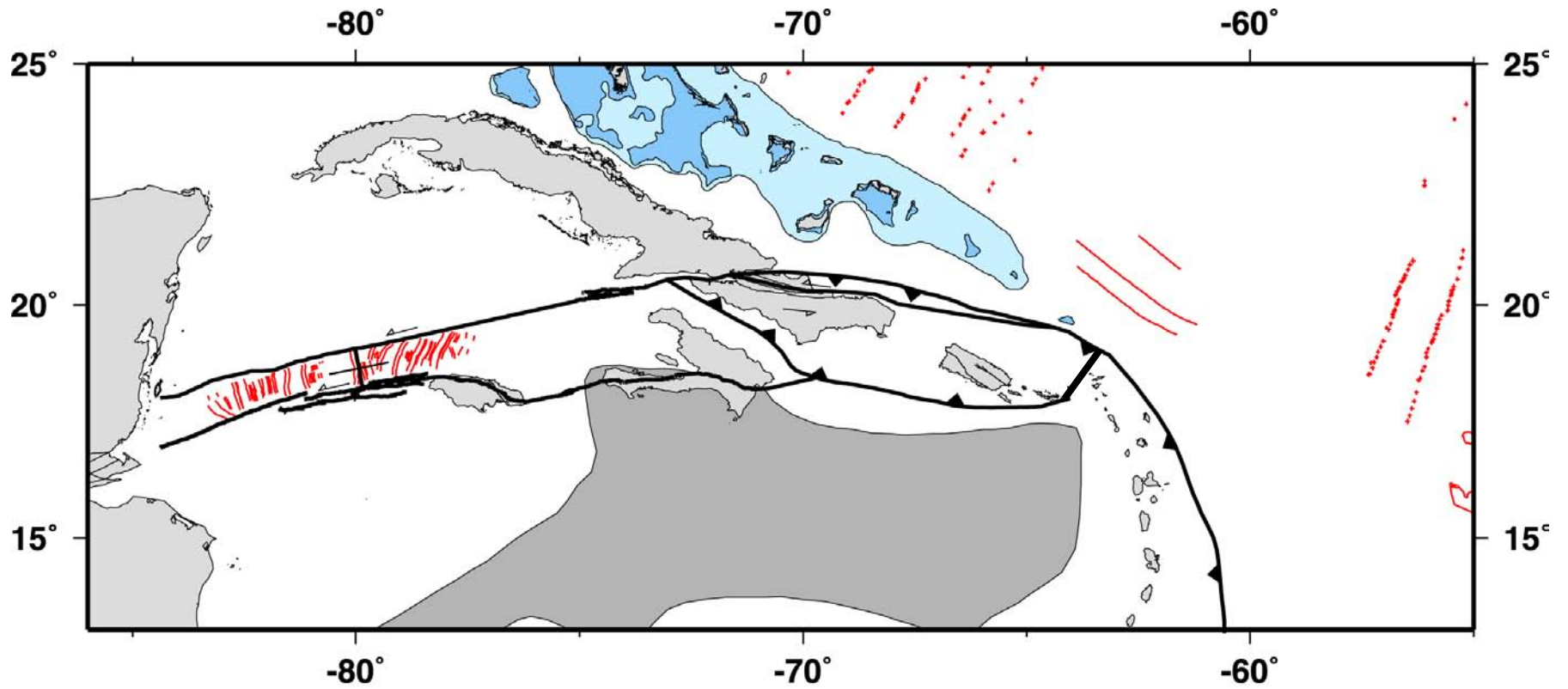
Early Miocene
19.5 Ma



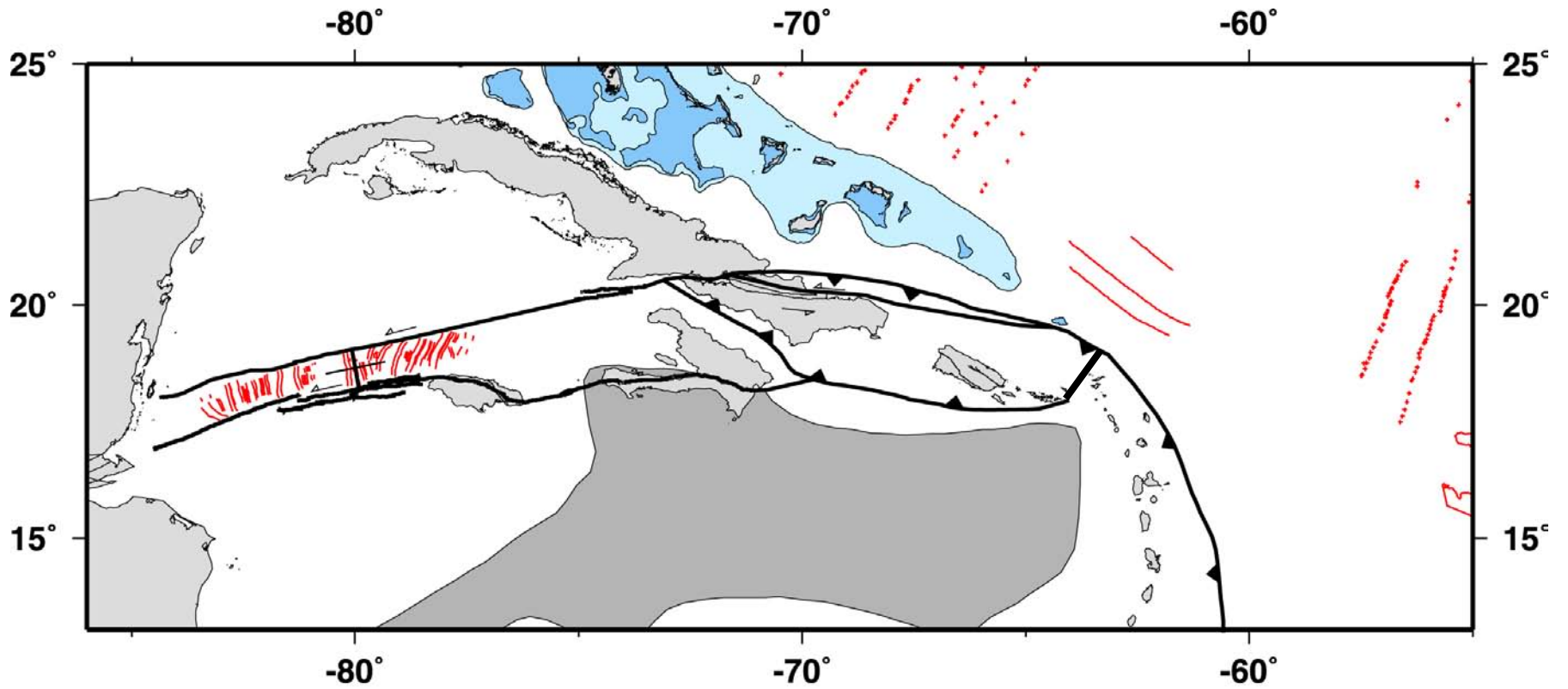
Early Miocene
19.0 Ma



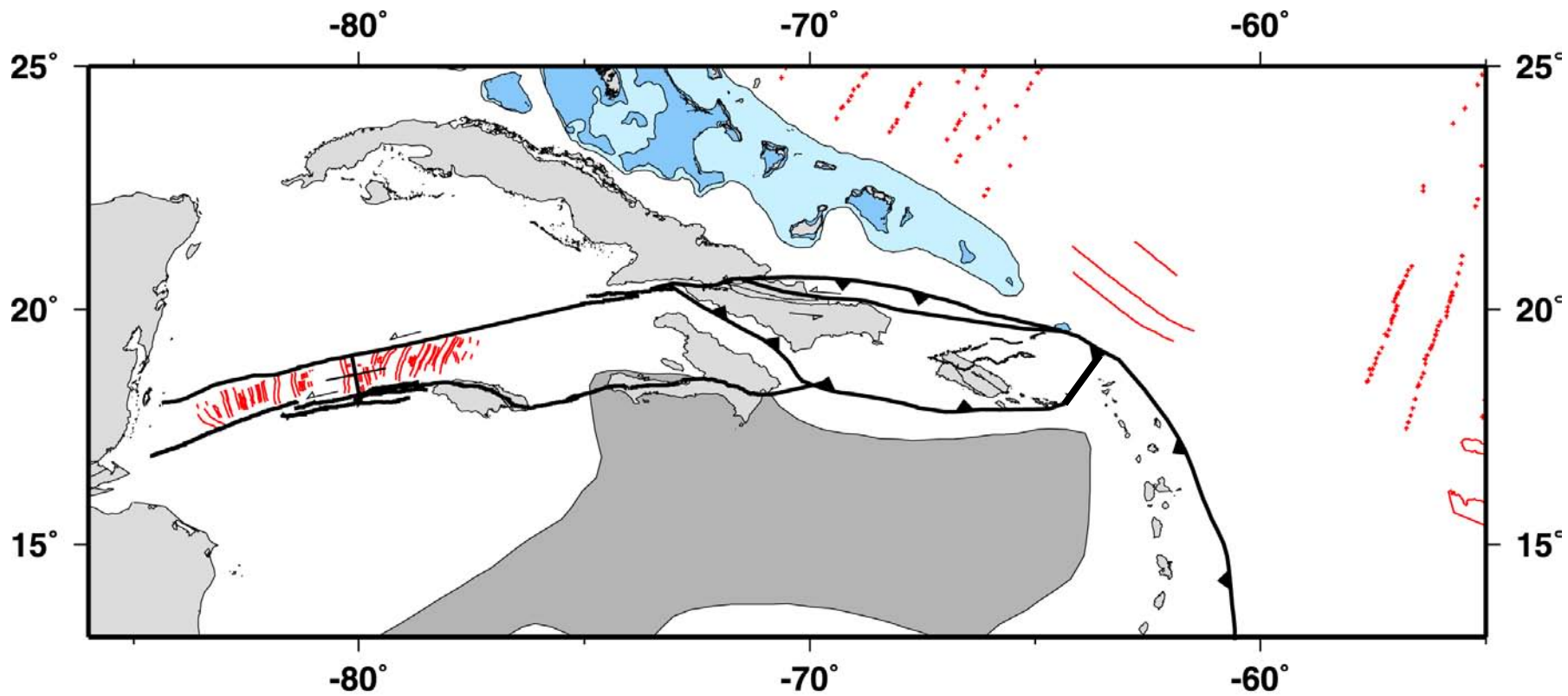
Early Miocene
18.5 Ma



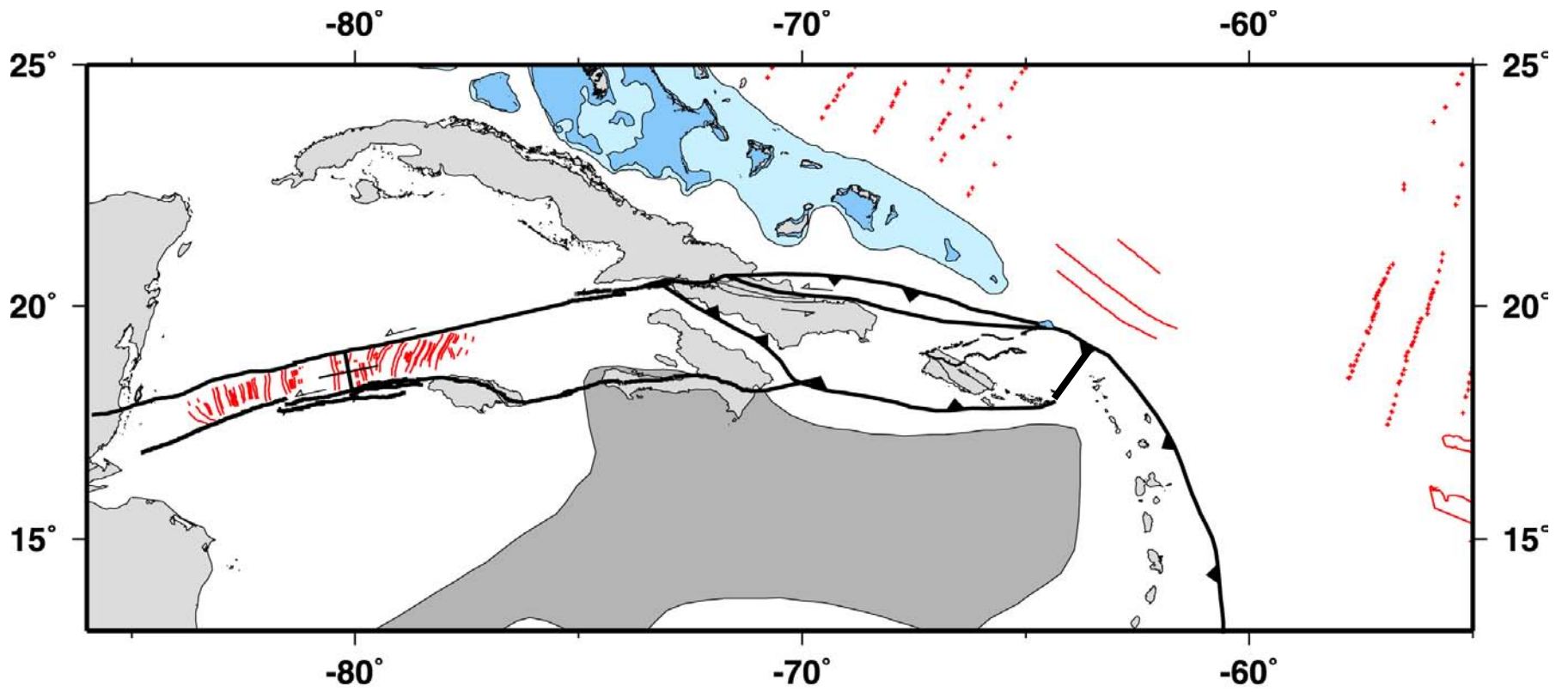
Early Miocene
18.0 Ma



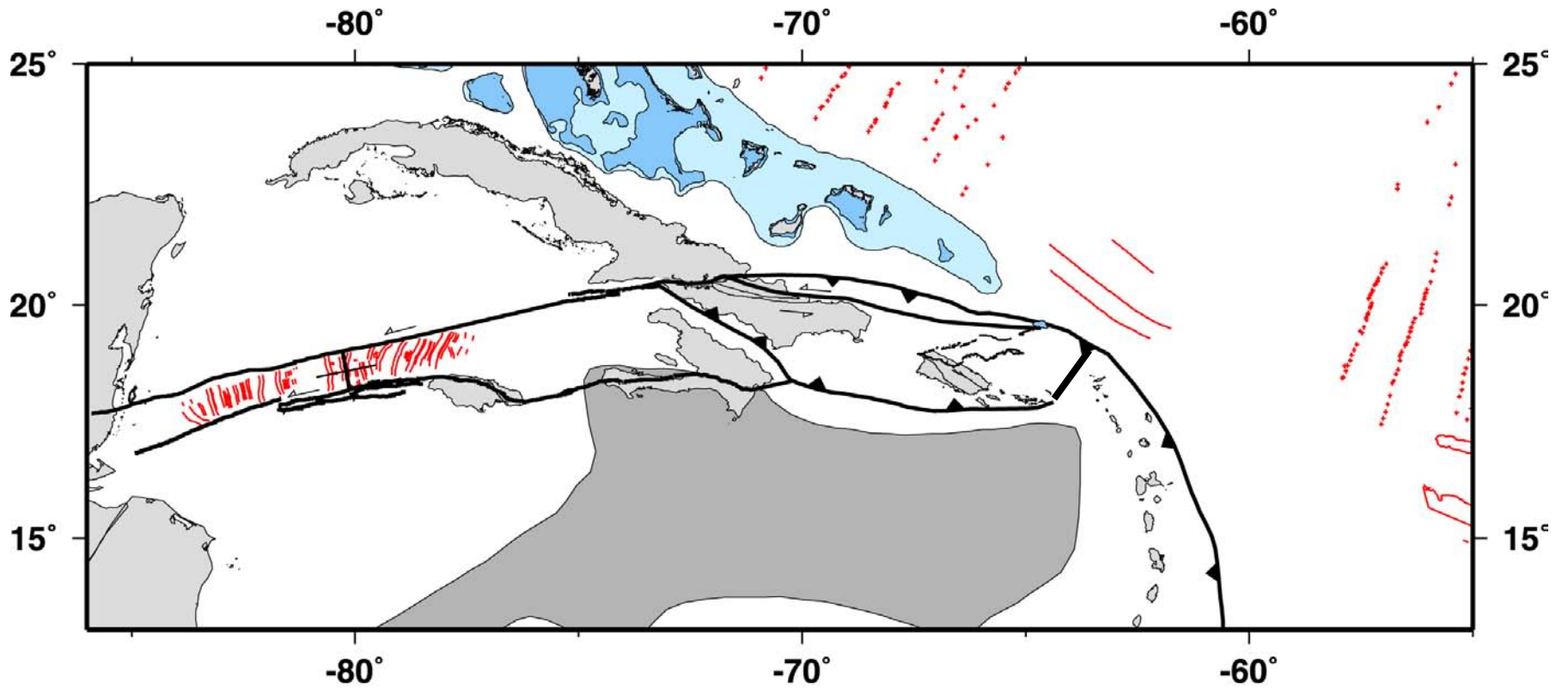
Early Miocene
17.5 Ma



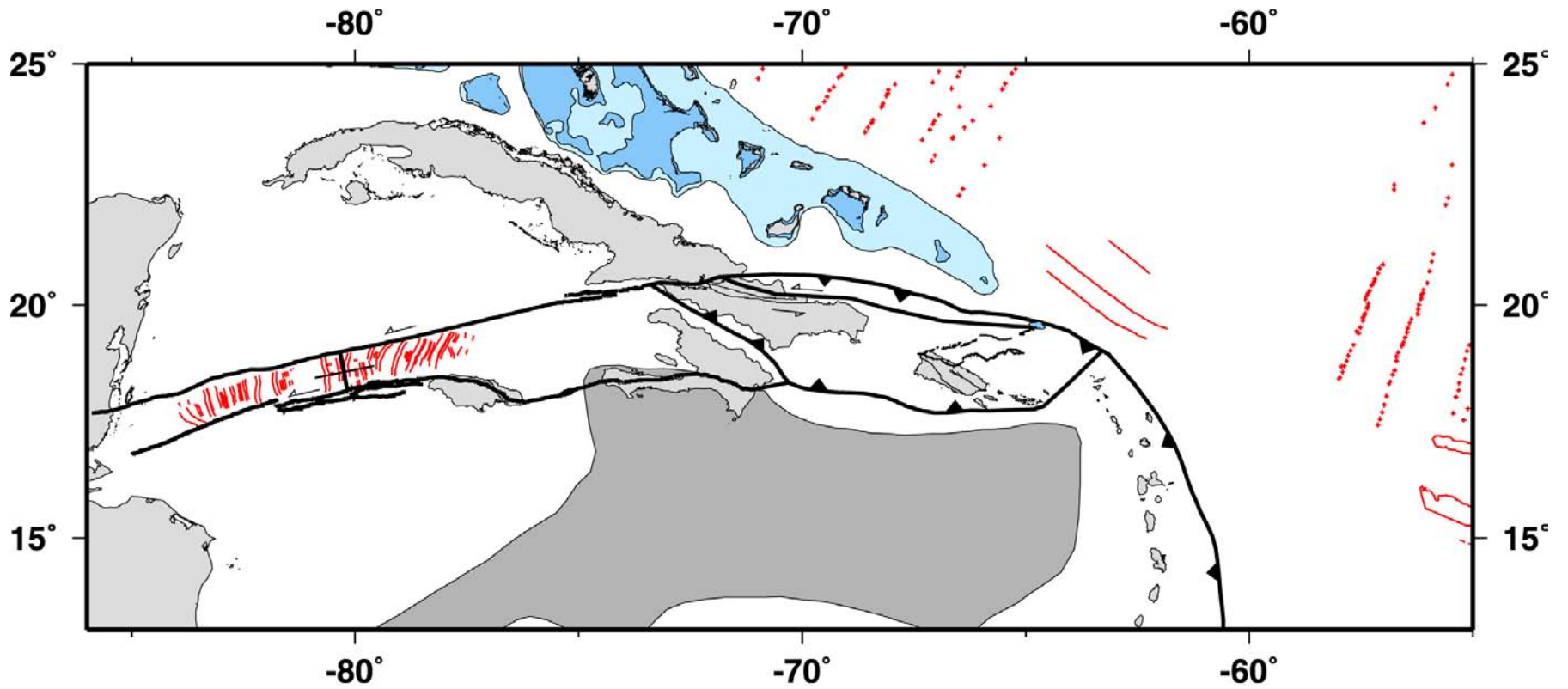
Early Miocene
17.0 Ma



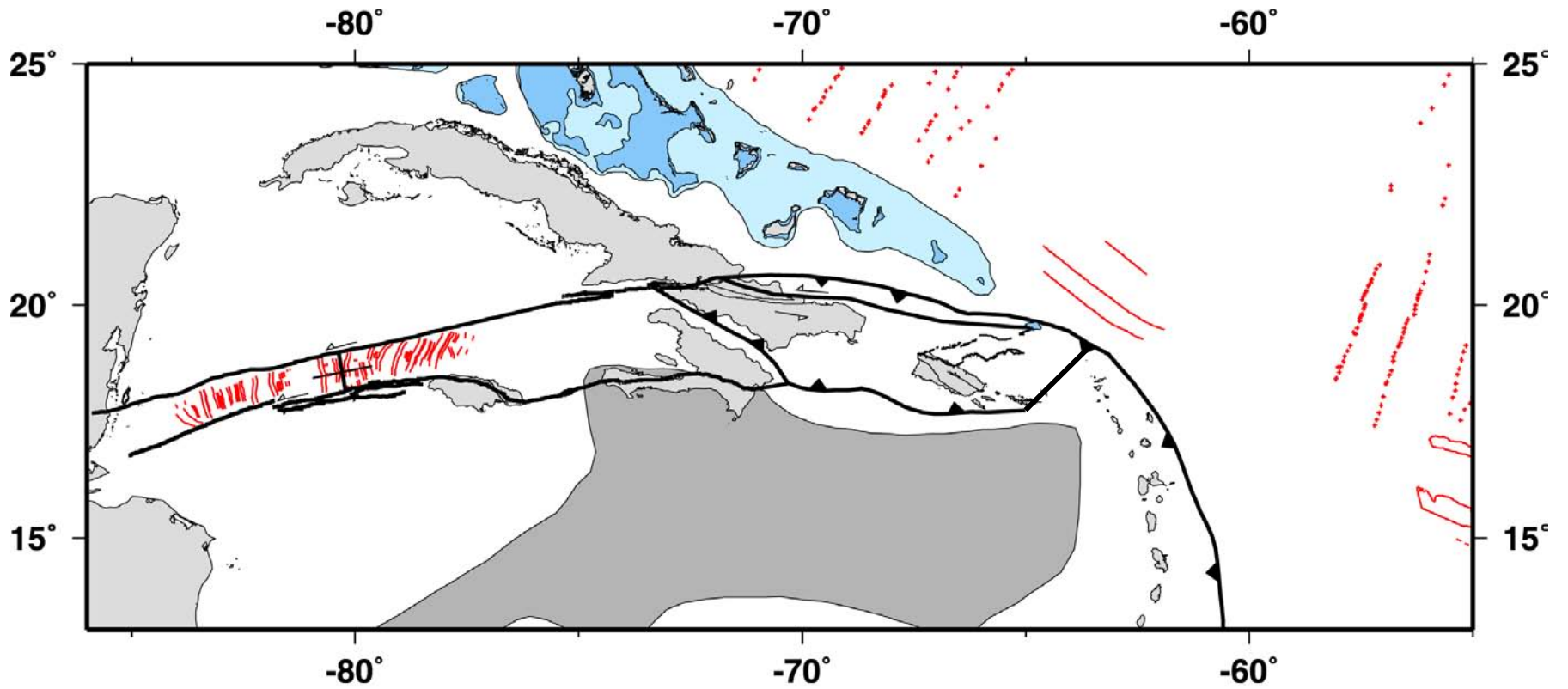
Early Miocene
16.5 Ma



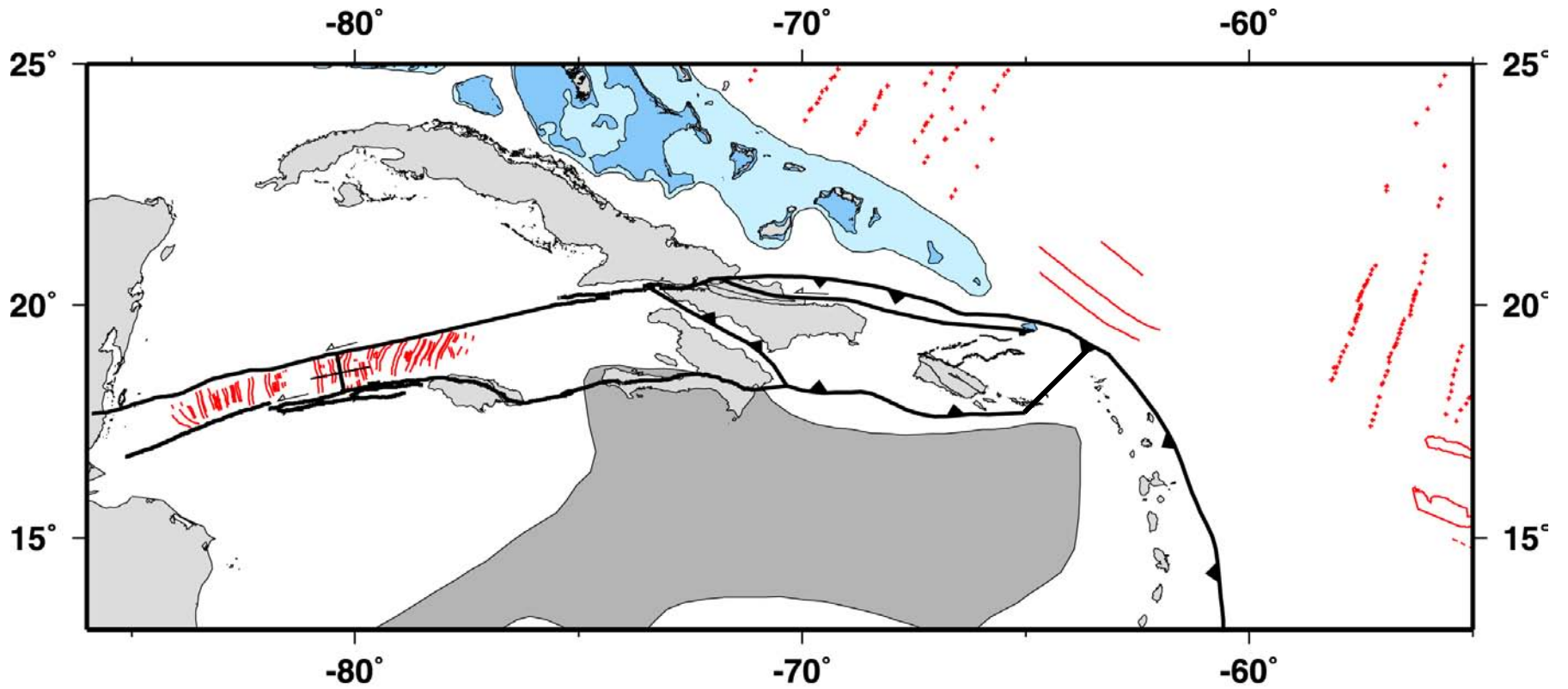
Middle Miocene
16.0 Ma



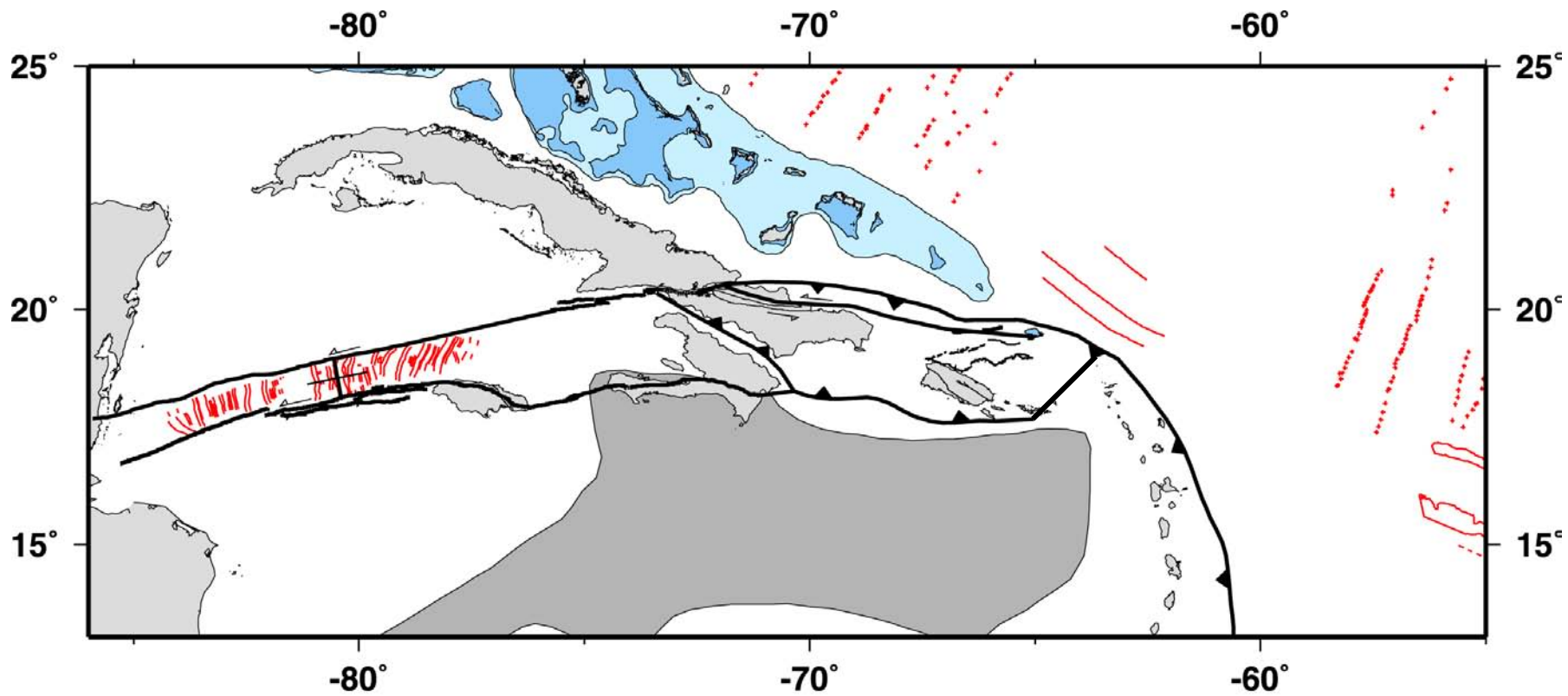
Middle Miocene
15.5 Ma



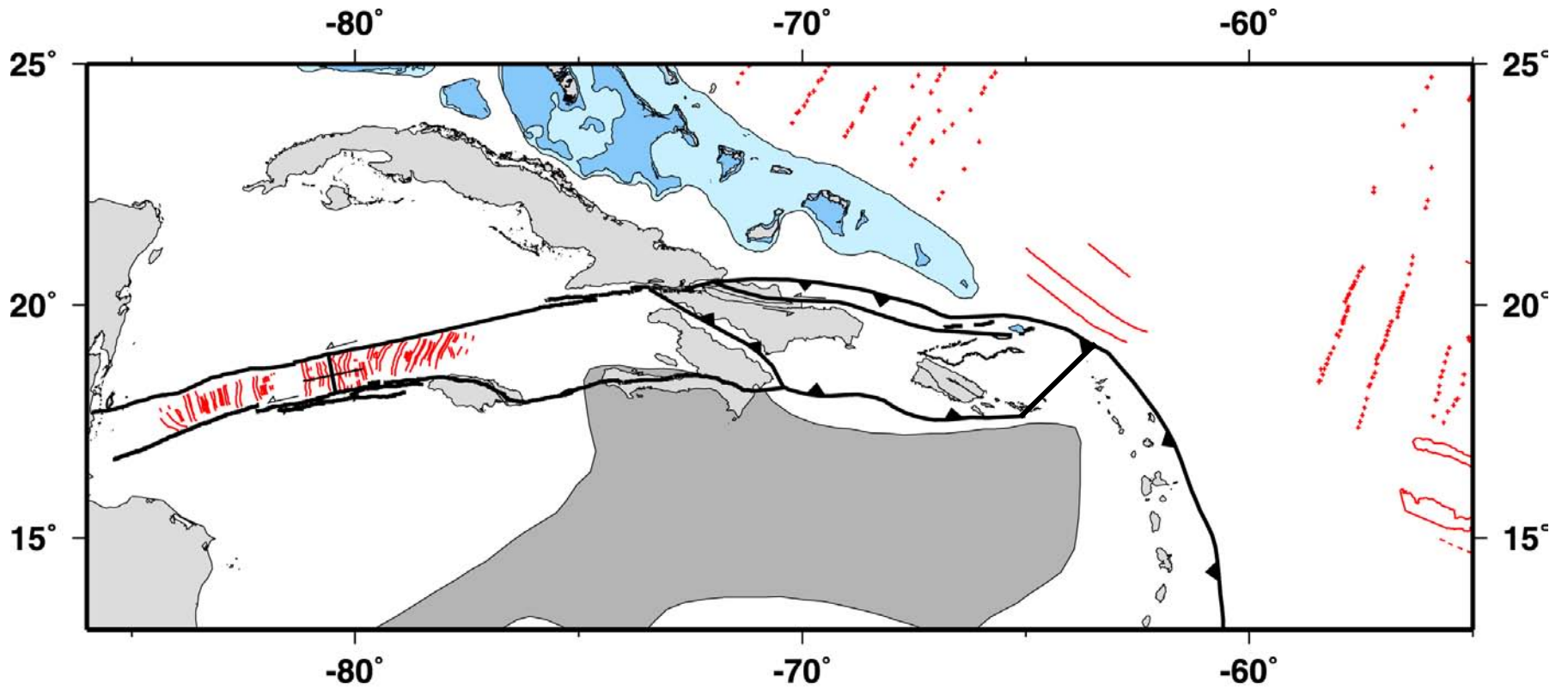
Middle Miocene
15.0 Ma



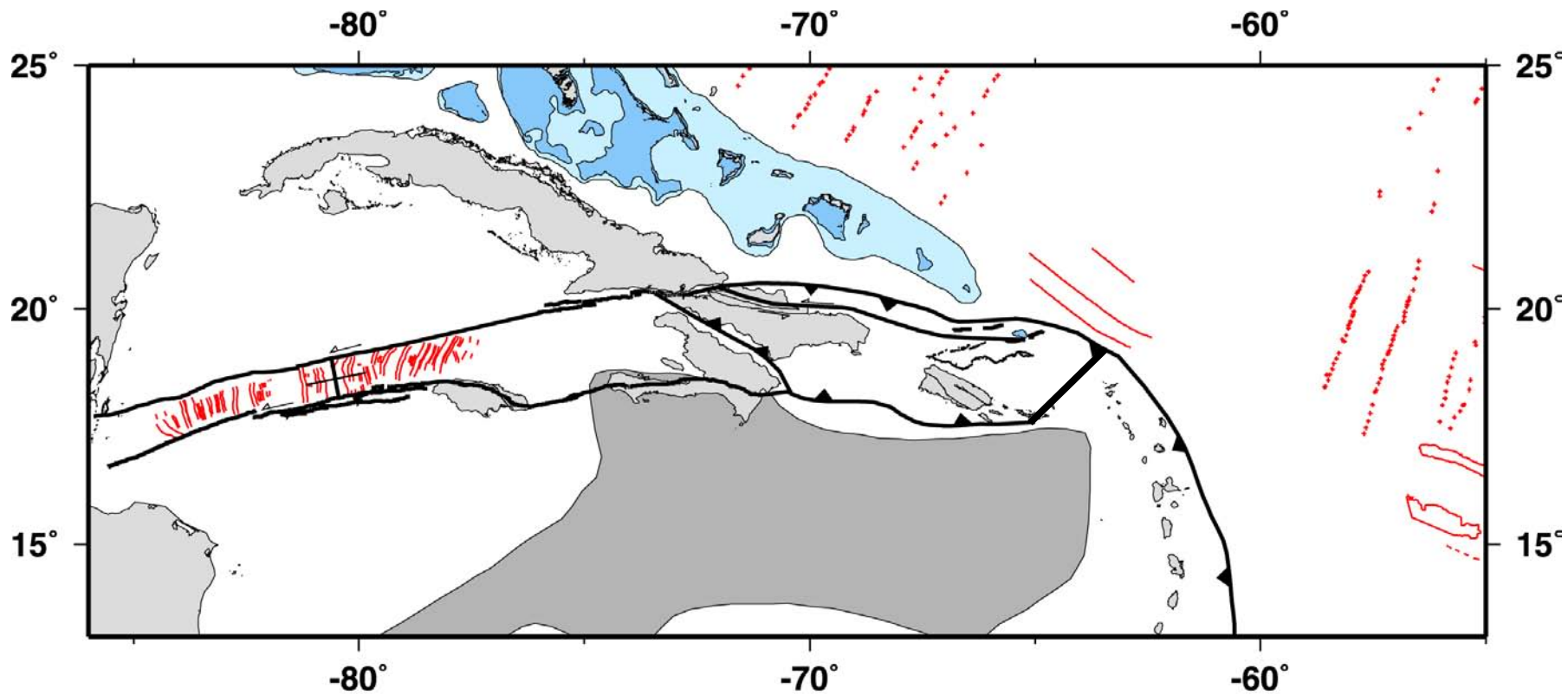
Middle Miocene
14.5 Ma



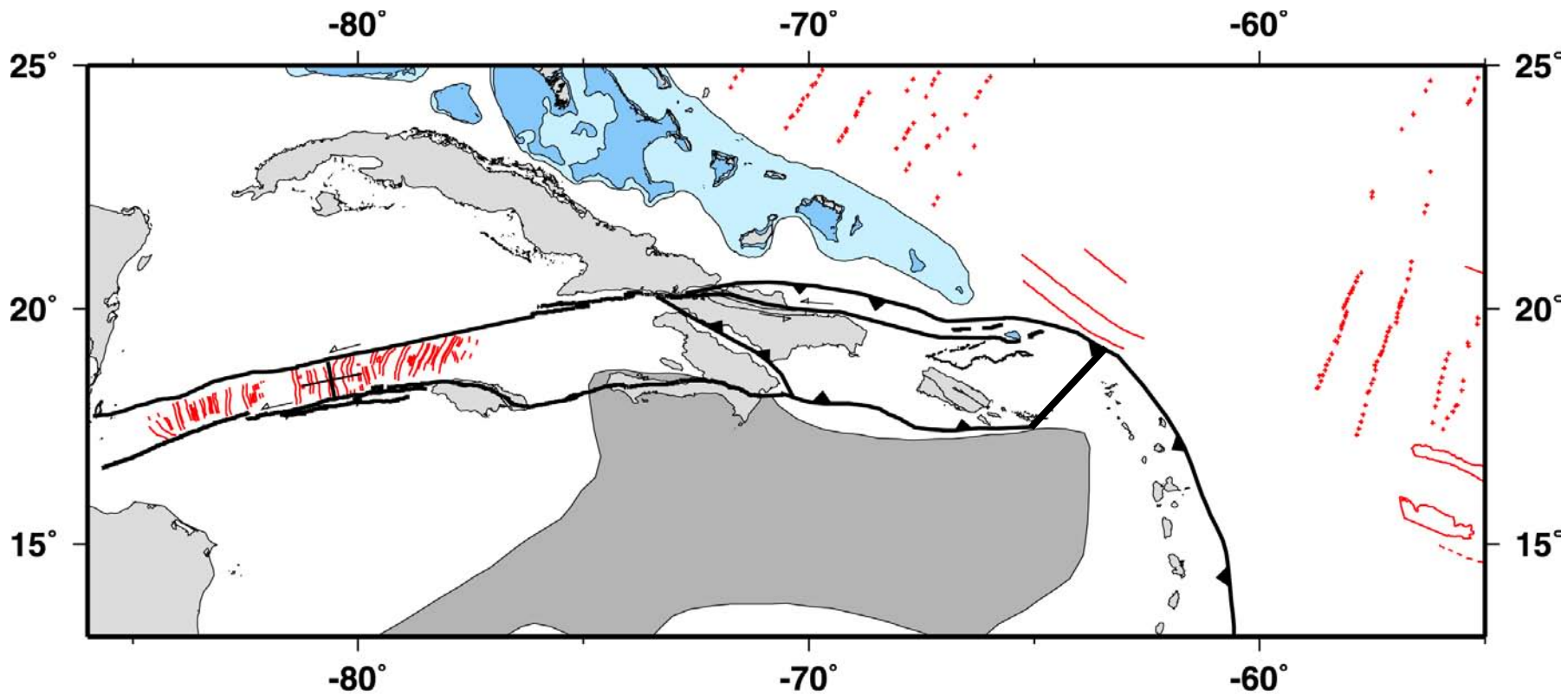
Middle Miocene
14.0 Ma



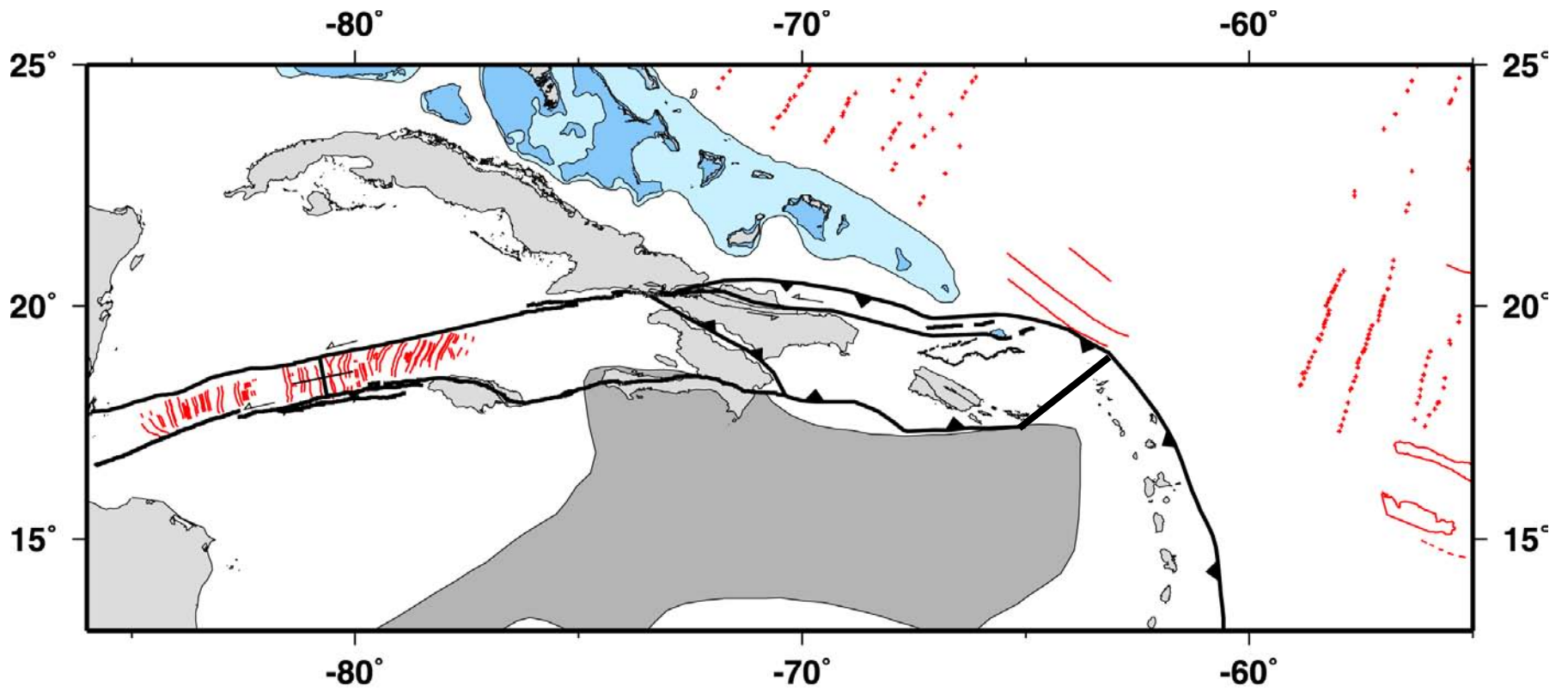
Middle Miocene
13.5 Ma



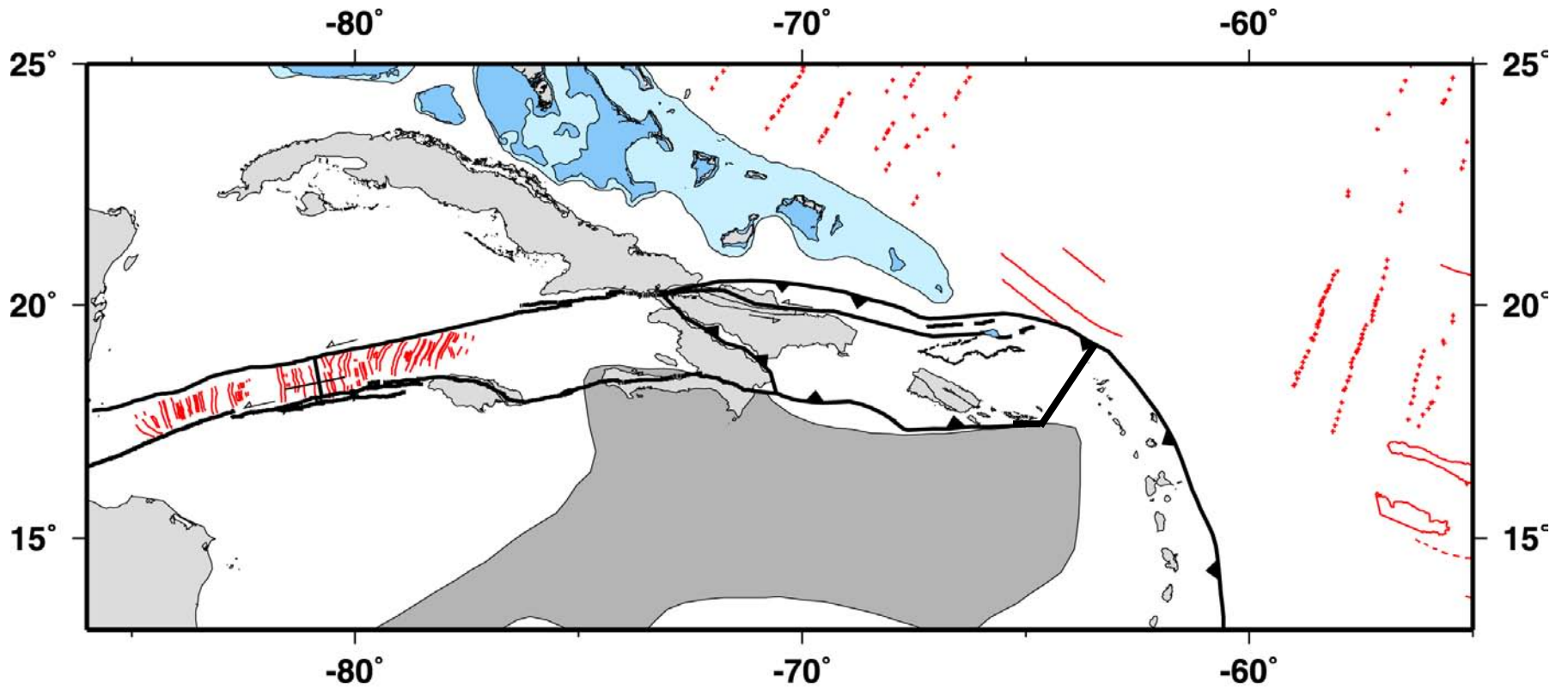
Middle Miocene
13.0 Ma



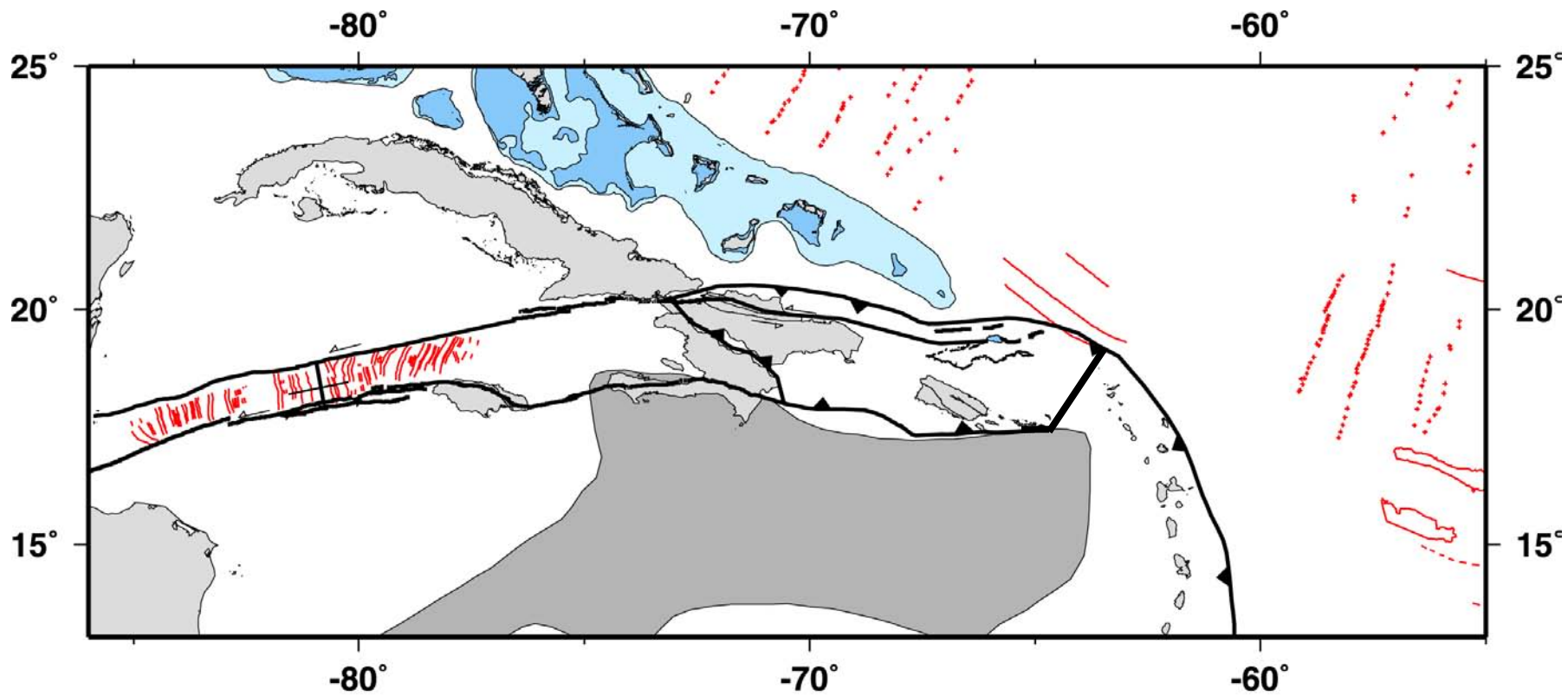
Middle Miocene
12.5 Ma



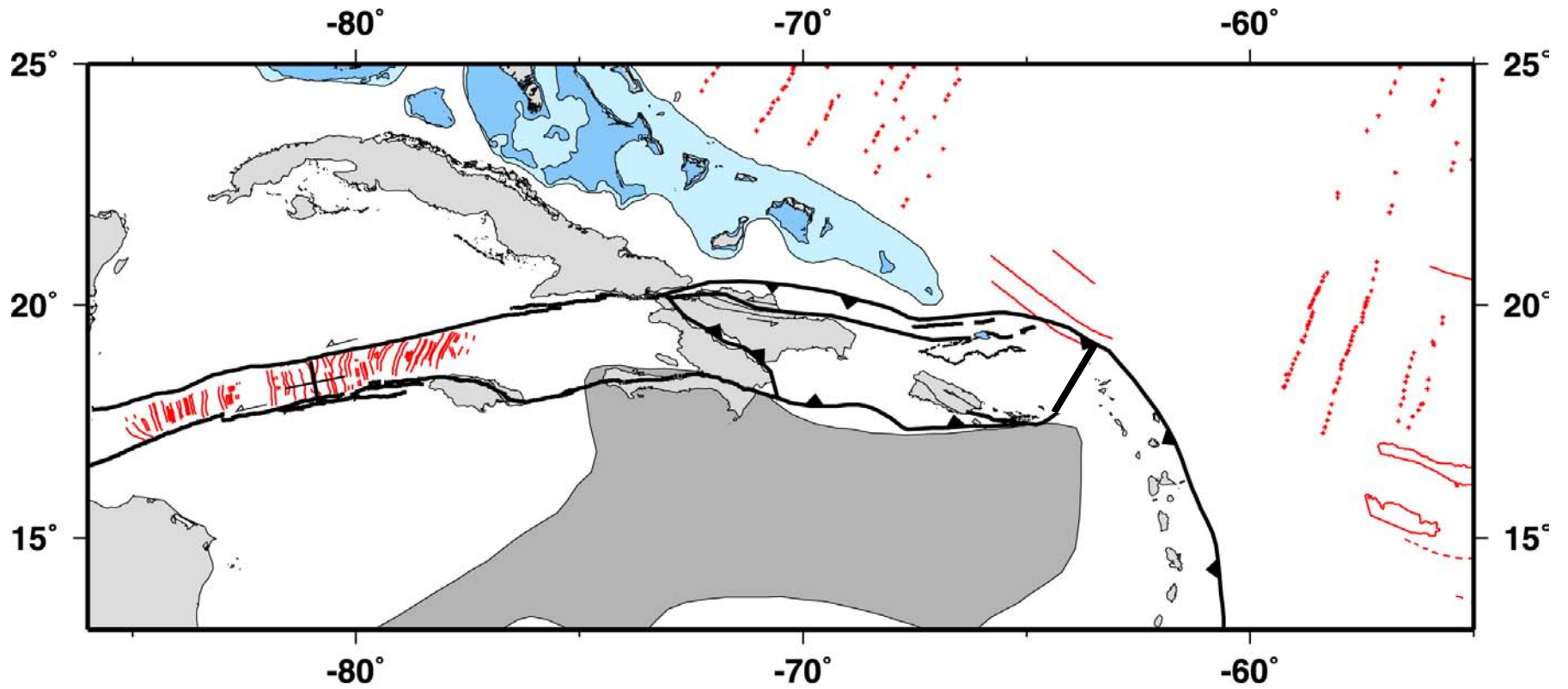
Middle Miocene
12.0 Ma



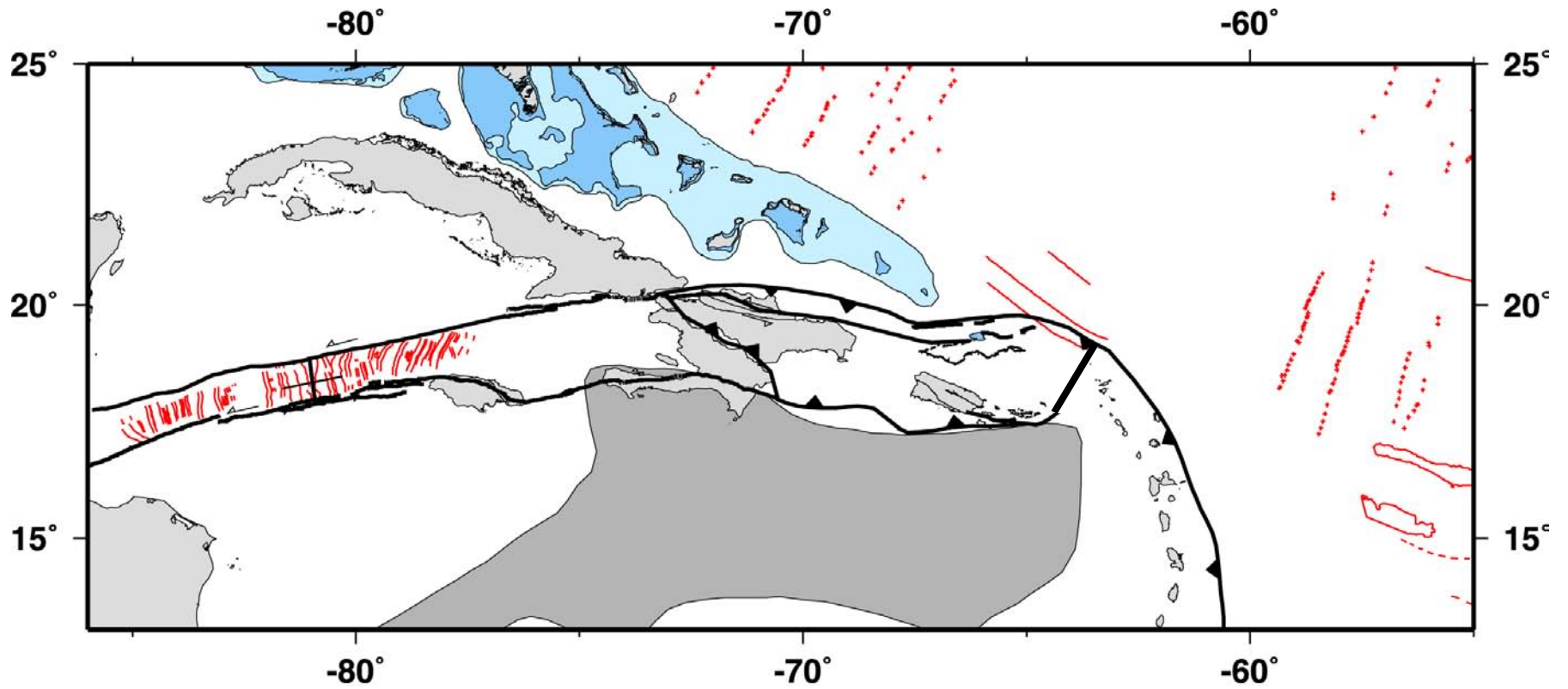
Middle Miocene
11.5 Ma



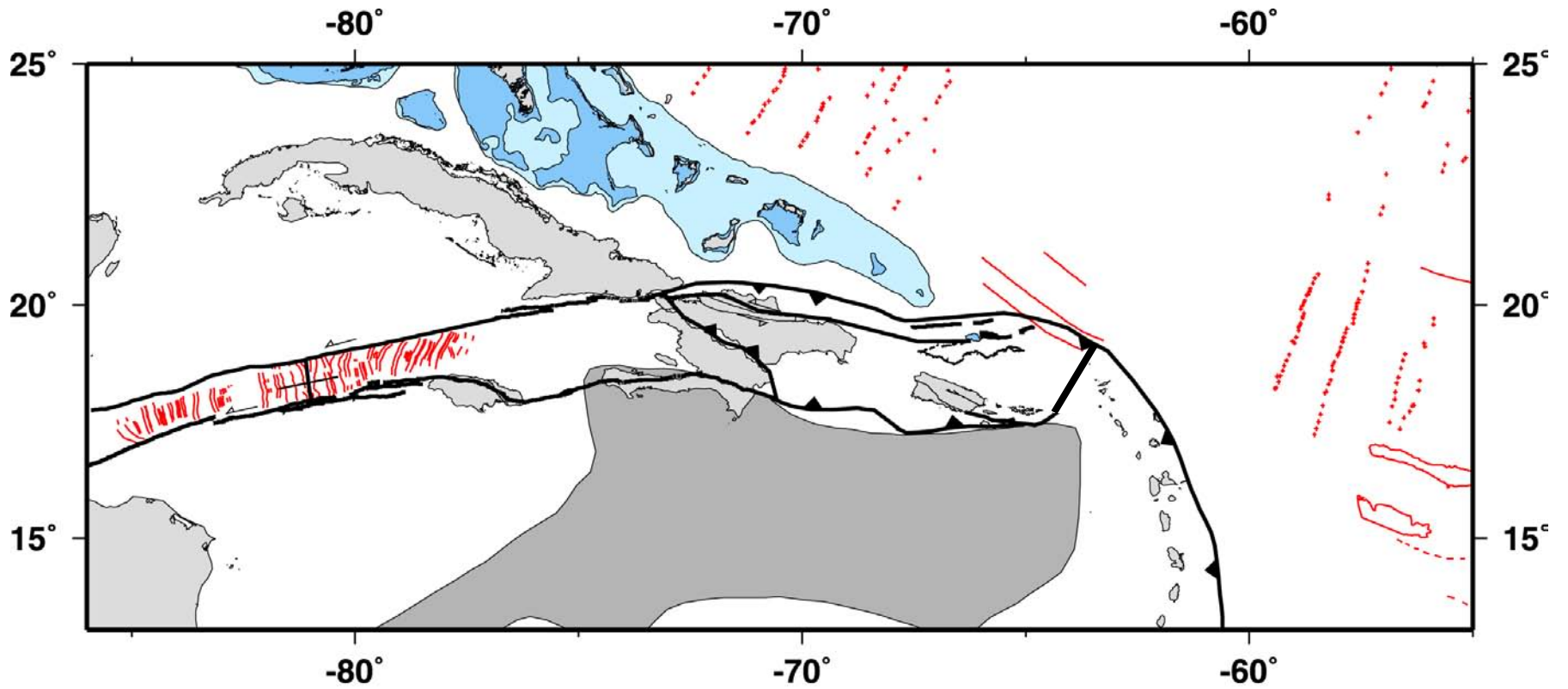
Late Miocene
11.0 Ma



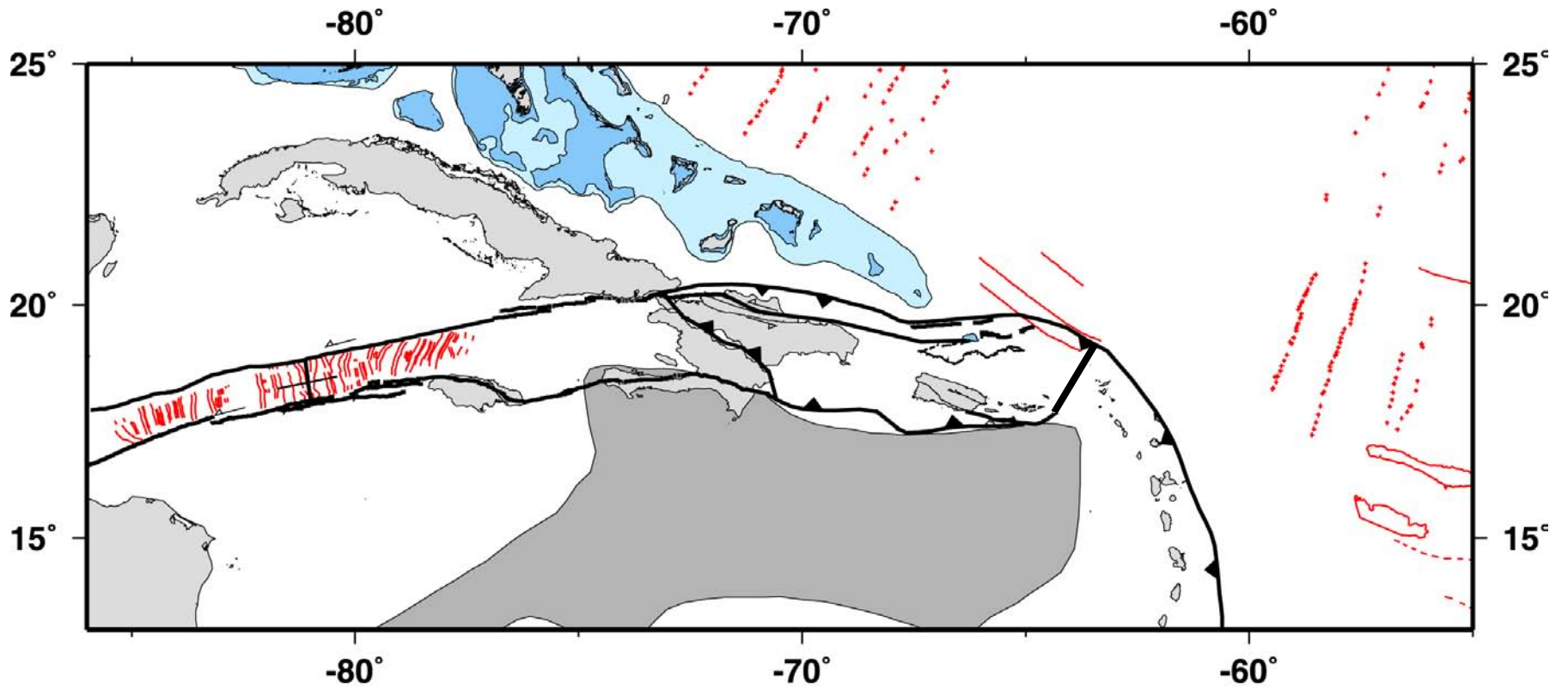
Late Miocene
10.5 Ma



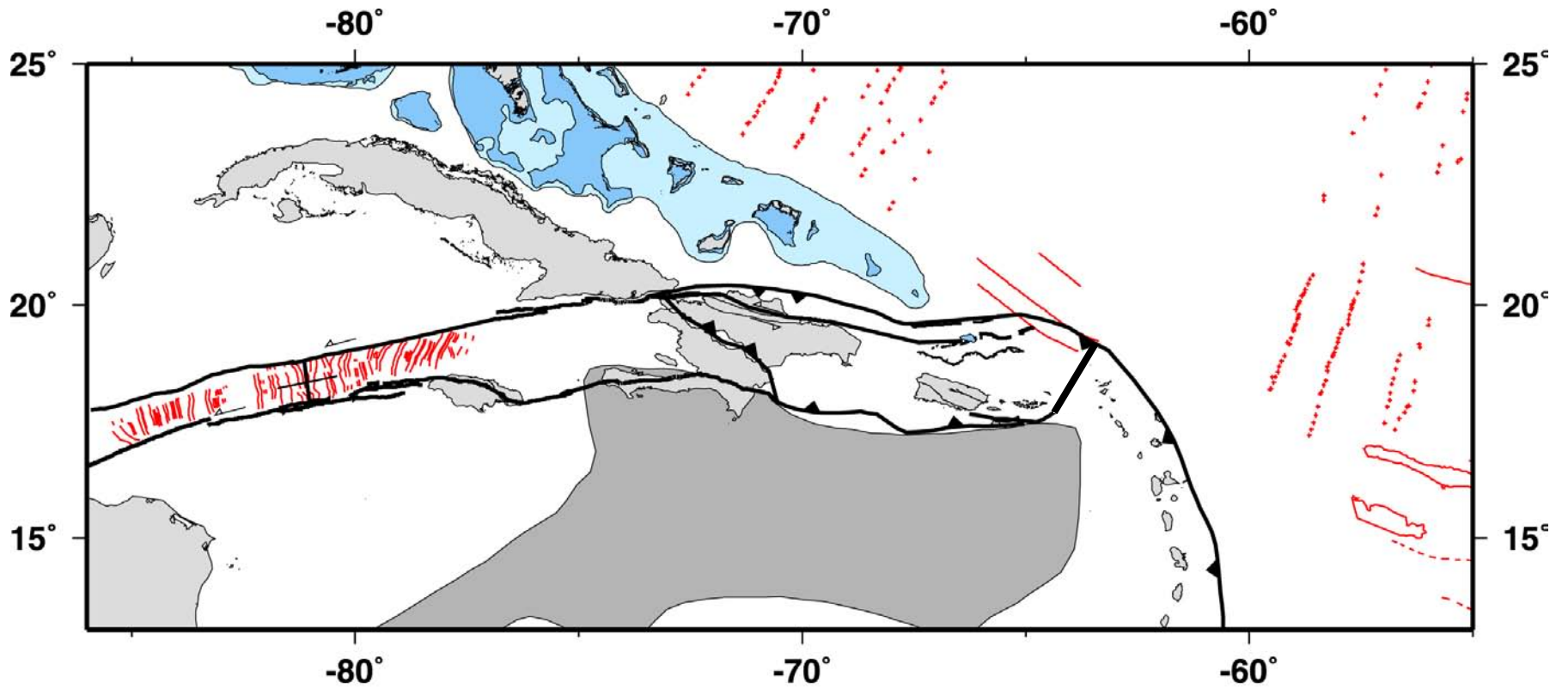
Late Miocene
10.0 Ma



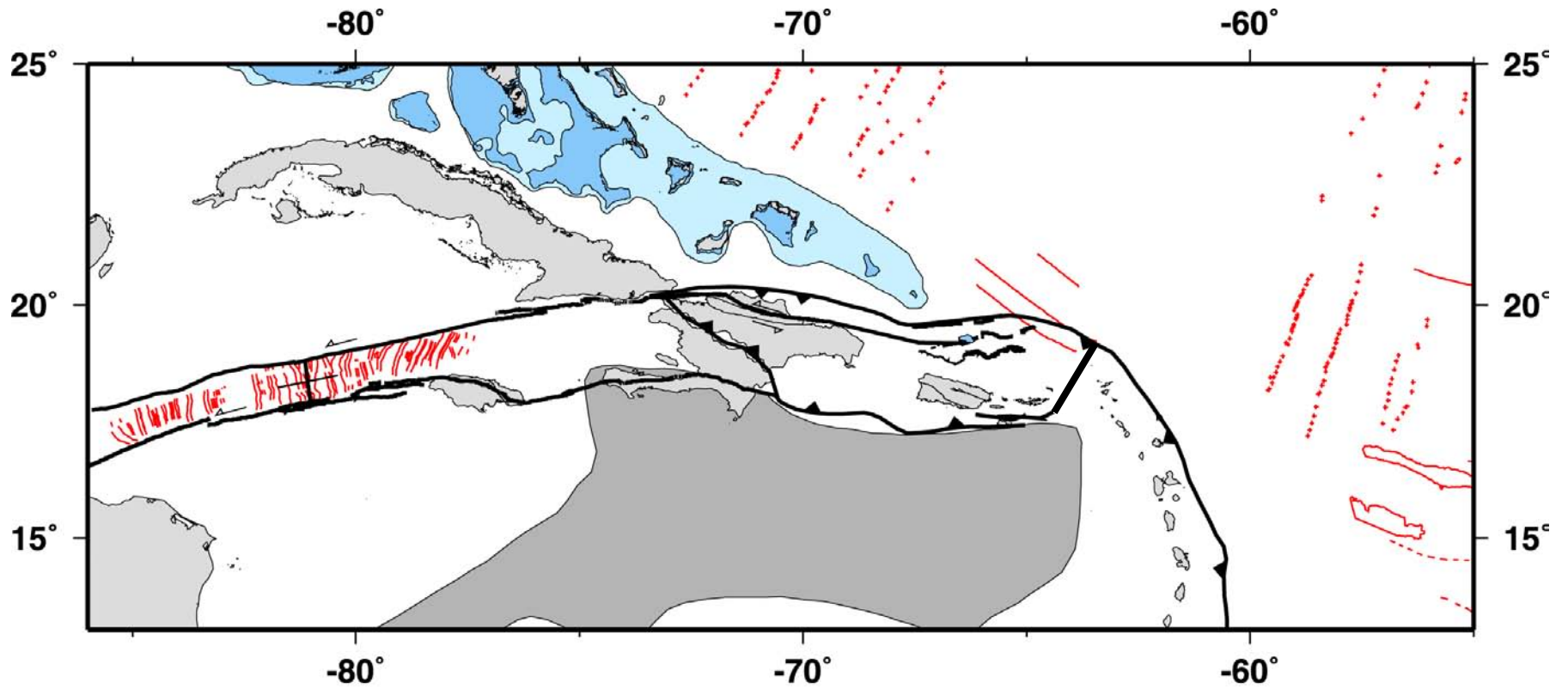
Late Miocene
09.5 Ma



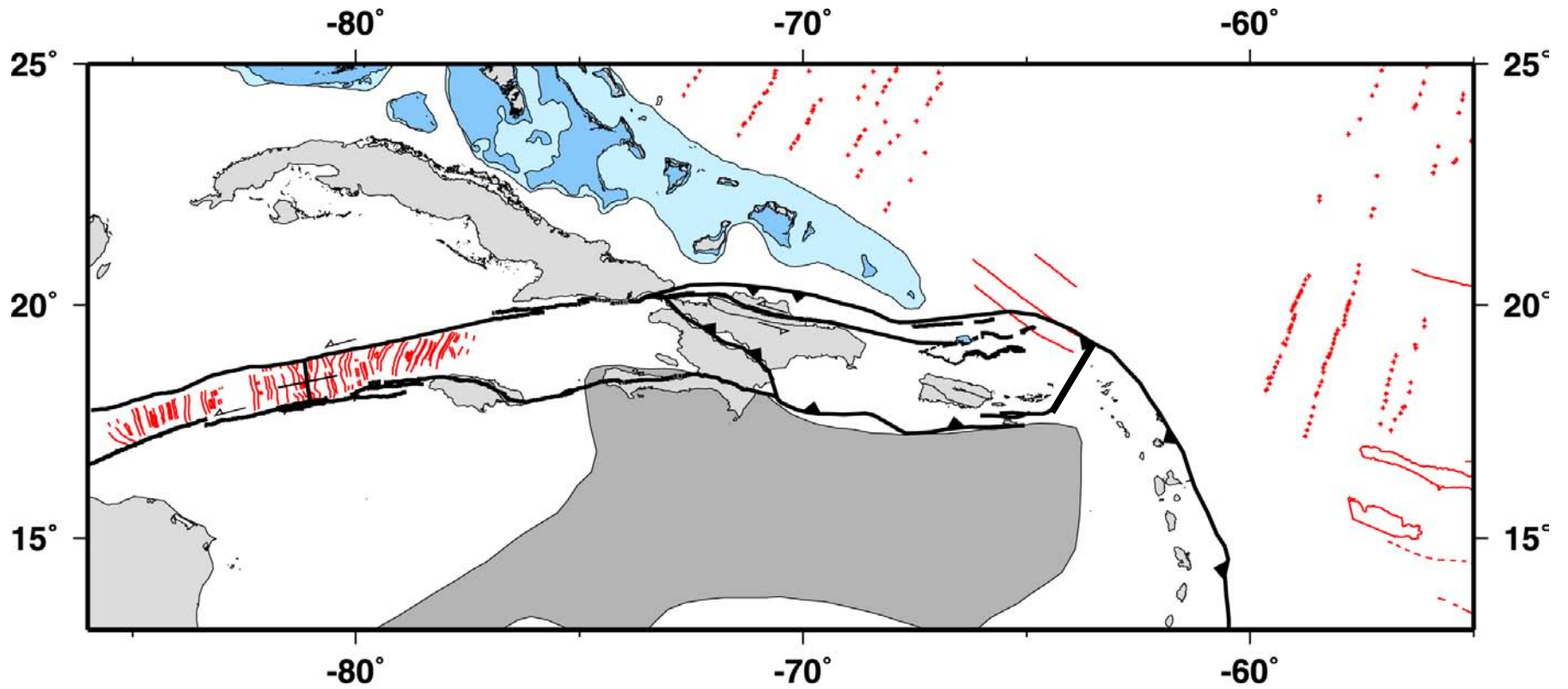
Late Miocene
09.0 Ma



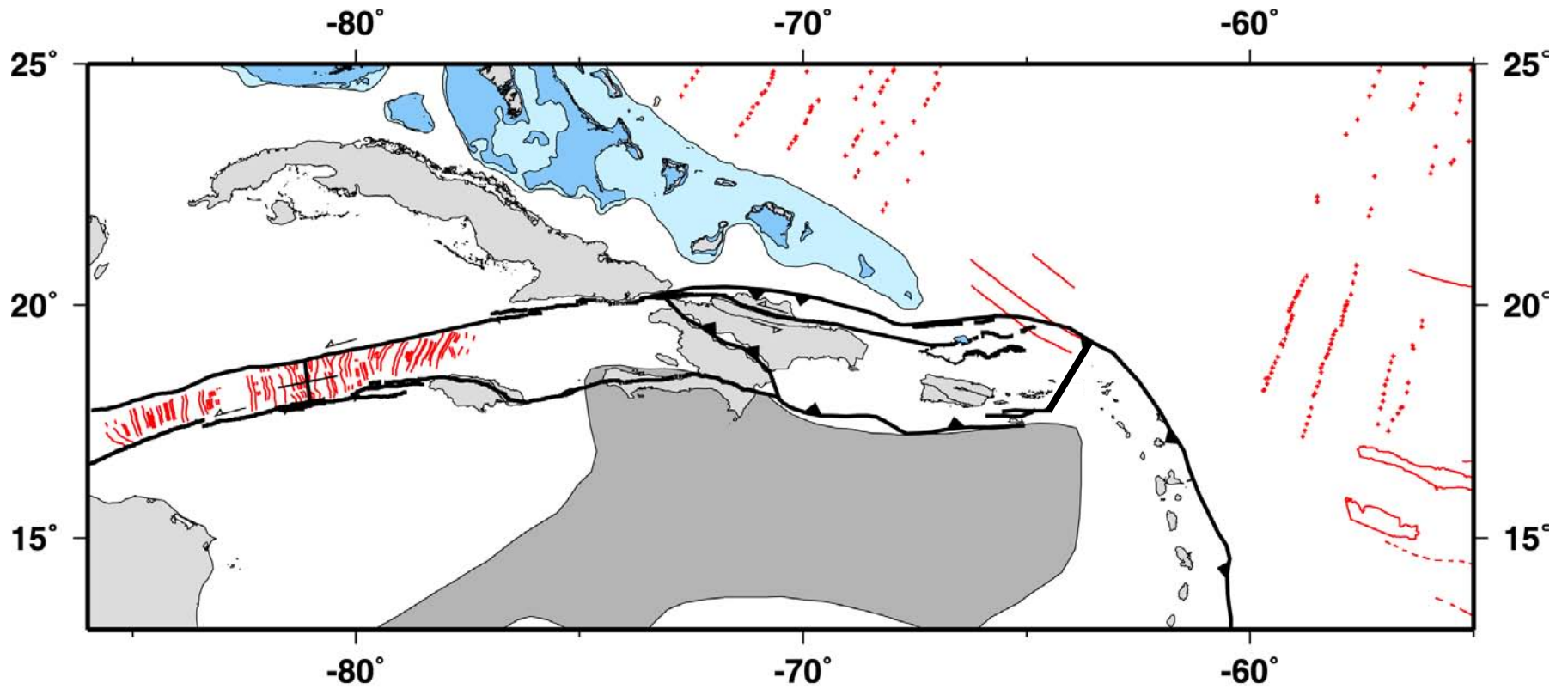
Late Miocene
08.5 Ma



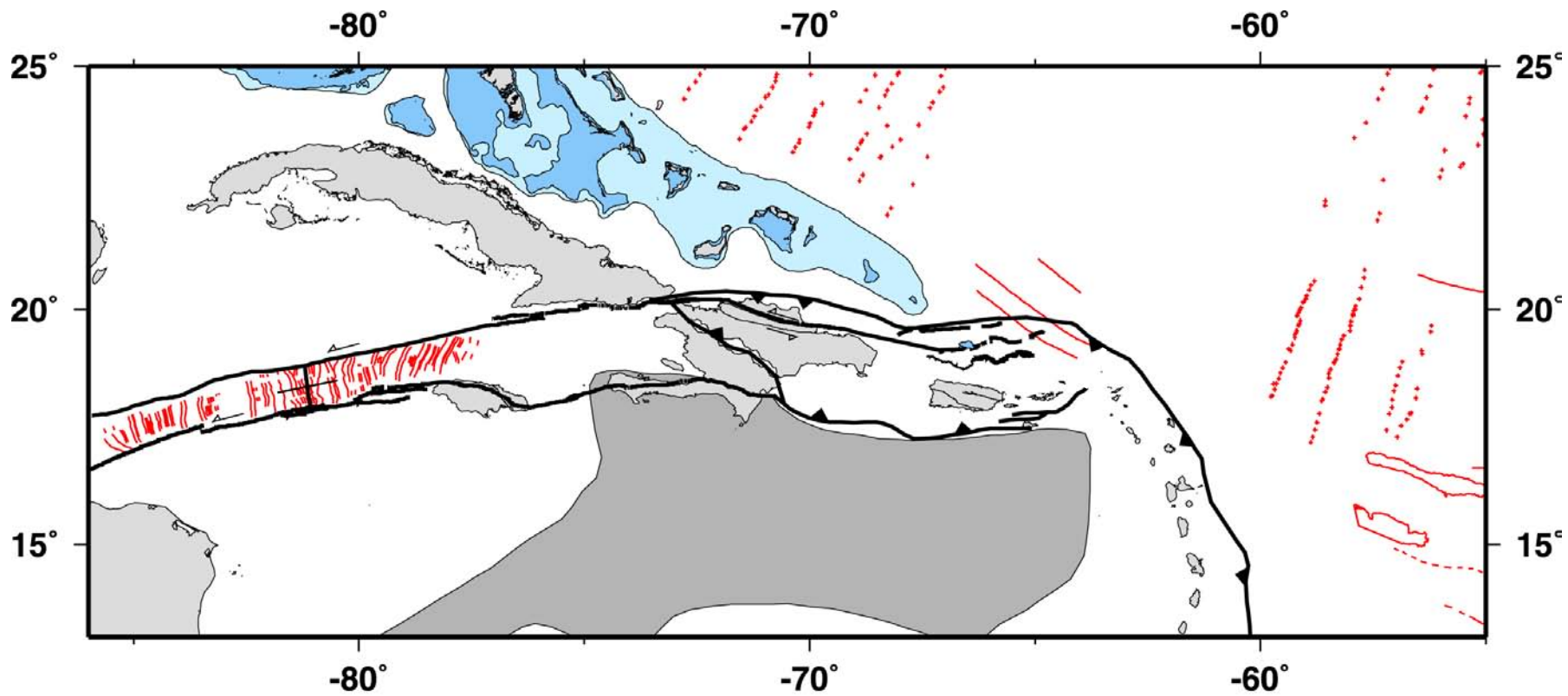
Late Miocene
08.0 Ma



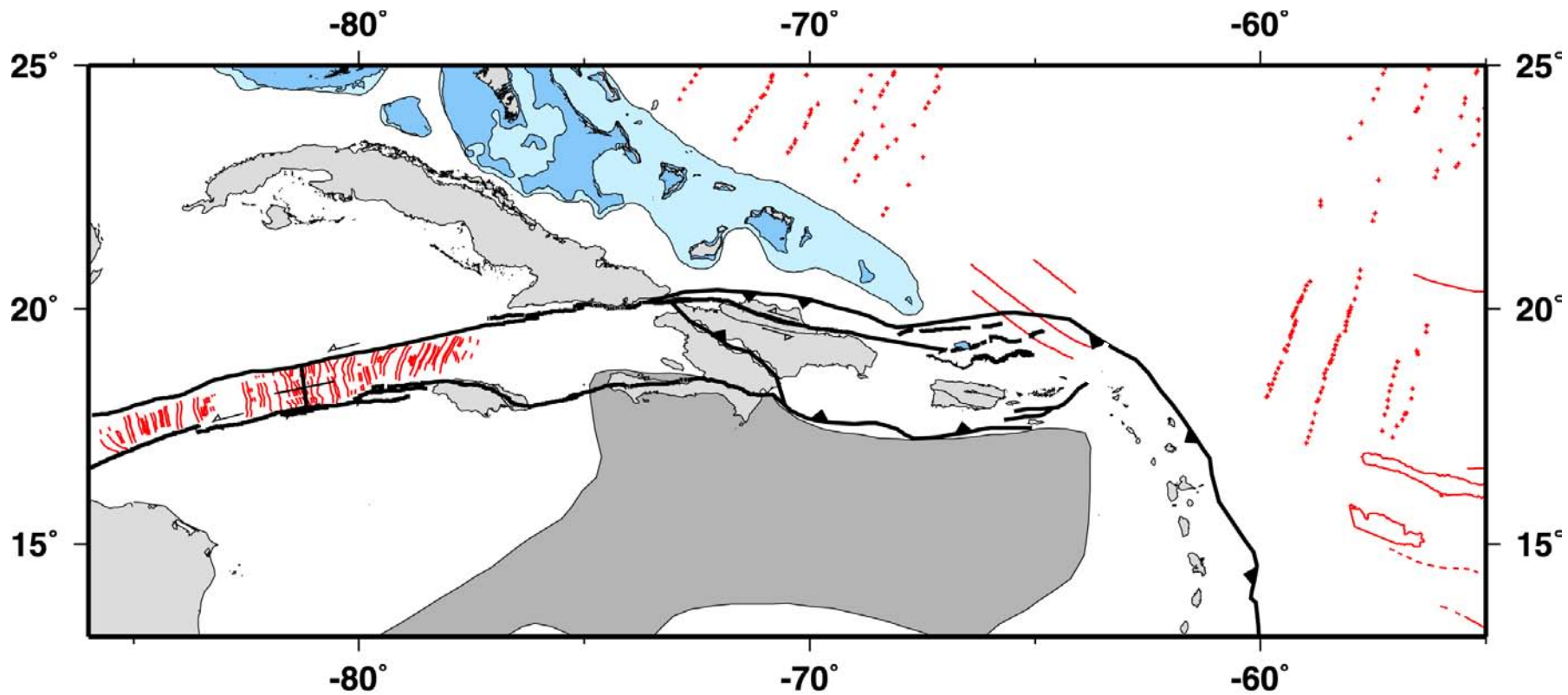
Late Miocene
07.5 Ma



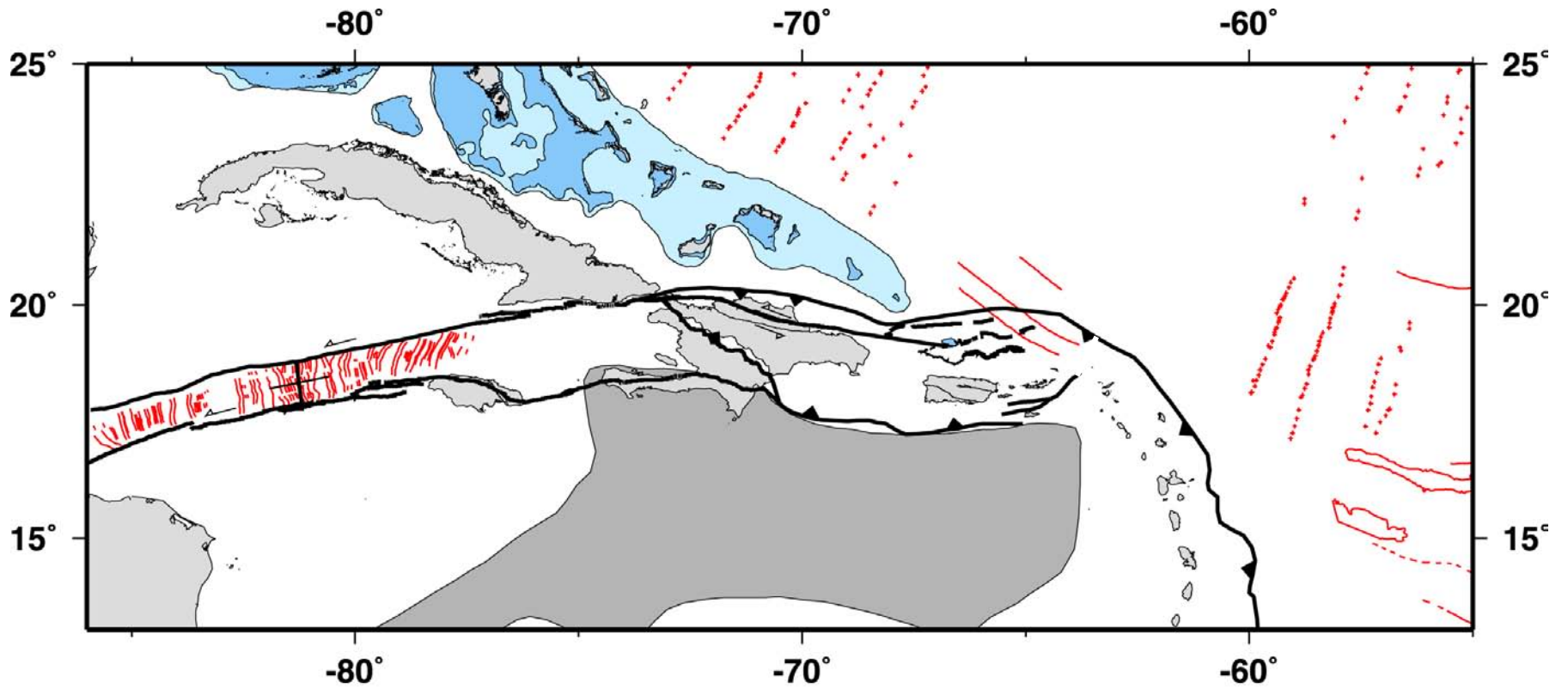
Late Miocene
07.0 Ma



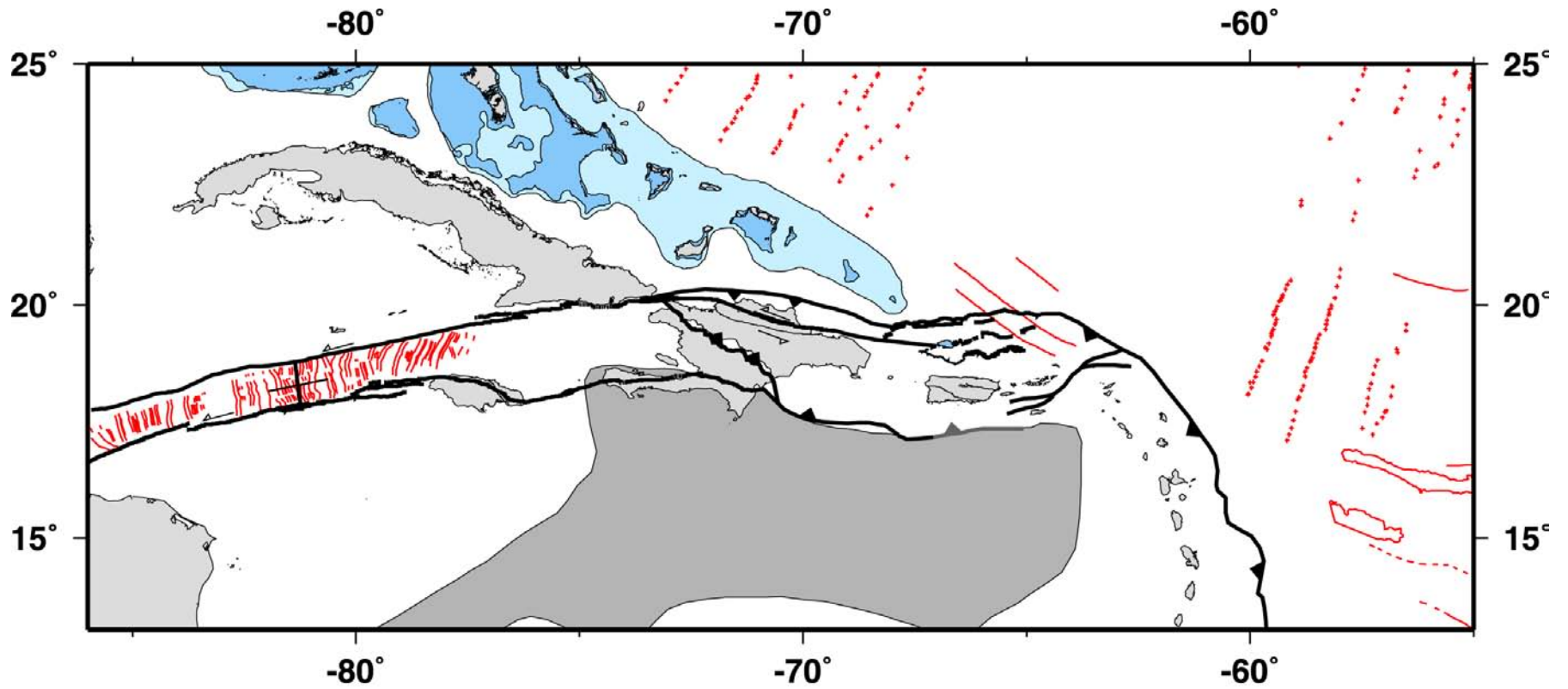
Late Miocene
06.5 Ma



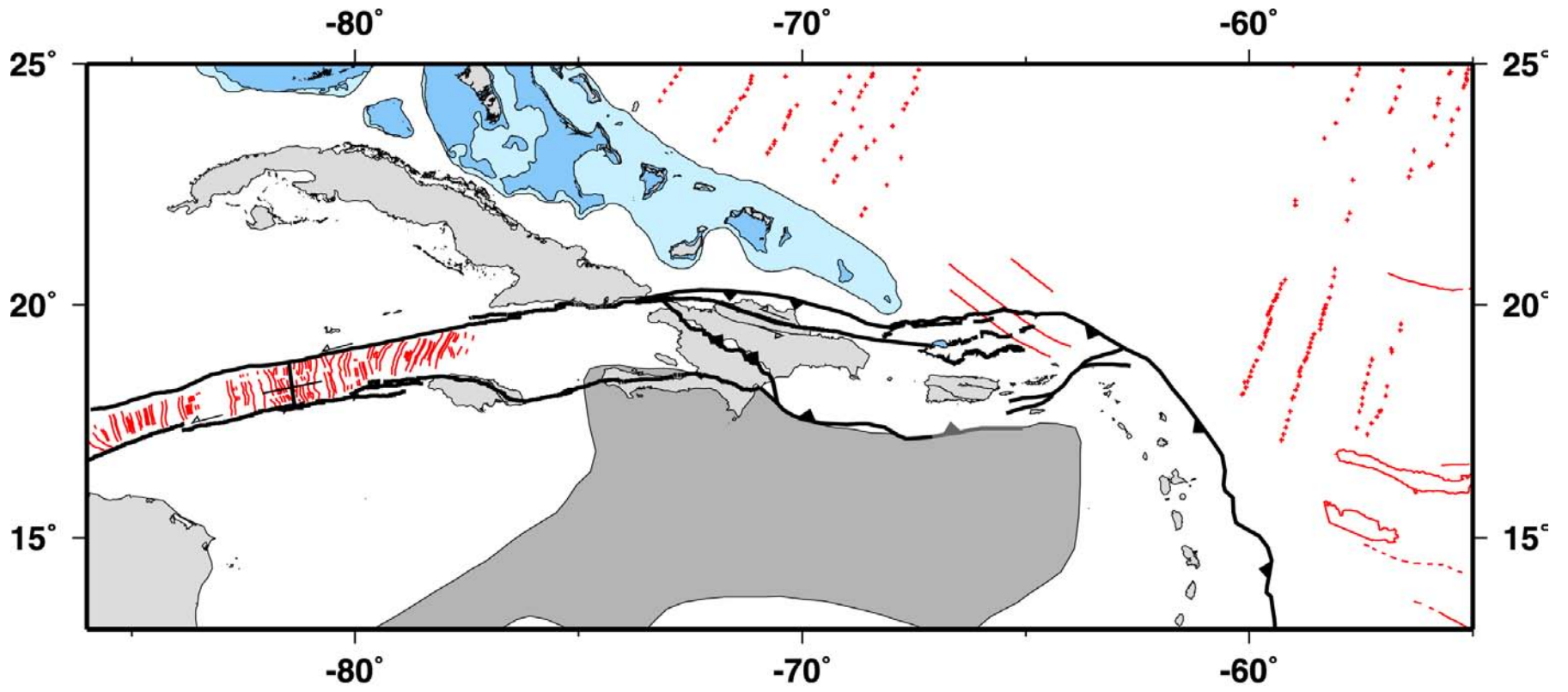
Late Miocene
06.0 Ma



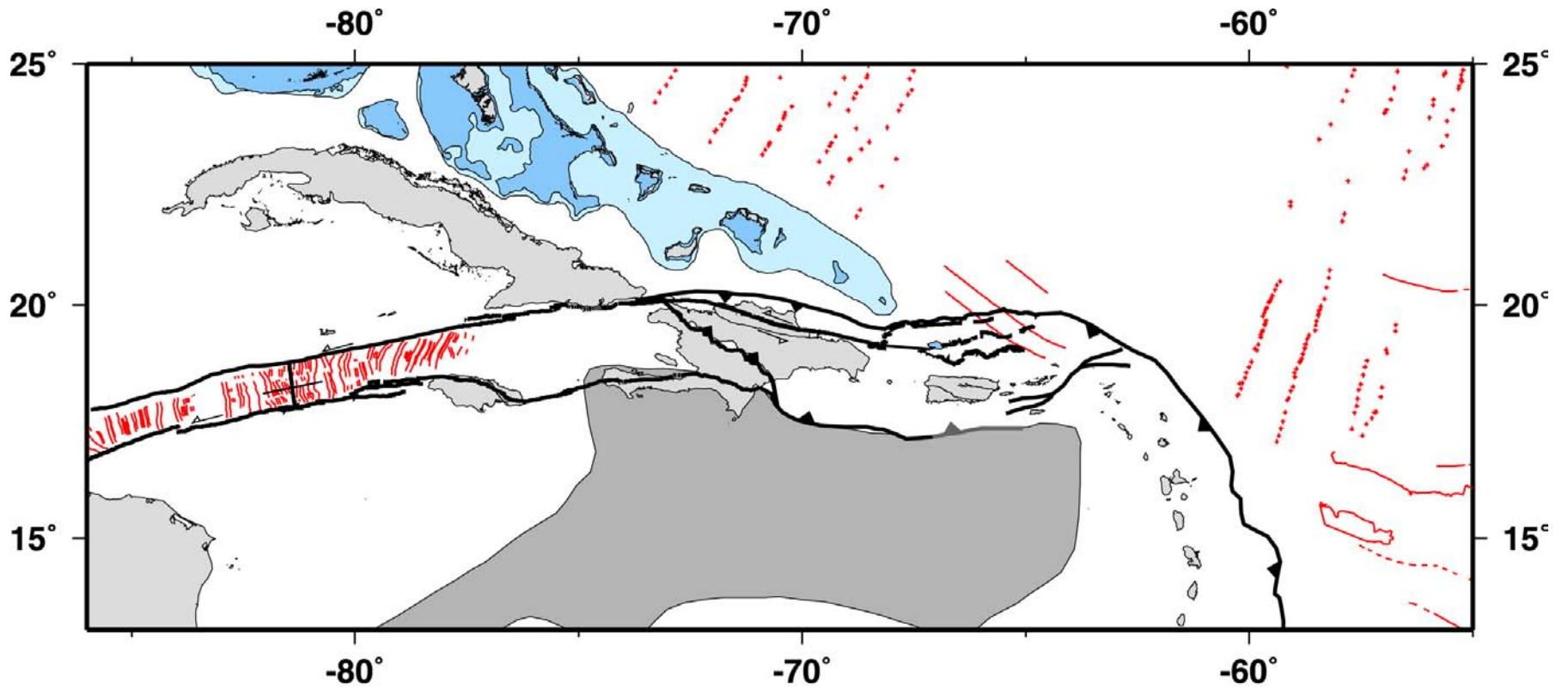
Late Miocene
05.5 Ma



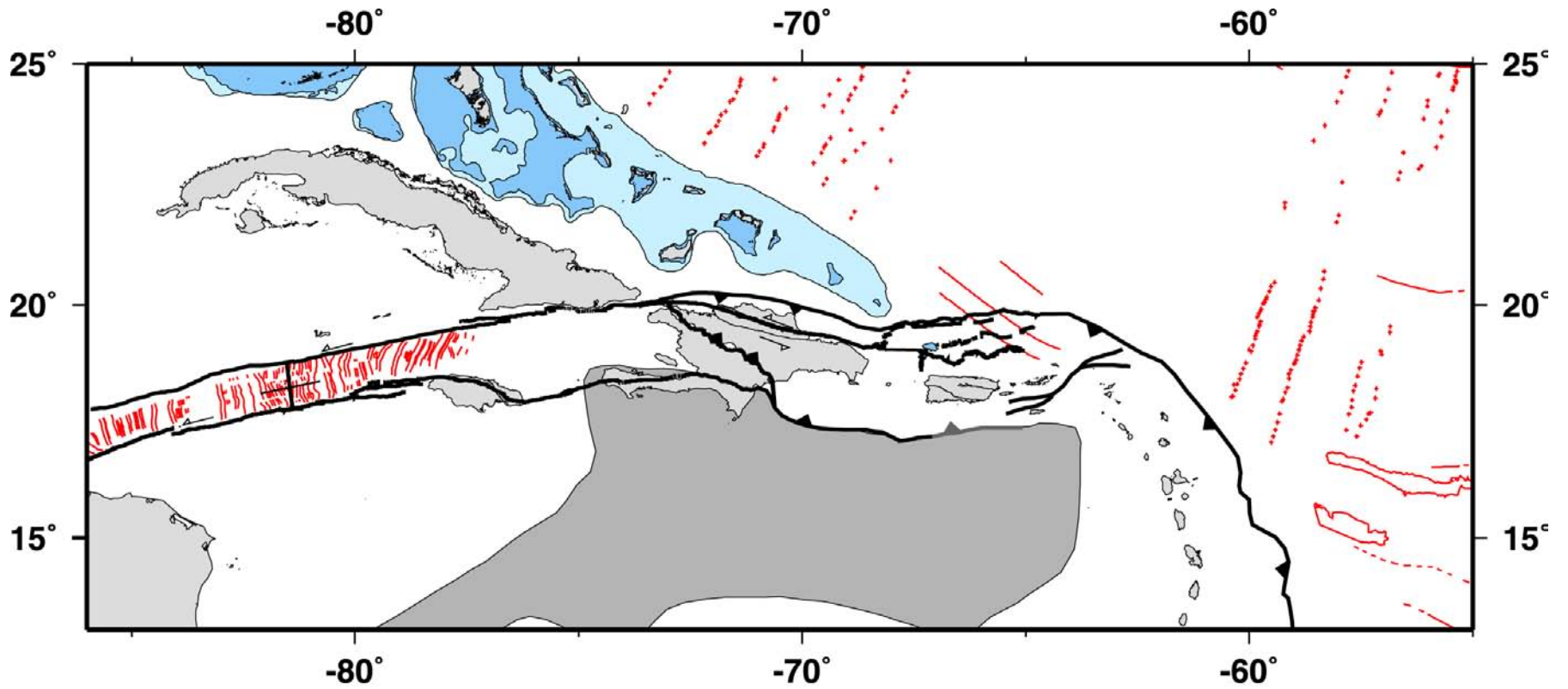
Early Pliocene
05.0 Ma



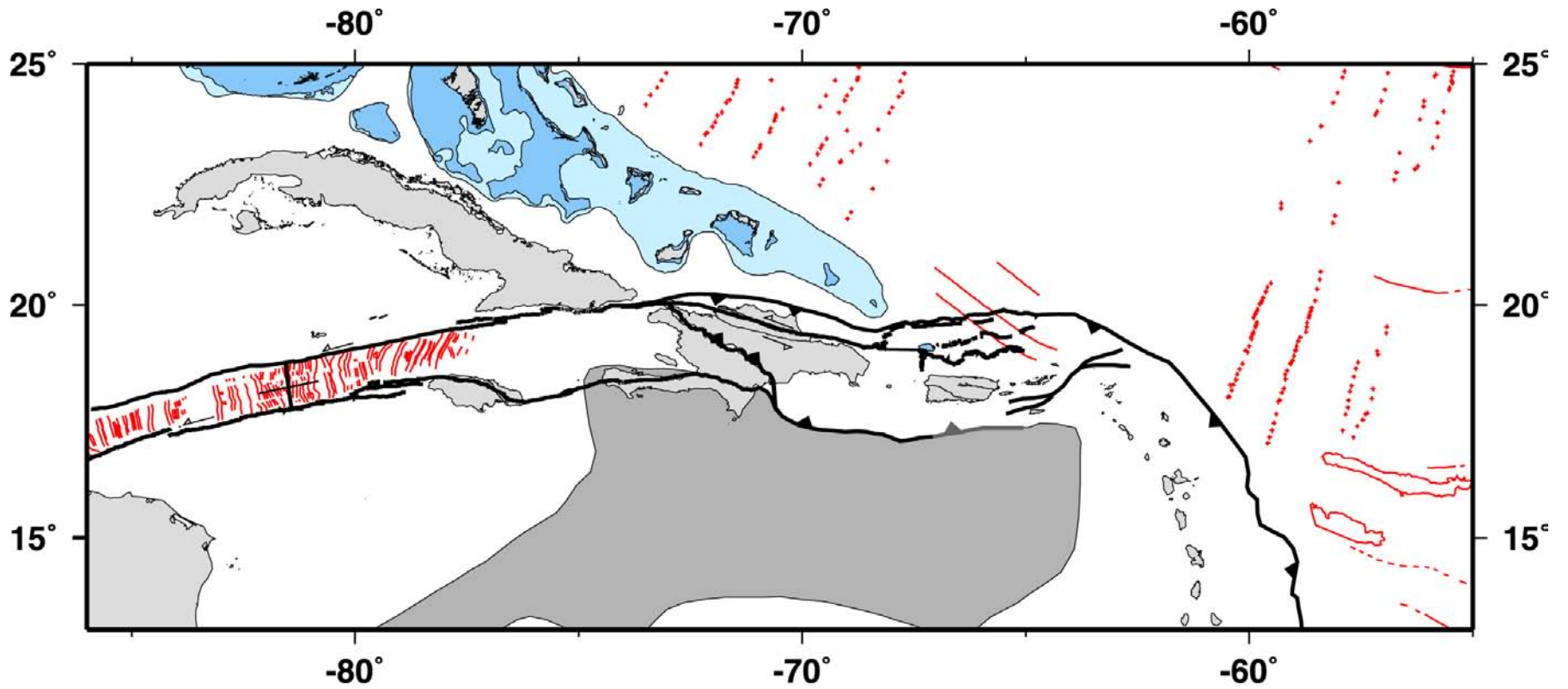
Early Pliocene
04.5 Ma



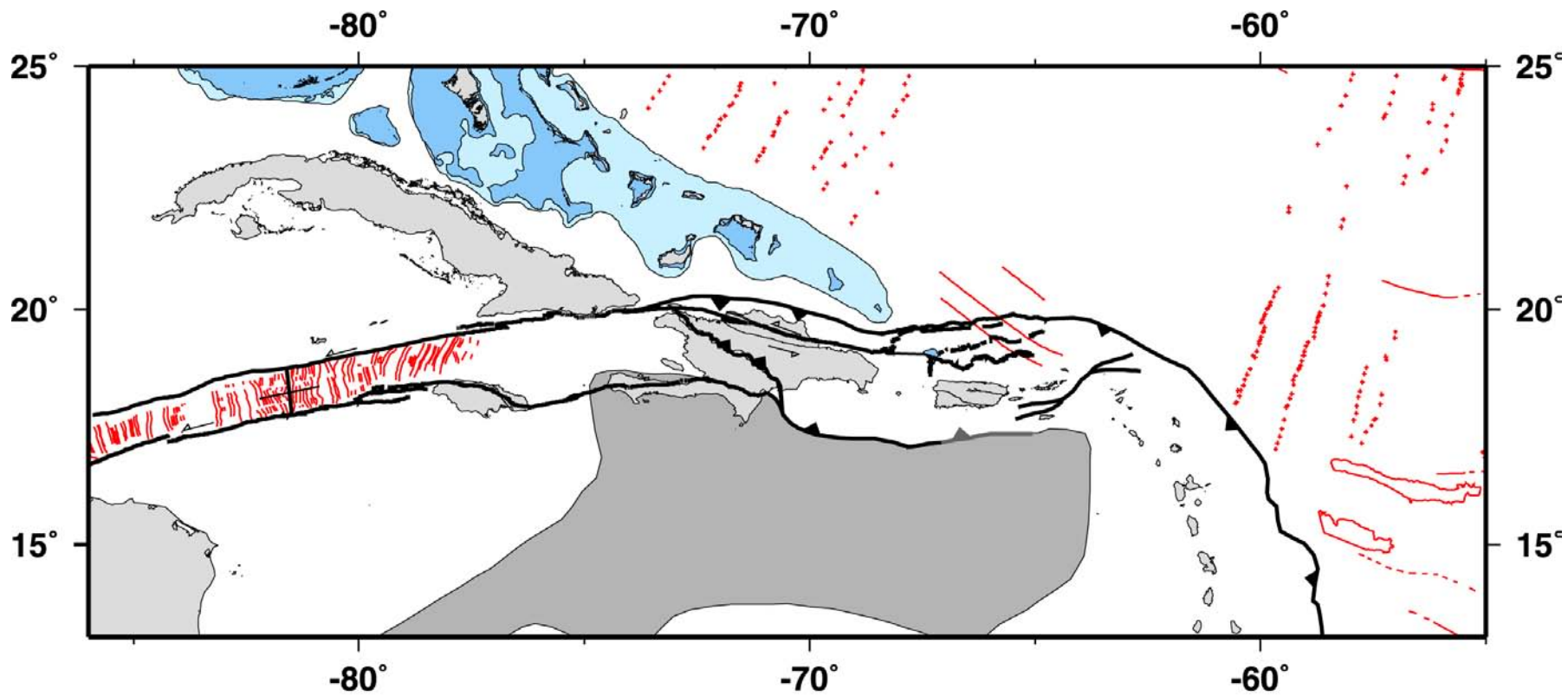
Early Pliocene
04.0 Ma



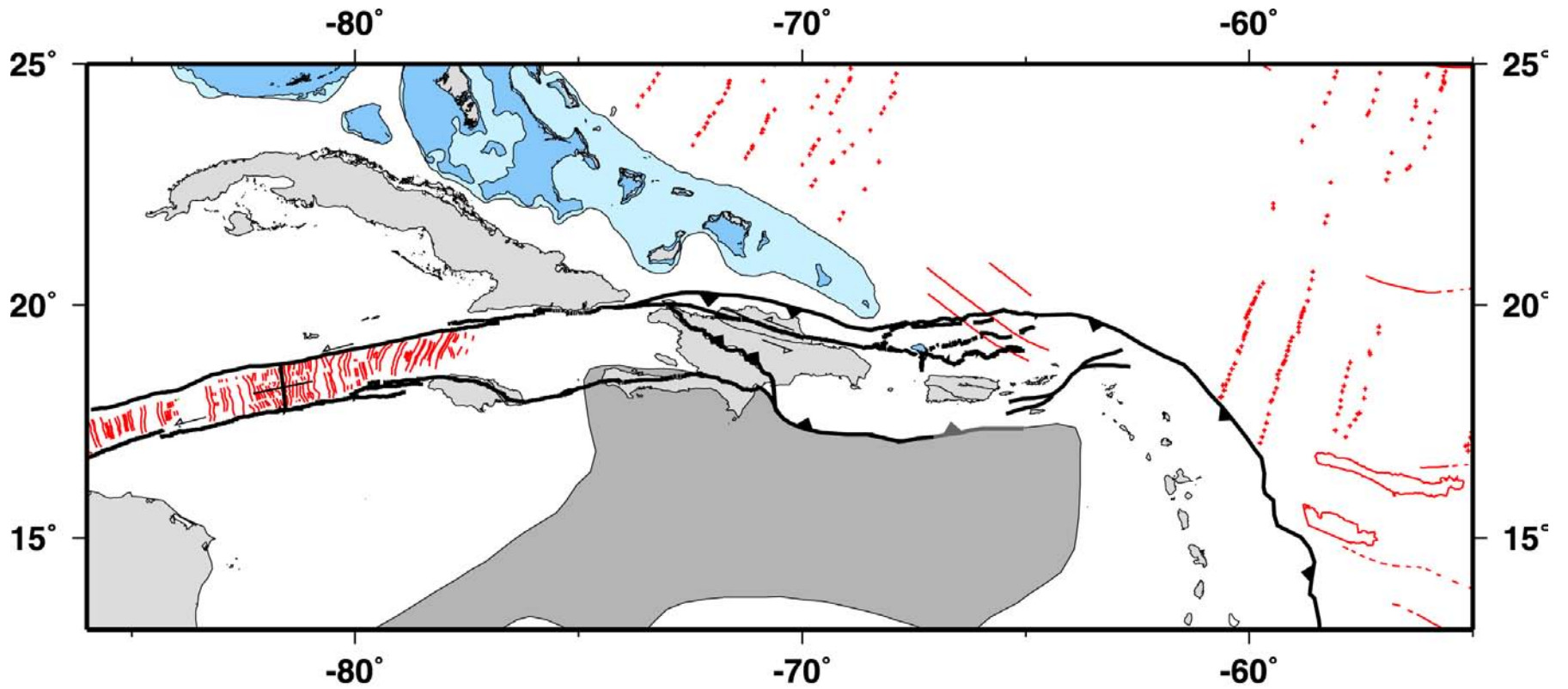
Late Pliocene
03.5 Ma



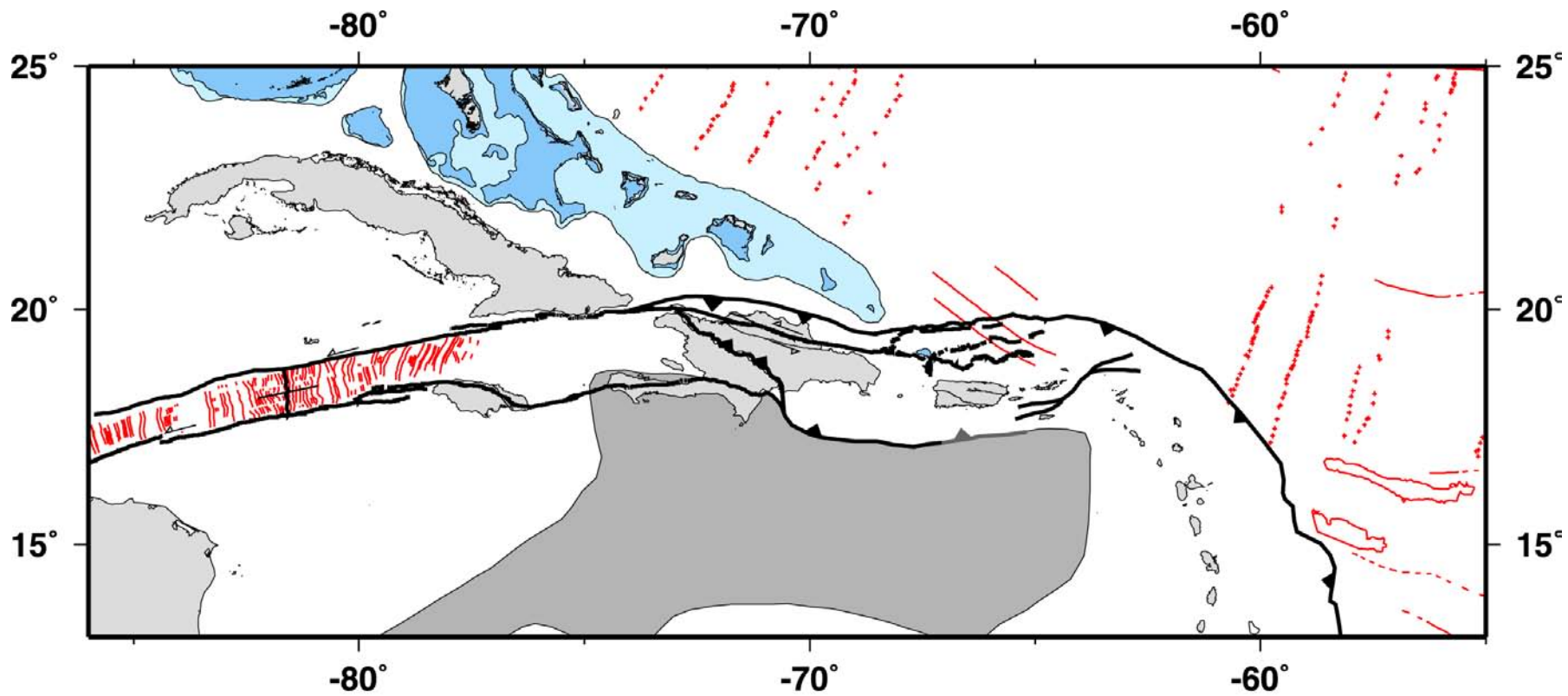
Late Pliocene
03.0 Ma



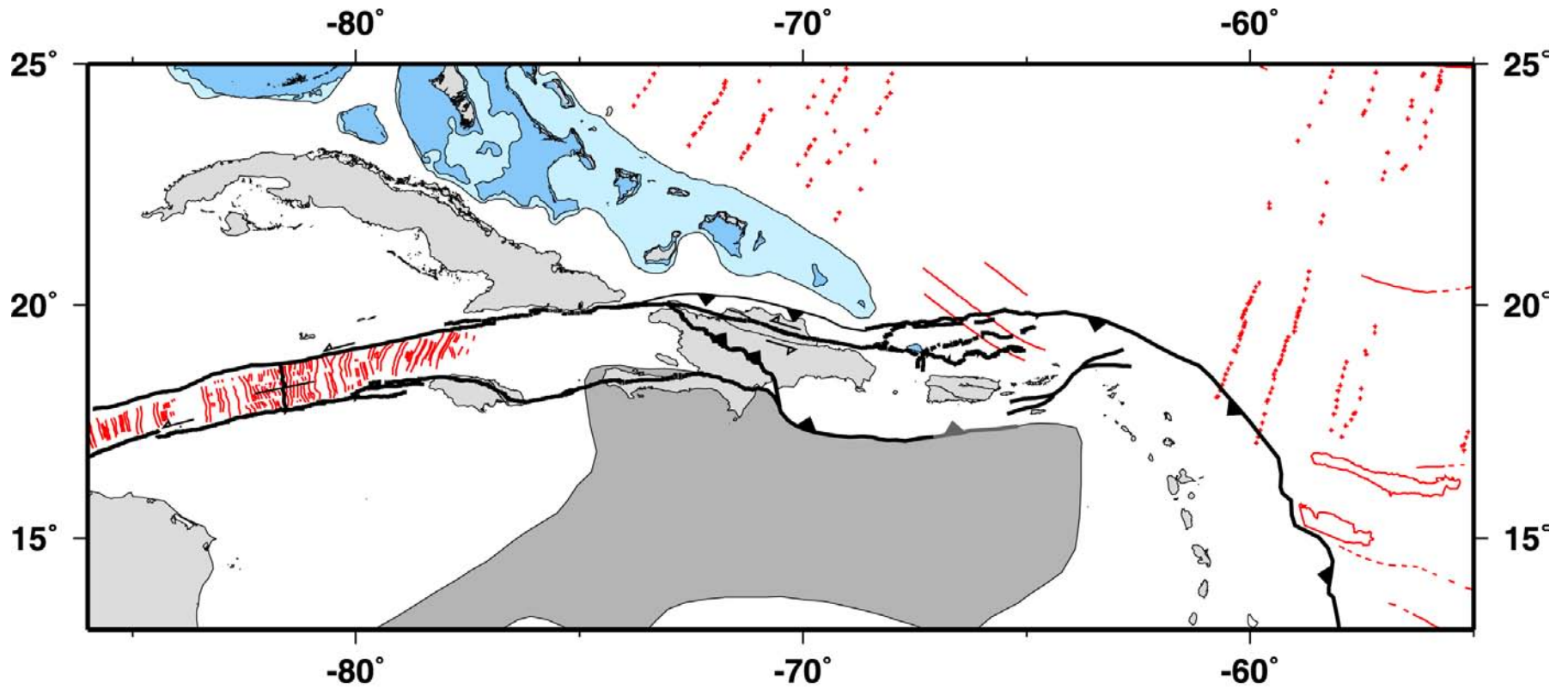
Late Pliocene
02.5 Ma



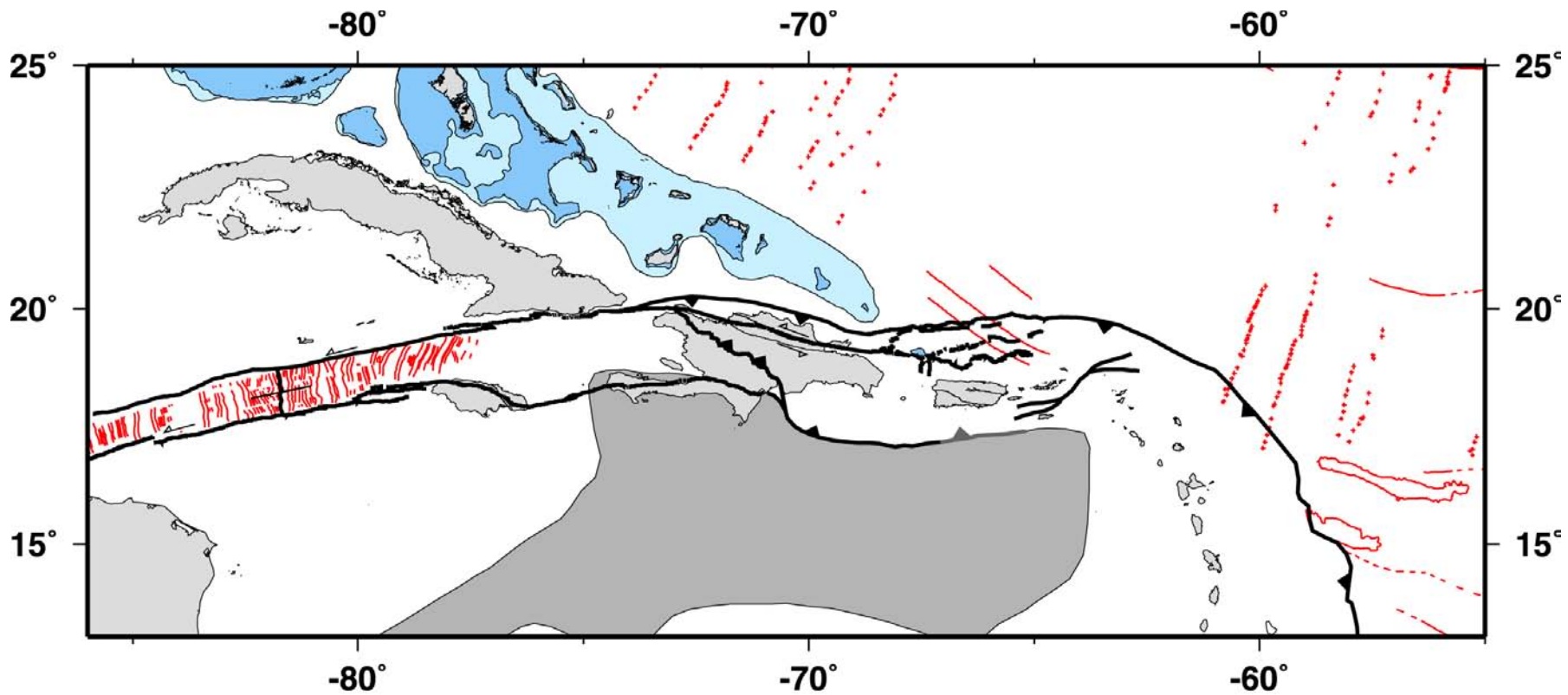
Late Pliocene
02.0 Ma



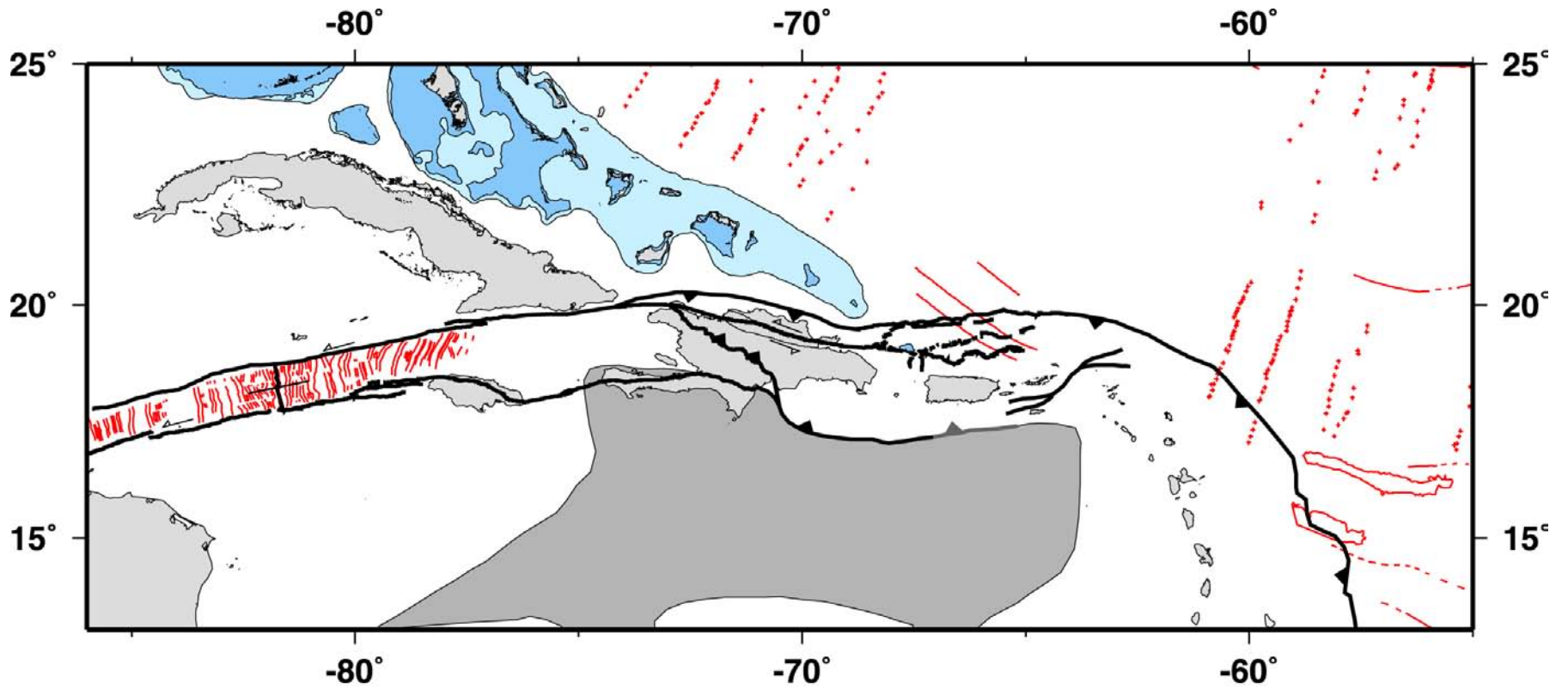
Pleistocene
01.5 Ma



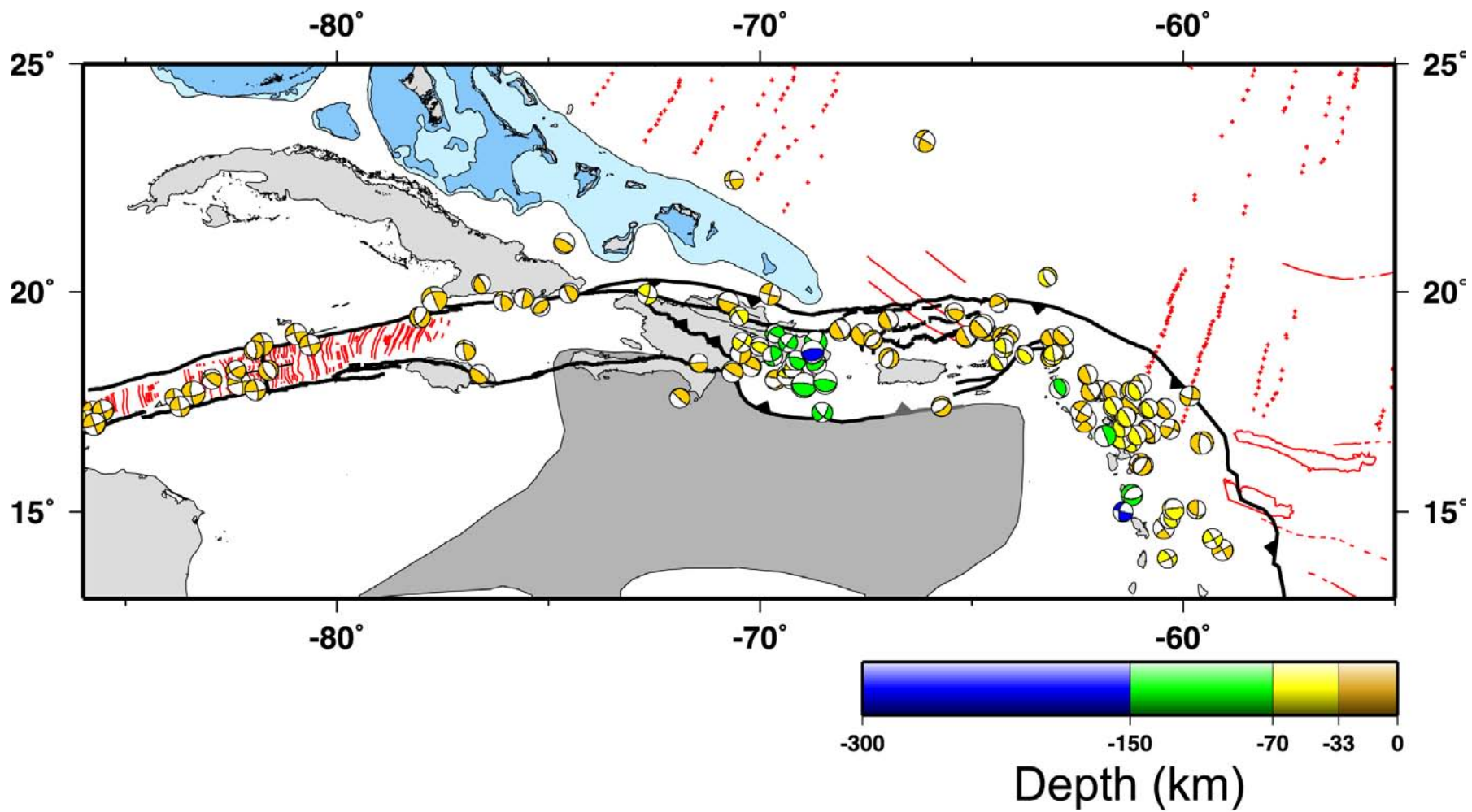
Pleistocene
01.0 Ma

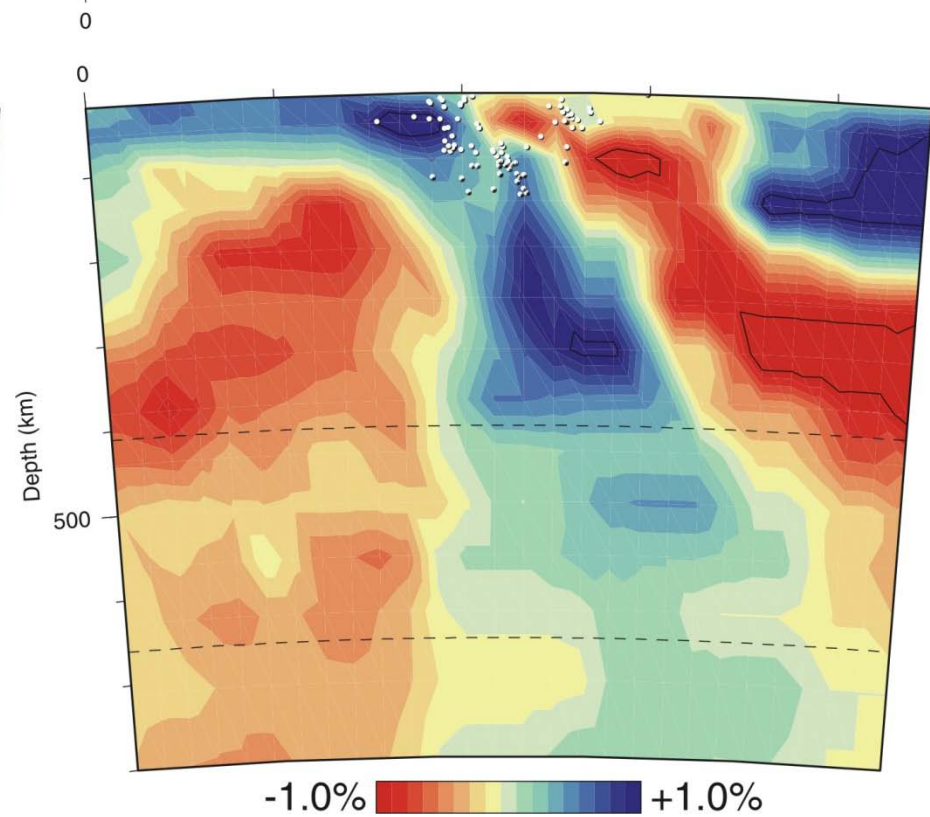
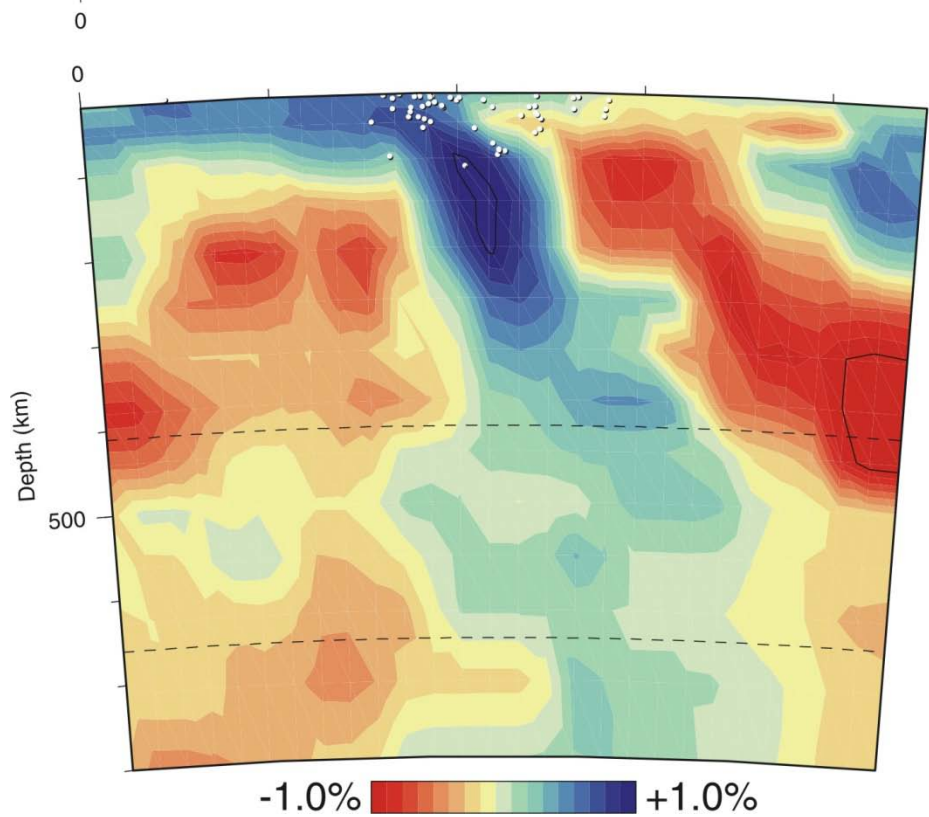
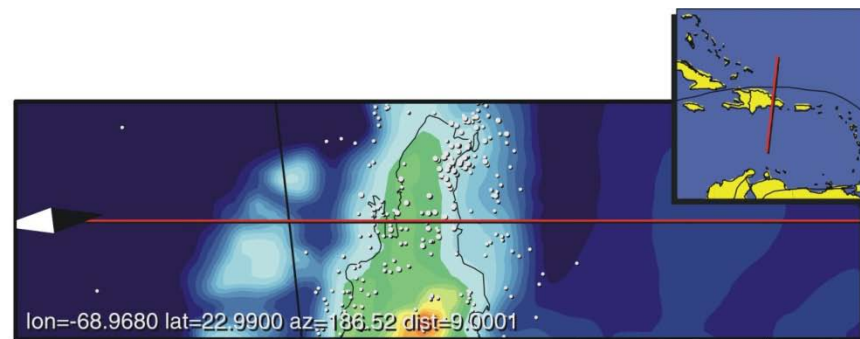
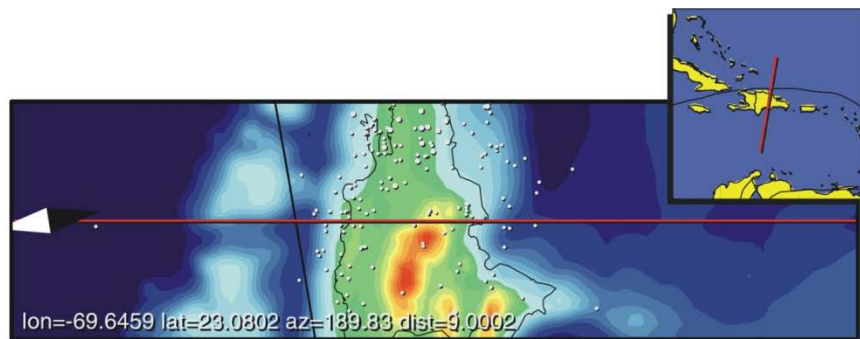


Pleistocene
00.5 Ma

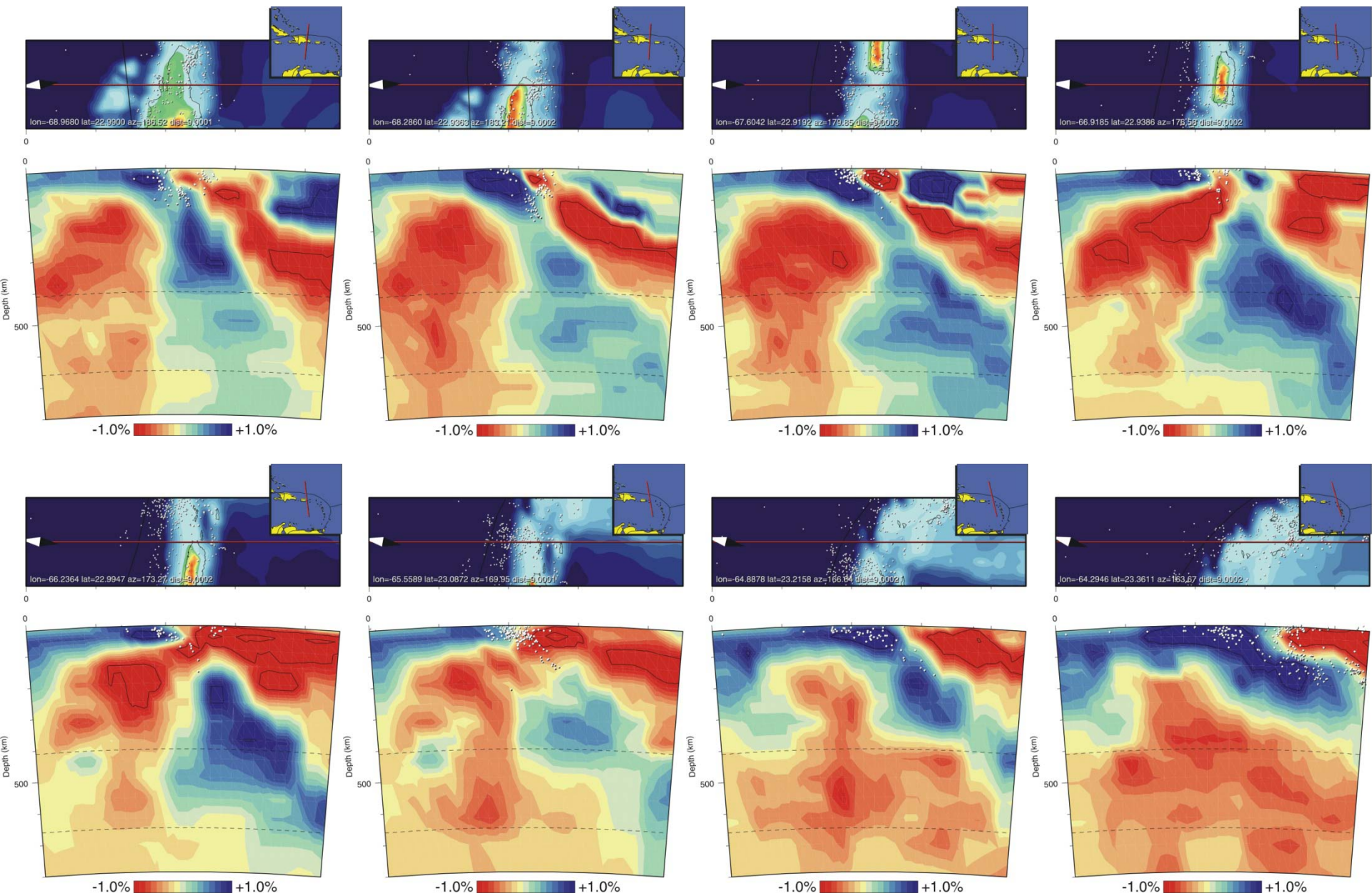


Present Day
00.0 Ma





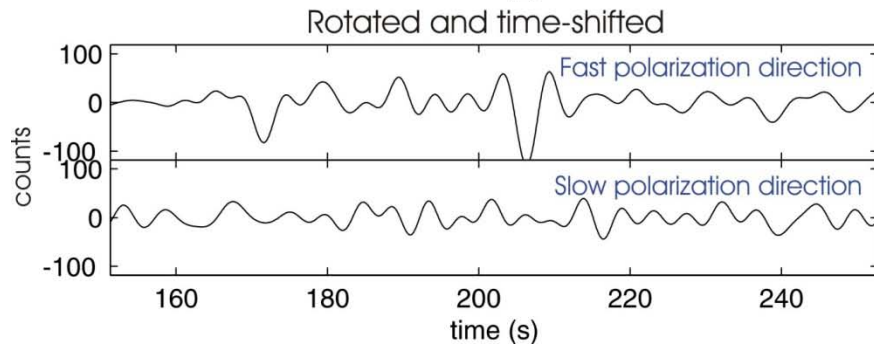
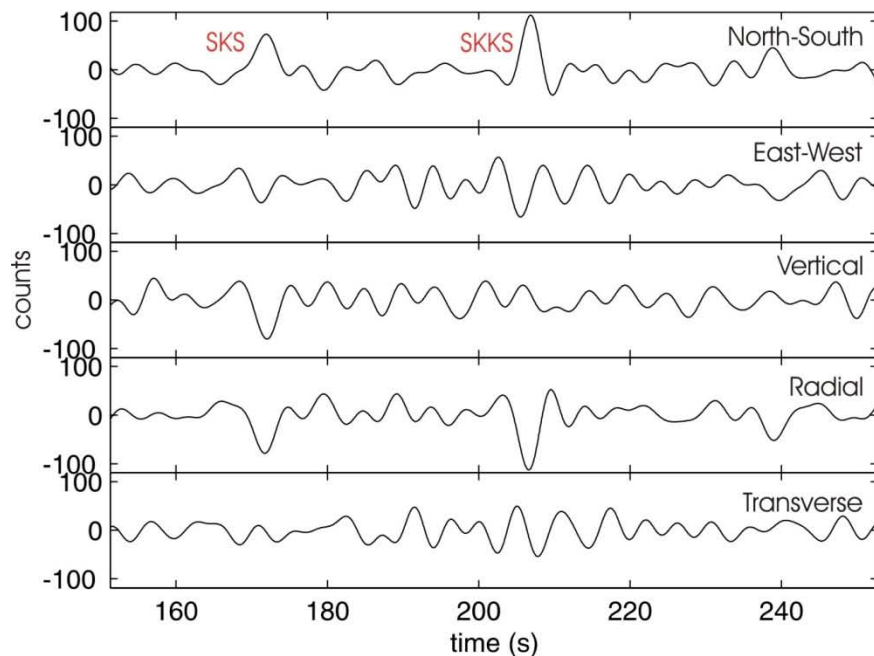
From Villasenor & Spakman (pers. comm., 2006)



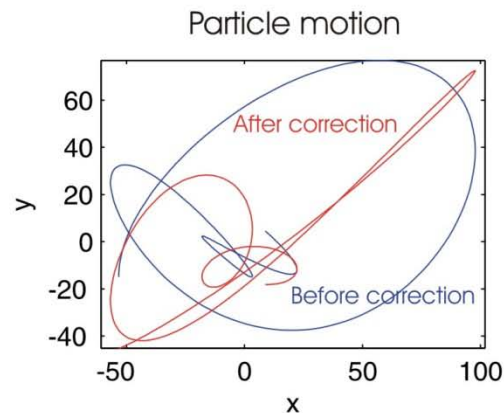
From Villasenor & Spakman (pers. comm., 2006)

SKS Splitting in the Caribbean/Central America Region

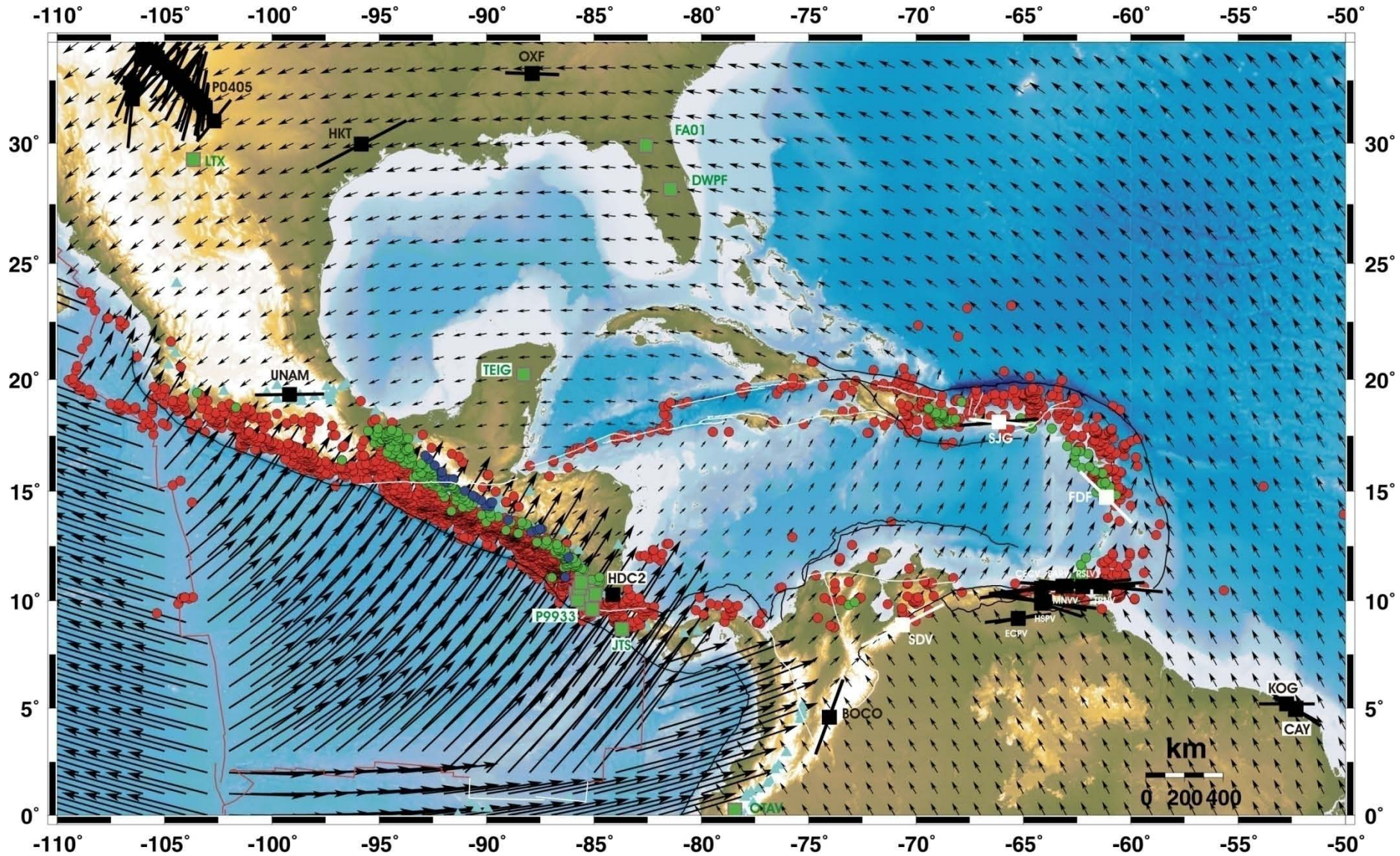
8/2/2002 23:11:39.1 29.280 138.970 426.1 6.3



Station **FDF**
(Geoscope Network, Martinique)



SKS Splitting in the Caribbean/Central America Region



Acknowledgments

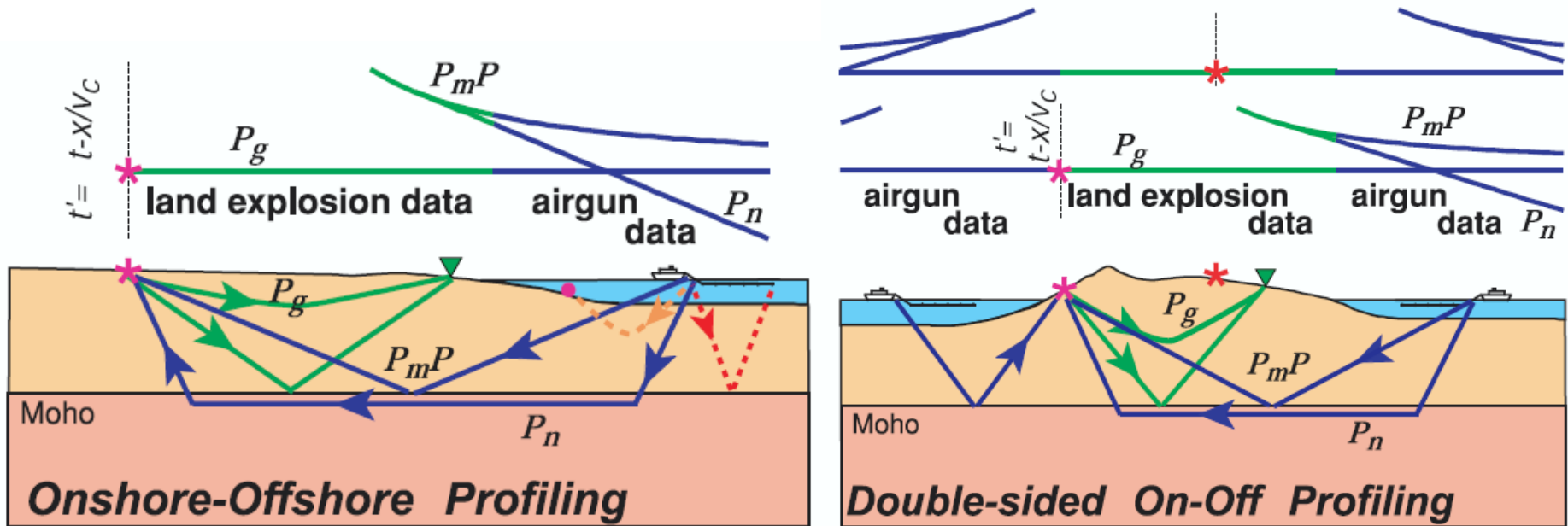
Paul Mann, Alejandro Escalona,
Lesli Wood, and Lisa Gahagen

University of Texas at Austin

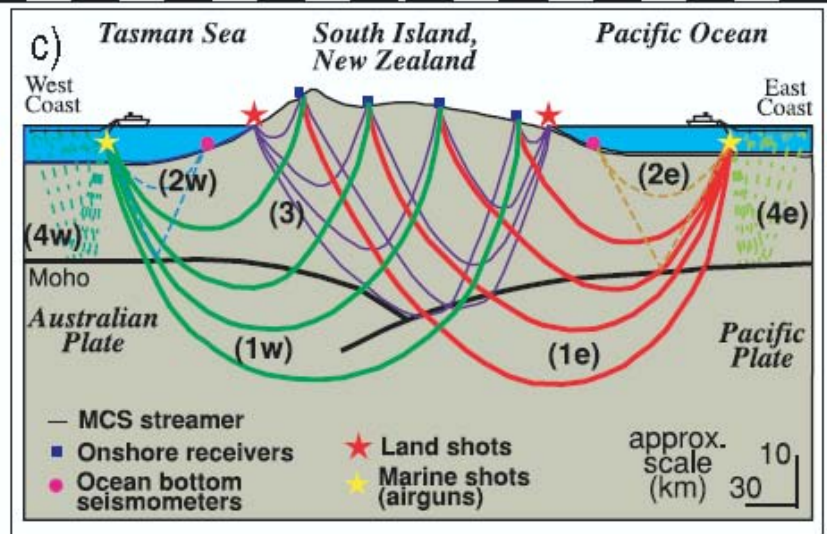
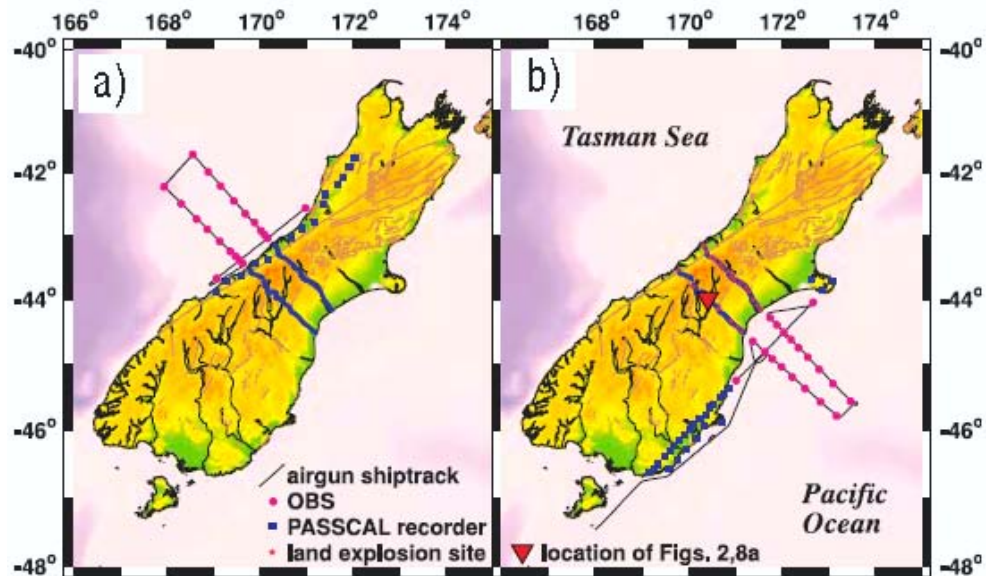
Rob Rogers

California State University at Stanislaus

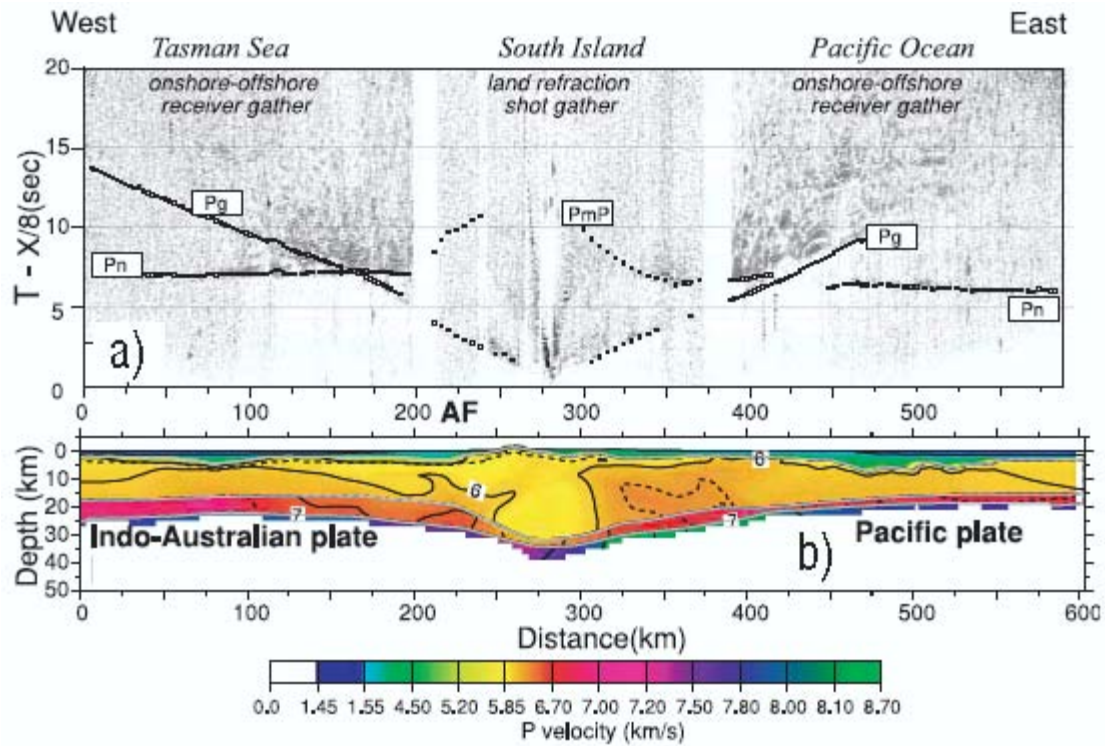
Imaging a plate boundary using double-sided onshore-offshore seismic profiling



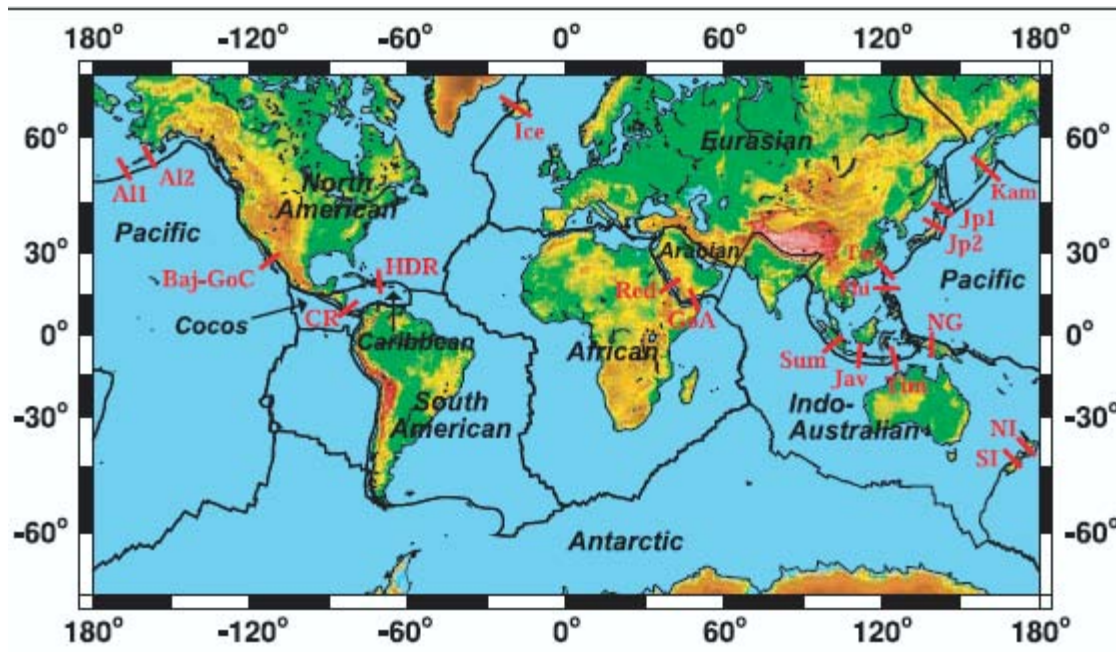
From Okaya et al., The Leading Edge, 2003



From Okaya et al., *The Leading Edge*, 2003

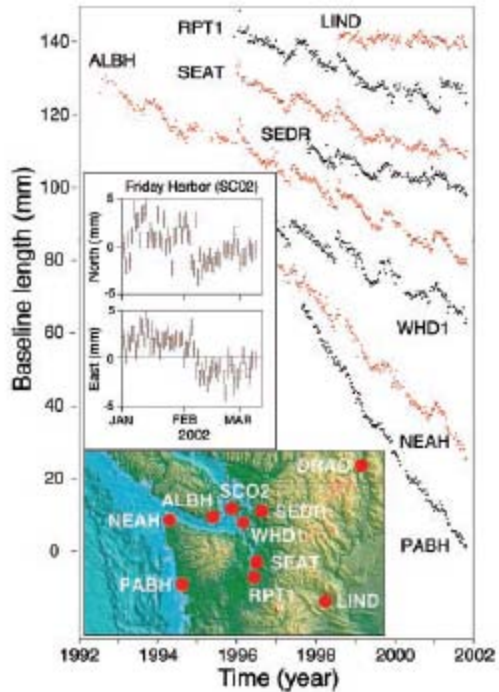


From Okaya et al., *The Leading Edge*, 2003

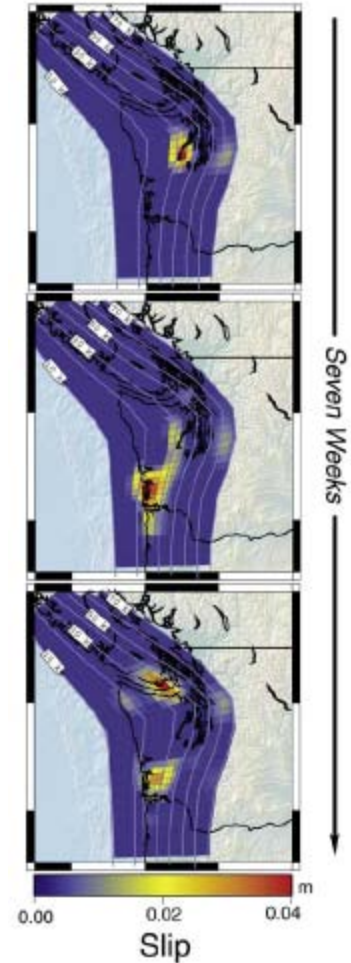


From Okaya et al., *The Leading Edge*, 2003

Periodic Slow Earthquakes from the Cascadia Subduction Zone

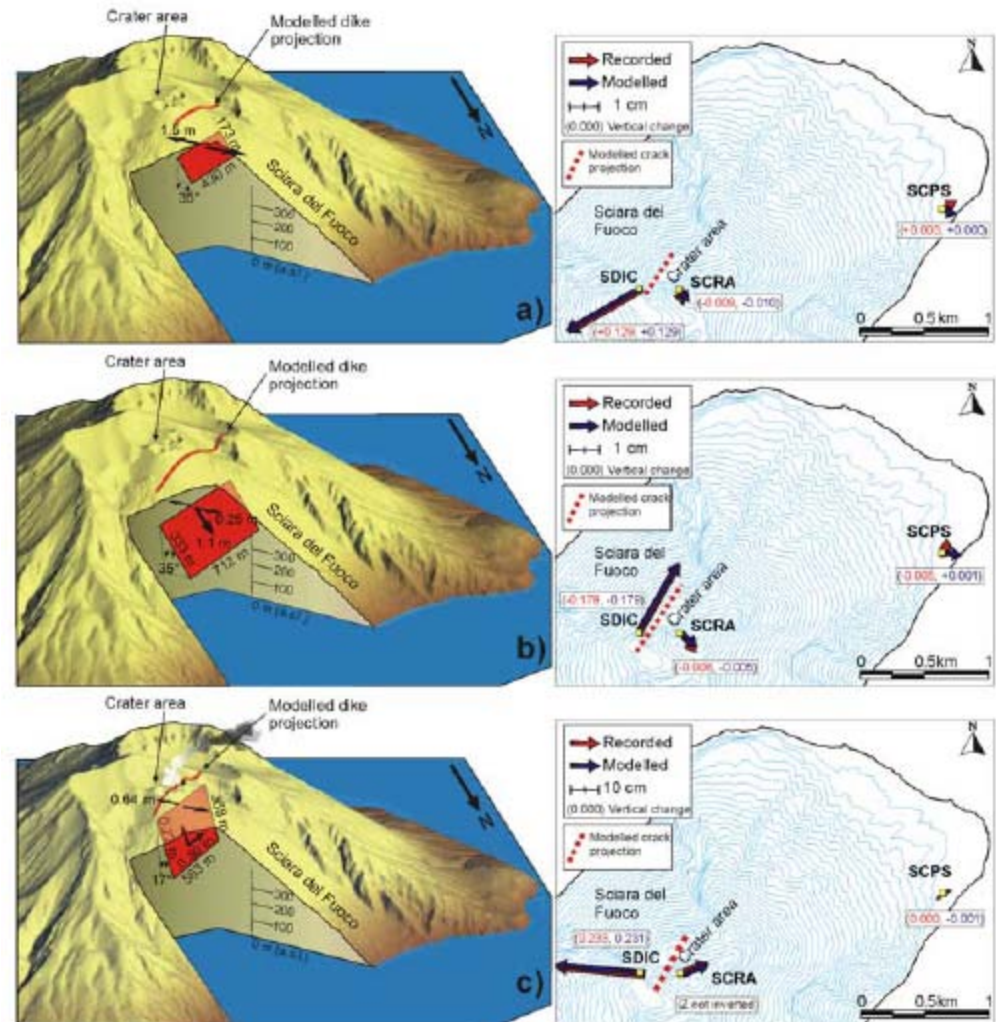
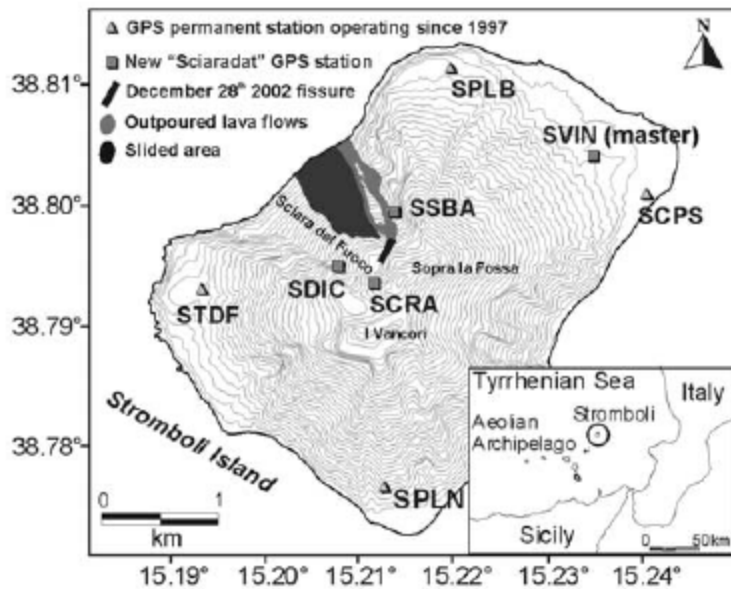


From Miller et al., *Science*, 2002



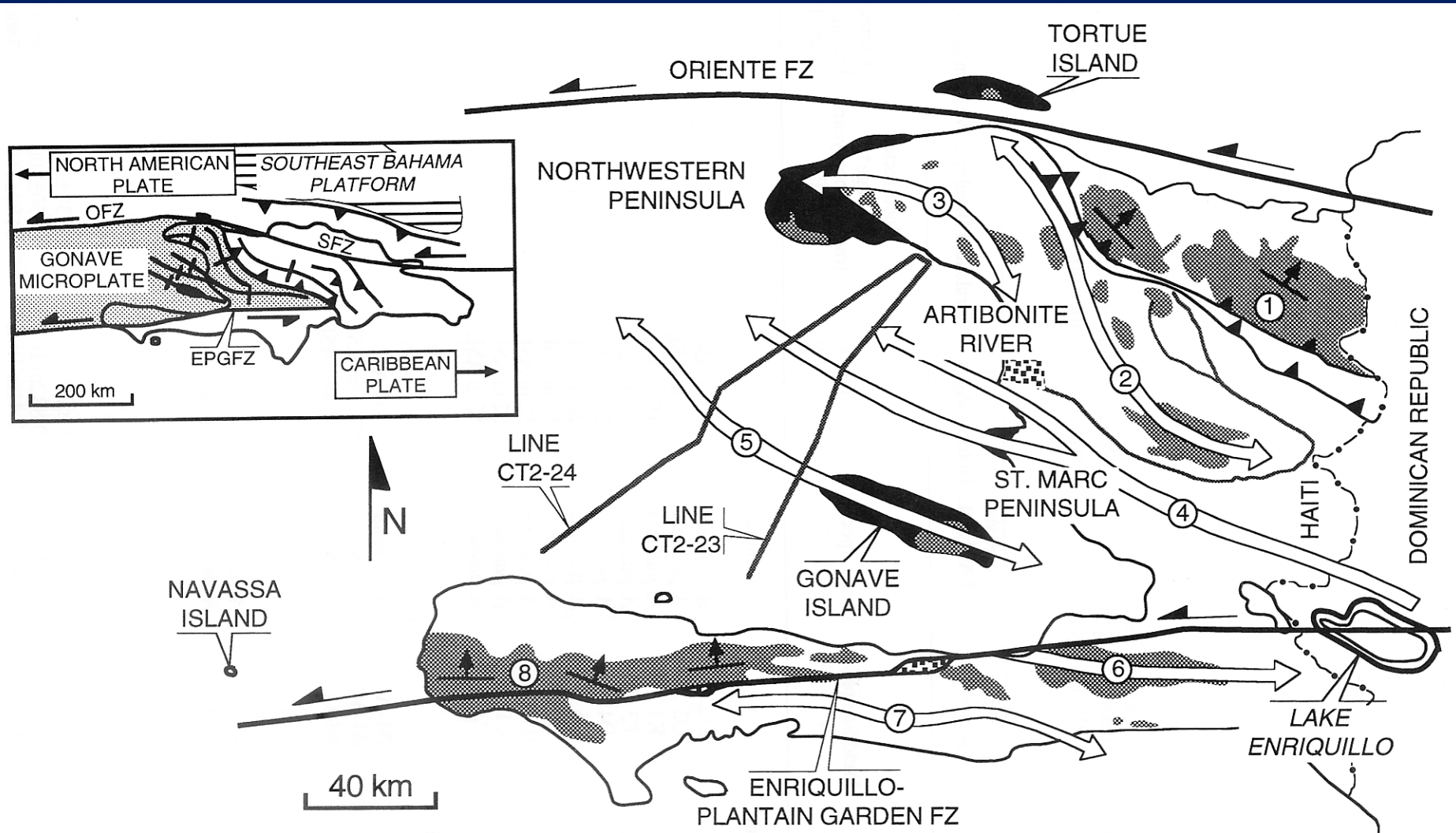
From Melbourne et al., *Geophys Res. Lett.*, 2005

The shallow plumbing system of Stromboli Island as imaged from 1 Hz instantaneous GPS positions

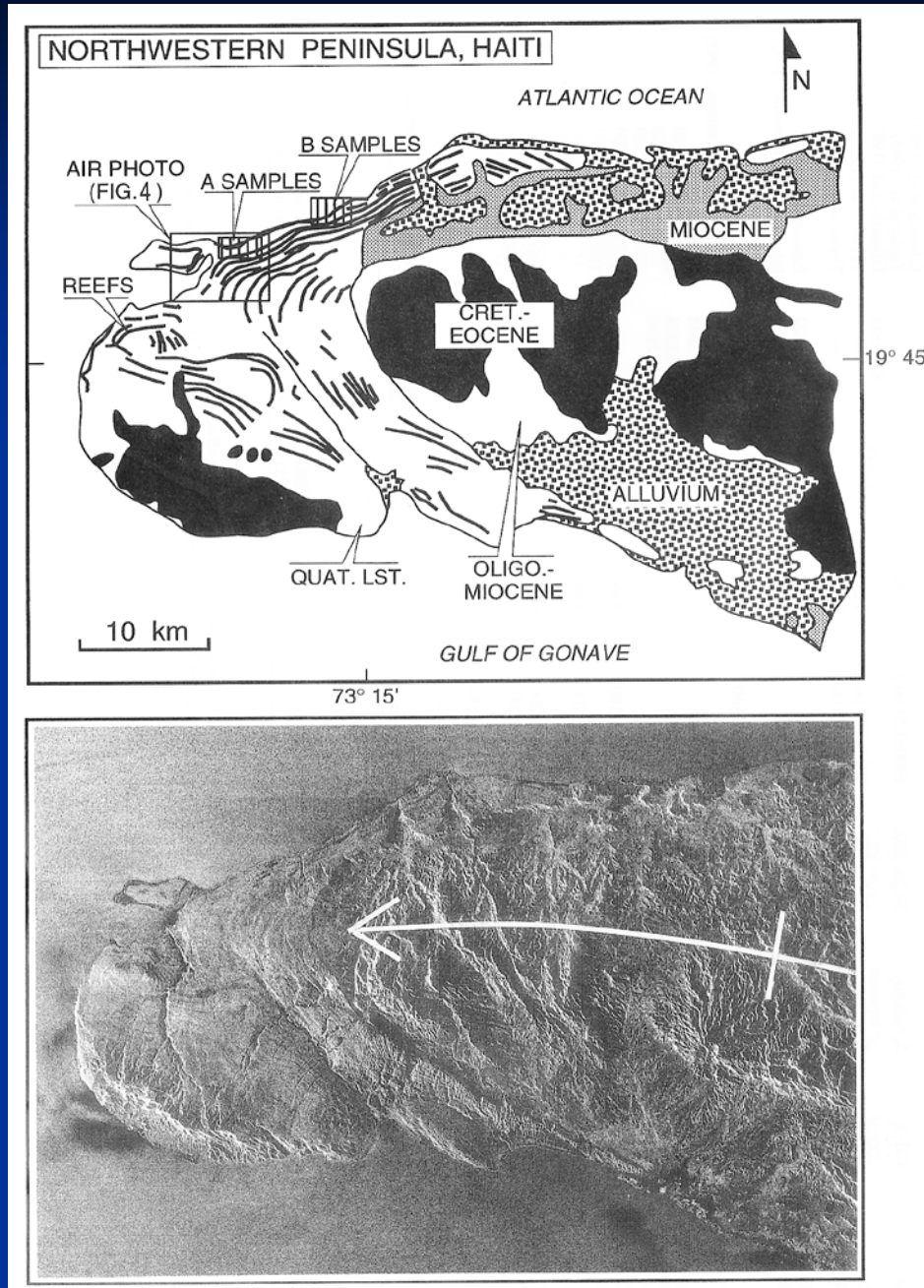


From Mattia et al., *Geophys Res. Lett.*, 2004

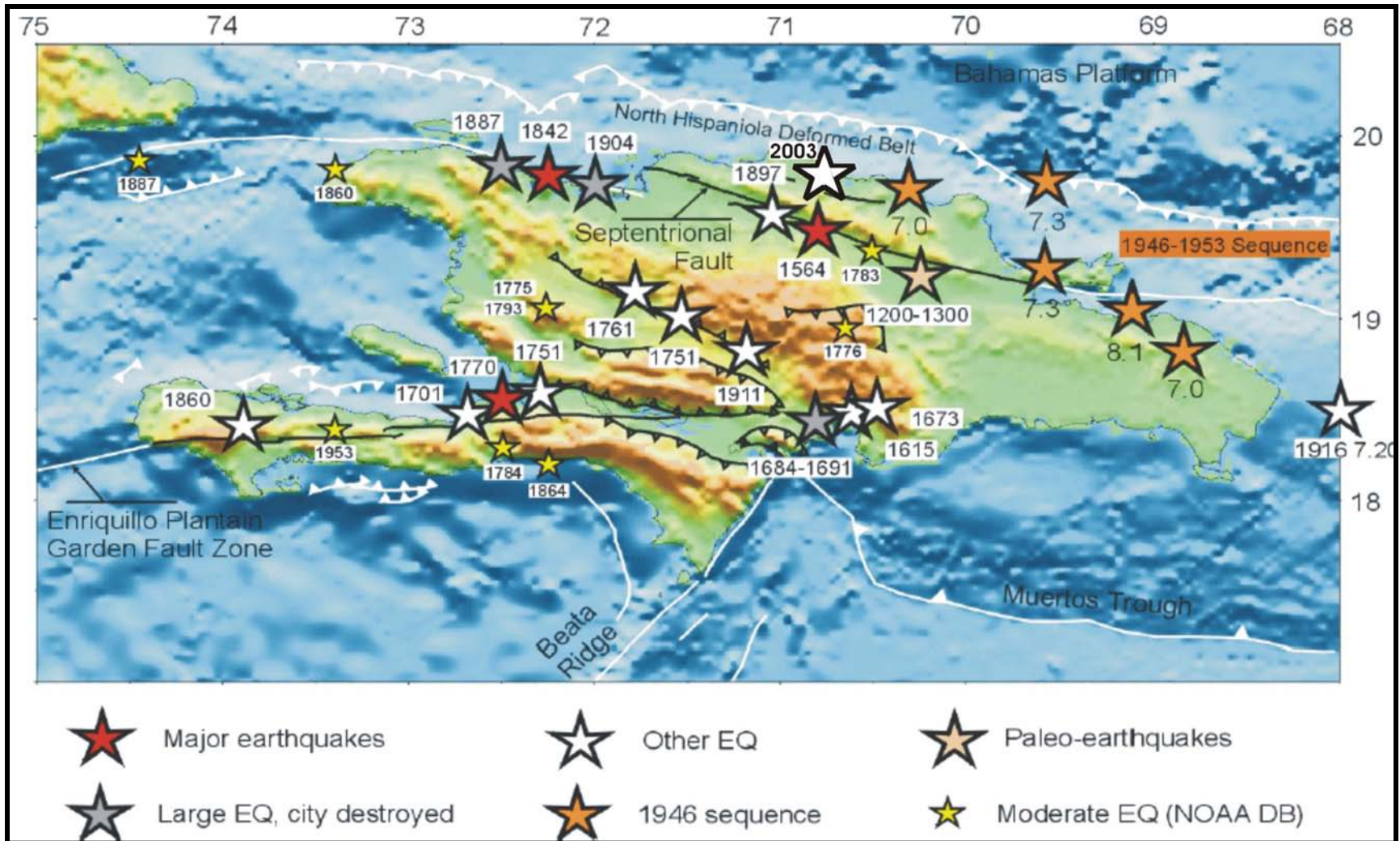
Coral reefs uplifted on anticlines in Haiti



Late Quaternary uplift rate in Haiti: 0.37 mm/yr

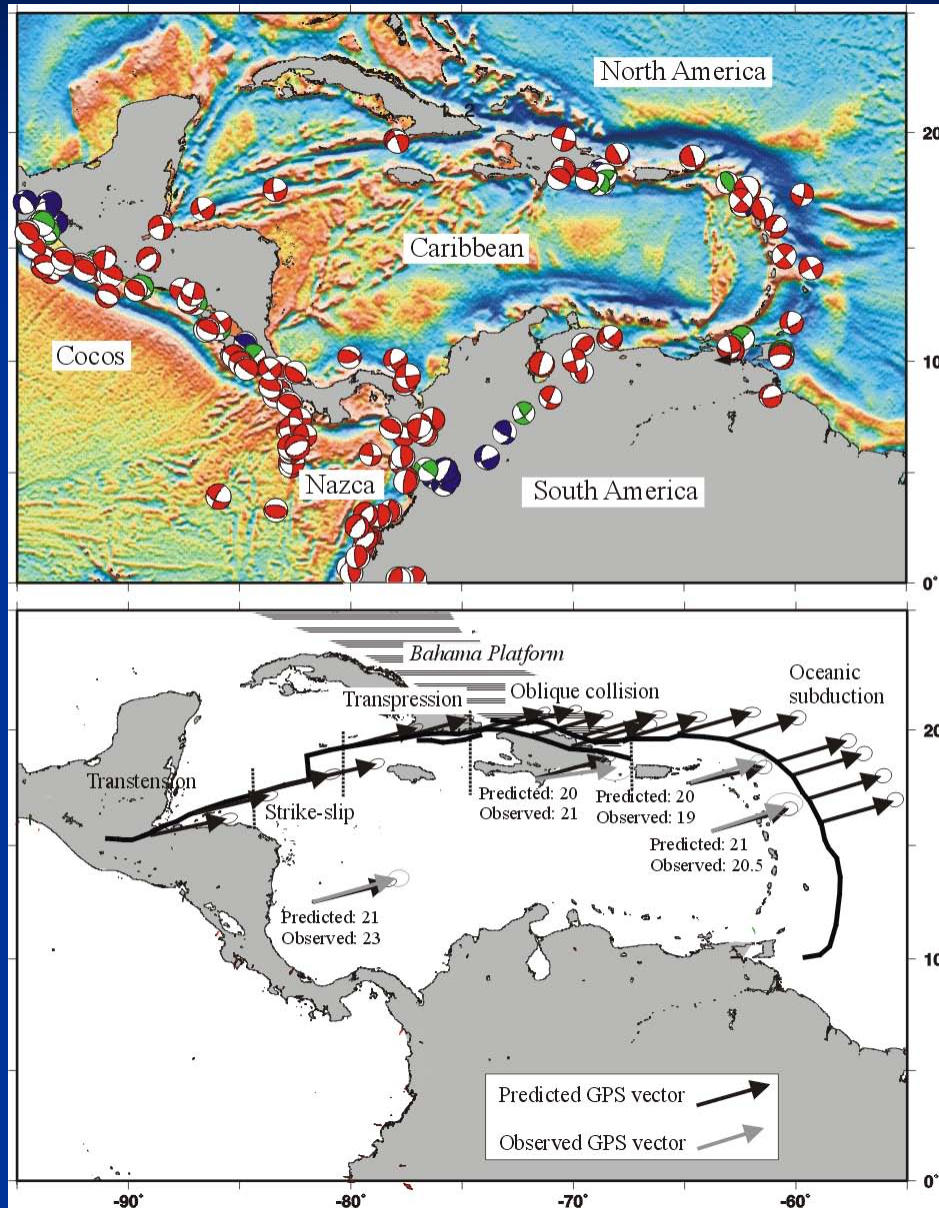


Historical earthquakes of Hispaniola, including the 22 September 2003 earthquake near Puerto Plata (M_w 6.4)

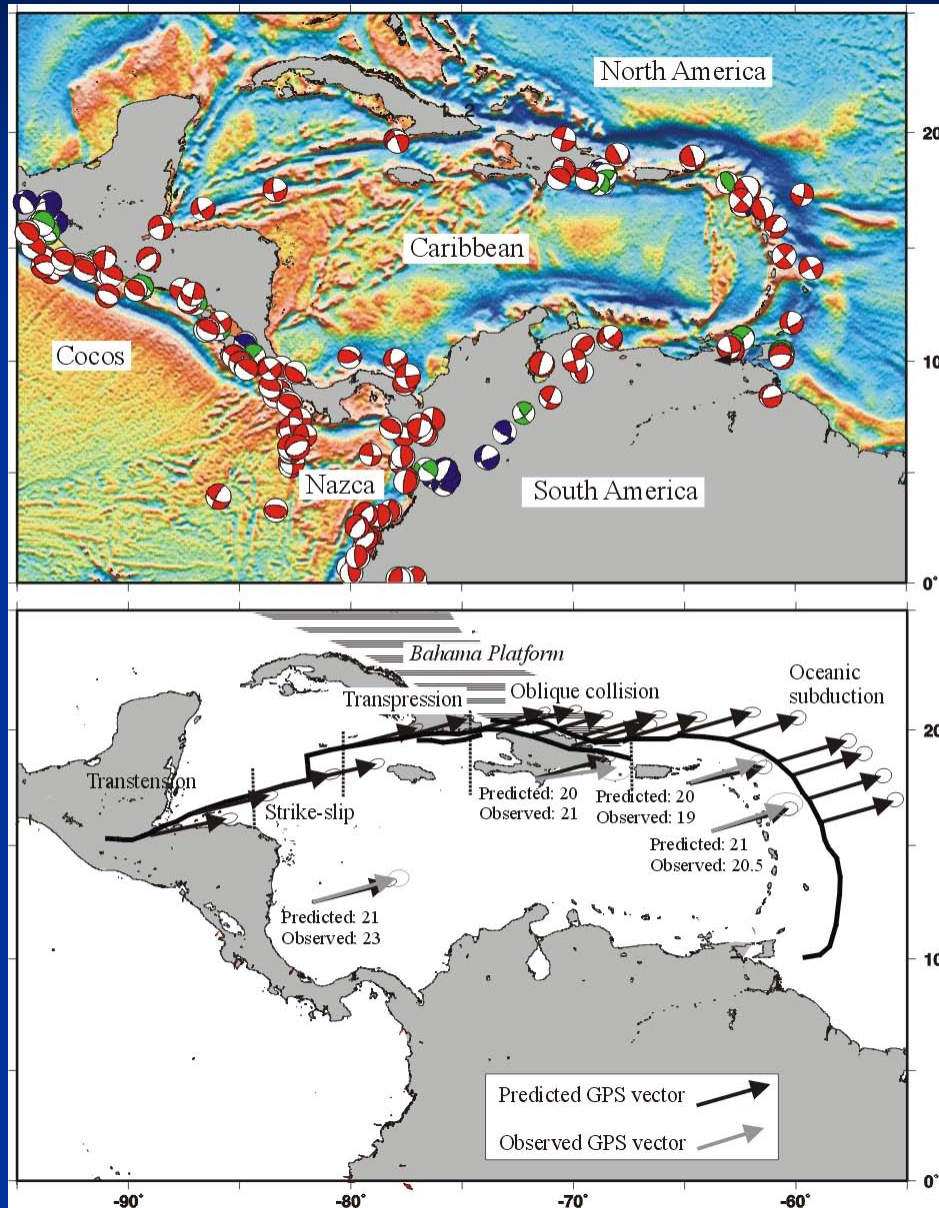


(From Mann et al., 2004)

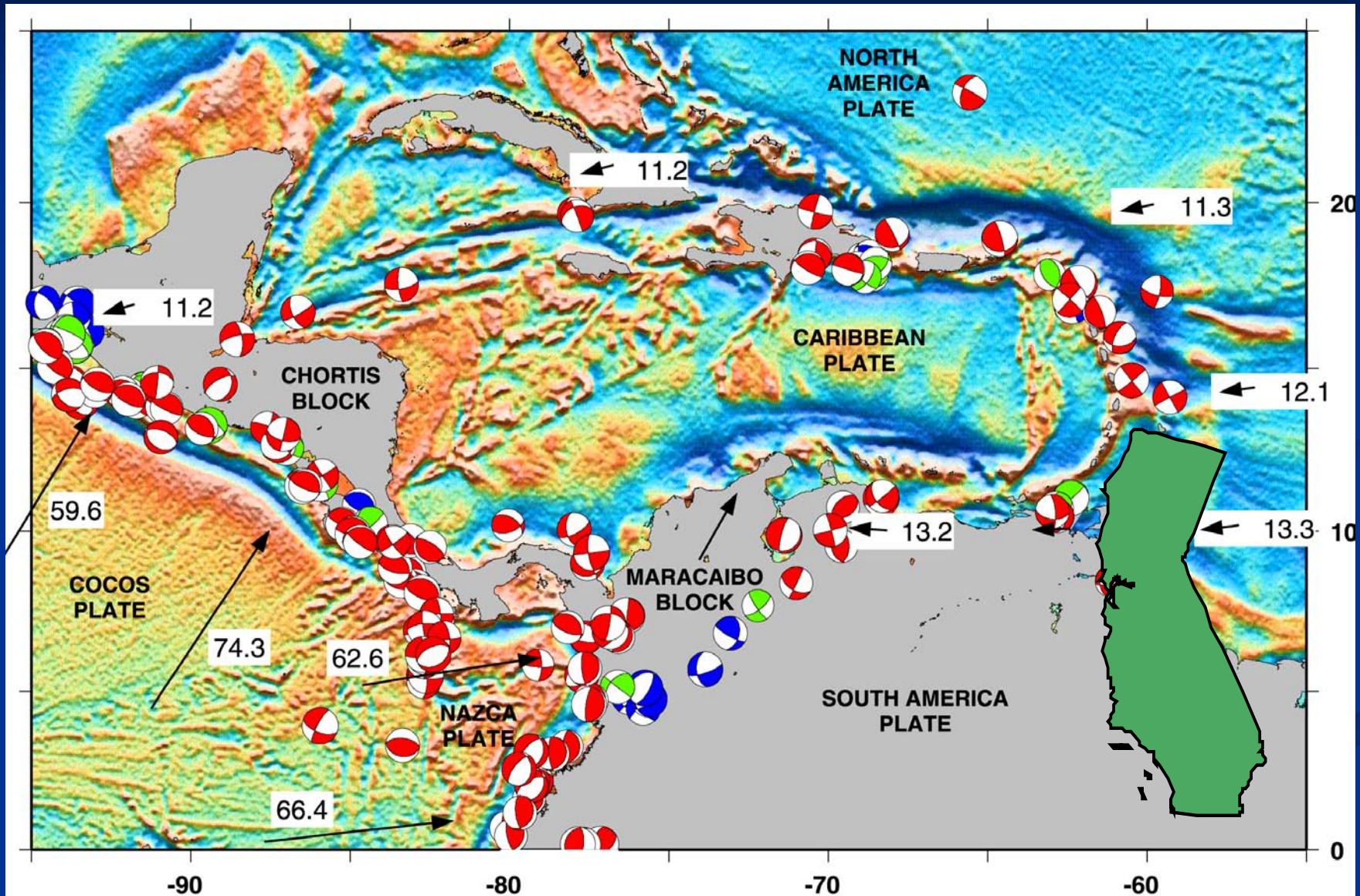
Relation of plate vector to along-strike structural changes



Relation of plate vector to along-strike structural changes



Caribbean Plate Boundaries



Relation of plate vector to along-strike structural changes

