Electronic Supplement 1: Data and uncertainties

The tables below summarize the information on the data collected for this study and used in the modeling, They consist of campaign GPS data (Tables 1,2,3) and data from continuous GPS stations (Table 4), coral measurements from Simeulue island [1] (Table 5) and estimation of the position of the pivot-line (Table 6) and estimation of uplift or subsidence (Table 7) based on satellite images analysis[1], and estimates of uplift or subsidence from eyewitness accounts [2]. GPS displacements (Table 1) were obtained from measurements collected one month or more after the earthquake, compared to measurements collected during various surveys between 1991 and 2001. A kinematic model was used to correct for steady motion that may have occurred in the time between the last occupation and just before the earthquake (Table 2). These corrections are also listed in Table 2. Uncertainties were scaled according to the time between occupations to account for unmodeled steady motions. Minimum and maximum constraints on vertical motions from satellite imagery were assigned uncertainties of 50 mm. Field observations of vertical motions had uncertainties that ranged from 50 mm (coral observations) to 1 meter (eyewitness accounts of sea-level change).

Table 1. Campaign GPS station coordinates and estimated displacements (mm) due to the 26 December 2004 Sumatra-Andaman earthquake. These displacements were estimated from the campaign data (see table 2 for campaign dates) and corrected for interseismic deformation using the velocities listed in Table 2. The uncertainties were increased by 5 mm for each elapsed year since the last occupation.

site	Long.	Lat.	East	North	sE	sN	Up	sU
BM12	98.9449	2.64259	-89.0	-19.8	66.6	23.8	-80.5	73.3
D962	97.4465	1.68602	-33.2	-27.0	64.9	25.3	-53.5	55.8
D972	96.6245	2.17441	10.0	-24.6	66.9	64.9	-571.4	66.9*
JAHE	98.5075	3.14524	-203.1	-21.8	9.34	88.2	5.3	89.9
K504	95.2435	5.43378	-2114.0	-1763.4	105.7	88.2	-171.7	59.7
K505	95.2716	5.48000	-2067.5	-1745.5	103.4	87.3	-61.1	80.7
K515	95.4873	5.56851	-1659.9	-1342.0	83.0	67.1	-46.2	63.7
LANG	97.9999	4.42753	-368.1	-98.9	41.1	42.6	-11.9	60.8
LHOK	97.1585	5.08665	-577.9	-219.0	43.4	47.8	76.5	105.4
MART	98.6823	2.52419	-144.8	-12.7	41.4	24.0	-122.8	86.9
NIND	98.7506	2.72953	-131.2	-6.5	32.6	23.0	-454.6	91.6*
PAND	98.8188	1.67586	-41.1	-35.5	41.8	39.7	-26.4	27.7
PIDI	95.9333	5.33080	-1399.3	-955.7	40.5	38.8	35.4	49.0

PISU	99.1472	2.44756	-82.5	-14.3	27.7	31.1	-12.9	61.7
SIPA	99.0890	2.10263	-102.7	-58.6	66.2	63.1	-114.4	69.9
TIGA	98.5622	2.91856	-142.6	-4.1	22.8	23.6	45.2	30.5*
R171	95.3877	2.95996	-3820.9	-4322.1	19.1	216.1	2098.8	45.8
R173	95.5183	4.60702	-2853.7	-2376.3	142.7	118.8	-601.0	42.0
R174	95.3654	4.84193	-2771.9	-2414.3	138.6	120.0	-583.8	84.1
R175	95.2030	5.24116	-2434.9	-2076.1	121.7	103.8	-226.6	121.1
R176	95.0572	5.71287	-2174.5	-1710.9	108.7	85.5	-142.1	90.8
R178	95.3331	5.85853	-1588.5	-1292.5	79.4	64.5		
TELE	98.6397	2.53485	-94.1	-2.6	27.5	22.9		

* Vertical measurements not been used in the inversion.

Table 2. Year of occupation for GPS campaign stations and velocities (in mm) relative to the Sunda Shelf used to correct for interseismic deformation. These velocities were estimated directly from the data or from a model of interseismic strain accumulation[3].

Date	91	92	93	94	95	96	97	98	99	01	05[1]	V_E	V_N	SigE	SigN
BM12				X						X	54	7.02	7.80		
D962	X	X	X							X	39	6.81	30.40	43.58	0.52*
D972	X		X								43	8.72	33.72		
JAHE		X									53	6.94	8.08		
K504		X	X	X							40	1.85	31.37		
K505		X	X	X							39	1.47	31.19		
K515		X	X								38	2.33	28.60		
LANG		X					X				41	5.97	5.63		
LHOK		X					X				36	6.51	6.16		
MART	X		X	X		X				X	55	5.25	11.81		
NIND				X						X	56	6.92	8.60		
PAND			X							X	33	3.01	26.02		
PIDI		X					X	X			37	7.93	11.31		
PISU				X						X	55	7.14	7.54		
SIPA	X		X								48	7.55	10.49		
TIGA				X						X	55	0.36	6.37	9.51	1.80*
R171								X			43	11.57	35.73		
R173								X			39	5.89	32.03		
R174							X				40	5.46	31.98		
R175							X				42	3.56	31.71		
R176								X			45	-2.29	30.11		
R178							X				49	-0.49	26.23		
TELE				X						X	55	4.67	12.62		

[1]Number of days after the main shock.

Table 3. Horizontal displacements (mm) in the Andaman & Nicobar Islands. Pre earthquake measurements from Sept-2004 and Post earthquake data from Jan-2005.

site	Long.	Lat.	East	North	sE	sN	Source
DGLP	92.969	13.16	-3940	-2759	193.0	143.6	CESS website*
PBLR	92.744	11.655	-2875	-1104	142.0	59.5	CESS website*
HBAY	92.544	10.591	-3419	-2972	166.7	153.3	CESS website*
CARN	92.804	9.247	-5545	-2948	272.8	155.6	CESS website*
CBAY	93.932	7.014	-4010	-2315	197.0	121.6	CESS website*

*CESS website, http://www.seires.net/content/view/123/52/. Uncertainties are not given on this website. We have assigned estimated values based on the comparison with our own measurements from Sumatra.

Table 4. Horizontal displacements (mm) at PHKT, SAMP and NTUS continuous GPS stations.

site	Long.	Lat.	East	North	sE	sN	Source
PHKT	98.308	8.105	-249.8	-107.26	3.2	2.27	Vigny et al[4]
PHKT	98.308	8.105	-307.8	-132.16	4.3	3.37	Vigny et al*
SAMP	98.715	3.62	-160.3	-13.83	3.7	2.56	This study*
NTUS	103.68	1.34	-22.15	11.05	3.9	1.74	This study*

*Cumulative displacement for 30 days deduced from the time series.

Table 5. Coral measurements from Simeulue island.

site	Long.	Lat.	Obs(cm)	Sig	Source
Cor1	95.763	2.709	131	5	this study
Cor2	95.716	2.749	147	16	this study
Cor3	95.714	2.807	148	16	this study
Cor4	95.836	2.914	34	16	this study
Cor5	95.872	2.613	101	5	this study
Cor6	95.937	2.548	46	5	this study
Cor7	95.992	2.569	48	5	this study
Cor8	95.763	2.861	132	5	this study
Cor9	95.918	2.844	22	5	this study
Cor10	95.804	2.924	46	5	this study

Table 6. Position of the Pivot Line determined from the Satellite Imagery study of Meltzner et al[1] Used in model of Fig3b only.

site	Long.	Lat.	Obs	Sig
SatIm1	93.36102	13.46991	0	25
SatIm2	93.29639	13.27142	0	25
SatIm3	93.23042	13.12814	0	25
SatIm4	93.13868	12.94974	0	25
SatIm5	93.03164	12.76625	0	25
SatIm6	92.93989	12.63372	0	25
SatIm7	92.86853	12.47061	0	25
SatIm8	92.78697	12.27183	0	25

SatIm9	92.71052	12.06284	0	25
SatIm10	92.63406	11.85896	0	25
SatIm11	92.56780	11.72643	0	25
SatIm12	92.50663	11.62959	0	25
SatIm13	92.46076	11.47667	0	25
SatIm14	92.45566	11.33395	0	25
SatIm15	92.49644	11.16575	0	25
SatIm16	92.62896	11.01793	0	25
SatIm17	92.72581	10.89050	0	25
SatIm18	92.74620	10.79366	0	25
SatIm19	92.75219	10.68587	0	25
SatIm20	92.75639	10.61016	0	25
SatIm21	92.73600	10.14632	0	25
SatIm27	95.98676	2.97826	0	25
SatIm28	96.06413	2.86430	0	25
SatIm29	96.13779	2.73399	0	25
SatIm30	96.20577	2.59235	0	25
SatIm31	96.24543	2.47904	0	25
SatIm32	96.26809	2.33740	0	25
SatIm33	96.25676	2.20709	0	25
SatIm34	96.20577	2.05412	0	25
SatIm35	96.04714	1.78784	0	25

Table 7. Satellite Imagery constraints of Meltzner et al[1]

Long.	Latit.	Min	Max	Label
98.348	1.972	-9999	432	AM164
98.373	2.010	-9999	437	AM163
98.266	2.027	-9999	432	AM162
98.176	2.096	-9999	421	AM161
98.125	2.146	-9999	421	AM160
98.038	2.188	-9999	421	AM159
97.935	2.254	-9999	418	AM158
96.445	2.333	-283	9999	AM134
96.487	2.405	-287	59	AM135
96.225	2.415	-168	9999	AM133
96.206	2.470	44	9999	AM132
96.133	2.519	50	9999	AM131
95.937	2.548	131	9999	AM129
95.992	2.569	80	9999	AM130
97.515	2.871	-9999	9	AM157
97.441	2.907	-9999	95	AM156
95.406	3.014	277	9999	AM128
97.192	3.257	-222	9999	AM155
97.125	3.338	-221	9999	AM154
97.052	3.455	-90	9999	AM153
97.000	3.547	-92	9999	AM152
95.622	4.600	-9999	0	AM151
95.249	5.498	-9999	0	AM150
95.277	5.508	-9999	0	AM149
95.252	5.542	-9999	0	AM147
95.270	5.548	-9999	0	AM146
95.235	5.552	-9999	0	AM148
95.300	5.560	-9999	0	AM145
95.333	5.577	-9999	0	AM144

95.360 5.592 -9999 0 AM143
95.400 5.626 -9999 0 AM142
95.414 5.646 -9999 0 AM141
93.877 6.820 -9999 -671 AM125
93.823 6.821 -9999 -671 AM124
93.774 6.920 -9999 -445 AM122
93.735 6.985 -9999 -445 AM121
93.674 7.026 -9999 -445 AM120
93.667 7.074 -9999 -417 AM119
93.663 7.104 -9999 -417 AM118
93.673 7.136 -9999 -384 AM117
93.885 7.173 -9999 -103 AM126
93.680 7.180 -9999 -464 AM116
93.757 7.204 -9999 -464 AM115
93.648 7.371 -9999 -209 AM114
93.686 7.373 -9999 -209 AM113
93.701 7.401 -9999 -209 AM112
93.623 7.470 -9999 -221 AM111
93.339 7.890 -9999 -319 AM108
93.328 8.002 -9999 27 AM107
93.601 8.080 -9999 -428 AM110
93.500 8.214 -9999 -390 AM109
93.117 8.232 -9999 -82 AM105
93.232 8.232 -9999 220 AM106
93.137 8.311 -9999 -4 AM104
93.068 8.460 -9999 25 AM103
92.798 9.118 -9999 -72 AM170
92.830 9.166 -9999 -72 AM102
92.720 9.211 -9999 -85 AM101
92.481 10.511 179 9999 AM097
92.543 10.511 179 9999 AM098
92.391 10.523 179 9999 AM096
92.382 10.546 218 9999 AM095
92.410 10.609 218 9999 AM094
92.384 10.662 218 9999 AM093
92.378 10.781 74 9999 AM092
92.608 10.783 175 9999 AM099
92.592 10.801 210 9999 AM090
92.431 10.830 210 9999 AM091
92.535 10.899 210 9999 AM089
92.236 10.972 294 9999 AM088
92.614 11.463 -9999 -230 AM079
92.570 11.497 -9999 -298 AM063
92.619 11.498 -9999 -230 AM078
92.288 11.520 295 9999 AM087
92.216 11.528 295 9999 AM086
92.746 11.548 -9999 -31 AM069
92.280 11.585 295 9999 AM085
92.219 11.596 295 9999 AM084
92.670 11.649 -9999 -660 AM068
92.603 11.662 -9999 -297 AM062
92.710 11.669 -9999 -660 AM067
92.754 11.702 -9999 -633 AM066
92.525 11.804 102 9999 AM060
92.529 11.877 102 9999 AM059
93.003 11.924 -9999 -35 AM076
92.551 11.930 100 9999 AM058

92.971 11.957 -9999 -35 AM075
92.929 11.992 -9999 -35 AM074
93.016 12.009 -9999 -35 AM073
92.625 12.035 95 9999 AM057
92.789 12.071 -9999 -453 AM065
92.954 12.105 -9999 -34 AM072
92.639 12.133 91 9999 AM056
92.830 12.153 -9999 -464 AM064
92.671 12.221 93 374 AM055
92.704 12.257 83 356 AM054
92.705 12.331 368 9999 AM049
92.950 12.371 -9999 -35 AM053
92.706 12.378 368 9999 AM048
92.964 12.405 -9999 -35 AM052
92.705 12.413 385 9999 AM047
92.705 12.467 385 9999 AM046
92.684 12.504 391 9999 AM045
92.690 12.557 391 9999 AM044
92.710 12.569 391 9999 AM043
92.688 12.583 391 9999 AM042
92.710 12.641 393 9999 AM041
92.726 12.717 393 9999 AM040
92.718 12.752 397 9999 AM039
92.950 12.852 9 170 AM050
92.734 12.864 397 9999 AM038
92.919 12.894 10 174 AM034
92.770 12.936 398 9999 AM037
92.799 13.025 375 9999 AM025
92.978 13.027 9 9999 AM033
92.707 13.062 97 9999 AM036
92.808 13.092 375 9999 AM024
92.819 13.108 359 9999 AM023
92.709 13.111 97 9999 AM035
93.041 13.117 171 9999 AM032
92.800 13.167 361 9999 AM022
92.825 13.199 362 9999 AM021
93.061 13.222 171 9999 AM031
93.090 13.296 174 9999 AM030
92.841 13.354 371 9999 AM020
92.846 13.389 382 9999 AM019
93.099 13.400 169 9999 AM029
93.074 13.419 214 9999 AM027
93.113 13.431 169 9999 AM028
92.898 13.473 378 9999 AM018
93.045 13.478 214 9999 AM026
92.879 13.493 378 9999 AM017
92.922 13.516 352 9999 AM015
92.882 13.537 378 9999 AM016
92.964 13.541 352 9999 AM014
92.895 13.568 392 9999 AM011
92.996 13.571 352 9999 AM013
93.038 13.575 352 9999 AM012
92.909 13.599 392 9999 AM010
93.060 13.611 376 9999 AM006
93.033 13.619 376 9999 AM007
92.984 13.647 376 9999 AM009
93.081 13.648 376 9999 AM005

93.029 13.674 376 9999 AM008
93.237 13.967 233 9999 AM004
93.236 14.015 233 9999 AM003
93.682 14.862 200 9999 AM001

* -9999 and 9999 indicate subsidence and uplift, respectively, are unbounded. Vertical displacements are in millimeters. Uncertainties for all are 75 mm. These data are used in the model of Fig 3a only.

Table 8: Field observations reported by Bilham et al.[2] updated from Bilham's website, http://cires.colorado.edu/~bilham/IndonesiAndaman2004.htm

site	Long.	Lat.	Obs	Sig	Source
Bil1	93.08	13.25	70	100	(Bilham et al. 2005)
Bil2	92.8	12.42	150	100	(Bilham et al. 2005)
Bil3	92.25	11.55	150	100	(Bilham et al. 2005)
Bil4	92.55	10.6	100	100	(Bilham et al. 2005)
Bil5	92.75	11.75	-150	100	(Bilham et al. 2005)
Bil6	92.7	9.2	100	100	(Bilham et al. 2005)*
Bil7	92.82	9.15	-100	100	(Bilham et al. 2005)
Bil8	93.85	6.8	-150	100	(from the Chief Hydrographer, Bilham et al. 2005)
Bil9	93.35	7.9	-200	100	Bilham's website

* Contradiction with satellite imagery observations at this point.

1. Meltzner, A. J. et al. Uplift and subsidence associated with the great Aceh-Andaman earthquake of 2004. J. Geophys. Res. 111, doi:10.1029/2005JB003891 (2006).
2. Bilham, R., Engdahl, R., Feldl, N. & Satyabala, S. P. Partial and complete rupture of the Indo-Andaman plate boundary 1847-2004. Seismological Research Letters 76, 299-311 (2005).
3. Prawirodirdjo, L., et al.,. Geodetic observations of interseismic strain segmentation at the Sumatra subduction zone. Geophys. Res. Lett. 24, 2601-2604 (1997).
4. Vigny, C. et al. Insight into the 2004 Sumatra-Andaman earthquake from GPS measurements in southeast Asia. Nature 436, 201-206 (2005).