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Seismicity Analysis for the Sumatra Region

A seismicity analysis for the Sumatra region is carried out by considering the two regional tectonic structures of Sumatra (Sumatra subduction and Sumatra strike-slip fault) and the stable Sunda plate. For the present study, the search spatial window for earthquake events are from and within the coordinates 7.5°S to 10°N and 90°E to 112°E from different available catalogue sources (BGS, ISC-GEM, ARUP, GCMT, ISC, USGS and ANSS). The temporal end date for catalogue s is 30 June 2013 inclusive.

1. Magnitude conversion

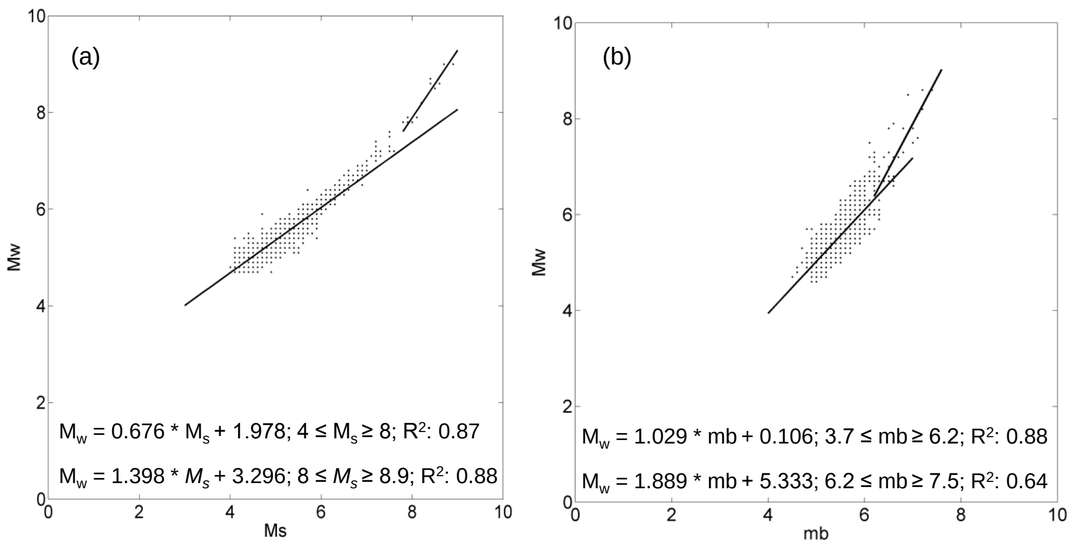

Figure 1: Conversion of magnitude between (a) Ms-Mw and (b) mb-Mw

Table 1: Summary of the earthquake catalogues from various sources			
SNo	Source	Start Date	End Date
1	BGS	1681/12/11	1903/02/27
2	ISC-GEM	1907/01/04	2009/12/23
3	ARUP	1833/11/24	2005/12/29
4	GCMT	1976/06/20	2013/06/26
5	ISC	1909/01/07	2008/12/21
6	USGS	1963/12/15	2013/06/26
7	ANSS	1963/02/15	2013/06/26

2. Seismicity plots of independent events

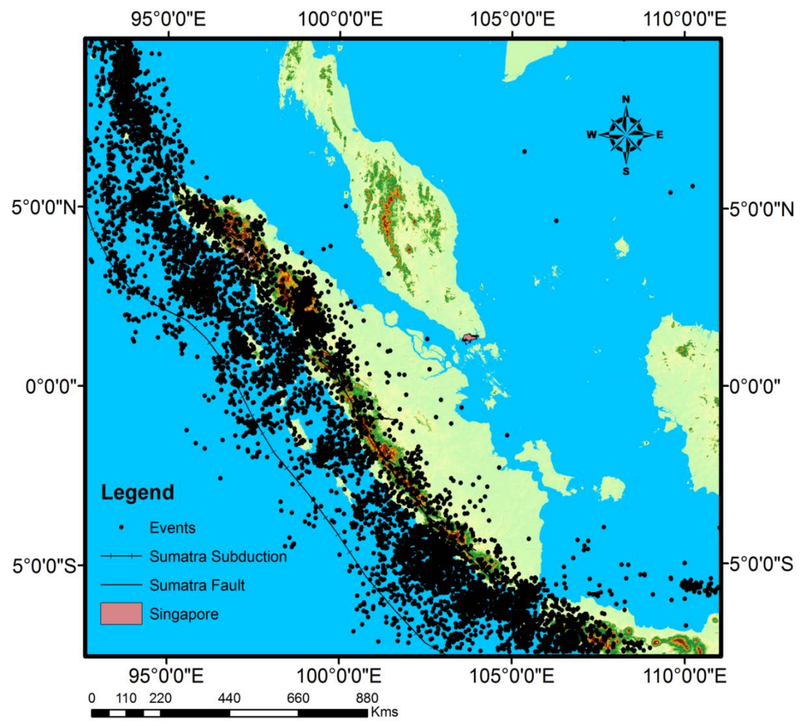

Figure 2: Overall seismicity plot of independent events

3. Source zones

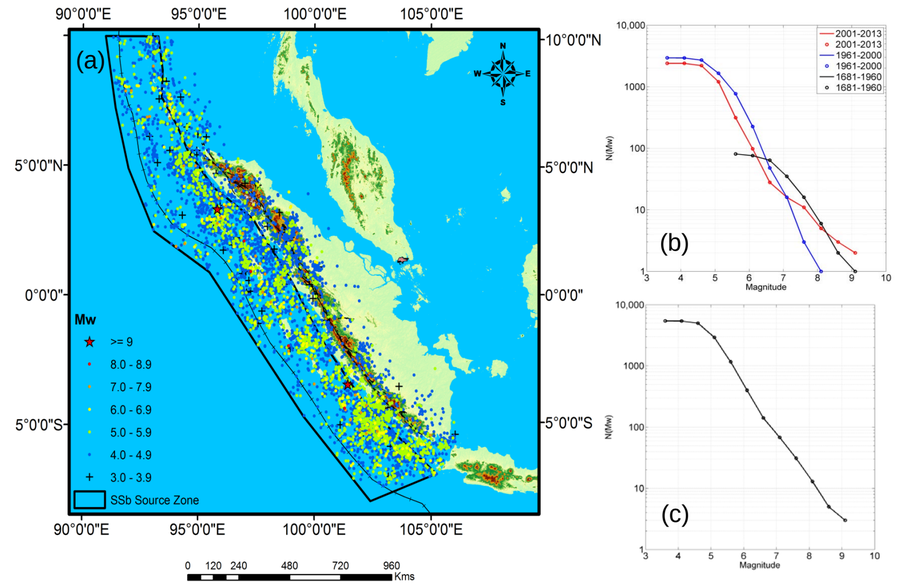

Figure 3A: Sumatra Subduction (SSb) events plots of (a) Independent events, (b) magnitude completeness (M_c) at different time periods and (c) overall magnitude completeness

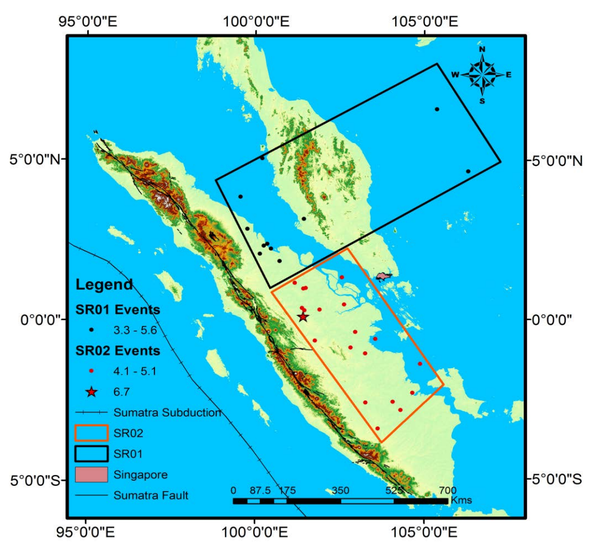

Figure 3C: Independent events of the stable Sunda Plate.

4. Seismicity Analysis

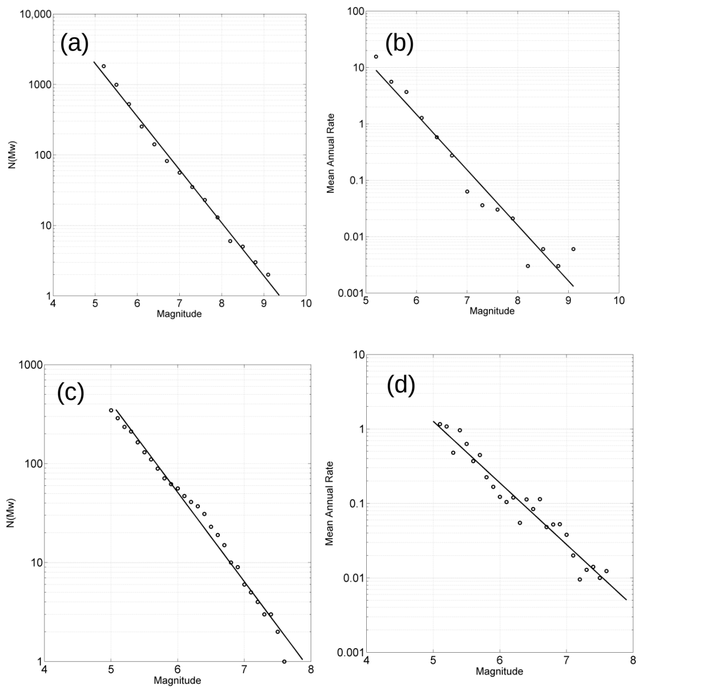

Figure 4: Cumulative plot for the (a) SSb events above M_c to estimate the seismicity parameters and (b) the annual rate of exceedance and (c) for SSt events to extimate Mc and (d) annual rate of exceedance

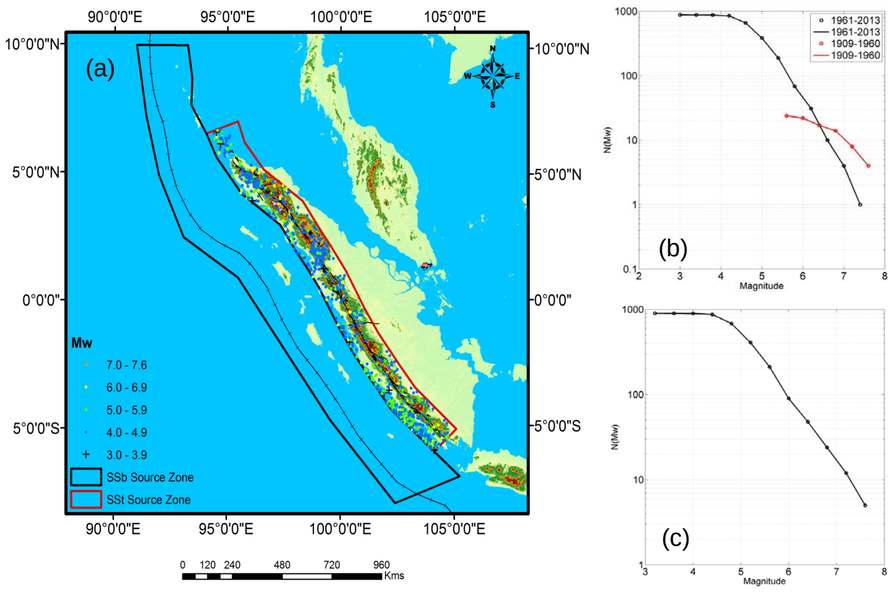

Figure 3B: Sumatra Strike-slip (SSt) events plots of (a) Independent events, (b) magnitude completeness (M_c) at different time periods and (c) overall magnitude completeness

Table 2: Summary of the seismic hazard parameters							
Source	M_{max}rec	m_{max}	M_c	a	b	λ_m	R_t (years)
SSb	9.1	9.35	5.1	7.06	0.75	0.000745	~1340
SSt	7.6	7.93	5.2	7.29	0.92	0.004774	~210
SR	6.7	6.7	-	-	-	-	-
M_{max}rec: Maximum recorded magnitude; R_t: Return period; λ_m: mean annual rate; M_c: minimum magnitude of completeness.							

Table 3: Summary of λ_m for the SSb and SSt source zones			
Source	Mag	λ_m	Rt (years)
SSb	9.4	0.0006	1.667
	9.1	0.0013	769
	8.8	0.0026	384
SSt	8.0	0.0042	238
	7.7	0.0074	135
	7.4	0.0131	76

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