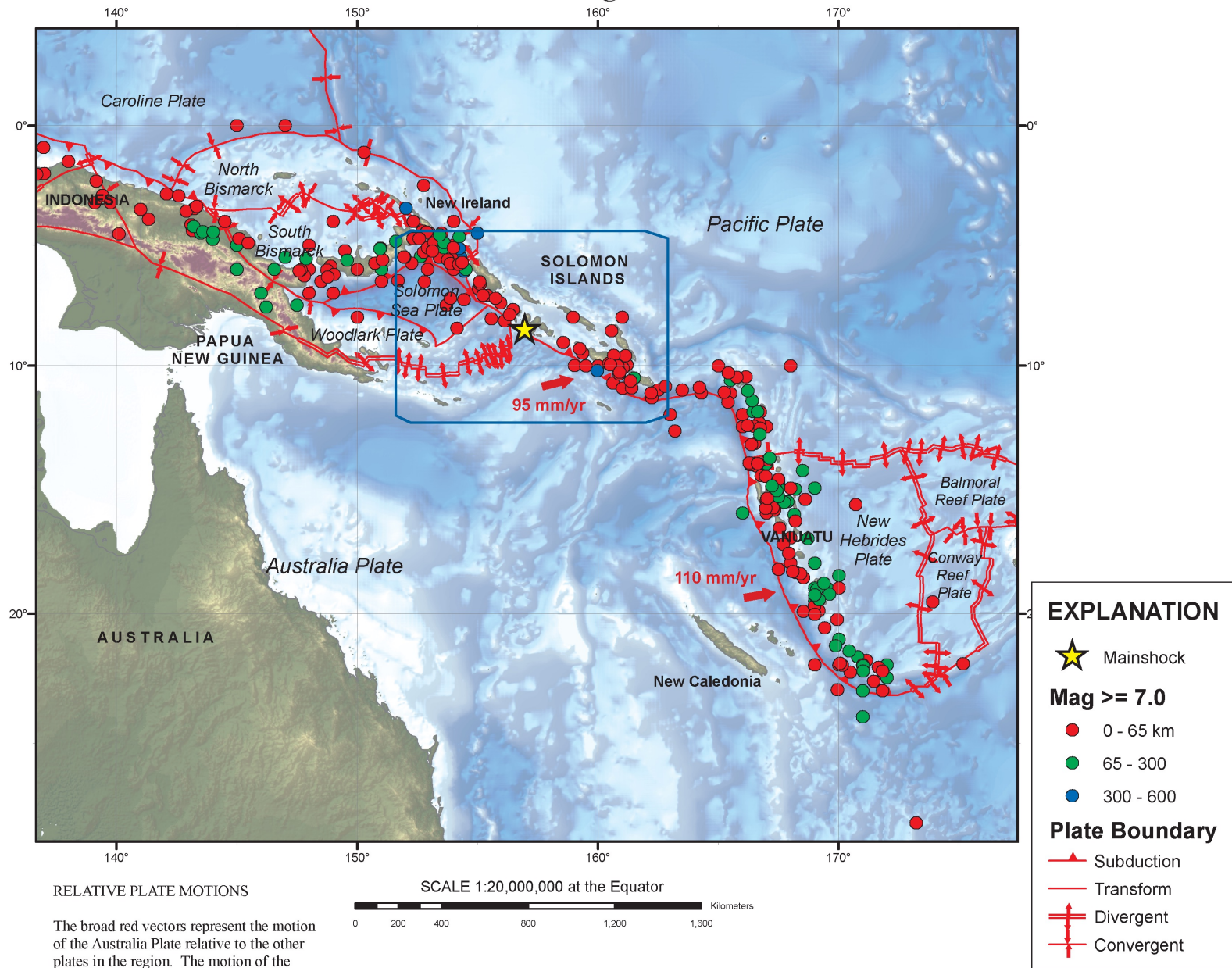


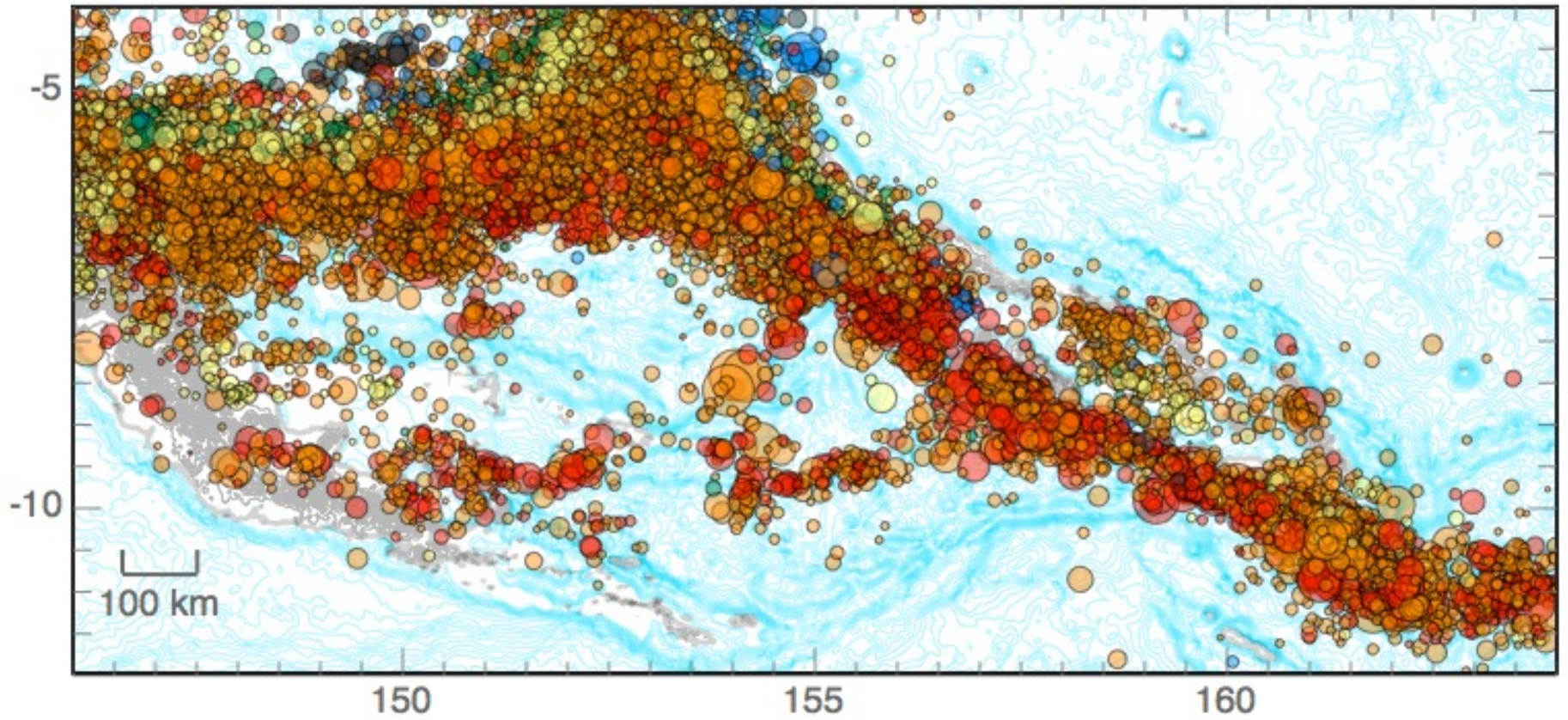
Solomon Islands/Vanuatu  
Trench System Overview  
Seismicity

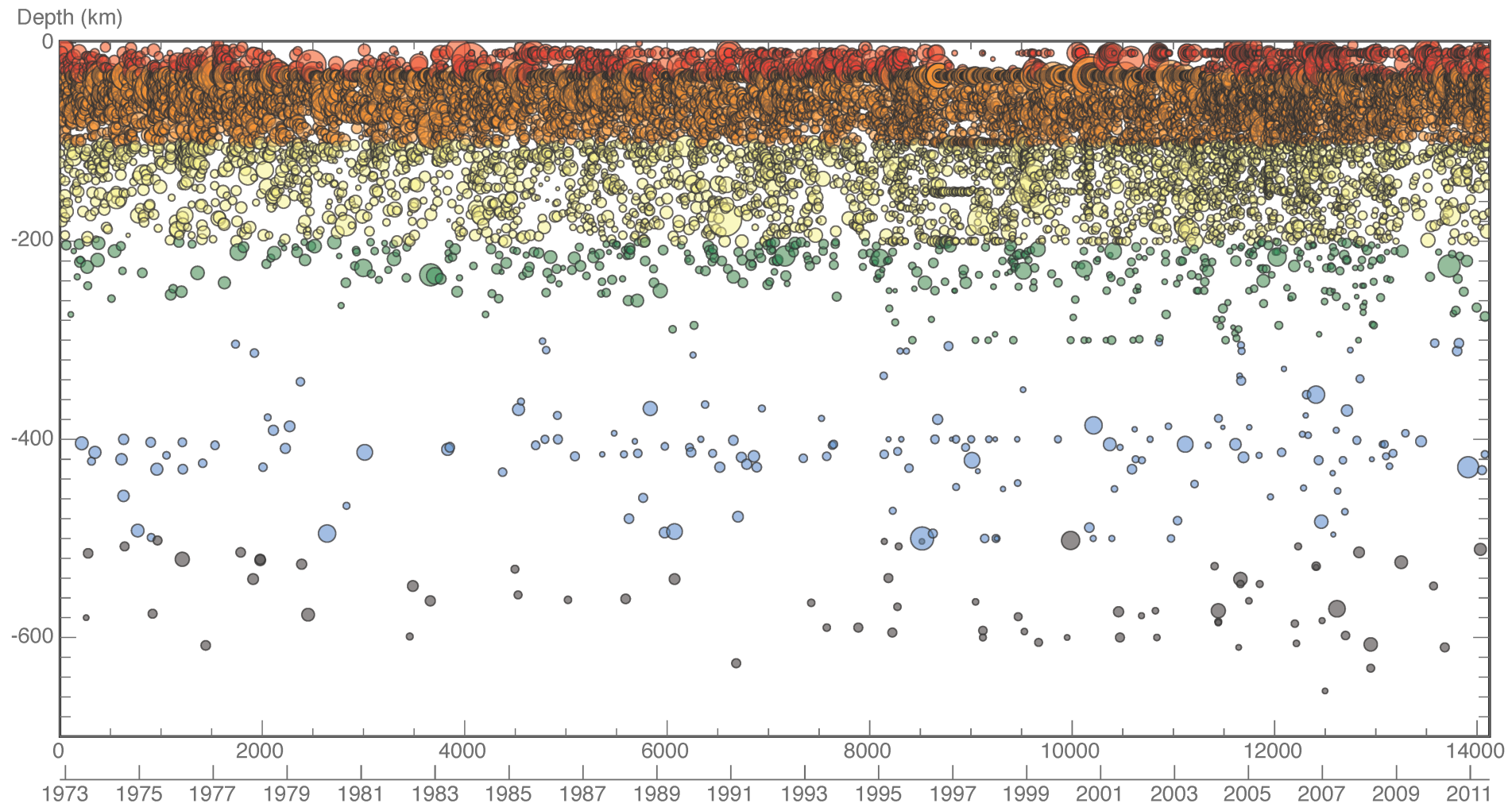
Thorne Lay

# Tectonic Setting

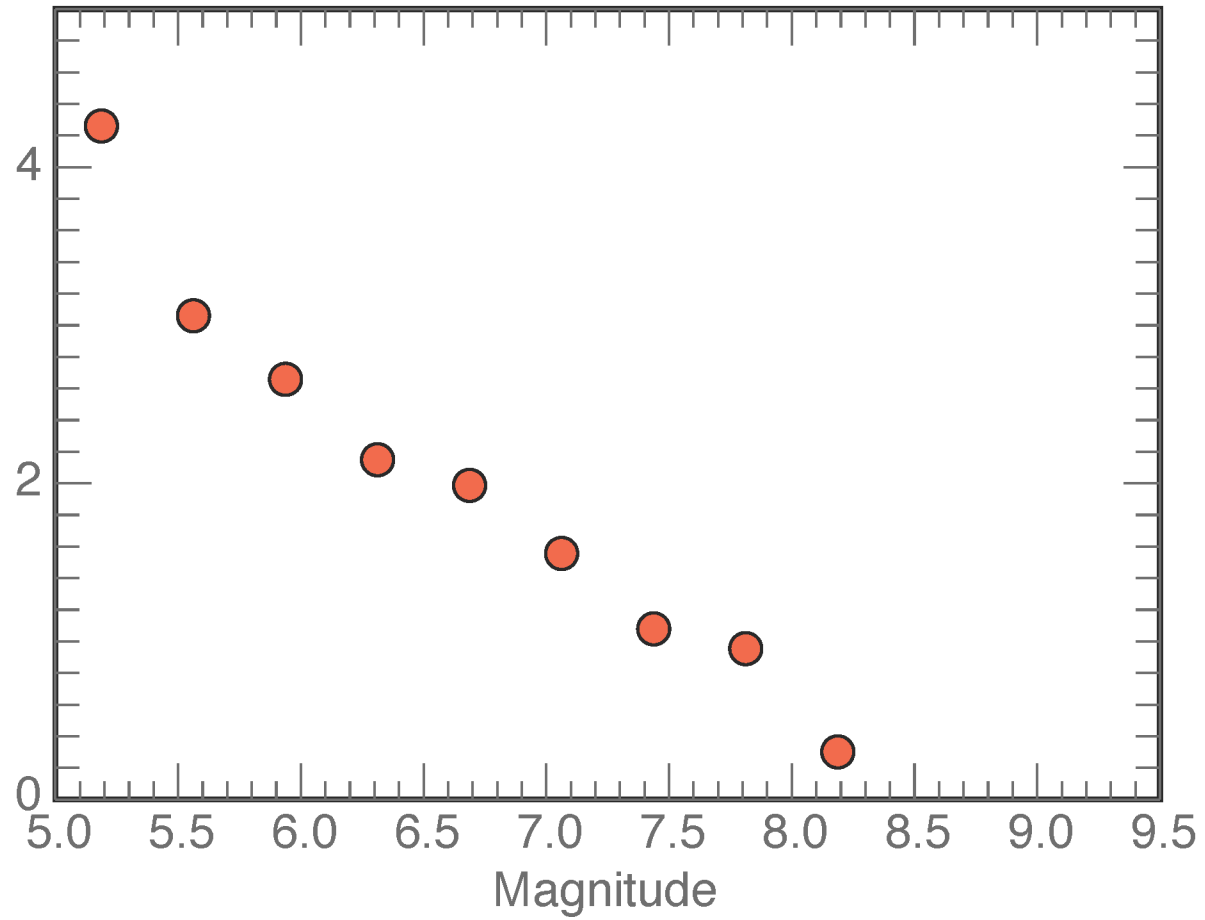


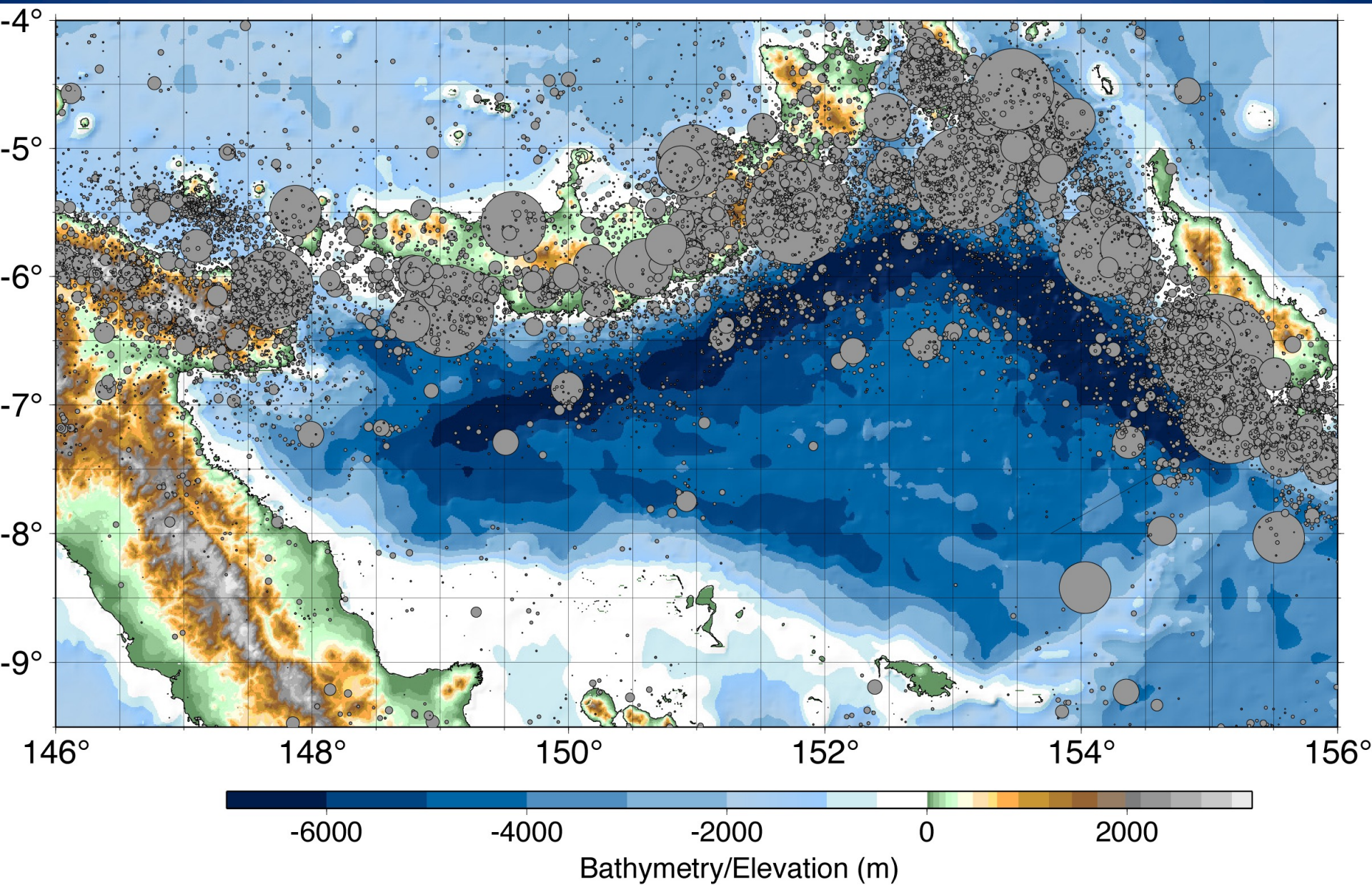
# Solomon Islands NEIC Seismicity 1973-2011

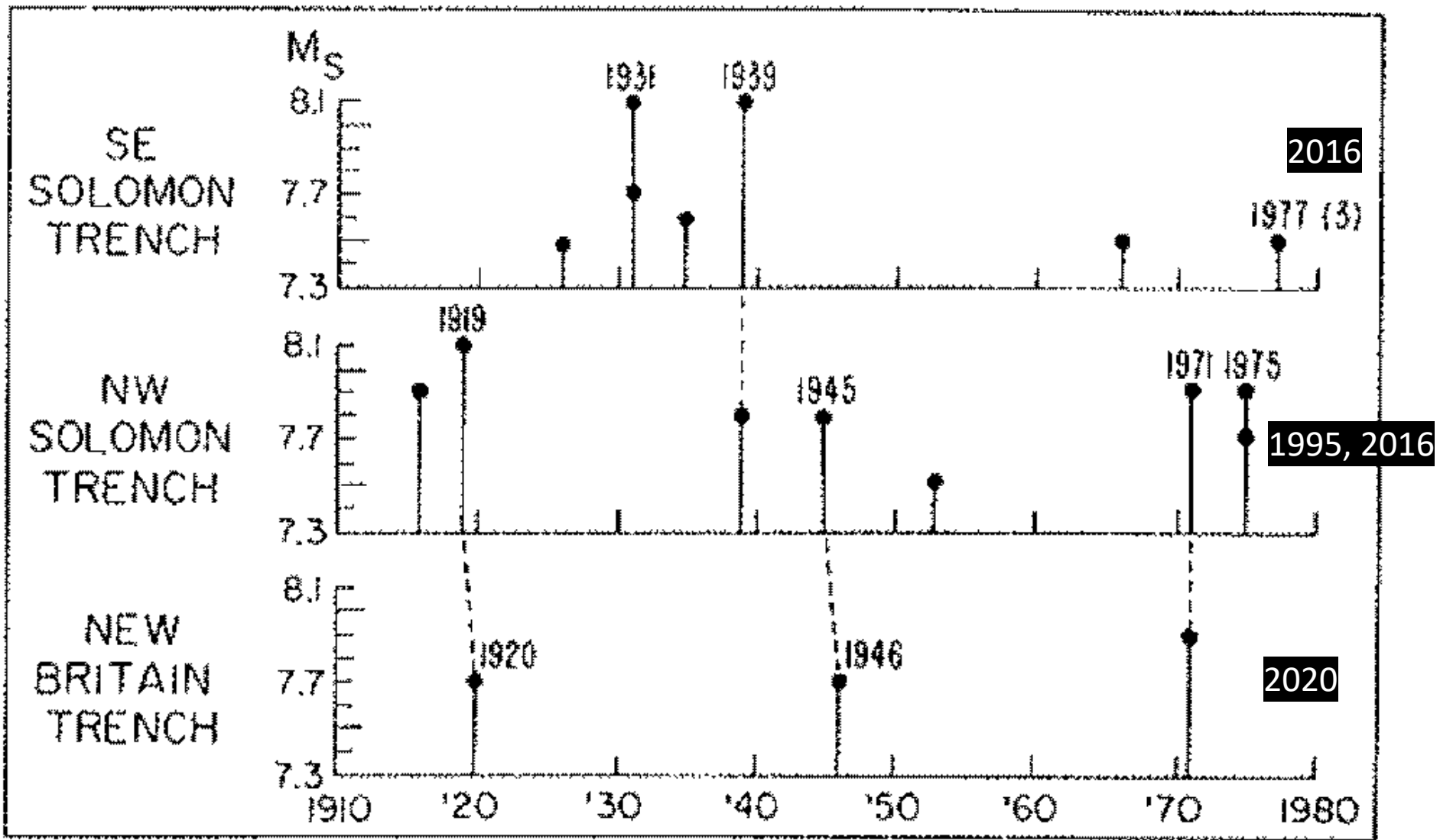


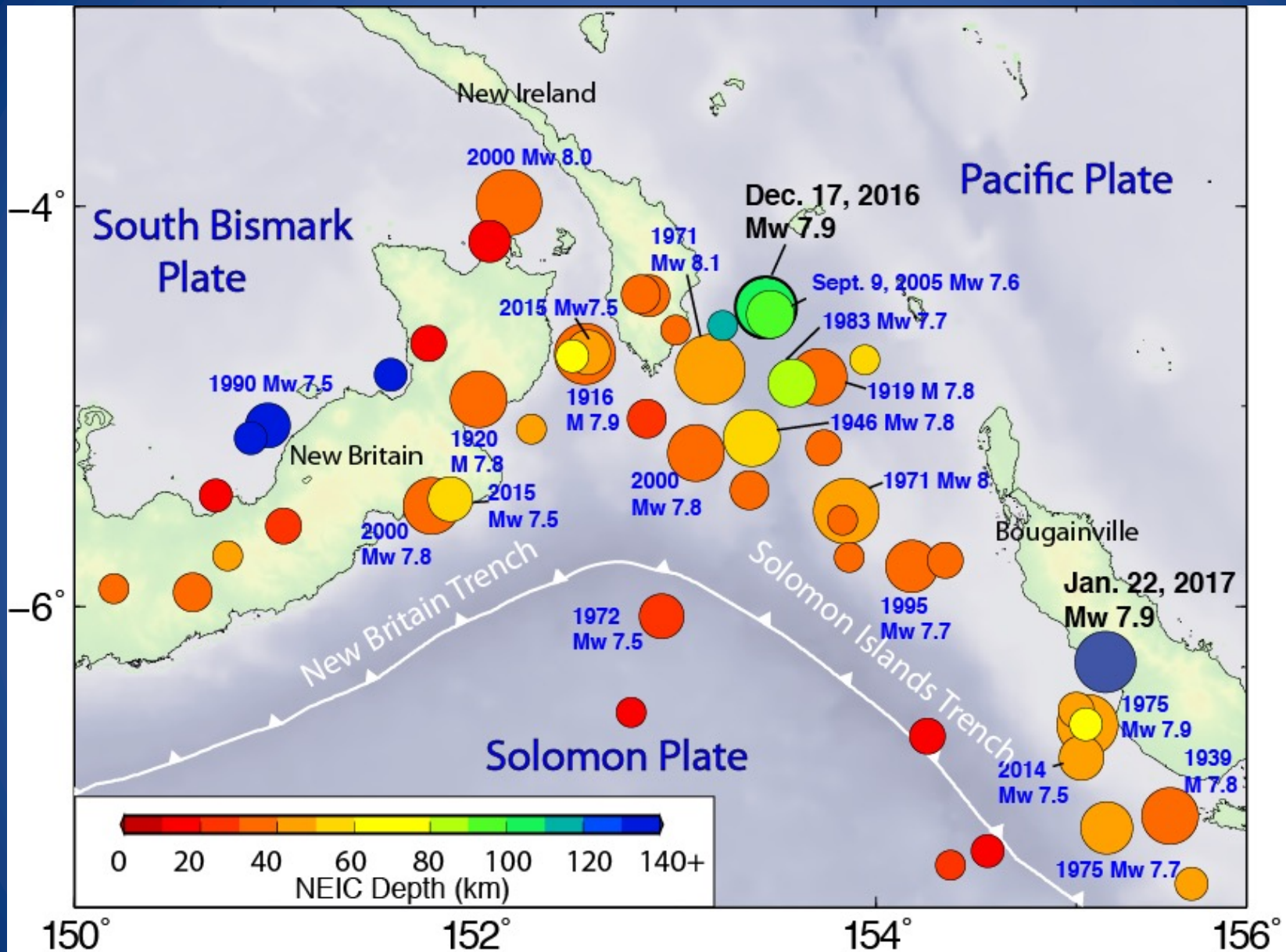


Log10 of Number

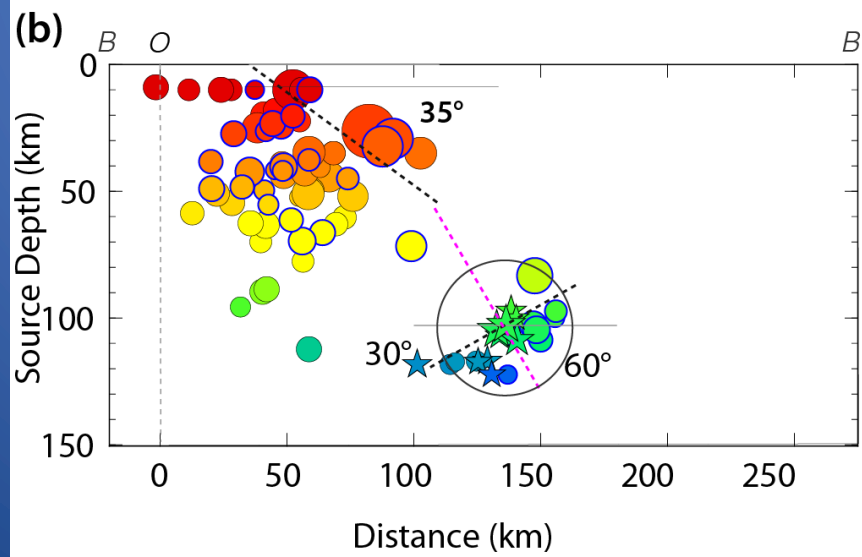
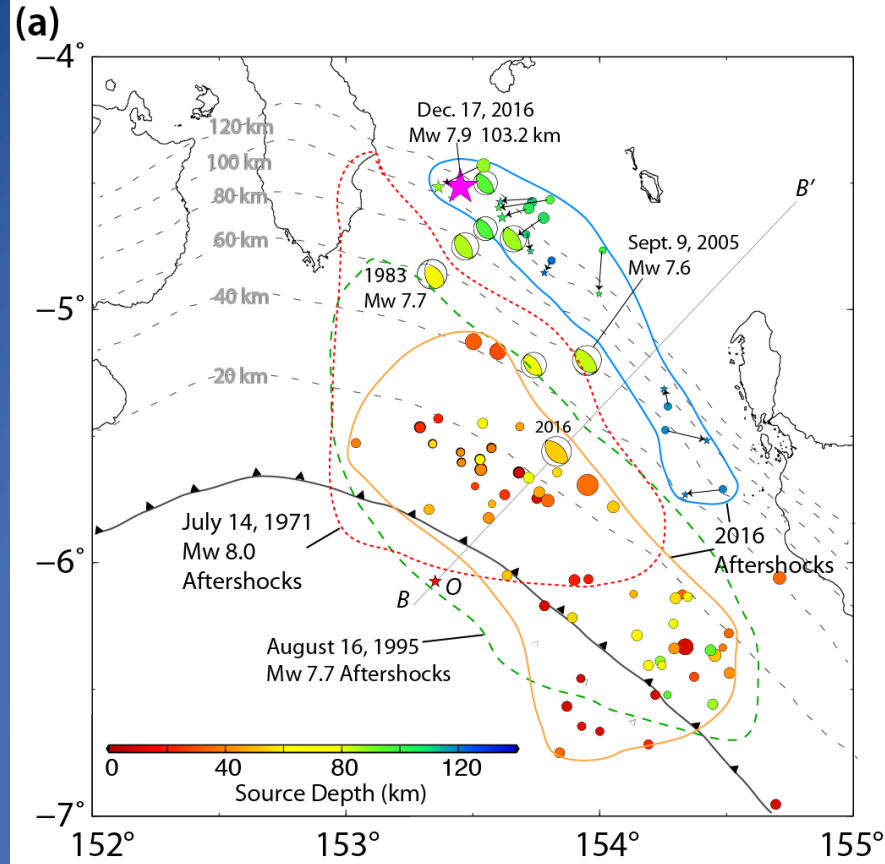


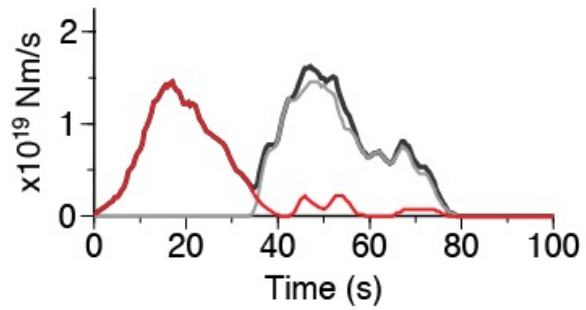
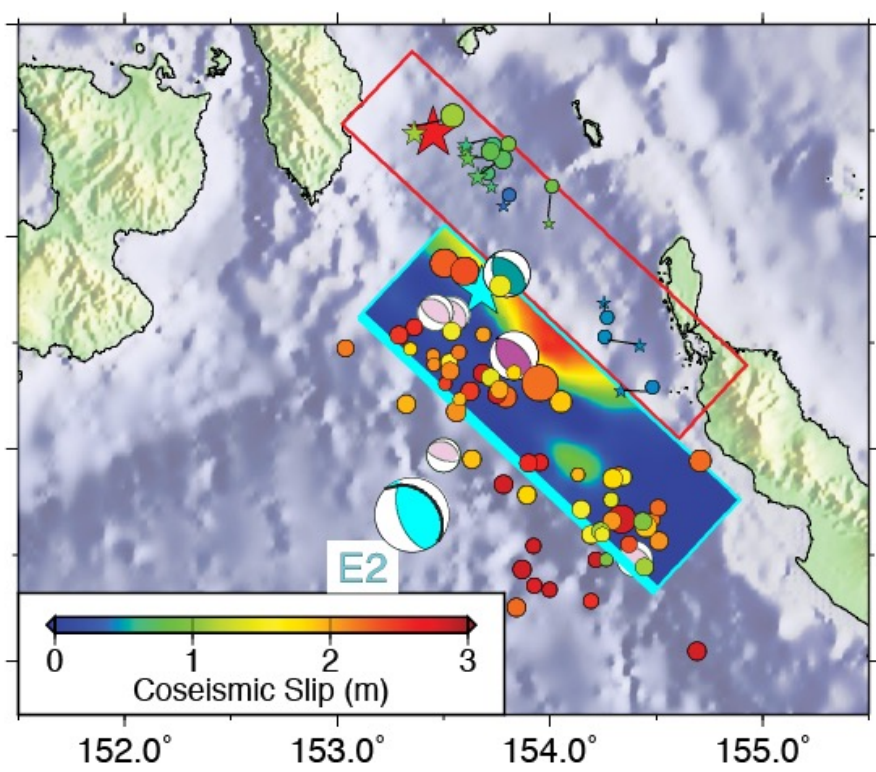
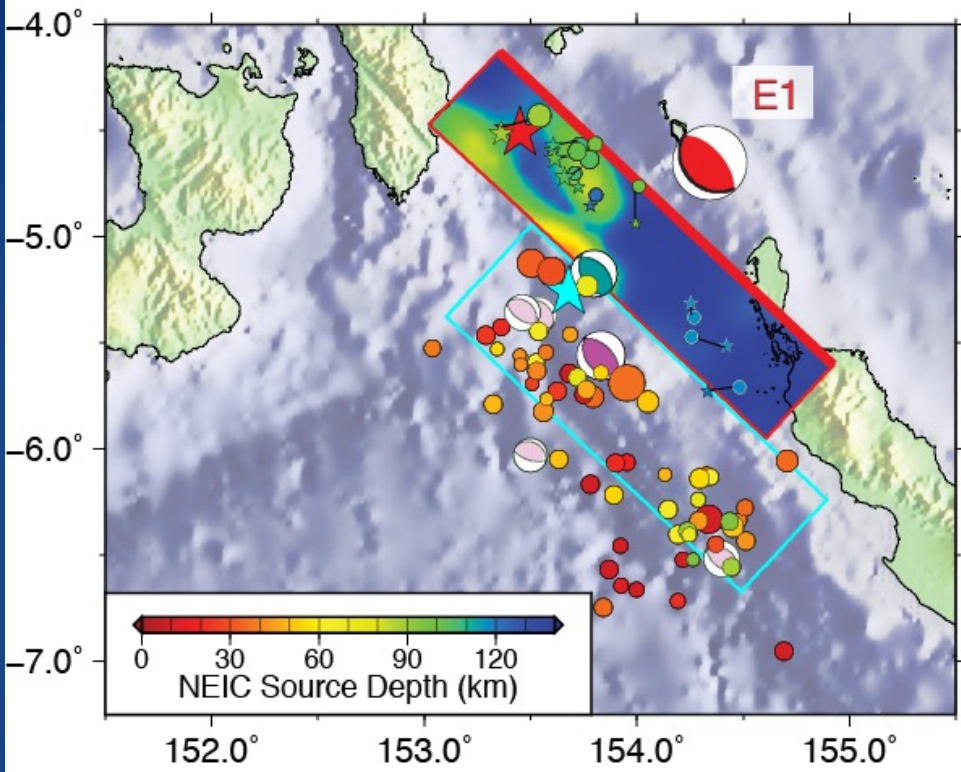




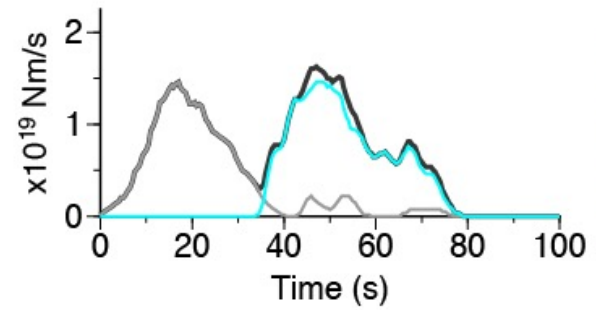






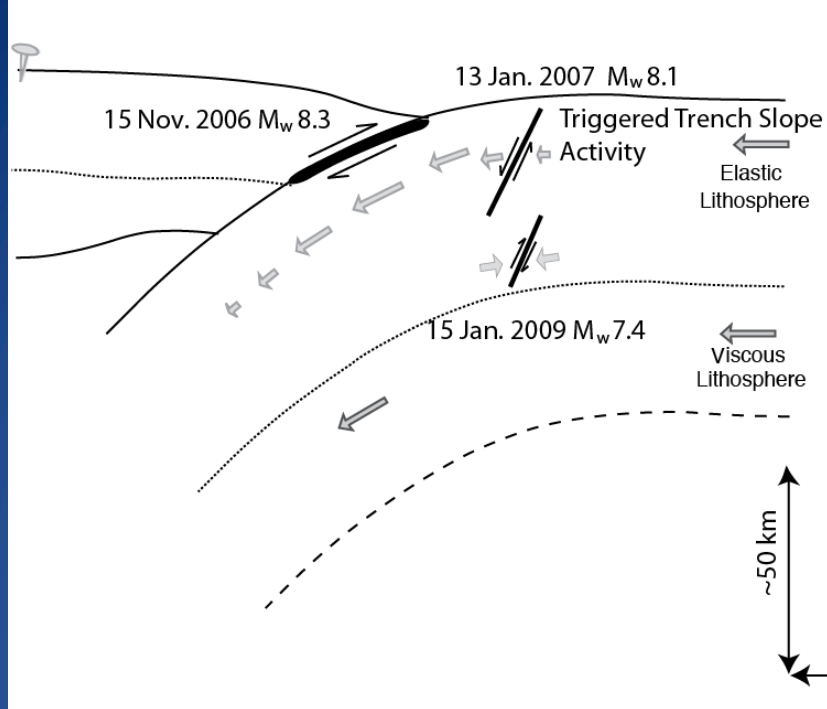


**E1**  
 $M_w = 7.59$   
 $H_c = 107 \text{ km}$   
 Strike  $133^\circ$   
 Dip  $30^\circ$

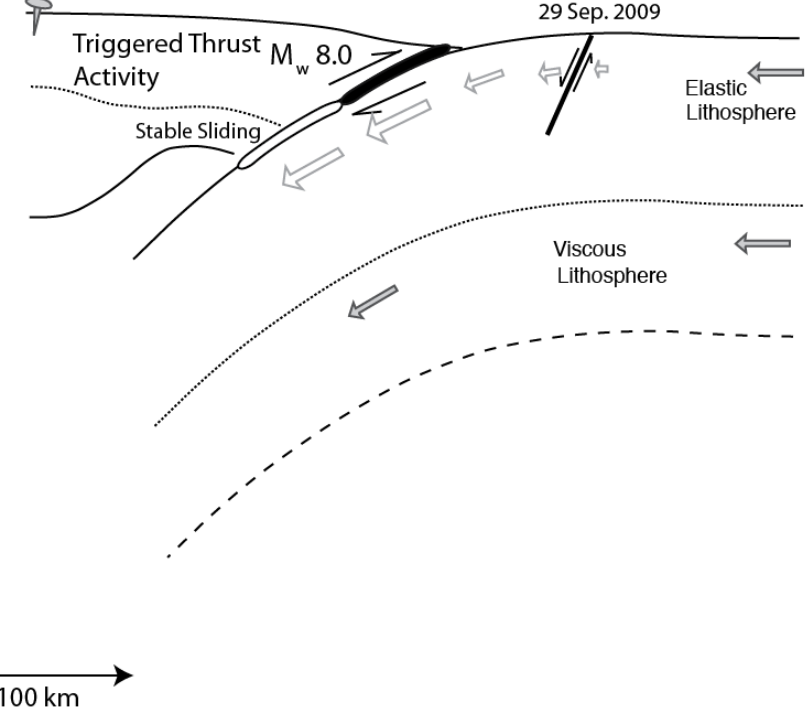


**E2**  
 $M_w = 7.63$   
 $H_c = 37 \text{ km}$   
 Strike  $313^\circ$   
 Dip  $35^\circ$

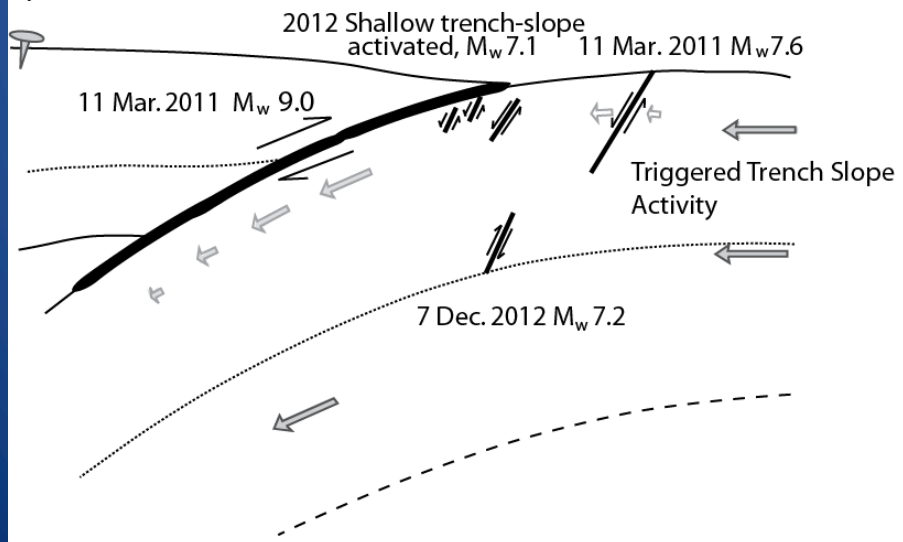
a) 2006-2009 Central Kuril Islands



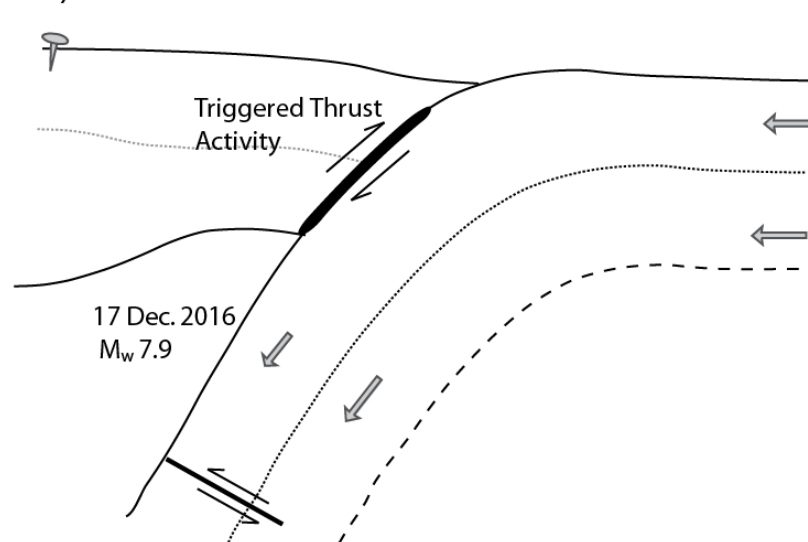
b) 2009 Samoa/Tonga

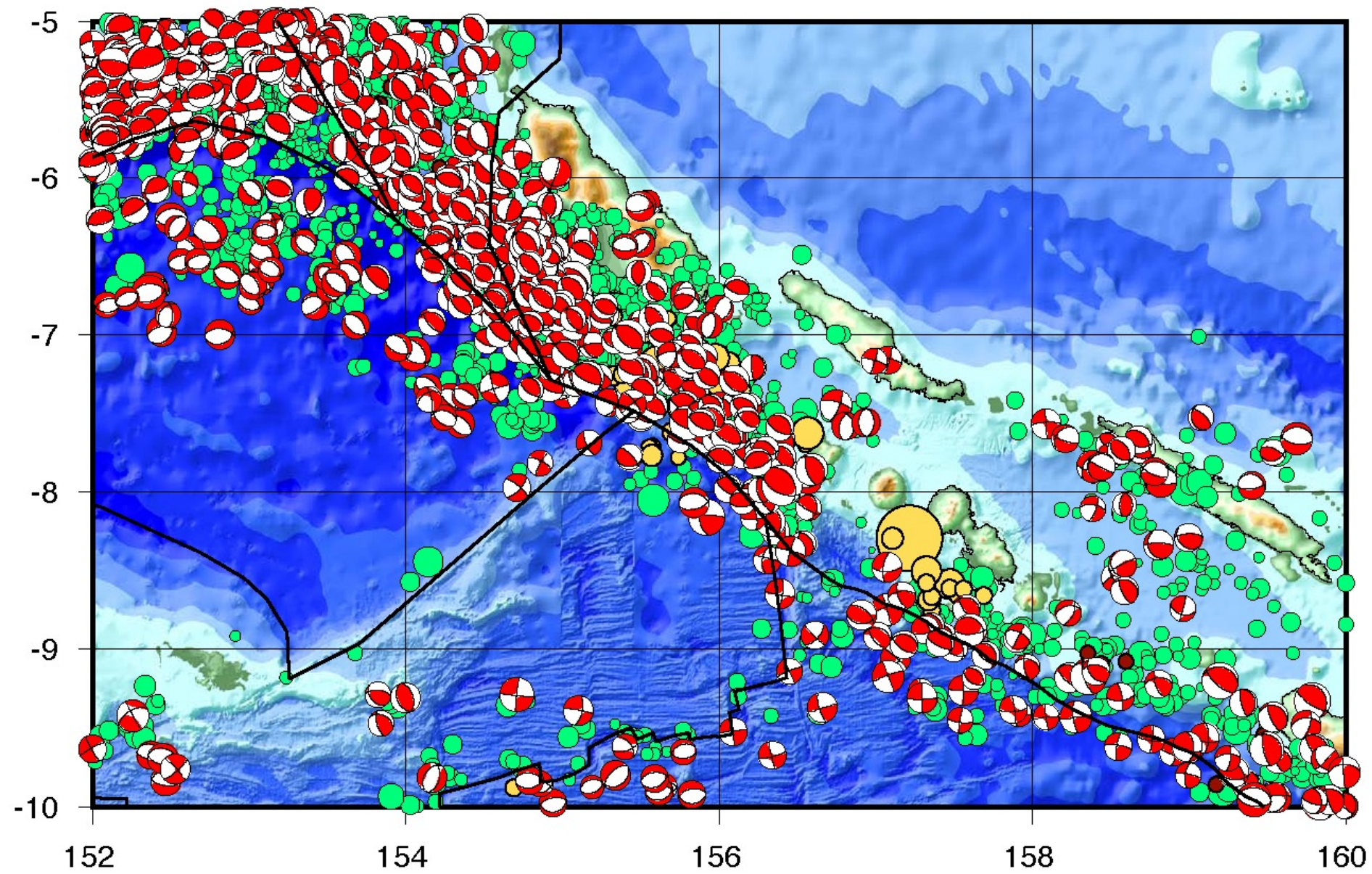


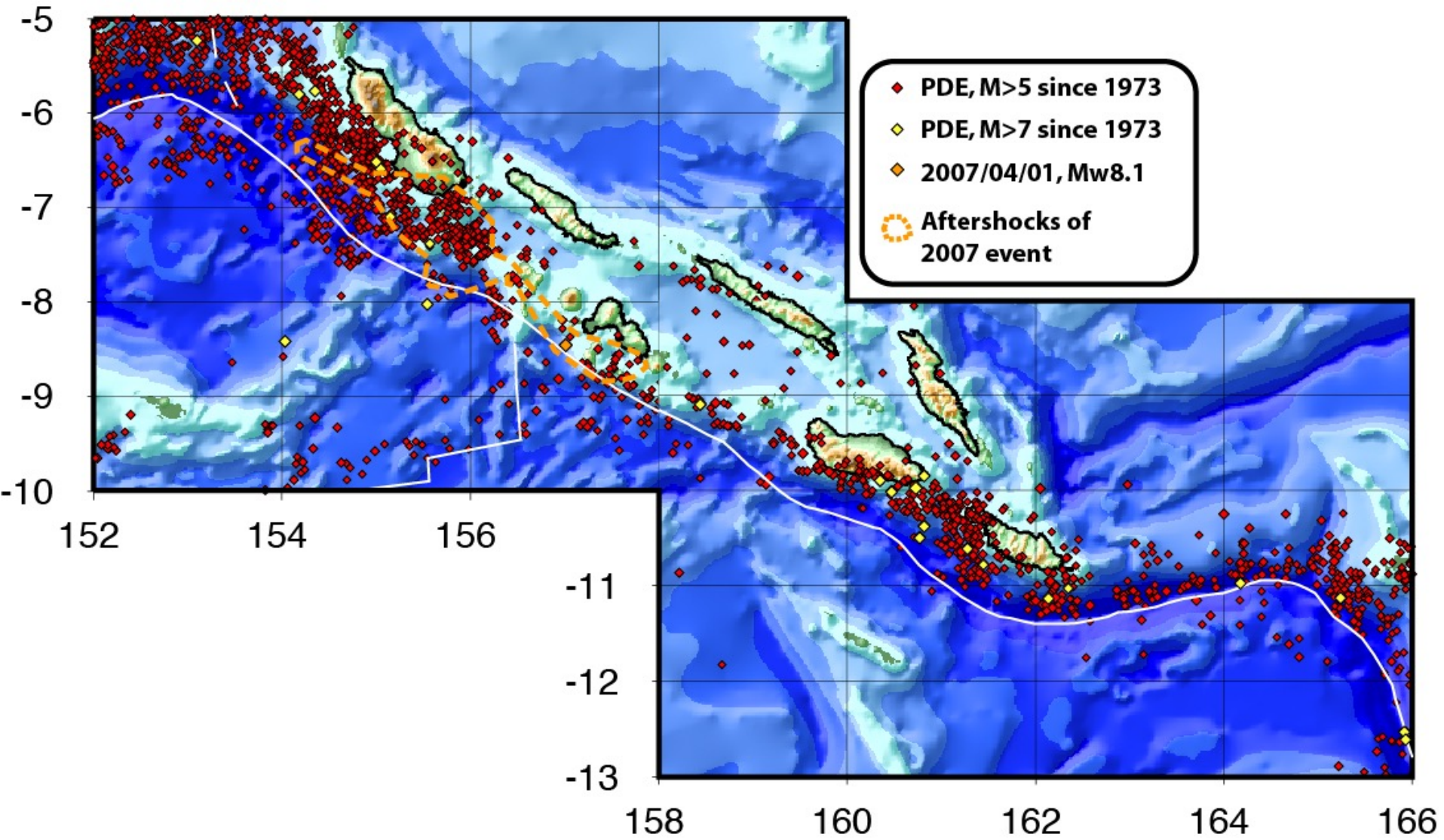
c) 2011-2012 Japan Trench



d) 2016 Solomon Islands



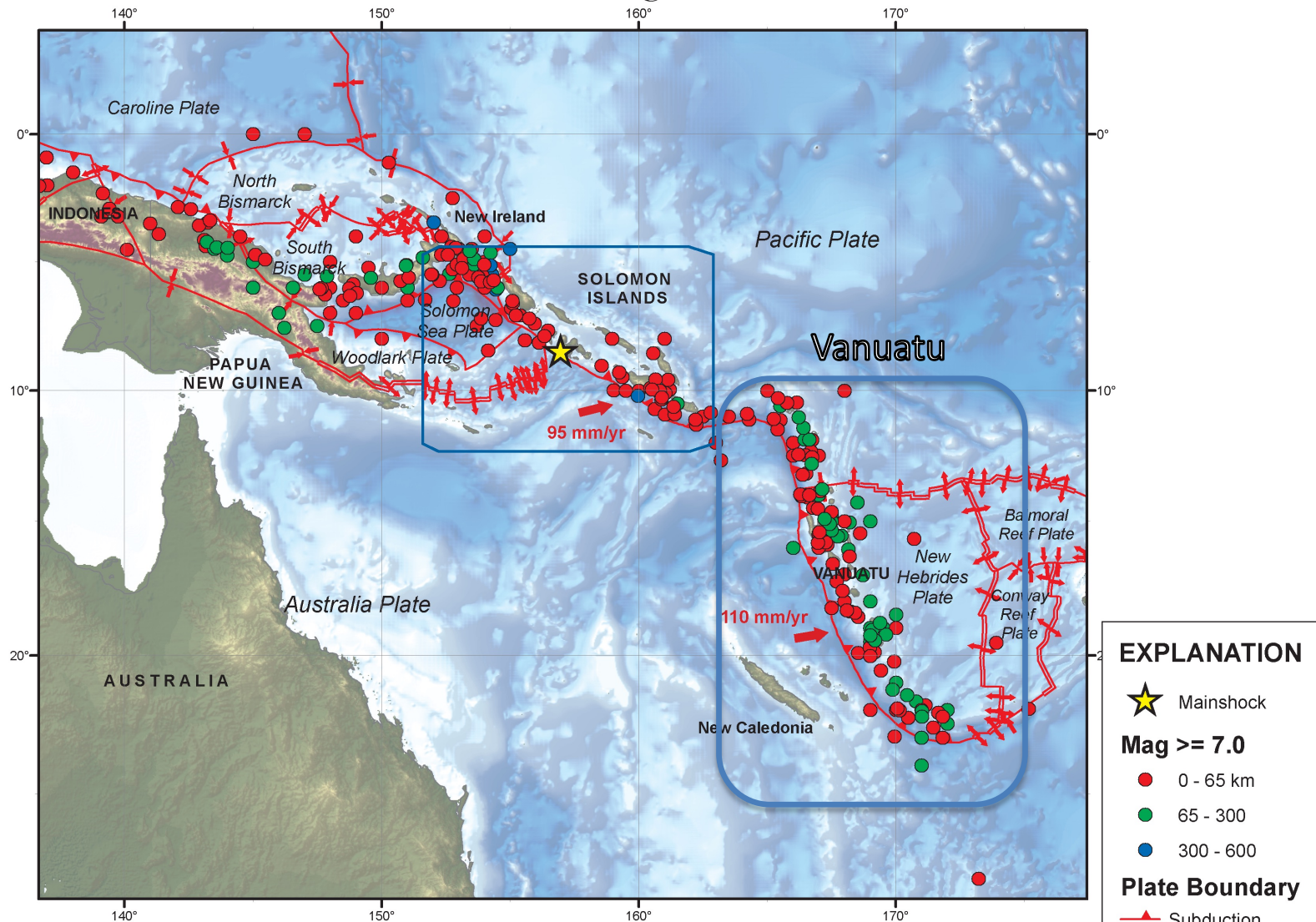




# Summary

1. Solomon Islands/New Britain Zone has hosted M 8.0.-8.1 earthquakes; several large doublets/triplets (1971, 1974, 1975, 1977(3), 2000, 2007\*)
2. The seismic activity level is high, and includes modest numbers of intermediate and deep earthquakes.
3. There are multiple small plates/plate fragments engaged in the collision; complicating plate convergence rates, directions to a certain degree
4. Boundaries between small plates are not absolute obstacles to rupture – 2007 M 8.1
5. Seems to be strong triggering/interaction even with strike-slip faults (New Ireland/Solomon/New Britain events Nov. 16/17, 2000)

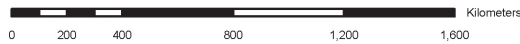
# Tectonic Setting



## RELATIVE PLATE MOTIONS

The broad red vectors represent the motion of the Australia Plate relative to the other plates in the region. The motion of the Australia Plate is generally northward with respect to the Pacific Plate, and many micro-plates are caught between them.

SCALE 1:20,000,000 at the Equator



## EXPLANATION

★ Mainshock

Mag  $\geq 7.0$

● 0 - 65 km

● 65 - 300

● 300 - 600

Plate Boundary

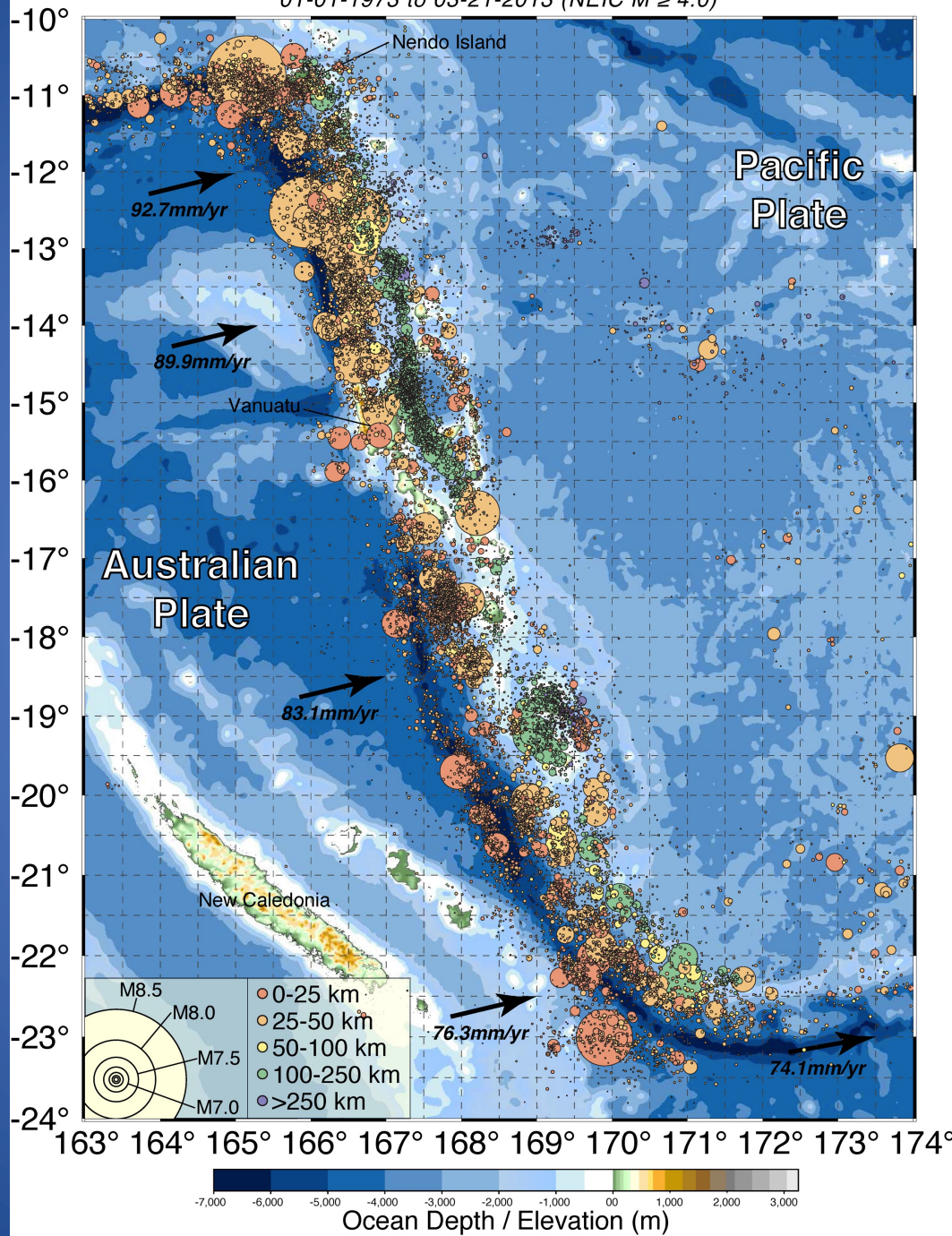
▲ Subduction

— Transform

⊥ Divergent

⊥ Convergent

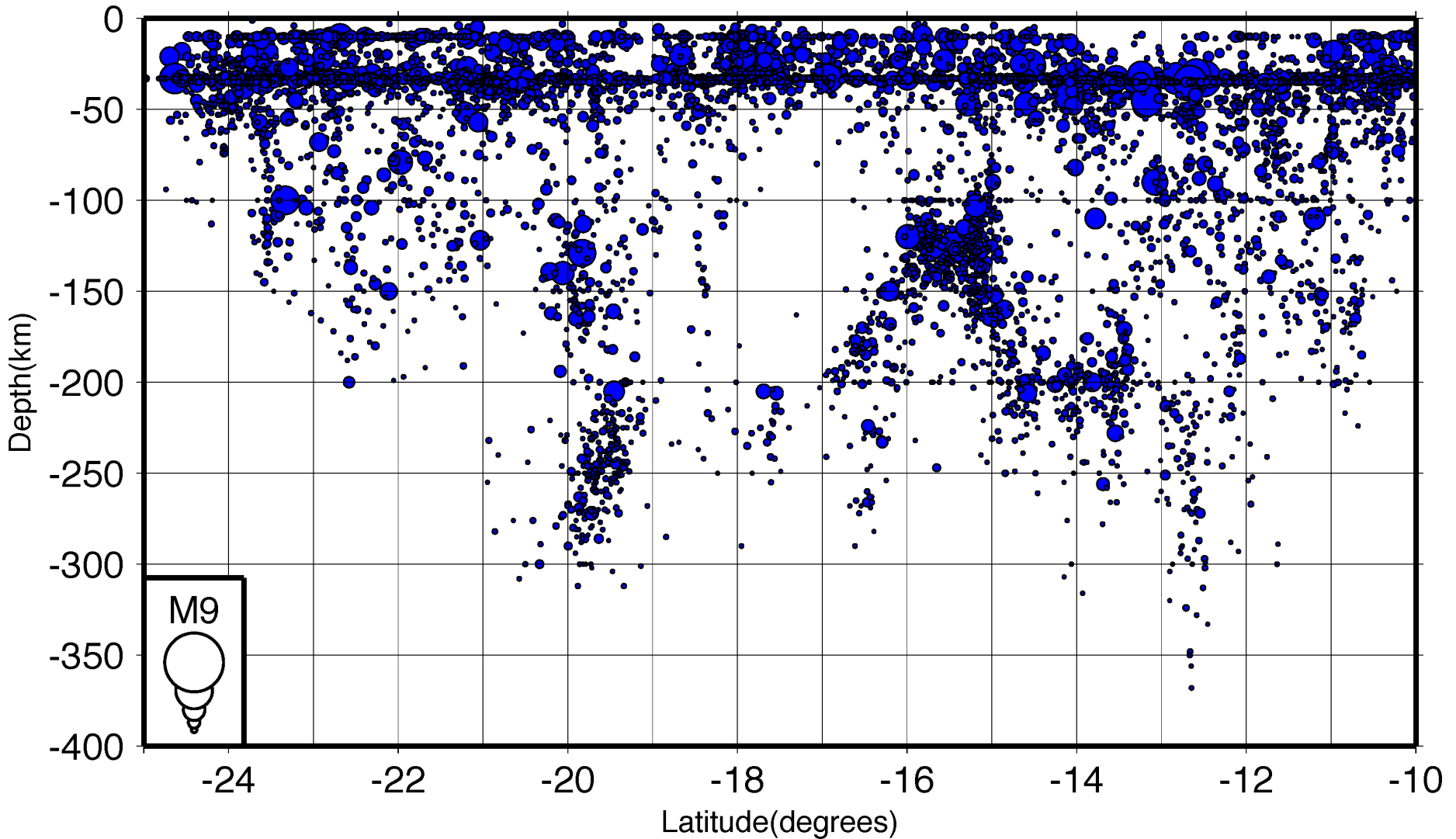
# Vanuatu Subduction Zone 01-01-1973 to 03-21-2013 (NEIC M ≥ 4.0)





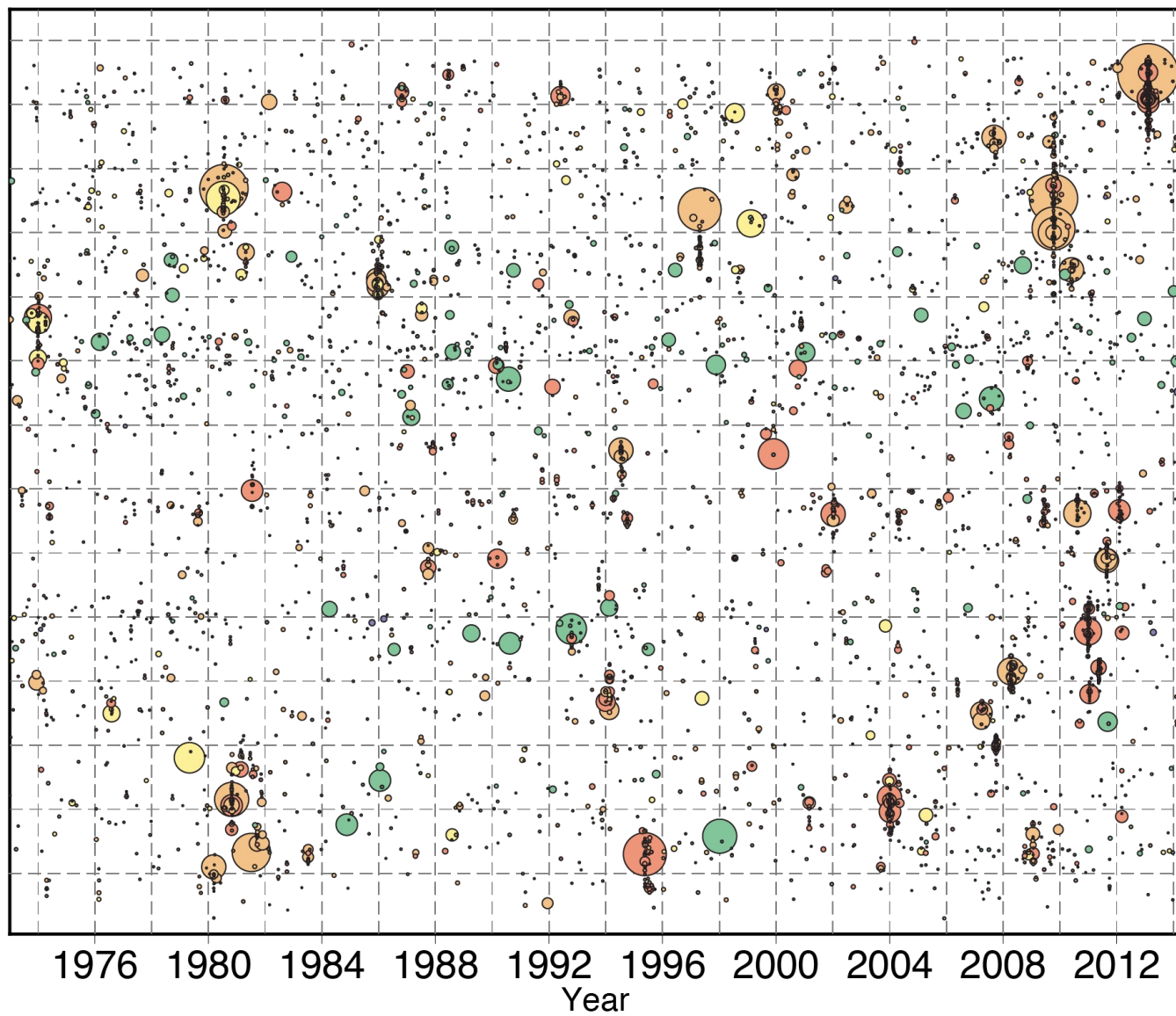
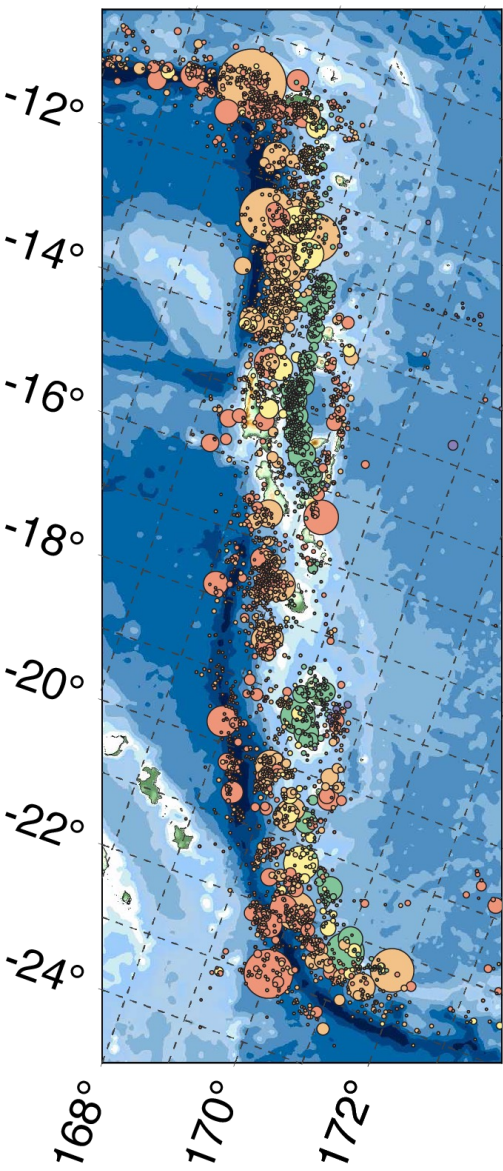
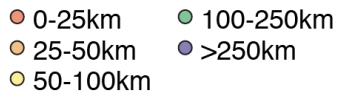
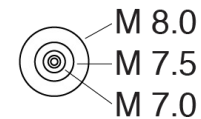
# Vanuatu seismicity profile along strike

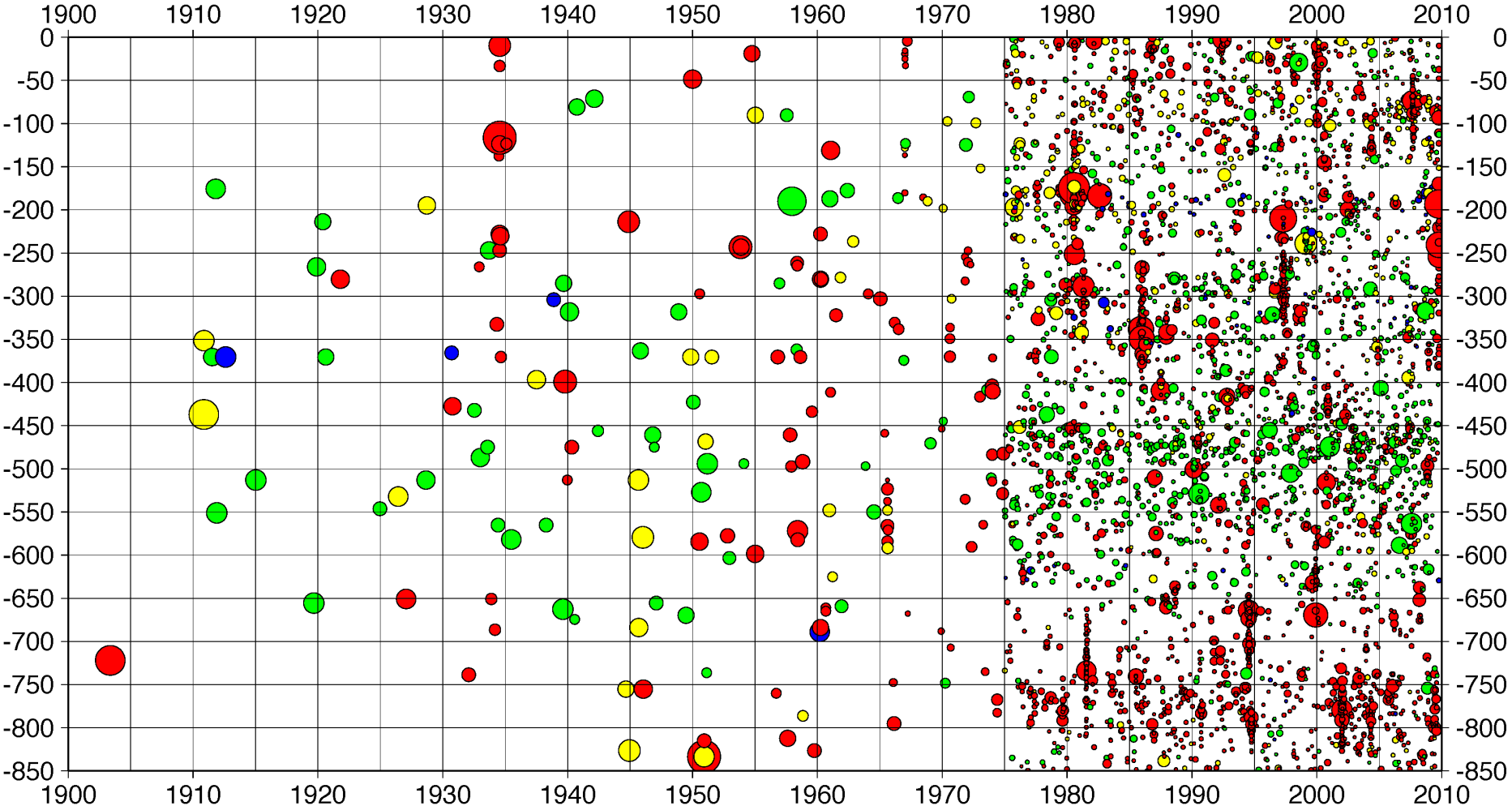
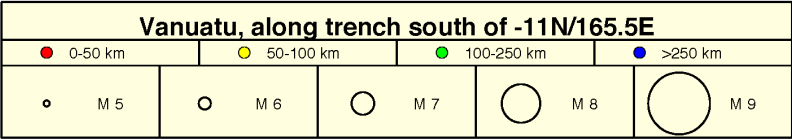
*>M4.5, since 1973*



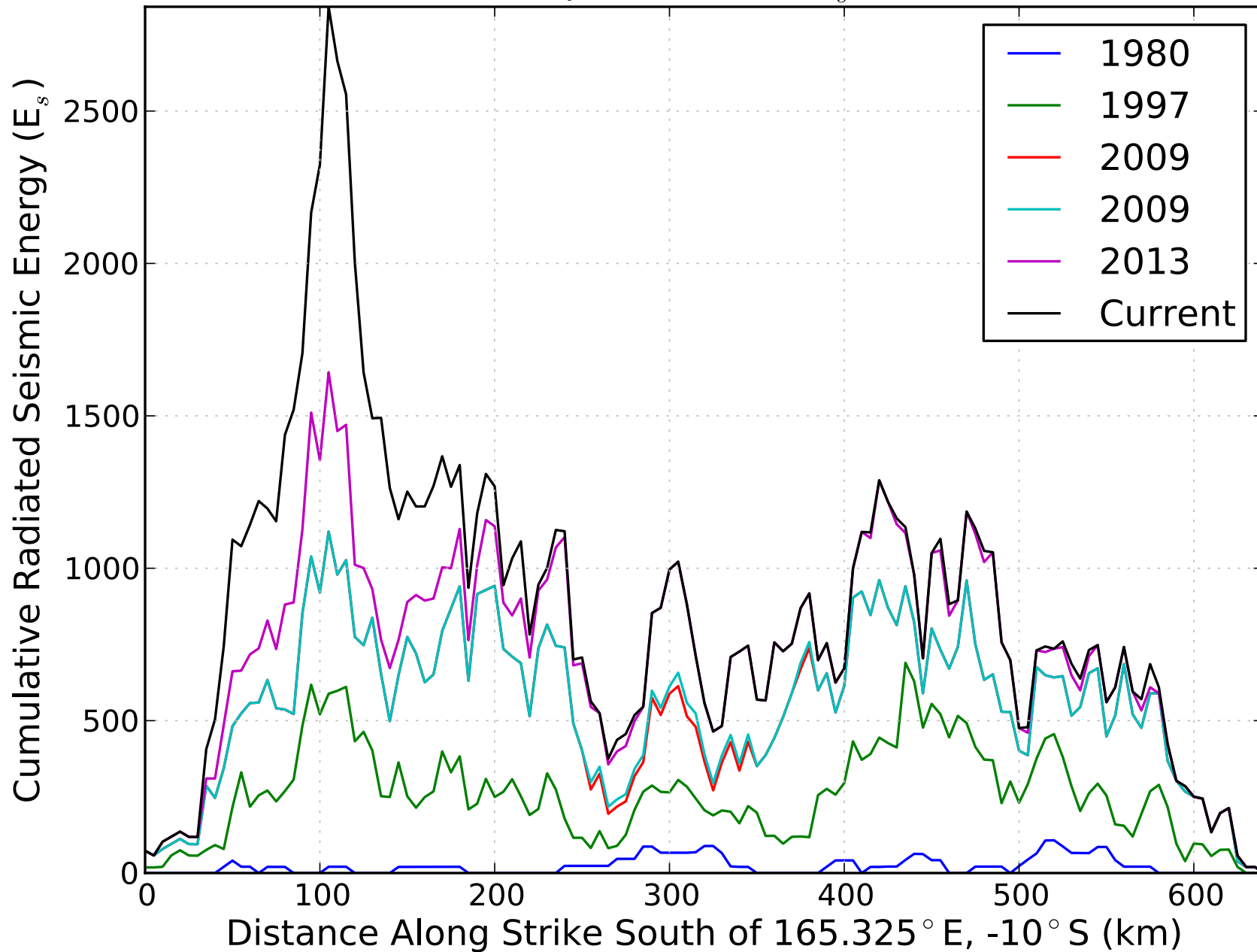
# Vanuatu Seismicity

*NEIC  $M \geq 5.0$*

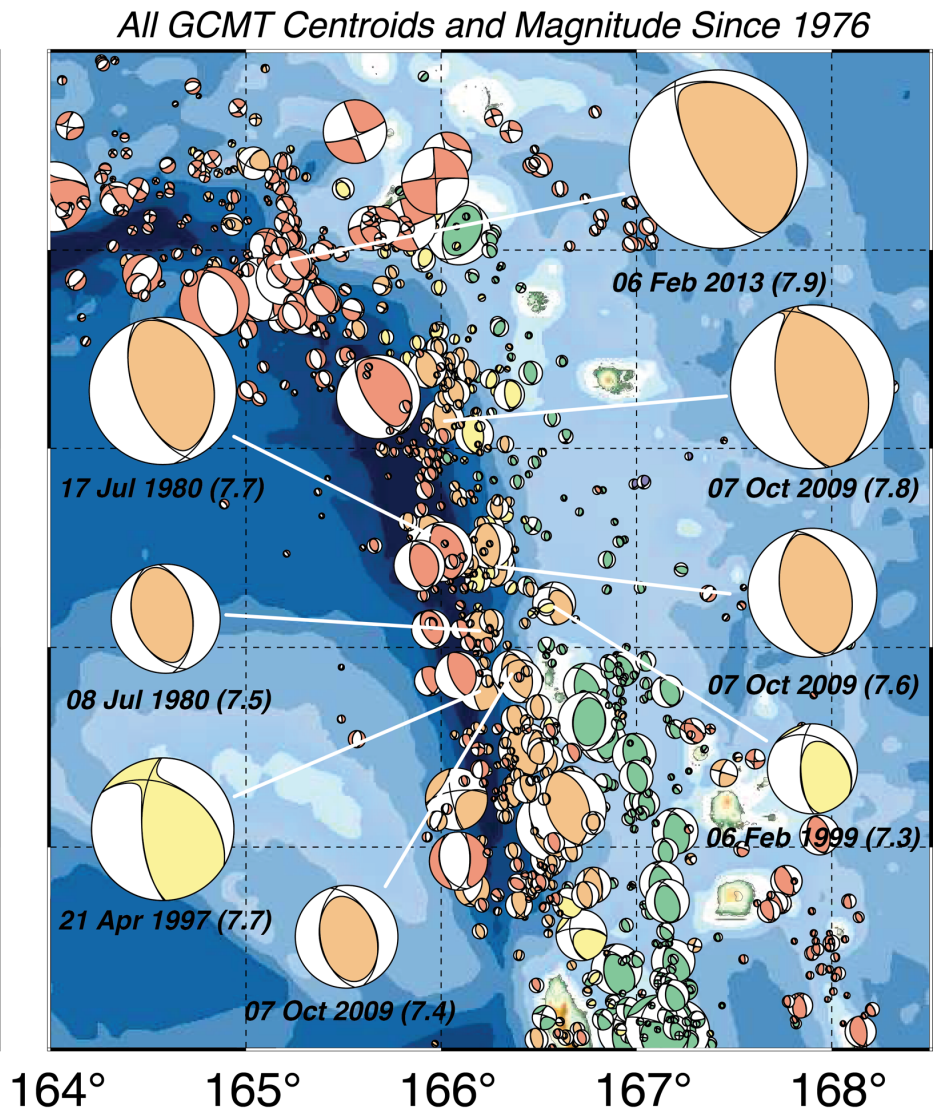
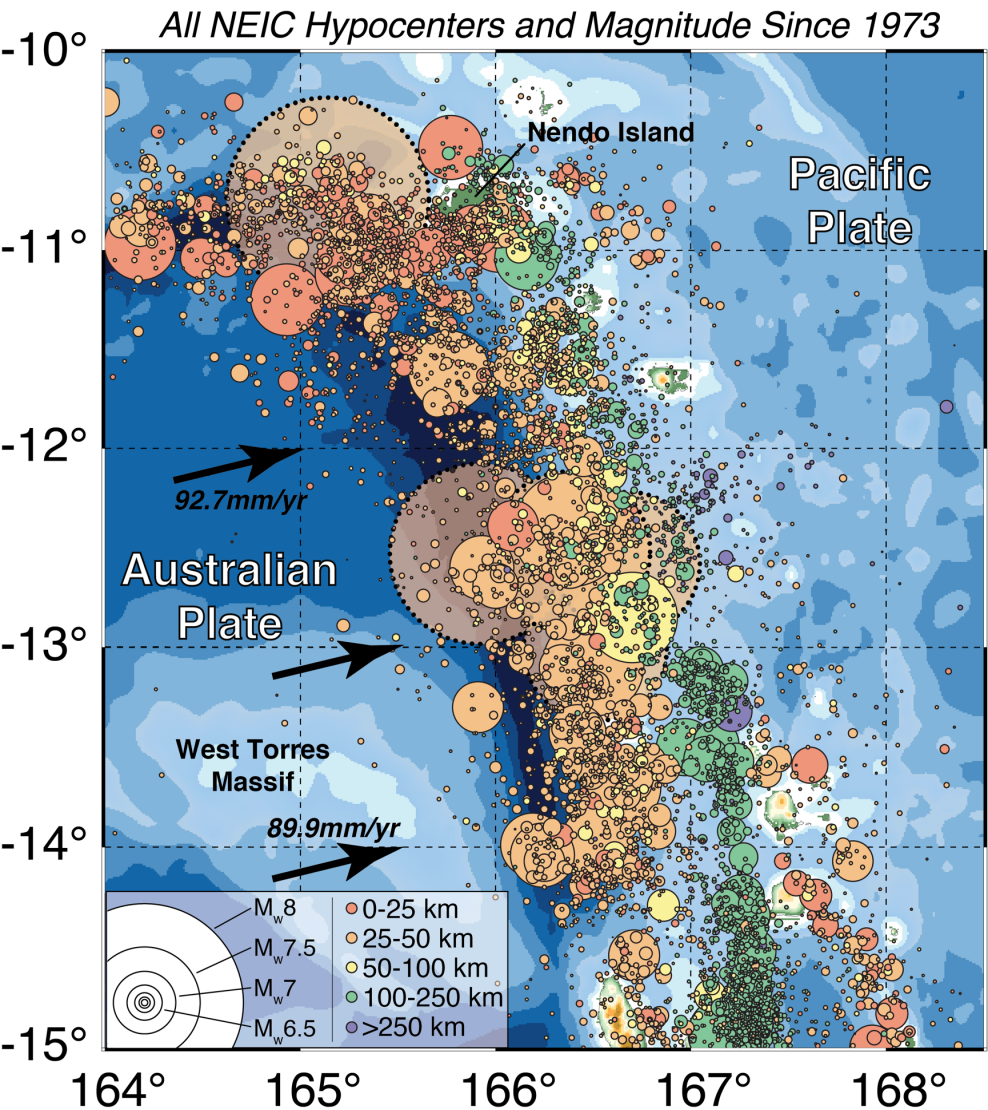


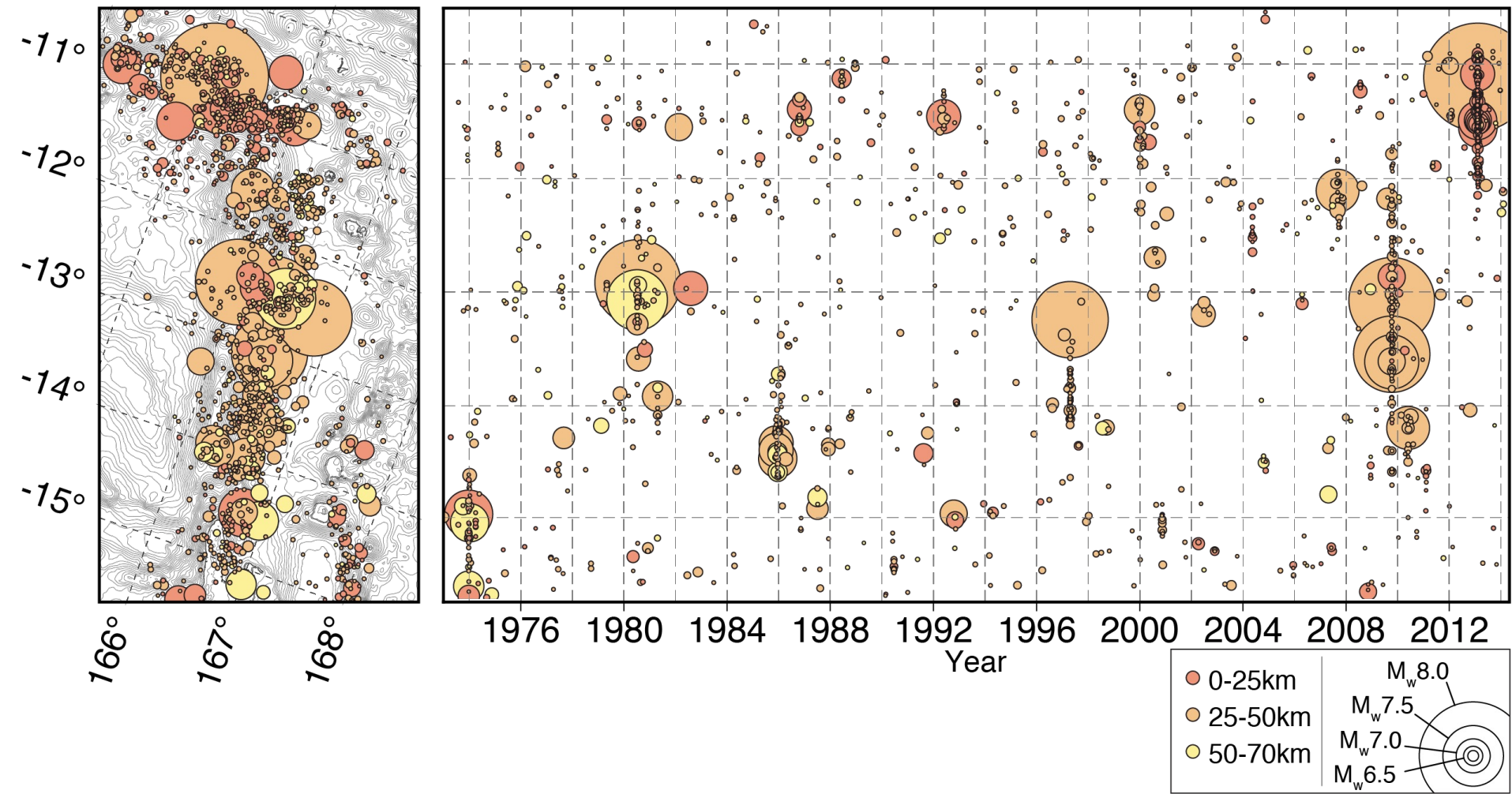


Cumulative  $E_s$  along strike since 1973  
( $M > 3.0$ , Depth  $< 70$ km):  $E_s = 1.5M + 11.8$

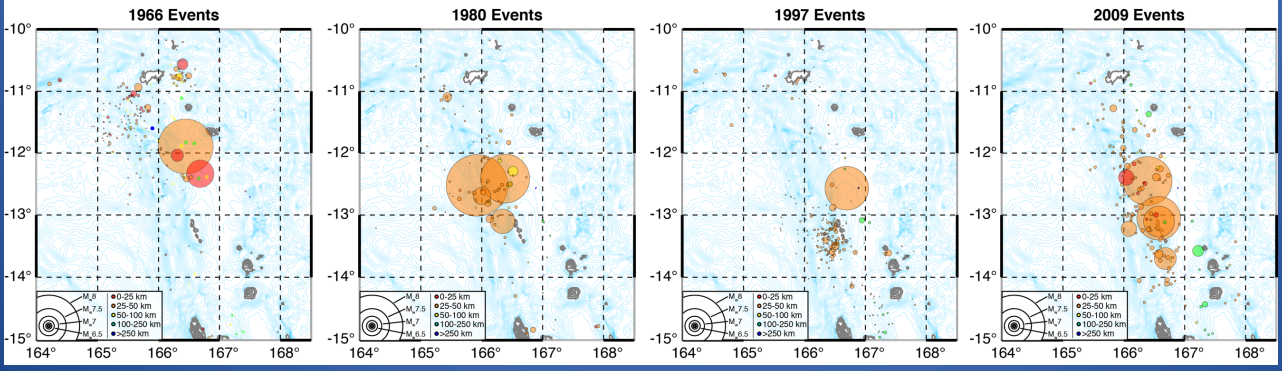
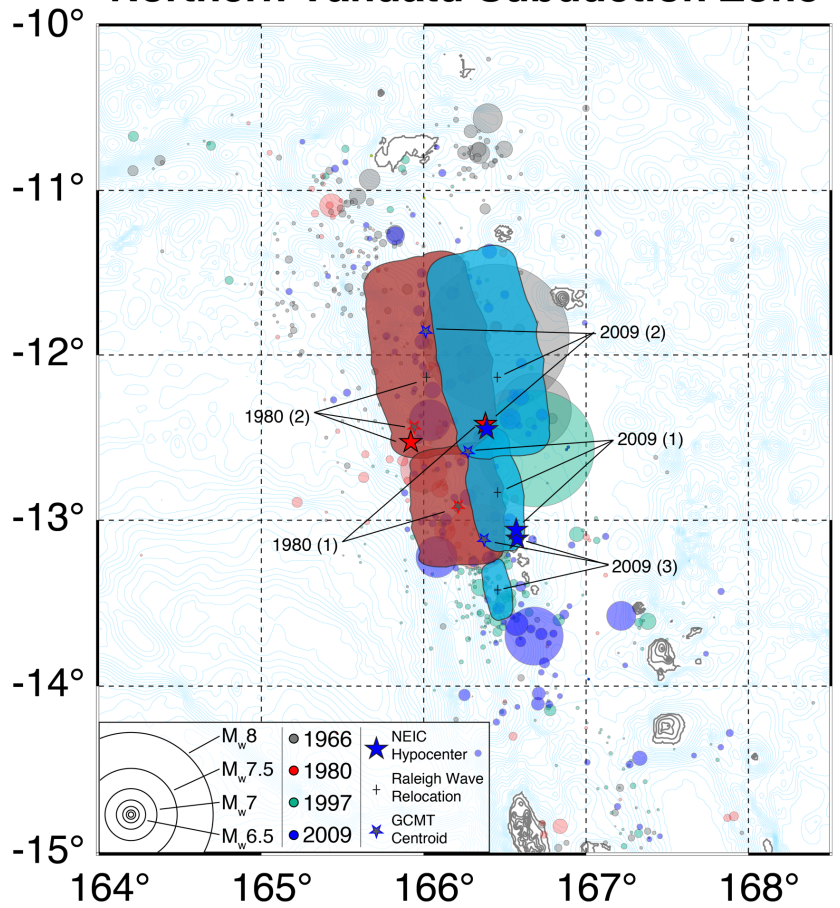


# Northern Vanuatu Subduction Zone

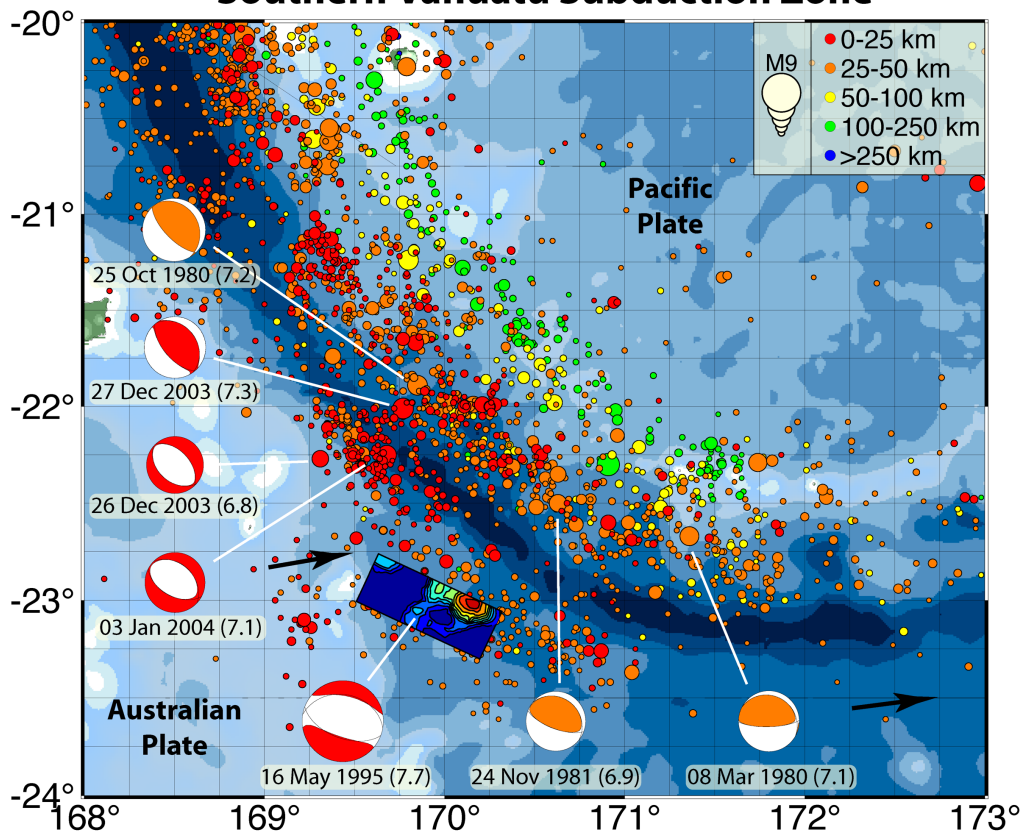




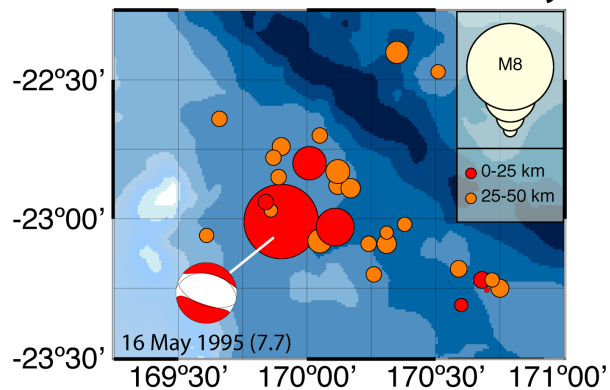
# Northern Vanuatu Subduction Zone



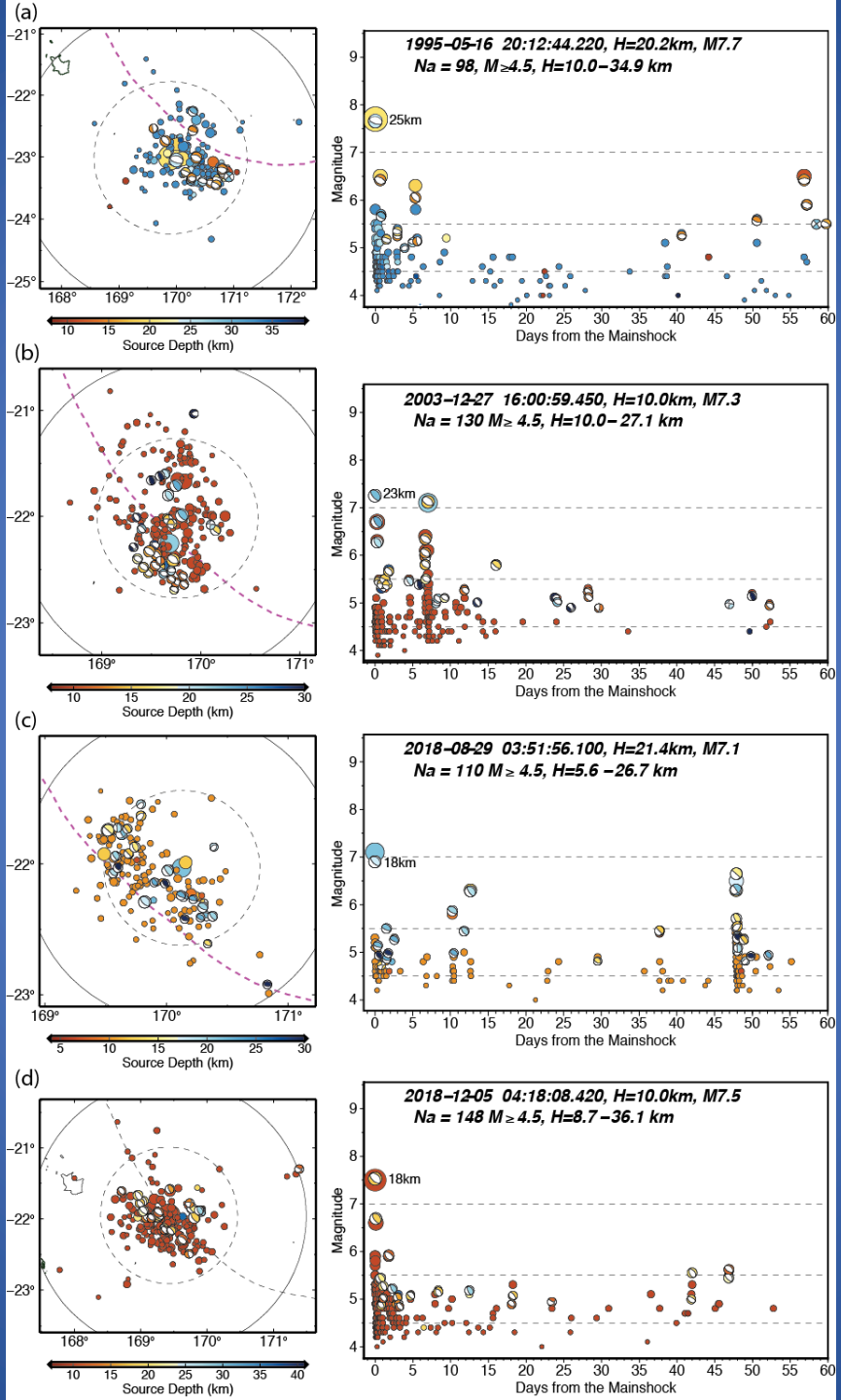
# Southern Vanuatu Subduction Zone



## 16 May 1995 (7.7) Two-Week Aftershock Activity







## Summary

1. Vanuatu region has hosted M 7.7.-8.0 earthquakes; several large doublets/triplets (1965, 1980, 2009)
2. The seismic activity level is high, and includes modest numbers of intermediate and deep earthquakes
3. The slab appears to be segmented, and large fracture zone disrupts seismicity, but the arc is very straight with fishhooks at north and south
4. Unclear whether any region has characteristic rupture, does seem that multiple asperities are involved
5. Large outer rise faulting has occurred.