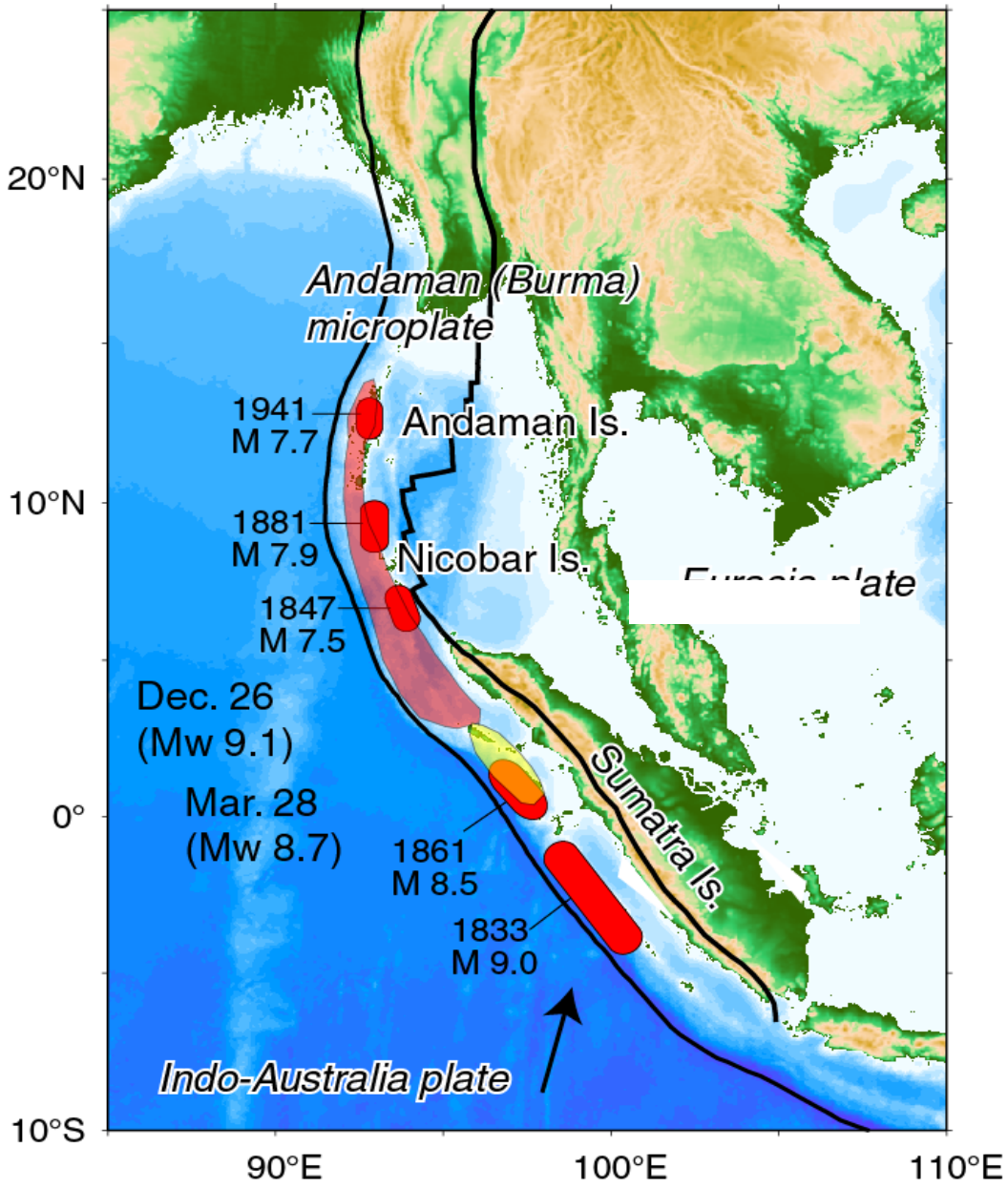
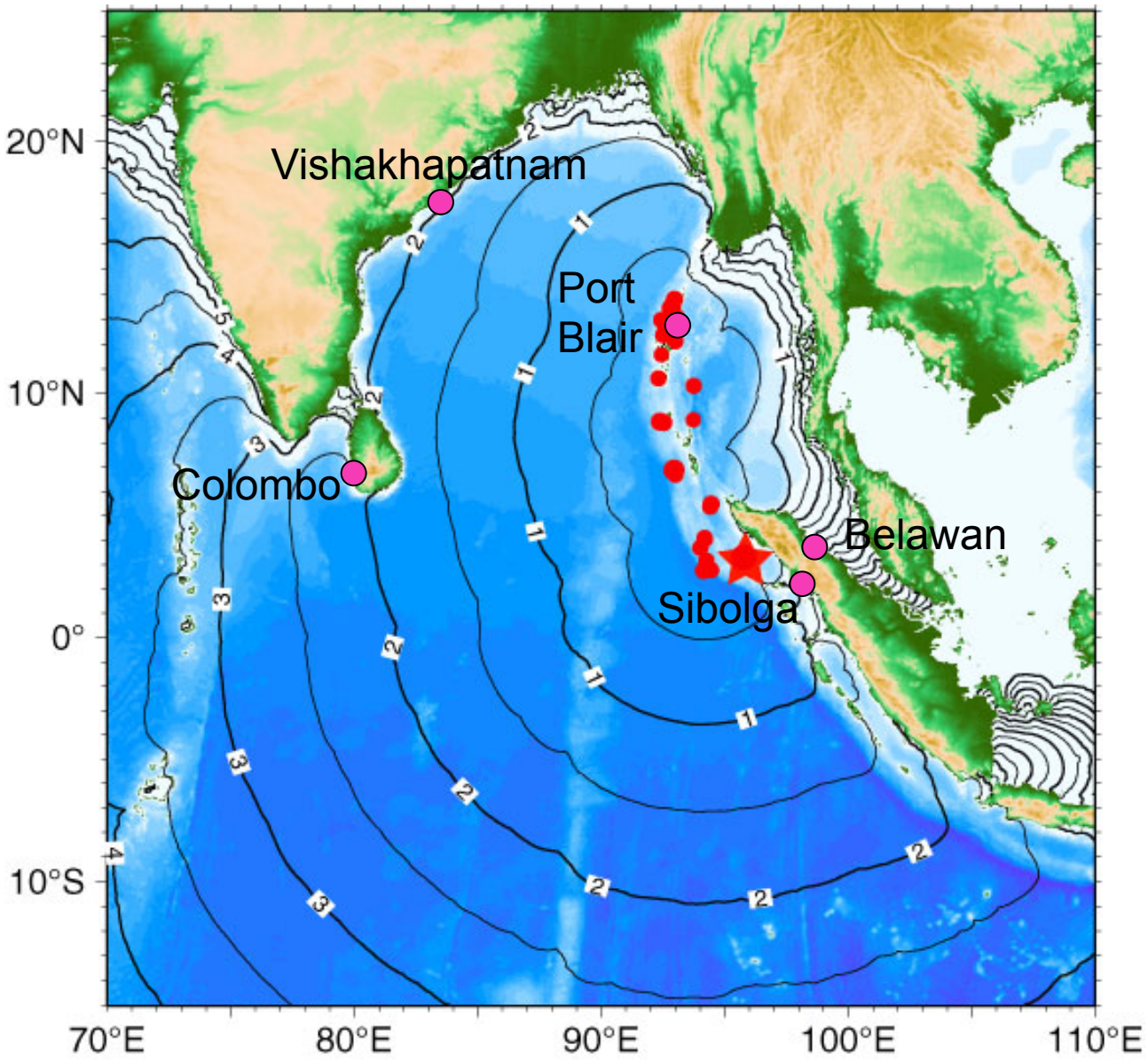
Generation of the 2004 Sumatra-Andaman Tsunami

WHIO, 30 Oct., 2006

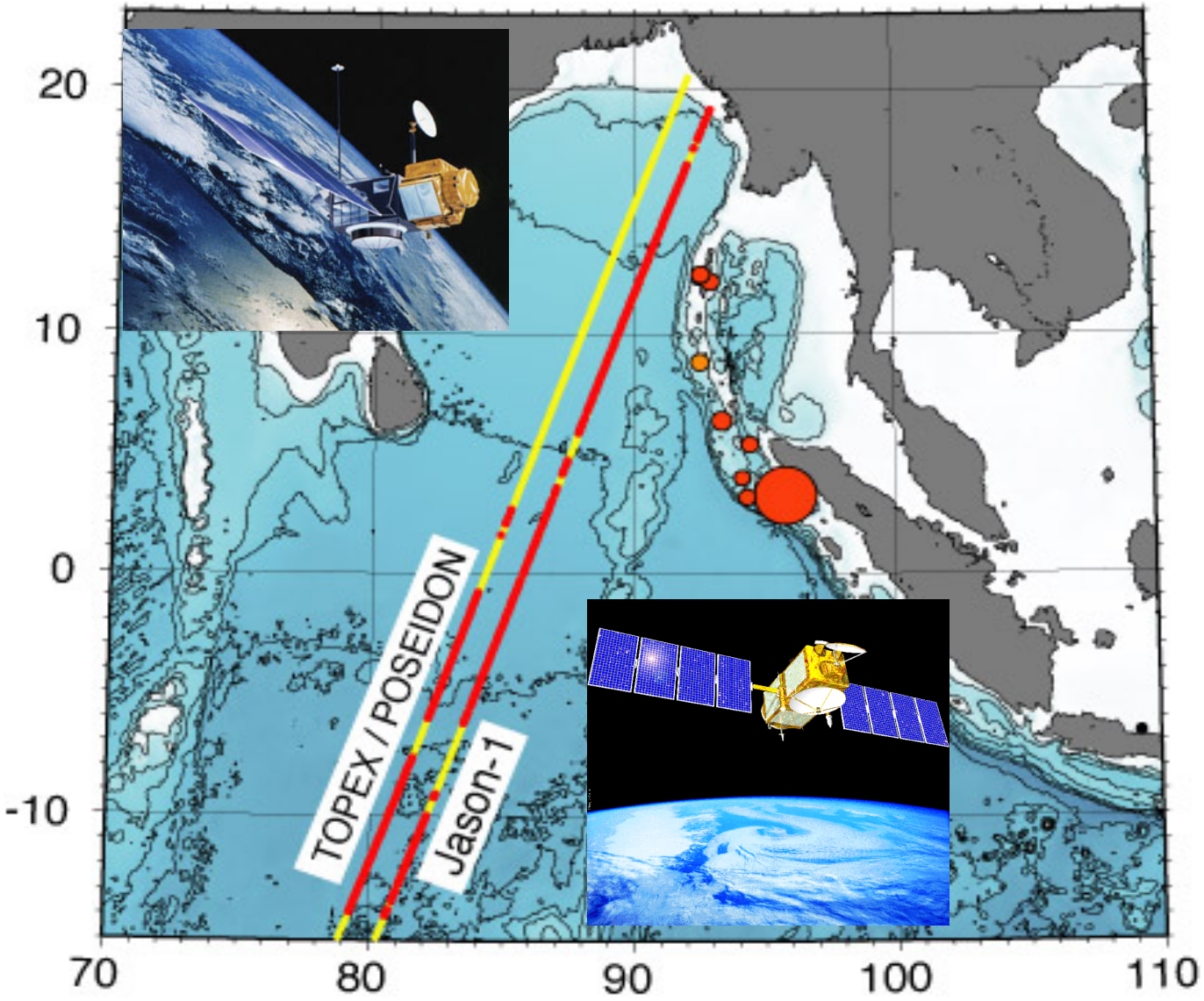
2004 Sumatra-Andaman earthquake

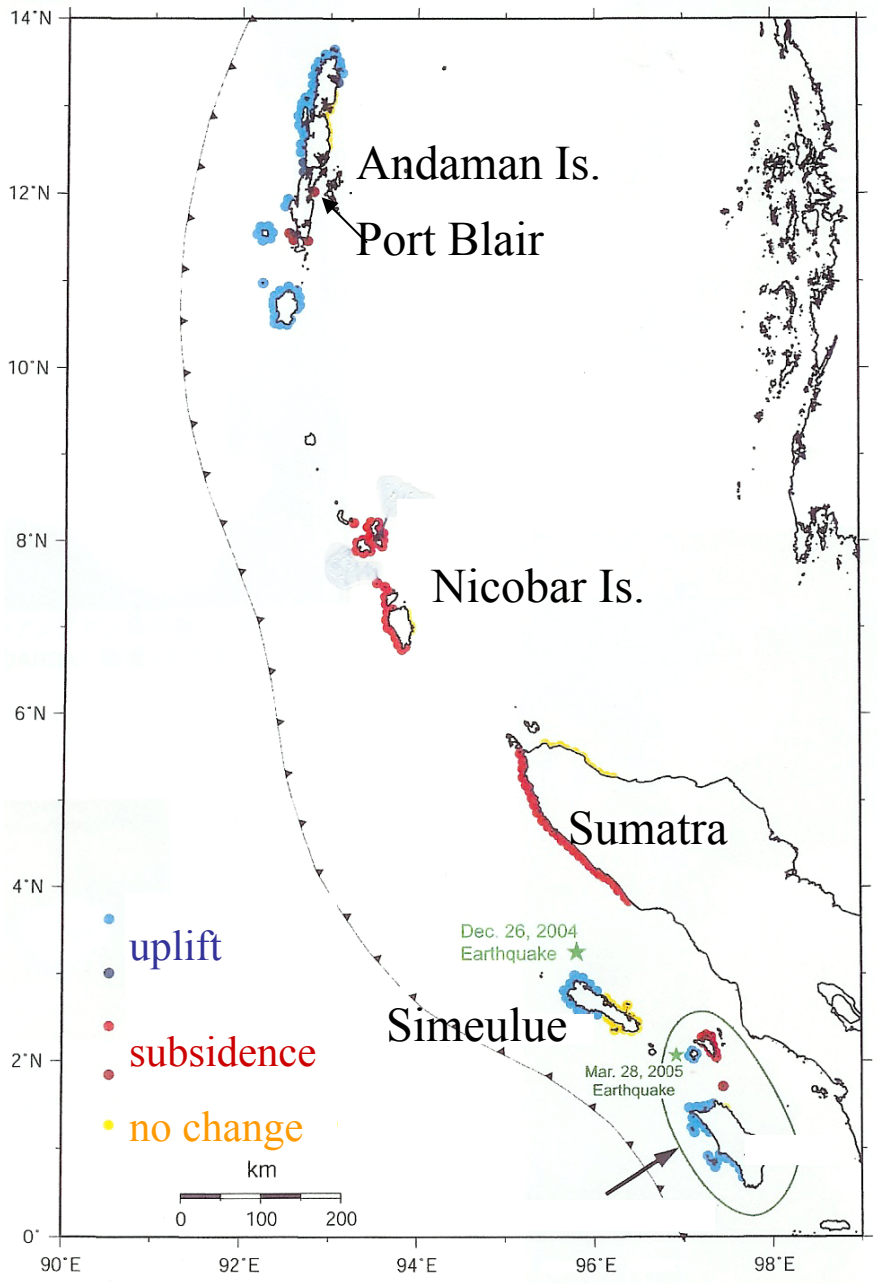


2004 great Sumatra-Andaman earthquake



Satellite altimetry





Analysis of satellite images (Tobita et al., 2005)

deformation survey results

Andaman Islands:

most of the coasts: uplift

near Port Blair: subsidence

Nicobar Islands: subsidence

(Malik and Murty, 2005)

Banda Ache 0.2-0.6m subsidence

West coast ~ 1m subsidence

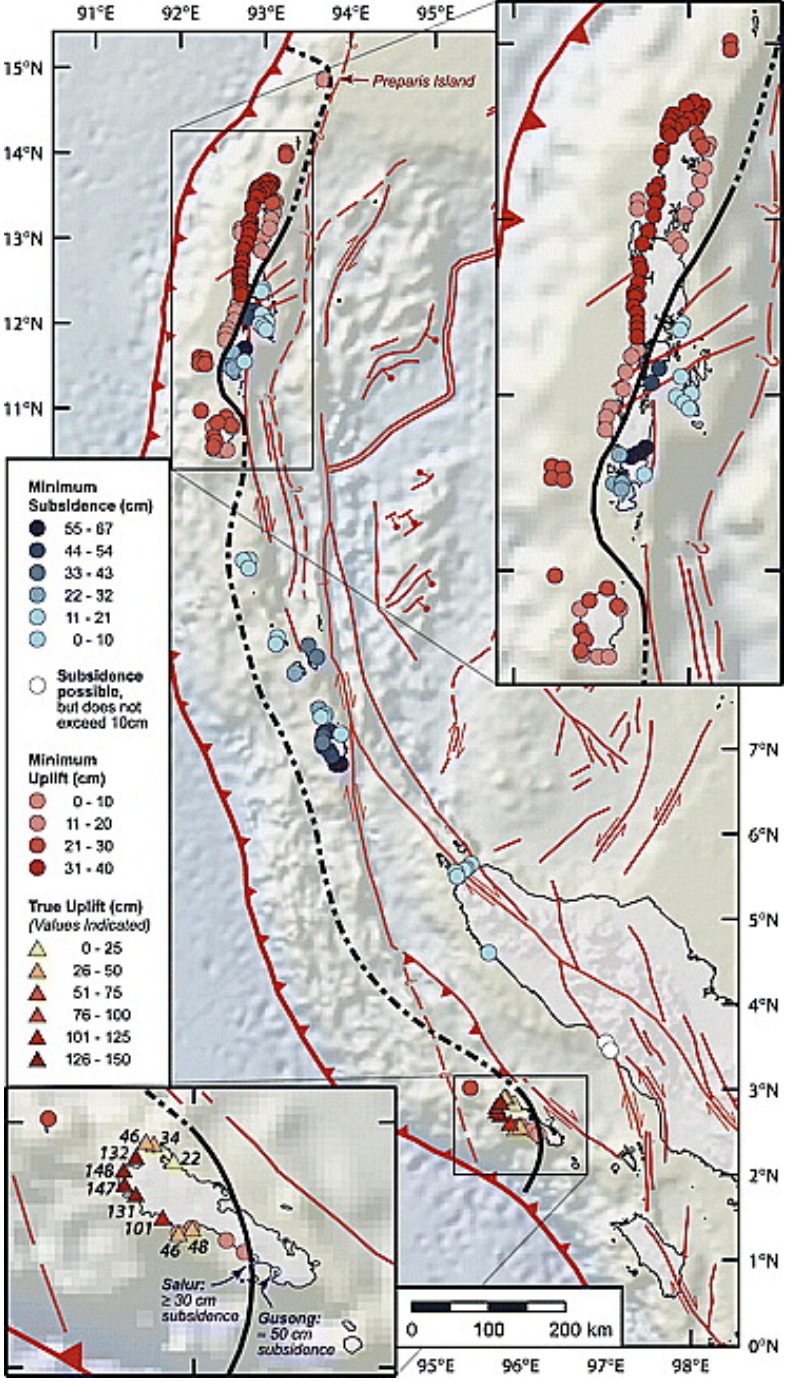
Simeulue Island

Northern coast about 1.5m uplift

Southern coast small subsidence

or no change

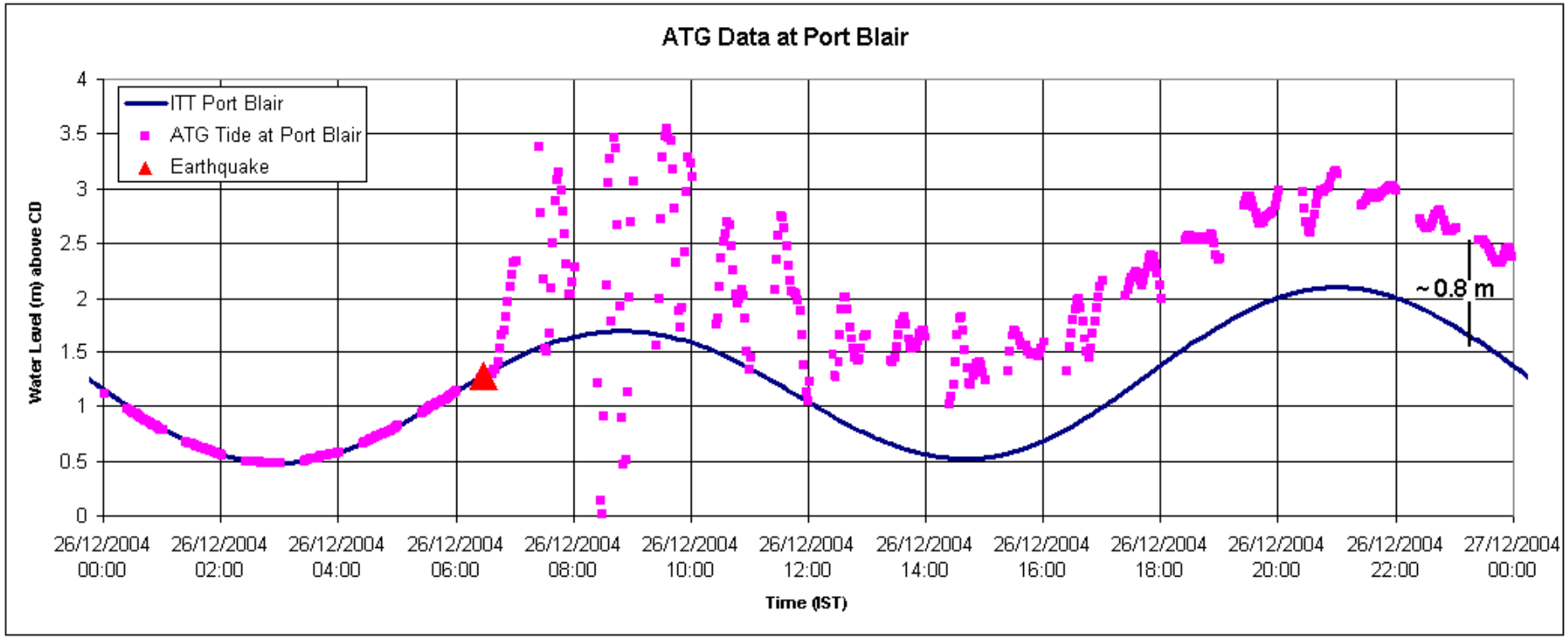
(Kaistrenko et al., 2005)



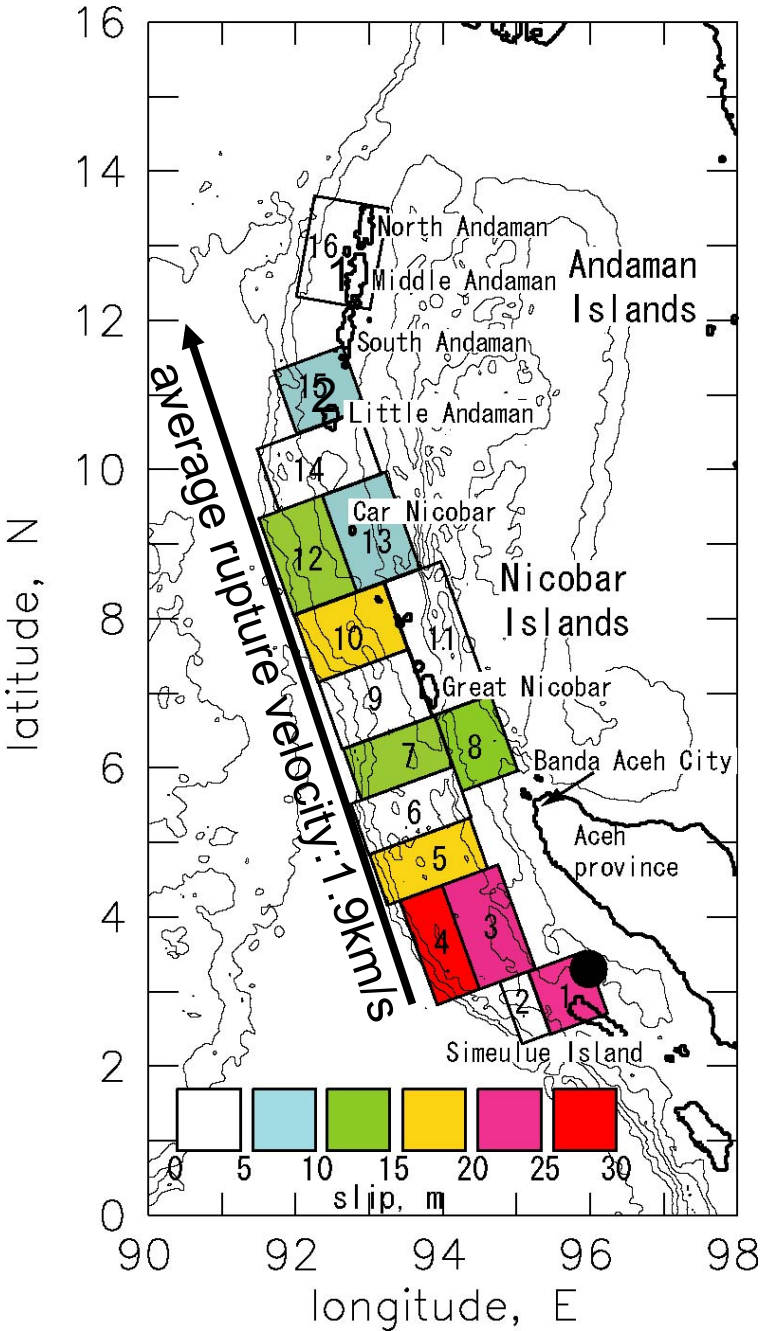
The minimum uplift or subsidences are estimated from the satellite images of coral heads in the sea.

Meltzner, et al., JGR, 2006

Tide gauge Data at Port Blair



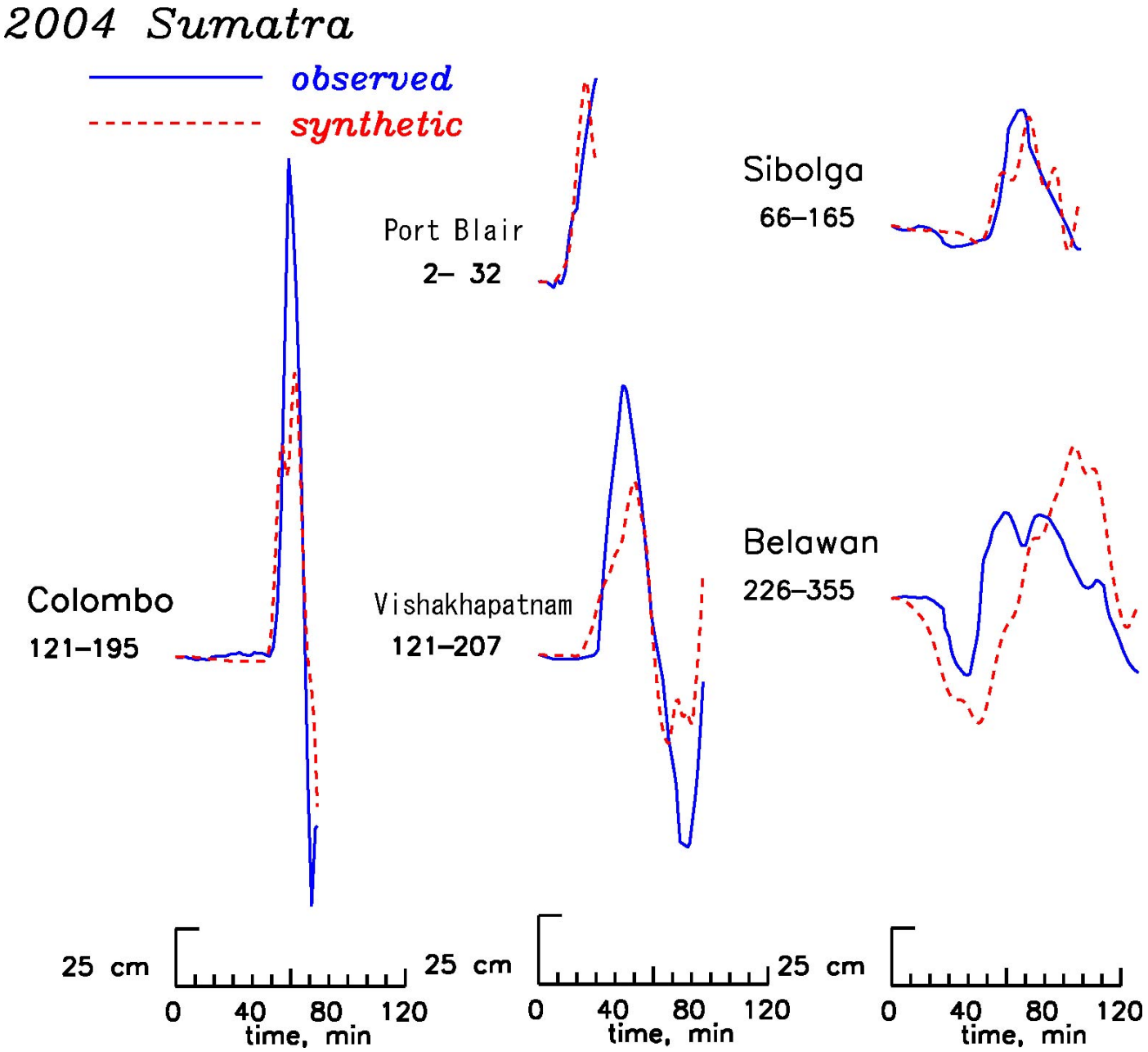
Slip distribution of the 2004 Sumatra earthquake estimated from the tsunami

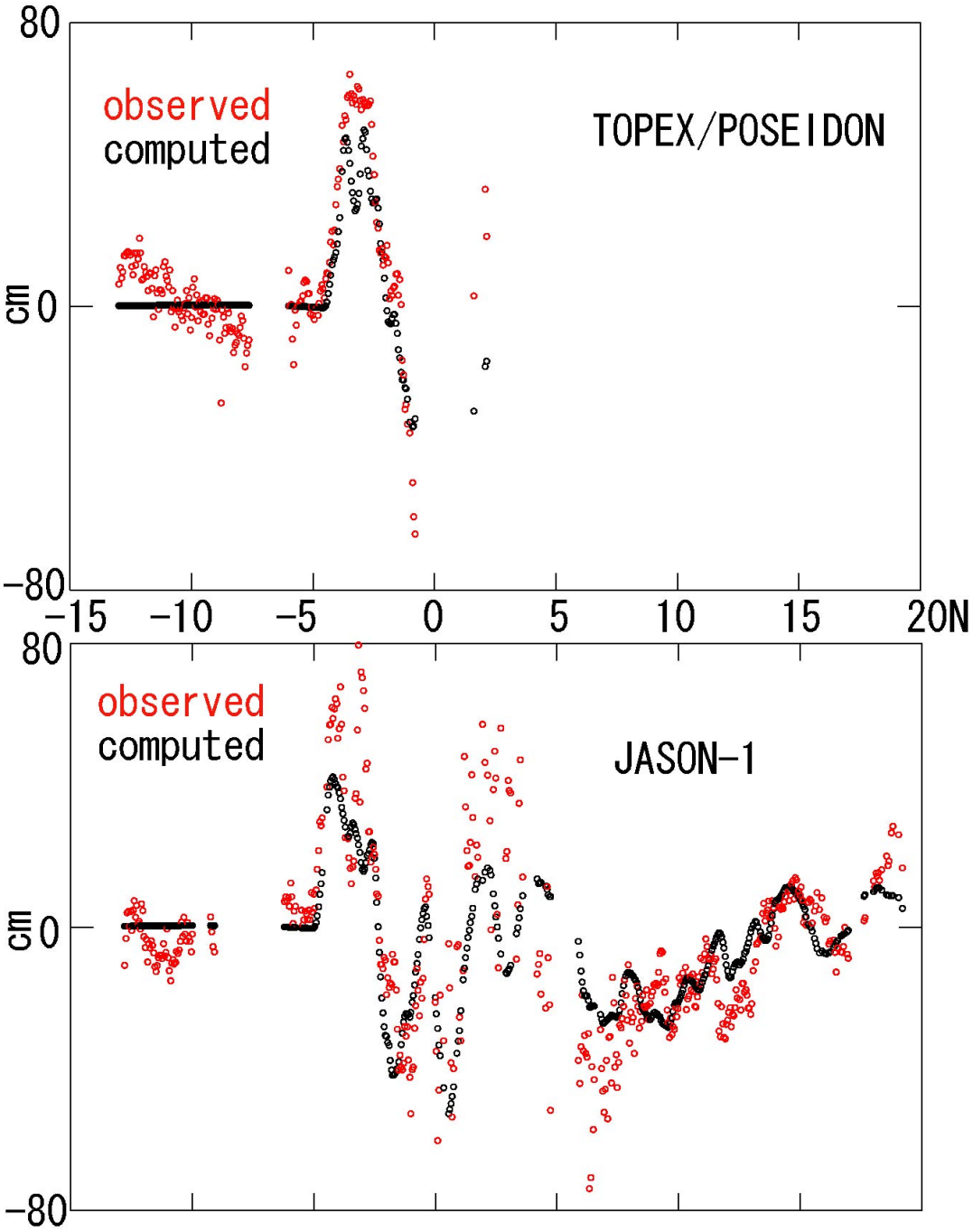


subfault	slip (m)	initial rupture time (min)
1	20.4	0
2	0.0	0
3	22.0	2
4	29.3	3
5	16.4	4
6	2.6	4
7	13.4	4
8	12.7	4
9	0.0	5
10	15.4	6
11	0.0	6
12	12.2	7
13	9.5	7
14	2.8	8
15	5.6	9
16	0.8	10

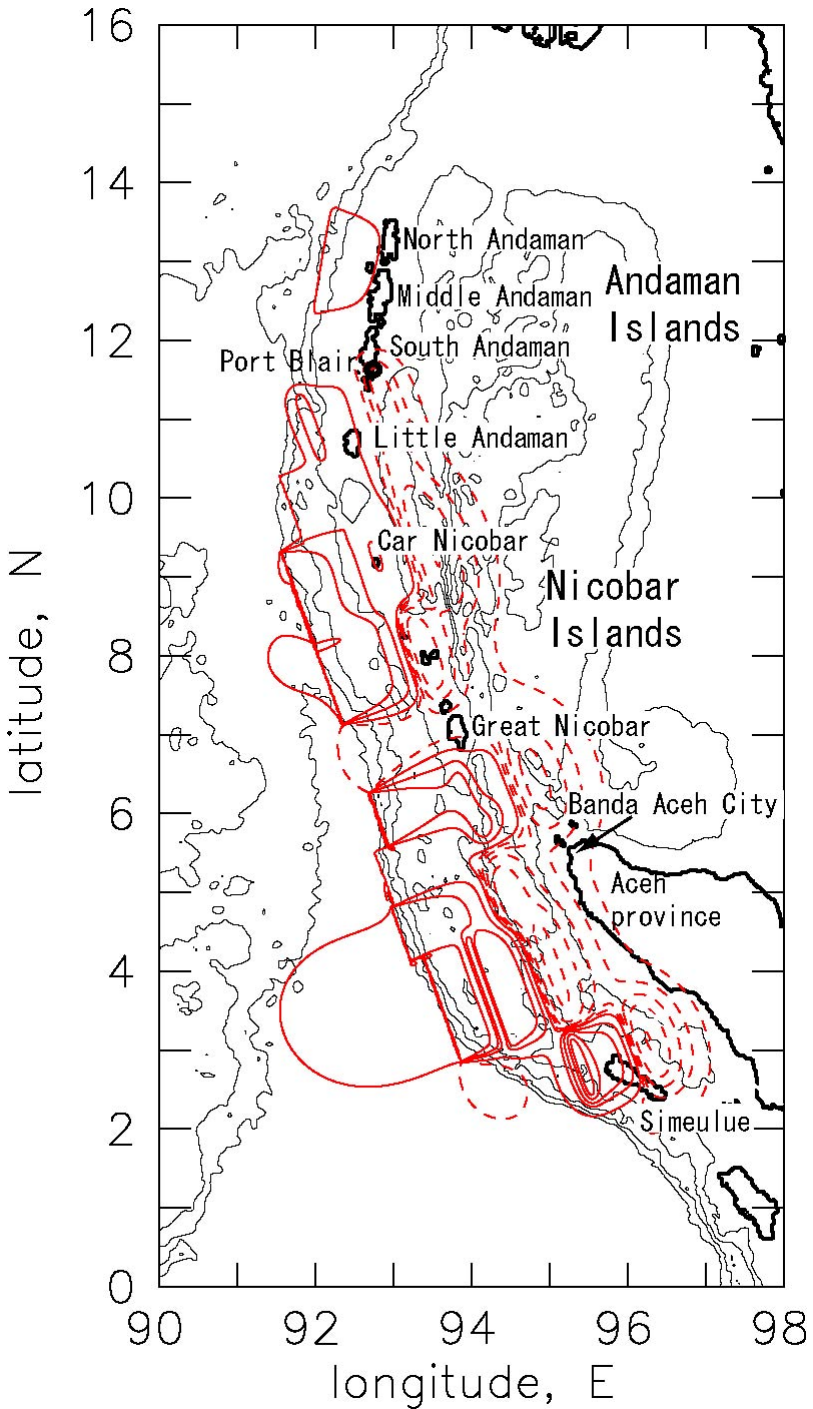
total seismic moment : 8.2 x 10^{22} Nm (Mw 9.2)

Comparison of observed and computed tsunami waveforms at tide gauges

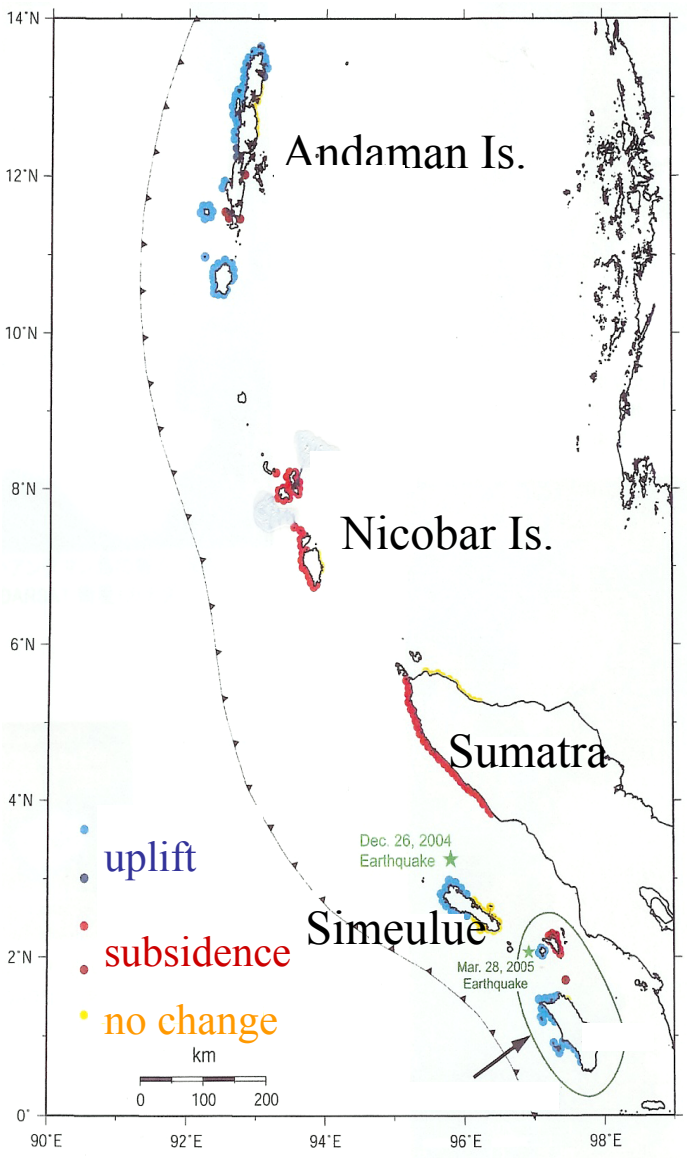




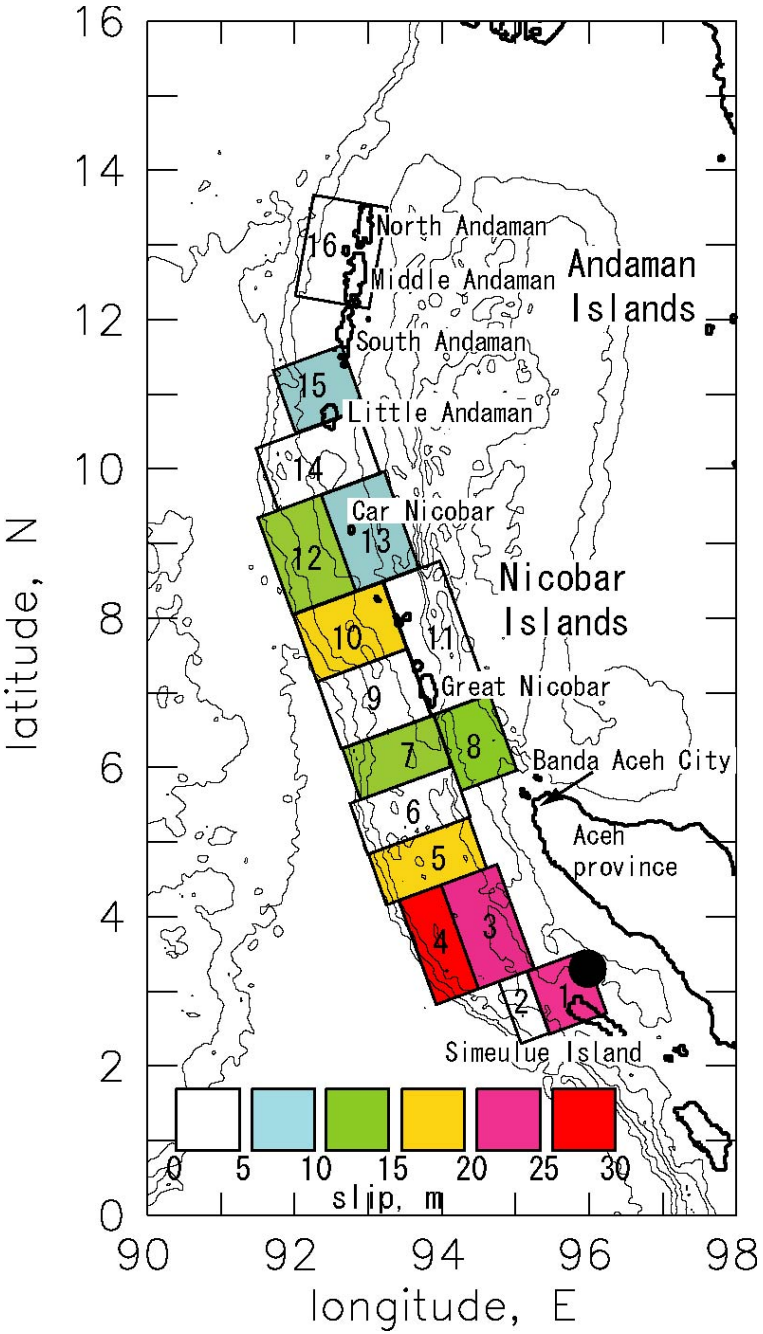
Comparison of observed tsunami obtained from the satellite altimetry and computed tsunamis.



Vertical displacement field



Analysis of satellite images (Tobita et al., 2005)



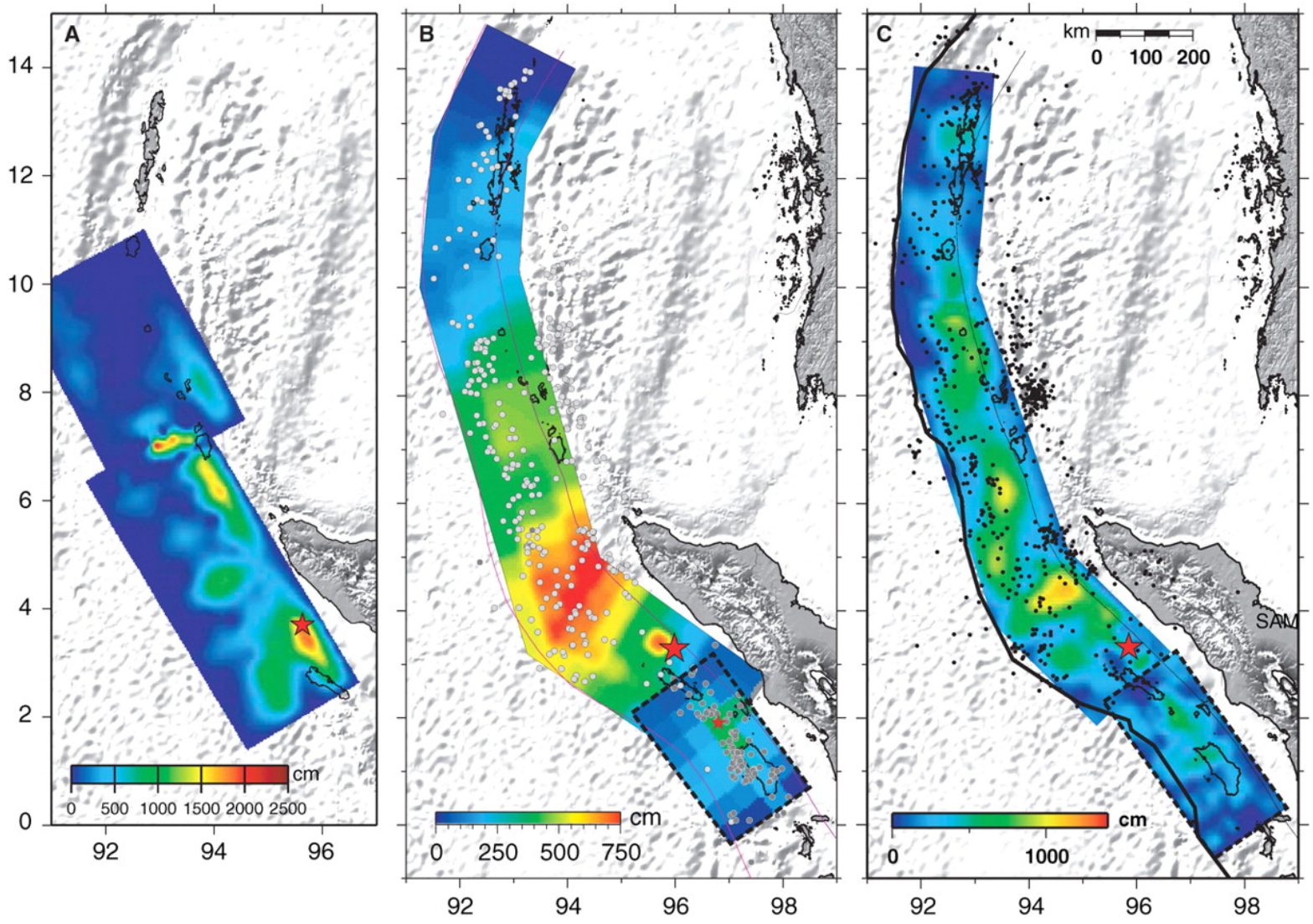
Slip distribution of the 2004 Sumatra earthquake estimated from the tsunami

Average rupture velocity of 1.9 km/sec.

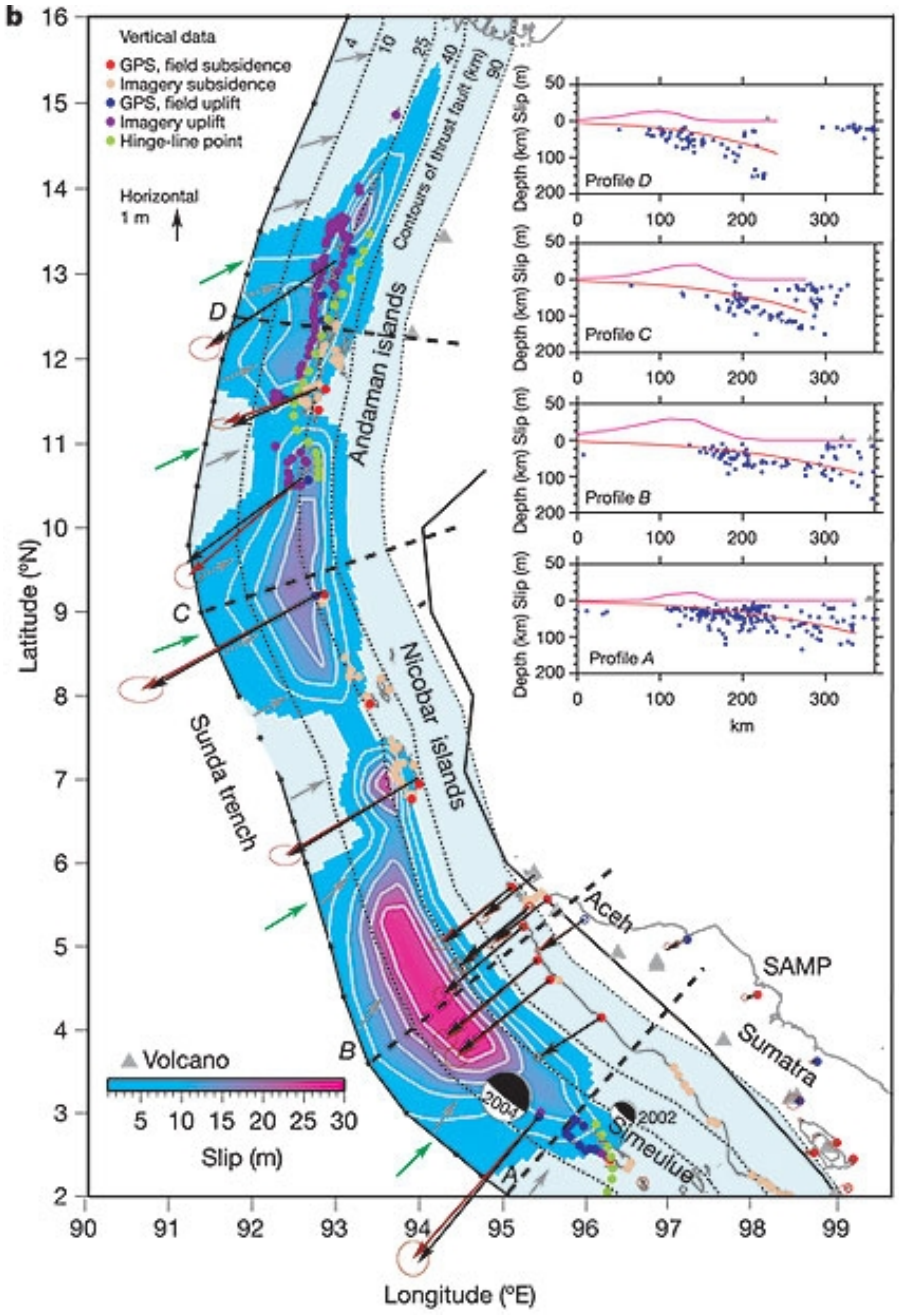
total seismic moment

8.2×10^{22} Nm (Mw 9.2)

Slip distributions of the 2004 and 2005 Sumatra-Andaman earthquake estimated from seismic waveform analyses (Ammon et al., 2005)



Method of the inversion



Slip function along the profile

$$S(z) = A\exp\left[-(z-m_z)^2/\sigma_z\right]$$

A: maximum slip

m_z: depth of the maximum slip

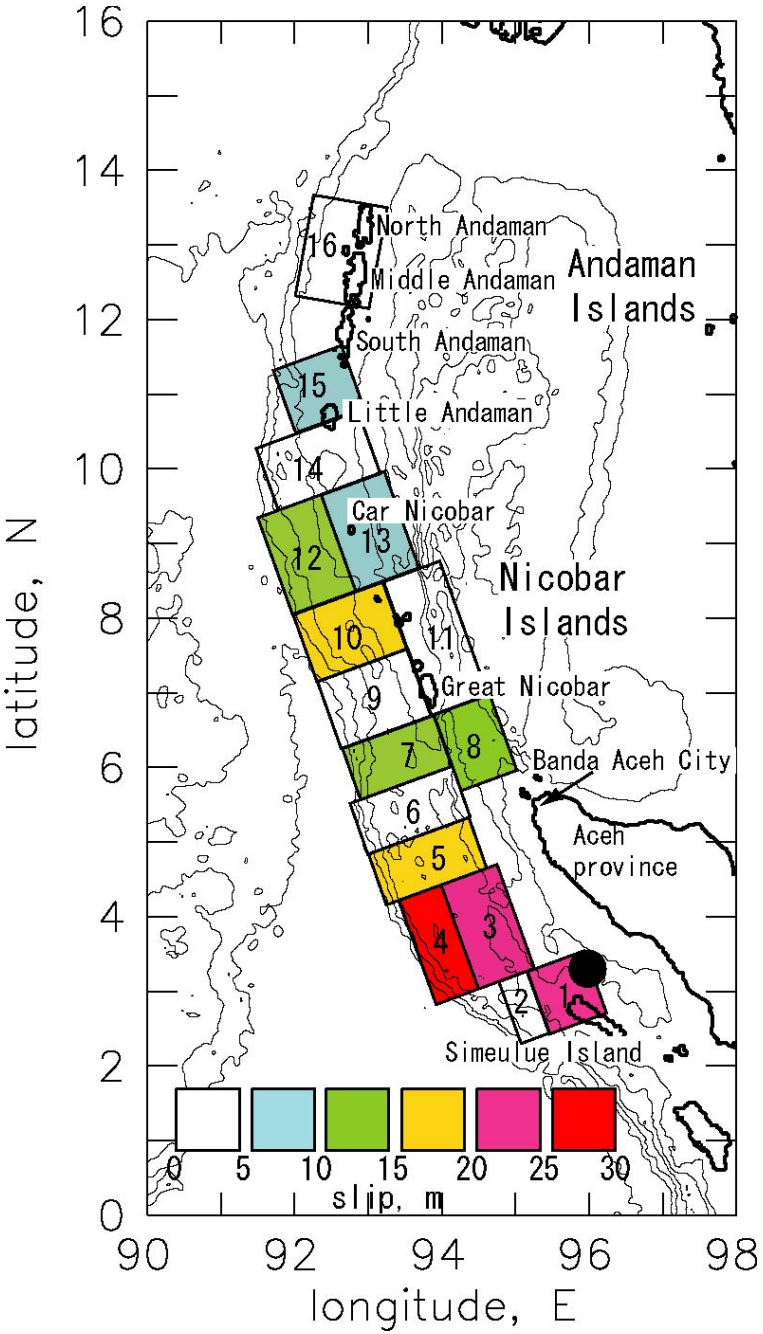
σ_z: width of the slip pattern

78 parameters for 26 profiles。

Total seismic moment

8.8 x 10^{22}Nm （Mw9.2）

Subarya, et al., Nature, 2006



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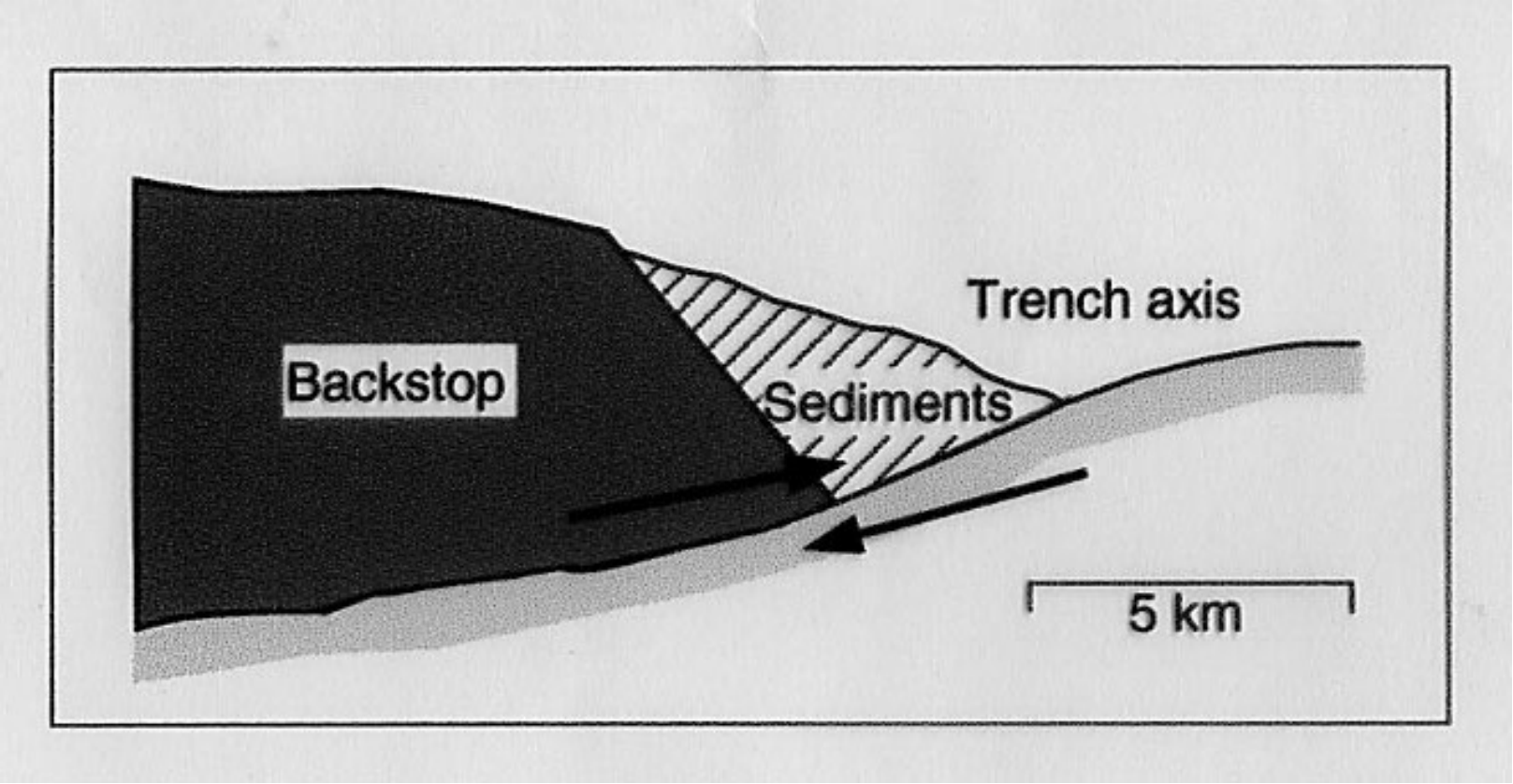
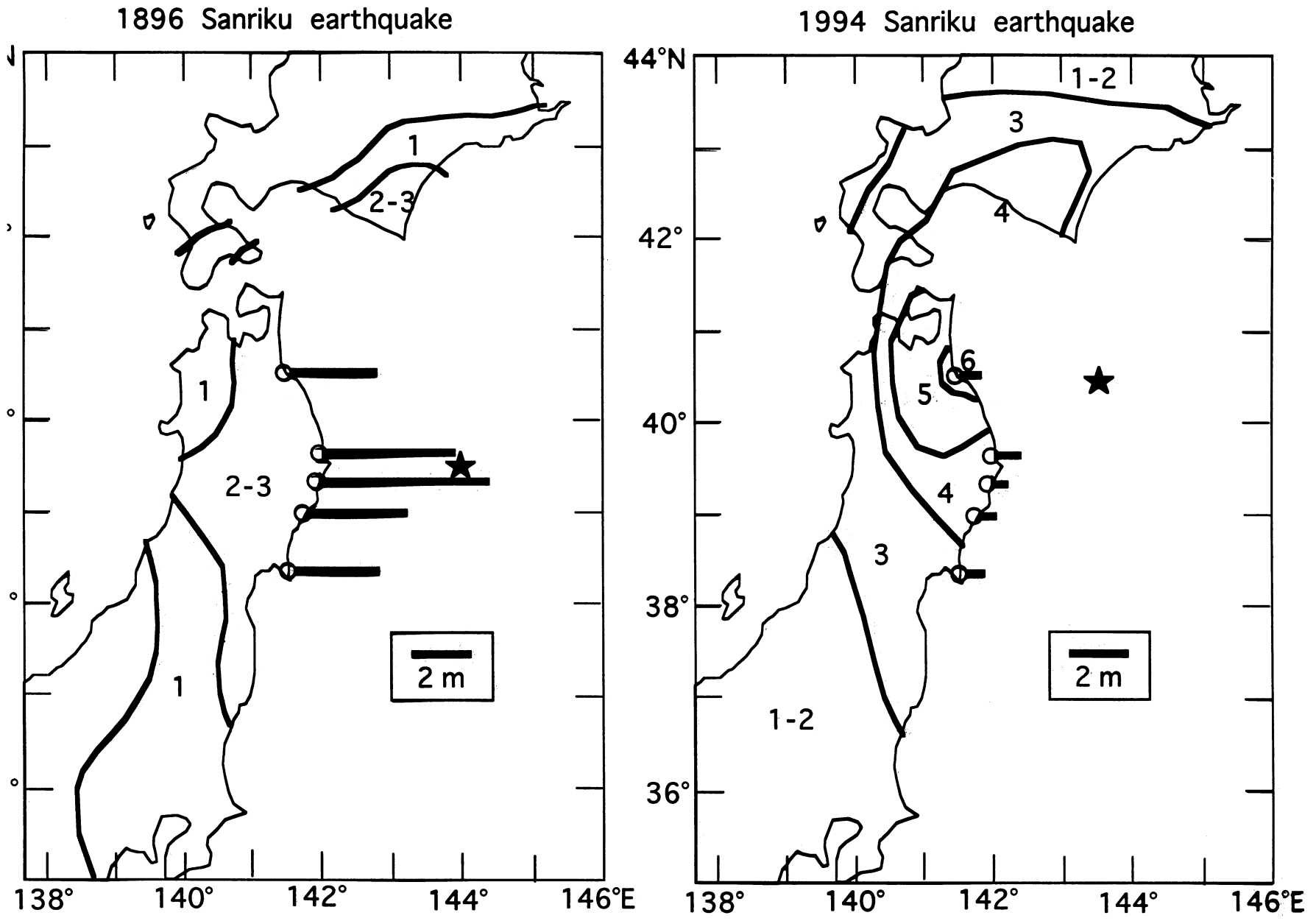
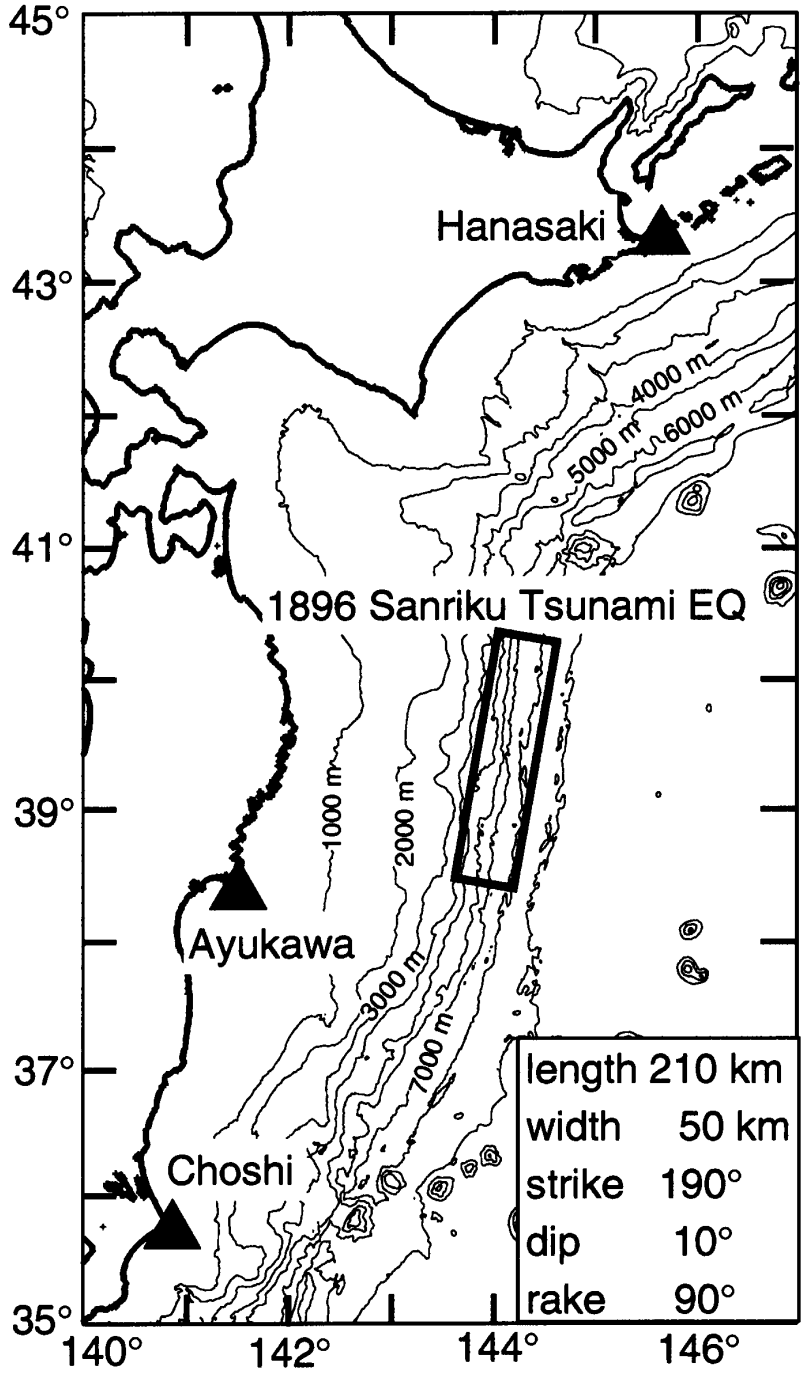
One mechanism to make large tsunamis

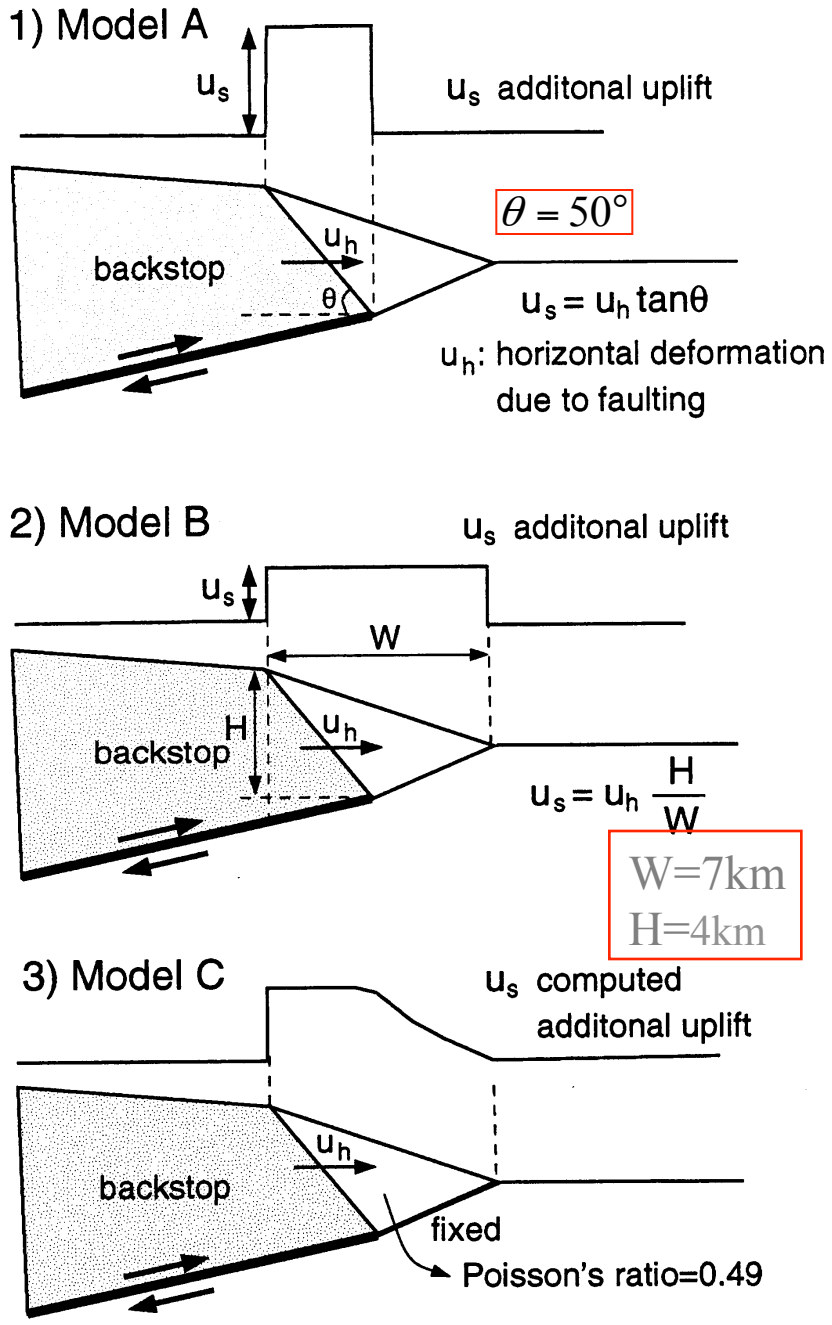


Comparison of seismic intensity and tsunami heights for two earthquakes





Fault parameters of the 1896 Sanriku Tsunami earthquake

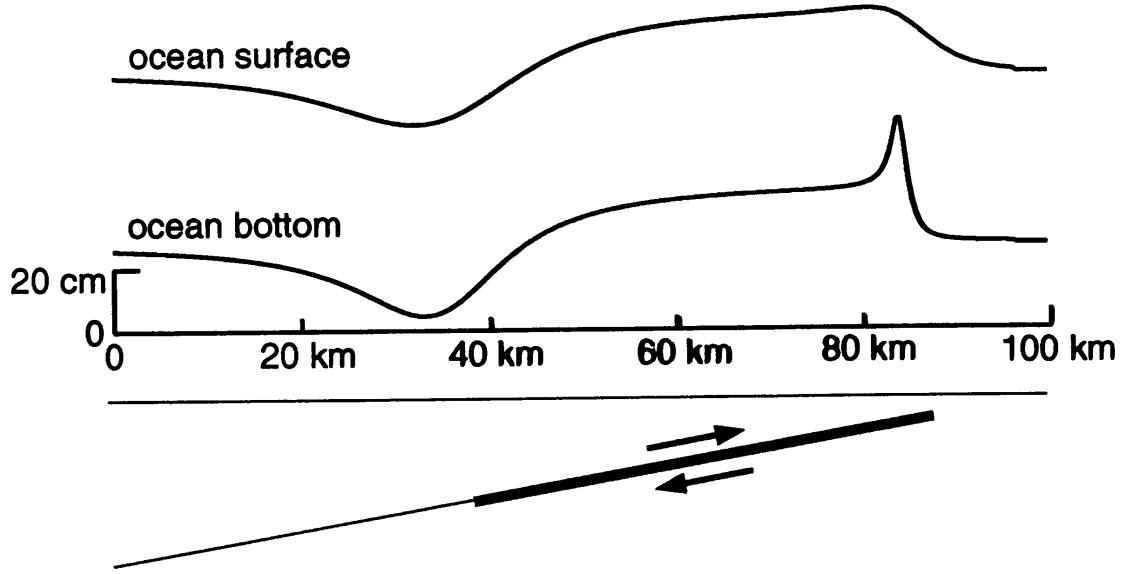


Three models for additional uplifts caused by sediments with horizontal movement of the backstop

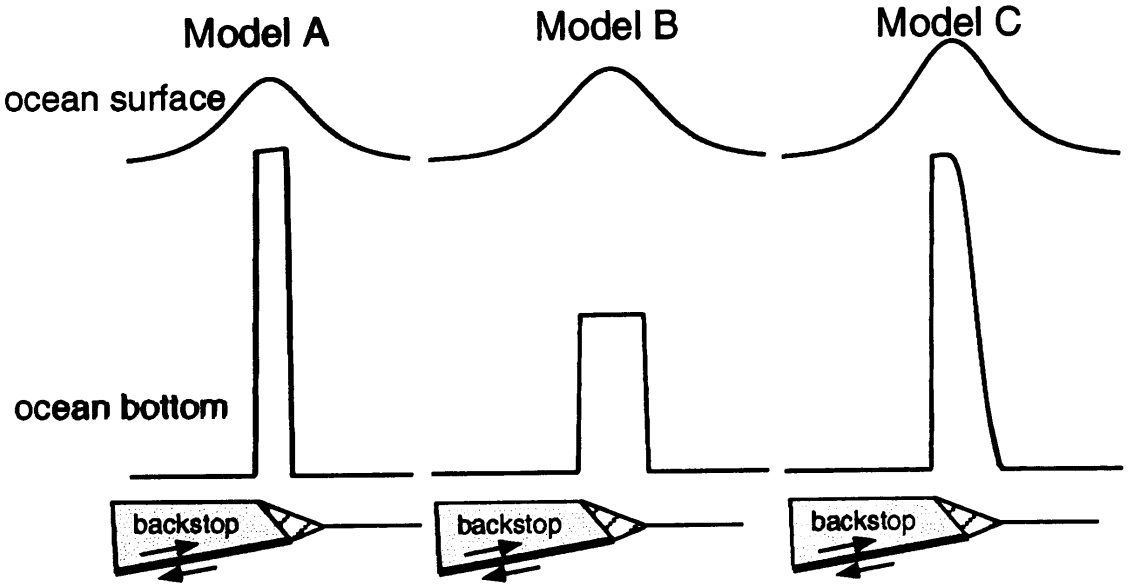
The survey of the seismic reflection and Seabeam mapping near the source region of the 1896 Sanriku tsunami earthquake

Tanioka and Seno, GRL(2001)

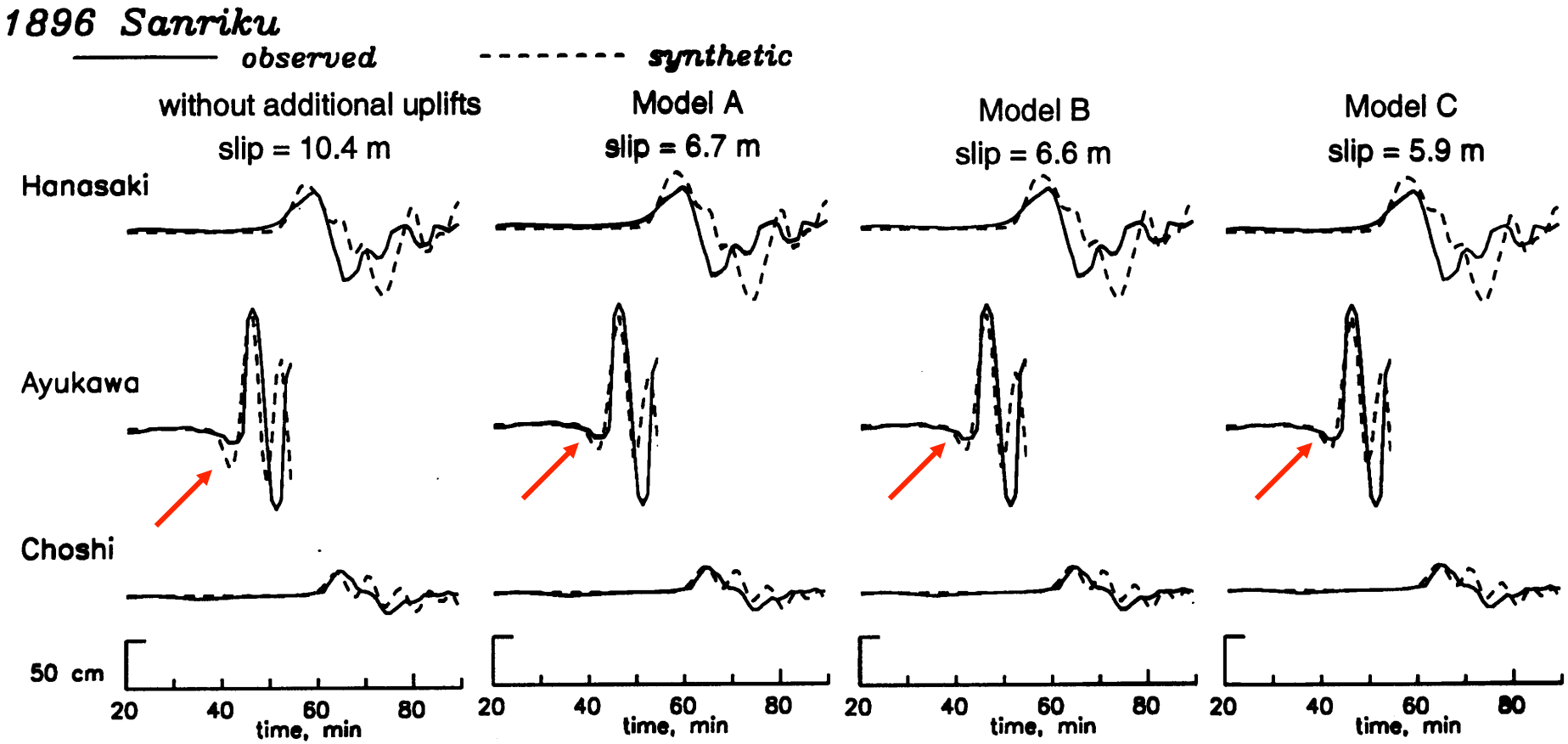
1) Elastic deformation due to faulting

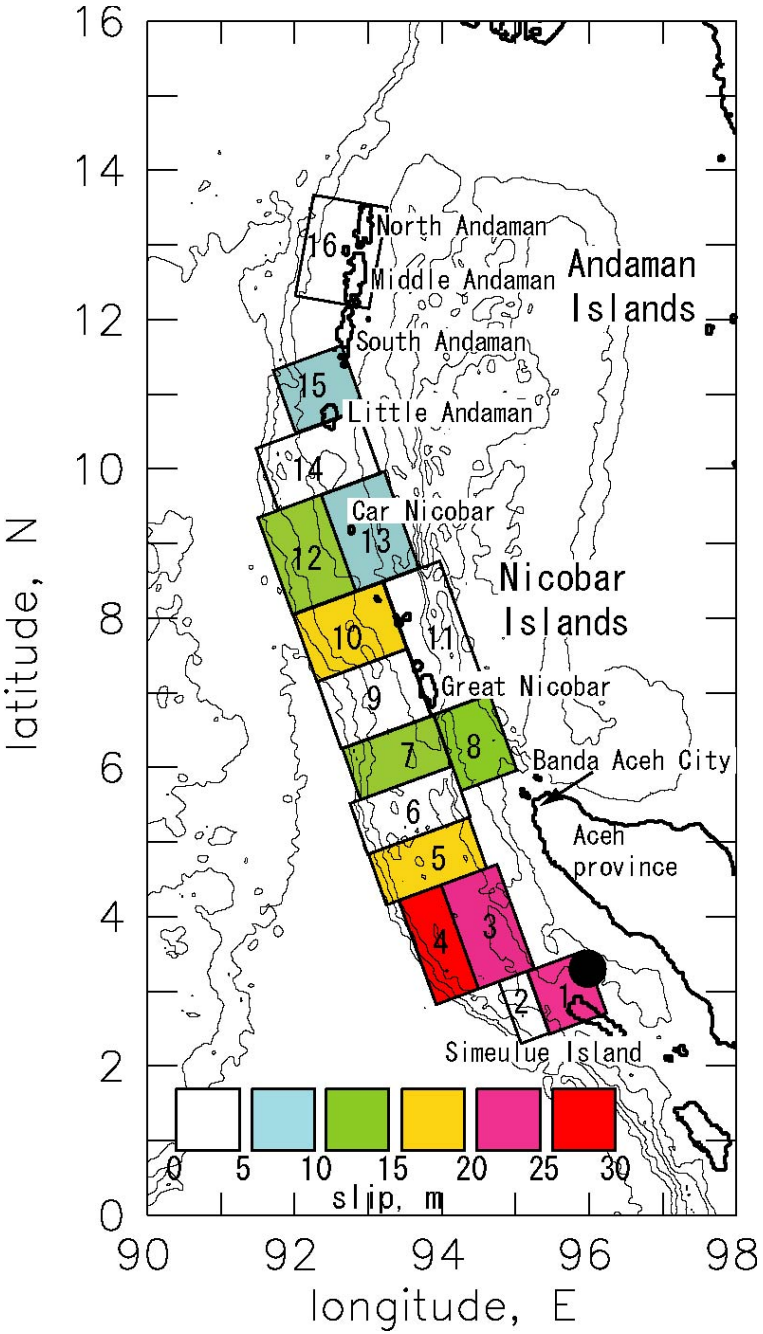


2) Additional uplift



Comparison of observed and computed tsunami waveforms





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