

# Identifikasi dan Karakterisasi Sumber Gempa Berdasarkan Data Geodetik (Tektonik Geodesi)

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## Irwan Meilano

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- 2) Pusat Penelitian Mitigasi Bencana (PPMB), ITB
- 3) Badan Informasi Geospasial (BIG)

# Motivasi dari penelitian

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72

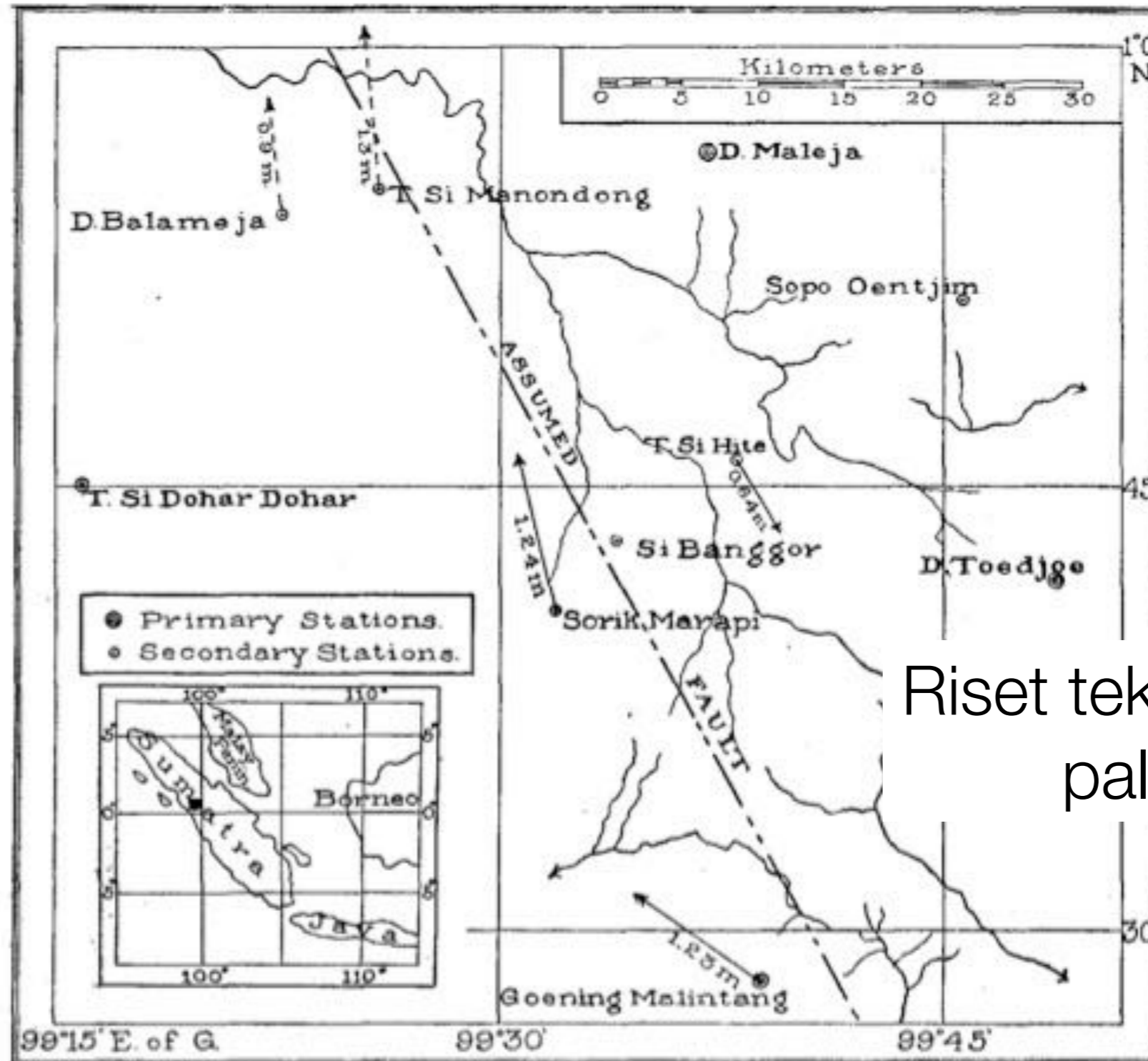
BULLETIN OF THE SEISMOLOGICAL SOCIETY

SUDDEN EARTH-MOVEMENTS IN SUMATRA IN 1892.

By HARRY FIELDING REID

F. Reid, 1910

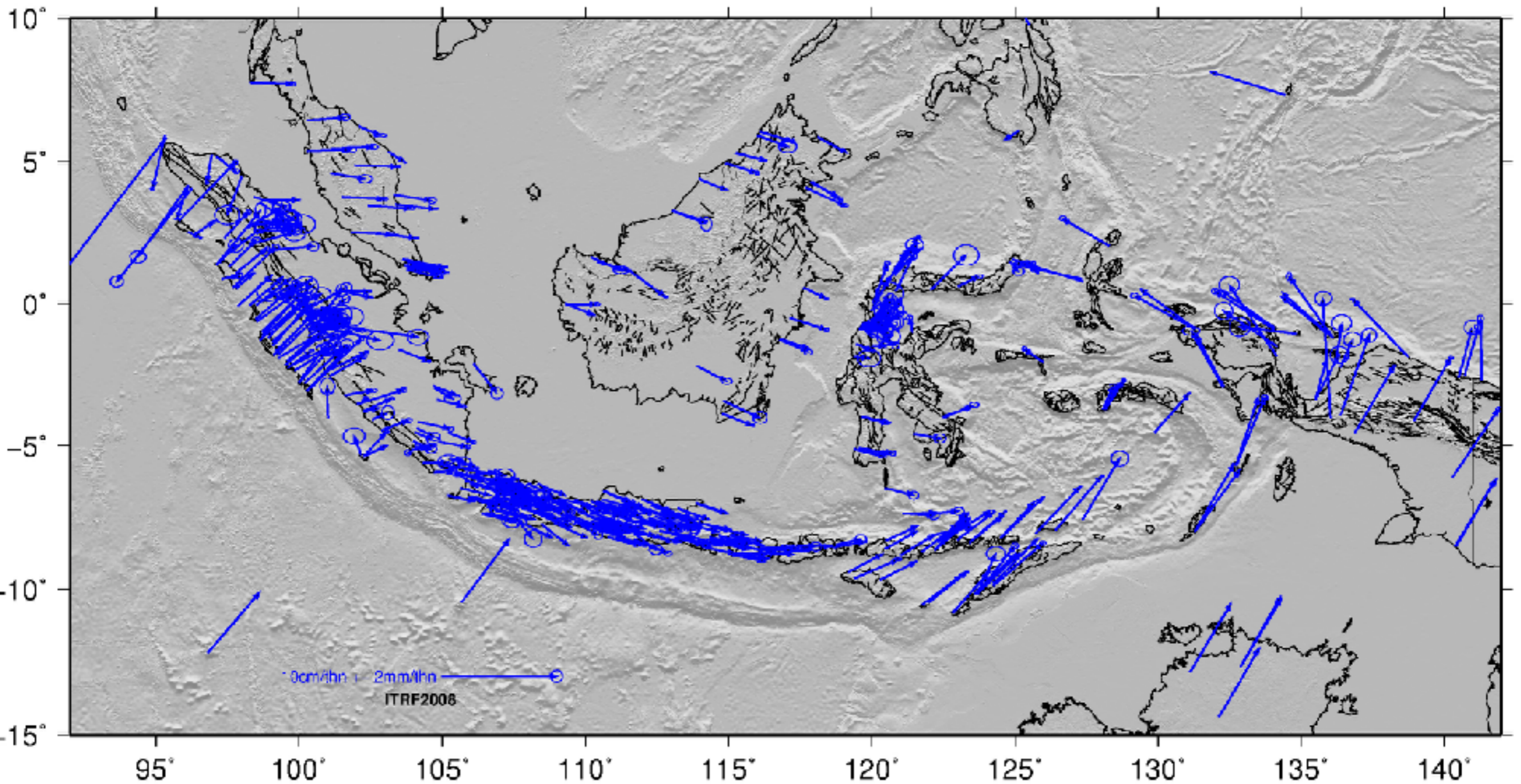
# Motivasi dari penelitian



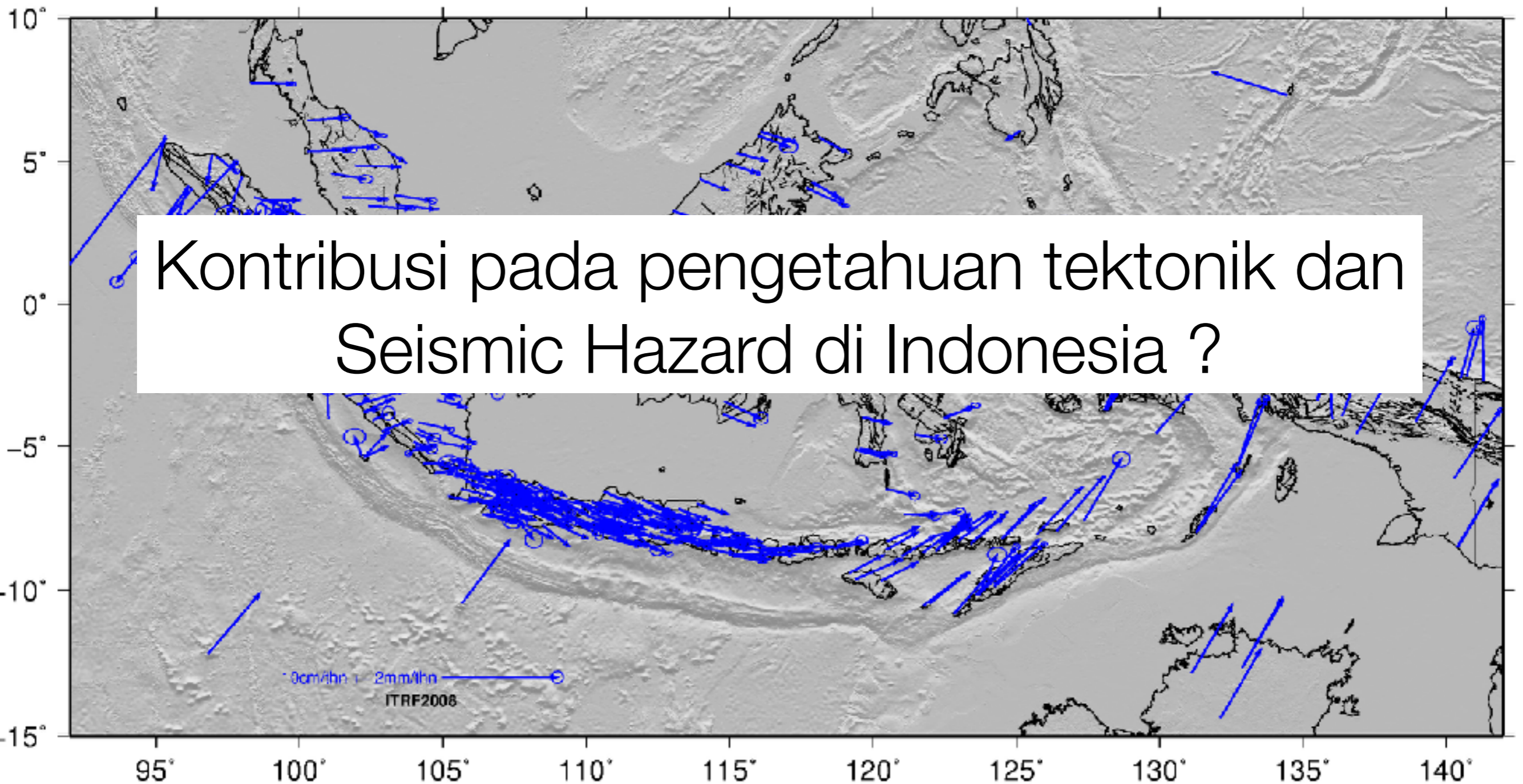
Riset tektonik geodesi paling awal

F. Reid, 1910

# Pergerakan di Indonesia (1992 - 2017)

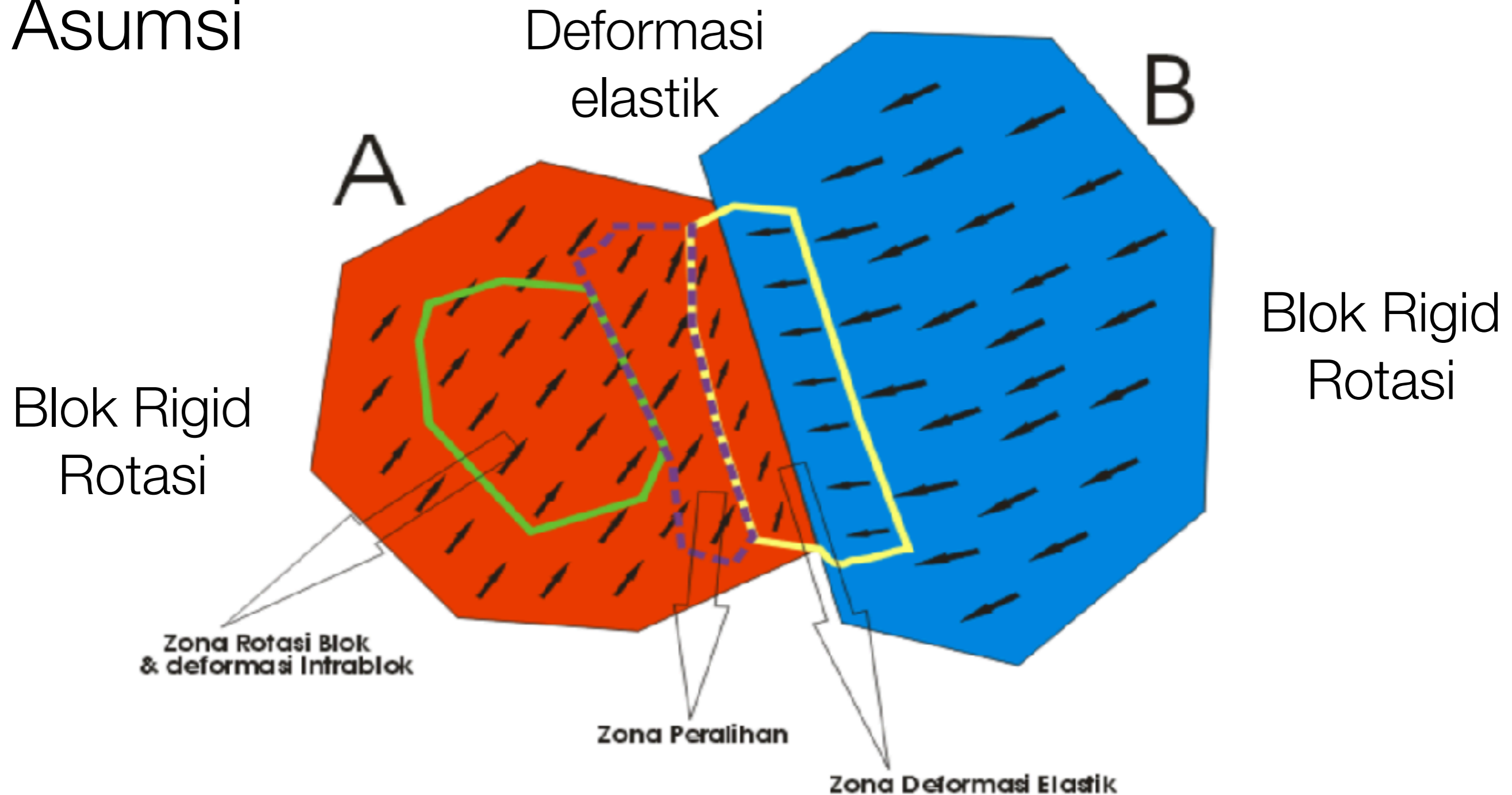


# Pergerakan di Indonesia (1992 - 2017)

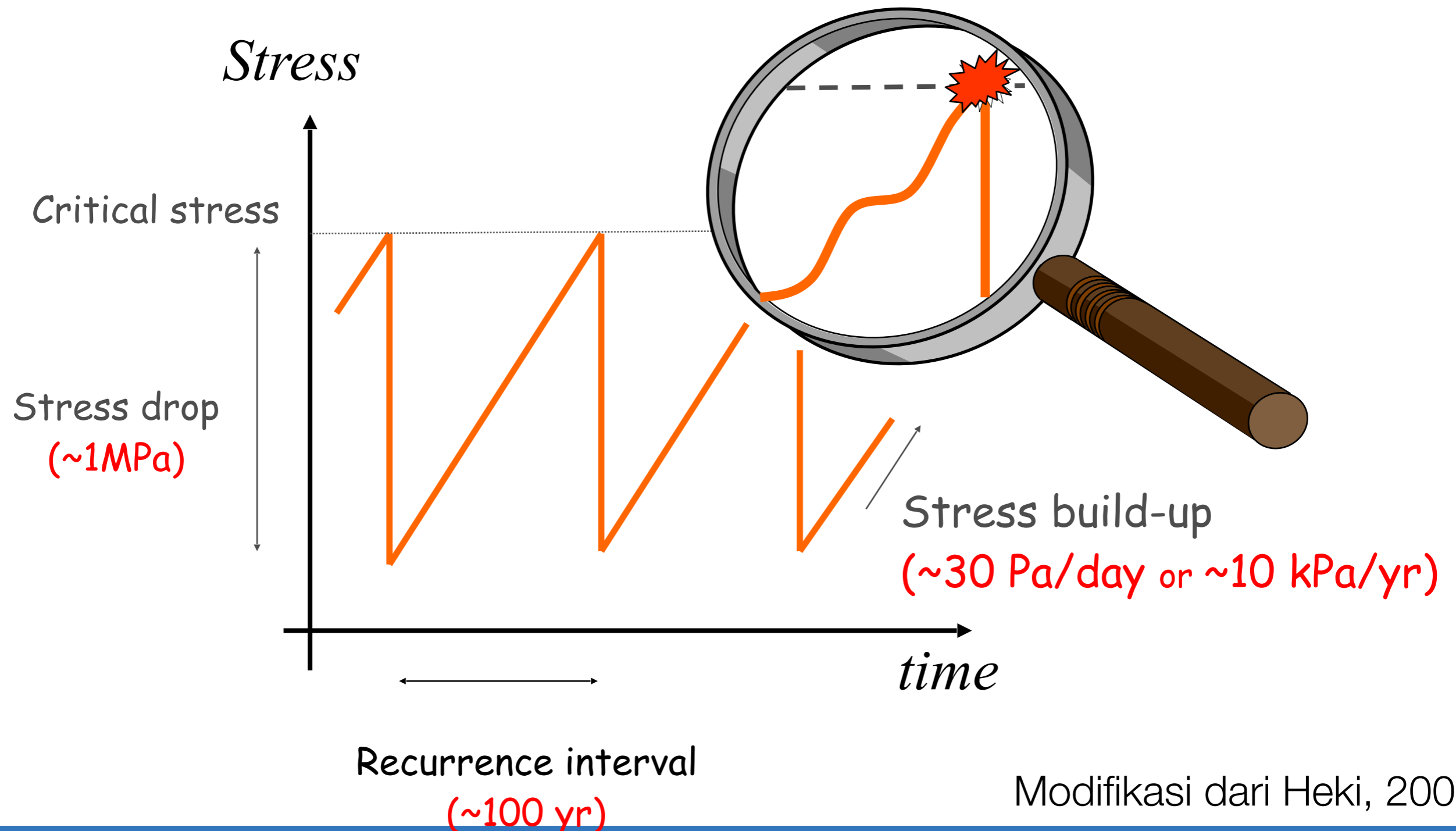


# Kontribusi pada interaksi blok tektonik

## Asumsi

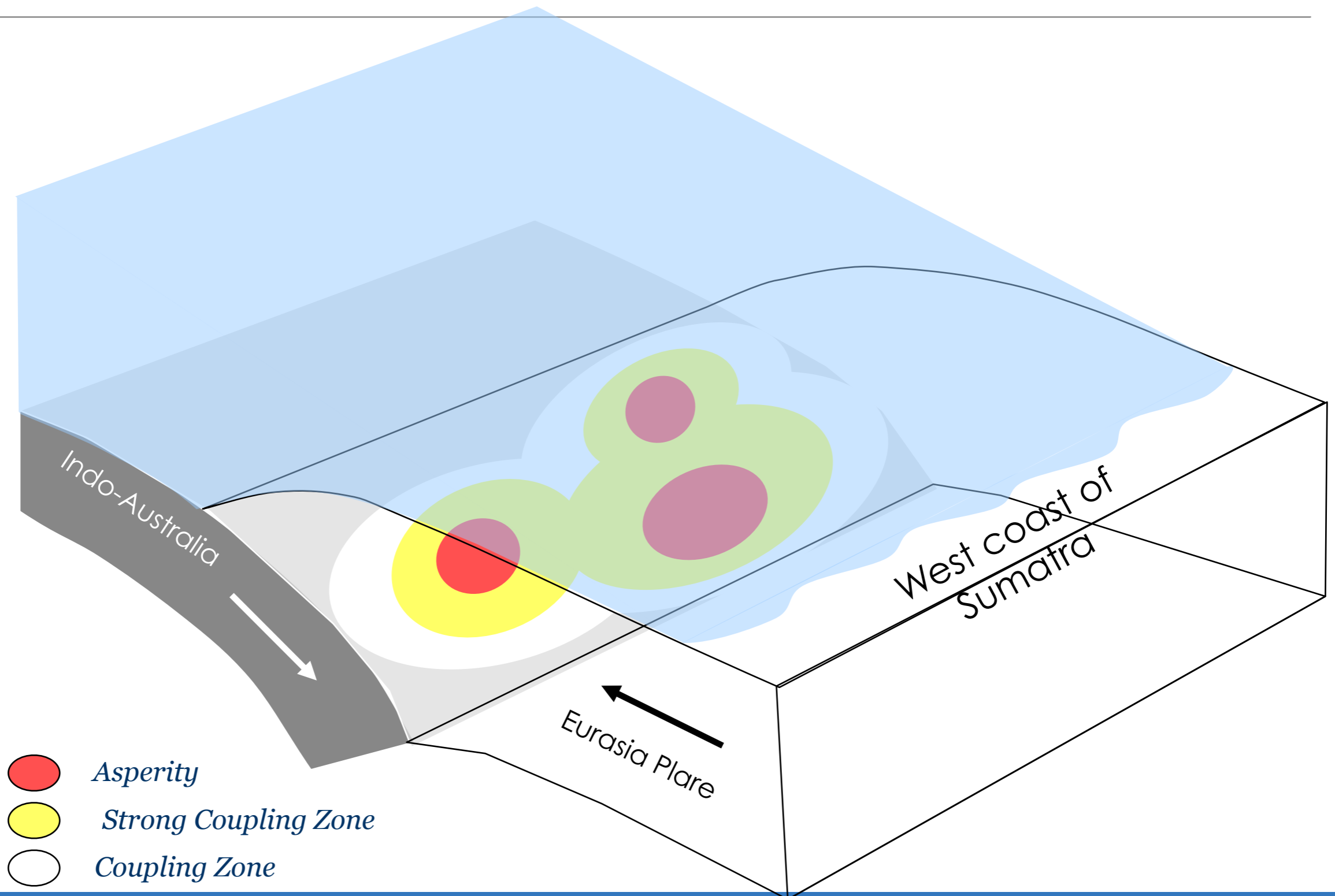


# Kontribusi pada perhitungan periodisasi gempa



Modifikasi dari Heki, 2002

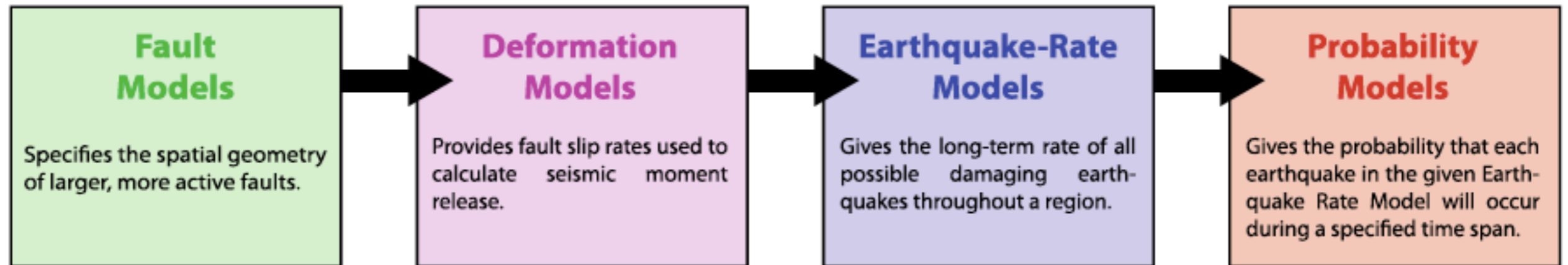
# Kontribusi pada pendefinisian potensi gempa





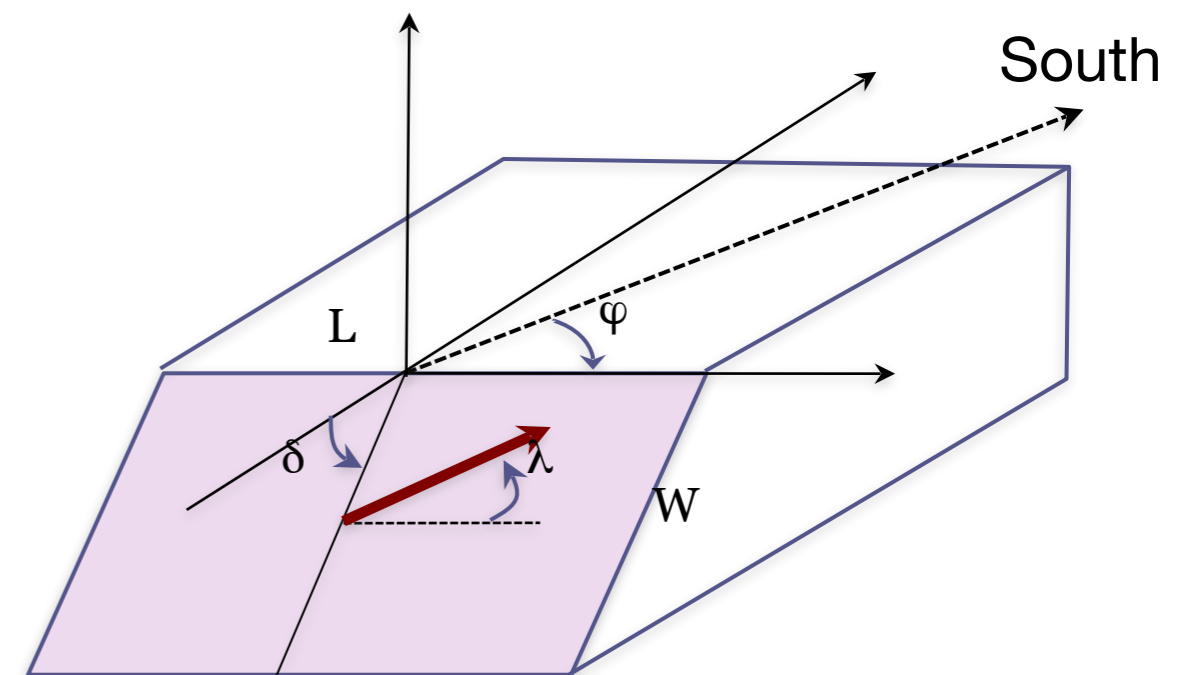
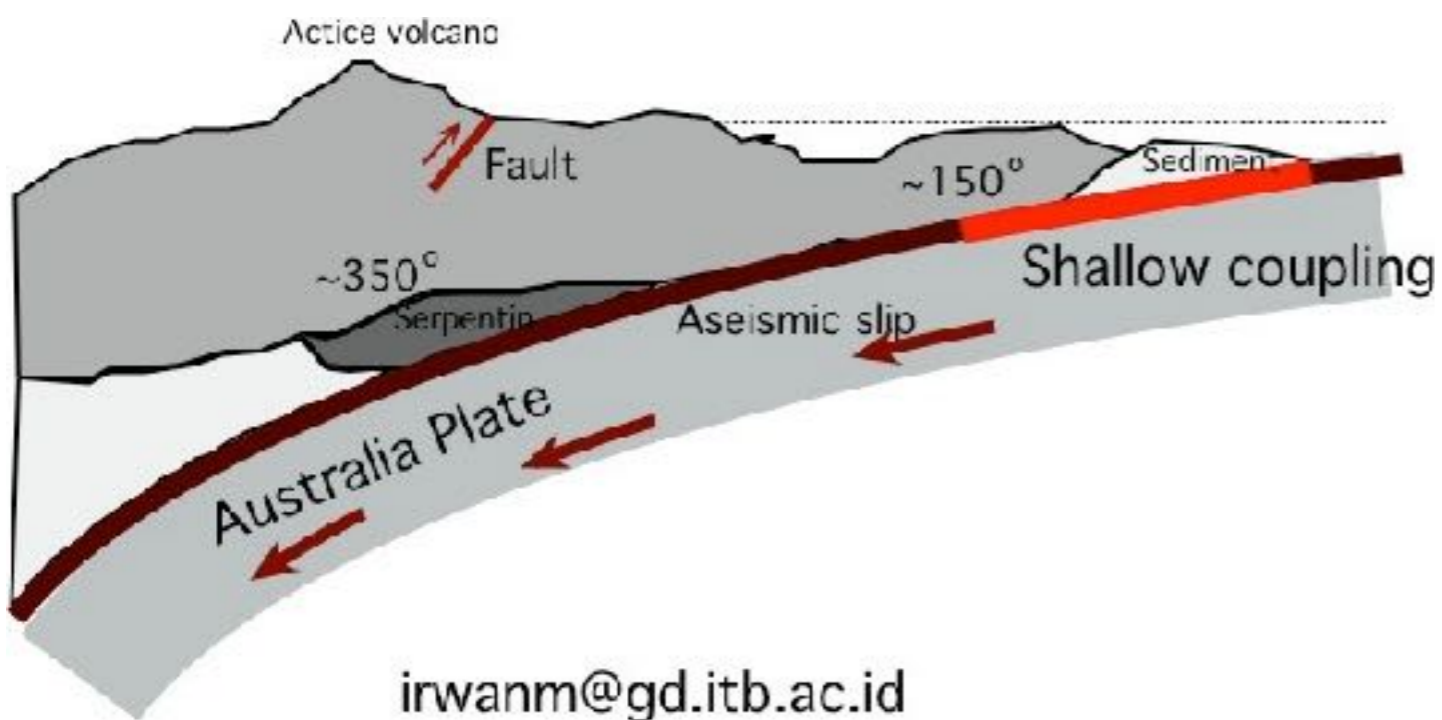
# Kontribusi pada seismic hazard (PSHA)

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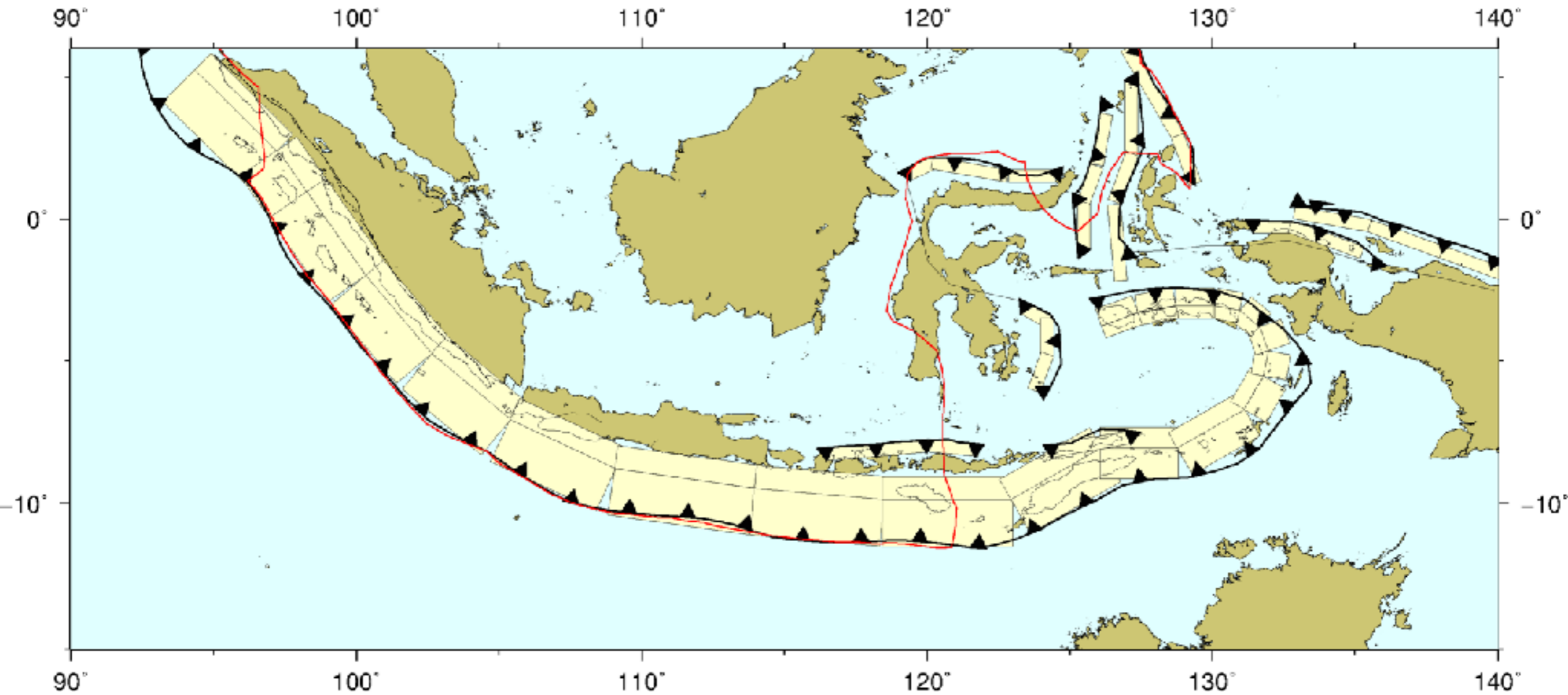
USGS, 2013

# Kontribusi 1 : Model geometri dari sumber gempa

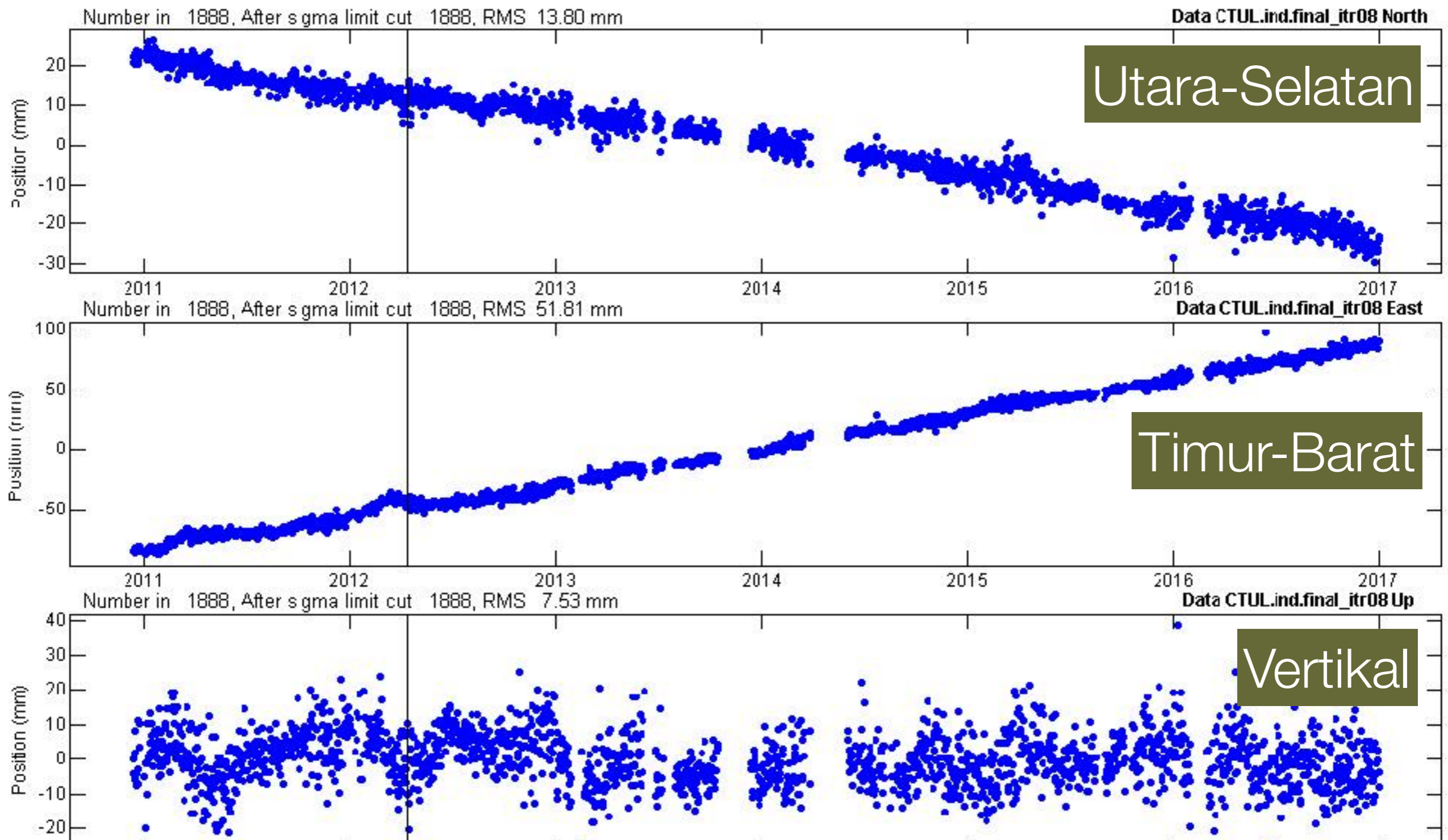


North-dipping fault, width 100km

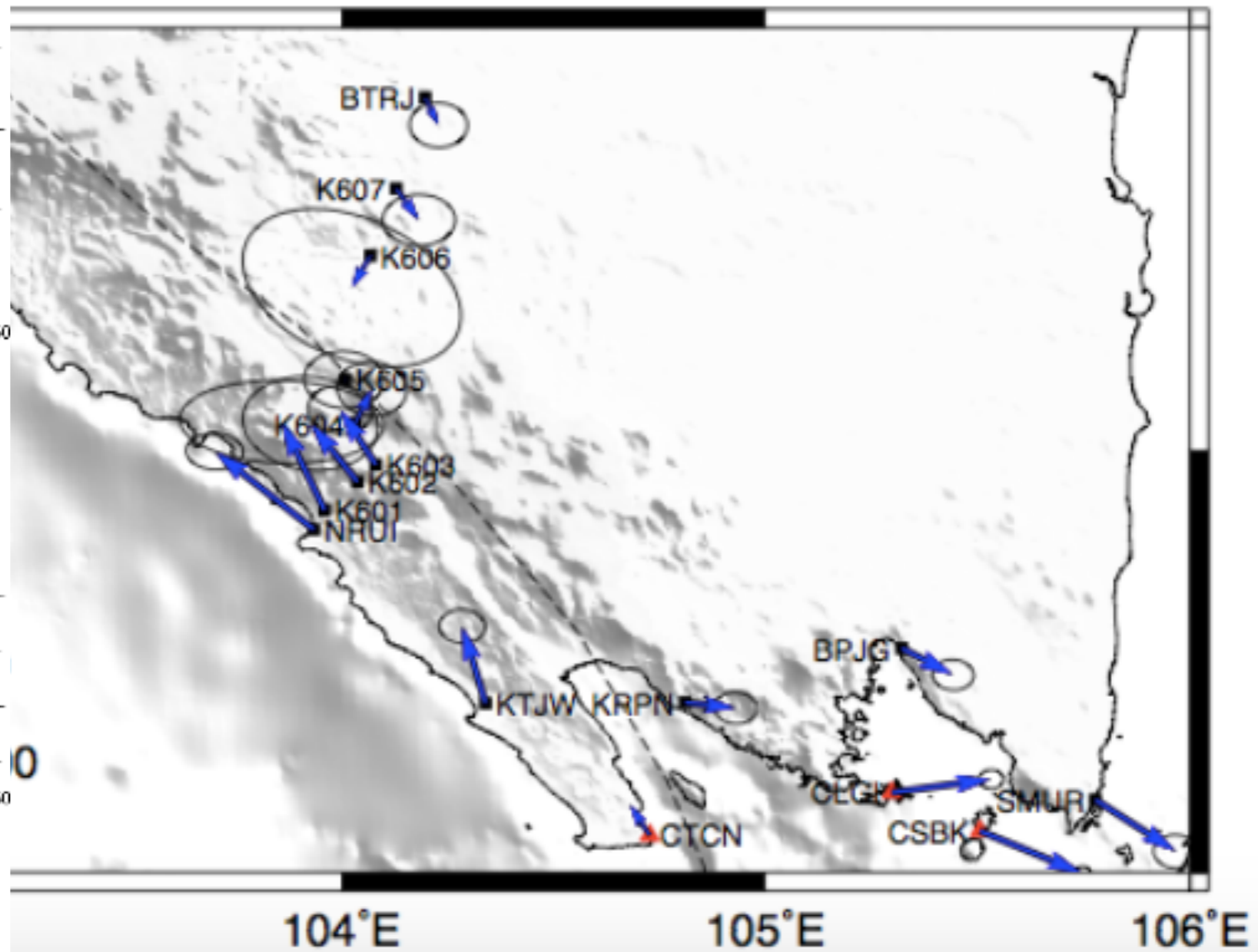
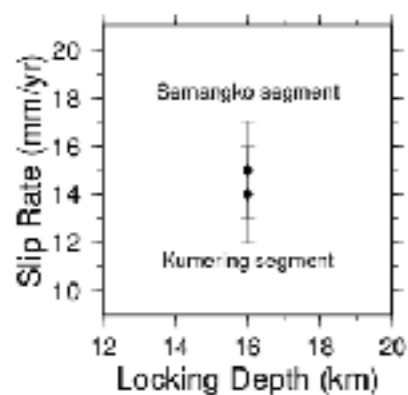
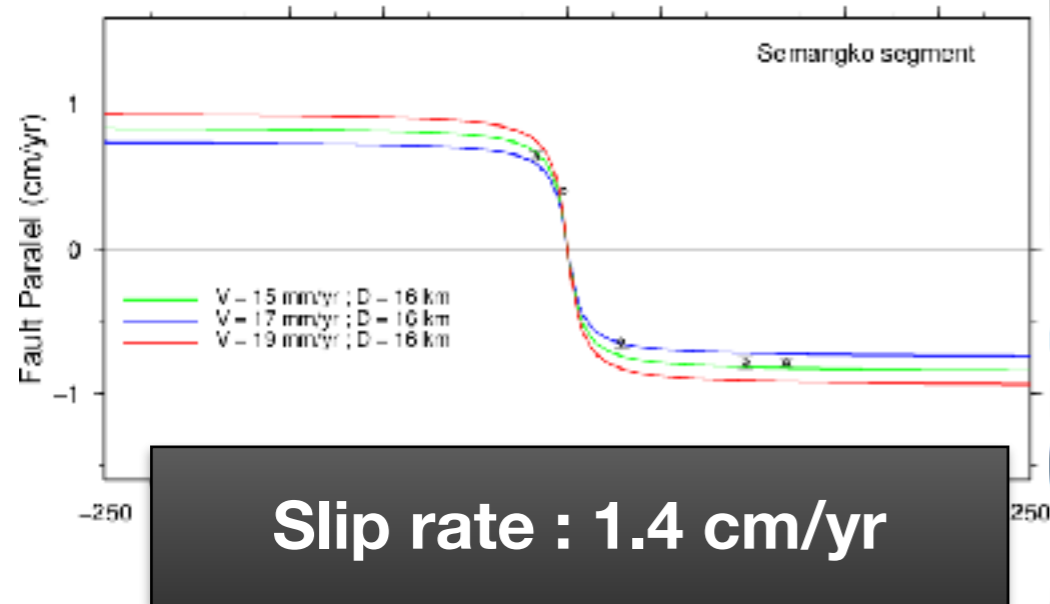
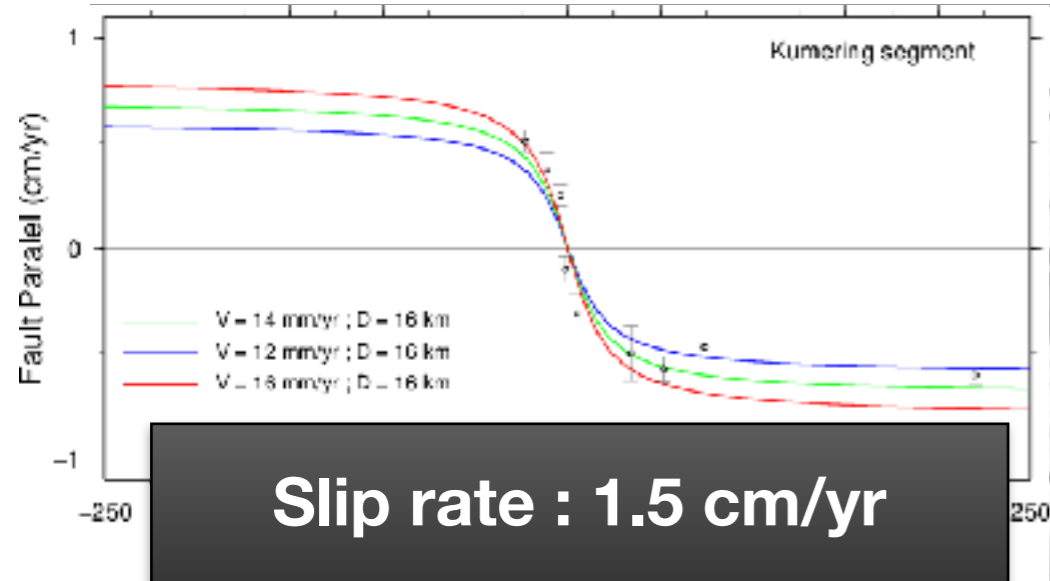
# Kontribusi 1 : Model geometri dari sumber gempa



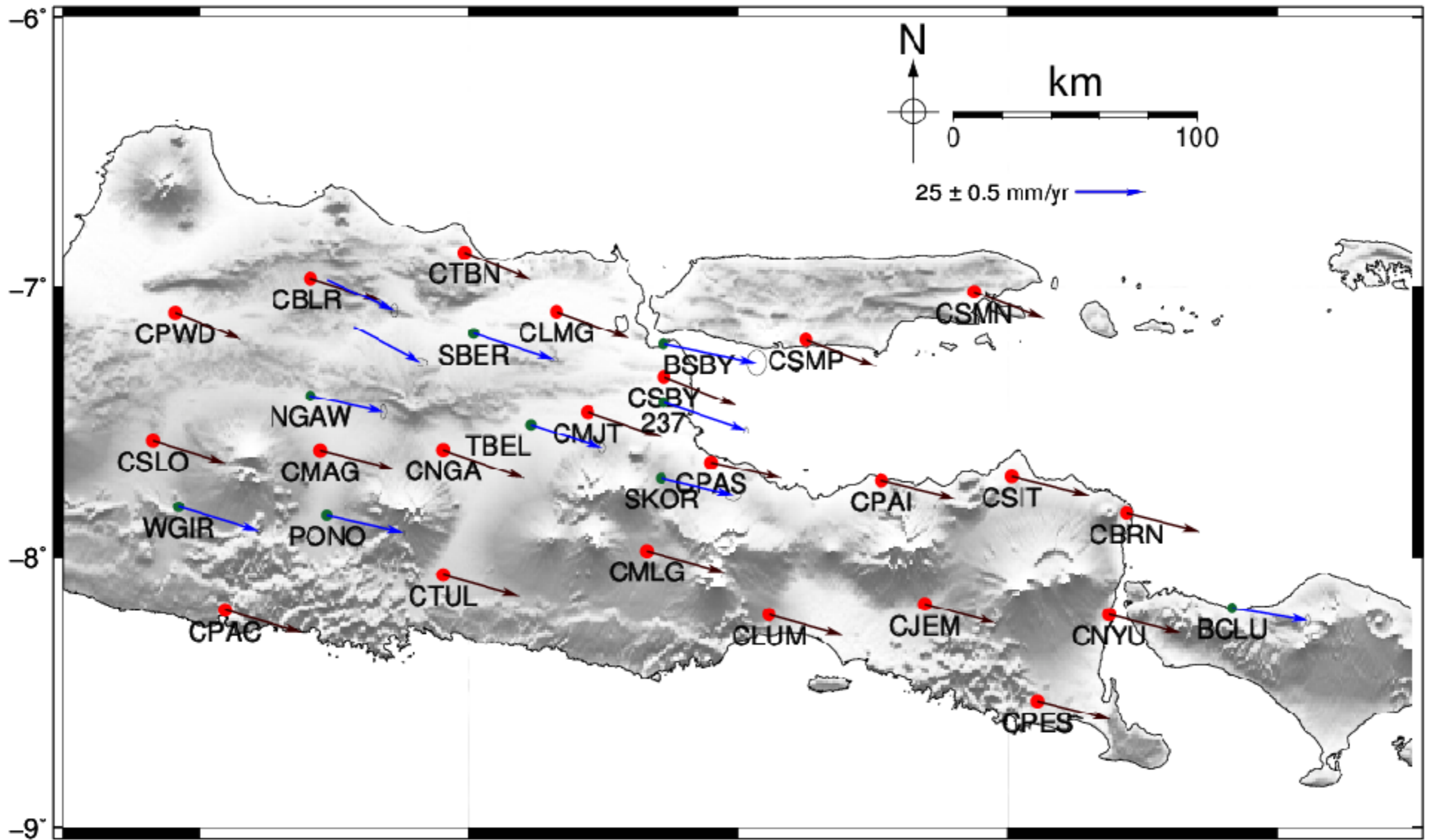
# Kontribusi 2 : Model deformasi (slip-rate)



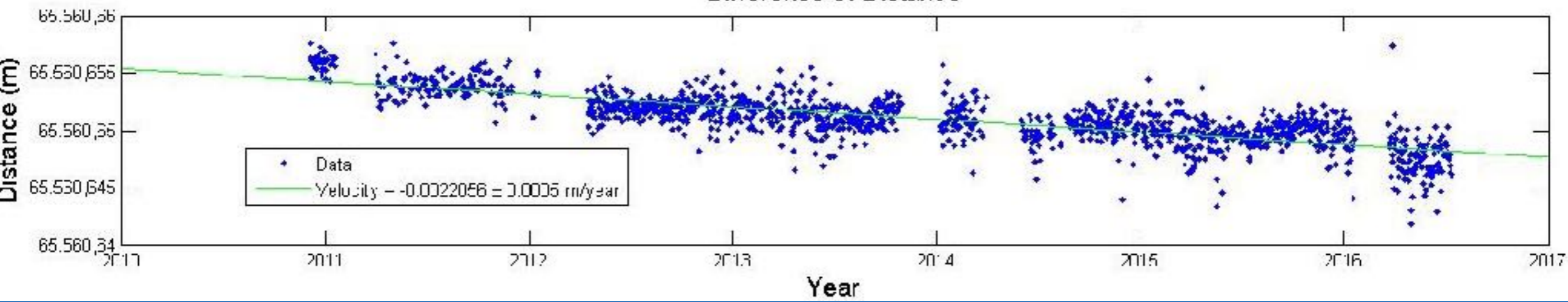
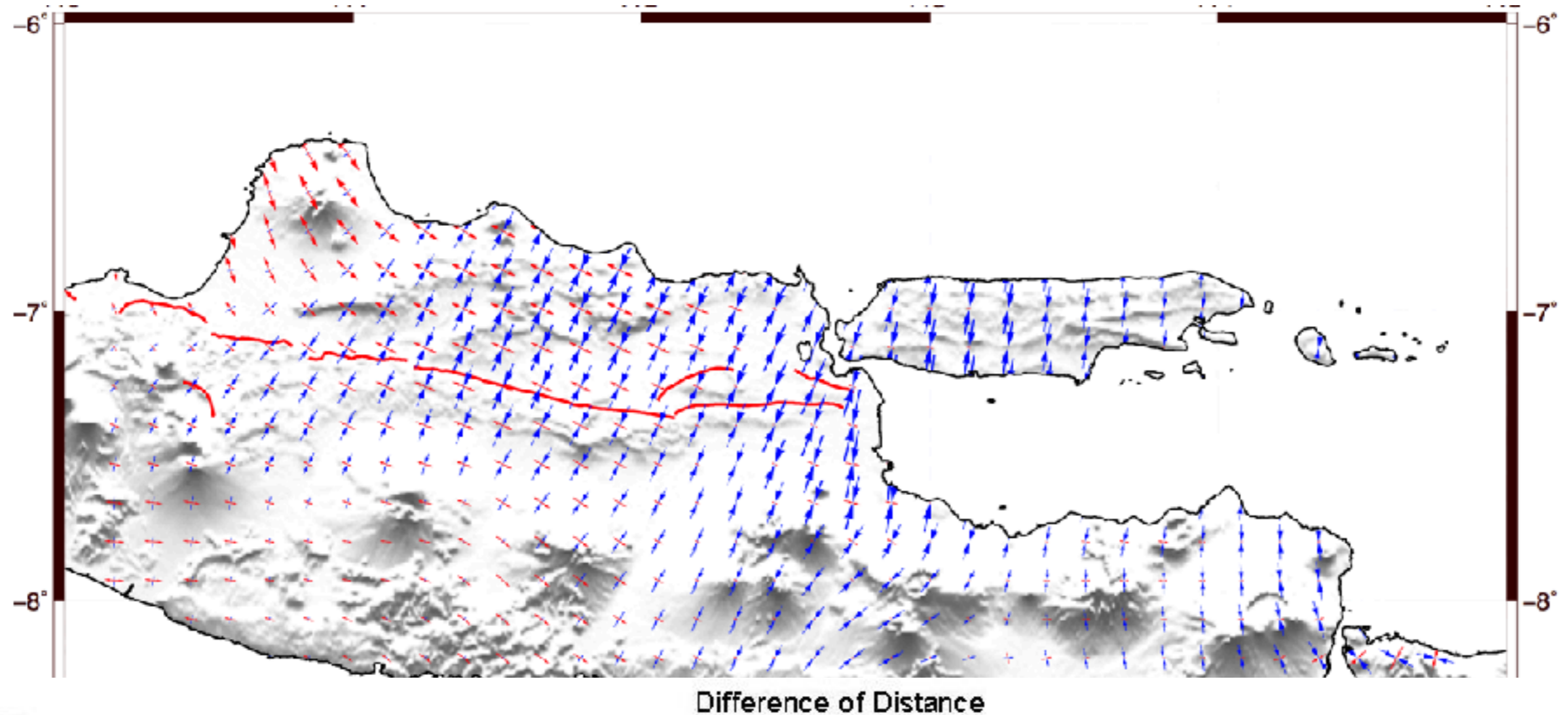
# Kontribusi 2 : Model deformasi (slip-rate)



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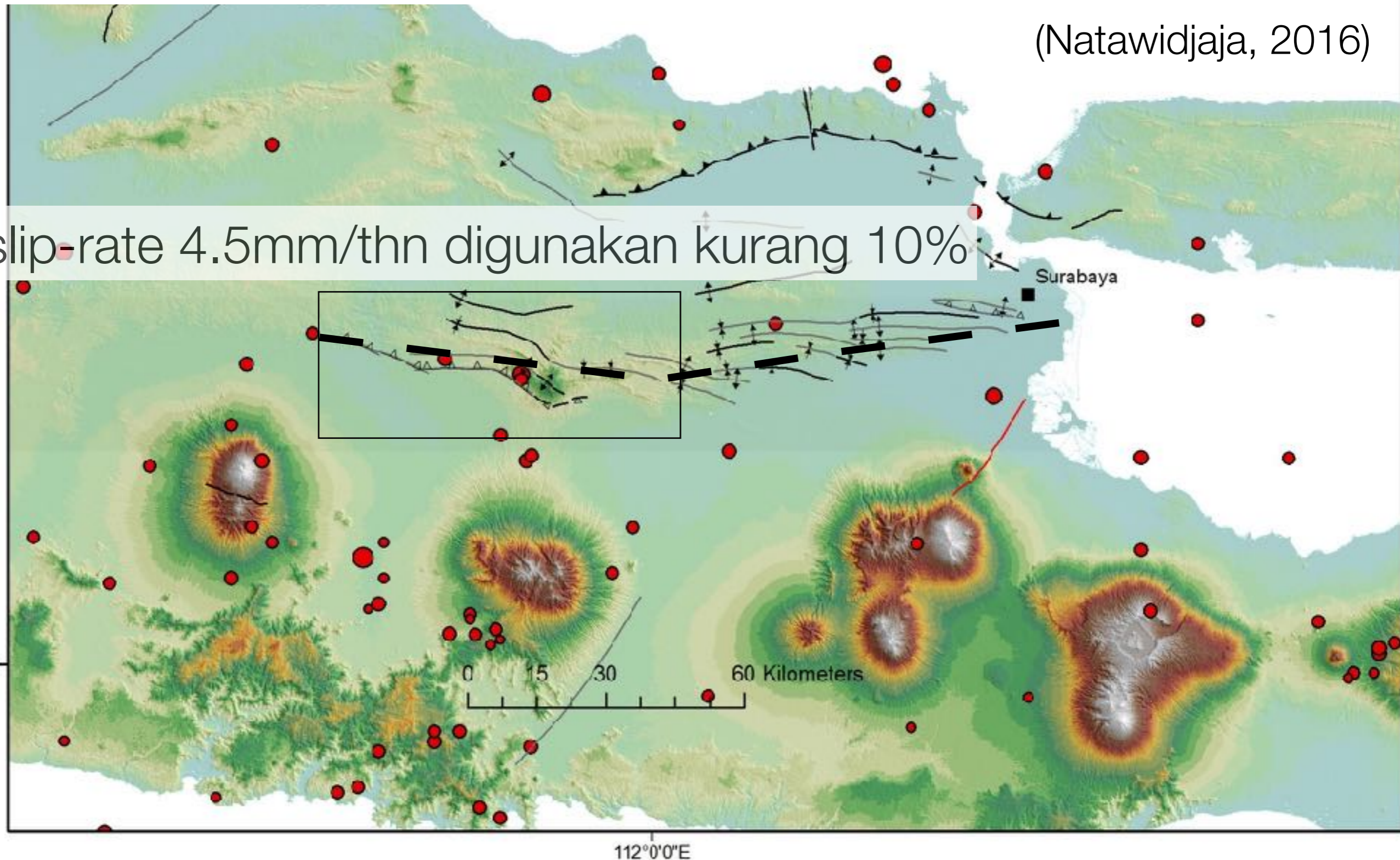
# Kontribusi 2 : Model deformasi (slip-rate)



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(Natawidjaja, 2016)

slip-rate 4.5mm/thn digunakan kurang 10%





# Kontribusi 2 : Model deformasi (slip-rate)



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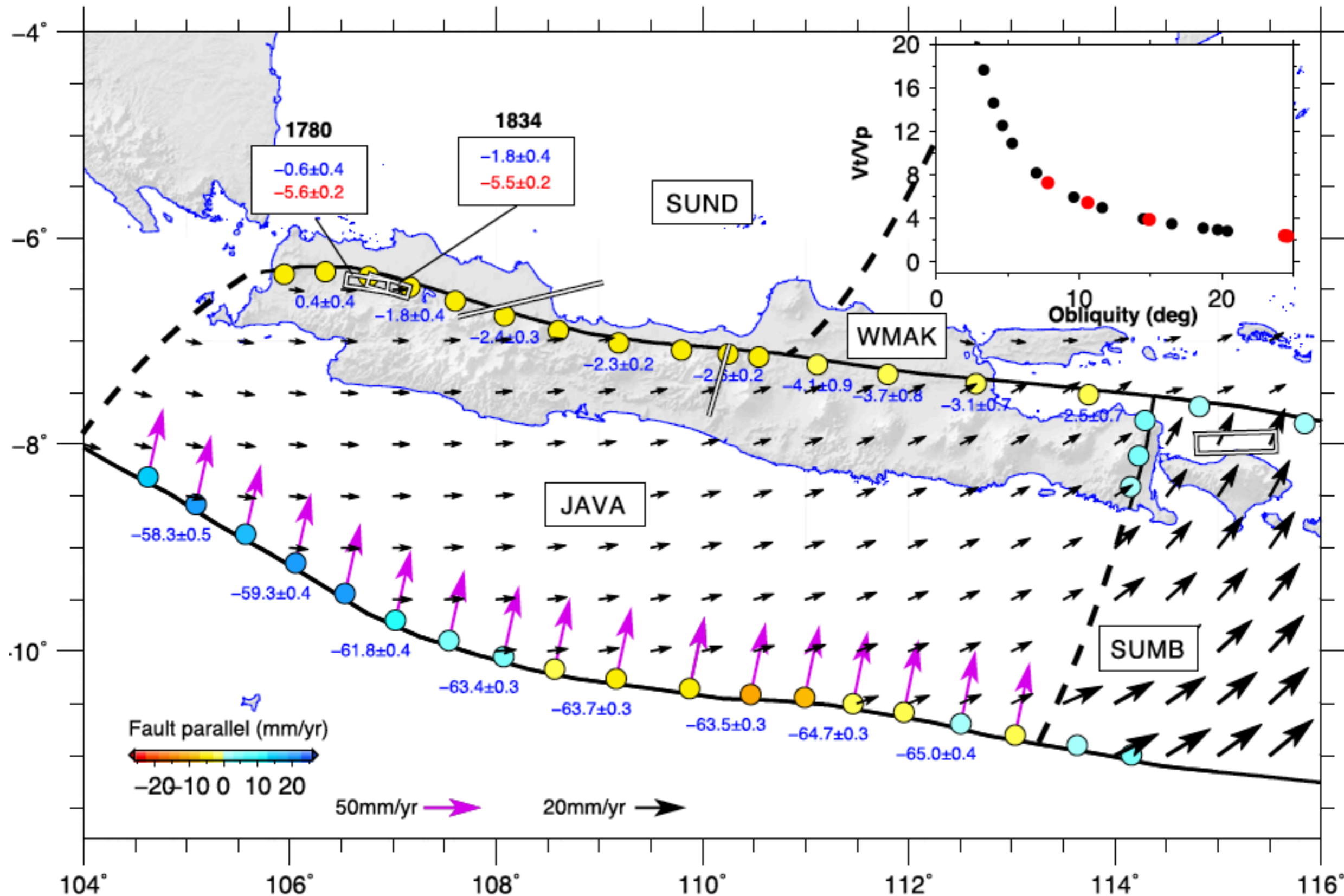
## The kinematics of crustal deformation in Java from GPS observations: Implications for fault slip partitioning

A. Koulali<sup>a,\*</sup>, S. McClusky<sup>a</sup>, S. Susilo<sup>b</sup>, Y. Leonard<sup>a</sup>, P. Cummins<sup>a</sup>, P. Tregoning<sup>a</sup>,  
I. Meilano<sup>c</sup>, J. Efendi<sup>b</sup>, A.B. Wijanarto<sup>b</sup>

<sup>a</sup> *Research School of Earth Sciences, Australian National University, Canberra, Australian Capital Territory, Australia*

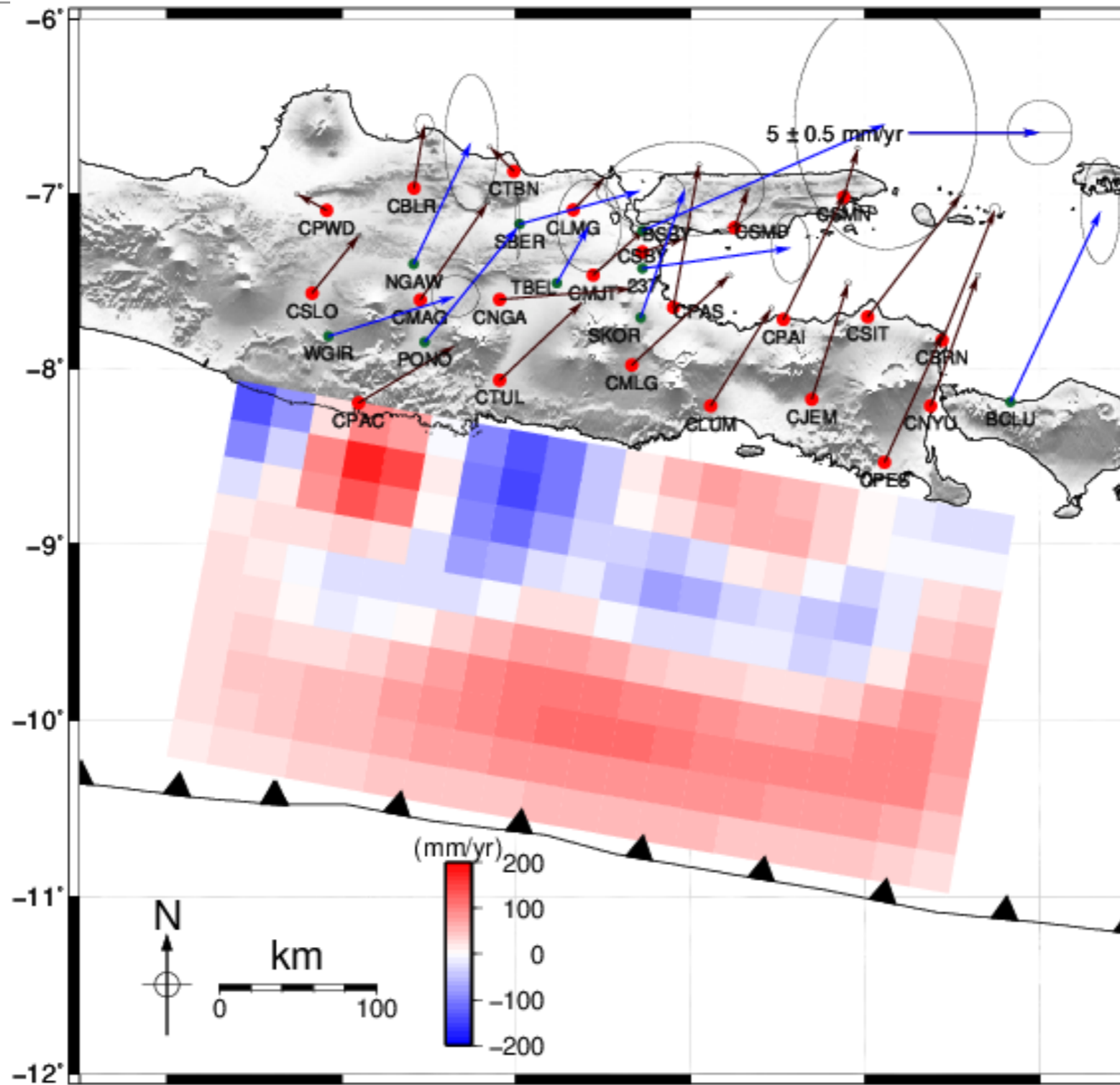
<sup>b</sup> *Bandan Informasi Geospasial, Cibinong, Indonesia*

<sup>c</sup> *Institute of Technology Bandung, Bandung, Indonesia*

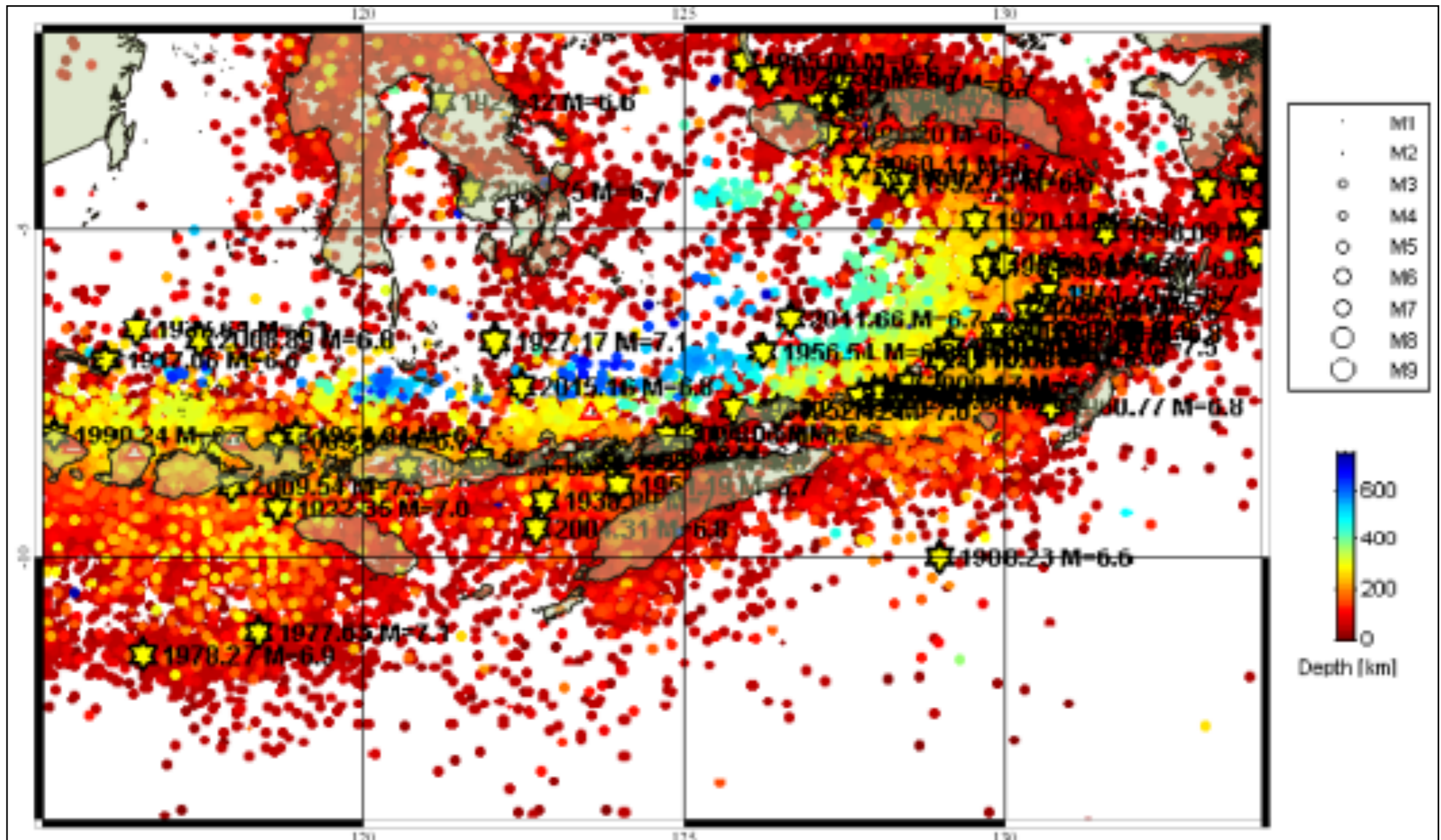


Kaolali et al., 2017

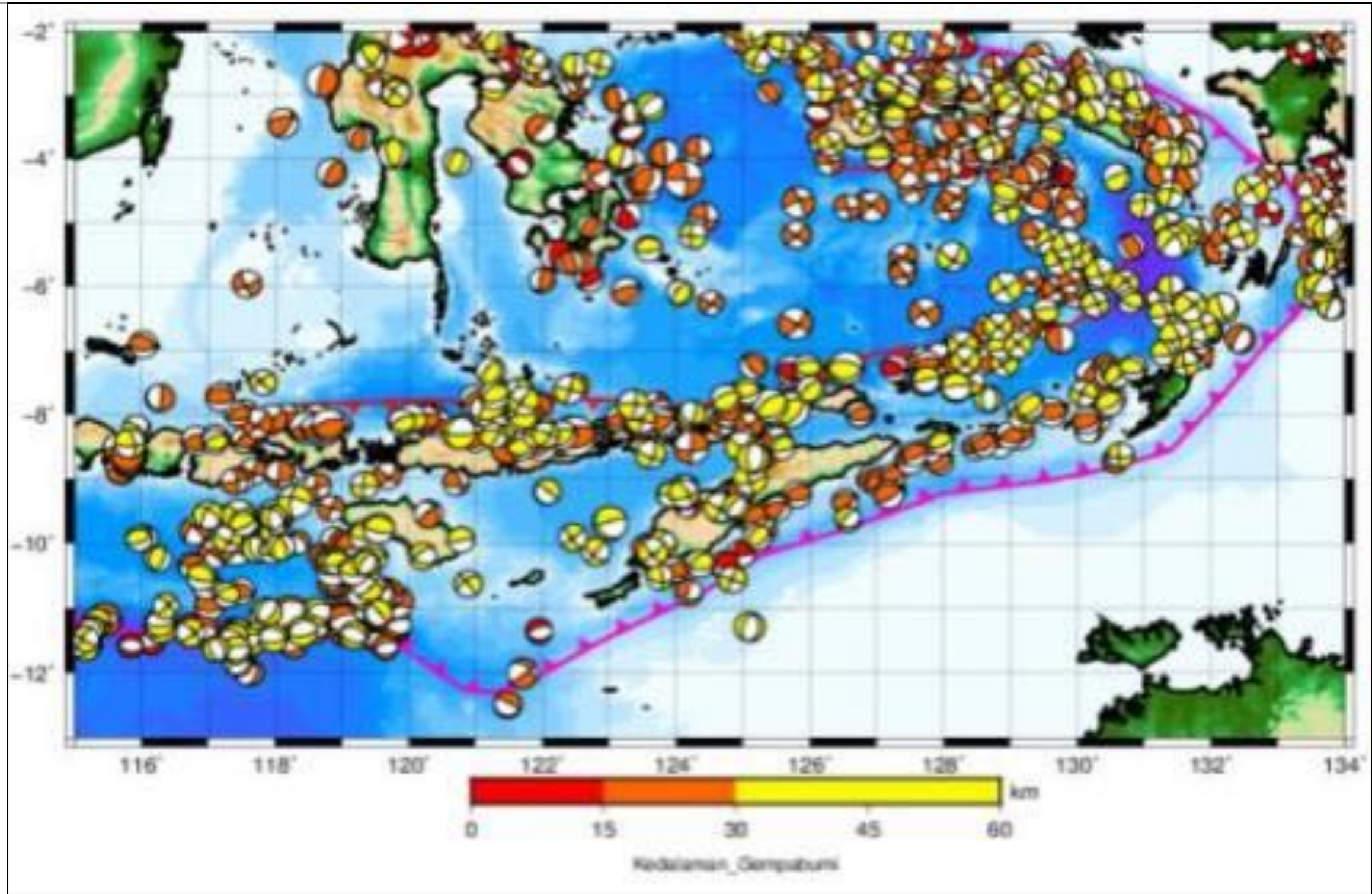
# Kontribusi 2 : Model deformasi (slip-rate)



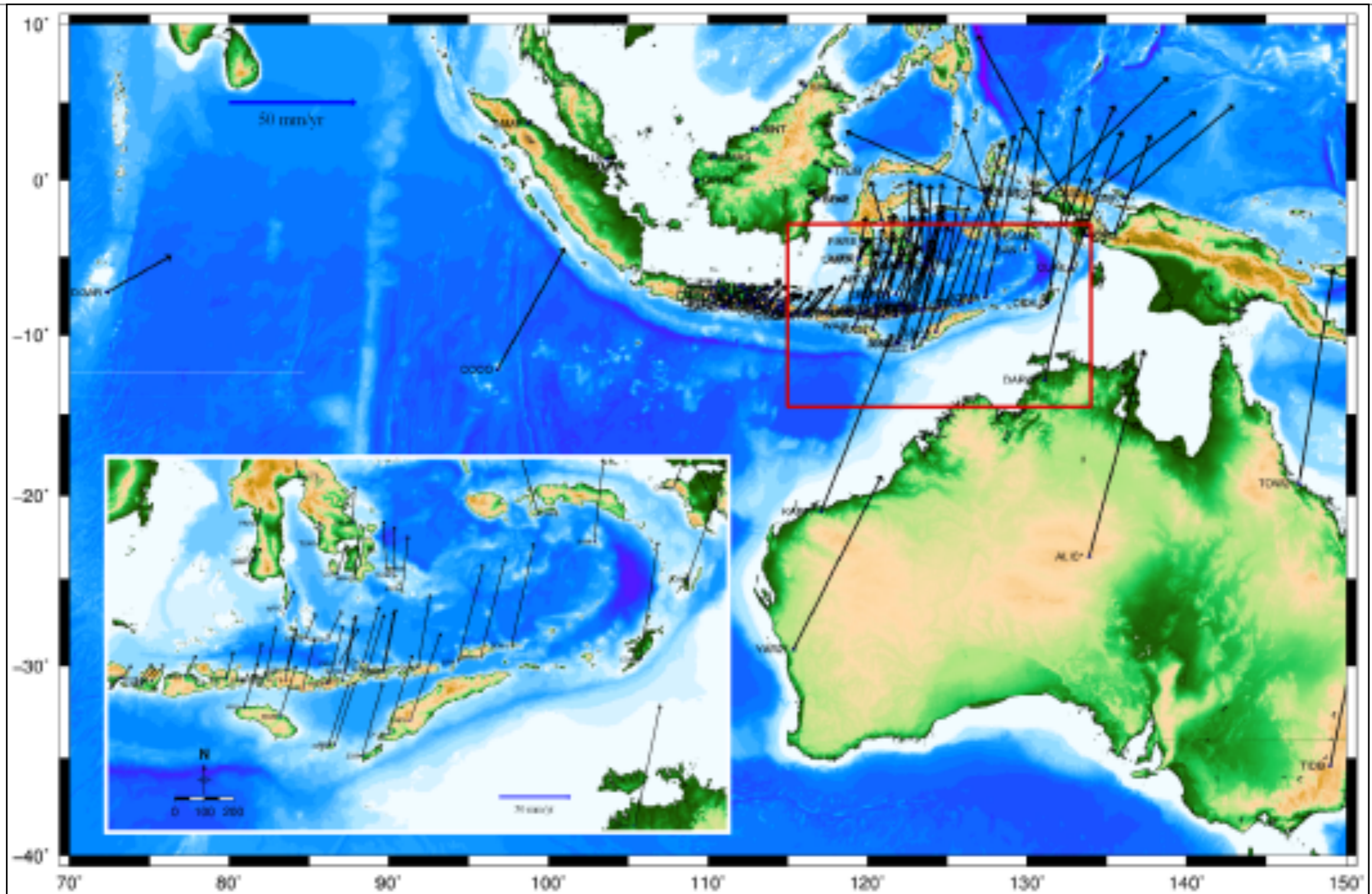
# Kontribusi 3 : Model Rate Gempa



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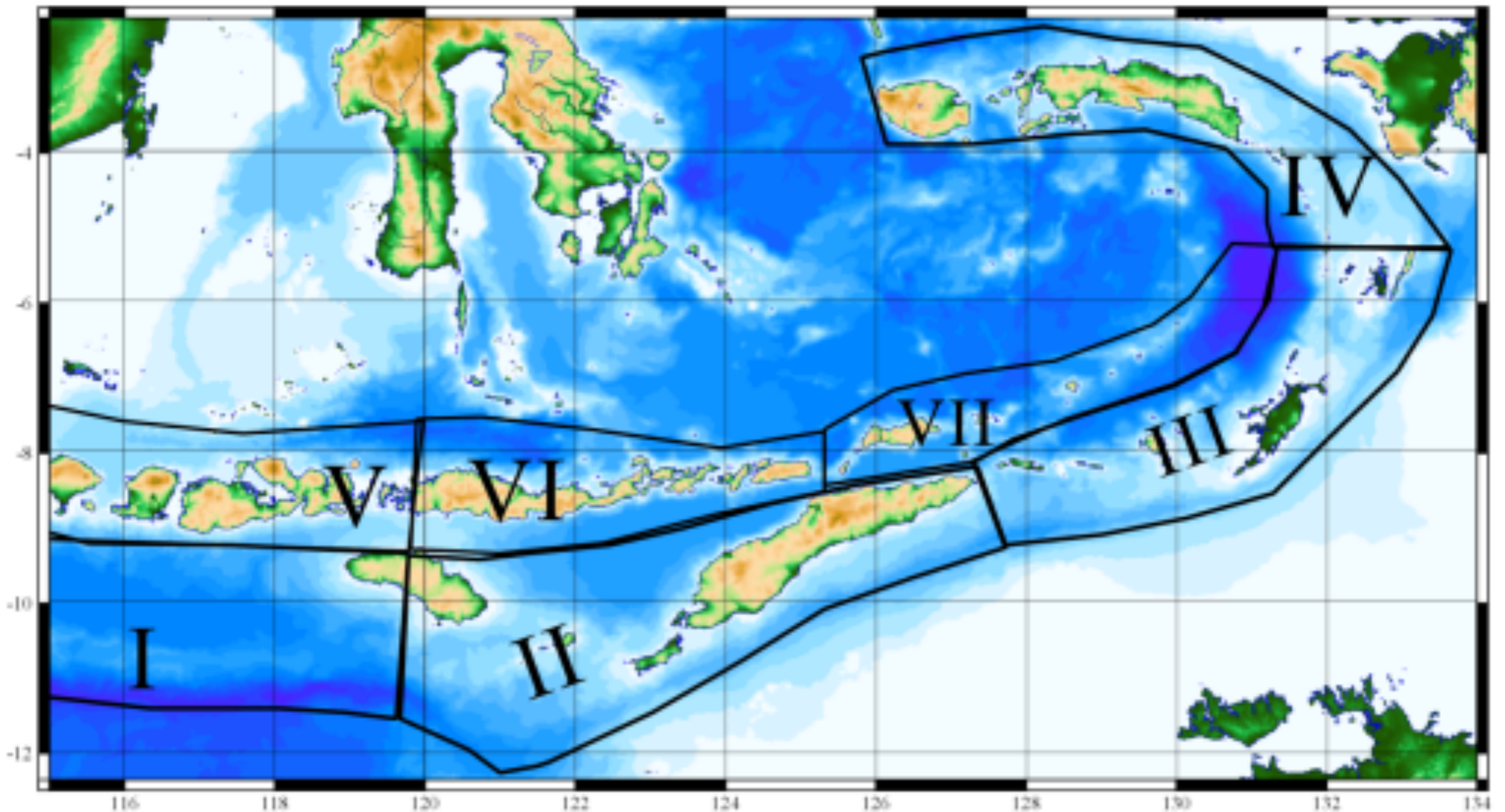
# Kontribusi 3 : Model Rate Gempa

Metoda	Persamaan
Anderson (1997)	$M_o = 2\mu AW \varepsilon_2 / k$
Ward (1994, 1998a, 1998b)	$M_o = 2\mu W A_{max} ( \varepsilon_1 ,  \varepsilon_2 )$
Working Group (1995)	$M_o = 2\mu W A (\varepsilon_1 - \varepsilon_2)$
Savage & Simpson (1997)	$M_o^{min} = 2\mu W A_{max} ( \varepsilon_1 ,  \varepsilon_2 ,  \varepsilon_1 - \varepsilon_2 )$

$$T(M) = \frac{1}{1 - 2b/3} \frac{M_{seis}}{\alpha M_{geod}} \left( \frac{M}{M_{seis}} \right)^{2b/3}$$

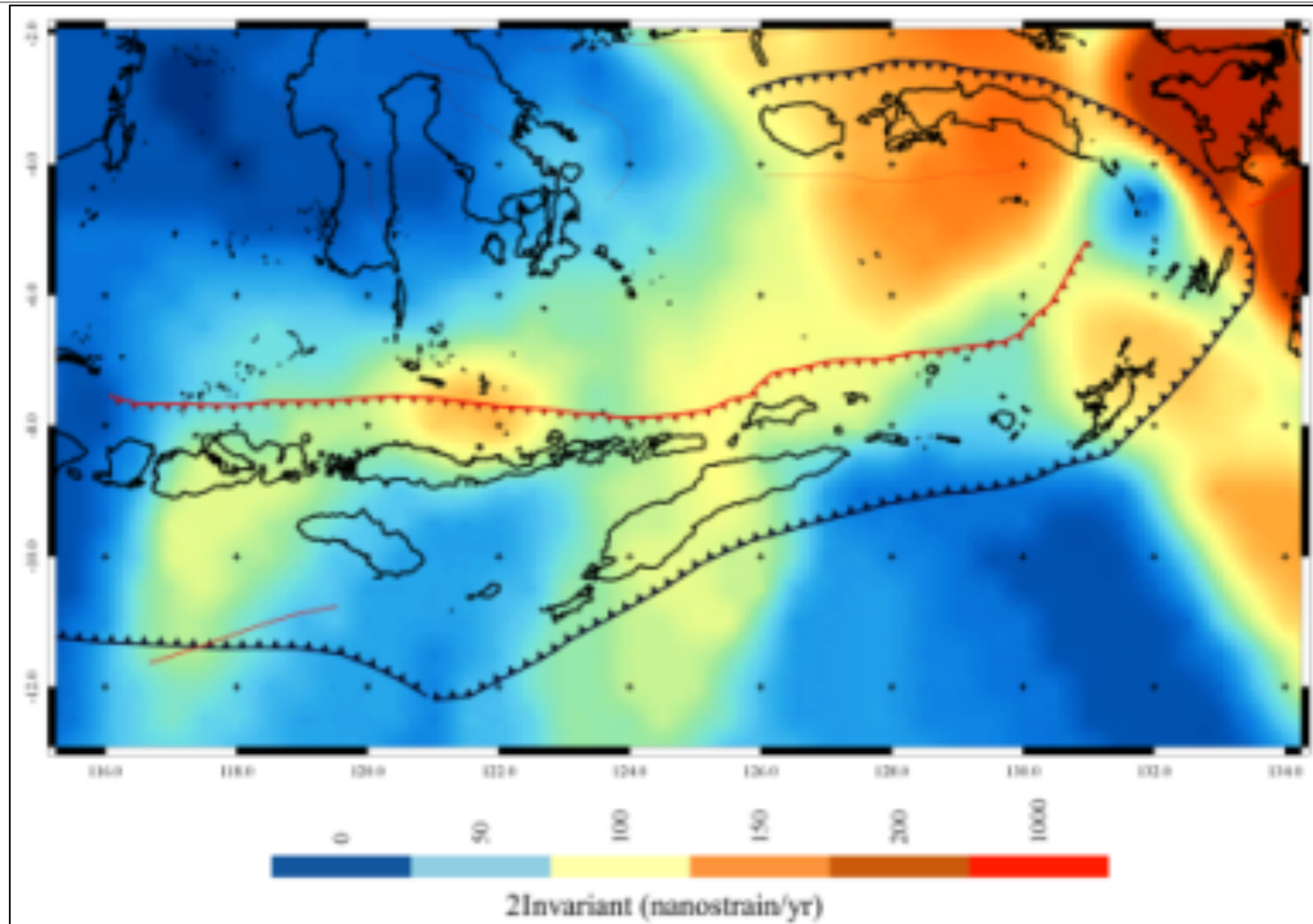
[Molnar, 1979; Ader et al., 2012]

# Kontribusi 3 : Model Rate Gempa

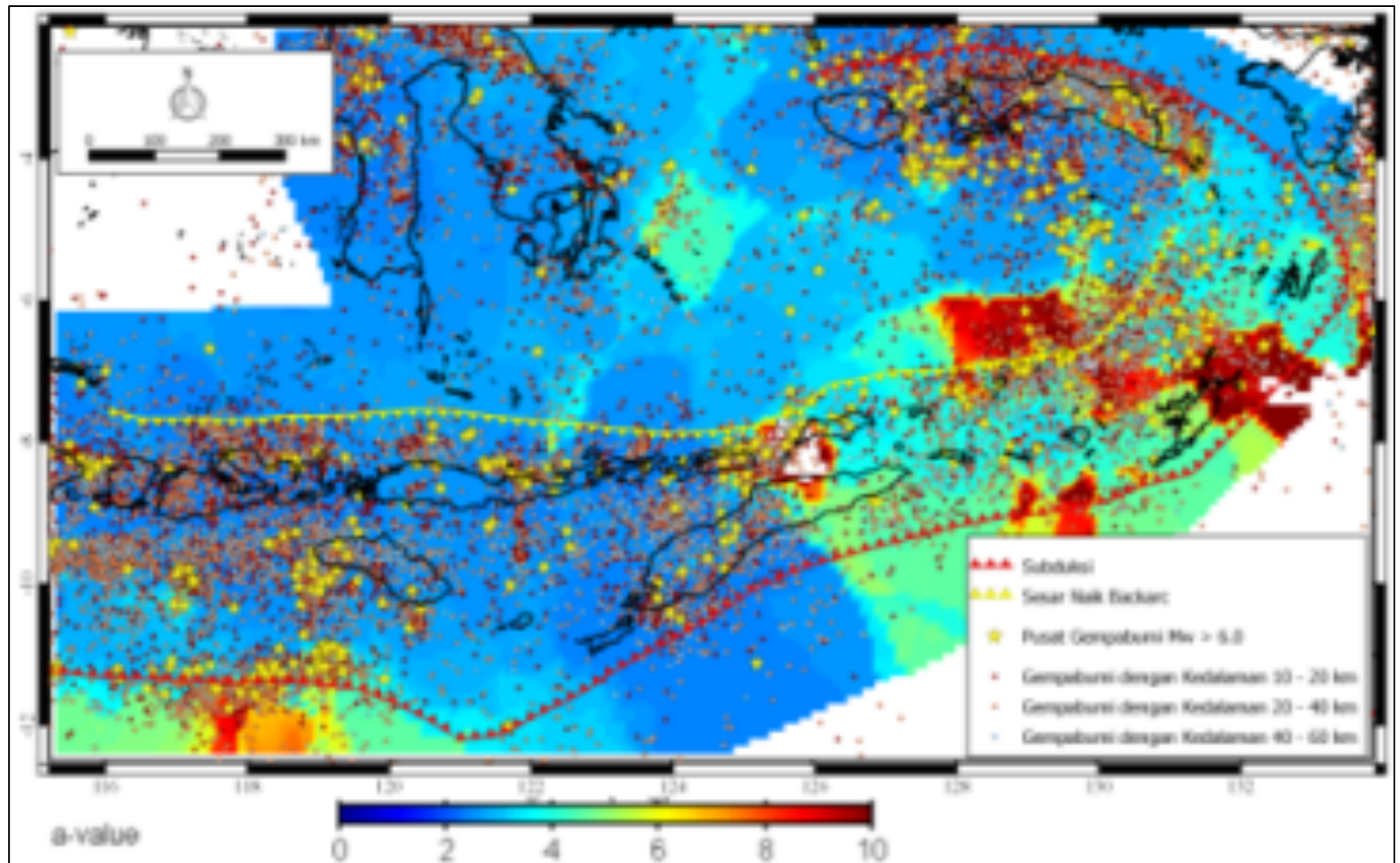




# Kontribusi 3 : Model Rate Gempa (GPS)



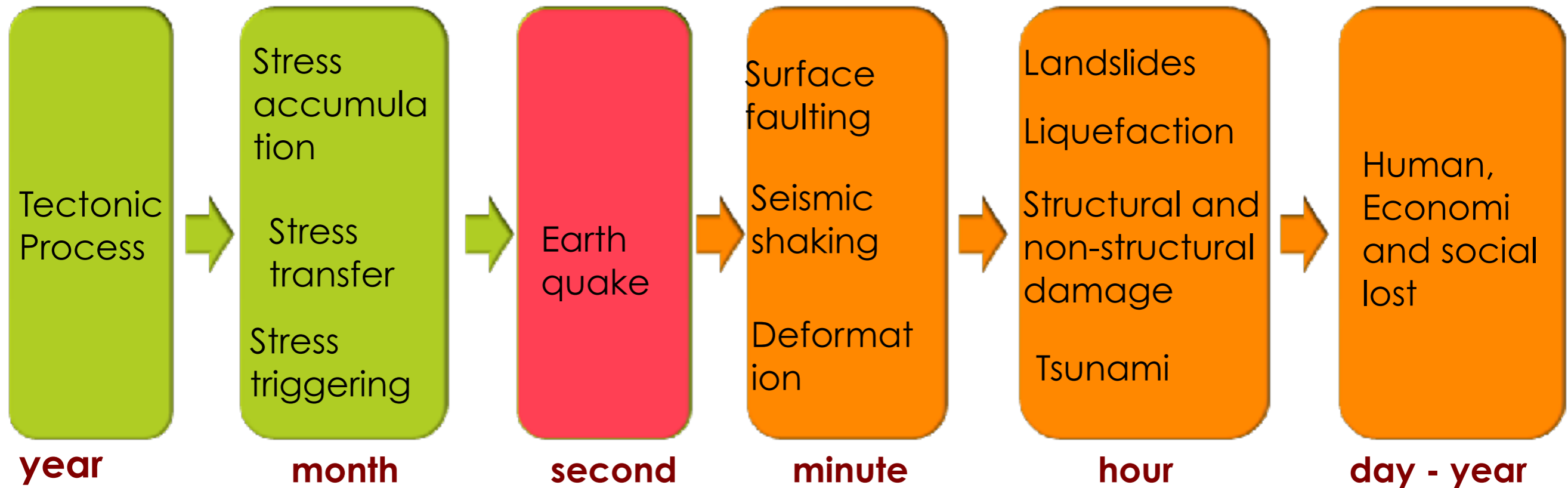
# Kontribusi 3 : Model Rate Gempa (Seismik)



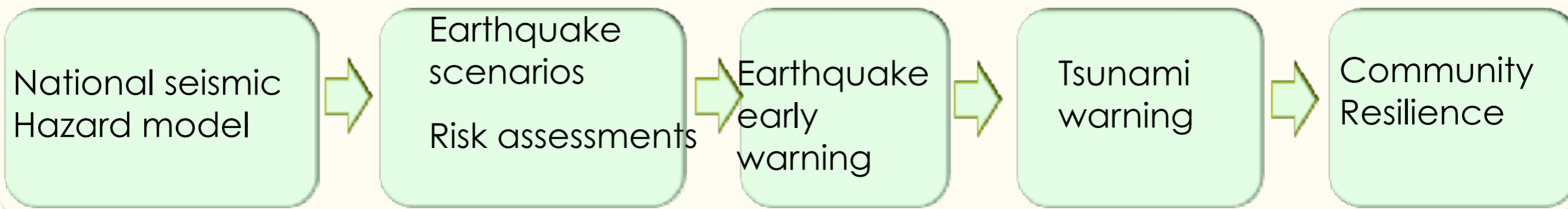
# Kontribusi 3 : Model Rate Gempa

Zona	Interval Perulangan Gempa (Tahun)								
	M <sub>w</sub>	5	5,5	6	6,5	7	7,5	8	8,5
	Mo	3,94E+23	2,21E+24	1,24E+25	6,99E+25	3,94E+26	2,21E+27	1,24E+28	6,99E+28
I		0,012 - 0,013	0,05 - 0,06	0,21 - 0,26	0,9 - 1,2	3,6 - 5,2	15,2 - 23,3	63 - 104	264 - 464
II		0,001 - 0,002	0,005 - 0,010	0,04 - 0,07	0,3 - 0,5	2,3 - 3,2	17,3 - 21,7	131,6 - 146,7	991,7 - 998,2
III		0,001 - 0,002	0,008 - 0,015	0,062 - 0,101	0,5 - 0,7	4,0 - 5,0	32,0 - 34,8	242,8 - 257,0	1703,9 - 2065,3
IV		0,001	0,006 - 0,007	0,052	0,42 - 0,45	3,63 - 3,65	29,3 - 31,4	235,2 - 270,4	1890,2 - 2327,8
V		0,03 - 0,08	0,15 - 0,44	0,77 - 2,42	3,9 - 13,1	19,7 - 71,3	99,8 - 387,2	506,0 - 2103,6	2565,3 - 11428,1
VI		0,017 - 0,023	0,075 - 0,115	0,34 - 0,57	1,53 - 2,83	6,9 - 14,0	31,2 - 69,4	141,1 - 344,0	637,6 - 1704,2
VII		0,003 - 0,005	0,024 - 0,038	0,20 - 0,28	1,65 - 2,04	13,6 - 15,0	108,8 - 111,4	803,5 - 916,2	5888,4 - 7533,5

# Penutup



## Earthquake Research



Modified from NRC, 2011

# Penutup : Dampak gempa terhadap SD

