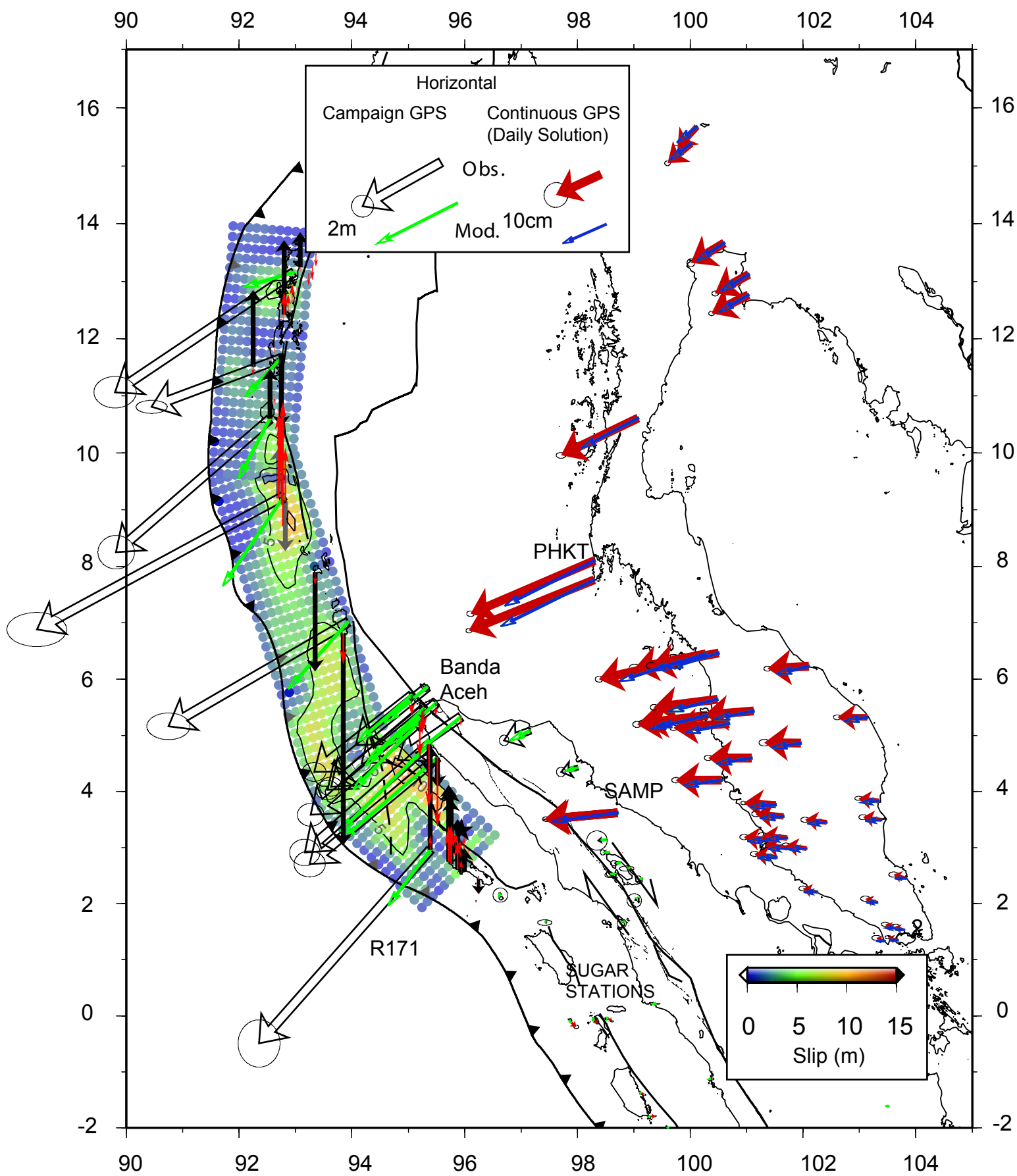
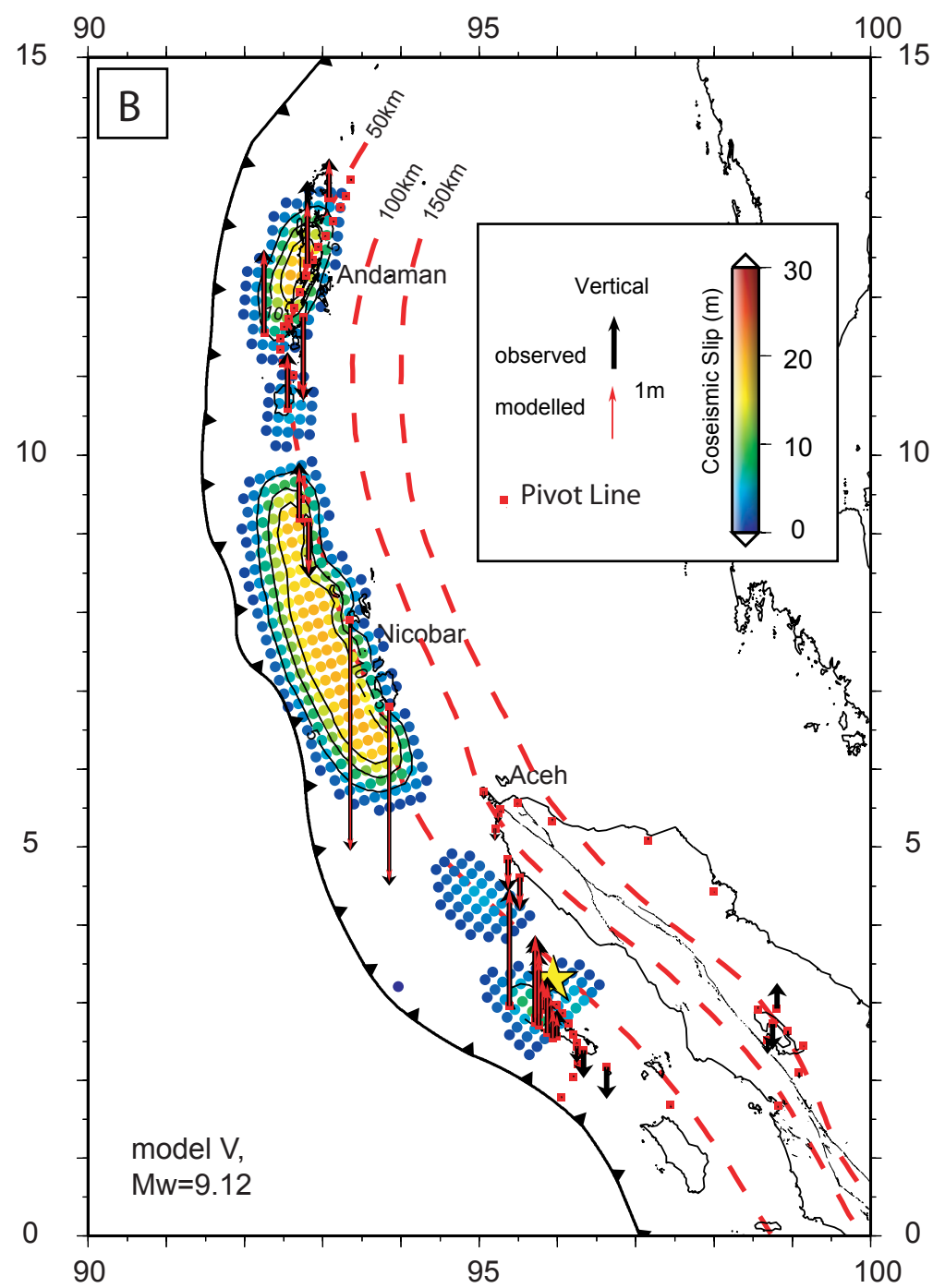
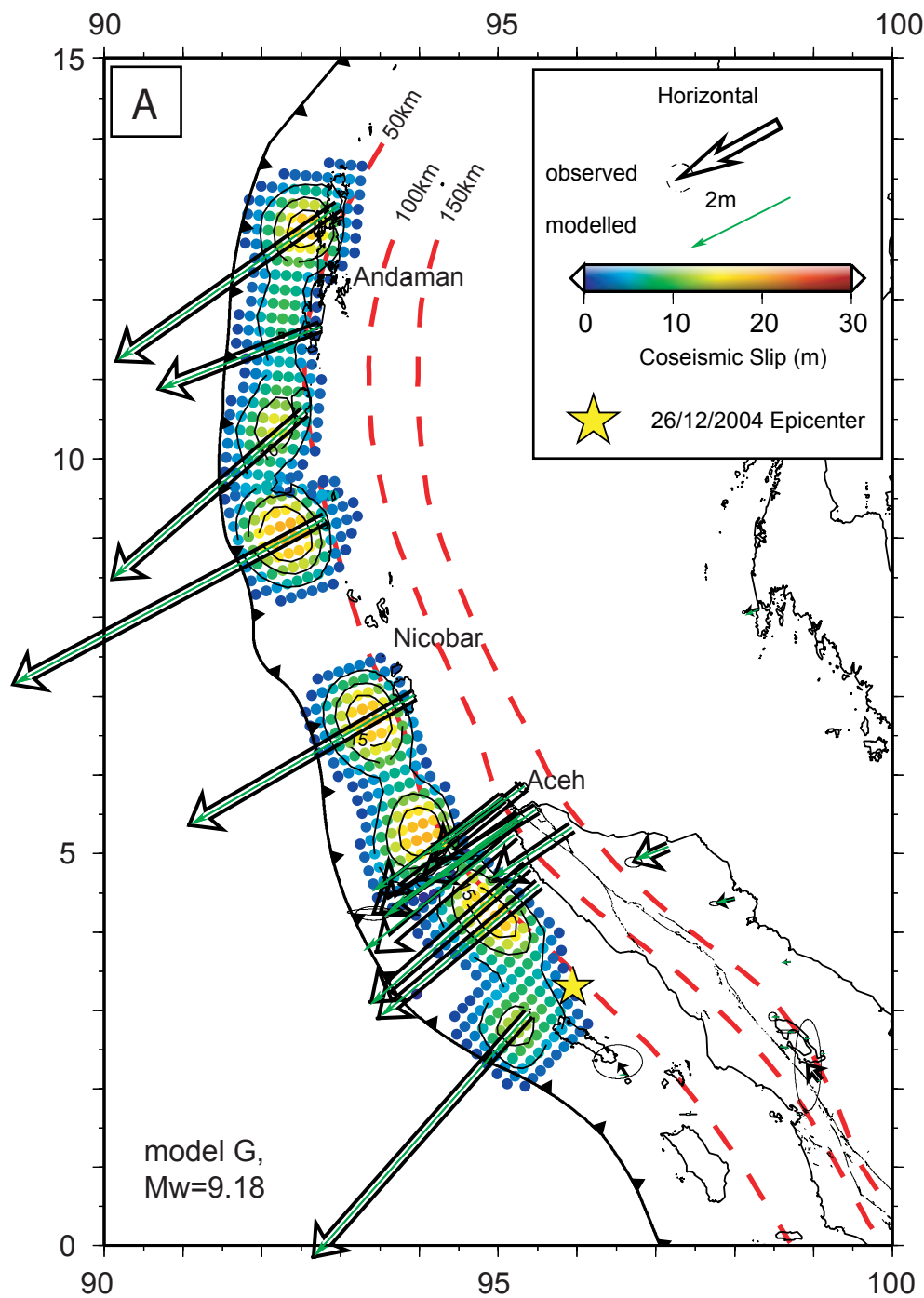
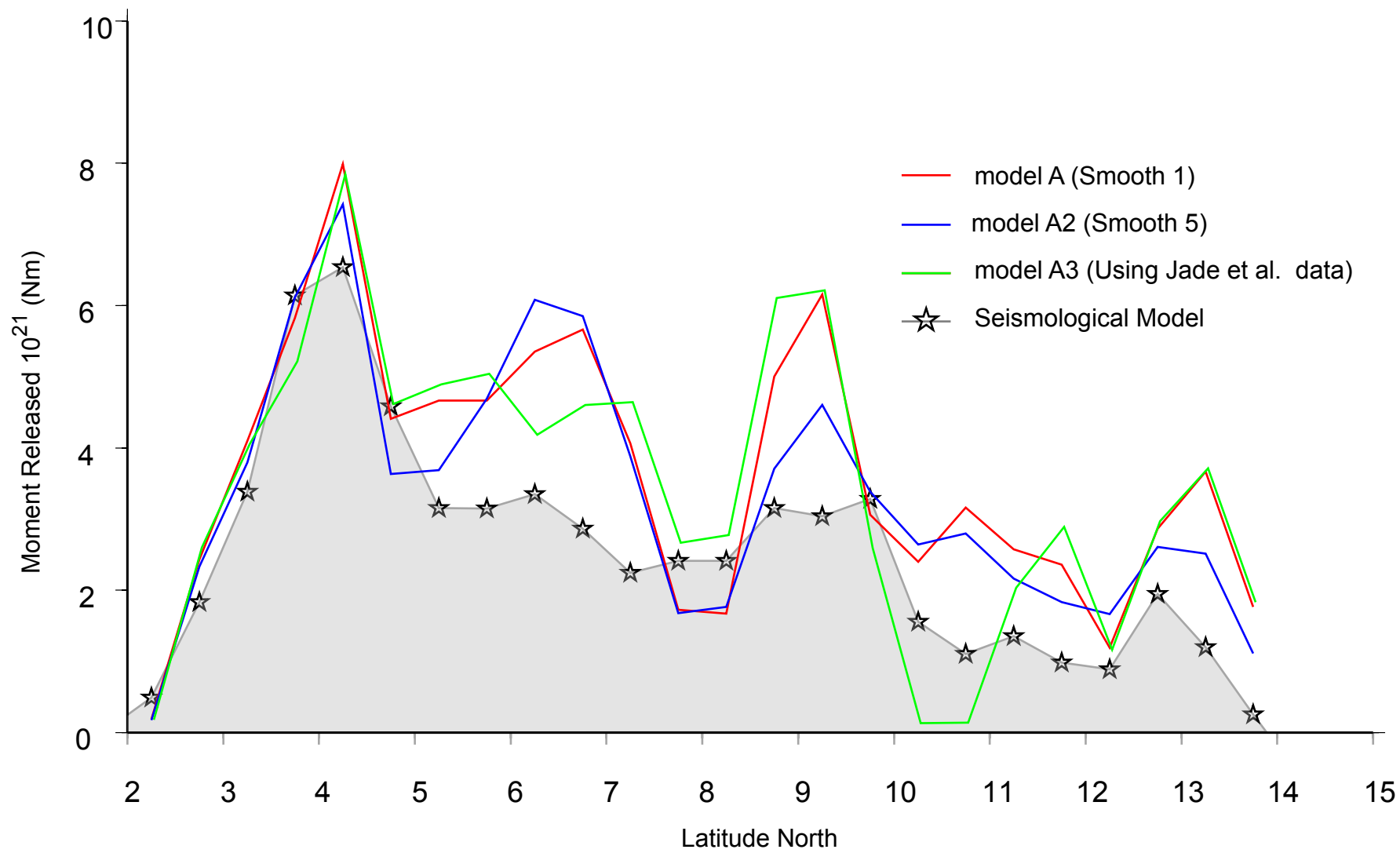




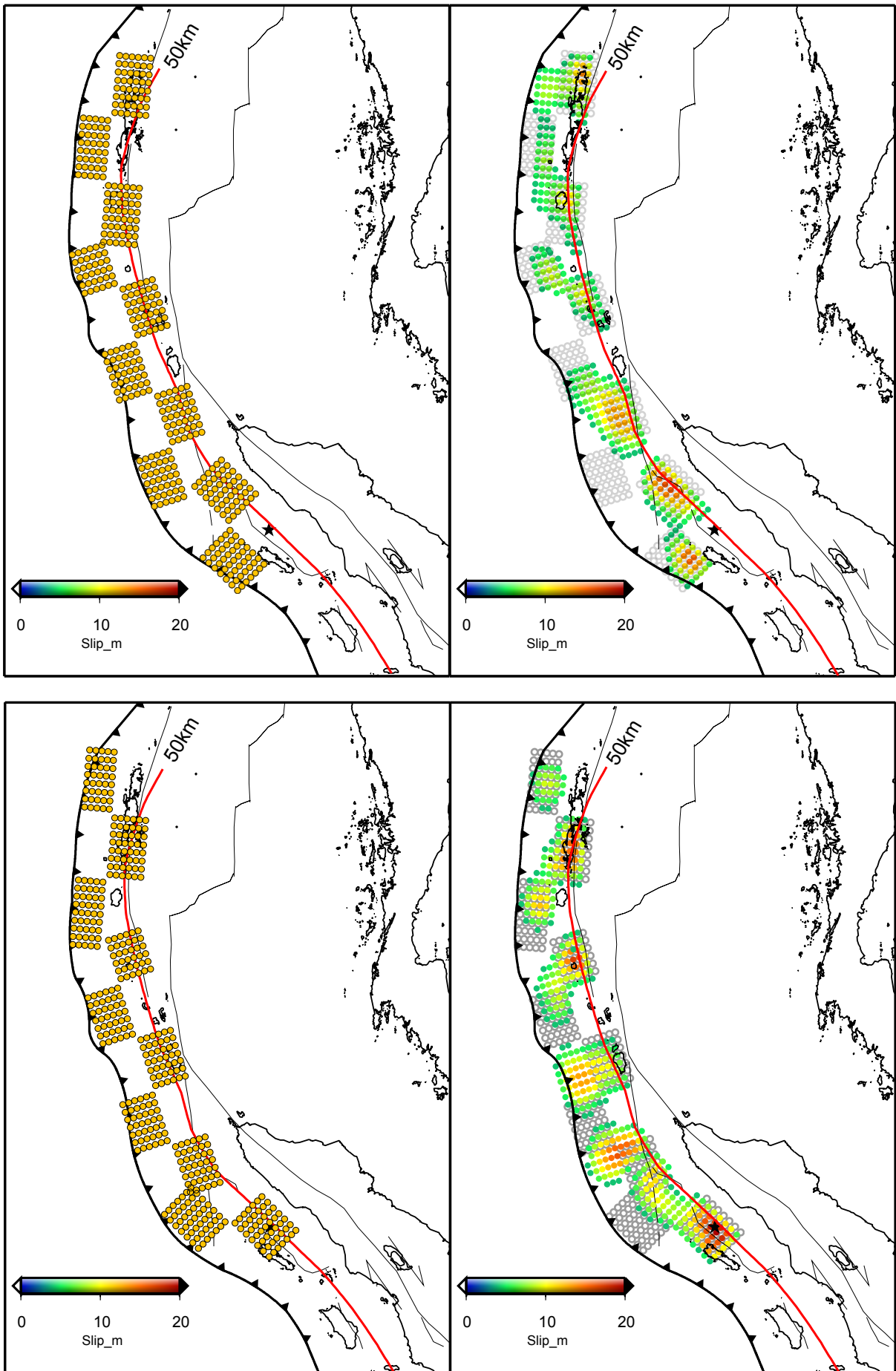
Supplementary Figure 1



Supplementary Figure 2



Supplementary Figure 3



Supplementary Figure 4

## 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 <sup>1</sup> (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<sup>1</sup>, and estimates of uplift or subsidence from eyewitness accounts <sup>2</sup>. 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   | 107.9 | 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 | 85.9  | 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<sup>3</sup>.

| Date | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 01 | 05 <sup>1</sup> | V <sub>E</sub> | V <sub>N</sub> | 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          |       |       |

<sup>1</sup>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  | -3990 | -2680 | 193.0 | 143.6 | CESS website* |
| PBLR | 92.744 | 11.655 | -2890 | -1080 | 142.0 | 59.5  | CESS website* |
| HBAY | 92.544 | 10.591 | -3430 | -2970 | 166.7 | 153.3 | CESS website* |
| CARN | 92.804 | 9.247  | -5530 | -2990 | 272.8 | 155.6 | CESS website* |
| CBAY | 93.932 | 7.014  | -4010 | -2330 | 197.0 | 121.6 | CESS website* |

\*CESS website, <http://www.seires.net/content/view/123/52/>

**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 <sup>4</sup> |
| PHKT | 98.308 | 8.105 | -307.8 | -132.16 | 4.3 | 3.37 | This study*              |
| 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<sup>1</sup> 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 |
| SatIm22 | 92.72581 | 9.68758  | 0 | 25 |
| SatIm23 | 92.72479 | 9.66425  | 0 | 25 |
| SatIm24 | 92.71982 | 9.45086  | 0 | 25 |
| SatIm25 | 92.75529 | 9.09613  | 0 | 25 |
| SatIm26 | 92.77303 | 8.72366  | 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<sup>1</sup>

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 -70 AM170  
92.830 9.166 -9999 -70 AM102  
92.720 9.211 -9999 -90 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.<sup>2</sup> 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                                  |

1. Meltzner, A. J. et al. Uplift and subsidence associated with the great Aceh-Andaman earthquake of 2004. *J. Geophys. Res.*, in press (2005).
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).

## Electronic Supplement 2

In this section we explain further the data handling and the modeling. The modeling results described in the paper were done in two ways – one to make a direct comparison to the seismological results of Ammon et al. (2005)<sup>1</sup> who used 3 dipping planes to represent the fault (Figure 3a) and the other to represent the 3-dimensional geometry of the subduction megathrust (Figure 3b).

### Model A

In order to allow some direct comparison with the seismologically-derived slip model of Ammon et al. (2005)<sup>1</sup>, we inverted the geodetic data using the same fault geometry and layered structure. The fault consists of 3 planar segments with different strikes, and dip angles increasing from 12° in the south to 17.5° in the north (Table1). The seismic model predicts relatively well the coseismic displacements observed at continuous GPS stations in Thailand and Malaysia (Figure S1). Following the methodology of Ji et al.<sup>2</sup> the Green's functions were computed using an average of the layered structure of CRUST2<sup>3</sup> (<http://mahi.ucsd.edu/Gabi/rem.dir/crust/crust2.html>). We searched for the minimum cost function, which is a combination of the weighted sum-squared residual,  $\chi^2$ , and two other terms to control the smoothness and moment:

$$\text{Cost} = \chi^2 + \lambda_1 (\Delta s / \alpha)^2 + \lambda_2 ((M_0 - M_0') / \beta)^2 \quad (1)$$

where  $\Delta s$  is the average difference of slip between adjacent cells,  $M_0'$  is some a priori scalar moment, meant to be a lower bound. The normalization coefficients  $\alpha$  and  $\beta$  were determined so that for  $\lambda_1 = \lambda_2 = 1$  the three criteria have equal importance, meaning that for the best fitting model  $\chi^2 = (\Delta s / \alpha)^2 = ((M_0 - M_0') / \beta)^2 = \text{Cost}/3$ . The coefficient  $\lambda_1$  is varied to control the smoothness of the solution and  $\lambda_2$  is varied to control the weight assigned to minimize the total moment. In all inversions listed in Table 2, we used a value  $M_0' = 6.2 \times 10^{22} \text{Nm}$  (corresponding to  $M_w = 9.1$ ). At each node the model parameters are the slip amplitude and rake. In these models, we used the points on the pivot line with the assigned uncertainties listed in Electronic Supplement 1. We

systematically checked that the best-fitting models listed in Table 2 predict values of uplift or subsidence in agreement with the minimum values determined from remote sensing.

Given that uncertainties vary significantly within one data set and might not be correctly scaled when different types of data are mixed, we have first run inversions where the vertical and the horizontal data are considered separately and not weighted. If only the GPS horizontal data are considered (model G, Figure S2a), the model yield a minimum rms of 8.7 cm only slightly larger than of the formal 1- $\sigma$  uncertainty on the GPS campaign measurements, with a moment close to the minimum seismic value  $M_0^{\text{III}}=6.2 \times 10^{22}\text{Nm}$ . If only the vertical displacements are considered (model V, Figure S2b), the model yields a minimum rms of 14 cm which is of the order of magnitude of the estimated uncertainty on the field data and somewhat larger than the uncertainty on the GPS vertical measurements. Again the moment is close to  $M_0^{\text{III}}$ . Although the two models have the about same moment they are actually quite different. The uplift data tend to require a wide ruptured zone but the amount of slip is generally poorly constrained, whereas the GPS horizontal data require high slip zones, which tend to be narrow due to the minimization of the total moment. We therefore inverted jointly the two data set by minimizing a  $\chi^2$  criterion in which the data are weighted according to their 1- $\sigma$  uncertainties. If the moment is forced to be close to the seismic estimate  $M_0^{\text{III}}$ , the weighted rms is no better than 4.61 cm, corresponding to a reduced  $\chi^2$  of 16.01, even if a rather rough slip distribution is allowed. If the constraint on the total moment is relaxed and the slip distribution allowed to be quite rough, the weighted rms drops to 1.80 cm, corresponding to a  $\chi_r^2$  of 2.44. The seismic moment increases to  $8.78 \times 10^{22}$  N-m, corresponding to a magnitude  $M_w=9.22$  (Figure 3, model A in Table 2). If the model is forced to be smoother by increasing the coefficient  $\lambda_1$  from 1 to 5 (model A2 in Table 2). The fit to the data gets slightly worse and the moment decrease to  $8.1 \times 10^{22}$  N.m ( $M_w=9.19$ ). Model A3 was obtained by replacing the measurements in the Andaman reported by CESS by those of Jade et al. The lack of data around 10-11N leads to a local minimum in the latitudinal distribution of geodetic moment that is clearly an artefact (Figure S3). The moment associated to this latter model is  $8.39 \times 10^{22}$  N.m corresponding to a  $M_w=9.20$  (Table 2).

We also conducted some checker board resolution test (Figure S4). In this test the fault plane is divided in  $100 \times 50 \text{ km}^2$  sub-faults with uniform slip set to 0 or 12m. Altogether these models show that our data set is consistent and does provide some reasonable constraints on the slip model. The resolution is best along the deeper part of the fault model. Slip along the shallow portion of the megathrust is not everywhere well resolved in particular between 4N and 5N. The moment corresponding to these models are systematically underestimated by 15 to 30%. Due to the sparse data distribution our inversion probably place only a lower bound on the geodetic moment required to fit the geodetic data. Finally, the comparison of the latitudinal distribution of moment in Figure S3 shows that the main features of our preferred model (model A) are probably robust.

## **Model B**

*Fault model.* We generated a structural representation of the curved plate interface (Table 3) from local and teleseismic earthquake observation and volcanoes. Trench-normal cross-sections of earthquakes<sup>4</sup> and the volcanic arc<sup>5</sup> were constructed every 0.5 to 1.0 degree along strike (origins of these cross-sections are shown as dots at the Sunda trench in Figure 3b). The top of the subducting plate was drawn to satisfy the conditions that it dip at only a few degrees at the trench, be near the top of the dipping seismic zone, and project to about 100 km depth beneath the volcanic arc. This dipping, curved interface is represented with nodes at depth approximately every 25 km across strike along 30 profiles. The fault model shows an increasing dip in the northern profiles. Figure 3b shows selected contours to the top of this slab structure.

*Coseismic slip direction.* To estimate the co-seismic slip direction on the fault, we solved for the normalized angular velocities of two forearc segments relative to Sunda. The angular velocities were constrained by five slip azimuths derived from the co-seismic inversions of Tsai et al. (2005)<sup>6</sup> - these were assigned uncertainties of 5°- and GPS vectors simultaneously. The two normalized rotation axes comprise 4 free parameters. We tried using up to four independent forearc sections but this did not improve the data

fit over the use of two. Because aftershock slip vectors reveal an abrupt change of  $15^\circ$  in the direction at about  $6^\circ$  N (see Figure 3a), we allowed the coseismic slip direction to be different north and south of that latitude. The coseismic slip vectors of Tsai et al. do not match in detail the predicted slip direction in part because they are centroid averages that each sample a roughly 300-km section of the fault. The motion of India/Australia relative to Sunda was based on the India-Eurasia pole of NUVEL-1A<sup>7</sup>. The motion of the forearc blocks relative to India gives the slip direction on the fault (gray arrows in Fig. 3b).

*Slip Inversion.* The estimation of the surface deformation due to slip on the fault was done with Okada's half-space dislocation algorithm<sup>8</sup> implemented in the inversion program *defnode* ([www.rpi.edu/~mccafr/defnode/](http://www.rpi.edu/~mccafr/defnode/)). The amplitude of the coseismic slip  $S(z)$  on the fault plane was fit as a Gaussian function of depth  $z$  along independent but unevenly spaced profiles across the margin (3 free parameters for each profile).

$$S(z) = A \exp [ - ( z - m_z )^2 / \sigma_z ] \quad (1)$$

where the free parameters are  $A$ , the amplitude,  $m_z$ , the depth of maximum slip, and  $\sigma_z$ , the spread in the slip. While there are 30 profiles, only 22 of them had independent values of the 3 parameters estimated (i.e., some profiles that were close together were forced to have the same 3 parameters).

The 70 free parameters were estimated by minimizing a penalty function that comprised data fits and constraints. For data that were described a mean and standard deviation, the penalty was the quantity  $R^T C^{-1} R$ , where  $R$  is the matrix of residuals and  $C$  is the data covariance matrix. For the imagery data, that are described as minimum subsidence or uplift, the penalty comprised  $(r / \sigma)^2$  where  $r$  is the difference between the predicted value and the minimum if the predicted value was less than the minimum and zero if the predicted value was greater than the minimum (see Appendix of McCaffrey, 2005<sup>9</sup>).

We have 287 observations giving 217 degrees of freedom. Parameter uncertainties were estimated from the *a posteriori* parameter covariance matrix, unscaled further since our final reduced chi-square of the misfits was close to unity. Formal uncertainties in the slip amplitudes at the nodes and in the geodetic moment were estimated by Monte Carlo error propagation. Finally, in order to avoid any extraneous slip not required by the data, we damped the solution in some instances by limiting the maximum slip amplitude and/or by applying a penalty function for exceeding a prescribed seismic moment. The final model in Figure 3b was not subject to this constraint. Other than by the spacing of independent slab profiles we did not apply any along strike smoothing.

The final best fit slip model had a potency of  $2.1 \times 10^{12} \text{ m}^3$ , corresponding to a seismic moment of  $8.7 \pm 0.1 \times 10^{22} \text{ N-m}$  ( $M_w = 9.22$  to  $9.23$ ) for a PREM model of rigidity as a function of depth (in this case the average rigidity over the slip range is 41.4 GPa). The average slip on the entire modeled fault area ( $5.6 \times 10^5 \text{ km}^2$ ) was 3.8 meters.

#### Final statistics of fits to data

| Data type                                                         | N   | Nrms  | Wrms    | Sum of wt.                                  |
|-------------------------------------------------------------------|-----|-------|---------|---------------------------------------------|
| Vertical                                                          |     |       |         |                                             |
| All vert.                                                         | 200 | 0.635 | 24.10   | 0.139E+00                                   |
| Sugar                                                             | 10  | 1.198 | 15.13   | 0.626E-01                                   |
| Surv. GPS                                                         | 19  | 1.519 | 51.35   | 0.166E-01                                   |
| Coral                                                             | 12  | 0.890 | 99.16   | 0.968E-03 Meltzner et al. (2005)            |
| Bilham                                                            | 12  | 1.000 | 1000.31 | 0.120E-04 Bilham (2005)                     |
| Imagery                                                           | 147 | 0.086 | 4.29    | 0.588E-01 Meltzner et al. (2005)            |
| Slip Vecs.                                                        | 5   | 1.808 | 9.04    | 0.200E+00 Tsai et al. (2005)                |
| GPS horizontal (N is the number of components; 2 for each vector) |     |       |         |                                             |
| All GPS                                                           | 82  | 0.947 | 7.05    | 0.148E+01                                   |
| Sugar                                                             | 20  | 1.240 | 4.74    | 0.137E+01                                   |
| CESS                                                              | 10  | 1.117 | 140.22  | 0.634E-03 CESS Website                      |
| Survey                                                            | 50  | 0.741 | 30.19   | 0.301E-01                                   |
| PHKT                                                              | 2   | 1.208 | 6.04    | 0.800E-01 Vigny et al. (2005) <sup>10</sup> |

## Figures Captions

**Figure S1.** Slip model derived from the inversion of body waves and surface waves (Model III of Ammon et al<sup>1</sup>) with predicted horizontal and vertical displacements. The model is compared with co-seismic displacements estimated at GPS stations in Thailand and Malaysia<sup>10</sup> and with our geodetic displacements which include ~1 month of postseismic deformation (see Table 2).

**Figure S2.** (a) Observed and predicted displacements from slip model obtained from the inversion of horizontal GPS measurements only (Model G in Table 2). (b) Observed and predicted displacements from the slip model obtained from the inversion of vertical displacements only (model V in Table 2). Slab contour from Gundmundsson & Sambridge<sup>11</sup>.

**Figure S3.** Latitudinal variations of scalar moments as determined from seismic model (Model III of Ammon et al<sup>1</sup>) and from the slip models A, A2 and A3 listed in Table 2.

**Figure S4.** Checker board resolution test. The forward models (left) corresponds to a Mw 9.20 ( $M_0 = 8.4 \cdot 10^{22}$  N.m) event. We computed theoretical displacements at the points where we have geodetic observations. These displacements were assigned the same uncertainties as our data and inverted with the same parameters as the reference model (Model A in Table 2; ie  $\lambda_1 = 1$ ,  $\lambda_2 = 0.01$ ). Inverted slip models correspond to a moment  $M_0 = 6.4 \cdot 10^{22}$  N.m (top right) and  $M_0 = 7.7 \cdot 10^{22}$  N.m (bottom right).

**Table 1: Fault geometry, Model A.**

| Segment | Location of southwest corner | Length (km) | Width (km) | Strike | Dip Angle |
|---------|------------------------------|-------------|------------|--------|-----------|
| 1       | Long. 95.25    Lat. 1.85     | 300         | 224        | 315    | 12        |
| 2       | Long. 93.34    Lat. 3.76     | 480         | 192        | 342    | 15        |
| 3       | Long. 91.46    Lat. 9.59     | 500         | 176        | 5      | 17.5      |

**Table 2: Models parameters.**

| Name      | Data Used                            | Mw   | Mo ( $10^{22}$ N-m) | $\chi_r^2$ * | Wrms  | Smooth | $\lambda_1$ | $\lambda_2$ |
|-----------|--------------------------------------|------|---------------------|--------------|-------|--------|-------------|-------------|
| AMMON III | seismic records                      | 9.12 | 6.22                | 66.87        | 132   | 20     | 0.1         | 0.01        |
| G         | GPS Hor. only                        | 9.18 | 7.69                | 9.61         | 8.68  | 64     | 1           | 0.01        |
| V         | Uplift only                          | 9.12 | 6.31                | 19.24        | 14.16 | 65     | 1           | 0.01        |
| A         | All geodetic data                    | 9.22 | 8.78                | 2.44         | 1.80  | 51     | 1           | 0.01        |
| A2        | All geodetic data                    | 9.19 | 8.10                | 4.875        | 2.54  | 39     | 5           | 0.01        |
| A3        | All Geodetic data<br><br>Jade et al. | 9.20 | 8.39                | 2.08         | 1.65  | 50     | 1           | 0.01        |

- Reduced Chi-square is defined here as  $\chi_r^2 = \frac{1}{n} \sum_{k=1}^n \left( \frac{(V_o^i - V_m^i)}{\sigma^i} \right)^2$  where n=190 is the number of data used in the inversion.

### Table 3: Fault geometry, Model B

Values refer to nodes in the fault plane. Fault strike is the direction from the node to the next node along strike. Fault dip is the dip from the node to the next node down dip

| Long.  | Lat.   | Depth | Strike | Dip |
|--------|--------|-------|--------|-----|
| 97.000 | 0.001  | 4.000 | 333.2  | 4.0 |
| 96.667 | 0.666  | 4.000 | 323.2  | 4.0 |
| 96.270 | 1.200  | 4.000 | 307.4  | 4.0 |
| 95.750 | 1.600  | 4.000 | 298.2  | 4.1 |
| 95.380 | 1.800  | 4.000 | 299.4  | 4.1 |
| 95.010 | 2.010  | 4.000 | 307.6  | 4.0 |
| 94.700 | 2.250  | 4.000 | 309.6  | 4.0 |
| 94.400 | 2.500  | 4.000 | 309.7  | 4.0 |
| 93.800 | 3.000  | 4.000 | 323.0  | 4.0 |
| 93.350 | 3.600  | 4.000 | 339.4  | 4.1 |
| 93.050 | 4.400  | 4.000 | 345.9  | 4.5 |
| 92.900 | 5.000  | 4.000 | 343.3  | 5.6 |
| 92.600 | 6.000  | 4.000 | 343.3  | 5.6 |
| 92.450 | 6.500  | 4.000 | 343.3  | 5.6 |
| 92.300 | 7.000  | 4.000 | 333.5  | 5.0 |
| 92.050 | 7.500  | 4.000 | 333.5  | 5.0 |
| 91.800 | 8.000  | 4.000 | 335.9  | 5.0 |
| 91.350 | 9.000  | 4.000 | 349.5  | 5.0 |
| 91.200 | 9.800  | 4.000 | 8.0    | 5.0 |
| 91.300 | 10.500 | 4.000 | 11.2   | 5.5 |
| 91.400 | 11.000 | 4.000 | 11.2   | 6.0 |
| 91.500 | 11.500 | 4.000 | 11.1   | 6.0 |
| 91.600 | 12.000 | 4.000 | 16.4   | 6.0 |
| 91.750 | 12.500 | 4.000 | 16.4   | 6.5 |
| 91.900 | 13.000 | 4.000 | 16.4   | 7.0 |
| 92.050 | 13.500 | 4.000 | 21.3   | 7.0 |
| 92.250 | 14.000 | 4.000 | 23.6   | 7.0 |
| 92.700 | 15.000 | 4.000 | 21.1   | 7.0 |
| 93.100 | 16.000 | 4.000 | 2.8    | 7.1 |
| 93.150 | 17.000 | 4.000 | ---    | 7.0 |
| 97.345 | 0.175  | 7.000 | 333.1  | 5.0 |
| 96.996 | 0.868  | 7.000 | 323.0  | 5.0 |
| 96.545 | 1.471  | 7.000 | 307.7  | 5.0 |
| 95.998 | 1.896  | 7.000 | 298.3  | 5.1 |
| 95.628 | 2.096  | 7.000 | 299.4  | 5.1 |

95.258 2.306 7.000 307.6 5.0  
94.948 2.546 7.000 309.7 5.0  
94.648 2.796 7.000 309.4 5.0  
94.083 3.263 7.000 323.2 5.0  
93.667 3.821 7.000 337.1 5.1  
93.362 4.545 7.000 340.1 5.5  
93.155 5.118 7.000 343.3 6.6  
92.855 6.118 7.000 343.4 6.6  
92.708 6.614 7.000 346.6 6.7  
92.588 7.116 7.000 333.3 6.0  
92.344 7.600 7.000 333.5 6.1  
92.096 8.095 7.000 335.9 6.0  
91.650 9.085 7.000 349.2 6.0  
91.513 9.800 7.000 5.9 6.0  
91.583 10.464 7.000 8.6 6.5  
91.659 10.967 7.000 11.2 7.0  
91.760 11.466 7.000 11.2 7.0  
91.859 11.960 7.000 14.4 7.0  
91.985 12.443 7.000 14.5 7.5  
92.115 12.935 7.000 16.4 8.0  
92.264 13.429 7.000 21.4 8.0  
92.465 13.932 7.000 23.7 8.0  
92.910 14.916 7.000 21.1 8.0  
93.323 15.954 7.000 3.0 8.1  
93.380 16.989 7.000 --- 8.0  
97.620 0.314 10.000 333.1 7.0  
97.258 1.030 10.000 322.9 7.0  
96.765 1.687 10.000 307.9 7.1  
96.196 2.132 10.000 298.3 7.1  
95.826 2.332 10.000 299.4 7.1  
95.457 2.542 10.000 307.6 7.0  
95.147 2.782 10.000 309.7 7.0  
94.847 3.032 10.000 309.2 7.0  
94.308 3.473 10.000 323.4 7.0  
93.920 3.998 10.000 335.4 7.1  
93.616 4.663 10.000 336.1 7.5  
93.370 5.218 10.000 343.3 8.6  
93.071 6.218 10.000 343.5 8.6  
92.925 6.710 10.000 349.0 8.8  
92.828 7.212 10.000 333.2 8.0  
92.589 7.684 10.000 333.4 8.1  
92.343 8.175 10.000 335.9 8.0  
91.900 9.156 10.000 349.0 8.0  
91.773 9.800 10.000 4.3 8.0  
91.822 10.434 10.000 6.7 8.5  
91.881 10.939 10.000 11.3 9.0

91.982 11.437 10.000 11.3 9.0  
92.081 11.925 10.000 12.8 9.0  
92.189 12.393 10.000 13.1 9.5  
92.304 12.878 10.000 16.4 10.0  
92.451 13.367 10.000 21.4 10.0  
92.653 13.873 10.000 23.8 10.0  
93.094 14.844 10.000 21.0 10.0  
93.518 15.913 10.000 3.2 10.1  
93.580 16.979 10.000 --- 9.9  
97.881 0.447 14.000 333.0 9.0  
97.506 1.186 14.000 322.9 9.0  
96.976 1.891 14.000 308.1 9.1  
96.385 2.356 14.000 298.3 9.2  
96.015 2.556 14.000 299.5 9.1  
95.645 2.766 14.000 307.6 9.0  
95.335 3.006 14.000 309.7 9.0  
95.035 3.256 14.000 309.0 9.0  
94.523 3.673 14.000 323.5 9.1  
94.160 4.166 14.000 334.2 9.1  
93.865 4.779 14.000 333.0 9.5  
93.589 5.320 14.000 343.4 10.6  
93.291 6.320 14.000 343.6 10.6  
93.147 6.808 14.000 350.9 11.0  
93.067 7.308 14.000 333.1 10.0  
92.833 7.767 14.000 333.4 10.1  
92.589 8.254 14.000 335.8 10.1  
92.149 9.226 14.000 348.7 10.0  
92.033 9.800 14.000 2.9 10.0  
92.064 10.404 14.000 5.2 10.5  
92.111 10.911 14.000 11.3 11.0  
92.212 11.407 14.000 11.4 11.0  
92.310 11.890 14.000 11.4 11.0  
92.403 12.341 14.000 11.7 11.5  
92.504 12.818 14.000 16.4 12.0  
92.649 13.300 14.000 21.4 12.0  
92.853 13.810 14.000 23.9 12.1  
93.289 14.766 14.000 20.9 12.0  
93.726 15.869 14.000 3.4 12.1  
93.793 16.968 14.000 --- 11.9  
98.134 0.576 19.000 332.9 12.0  
97.746 1.337 19.000 322.8 12.0  
97.180 2.088 19.000 308.3 12.1  
96.568 2.574 19.000 298.3 12.2  
96.198 2.774 19.000 299.5 12.2  
95.828 2.984 19.000 307.6 12.0  
95.518 3.224 19.000 309.7 12.0

95.218 3.474 19.000 308.8 12.0  
94.731 3.867 19.000 323.8 12.1  
94.394 4.329 19.000 333.1 12.1  
94.109 4.892 19.000 330.5 12.5  
93.810 5.423 19.000 343.4 14.0  
93.512 6.423 19.000 343.7 14.1  
93.370 6.907 19.000 352.6 14.6  
93.306 7.403 19.000 333.0 13.6  
93.077 7.850 19.000 333.4 13.6  
92.834 8.333 19.000 335.8 13.6  
92.398 9.297 19.000 348.2 13.5  
92.292 9.800 19.000 1.7 13.5  
92.309 10.373 19.000 4.0 14.0  
92.345 10.881 19.000 11.4 14.5  
92.445 11.376 19.000 11.5 14.5  
92.544 11.854 19.000 10.1 14.5  
92.622 12.288 19.000 10.5 15.0  
92.711 12.755 19.000 16.5 15.5  
92.854 13.231 19.000 21.4 15.5  
93.061 13.744 19.000 24.0 15.6  
93.492 14.686 19.000 20.9 15.5  
93.941 15.824 19.000 3.6 15.7  
94.014 16.956 19.000 --- 15.4  
98.360 0.691 25.000 332.8 15.0  
97.961 1.473 25.000 322.7 15.0  
97.364 2.263 25.000 308.4 15.1  
96.731 2.768 25.000 298.3 15.3  
96.361 2.968 25.000 299.5 15.2  
95.991 3.178 25.000 307.6 15.0  
95.681 3.418 25.000 309.7 15.0  
95.382 3.668 25.000 308.6 15.0  
94.917 4.040 25.000 324.0 15.1  
94.602 4.475 25.000 332.6 15.1  
94.332 4.996 25.000 328.0 16.1  
94.009 5.515 25.000 343.4 16.8  
93.711 6.515 25.000 343.8 16.8  
93.571 6.996 25.000 353.6 17.3  
93.516 7.487 25.000 332.8 17.8  
93.291 7.924 25.000 333.3 17.8  
93.050 8.402 25.000 335.8 17.8  
92.617 9.359 25.000 347.8 17.7  
92.520 9.800 25.000 0.7 17.7  
92.527 10.345 25.000 3.1 18.3  
92.555 10.855 25.000 11.4 18.8  
92.656 11.349 25.000 11.5 18.8  
92.754 11.821 25.000 9.0 18.8

92.822 12.239 25.000 9.6 19.6  
92.901 12.698 25.000 16.5 19.9  
93.043 13.168 25.000 21.5 19.9  
93.251 13.684 25.000 24.1 20.0  
93.678 14.612 25.000 20.8 19.9  
94.138 15.782 25.000 3.7 20.1  
94.217 16.944 25.000 --- 19.8  
98.569 0.799 32.000 332.8 18.0  
98.159 1.600 32.000 322.7 18.1  
97.534 2.426 32.000 308.6 18.1  
96.882 2.948 32.000 298.3 18.3  
96.512 3.148 32.000 299.5 18.3  
96.142 3.358 32.000 307.6 18.0  
95.833 3.598 32.000 309.7 18.0  
95.533 3.848 32.000 308.4 18.0  
95.090 4.200 32.000 324.2 18.2  
94.795 4.609 32.000 331.2 18.1  
94.532 5.089 32.000 327.2 18.7  
94.201 5.604 32.000 343.4 19.9  
93.903 6.604 32.000 343.9 19.9  
93.765 7.081 32.000 352.3 20.4  
93.700 7.561 32.000 332.7 21.0  
93.479 7.988 32.000 333.3 21.1  
93.239 8.463 32.000 335.8 21.0  
92.809 9.413 32.000 347.2 20.9  
92.720 9.800 32.000 360.0 20.9  
92.720 10.321 32.000 2.4 21.4  
92.742 10.831 32.000 11.5 21.7  
92.843 11.324 32.000 11.6 21.6  
92.941 11.792 32.000 8.0 21.6  
92.999 12.196 32.000 9.1 22.1  
93.072 12.646 32.000 16.5 22.4  
93.212 13.111 32.000 21.5 22.4  
93.421 13.630 32.000 24.2 22.5  
93.844 14.546 32.000 20.8 22.4  
94.314 15.744 32.000 3.9 22.6  
94.398 16.932 32.000 --- 22.3  
98.766 0.900 40.000 332.7 21.0  
98.346 1.719 40.000 322.7 21.1  
97.694 2.578 40.000 308.7 21.2  
97.025 3.118 40.000 298.3 21.4  
96.655 3.318 40.000 299.5 21.3  
96.285 3.528 40.000 307.6 21.0  
95.975 3.768 40.000 309.7 21.0  
95.676 4.018 40.000 308.1 21.0  
95.252 4.351 40.000 324.4 21.2

94.977 4.736 40.000 330.6 21.1  
94.728 5.180 40.000 325.9 22.3  
94.384 5.689 40.000 343.4 23.4  
94.087 6.689 40.000 343.9 23.5  
93.950 7.163 40.000 351.1 23.9  
93.876 7.632 40.000 332.6 24.0  
93.659 8.049 40.000 333.3 24.1  
93.421 8.521 40.000 335.7 24.0  
92.992 9.465 40.000 346.5 23.9  
92.911 9.800 40.000 359.4 23.9  
92.906 10.298 40.000 2.1 24.8  
92.926 10.808 40.000 11.5 25.6  
93.027 11.300 40.000 11.7 25.6  
93.124 11.764 40.000 7.3 25.5  
93.175 12.153 40.000 8.5 26.1  
93.243 12.595 40.000 16.5 26.5  
93.381 13.054 40.000 21.5 26.5  
93.592 13.577 40.000 24.3 26.6  
94.011 14.480 40.000 20.8 26.5  
94.491 15.706 40.000 4.0 26.7  
94.580 16.920 40.000 --- 26.4  
98.995 1.018 51.000 332.6 24.0  
98.563 1.858 51.000 322.6 24.1  
97.881 2.756 51.000 308.9 24.2  
97.190 3.315 51.000 298.3 24.4  
96.821 3.515 51.000 299.5 24.4  
96.451 3.725 51.000 307.7 24.0  
96.141 3.965 51.000 309.7 24.0  
95.842 4.215 51.000 307.8 24.0  
95.441 4.527 51.000 324.7 24.2  
95.189 4.884 51.000 329.1 24.0  
94.951 5.283 51.000 324.7 25.4  
94.594 5.787 51.000 343.5 26.5  
94.297 6.787 51.000 344.0 26.5  
94.163 7.257 51.000 350.4 26.9  
94.085 7.715 51.000 332.4 27.0  
93.872 8.122 51.000 333.3 27.1  
93.635 8.590 51.000 335.7 27.0  
93.210 9.526 51.000 345.4 26.9  
93.138 9.800 51.000 358.2 26.9  
93.123 10.270 51.000 1.3 27.9  
93.135 10.782 51.000 11.6 28.6  
93.237 11.273 51.000 11.8 28.6  
93.334 11.731 51.000 6.5 28.5  
93.377 12.104 51.000 7.8 29.2  
93.437 12.536 51.000 16.5 29.5

93.574 12.988 51.000 21.5 29.5  
93.786 13.515 51.000 24.4 29.7  
94.201 14.405 51.000 20.7 29.5  
94.692 15.662 51.000 4.2 29.8  
94.787 16.907 51.000 --- 29.3  
99.210 1.130 63.000 332.6 28.0  
98.766 1.990 63.000 322.6 28.1  
98.058 2.922 63.000 309.0 28.2  
97.347 3.501 63.000 298.3 28.5  
96.977 3.701 63.000 299.5 28.4  
96.607 3.911 63.000 307.7 28.0  
96.297 4.151 63.000 309.7 28.0  
95.998 4.401 63.000 307.5 28.0  
95.619 4.692 63.000 325.1 28.3  
95.388 5.023 63.000 327.5 28.0  
95.161 5.381 63.000 323.6 29.6  
94.794 5.879 63.000 343.5 30.5  
94.497 6.879 63.000 344.1 30.5  
94.364 7.346 63.000 349.9 30.9  
94.284 7.795 63.000 332.3 31.0  
94.076 8.191 63.000 333.2 31.1  
93.840 8.656 63.000 335.7 31.1  
93.417 9.585 63.000 343.7 30.9  
93.354 9.800 63.000 357.0 31.0  
93.330 10.244 63.000 0.6 31.9  
93.336 10.757 63.000 11.6 32.6  
93.438 11.247 63.000 11.8 32.6  
93.534 11.700 63.000 5.6 32.6  
93.570 12.057 63.000 7.1 33.2  
93.623 12.480 63.000 16.6 33.5  
93.758 12.926 63.000 21.6 33.5  
93.973 13.456 63.000 24.5 33.7  
94.383 14.333 63.000 20.7 33.5  
94.886 15.620 63.000 4.3 33.8  
94.986 16.893 63.000 --- 33.3  
99.405 1.231 76.000 332.5 33.0  
98.951 2.109 76.000 322.6 33.1  
98.218 3.073 76.000 309.1 33.2  
97.488 3.669 76.000 298.3 33.5  
97.118 3.869 76.000 299.5 33.4  
96.749 4.079 76.000 307.7 33.0  
96.439 4.319 76.000 309.8 33.0  
96.140 4.569 76.000 307.1 33.0  
95.780 4.842 76.000 325.4 33.3  
95.569 5.149 76.000 326.0 33.0  
95.353 5.470 76.000 322.7 34.7

94.977 5.964 76.000 343.5 35.5  
94.681 6.964 76.000 344.2 35.6  
94.550 7.428 76.000 349.4 35.9  
94.467 7.868 76.000 332.2 36.0  
94.262 8.255 76.000 333.2 36.2  
94.028 8.716 76.000 335.7 36.1  
93.608 9.639 76.000 341.1 36.1  
93.552 9.800 76.000 355.8 36.0  
93.521 10.220 76.000 360.0 37.0  
93.521 10.733 76.000 11.7 37.6  
93.623 11.222 76.000 11.9 37.6  
93.719 11.672 76.000 4.8 37.6  
93.748 12.013 76.000 6.5 38.3  
93.796 12.427 76.000 16.6 38.5  
93.930 12.867 76.000 21.6 38.5  
94.146 13.402 76.000 24.6 38.7  
94.552 14.266 76.000 20.7 38.5  
95.065 15.581 76.000 4.5 38.8  
95.170 16.879 76.000 --- 38.3  
99.577 1.320 90.000 332.5 ---  
99.114 2.214 90.000 322.6 ---  
98.359 3.206 90.000 309.2 ---  
97.613 3.818 90.000 298.3 ---  
97.243 4.018 90.000 299.5 ---  
96.874 4.228 90.000 307.7 ---  
96.564 4.468 90.000 309.8 ---  
96.265 4.718 90.000 306.8 ---  
95.922 4.974 90.000 325.8 ---  
95.729 5.261 90.000 324.5 ---  
95.523 5.549 90.000 322.0 ---  
95.140 6.040 90.000 343.5 ---  
94.844 7.040 90.000 344.3 ---  
94.714 7.501 90.000 349.0 ---  
94.630 7.933 90.000 332.0 ---  
94.428 8.311 90.000 333.2 ---  
94.195 8.770 90.000 335.7 ---  
93.777 9.687 90.000 336.9 ---  
93.729 9.800 90.000 354.7 ---  
93.691 10.199 90.000 359.5 ---  
93.687 10.712 90.000 11.7 ---  
93.789 11.201 90.000 12.0 ---  
93.885 11.646 90.000 4.1 ---  
93.908 11.974 90.000 5.9 ---  
93.951 12.381 90.000 16.6 ---  
94.083 12.815 90.000 21.6 ---  
94.300 13.353 90.000 24.7 ---

94.703 14.206 90.000 20.7 ---  
 95.225 15.546 90.000 4.6 ---  
 95.335 16.867 90.000 --- ---

## References :

1. Ammon, C. J. et al. Rupture process of the 2004 Sumatra-Andaman earthquake. *Science* 308, 1133-1139 (2005).
2. Ji, C., Wald, D. & Helmberger, D. V. Source Description of the 1999 Hector Mine, California Earthquake, Part I: Wavelet Domain Inversion Theory and Resolution Analysis. *Bull. Seismo. Soc. Am.* 92, 1192-1207 (2002).
3. Bassin, C., Laske, G. & Masters, G. The current limits of resolution for surface wave tomography in North America. *Eos Trans. AGU* 81(48), S12A-03 (2000).
4. Fauzi, McCaffrey, R., Sunaryo, D. & Prih-Haryadi, P. Lateral variation in slab orientation beneath Toba caldera, northern Sumatra. *Geophys. Res. Lett.* 23, 443-446 (1996).
5. Simkin, T. et al. *Volcanoes of the World* (Hutchinson-Ross, Stroudsburg, Pennsylvania, 1981).
6. Tsai, V. C., Nettles, M., Ekstrom, G. & Dziewonski, A. M. Multiple CMT source analysis of the 2004 Sumatra earthquake. *Geophysical Research Letters* 32 (2005).
7. DeMets, C., Gordon, R.G., Argus, D.F., Stein, S., Effect of recent revisions to the geomagnetic reversal time scale on current plate motions. *Geophys. Res. Lett.* 21, 2191-2194 (1994).
8. Okada, Y. Internal deformation due to shear and tensile faults in a half-space. *Bull. Seism. Soc. Am.* 82, 1018-1040 (1992).
9. McCaffrey, R. Block kinematics of the Pacific-North America plate boundary in the southwestern United States from inversion of GPS, seismological, and geologic data. *Journal of Geophysical Research-Solid Earth* 110 (2005).
10. Vigny, C. et al. Insight into the 2004 Sumatra-Andaman earthquake from GPS measurements in southeast Asia. *Nature* 436, 201-206 (2005).
11. Gundmundsson, O. & Sambridge, M. A regionalized upper mantle (RUM) seismic model. *J. Geophys. Res.* 103, 7121-7136 (1998).