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*Supplement of*

## **Source of the 6 February 2013 $M_w = 8.0$ Santa Cruz Islands Tsunami**

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**Table S1 – Fault model**

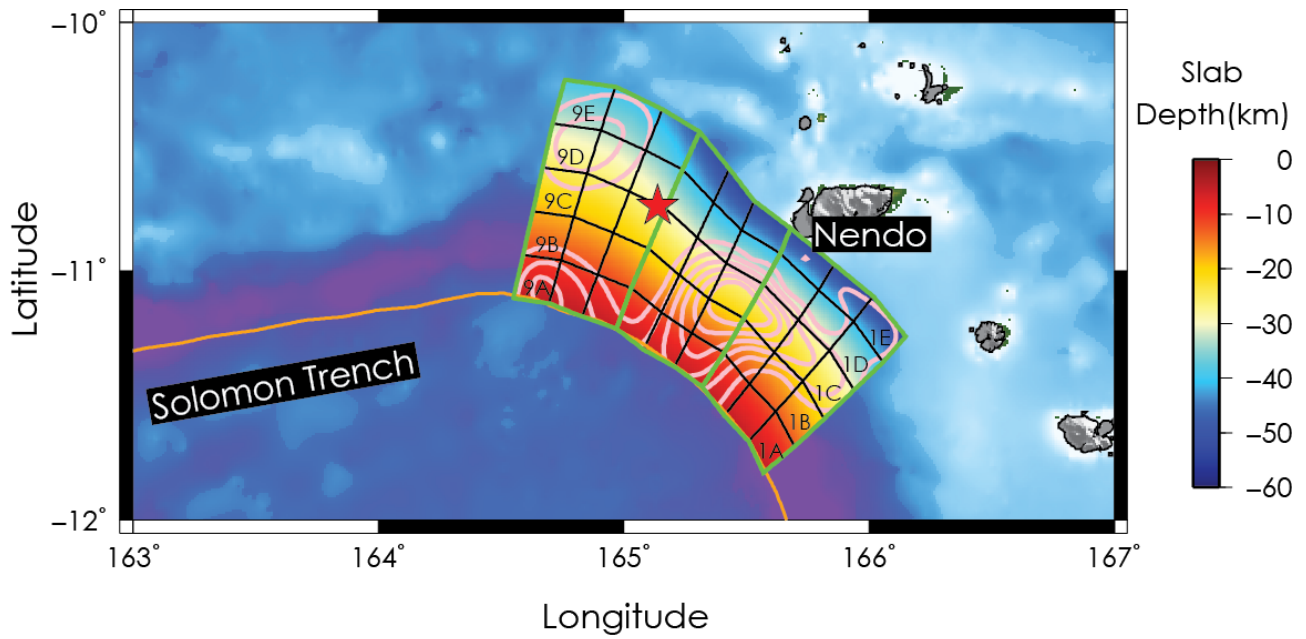
Subf #	Top Left		Top Right		Bottom Right		Bottom Left		Center Depth (km)	Strike (°)	Dip (°)
	Lon (°)	Lat (°)	Lon (°)	Lat (°)	Lon (°)	Lat (°)	Lon (°)	Lat (°)			
1A	165.57	-11.81	165.51	-11.69	165.62	-11.56	165.70	-11.70	8.349	333.0	26.9
2A	165.51	-11.69	165.41	-11.58	165.51	-11.46	165.62	-11.56	8.056	316.9	24.8
3A	165.41	-11.58	165.32	-11.47	165.41	-11.33	165.51	-11.46	7.961	324.1	23.7
4A	165.32	-11.47	165.21	-11.39	165.28	-11.25	165.41	-11.33	8.077	304.1	24.1
5A	165.21	-11.39	165.08	-11.32	165.15	-11.17	165.28	-11.25	8.304	300.0	26.0
6A	165.08	-11.32	164.97	-11.23	165.03	-11.07	165.15	-11.17	8.299	306.9	25.7
7A	164.97	-11.23	164.83	-11.18	164.89	-11.02	165.03	-11.07	7.864	290.0	23.3
8A	164.83	-11.18	164.70	-11.13	164.74	-10.96	164.89	-11.02	7.565	291.5	19.7
9A	164.70	-11.13	164.55	-11.11	164.59	-10.94	164.74	-10.96	7.486	278.7	19.5
1B	165.70	-11.70	165.62	-11.56	165.73	-11.44	165.82	-11.59	16.998	331.8	26.5
2B	165.62	-11.56	165.51	-11.46	165.61	-11.33	165.73	-11.44	16.139	316.1	24.6
3B	165.51	-11.46	165.41	-11.33	165.49	-11.19	165.61	-11.33	15.89	321.0	23.6
4B	165.41	-11.33	165.28	-11.25	165.35	-11.11	165.49	-11.19	16.274	301.2	24.4
5B	165.28	-11.25	165.15	-11.17	165.23	-11.02	165.35	-11.11	16.948	304.7	26.1
6B	165.15	-11.17	165.03	-11.07	165.10	-10.91	165.23	-11.02	16.918	309.2	25.7
7B	165.03	-11.07	164.89	-11.02	164.96	-10.85	165.10	-10.91	15.645	292.1	23.4
8B	164.89	-11.02	164.74	-10.96	164.80	-10.78	164.96	-10.85	14.723	291.6	20.1
9B	164.74	-10.96	164.59	-10.94	164.63	-10.76	164.80	-10.78	14.483	278.0	19.3
1C	165.82	-11.59	165.73	-11.44	165.84	-11.32	165.94	-11.48	25.366	330.4	23.8
2C	165.73	-11.44	165.61	-11.33	165.71	-11.20	165.84	-11.32	24.167	315.4	24.3
3C	165.61	-11.33	165.49	-11.19	165.57	-11.05	165.71	-11.20	23.843	318.3	23.6
4C	165.49	-11.19	165.35	-11.11	165.42	-10.97	165.57	-11.05	24.557	299.6	24.7
5C	165.35	-11.11	165.23	-11.02	165.30	-10.87	165.42	-10.97	25.684	308.7	26.0
6C	165.23	-11.02	165.10	-10.91	165.17	-10.75	165.30	-10.87	25.597	311.0	25.9
7C	165.10	-10.91	164.96	-10.85	165.02	-10.68	165.17	-10.75	23.538	293.9	23.6
8C	164.96	-10.85	164.80	-10.78	164.85	-10.61	165.02	-10.68	21.946	292.3	20.6
9C	164.80	-10.78	164.63	-10.76	164.67	-10.58	164.85	-10.61	21.532	277.7	19.1
1D	165.94	-11.48	165.84	-11.32	165.94	-11.20	166.06	-11.37	34.256	328.0	27.8
2D	165.84	-11.32	165.71	-11.20	165.79	-11.08	165.94	-11.20	33.341	314.8	30.3
3D	165.71	-11.20	165.57	-11.05	165.64	-10.93	165.79	-11.08	33.166	315.7	33.8
4D	165.57	-11.05	165.42	-10.97	165.48	-10.84	165.64	-10.93	34.166	299.5	33.8
5D	165.42	-10.97	165.30	-10.87	165.37	-10.73	165.48	-10.84	35.759	311.9	34.6
6D	165.30	-10.87	165.17	-10.75	165.24	-10.59	165.37	-10.73	35.077	312.5	33.6
7D	165.17	-10.75	165.02	-10.68	165.09	-10.52	165.24	-10.59	31.67	295.4	25.2
8D	165.02	-10.68	164.85	-10.61	164.91	-10.43	165.09	-10.52	29.238	293.3	21.1
9D	164.85	-10.61	164.67	-10.58	164.71	-10.41	164.91	-10.43	28.636	277.5	19.1
1E	166.06	-11.37	165.94	-11.20	166.02	-11.10	166.15	-11.26	45.706	324.4	39.3
2E	165.94	-11.20	165.79	-11.08	165.86	-10.98	166.02	-11.10	45.556	312.1	44.7
3E	165.79	-11.08	165.64	-10.93	165.68	-10.83	165.86	-10.98	45.77	313.7	47.4
4E	165.64	-10.93	165.48	-10.84	165.53	-10.72	165.68	-10.83	46.751	300.9	50.4
5E	165.48	-10.84	165.37	-10.73	165.43	-10.59	165.53	-10.72	47.967	314.9	43.8
6E	165.37	-10.73	165.24	-10.59	165.31	-10.44	165.43	-10.59	45.836	316.9	36.0
7E	165.24	-10.59	165.09	-10.52	165.16	-10.35	165.31	-10.44	40.346	297.4	29.3
8E	165.09	-10.52	164.91	-10.43	164.97	-10.26	165.16	-10.35	36.591	294.5	21.4
9E	164.91	-10.43	164.71	-10.41	164.76	-10.23	164.97	-10.26	35.796	277.7	19.1

**Table S2 - Tsunami sensors**

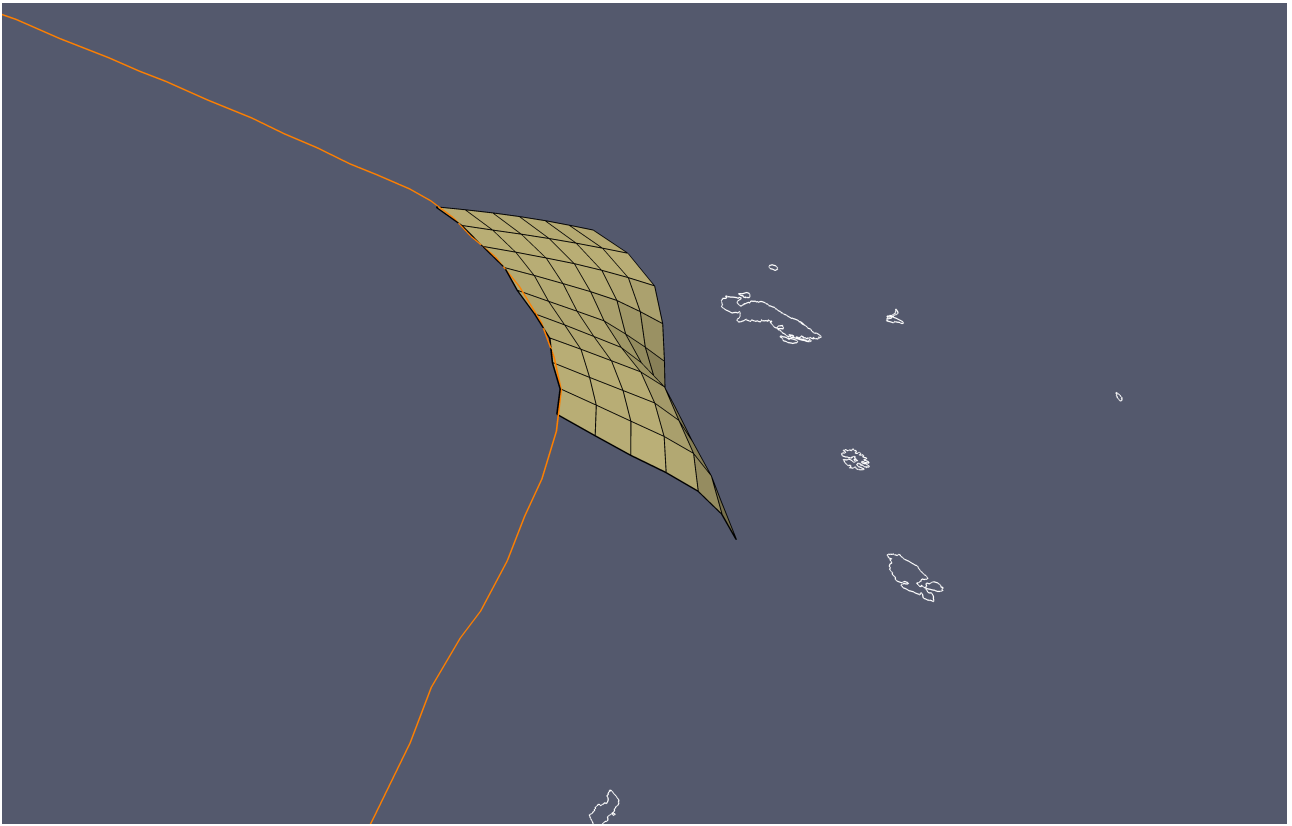
Station	Lon (°)	Lat (°)	Sampling (min)
DART 51425	183.7594	-9.5103	1
DART 52403	145.5919	4.0522	1
DART 52406	165.0017	-5.2933	1
DART 55012	158.4003	-15.7989	1
DART 55023	153.5797	-14.8000	1
Honiara	159.9555	-9.4289	1
Lata Wharf	165.8019	-10.7208	1
Lautoka	177.4383	-17.6049	1

**Table S3 – Slip model**

Subf. #	Average Model		Best Model	
	Slip (m)	Rake (°)	Slip (m)	Rake (°)
1A	0.2±0.4	84.1±5.9	0.0	80
2A	0.4±0.6	84.1±5.9	0.0	80
3A	2.1±1.1	84.1±5.9	0.5	80
4A	5.8±1.2	45.6±5.5	4.5	50
5A	4.8±1.0	45.6±5.5	5.0	50
6A	1.5±0.9	45.6±5.5	1.5	50
7A	1.9±1.0	41.2±2.6	2.0	40
8A	3.7±0.9	41.2±2.6	4.0	40
9A	4.6±0.9	41.2±2.6	3.5	40
1B	0.4±0.5	84.1±5.9	0.0	80
2B	0.5±0.6	84.1±5.9	0.5	80
3B	3.7±1.3	84.1±5.9	4.0	80
4B	8.2±1.0	45.6±5.5	9.5	50
5B	6.2±1.0	45.6±5.5	5.5	50
6B	0.2±0.3	45.6±5.5	0.0	50
7B	0.1±0.2	41.2±2.6	0.0	40
8B	0.4±0.5	41.2±2.6	0.0	40
9B	0.6±0.6	41.2±2.6	0.5	40
1C	3.9±1.0	84.1±5.9	4.5	80
2C	5.4±1.2	84.1±5.9	5.0	80
3C	9.1±1.3	84.1±5.9	7.5	80
4C	10.9±1.0	45.6±5.5	10.5	50
5C	5.0±1.2	45.6±5.5	6.0	50
6C	0.1±0.2	45.6±5.5	0.0	50
7C	0.0±0.1	41.2±2.6	0.0	40
8C	0.3±0.4	41.2±2.6	0.0	40
9C	1.0±0.7	41.2±2.6	1.5	40
1D	1.9±1.0	84.1±5.9	2.5	80
2D	0.4±0.5	84.1±5.9	0.0	80
3D	0.5±0.6	84.1±5.9	0.0	80
4D	1.2±0.9	45.6±5.5	1.0	50
5D	0.7±0.7	45.6±5.5	1.5	50
6D	0.0±0.2	45.6±5.5	0.0	50
7D	0.1±0.2	41.2±2.6	0.0	40
8D	2.6±1.0	41.2±2.6	3.0	40
9D	4.4±1.0	41.2±2.6	4.0	40
1E	2.7±1.2	84.1±5.9	3.0	80
2E	1.7±1.0	84.1±5.9	1.0	80
3E	1.5±1.0	84.1±5.9	1.5	80
4E	0.5±0.7	45.6±5.5	0.0	50
5E	0.1±0.3	45.6±5.5	0.0	50
6E	0.1±0.2	45.6±5.5	0.0	50
7E	0.2±0.3	41.2±2.6	0.0	40
8E	2.6±0.9	41.2±2.6	3.0	40
9E	1.9±1.0	41.2±2.6	1.5	40

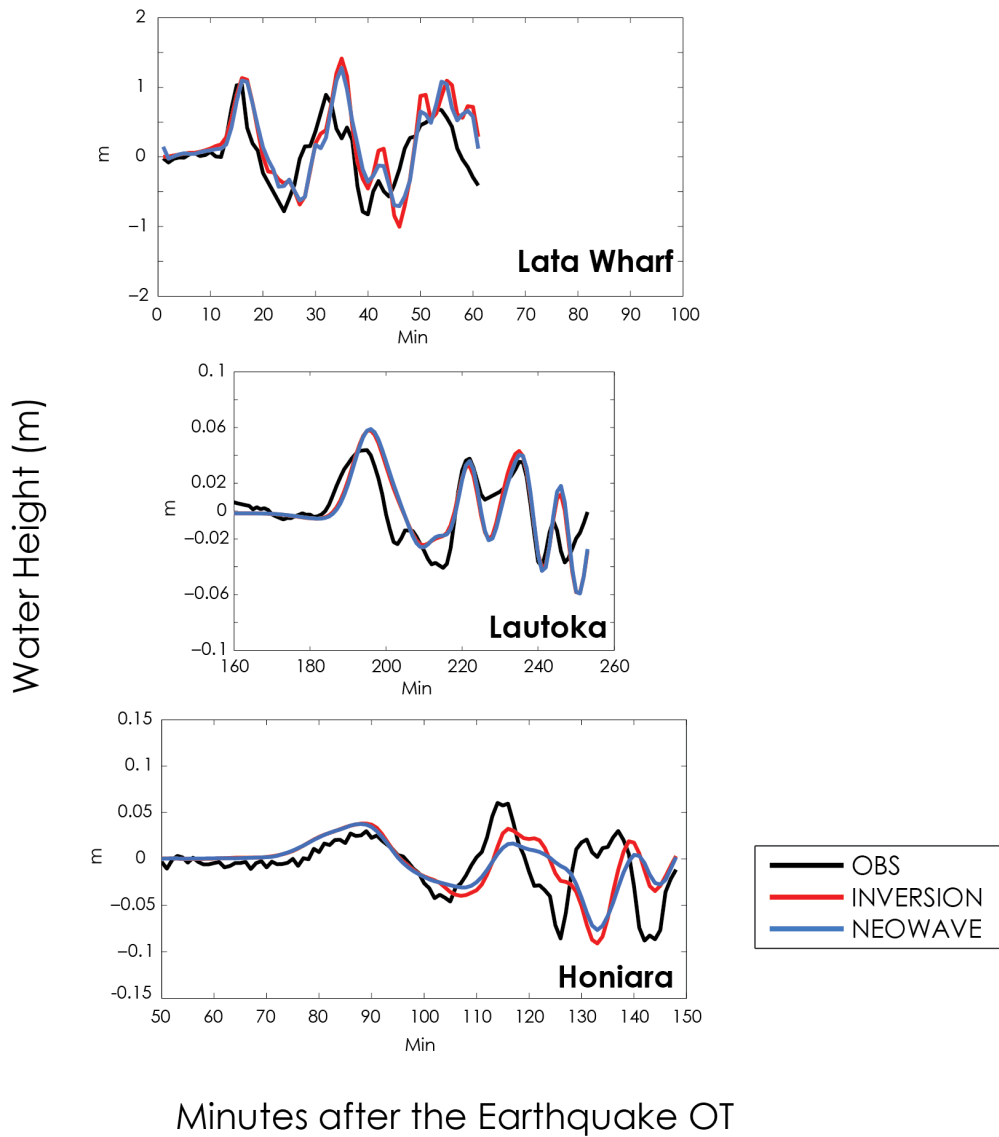


**Figure S1. Fault model.** The fault plane is tessellated with 45 quadrangular subfaults of size  $\sim 20 \times 20$  km. The subfaults are progressively ordered from the southernmost shallowest to the northernmost deepest. The subfaults numbering follows that in Table S1, in order to associate the position on the map to the slip values. Green larger quadrilaterals identify the zones in which we kept the rake constant. Colorbar indicates the depth variation along the fault surface. Red star indicates the epicentre position. Slip model shown in the main text is contoured (pink solid line) in 1.5 m intervals.



**Figure S2 – Fault model – 3D view.** Fault model viewed from South-East.

**Figure S3 – Resolution test, data fit.** Comparison between target (black lines) and predicted (dashed red lines) tsunami waveforms.



**Figure S4 – Validity of linear approximation.** Comparison among predicted tsunami waveforms obtained by Green’s functions superposition (red) and those ones obtained by a single run “from scratch” with NEOWAVE (blue). Observed tsunami waveforms in black.