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Geoscience Australia

Australian Seismological Report 2011

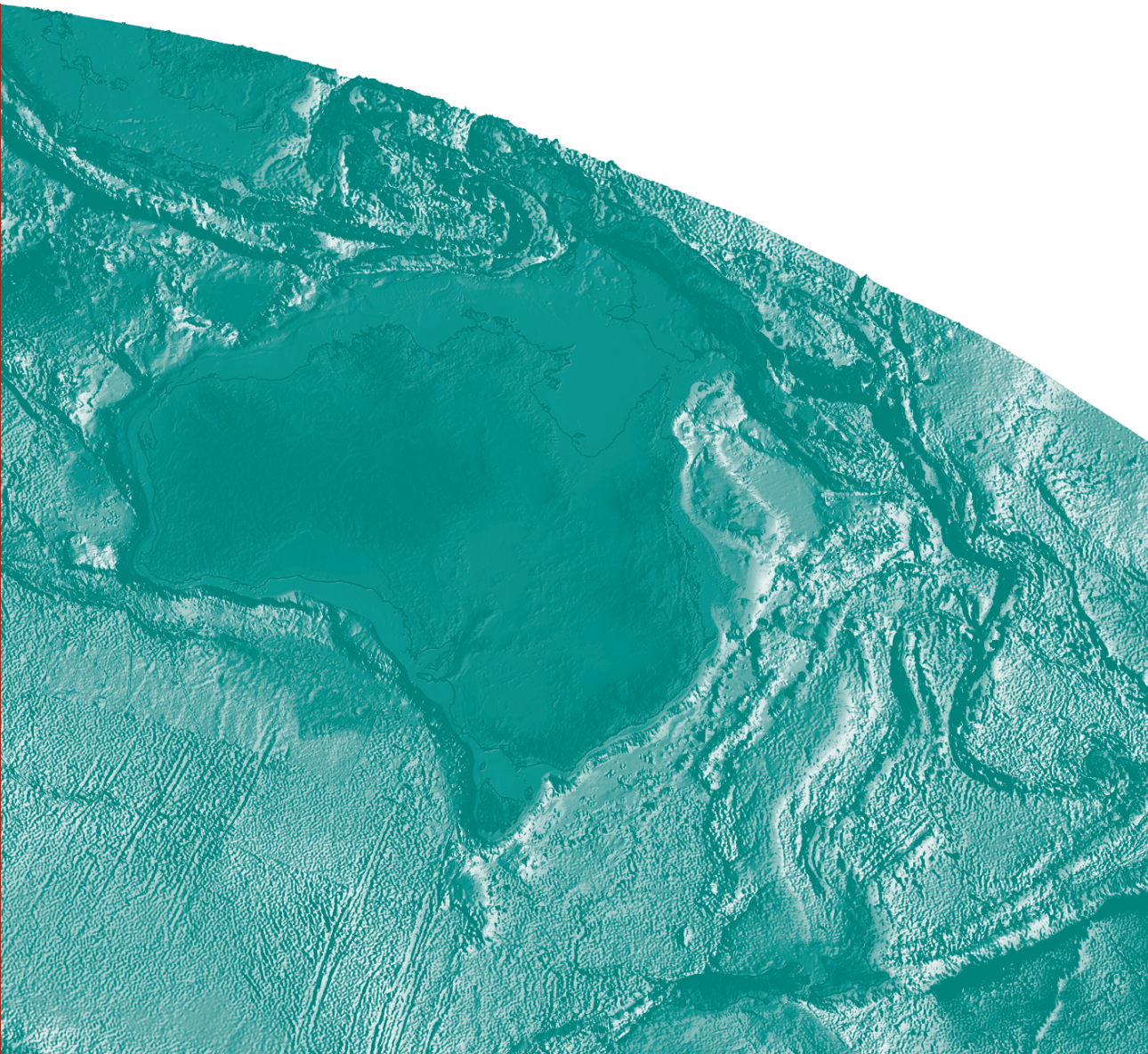
Compiled by: Glanville, D.H.

Record

2012/46

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Australian Government
Geoscience Australia



Government of South Australia
**Department for Manufacturing,
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Introduction

This report details earthquakes detected and located by Geoscience Australia (GA), The Department of Manufacturing, Innovation, Trade, Resources and energy (DMITRE) and Environmental Systems and Services (ES&S) in 2011. Detailed summaries of earthquakes occurring or felt in Australia are provided, along with earthquakes detected within the Australian region and the world, which are recorded as part of earthquake monitoring conducted in the operation of the Joint Australian Tsunami Warning Centre (JATWC). Individual State and Territory earthquake summaries are included for more detailed information regarding earthquakes in that State/Territory. Tables are also provided detailing the largest earthquakes ever recorded in that State/Territory and largest earthquakes (e.g. Top 10) for that State/Territory in 2011, where appropriate. The date and time of the earthquake is provided in Universal Time (UTC). Seismic networks operating in Australia are also detailed by their various operators in this report.

Earthquakes are located at Geoscience Australia using the following procedures:

- An automated system using Antelope® software generates seismic event solutions. These are evaluated by the seismologist on duty to determine validity, size and location.
- Blasts are differentiated when possible and are usually not located, and (generally) not included in the earthquake database.
- Earthquakes worldwide that are determined to have a magnitude (Mb or MWp) of 6.0 or higher by the duty seismologist are entered into the Geoscience Australia earthquakes database as a preliminary solution.
- Earthquakes that are located within the Australian Region, encompassing Latitude 10°N to -70°S and Longitude 85°E to -150°W, and are determined to have a magnitude of 5.0 or higher by the duty seismologist are entered into the Geoscience Australia earthquakes database as a preliminary solution.
- Earthquakes that are within Australia and are determined to have a magnitude of 4.5 or higher by the duty seismologist are entered into the Geoscience Australia earthquakes database as a preliminary solution.
- Earthquakes that are within Australia and are determined to have a magnitude of 3.5 or higher by the duty seismologist and are located near a populated area are entered into the Geoscience Australia earthquakes database as a preliminary solution.
- Earthquakes that are felt within Australia are located by the duty seismologist and entered into the Geoscience Australia earthquakes database as a preliminary solution.
- All preliminary solutions are reviewed by Seismic Analysts using the Antelope® software tool DBloc2. Arrivals and stations used in the solution are reviewed and location and magnitudes of the earthquake are updated and the solution finalised.
- Seismic Analysts then analyse Australian seismic station records for smaller local events that are then located, a magnitude is determined and the event is entered into the Geoscience Australia earthquakes database as a final solution. This requires a clear signal on 3 or more seismic stations.
- For events outside Australia, locations are determined using the IASPEI-91 velocity model and Mb, Msx and MWp are calculated whenever suitable.
- For events inside Australia, both IASPEI-91, and local Australian velocity models are used to determine location, the model which has the best fit to arrivals taking precedence. Magnitudes are calculated using the amplitude of maximum displacement on the Vertical component of the seismogram that is converted to a Wood-Anderson seismometer response, using the following 3 formulae:
 - For WA & NT: Gaull and Gregson (1991)
 - For SA: Greenhalgh and Singh (1986)
 - For Eastern Australia: Michael-Leiba and Malafant (1992)

More information can be accessed at the Geoscience Australia Recent Earthquakes Website:
<http://www.ga.gov.au/earthquakes/>

More information about the Joint Australian Tsunami Warning System can be accessed at:
<http://www.bom.gov.au/tsunami/>

If you have felt an earthquake you can lodge a felt report on our website. We use this information to construct isoseismal maps detailing intensity and felt radius for Australian earthquakes near population centres, and to gain a better understanding of the ground shaking characteristics for Australian earthquakes.

<http://www.ga.gov.au/earthquakes/staticPageController.do?page=felt-earthquake>

Or follow the link from:

<http://www.ga.gov.au/earthquakes/>

More earthquake and seismic information for South Australia can be found at:
<http://www.pir.sa.gov.au/minerals/earthquakes>

More earthquake and seismic information for New South Wales, Queensland, Tasmania and Victoria are available on the Environmental Systems and Services website at:
<http://www.esands.com/>

Other organisations and private seismic stations include:

Australian seismometers in schools network. www.facebook.com/ausisnetwork,

Website www.ausis.edu.au (soon to be launched) or email ausis@anu.edu.au

Australian Earthquake Engineering Society

<http://www.aees.org.au/>

Edward Pigot Seismic Observatory (EPSO), Coonabarabran, NSW, Australia

<http://www.map.id.au/seismic/>

Regional seismic users group website

<http://www.rsuw.daleh.id.au/>

Australia

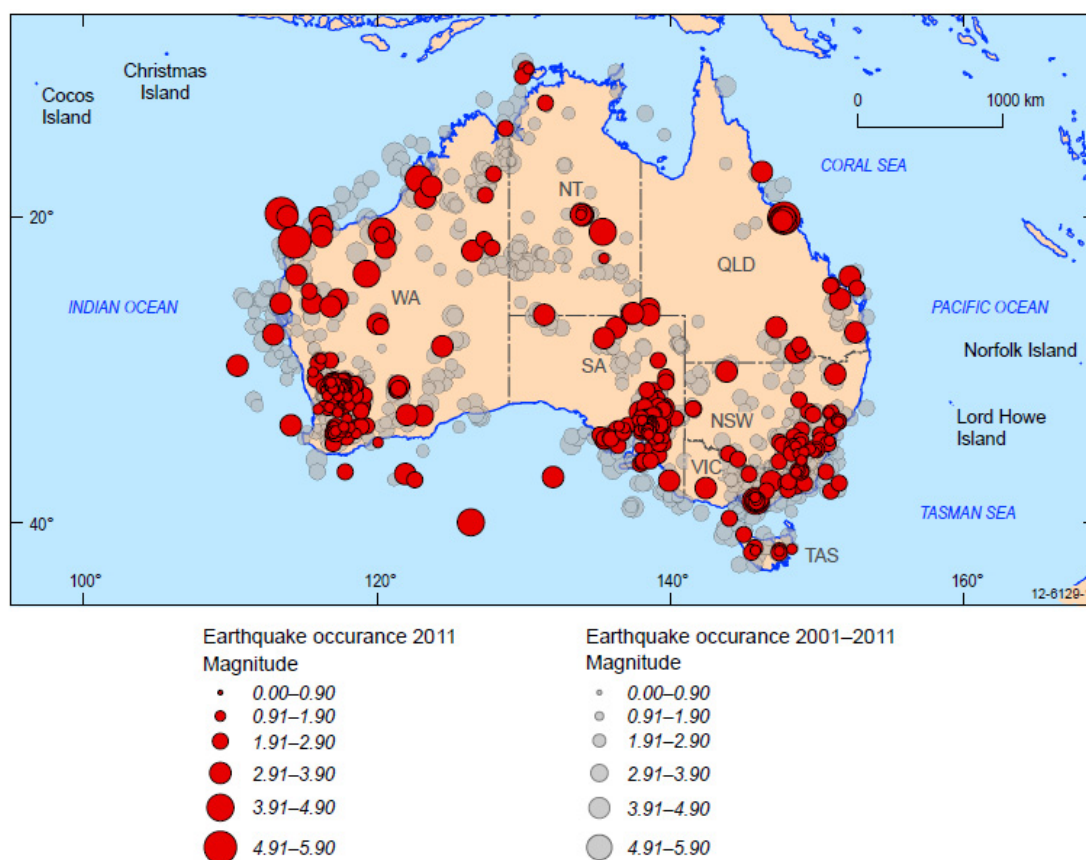


Figure 1: Map of 2011 Australian Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 1: Australian Top 10 Earthquakes 2011 (Recorded by Geoscience Australia)

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
5.3	16-Apr-11	05:31:18	-20.085	147.764	7	Near Bowen, QLD.
5.3	17-Apr-11	18:41:20	-19.803	113.525	30	North of Exmouth, WA.
5.1	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.
4.5	20-May-11	20:03:29	-23.46	119.332	9	SW of Newman, WA.
4.5	14-Jul-11	05:51:36	-20.865	120.356	12	NE of Marble Bar, WA.
4.4	21-Feb-11	21:59:36	-20.903	135.42	1	Hatches Creek, NT.
4.4	05-Jul-11	01:32:11	-38.412	145.839	2	Korumburra, VIC.
4.3	15-Oct-11	10:38:10	-21.935	113.534	0	Near Carrieton, SA.
4.3	28-Oct-11	09:08:41	-35.033	139.002	0	Great Australian Bight.
4.1	16-Apr-11	07:06:52	-20.17	147.679	0	Near Bowen, QLD.

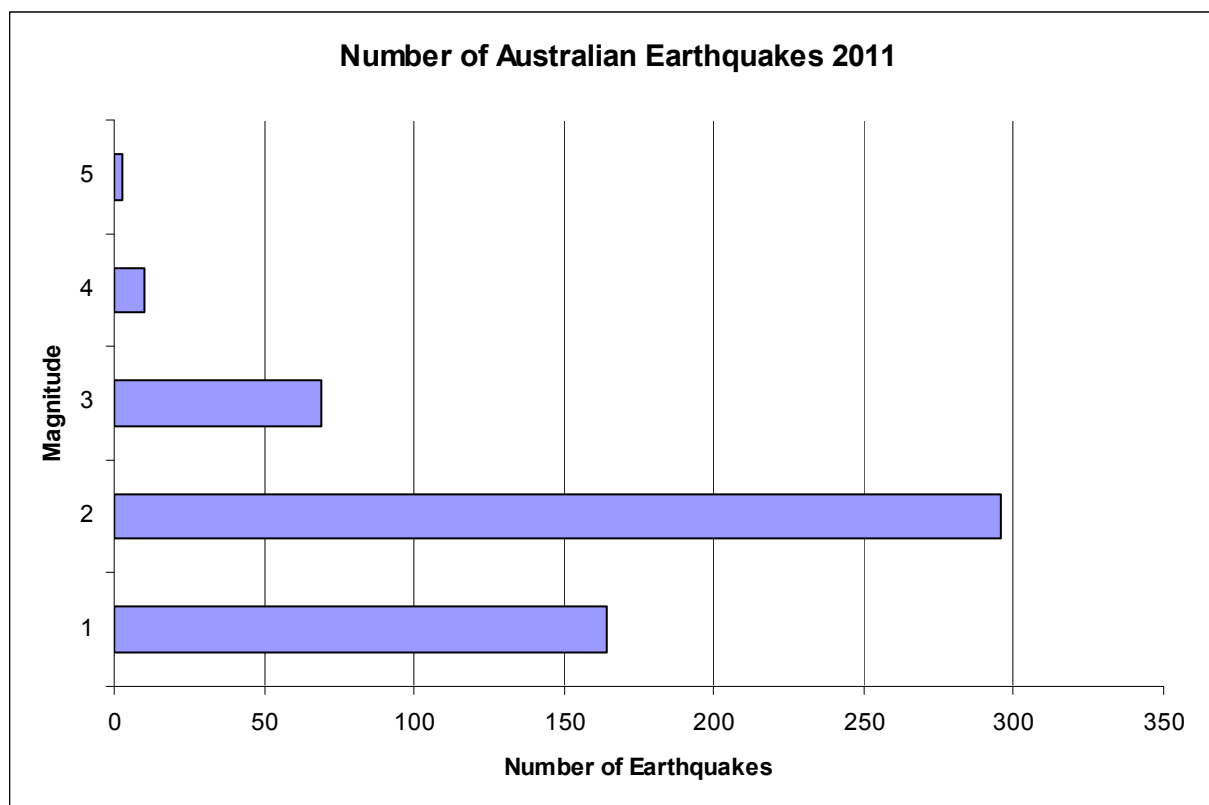


Figure 2: Number of Australian Earthquakes by Magnitude 2011. (Note that not all small earthquakes [less than magnitude 3] can be located)

Table 2: Australian Top 10 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
7.3	29-Apr-1941	01:35:39	-26.920	115.800	0	Meeberrie, WA.
6.9	26-Jan-1892	16:48:00	-40.400	149.500	0	Tasman Sea, NE TAS.
6.9	14-Oct-1968	02:58:50	-31.620	116.980	10	Meckering, WA.
6.8	12-May-1885	23:37:00	-39.900	148.900	0	Tasman Sea, NE TAS.
6.7	24-Mar-1970	10:35:17	-22.050	126.610	8	L McKay, WA.
6.7	22-Jan-1988	12:05:00	-19.838	133.994	5	Tennant Creek, NT.
6.6	16-Aug-1929	21:28:23	-16.990	120.660	33	Broome, WA.
6.6	23-Apr-1979	05:45:10	-16.660	120.270	26	Broome, WA.
6.5	10-May-1897	05:26:00	-37.333	139.750	0	Beachport, SA.
6.5	27-Jun-1941	07:55:49	-25.950	137.340	0	Simpson Desert, NT.

Table 3: Time since last Magnitude 5, 6, and 7 in Australia as of end 2011.

MAGNITUDE	DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION	TIME SINCE
5.1	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.	26 Days
6.3	10-Aug-1997	09:20:31	-16.050	124.423	10	Collier Bay WA.	14 yrs
7.3	29-Apr-1941	01:35:39	-26.920	115.800	0	Meeberrie WA.	70 yrs

Table 4: Australian Earthquakes 2011 (Recorded by Geoscience Australia)

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.3	ML	02-Jan-11	00:21:21	-31.966	139.505	11	North of Yunta, SA.
3.5	ML	04-Jan-11	16:40:12	-34.058	135.55	0	NW of Cummins, SA.
2.4	ML	04-Jan-11	22:35:22	-11.327	130.182	0	Bathurst Island, NT.
2.2	ML	04-Jan-11	22:37:13	-34.01	135.585	0	NW of Cummins, SA.
1.8	ML	05-Jan-11	17:42:57	-11.337	130.357	6	Bathurst Island, NT.
1.6	ML	05-Jan-11	22:39:39	-30.761	117.767	1	NW of Bencubbin, WA.
3.0	ML	06-Jan-11	01:01:59	-36.5	121.957	10	South of Esperance, SA.
2.6	ML	06-Jan-11	10:00:54	-35.489	144.623	0	West of Deniliquin, NSW.
2.2	ML	08-Jan-11	07:46:29	-34.062	135.506	0	NW of Cummins, SA.
2.7	ML	08-Jan-11	12:57:19	-14.771	128.795	10	Offshore, N of Kununurra, WA.
1.8	ML	08-Jan-11	19:29:32	-33.175	138.676	0	Near Jamestown, SA.
1.7	ML	08-Jan-11	19:49:03	-33.167	138.665	0	Near Jamestown, SA.
1.9	ML	09-Jan-11	01:40:08	-32.81	138.169	15	NW of Melrose, SA.
2.3	ML	09-Jan-11	06:44:53	-33.009	139.478	10	E of Peterborough, SA.
1.7	ML	11-Jan-11	02:40:48	-34.931	149.986	6	SE of Goulburn, NSW.
3.5	ML	11-Jan-11	03:11:39	-27.997	124.491	0	Lake Yeo, WA.
1.9	ML	11-Jan-11	10:00:42	-32.259	117.424	0	S of Quairading, WA.
1.9	ML	11-Jan-11	19:21:35	-36.301	148.658	12	N of Jindabyne, NSW.
1.3	ML	12-Jan-11	06:12:47	-32.298	117.37	0	East of Brookton, WA.
2.6	ML	13-Jan-11	07:26:00	-36.911	122.615	0	Offshore, S of Esperance, WA.
3.9	ML	15-Jan-11	00:38:01	-33.573	136.467	1	Cleve, SA.
1.8	ML	15-Jan-11	17:23:55	-30.502	117.637	19	W of Beacon, WA.
2.2	ML	16-Jan-11	01:11:55	-30.474	116.964	0	NE of Ballidu, WA.
3.1	ML	16-Jan-11	06:26:39	-21.872	120.609	10	SE of Marble Bar, WA.
2.0	ML	17-Jan-11	10:08:49	-33.18	138.686	0	NE of Jamestown, SA.
1.4	ML	19-Jan-11	02:39:39	-33.643	117.622	0	NE of Katanning, WA.
2.3	ML	22-Jan-11	01:35:06	-31.675	117.114	6	SE of Meckering, WA.
2.2	ML	22-Jan-11	10:40:51	-30.82	117.968	9	E of Bencubbin, WA.
3.3	ML	23-Jan-11	19:40:16	-28.393	148.522	10	St George, QLD.
2.7	ML	24-Jan-11	13:05:49	-35.097	143.984	10	Moulamein, NSW.
2.0	ML	24-Jan-11	13:47:02	-31.672	117.17	12	SW of Cunderdin, WA.
1.7	ML	25-Jan-11	04:45:27	-30.727	117.838	8	Bencubbin area, WA.
2.6	ML	25-Jan-11	11:28:52	-33.485	148.953	5	Near Orange, NSW.
2.6	ML	25-Jan-11	23:57:57	-32.105	139.608	10	E of Hawker, SA.
2.1	ML	26-Jan-11	07:52:34	-33.545	138.558	10	Spalding area, SA.
2.5	ML	28-Jan-11	09:11:09	-33.97	117.962	0	Gnowangerup area, WA.
2.3	ML	28-Jan-11	10:43:03	-33.789	150.246	10	Katoomba area, NSW.
2.4	ML	28-Jan-11	11:47:08	-36.362	150.625	10	E of Narooma, NSW.
2.3	ML	29-Jan-11	00:17:49	-33.679	136.765	10	E of Cleve, SA.
2.6	ML	29-Jan-11	15:29:33	-31.466	148.784	10	NE of Gilgandra, NSW.
2.2	ML	29-Jan-11	20:38:36	-30.578	118.045	0	SE of Beacon, WA.
2.5	ML	29-Jan-11	22:42:33	-21.893	127.867	15	NW of Lake Mackay, WA.
1.8	ML	29-Jan-11	23:18:39	-33.723	118.594	10	NE of Ongerup, WA.
2.4	ML	30-Jan-11	04:59:12	-30.545	118.083	0	Beacon area, WA.
2.5	ML	30-Jan-11	08:57:03	-30.535	118.105	0	Beacon area, WA.
1.9	ML	31-Jan-11	01:05:25	-30.679	117.924	10	NE of Bencubbin, WA.
2.2	ML	01-Feb-11	08:15:47	-34.416	150.402	10	NW of Bowral, NSW.
2.3	ML	05-Feb-11	20:27:38	-32.139	139.581	10	North of Yunta, SA.
2.3	ML	05-Feb-11	20:29:14	-32.285	139.652	10	North of Yunta, SA.

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2.4	ML	06-Feb-11	01:07:30	-30.681	118.629	3	SE of Bonnie Rock, WA.
1.9	ML	06-Feb-11	01:17:11	-19.699	134	0	Tennant Creek area, NT.
2.6	ML	06-Feb-11	08:05:45	-28.326	149.031	10	St George area, QLD.
2.3	ML	06-Feb-11	16:44:47	-31.88	119.049	10	NE of Hyden, WA.
2.2	ML	06-Feb-11	16:48:50	-31.928	119.03	10	NE of Hyden, WA.
2.5	ML	08-Feb-11	16:03:26	-32.223	139.572	8	North of Yunta, SA.
2.4	ML	09-Feb-11	14:41:04	-32.939	151.361	13	S of Cessnock, NSW.
2.4	ML	09-Feb-11	16:51:13	-32.915	151.462	0	Mount Vincent, NSW.
1.7	ML	09-Feb-11	17:02:44	-32.929	151.472	0	Mount Vincent, NSW.
2.2	ML	10-Feb-11	23:33:06	-32.873	151.449	0	SE of Cessnock, NSW.
2.3	ML	11-Feb-11	11:28:50	-37.14	147.91	0	Mt Nugong, Vic.
2.0	ML	12-Feb-11	19:23:57	-30.45	118.563	0	NE of Bonnie Rock, WA.
1.6	ML	13-Feb-11	06:05:59	-31.688	117.06	0	Meckering, WA.
2.3	ML	13-Feb-11	14:48:09	-33.21	138.625	2	E of Jamestown, SA.
2.1	ML	14-Feb-11	01:08:41	-33.561	138.314	5	Koolunga, SA.
1.9	ML	14-Feb-11	15:48:10	-33.231	138.6	5	S of Jamestown, SA.
2.1	ML	15-Feb-11	04:00:46	-37.16	149.143	0	Bondi Forest, NSW.
1.2	ML	15-Feb-11	06:35:31	-22.528	135.501	0	NE of Mount Swan, NT.
1.6	ML	15-Feb-11	09:46:58	-31.275	118.022	10	NW of Merredin, WA.
2.0	ML	15-Feb-11	20:48:39	-32.723	138.269	10	Willowie area, SA.
1.5	ML	16-Feb-11	06:59:20	-31.881	116.384	9	Woottating, WA.
2.5	ML	19-Feb-11	07:15:37	-31.61	138.749	10	NE of Hawker, SA.
3.0	ML	20-Feb-11	15:30:34	-32.606	138.501	0	Coomooroo, SA.
4.4	ML	21-Feb-11	21:59:36	-20.903	135.42	1	Hatches Creek, NT.
1.5	ML	22-Feb-11	09:31:40	-35.029	149.143	7	Near Murrumbateman, NSW.
2.1	ML	23-Feb-11	03:19:32	-30.667	117.442	8	N of Koorda, WA.
3.0	ML	24-Feb-11	02:26:20	-26.564	120.084	10	Near Wiluna, WA.
2.4	ML	26-Feb-11	00:46:39	-37.687	146.567	10	Near Licola, Vic.
2.0	ML	26-Feb-11	03:53:46	-33.17	137.121	4	SW of Whyalla, SA.
1.9	ML	27-Feb-11	10:39:57	-30.676	117.452	3	North of Koorda, WA.
2.2	ML	27-Feb-11	13:29:00	-32.922	151.437	0	Mount Vincent, NSW.
3.4	ML	28-Feb-11	16:31:09	-20.564	116.333	6	NW of Dampier, WA.
2.2	ML	02-Mar-11	23:02:55	-34.025	135.941	10	SE of Brooker, SA.
1.5	ML	02-Mar-11	23:48:35	-30.763	117.102	9	NW of Cadoux, WA.
1.0	ML	03-Mar-11	03:36:51	-30.769	117.057	0	Cadoux, WA.
2.0	ML	03-Mar-11	05:07:55	-30.283	117.696	6	NW of Beacon, WA.
1.4	ML	04-Mar-11	03:59:27	-32.097	116.039	9	NW of Roleystone, WA.
2.5	ML	04-Mar-11	19:00:00	-27.897	148.803	10	St George area, QLD.
2.3	ML	06-Mar-11	05:10:25	-31.252	118.545	4	East of Goomarin, WA.
3.6	ML	07-Mar-11	04:20:37	-19.89	134.073	8	Tennant Creek, NT.
2.3	ML	07-Mar-11	18:04:19	-30.443	118.582	0	Bonnie Rock area, WA.
1.2	ML	09-Mar-11	04:51:10	-33.276	117.785	0	Near Dumbleyung, WA.
2.4	ML	09-Mar-11	20:27:46	-11.753	129.938	10	Bathurst Island, NT.
1.5	ML	12-Mar-11	22:11:20	-30.323	117.244	10	NE of Kalannie, WA.
2.1	ML	13-Mar-11	14:28:07	-32.616	138.407	10	Hammond, SA.
3.6	ML	15-Mar-11	06:07:59	-17.327	146.253	0	Offshore Innisfail, Qld.
2.4	ML	21-Mar-11	16:35:18	-31.488	138.659	18	Wilpena Pound, SA.
3.6	ML	23-Mar-11	03:27:50	-29.23	110.53	28	Offshore West of Geraldton, WA.
2.4	ML	25-Mar-11	02:40:31	-38.384	145.818	11	Near Korumburra, VIC.
3.4	ML	26-Mar-11	19:22:46	-27.482	135.489	10	NE of Coober Pedy, SA.
1.9	ML	27-Mar-11	01:21:54	-34.333	120.101	10	S of Hopetoun, WA.
2.4	ML	27-Mar-11	11:30:09	-33.246	138.506	7	Jamestown, SA.
1.6	ML	30-Mar-11	11:50:09	-31.639	116.994	0	Meckering, WA.

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2.3	ML	31-Mar-11	11:46:19	-34.727	148.306	1	Young area, NSW.
1.8	ML	31-Mar-11	19:32:44	-34.594	148.586	0	Young area, NSW.
3.7	ML	31-Mar-11	20:27:39	-36.726	132.03	0	Great Australian Bight.
2.3	ML	02-Apr-11	03:27:36	-31.876	139.188	0	Near Baratta Hill, SA.
3.7	ML	02-Apr-11	06:07:03	-25.055	117.345	0	Mount Clare, WA.
1.6	ML	04-Apr-11	10:16:59	-30.743	117.405	7	NW of Koorda, WA.
1.3	ML	04-Apr-11	11:36:39	-34.974	149.12	0	Near Murrumbateman, NSW.
2.7	ML	04-Apr-11	12:03:04	-17.452	127.984	0	W of Purnululu, WA.
2.0	ML	05-Apr-11	14:47:47	-33.775	138.68	4	NE of Clare, SA.
1.6	ML	05-Apr-11	14:53:25	-33.313	118.21	0	Merilup, WA.
2.0	ML	07-Apr-11	04:41:05	-30.704	118.245	0	SW of Bonnie Rock, WA.
2.4	ML	08-Apr-11	19:51:33	-38.503	145.852	0	Near Korumburra, VIC.
2.1	ML	09-Apr-11	08:54:49	-34.395	139.553	0	SW of Blanchetown, SA.
2.8	ML	10-Apr-11	16:12:18	-13.296	131.513	0	SE of Bachelor, NT.
2.0	ML	11-Apr-11	12:47:54	-30.576	117.534	10	NE of Koorda, WA.
2.7	ML	12-Apr-11	10:29:45	-42.207	145.54	0	South of Queenstown, TAS.
1.9	ML	12-Apr-11	11:33:34	-33.464	138.288	5	SE of Crystal Brook, SA.
3.6	ML	14-Apr-11	01:18:22	-18.197	123.73	20	South of Derby, WA.
2.2	ML	15-Apr-11	10:06:19	-30.258	116.962	2	NW of Kalannie, WA.
1.0	ML	15-Apr-11	10:56:01	-30.325	116.913	2	NW of Kalannie, WA.
1.9	ML	15-Apr-11	14:09:16	-34.404	148.452	3	NE of Kingsvale, NSW.
1.4	ML	15-Apr-11	18:33:48	-30.256	116.828	0	E of Dalwallinu, WA.
5.3	ML	16-Apr-11	05:31:18	-20.085	147.764	7	Near Bowen, QLD.
4.1	ML	16-Apr-11	07:06:52	-20.17	147.679	0	Near Bowen, QLD.
1.7	ML	16-Apr-11	11:33:37	-31.869	118.179	13	Bruce Rock, WA.
1.6	ML	16-Apr-11	12:59:16	-30.157	117.107	0	N of Kalannie, WA.
3.2	ML	16-Apr-11	13:06:44	-20.191	147.692	0	Near Bowen, QLD.
3.4	ML	16-Apr-11	15:33:19	-20.128	147.759	4	Near Bowen, QLD.
2.0	ML	16-Apr-11	22:08:16	-34.076	135.98	10	Moody, SA.
3.2	ML	17-Apr-11	01:35:55	-20.174	147.668	0	Near Bowen, QLD.
1.9	ML	17-Apr-11	14:13:05	-32.733	118.003	0	Kulin, WA.
5.3	MB	17-Apr-11	18:41:20	-19.803	113.525	30	North of Exmouth, WA.
2.2	ML	19-Apr-11	07:30:59	-31.707	117.076	6	Near Meckering, WA.
3.2	ML	19-Apr-11	07:38:05	-20.067	147.81	6	Near Bowen, QLD.
2.4	ML	19-Apr-11	20:13:39	-24.353	152.722	10	SE of Gladstone, QLD.
3.6	ML	20-Apr-11	19:23:04	-19.987	113.932	15	N of Exmouth, WA.
1.7	ML	21-Apr-11	03:53:39	-34.795	149.994	0	E of Dalton, NSW.
2.3	ML	22-Apr-11	15:18:14	-33.2	139.304	9	E of Jamestown, SA.
1.1	ML	22-Apr-11	17:44:56	-30.522	116.867	10	NE of Ballidu, WA.
1.9	ML	22-Apr-11	18:25:35	-34.15	138.895	10	Marrabel, SA.
2.8	ML	23-Apr-11	02:22:52	-31.031	138.858	10	Blinman area, SA.
1.5	ML	23-Apr-11	19:16:24	-33.552	117.04	0	Beaufort River, WA.
2.1	ML	24-Apr-11	19:29:08	-30.532	118.6	10	E of Bonnie Rock, WA.
1.4	ML	25-Apr-11	01:42:44	-33.403	117.774	10	S of Dumbleyung, WA.
1.8	ML	26-Apr-11	11:31:01	-30.516	116.843	0	Ballidu, WA.
3.4	ML	26-Apr-11	14:27:52	-30.508	117.155	0	Burakin, WA.
1.7	ML	26-Apr-11	14:36:11	-30.507	116.844	0	Ballidu, WA.
1.7	ML	26-Apr-11	22:11:50	-30.501	116.837	0	Ballidu, WA.
2.0	ML	27-Apr-11	10:40:48	-30.737	121.511	0	Near Kalgoorlie, WA.
1.8	ML	27-Apr-11	16:40:58	-30.504	116.841	0	Ballidu, WA.
2.5	ML	28-Apr-11	19:57:56	-32.712	140.379	10	Wadnaminga area, SA.
2.0	ML	30-Apr-11	13:00:47	-30.26	116.91	0	NW of Kalannie, WA.
1.7	ML	01-May-11	15:17:57	-34.289	148.911	4	Frogmore, NSW.
3.0	ML	01-May-11	21:40:20	-19.876	133.928	5	Near Tennant Creek, NT.

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3.3	ML	04-May-11	12:29:17	-32.273	137.931	0	NW of Quorn, SA.
2.0	ML	04-May-11	20:13:16	-34.716	149.75	2	Goulburn, NSW.
3.1	ML	05-May-11	05:35:05	-20.242	147.651	0	SW of Bowen, Qld.
1.7	ML	06-May-11	12:52:04	-30.539	116.789	7	North of Ballidu, WA.
1.7	ML	06-May-11	20:08:17	-30.486	116.89	2	NE of Ballidu, WA.
4.0	ML	07-May-11	05:23:36	-17.735	122.881	10	NE of Broome, WA.
2.5	ML	08-May-11	05:49:00	-24.159	151.008	8	E of Dumgree, QLD.
2.3	ML	08-May-11	18:55:18	-34.408	117.045	0	N of Rocky Gully, WA.
1.7	ML	08-May-11	23:15:31	-33.607	117.329	0	NW of Katanning, WA.
3.5	ML	09-May-11	08:18:10	-27.25	112.972	10	Off Kalbarri, WA.
1.6	ML	10-May-11	13:29:21	-32.121	117.185	0	SW of Quairading, WA.
1.5	ML	10-May-11	13:36:46	-32.125	117.186	2	SW of Quairading, WA.
3.1	ML	12-May-11	18:36:54	-32.463	122.068	19	SE of Norseman, WA.
2.0	ML	13-May-11	18:19:25	-30.258	117.676	10	NW of Beacon, WA.
2.2	ML	13-May-11	23:21:29	-30.3	117.197	11	NE of Kalannie, WA.
3.3	ML	13-May-11	23:25:55	-25.014	151.579	1	W of Moolboolaman, QLD.
2.3	ML	15-May-11	09:31:02	-32.129	139.52	10	NW of Manna Hill, SA.
1.9	ML	15-May-11	20:33:20	-31.471	117.869	0	E of Kellerberrin, WA.
2.7	ML	16-May-11	03:30:36	-31.386	139.133	10	NE of Hawker, SA.
1.4	ML	16-May-11	08:55:17	-33.555	117.228	7	E of Beaufort River, WA.
2.5	ML	16-May-11	14:47:13	-37.701	150.942	20	Offshore, SE of Eden, NSW.
2.4	ML	18-May-11	13:34:08	-32.31	150.95	1	SE of Muswellbrook, NSW.
2.8	ML	18-May-11	20:41:04	-30.878	138.879	10	NE of Blinman, SA.
4.5	MB	20-May-11	20:03:29	-23.46	119.332	9	SW of Newman, WA.
2.2	ML	21-May-11	01:57:57	-30.575	116.994	0	SW of Burakin, WA.
2.5	ML	22-May-11	01:40:31	-33.2	119.328	10	SE of Newdegate, WA.
2.0	ML	22-May-11	16:25:49	-33.114	138.364	10	E of Port Pirie, SA.
2.6	ML	22-May-11	18:16:18	-33.261	139.33	10	E of Terowie, SA.
2.4	ML	23-May-11	04:18:34	-33.196	139.247	2	E of Terowie, SA.
3.2	ML	23-May-11	13:47:13	-26.002	131.424	0	SE of Yulara, SA.
1.7	ML	24-May-11	05:54:01	-32.82	137.768	6	S of Blanche Harbor, SA.
3.7	ML	24-May-11	10:27:16	-33.167	139.271	0	E of Terowie, SA.
3.6	ML	24-May-11	12:45:51	-33.172	139.318	5	E of Terowie, SA.
2.6	ML	24-May-11	16:13:56	-35.63	147.428	0	Holbrook area, NSW.
2.5	ML	24-May-11	16:42:24	-32.25	138.861	0	Bendelby Ranges, SA.
1.7	ML	24-May-11	17:11:19	-41.948	148.302	0	Bichino area, Tas.
2.2	ML	24-May-11	21:26:31	-35.198	139.226	0	Murray Bridge area, SA.
2.7	ML	25-May-11	22:05:20	-32.341	138.823	0	NE of Orroroo, SA.
2.2	ML	25-May-11	22:19:20	-32.434	138.911	10	NE of Orroroo, SA.
3.4	ML	26-May-11	12:28:45	-26.801	147.232	10	SE of Charleville, QLD.
3.2	ML	28-May-11	10:34:55	-33.28	139.349	10	SE of Terowie, SA.
1.6	ML	28-May-11	12:00:54	-35.374	148.935	10	Pierces Creek, ACT.
1.3	ML	30-May-11	11:48:33	-30.6	116.972	10	E of Ballidu, WA.
3.8	ML	01-Jun-11	03:29:04	-37.49	142.425	2	Grampians National Park, VIC.
2.2	ML	03-Jun-11	17:18:19	-31.181	119.191	10	NW of Southern Cross, WA.
1.5	ML	04-Jun-11	20:24:14	-31.955	116.81	0	Gwambygine, WA.
2.0	ML	05-Jun-11	04:09:47	-30.519	116.848	2	NE of Ballidu, WA.
1.5	ML	05-Jun-11	05:04:26	-30.446	116.878	0	NE of Ballidu, WA.
2.4	ML	05-Jun-11	07:06:39	-33.26	139.324	10	SE of Terowie, SA.
2.4	ML	05-Jun-11	20:37:22	-34.526	136.446	10	NE of Port Lincoln, SA.
2.1	ML	09-Jun-11	00:14:49	-33.76	138.893	15	SW of Burra, SA.
1.9	ML	12-Jun-11	00:35:51	-31.703	117.073	0	Meckering, WA.
2.3	ML	13-Jun-11	17:22:46	-34.251	135.486	0	E of Cummins, SA.
2.4	ML	14-Jun-11	11:51:29	-30.49	116.776	0	N of Ballidu, WA.

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1.8	ML	14-Jun-11	22:33:40	-30.491	116.875	0	NE of Ballidu, WA.
2.0	ML	15-Jun-11	08:13:30	-34.611	148.315	0	SW of Harden, NSW.
2.0	ML	15-Jun-11	18:58:57	-32.801	138.215	6	NE of Melrose, SA.
2.2	ML	16-Jun-11	18:18:34	-33.933	148.448	0	E of Grenfell, NSW.
1.9	ML	17-Jun-11	00:19:24	-34.778	149.099	0	Jerrawa, NSW.
2.5	ML	17-Jun-11	10:39:27	-32.443	149.742	10	NE of Mudgee, NSW.
1.6	ML	17-Jun-11	16:17:23	-30.494	116.875	0	NE of Ballidu, WA.
1.7	ML	18-Jun-11	19:57:53	-32.145	117.227	0	SW of Quairading, WA.
2.0	ML	20-Jun-11	12:42:46	-30.386	116.944	0	Kalannie area, WA.
2.3	ML	20-Jun-11	15:58:06	-31.808	117.325	12	Youndegin, WA.
1.9	ML	21-Jun-11	03:12:34	-34.855	149.766	10	S of Goulburn, NSW.
2.2	ML	21-Jun-11	14:06:29	-32.719	138.357	12	NE of Melrose, SA.
3.1	ML	21-Jun-11	20:03:26	-25.292	113.481	0	W of Carnarvon, WA.
2.7	ML	22-Jun-11	13:03:53	-33.813	135.232	0	Sheringa, SA.
1.2	ML	23-Jun-11	20:01:59	-30.804	117.107	0	Cadoux, WA.
3.0	ML	26-Jun-11	20:32:14	-27.111	152.611	0	West of Mount Mee, QLD.
1.7	ML	27-Jun-11	19:47:05	-36.381	148.596	0	Jindabyne, NSW.
3.5	ML	27-Jun-11	22:18:34	-25.283	115.643	0	SE of Gascoyne Junction, WA.
2.1	ML	28-Jun-11	08:34:35	-32.651	138.267	10	NE of Melrose, SA.
1.4	ML	02-Jul-11	10:26:59	-34.763	149.555	0	West of Goulburn, NSW.
1.6	ML	04-Jul-11	21:16:16	-32.131	117.206	0	SW of Quairading, WA.
1.7	ML	04-Jul-11	21:39:58	-32.132	117.216	1	SW of Quairading, WA.
4.4	ML	05-Jul-11	01:32:11	-38.412	145.839	2	Korumburra, Vic.
3.3	ML	05-Jul-11	02:37:16	-38.404	145.888	0	Korumburra, Vic.
3.7	ML	05-Jul-11	09:16:26	-38.412	145.806	6	Korumburra, Vic.
2.7	ML	05-Jul-11	16:02:10	-32.219	149.398	0	NW of Gulgong, NSW.
3.3	ML	05-Jul-11	17:03:09	-38.45	145.835	3	Korumburra, Vic.
1.9	ML	06-Jul-11	15:50:23	-30.809	117.038	0	Manmanning, WA.
2.8	ML	07-Jul-11	00:01:59	-30.832	121.473	0	Kalgoorlie, WA.
3.0	ML	07-Jul-11	17:49:50	-38.359	145.823	7	Korumburra, Vic.
2.3	ML	07-Jul-11	20:59:28	-42.214	147.419	0	Oatlands, Tas.
2.1	ML	09-Jul-11	00:46:30	-38.38	145.721	0	Korumburra, Vic.
1.9	ML	09-Jul-11	17:55:23	-34.787	149.17	5	Oolong, NSW.
1.9	ML	09-Jul-11	17:59:16	-34.785	149.171	0	Oolong, NSW.
3.1	ML	10-Jul-11	03:32:37	-37.023	146.901	0	S of Bright, Vic.
2.9	ML	11-Jul-11	12:19:29	-30.202	139.729	4	E of Leigh Creek, SA.
2.6	ML	11-Jul-11	13:28:33	-32.065	141.624	0	SE of Broken Hill, NSW.
3.5	ML	11-Jul-11	19:39:58	-20.051	116.135	33	NW of Dampier, WA.
2.9	ML	13-Jul-11	16:30:12	-29.968	139.721	4	NE of Arkaroola Village, SA.
1.9	ML	13-Jul-11	19:04:30	-36.293	148.83	2	Near Berridale, NSW.
3.4	ML	14-Jul-11	02:35:53	-33.165	114.173	0	W of Bunbury, WA.
4.5	ML	14-Jul-11	05:51:36	-20.865	120.356	12	NE of Marble Bar, WA.
2.7	ML	14-Jul-11	10:27:45	-21.093	120.351	11	E of Marble Bar, WA.
2.2	ML	14-Jul-11	10:57:27	-36.293	148.801	0	Near Berridale, NSW.
1.9	ML	14-Jul-11	18:41:30	-36.274	148.855	2	Near Berridale, NSW.
2.2	ML	14-Jul-11	22:49:50	-28.903	116.867	0	S of Yalgoo, WA.
2.7	ML	15-Jul-11	06:06:26	-30.319	139.714	0	E of Arkaroola Village, SA.
2.0	ML	15-Jul-11	13:41:24	-36.343	148.898	2	Near Berridale, NSW.
2.1	ML	17-Jul-11	00:17:43	-31.843	117.836	0	S of Kellerberrin, WA.
1.5	ML	17-Jul-11	00:43:07	-33.72	117.067	0	NW of Kojonup, WA.
2.5	ML	17-Jul-11	01:22:28	-31.837	117.8	2	S of Kellerberrin, WA.
2.2	ML	18-Jul-11	17:58:47	-34.311	147.44	0	Temora, NSW.
2.0	ML	19-Jul-11	03:01:43	-36.346	148.907	0	Near Berridale, NSW.
2.4	ML	19-Jul-11	05:52:58	-31.286	138.617	0	S of Blinman, SA.

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1.5	ML	21-Jul-11	18:23:11	-30.575	116.987	0	SW of Burakin, WA.
2.4	ML	21-Jul-11	18:33:02	-31.151	119.072	10	N of Moorine Rock, WA.
2.2	ML	22-Jul-11	06:00:30	-36.263	148.89	0	Near Berridale, NSW.
1.7	ML	22-Jul-11	07:53:46	-31.896	117.281	0	Youndegin, WA.
1.9	ML	22-Jul-11	22:02:00	-34.829	149.144	10	Oolong, NSW.
1.6	ML	23-Jul-11	09:29:20	-33.527	138.69	0	Spalding area, SA.
2.8	ML	23-Jul-11	20:47:55	-31.945	138.788	20	E of Hawker, SA.
3.2	ML	24-Jul-11	13:16:30	-23.533	114.557	10	SE of Giralia, WA.
1.9	ML	26-Jul-11	05:07:16	-42.056	145.82	0	Near Queenstown, TAS.
1.9	ML	27-Jul-11	00:20:03	-30.615	117.668	0	SW of Beacon, WA.
3.3	ML	27-Jul-11	04:02:42	-30.573	121.529	0	Kalgoorlie, WA.
2.0	ML	27-Jul-11	22:27:40	-32.493	138.842	10	NE of Orroroo, SA.
2.2	ML	28-Jul-11	20:41:33	-37.373	148.597	10	NE of Orbost, Vic.
3.0	ML	29-Jul-11	03:37:30	-29.604	143.839	15	NW of Bourke, NSW.
2.2	ML	29-Jul-11	18:08:51	-35.595	138.187	15	E of Cape Jervis, SA.
2.6	ML	30-Jul-11	14:27:02	-31.288	118.074	0	Merredin area, WA.
2.6	ML	30-Jul-11	21:18:45	-31.295	118.05	5	NW of Merredin, WA.
2.5	ML	30-Jul-11	23:10:48	-31.277	117.991	2	NW of Merredin, WA.
2.5	ML	31-Jul-11	13:50:22	-30.122	115.855	16	SW of Marchagee, WA.
2.3	ML	31-Jul-11	16:53:46	-30.189	117.827	0	N of Beacon, WA.
2.1	ML	31-Jul-11	17:04:00	-30.273	117.804	0	N of Beacon, WA.
2.1	ML	31-Jul-11	17:07:31	-30.271	117.809	0	N of Beacon, WA.
2.3	ML	31-Jul-11	18:23:49	-31.296	118.196	0	N of Merredin, WA.
2.2	ML	02-Aug-11	00:53:50	-32.511	138.406	20	Near Hammond, SA.
2.5	ML	02-Aug-11	01:20:15	-24.2	150.919	10	NE of Biloela, QLD.
1.6	ML	03-Aug-11	14:06:43	-33.339	138.499	14	Bundaleer Gardens, SA.
2.3	ML	03-Aug-11	21:56:53	-38.389	145.835	10	Korumburra, Vic.
2.0	ML	04-Aug-11	14:21:09	-38.48	145.871	10	SE of Korumburra, Vic.
2.7	ML	05-Aug-11	09:47:50	-33.201	118.915	10	SW of Newdegate, WA.
2.7	ML	05-Aug-11	09:58:29	-33.227	118.852	10	SW of Newdegate, WA.
2.6	ML	05-Aug-11	10:55:56	-33.252	118.719	10	SW of Newdegate, WA.
2.1	ML	05-Aug-11	16:46:39	-34.417	139.255	21	E of Truro, SA.
2.5	ML	06-Aug-11	08:23:45	-33.243	118.831	2	SW of Newdegate, WA.
2.2	ML	06-Aug-11	18:14:48	-37.618	148.018	0	NE of Bruthen, Vic.
2.2	ML	07-Aug-11	07:28:25	-33.6	138.021	4	E of Port Broughton, SA.
2.0	ML	07-Aug-11	09:00:33	-34.166	150.281	10	Near Lake Burragorang, NSW.
2.0	ML	08-Aug-11	08:38:14	-29.083	116.009	0	Near Morawa, WA.
2.0	ML	10-Aug-11	01:48:39	-30.668	116.699	0	Ballidu, WA.
2.4	ML	11-Aug-11	11:51:37	-32.095	138.672	12	SE of Hawker, SA.
2.4	ML	11-Aug-11	17:09:16	-32.905	151.216	10	Millfield, NSW.
2.6	ML	11-Aug-11	17:53:52	-18.698	127.42	4	SW of Halls Creek, WA.
1.6	ML	13-Aug-11	00:50:49	-33.44	138.498	9	NW of Spalding, SA.
1.8	ML	14-Aug-11	01:32:32	-32.303	150.805	0	Near Muswellbrook, NSW.
1.6	ML	16-Aug-11	02:57:39	-34.972	149.812	12	SW of Bungonia, NSW.
2.1	ML	17-Aug-11	18:01:32	-30.619	116.438	0	W of Ballidu, WA.
3.1	ML	18-Aug-11	04:46:38	-36.965	139.95	10	NE of Robe, SA.
3.1	ML	18-Aug-11	09:42:41	-21.177	116.25	0	Near Mardie, WA.
2.4	ML	19-Aug-11	07:38:26	-33.258	118.946	0	Newdegate, WA.
2.1	ML	24-Aug-11	14:04:17	-34.497	147.627	7	Near Temora, NSW.
1.7	ML	26-Aug-11	18:29:01	-31.715	117.08	6	SE of Meckering, WA.
2.1	ML	28-Aug-11	01:50:02	-38.328	145.917	7	Near Korumburra, Vic.
2.3	ML	28-Aug-11	08:29:51	-32.812	138.36	18	E of Melrose, SA.
2.3	ML	29-Aug-11	05:33:12	-32.612	138.513	4	Near Orroroo, SA.
3.3	ML	29-Aug-11	19:54:08	-25.919	137.471	10	Near Poeppel's Corner, NT.

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3.4	ML	30-Aug-11	02:42:13	-25.943	137.378	10	Near Poeppel's Corner, NT.
3.8	ML	01-Sep-11	01:56:51	-18.845	123.3	10	Inland of Broome, WA.
1.4	ML	03-Sep-11	04:00:58	-35.1	148.729	0	Wee Jasper, NSW.
2.0	ML	04-Sep-11	02:52:25	-30.274	117.665	0	NW of Beacon, WA.
2.2	ML	04-Sep-11	10:52:40	-33.074	138.701	0	Near Jamestown, SA.
3.8	ML	04-Sep-11	11:15:11	-33.079	138.713	2	Near Jamestown, SA.
1.8	ML	04-Sep-11	11:26:02	-33.092	138.686	0	Near Jamestown, SA.
2.0	ML	04-Sep-11	11:45:45	-33.123	138.629	7	Near Jamestown, SA.
1.8	ML	04-Sep-11	13:19:52	-33.117	138.684	0	Near Jamestown, SA.
2.2	ML	04-Sep-11	16:13:50	-33.125	138.673	0	Near Jamestown, SA.
2.2	ML	04-Sep-11	16:19:59	-33.142	138.665	3	Near Jamestown, SA.
2.0	ML	04-Sep-11	16:21:28	-33.132	138.657	0	Near Jamestown, SA.
2.7	ML	04-Sep-11	23:46:59	-33.11	138.693	0	Near Jamestown, SA.
2.7	ML	04-Sep-11	23:48:55	-33.04	138.733	0	Near Yongala, SA.
2.0	ML	04-Sep-11	23:54:19	-33.149	138.665	0	Near Jamestown, SA.
2.1	ML	05-Sep-11	00:41:23	-33.193	138.656	12	Near Jamestown, SA.
1.8	ML	05-Sep-11	00:42:55	-33.027	138.73	0	Near Yongala, SA.
2.3	ML	05-Sep-11	01:03:42	-33.046	138.727	0	Near Yongala, SA.
2.1	ML	05-Sep-11	01:49:39	-33.108	138.692	1	Near Yongala, SA.
2.2	ML	05-Sep-11	02:50:19	-33.066	138.717	2	Near Yongala, SA.
2.0	ML	05-Sep-11	03:09:50	-33.04	138.776	5	Near Yongala, SA.
2.3	ML	05-Sep-11	09:02:51	-33.049	138.735	0	Near Yongala, SA.
2.1	ML	06-Sep-11	05:24:16	-33.044	138.774	0	Near Yongala, SA.
1.9	ML	06-Sep-11	12:41:41	-33.163	138.701	10	Near Jamestown, SA.
1.9	ML	06-Sep-11	17:11:27	-33.073	138.713	0	Near Yongala, SA.
2.2	ML	06-Sep-11	21:29:05	-33.123	138.746	1	Near Yongala, SA.
2.2	ML	06-Sep-11	21:55:15	-33.099	138.718	0	Near Yongala, SA.
2.6	ML	07-Sep-11	06:51:08	-33.085	138.667	0	SW of Yongala, SA.
2.2	ML	07-Sep-11	12:39:27	-33.104	138.696	2	Near Yongala, SA.
2.2	ML	07-Sep-11	15:56:00	-33.041	138.72	3	Near Yongala, SA.
1.8	ML	08-Sep-11	15:09:08	-31.617	117.098	5	Near Meckering, WA.
2.3	ML	09-Sep-11	04:54:20	-33.175	138.662	10	Near Jamestown, SA.
3.1	ML	09-Sep-11	13:39:19	-38.413	145.848	0	Korumburra, Victoria.
3.5	ML	09-Sep-11	22:24:40	-26.81	136.326	10	Simpson Desert, SA.
2.4	ML	09-Sep-11	23:12:33	-31.973	116.718	0	NW of York, WA.
1.5	ML	11-Sep-11	19:27:55	-35.578	148.908	0	Near Tharwa, ACT.
1.4	ML	11-Sep-11	19:28:47	-35.565	148.934	0	Near Tharwa, ACT.
1.2	ML	11-Sep-11	19:29:38	-35.541	148.948	0	Near Tharwa, ACT.
2.0	ML	12-Sep-11	03:22:43	-33.111	138.726	0	Near Yongala, SA.
2.1	ML	12-Sep-11	16:33:34	-40.857	145.028	14	Near Smithton, Tas.
1.8	ML	12-Sep-11	17:08:03	-31.456	117.526	0	NW of Kellerberrin, WA.
2.3	ML	14-Sep-11	08:29:22	-33.154	138.669	8	Near Jamestown, SA.
2.0	ML	14-Sep-11	08:46:58	-33.17	138.651	9	Near Jamestown, SA.
2.1	ML	14-Sep-11	22:56:43	-33.107	138.716	0	Near Yongala, SA.
1.6	ML	15-Sep-11	14:03:41	-30.446	116.896	0	NE of Ballidu, WA.
4.0	ML	17-Sep-11	16:28:27	-20.184	147.728	6	SW of Bowen, QLD.
2.6	ML	18-Sep-11	19:13:26	-32.21	138.236	7	NE of Quorn, SA.
2.2	ML	19-Sep-11	00:01:26	-36.243	148.914	11	NE of Berridale, NSW.
1.9	ML	19-Sep-11	14:00:34	-33.517	137.923	0	Fisherman's Bay, SA.
2.4	ML	19-Sep-11	14:50:09	-33.056	138.719	2	Near Yongala, SA.
2.1	ML	19-Sep-11	15:01:35	-33.089	138.737	0	Near Yongala, SA.
1.9	ML	19-Sep-11	15:32:56	-33.071	138.653	0	Near Yongala, SA.
2.4	ML	19-Sep-11	18:16:38	-33.079	138.697	4	Near Yongala, SA.
2.2	ML	22-Sep-11	04:46:06	-33.724	117.111	0	Near Katanning, WA.
3.4	ML	22-Sep-11	04:51:58	-33.733	117.217	5	Near Katanning, WA.

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2.2	ML	22-Sep-11	19:32:24	-33.201	138.664	15	Jamestown, SA.
1.7	ML	22-Sep-11	22:07:03	-30.474	116.903	12	NE of Ballidu, WA.
3.3	ML	23-Sep-11	16:42:12	-32.626	138.565	6	NW of Orreroo, SA.
1.5	ML	23-Sep-11	18:24:53	-35.199	148.839	6	Near Uriarra, NSW.
2.2	ML	23-Sep-11	22:09:54	-33.737	117.24	7	NE of Kojonup, WA.
3.0	ML	24-Sep-11	02:33:06	-25.486	116.885	10	NW of Meekatharra, WA.
2.8	ML	24-Sep-11	13:14:02	-32.614	138.562	4	NW of Orreroo, SA.
2.8	ML	26-Sep-11	16:24:20	-28.905	139.195	10	N of Arkaroola, SA.
2.0	ML	27-Sep-11	16:09:15	-31.274	117.493	3	SE of Wyalkatchem, WA.
3.1	ML	27-Sep-11	19:13:38	-30.642	117.8	2	SW of Beacon, WA.
2.2	ML	27-Sep-11	22:17:17	-30.678	117.769	10	SW of Beacon, WA.
2.2	ML	28-Sep-11	22:38:03	-30.651	117.761	0	SW of Beacon, WA.
2.1	ML	29-Sep-11	02:08:14	-30.599	117.834	10	SW of Beacon, WA.
2.0	ML	29-Sep-11	02:16:54	-30.627	117.719	10	SW of Beacon, WA.
1.8	ML	29-Sep-11	03:27:46	-30.772	117.022	10	Cadoux, WA.
1.9	ML	01-Oct-11	17:17:10	-31.242	117.473	0	SE of Wyalkatchem, WA.
2.0	ML	02-Oct-11	14:21:12	-30.757	117.675	6	NW of Bencubbin, WA.
1.8	ML	02-Oct-11	15:10:56	-31.234	117.455	7	SE of Wyalkatchem, WA.
1.9	ML	02-Oct-11	16:11:36	-36.324	149.094	10	S of Cooma, NSW.
1.9	ML	02-Oct-11	18:52:31	-31.248	117.44	1	SE of Wyalkatchem, WA.
1.9	ML	02-Oct-11	19:41:48	-31.247	117.431	5	SE of Wyalkatchem, WA.
1.9	ML	02-Oct-11	21:54:42	-31.273	117.418	0	SE of Wyalkatchem, WA.
2.0	ML	04-Oct-11	12:24:24	-30.633	117.789	0	SW of Beacon, WA.
2.2	ML	05-Oct-11	09:47:25	-38.384	145.885	1	Near Korumburra, VIC.
2.2	ML	05-Oct-11	12:10:49	-30.608	117.917	0	S of Beacon, WA.
3.5	ML	05-Oct-11	17:06:17	-33.73	117.236	16	Near Kojonup, WA.
2.0	ML	06-Oct-11	14:22:33	-30.649	117.755	11	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:08:22	-30.708	117.735	1	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:11:06	-30.647	117.799	2	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:16:14	-30.71	117.736	12	SW of Beacon, WA.
1.9	ML	07-Oct-11	17:01:43	-28.744	116.134	0	N of Morawa, WA.
1.8	ML	07-Oct-11	20:34:32	-33.094	138.682	0	SW of Yongala, SA.
1.9	ML	07-Oct-11	23:48:03	-28.811	116.243	0	N of Morawa, WA.
1.5	ML	08-Oct-11	04:01:51	-30.426	116.911	0	SW of Kalannie, WA.
2.5	ML	08-Oct-11	21:40:30	-38.317	146.163	4	SW of Moe, Vic.
1.9	ML	09-Oct-11	14:35:18	-33.086	138.681	1	Yongala, SA.
2.0	ML	10-Oct-11	00:17:02	-31.68	117.038	0	Meckering, WA.
2.1	ML	10-Oct-11	09:28:39	-31.2	118.56	15	Near Westonia, WA.
1.9	ML	10-Oct-11	16:19:33	-34.705	137.933	28	NE of Port Vincent, SA.
2.7	ML	11-Oct-11	21:22:23	-30.161	117.135	11	N of Kalannie, WA.
1.6	ML	12-Oct-11	12:48:49	-34.026	139.235	4	E of Robertstown, SA.
1.7	ML	12-Oct-11	17:50:39	-34.041	139.616	8	W of Morgan, SA.
2.4	MS	13-Oct-11	09:58:43	-38.378	145.848	5	Near Korumburra, VIC.
2.1	ML	13-Oct-11	11:15:18	-38.386	145.901	1	Near Korumburra, Vic.
2.4	ML	13-Oct-11	16:19:46	-31.459	118.894	16	E of Merredin, WA.
2.8	ML	14-Oct-11	01:09:30	-33.716	117.2	15	Near Kojonup, WA.
2.7	ML	14-Oct-11	05:20:15	-30.734	117.236	4	Near Cadoux, WA.
4.3	ML	15-Oct-11	10:38:10	-32.286	138.819	0	Near Carrieton, SA.
2.0	ML	15-Oct-11	12:40:09	-35.085	148.258	6	Near Gundagai, NSW.
2.0	ML	16-Oct-11	02:26:13	-33.602	136.807	10	NE of Cleve, SA.
2.6	ML	16-Oct-11	05:38:59	-31.549	138.591	10	S of Wilpena Pound, SA.
2.3	ML	18-Oct-11	15:00:35	-30.651	117.814	4	SW of Beacon, WA.
3.4	ML	18-Oct-11	15:52:24	-35.072	138.65	24	Near Blackwood, SA.
2.1	ML	19-Oct-11	02:22:24	-30.782	117.103	8	Cadoux, WA.
1.8	ML	19-Oct-11	21:13:15	-33.642	117.974	10	Near Katanning, WA.

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1.9	ML	20-Oct-11	20:06:56	-38.355	145.88	10	Korumburra, VIC.
2.8	ML	21-Oct-11	07:45:42	-24.538	115.418	10	NE of Gascoyne Junction, WA.
3.1	ML	21-Oct-11	22:52:59	-38.381	145.907	0	Near Korumburra, VIC.
1.7	ML	22-Oct-11	13:48:16	-31.619	117.078	12	NE of Meckering, WA.
3.1	ML	22-Oct-11	17:18:31	-32.025	139.564	10	N of Yunta, SA.
1.9	ML	24-Oct-11	15:22:41	-32.887	151.343	10	Ellalong, NSW.
2.2	ML	25-Oct-11	22:18:30	-37.031	148.058	11	NE of Omeo, VIC.
2.1	ML	26-Oct-11	00:42:21	-33.22	151.037	0	NE of St Albans, NSW.
1.6	ML	26-Oct-11	05:46:27	-30.6	117.625	0	SW of Beacon, WA.
1.5	ML	26-Oct-11	11:38:20	-33.788	138.544	0	NW of Clare, SA.
3.1	ML	27-Oct-11	07:05:55	-22.061	126.529	10	E of Tobin Lake, WA.
2.2	ML	27-Oct-11	20:13:34	-30.599	117.563	10	NE of Cadoux, WA.
4.3	ML	28-Oct-11	09:08:41	-39.964	126.44	0	Great Australian Bight.
2.1	ML	28-Oct-11	21:00:02	-30.805	117.11	0	Cadoux, WA.
2.8	ML	29-Oct-11	07:48:33	-36.357	117.874	10	S of Albany, WA.
1.8	ML	29-Oct-11	10:16:01	-30.833	116.577	0	NW of Wongan Hills, WA.
2.5	ML	01-Nov-11	01:11:42	-31.151	117.611	10	Near Wyalkatchem, WA.
2.3	ML	01-Nov-11	02:40:47	-31.246	117.46	9	Wyalkatchem, WA.
2.0	ML	01-Nov-11	04:38:14	-31.225	117.479	8	Wyalkatchem, WA.
2.4	ML	01-Nov-11	05:27:14	-31.222	117.486	10	Wyalkatchem, WA.
2.0	ML	01-Nov-11	16:22:12	-34.413	150.755	0	NW of Mount Kembla, NSW.
2.4	ML	01-Nov-11	17:48:04	-33.007	138.74	2	Yongala, SA.
2.5	ML	02-Nov-11	03:32:49	-30.871	121.474	4	Kalgoorlie, WA.
1.9	ML	02-Nov-11	15:15:48	-34.476	148.763	0	Near Boorowa, NSW.
3.7	ML	02-Nov-11	16:32:53	-23.64	152.241	10	Offshore E of Gladstone, QLD.
2	ML	03-Nov-11	17:24:46	-35.58	138.667	1	SE of Victor Harbor, SA.
1.5	ML	03-Nov-11	18:21:34	-31.217	117.412	0	Wyalkatchem, WA.
1.7	ML	03-Nov-11	19:55:04	-30.613	117.599	1	NE of Koorda, WA.
2.1	ML	03-Nov-11	20:15:51	-33.126	138.683	5	Near Jamestown, SA.
2.3	ML	04-Nov-11	19:32:52	-30.75	117.845	0	N of Bencubbin, WA.
1.7	ML	05-Nov-11	08:10:55	-31.21	117.492	0	E of Wyalkatchem, WA.
1.5	ML	05-Nov-11	13:50:40	-34.582	148.557	12	Galong, NSW.
1.7	ML	06-Nov-11	03:19:31	-31.212	117.499	2	SE of Wyalkatchem, WA.
2.2	ML	06-Nov-11	18:50:08	-30.261	117.81	10	N of Beacon, WA.
2.0	ML	07-Nov-11	12:47:37	-30.583	117.668	10	SW of Beacon, WA.
2.3	ML	07-Nov-11	13:38:37	-30.605	117.636	15	SW of Beacon, WA.
1.6	ML	08-Nov-11	09:25:57	-34.017	139.203	4	Near Robertstown, SA.
2.3	ML	08-Nov-11	10:54:01	-30.636	117.579	0	NE of Koorda, WA.
2.2	ML	08-Nov-11	14:58:22	-30.605	117.616	0	NE of Koorda, WA.
1.8	ML	08-Nov-11	16:54:40	-30.634	117.586	13	NE of Koorda, WA.
2.1	ML	08-Nov-11	19:30:15	-31.787	117.366	0	SE of Cunderdin, WA.
1.8	ML	08-Nov-11	20:29:55	-31.521	117.114	8	NE of Meckering, WA.
2.3	ML	09-Nov-11	02:33:07	-31.257	117.44	0	Wyalkatchem, WA.
1.9	ML	09-Nov-11	08:50:49	-31.247	117.415	6	Wyalkatchem, WA.
2.1	ML	09-Nov-11	13:38:41	-30.636	117.583	3	NE of Koorda, WA.
1.8	ML	09-Nov-11	20:56:50	-31.45	117.171	1	NE of Meckering, WA.
2.0	ML	10-Nov-11	02:41:10	-34.829	149.985	10	SE of Goulburn, NSW.
2.3	ML	11-Nov-11	12:11:47	-30.834	138.41	10	Beltana, SA.
2.8	ML	11-Nov-11	19:43:53	-21.368	127.337	15	Lake Mackay, WA.
1.9	ML	11-Nov-11	20:25:22	-31.254	117.447	0	SE of Wyalkatchem, WA.
2.0	ML	12-Nov-11	16:39:40	-33.086	138.066	0	NE of Port Flinders, SA.
1.6	ML	12-Nov-11	20:25:13	-33.685	138.444	10	NW of Clare, SA.
3.4	ML	13-Nov-11	00:05:07	-29.792	151.241	6	W of Inverell, NSW.

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1.9	ML	13-Nov-11	02:52:48	-29.66	115.684	0	Yarra Yarra Lakes, WA.
2.0	ML	13-Nov-11	03:08:33	-33.422	138.079	15	SW of Crystal Brook, SA.
2.2	ML	13-Nov-11	06:48:38	-31.919	138.272	10	W of Hawker, SA.
1.3	ML	14-Nov-11	02:10:25	-30.806	117.139	0	S of Cadoux, WA.
2.9	ML	14-Nov-11	02:43:03	-42.077	147.431	2	Near Ross, TAS.
1.9	ML	14-Nov-11	09:45:56	-36.276	148.831	0	Near Berridale, NSW.
1.9	ML	14-Nov-11	10:09:46	-36.159	148.735	0	Near Lake Eucumbene, NSW.
1.7	ML	16-Nov-11	10:24:15	-33.388	138.207	18	S of Crystal Brook, SA.
1.8	ML	16-Nov-11	15:05:36	-31.442	117.138	10	NE of Meckering, WA.
2.4	ML	19-Nov-11	23:38:33	-35.807	137.954	5	Kangaroo Island, SA.
1.7	ML	21-Nov-11	07:53:27	-33.526	138.388	10	SE of Crystal Brook, SA.
2.9	ML	21-Nov-11	20:11:43	-41.853	145.764	0	Queenstown, TAS.
2.0	ML	22-Nov-11	01:50:30	-33.444	138.408	8	SE of Crystal Brook, SA.
1.4	ML	23-Nov-11	16:42:57	-31.204	116.652	2	NE of Bolgart, WA.
2.5	ML	23-Nov-11	16:57:42	-32.891	151.356	9	S of Cessnock, NSW.
1.6	ML	23-Nov-11	19:39:17	-42.105	147.449	15	Near Ross, TAS.
2.6	ML	24-Nov-11	04:11:48	-30.626	117.578	10	NE of Koorda, WA.
2.4	ML	24-Nov-11	04:21:09	-30.636	117.586	4	NE of Koorda, WA.
1.6	ML	24-Nov-11	06:58:18	-30.729	117.459	0	N of Koorda, WA.
2.3	ML	24-Nov-11	17:03:40	-37.147	151.519	0	E of Eden, NSW.
2.7	ML	24-Nov-11	17:57:20	-30.846	121.39	19	SW of Kalgoorlie, WA.
1.4	ML	24-Nov-11	18:20:46	-33.198	136.522	10	Kimba, SA.
2.0	ML	25-Nov-11	09:28:22	-32.69	138.027	0	Near Wilmington, SA.
1.9	ML	26-Nov-11	13:40:49	-34.204	150.857	15	E of Appin, NSW.
3.8	ML	26-Nov-11	15:30:20	-25.631	138.567	10	SW of Lake Machattie, QLD.
2.7	ML	26-Nov-11	18:41:44	-39.673	144.031	10	King Island, TAS.
1.7	ML	26-Nov-11	20:29:36	-33.464	138.435	15	SE of Crystal Brook, SA.
3.5	ML	26-Nov-11	20:59:43	-26.007	138.56	0	Simpson Desert, SA.
2.8	ML	27-Nov-11	06:21:00	-30.61	117.572	0	Near Koorda, WA.
2.1	ML	27-Nov-11	06:37:42	-30.625	117.564	0	Near Koorda, WA.
2.7	ML	27-Nov-11	06:54:25	-30.633	117.56	0	Near Koorda, WA.
2.0	ML	27-Nov-11	16:20:42	-30.668	117.536	0	Near Koorda, WA.
2.7	ML	28-Nov-11	02:27:42	-30.586	117.656	18	NE of Koorda, WA.
1.6	ML	29-Nov-11	17:52:39	-33.362	136.915	0	SE of Kimba, SA.
2.0	ML	01-Dec-11	15:06:08	-33.115	138.521	12	Near Jamestown, SA.
2.0	ML	04-Dec-11	06:55:38	-36.296	148.684	31	NW of Berridale, NSW.
2.1	ML	04-Dec-11	14:52:52	-34.211	148.912	0	Frogmore, NSW.
2.0	ML	05-Dec-11	14:48:27	-33.148	139.326	5	E of Franklyn, SA.
1.9	ML	05-Dec-11	18:33:53	-19.873	133.933	0	SW of Tennant Creek, NT.
5.1	ML	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.
1.9	ML	07-Dec-11	06:40:39	-33.189	138.689	11	NE of Jamestown, SA.
1.7	ML	11-Dec-11	08:25:40	-33.175	138.523	13	Near Jamestown, SA.
2.0	ML	11-Dec-11	08:43:23	-36.523	145.368	10	S of Shepparton, VIC.
2.2	ML	11-Dec-11	15:48:29	-32.054	141.556	6	SE of Broken Hill, NSW.
2.4	ML	12-Dec-11	03:03:42	-33.263	138.665	12	SE of Jamestown, SA.
1.7	ML	12-Dec-11	14:47:05	-32.845	138.104	5	Near Melrose, SA.
3.4	ML	14-Dec-11	05:49:15	-32.513	123.152	15	Near Balladonia, WA.
2.0	ML	14-Dec-11	10:47:51	-33.276	117.166	12	NW of Wagin, WA.
2.4	ML	16-Dec-11	10:40:37	-35.662	138.123	14	S of Cape Jervis, SA.
1.8	ML	16-Dec-11	11:07:17	-33.255	117.092	13	NE of Brookton, WA.
2.0	ML	16-Dec-11	12:22:04	-33.256	117.252	17	NE of Brookton, WA.
1.8	ML	16-Dec-11	15:12:52	-33.261	117.109	12	NE of Brookton, WA.
2.4	ML	17-Dec-11	03:24:34	-32.864	138.473	7	E of Booleroo Centre, SA.
2.0	ML	21-Dec-11	04:37:37	-30.684	117.639	0	SW of Beacon, WA.

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1.8	ML	22-Dec-11	11:31:02	-30.678	117.571	2	NE of Koorda, WA.
1.7	ML	23-Dec-11	16:54:24	-38.143	145.8	5	Near Garfield, VIC.
2.2	ML	24-Dec-11	13:04:53	-32.197	118.926	14	N of Hyden, WA.
2.2	ML	24-Dec-11	15:33:04	-32.214	118.946	15	N of Hyden, WA.
2.0	ML	25-Dec-11	20:08:19	-31.722	117.031	8	Meckering, WA.
2.7	ML	27-Dec-11	14:10:50	-26.741	120.296	10	Near Wiluna, WA.
2.0	ML	28-Dec-11	17:05:20	-31.702	117.057	11	SE of Meckering, WA.
3.1	ML	29-Dec-11	08:57:26	-19.857	133.992	0	Tennant Creek, NT.
2.0	ML	31-Dec-11	20:24:51	-33.208	138.685	0	Jamestown, SA.

Geoscience Australia's Geophysical Network Operations

From 1 January 2011 to 31 December 2011

Tim Barton
Geophysical Network Section Leader

Introduction

The Geophysical Network Section (GN) in the Minerals & Natural Hazards Division is responsible for the operation of the Australian National Seismograph Network, affiliate seismic stations, and support for International Monitoring stations under Australia's obligations for the Comprehensive Nuclear Test Ban Treaty which includes seismic, infrasound and hydroacoustic facilities. The section also provides technical support for other observatory activities undertaken by GA in geomagnetism and geodetic stations. The support extends across continental Australia, throughout the Pacific, Indian and Southern Oceans, Papua New Guinea and the Australian Antarctic Territories.

In addition the section is responsible for the ingestion of real time data streams for over 200 seismic stations worldwide to support the operations of the Australian Tsunami Warning System (ATWS) at GA.

For all data streams GN is required to ensure that data is fit for purpose so the section invests much effort into State of Health (SoH) monitoring and Quality Assurance (QA) and Quality Control (QC) of seismic and ancillary data.

The GN section is also responsible for the delivery of data to stakeholders both within and external to GA. The focus for external stakeholders is on international warning centres and as such the bulk of the available resources are devoted to the serving of real time data streams. As GA does not currently operate a Data Management Centre (DMC) the delivery of legacy data continues to be a problematical issue in terms of meeting client expectations. However, we are fortunate to be able in 2011 to serve all of our real time data to the IRIS DMC who provide a suite of tools that should meet all client demands.

The network design and operation is based around a series of defined requirements. These have evolved over the last 30 years and were first articulated in a review of BMR activities in the fields of earthquake seismology and geomagnetism undertaken during 1981 (BMR Record 1981/15) whose main recommendations were:

'That a national seismograph network should be developed to provide the capability for

(a) Locating continent-wide, all Australian earthquakes with magnitudes greater than 4.0 on the Richter Scale;

(b) Locating all earthquakes with magnitude greater than 3.0 on the Richter Scale in the continent's most seismically active and populous areas; and

(c) Detecting continent-wide, all earthquakes with magnitudes greater than 3.0 on the Richter Scale'

The current operational metrics for the ANSN are:

(a) Allow the detection, location (position, depth) and magnitude of all earthquakes of magnitude 3.5 or greater anywhere in Australia within 24 hours of an earthquake event;

(b) Allow the detection of 99.9% of earthquakes of magnitude 6.0 or greater anywhere in the region of the Indian Ocean, southwest Pacific, and the Indonesian archipelago within 10 minutes of the earthquake happening.

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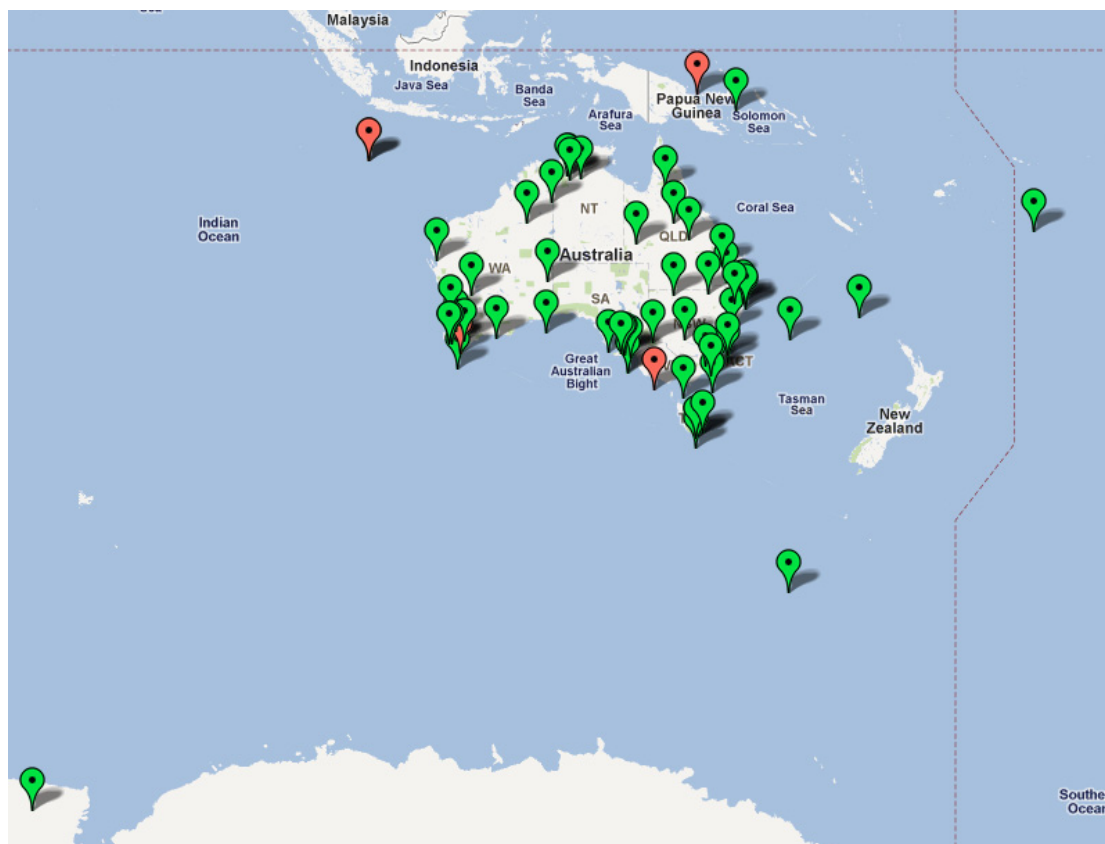


Figure 3: Australian National Seismic Network (ANSN) Stations

The current network stations are listed in [Table 5](#) as at 1 November 2011. All stations are part of the AU network except where noted. Those marked * are stations which were upgraded under the JUMP (Joint Urban Monitoring Program) re-equipment program commenced in 2008-09. Station equipment and sensors are not presented here. However, in general most stations have broadband sensors, except those marked * which are short period. Most stations also have a strong motion sensor.

[Table 6](#) lists stations either currently under construction or planned for the 2012-2013 period.

[Table 7](#) lists stations operated that are not available through real time feeds and have limited data availability.

Network Changes in 2011

New stations

- Newcastle Hard Rock (NTLH)
- Wollongong Hard Rock (WOLH)
- Gladstone Soft Rock (GD1S) (Queensland Government owned station)
- Equipment and borehole seismometers installed at the 13 element Pilbara Seismic Array (PSAR). The system is currently having some technical issues with respect to dual data streaming and QA/QC work will be done for several months prior to the system being certified for full usage.

Station Equipment upgrades

- IRIS / USGS Q330 upgrades undertaken at Marble Bar (MBWA), Charters Towers (CTAO) and Narrogin (NWA0).
- VSAT Modems upgraded at Cobar (CMSA), Kakadu (KDU), Kununarra (KNRA), Lord Howe Island (LHI), Manton Dam (MTN), Meekatharra (MEEK), Norfolk Island (NFK) and Roma (RMQ). Next-G Modems replaced at Gold Coast 1 Soft Rock (GC1S) and Whyalla (WHYH).
- Q330 installed at Forrest (FORT)
- Nanometrics Taurus installed at Dalton (DLN) with Next-G comms.
- CMG-5T installed at MUN.
- New Freewave radios installed at Roma (RMQ) between remote and relay site.
- Installed Q330HR and Marmot at Hallett, SA (HTT)

Station Infrastructure upgrades

- Equipment infrastructure housing upgrade completed at Mangrove Creek Dam (MGCD), Mila (MILA) and Fitzroy Crossing (FITZ) including VSAT move to site.
- Installation of vault for future site upgrade at Forrest (FORT). VSAT Pole erected, solar panels erected and trenching for conduits completed during install.
- Civil works were completed for the new station at Oodnadatta (OOD), SA
- Civil works at Mulgathing (MULG), SA were suspended due to access issues into the Woomera Prohibited Area (WPA) by the DoD.
- GHSS, PTPS power system upgrades.

Other significant issues

- In December 2010 water inundated the Meekatharra (MEEK) seismic vault. The station is currently operating with an STS-2 on the surface.

Proposed Network Changes in 2012-2013

In the 2012-2013 period subject to available resources and necessary approvals the following network changes may occur. Should resources be available some of these activities may be rescheduled for 2011-2012.

- Victoria JUMP station upgrades - Reoccupy the old ES&S Greenvale site, new site at Scienceworks, new site at Deakin University, new JUMP equipment at BRAT
- NSW JUMP station upgrade - Newcastle NTLH should be in PRODUCTION (full usage), site selection for WOLS in Wollongong.
- ACT JUMP station upgrade - Parliament House, PHB, new equipment.
- NSW miscellaneous sites - Decommission KIM, QFS; as equipment is beyond end of life.
- SA regional - Installation of systems at OOD and LCRK or MULG if available. INKA install if site is constructed.
- Queensland JUMP sites in Townsville will be built and installed by the Queensland Government.
- Upgrade of digitisers, subject to GA Capital funding, from GA designed GDAS systems in KDU, MILA, MGCD, RMQ, HTT, RIV, YNG.
- Equipment housing upgrades at MTSU, ARPS, FORT, NAPP
- RMQ VSAT relocation to site.
- Install of STS-2's at GIRL and FORT to replace short period sensors.

GA waveform data availability

All of GA's seismic data may be freely used under Creative Commons Attribution 3.0 Australia Licence. Please refer to <http://www.ga.gov.au/copyright.html> for further information.

AutoDRM

AutoDRM is available for limited periods of time from the GA archive. Currently this is around 30 days from present time. AutoDRM has limited support at GA and is available through its inclusion in the Antelope Software Package. Its continued availability is contingent upon continued support from the vendor.

AutoDRM is also available from the IRIS DMC. GA has been providing a large number of stations to the IRIS DMC for a number of years and since late October 2011 all of the operational upgraded JUMP stations have also been supplied to the IRIS DMC.

SEEDLINK

Real time data is available from the GA Seedlink or IRIS DMC Seedlink server.

Guidelines for downloading from GA's server are provided on page 38 and IRIS in page 41.

Notes on data sample rates and storage time limits

In general all of ANSN sites stream either 20sps or 40sps data streams for seismic and strong motion channels. Details of individual stations can be found in the dataless SEED volumes or viewed in the IRIS DMC MetaData Aggregator.

GA undertakes considerable efforts to maintain up to date information to the IRIS DMC as part of GA's QA processes.

The digitiser technologies employed on all of GA's real-time stations includes locally stored high sample rate data (HSD) either at 100sps or 200sps for seismic and strong motion channels. Depending on the digitiser HSD is stored locally from between 7 days (2Gb GDAS) to ~30 days for Q330HR/Marmot and ~30 days for Reftek R130 (4Gb) units. These data are not available through any of our automated data delivery systems at this time. These data are downloaded using a semi-automated process either on request with justification or under internal GA guidelines for >M3.5 events.

The HSD downloaded data is stored on internal servers at GA and at this time not made generally available due to resourcing restrictions. However, on occasion requests from external users for copies of these data may be made available if we are able to assist.

[Table 4](#) lists HSD downloaded in 2011

Seismographic Paper Records Scanning Project

Background

The project commenced in August 2009 in response to a storage issue identified at GA which provided the driver for a business case to preserve the records digitally and allow for the sentencing for disposal of completed scanned records under the Australia Archives Act.

Extensive testing and stakeholder engagement was undertaken to deliver a scanned product that captured all the information from the original record. In fact in some cases, particularly for annotated smoked paper records the scans were an improvement over naked eye viewing.

The collection is derived from a number of agencies, some of which are now defunct, and consists of records from over 200 seismic stations in Australia, AAT and PNG. Records date from the 1890's till the present. There are 51 pallets containing 3060 boxes with additional boxes being discovered from other areas in GA. It is currently estimated there are 750,000 records to be scanned.

Prior to disposal occurring several actions are required to be done prior to sentencing. Firstly provenance of the records must be established. For most stations this is relatively straightforward and merely requires a demonstration that GA or its predecessors established, owned or were custodians of the station and the data it produced.

Current status

As of late November a total of 343,555 paper records have been scanned and 7764 supplementary photos done with associated metadata captured. This work is now being undertaken in a separate Division at GA following the organisation's recent restructure.

343555 scans complete with 7764 supplementary photos.

We are well on the way to reaching the halfway mark in the project by the end of the financial year.

The project has been visited by Kevin Fenaughty of GNSS NZ, Dmitry Storchak of the ISC and Emile Okal who all lauded our efforts.

Two side projects are currently being undertaken on an opportunity basis in the Geophysical Network Section. The first is a compilation of individual station histories based upon BMR/AGSO/GA publications from the 1940's to present. This project has been made feasible using searchable pdf's generated from a digitisation project undertaken by the GA Library of Reports, Records and BMR/AGSO Journals over the previous couple of years. The second project is to define a series of criteria to preserve a subset of the original records. Preliminary work indicates that a selection of type examples be preserved such as smoked paper, photographic and ink record examples. In addition significant earthquake events (eg Australian events of $M > 5.5$ and world events of $M > 7.5$) may warrant preservation of original records for cultural heritage purposes. This is currently a work in progress. It should be noted that in the process of the scanning project it was discovered that several original records from significant events are missing from the record boxes. It is assumed these have been removed by researchers and not returned. There have however been several cases of misfiled records being discovered.

Data availability

At this time there are no active plans to make these scanned records available for external use due to resource limitations. The focus has been to ensure that resources continue to be made available to complete the scanning project. The order in which the original records were stored makes it essential to scan all of them because it has not been possible to prioritise the order of scanning or in fact determine a philosophy to apply such as "scan all station XXX since 19xx" or "scan all records from 19xx to 19xx".

The database being compiled during the project has enabled some international researchers to visit GA and access some of the scanned records on an ad-hoc basis. At this time we would not like to encourage this to be too frequent as it impacts on the scanning productivity.

Table 5: Geoscience Australia operated real time telemetry seismic stations

Station Code	Station Name		
ARMA	Armidale, NSW	MUN	Mundaring Weir, WA
ARPS	Mount Arapiles, Vic	NAPP*	Napperby, SA
ASAR	AS01 to AS19 Alice Springs	NFK	Norfolk Island
	Array Elements	NIUE	Niue, Pacific Ocean
BBOO	Buckleboo Station, SA	NTLS*	Newcastle sportsfield No.2, NSW
BLDU	Ballidu, WA	PTPS*	Port Pirie, SA
BN2S*	Brisbane Soft Rock, Qld	QIS	Mt Isa, Qld
CAN	Mt Stromlo, Australian Capital Territory (Geoscope G)	QLP	Quilpie, Qld
CARL*	Carlisle, Perth, WA	RABL	Rabaul, Papua New Guinea
CASY	Casey, AAT (IRIS IU)	RIV	Riverview, NSW
CMSA	Cobar, NSW	RK2S*	Rockhampton Soft Rock, Qld
CNB	Kowen Forest, Australian Capital Territory	RKGY	Rocky Gully, WA
COCO	Cocos Island, Indian Ocean (IRIS/IDA II)	RMQ	Roma, Qld
COEN	Coen, Qld	SYM	GA Symonston, ACT (Test site)
CORO*	Coronation Park, Launceston, Tasmania	STKA	Stephens Creek Reservoir, NSW (CTBTO IM)
CTA	Charters Towers, Qld (IRIS IU)	SYDH*	Kingswood College, Sydney, NSW
CTAO	Charters Towers, Qld (CTBTO IM)	SYDS*	David Phillips Sportsfield, NSW
DPH*	Darwin Parliament House, NT	TOO	Toolangi, Vic
DRS*	Darwin Rock Store, NT	TW1H*	Toowoomba Hard Rock, Qld
EIDS	Eidsvold Station, Qld	TWOA*	Flinders University, Adelaide, South Aust.
FITZ	Fitzroy Crossing, WA (CTBTO IM)	WHYH*	Whyalla, SA
FORT	Forrest, WA	WOLH*	Wollongong Hard Rock, NSW
GC1S*	Gold Coast Soft Rock, Qld	WRKA	Warakurna, WA
GC2F*	Gold Coast Fill, Qld	WRA	Warramunga Array, NT (CTBTO IM)
GEES*	Gees Lookout, Launceston, Tasmania	XMI	Christmas Island Airport
GHSS*	Government House, Adelaide, South Aust.	XMIS	Christmas Island Grants Well
GIRL	Giralia, WA	YNG	Young, NSW
GLAD*	Gladstone, Tasmania		
HTT	Hallett, SA		
KDU	Kakadu, NT		
KLBR	Kellerberrin, WA		
KMBL	Kambalda, WA		
KNRA	Kununurra, WA		
LHI	Lord Howe Island		
MANU	Manus Island, Papua New Guinea		
MAW	Mawson, Antarctica (CTBTO IM)		
MBWA	Marble Bar, WA (IRIS IU)		
MCQ	Macquarie Island		
MEEK	Meekatharra, WA		
MGCD	Mangrove Creek Dam, NSW		
MILA	Mila, NSW		
MOO	Moorlands, Tasmania		
MORW	Morawa, WA		
MTKN*	Mount Kenneth, Perth, WA		
MTN	Manton Dan, NT		
MTSU	Mount Surprise, Qld		

* indicates a former JUMP/Triggered station

Table 6: Geoscience Australia seismic stations under development

Queensland

Station Code	Station Name
BN1H*(i)	Brisbane Hard Rock, Qld
CN1H*(i)	Cairns Hard Rock, Qld
CN2S*(i)	Cairns Soft Rock, Qld
RK1H*(i)	Rockhampton Hard Rock, Qld
TV1H*(i)	Townsville Hard Rock, Qld
TV2S*(i)	Townsville Soft Rock, Qld

Notes:

- (i) JUMP replacement station under construction by Queensland Government, equipment and comms systems procured.

South Australia

Station Code	Station Name
INKA(ii)	Innaminka, SA
LCRK(iii)	Leigh Creek, SA
MULG(iv)	Mulgathing, SA
OOD(v)	Oodnadatta, SA

Notes:

- (ii) Civil components in storage in Port Augusta. Final site location and negotiation to be completed. Possible construction in 2012-13.
- (iii) Civil components in storage in Port Augusta. Awaiting final sign-off on site access before construction can be planned. Construction planned in early 2012.
- (iv) Civil components in storage in Port Augusta. Contractor signed up for civil works delayed in October 2011 due to WPA site access approvals deferred as a result of new WPA management Plan. Negotiations continuing to obtain a Deed of Licence. Construction hopefully can be rescheduled for early 2012.
- (v) Civil works in progress in November 2011. This was planned to be undertaken in conjunction with MULG. Since logistics and contracts were well advanced when entry to WPA was refused plans operations were rescheduled to undertake this build only. Equipment installation will be done in conjunction when a second station is built.

Western Australia

Station Code	Station Name
PSAR(vi)	Pilbara Seismic Array, WA

Notes:

- (vi) Civil works were completed in early 2011. Sensors, digitisers and comms were installed in mid 2011. This 13 element Broad Band Array is currently under operational testing and will be placed into production once this has been satisfactorily completed. As this facility is not manned site visits from GA are required to address any issues identified in the test phase.

Table 6 cont. Geoscience Australia seismic stations under development

ACT

Station Code	Station Name
PHB*(vii)	Parliament House Canberra, ACT

Notes:

(vii) Equipment procured, awaiting staff resources to determine a timing solution with no GPS access before install can proceed. Station currently has a dial up Classic installed.

Victoria

Station Code	Station Name
Greenvale*(viii)	Greenvale Reservoir, Vic
BRAT*(ix)	Ballarat Reservoir, Vic
Melbourne*(x)	Scienceworks, Melbourne, Vic
Deakin Uni*(xi)	Deakin University, Geelong, Vic

Notes:

(viii) Hard Rock Site selected, Deed of licence being negotiated with Melbourne Water, equipment and civil components in storage. Install planned for 2012.
 (ix) Existing site operated by ES&S which is still technically a Victorian JUMP station, equipment in stock. Install planned for 2012.
 (x) Negotiations in progress with Scienceworks for install in a basement in the facility, equipment in stock. Install planned for 2012.
 (xi) Site located on campus, Deed of licence being negotiated with Deakin University, equipment and civil components in storage. Install planned for 2012.

New South Wales

Station Code	Station Name
NTLH*(xii)	Newcastle Hard Rock, Newcastle, NSW
WOLS*(xiii)	Wollongong Soft Rock, Wollongong, NSW

Notes:

(xii) Hard Rock Site to replace NLD, Deed of licence signed with Hunter Water, equipment and civil components in storage. Install planned for late 2011 subject to staffing availability.
 (xiii) New site yet to be located, equipment and civil components in storage.

Table 7: Geoscience Australia operated non-real time seismic stations

Station Code	Station Name
DLN(xiv)	Dalton, NSW
SY01 to 06(xv)	Various sites in Western Sydney
QFS(xvi)	Quorrobolong Fire Station, NSW
KIM(xvii)	Newcastle, NSW
CHI(xviii)	Chichester Dam, NSW

Notes:

(xiv) Station previously referred to as DAL was renamed to an ISC code of DLN which had been used for many years by ANU in the vicinity. Station consists of L4C single component seismometer in a borehole with a CMG5T accelerometer linked to a 3 channel Nanometrics Taurus digitiser at 200 sps and a Next-G modem. For technical reasons this is not currently streamed real time and data is downloaded manually when required.

(xv) These are temporary stations installed in 2006. They currently consist of L4C3D three component seismometer in pits linked to a 3 channel Nanometrics Taurus digitiser at 200 sps and a Next-G modem. For technical reasons these are not currently streamed real time and data is downloaded manually when required.

(xvi) QFS is a Kelunji Classic on dial-up. Its current status is unknown. It will be decommissioned following the installation of NTLH.

(xvii) KIM is a Kelunji Classic on dial-up. Its current status is unknown. It will be decommissioned following the installation of NTLH. The equipment is not owned by GA who have been covering the operational costs for some years. Some investigation will be required prior to its removal.

(xviii) CHI is a Kelunji Classic on dial-up. Believed to be still operational. It will be decommissioned once the NSW JUMP sites provide adequate coverage.

High Sample Data for the year 1 January 2011 to 30 October 2011

Operating principles

GA has developed a set of guidelines for the semi-automatic download high sample data from seismic stations within Australia and its Territories. The majority of ANSN stations with seismometer and accelerometer data are sampled at either 100 sps or 200 sps depending upon digitiser.

For segmented standard sampled data streams at 20 sps or 40 sps availability is best accessed through the IRIS DMC. Real time data may be streamed by SEEDLINK from GA or IRIS.

Earthquake Magnitude and Distance

In the event of an Earthquake within Australia and Territories

Magnitude 3.0 - 4.0 collect data from stations within 2000km

Magnitude 4.0 - 4.5 collect data from stations within 3000km

Magnitude > 4.5 collect data from stations within 4000km

Consideration is also given to requests by Earthquake Hazard Section staff at GA for events which are evaluated as significant for a particular reason. In such cases the stations recovered will be decided upon depending on the nature of the event.

Download parameters

Start-time: 30 second before the P arrival time

End-time: 20 minutes after P arrival time

Format: MiniSEED

GA currently operates a number of different data digitiser systems with different capacity of the data storage system.

- Q330HR/Marmot – 200 sps data for 6 channels up to 30 days
- GDAS – 100 sps or 200 sps data for 6 channels up 7 to 14 days subject to size of onboard memory
- Reftek R130-1- 200 sps data for 6 channels up to 30 days subject to size of onboard memory
- Taurus- 200 sps data for 3 channels up to 30 days subject to size of onboard memory

Table 8: HSD downloads 1 January 2011 to 30 October 2011

Event No	Date	Jdate	UTC	Mag	Sta	Channel	Name
344612	16/04/2011	2011106	7:00	4.1	ARMA	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	COEN	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	EIDS	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	QIS	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	QLP	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	RK2S	3 S and 3A	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	RMQ	6	Bowen QLD
344612	16/04/2011	2011106	7:00	4.1	TW1H	3 S and 3A	Bowen QLD
344484	16/04/2011	2011106	5:22	5.3	RK1H	3 S and 3A	Bowen QLD
344484	16/04/2011	2011106	5:22	5.3	RK2S	3 S and 3A	Bowen QLD
344484	16/04/2011	2011106	5:22	5.3	TW1H	3 S and 3A	Bowen QLD
344484	16/04/2011	2011106	5:22	5.3	WHYH	3 S and 3A	Bowen QLD
360116	20/05/2011	2011140	20:02	4.5	GIRL	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	KLBR	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	KMBL	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	KNRA	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	MORW	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	WRKA	3 S and 3A	Newman WA
360116	20/05/2011	2011140	20:02	4.5	BLDU	3 S and 3A	Newman WA
363840	1/06/2011	2011152	3:28	3.8	ARPS	3 S and 3A	Grampians VIC
363840	1/06/2011	2011152	3:28	3.8	BBOO	3 S and 3A	Grampians VIC
363840	1/06/2011	2011152	3:28	3.8	HTT	6	Grampians VIC
363840	1/06/2011	2011152	3:28	3.8	MILA	6	Grampians VIC
363840	1/06/2011	2011152	3:28	3.8	TOO	3 S and 3A	Grampians VIC
	7/06/2011	2011158	0:00		MOO	3 S and 3A	
2735266	26/06/2011	2011174	20:30	3.0	ARMA	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:30	3.0	RK1H	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:30	3.0	RK2S	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:30	3.0	RMQ	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	BN2S	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	CMSA	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	EIDS	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	GCIS	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	QLP	3 S and 3A	Mount Mee QLD
2735266	26/06/2011	2011174	20:32	3.0	TW1H	3 S and 3A	Mount Mee QLD
376336	5/07/2011	2011186	1:30	4.4	PTPS	3 S and 3A	Korumburra VIC
376336	5/07/2011	2011186	1:30	4.4	TOO	3 S and 3A	Korumburra VIC
376336	5/07/2011	2011186	1:30	4.4	TWOA	3 S and 3A	Korumburra VIC
376336	5/07/2011	2011186	1:30	4.4	YNG	6	Korumburra VIC

Table 4 cont. HSD downloads 1 January 2011 to 30 October 2011

Event No	Date	Jdate	UTC	Mag	Sta	Channel	Name
382674	14/07/2011	2011195	5:50	4.5	GIRL	3 S and 3A	Marble Bar WA
382674	14/07/2011	2011195	5:50	4.5	KNRA	3 S and 3A	Marble Bar WA
382674	14/07/2011	2011195	5:50	4.5	MEEK	3 S and 3A	Marble Bar WA
	3/09/2011	2011246	23:02		GHSS	3 S and 3A	
	3/09/2011	2011246	23:02		NAPP	3 S and 3A	
	3/09/2011	2011246	23:02		PTPS	3 S and 3A	
	3/09/2011	2011246	23:02		WHYH	3 S and 3A	
407020	4/09/2011	2011247	11:14	3.8	HTT	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	BBOO	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	GHSS	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	NAPP	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	PTPS	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	TWOA	3 S and 3A	Jamestown SA
407020	4/09/2011	2011247	11:14	3.8	WHYH	3 S and 3A	Jamestown SA
2736349	5/09/2011	2011248	0:01	2.1	NAPP	3 S and 3A	Jamestown SA
2736386	6/09/2011	2011249	5:28	2.1	NAPP	3 S and 3A	Yongala SA
	6/09/2011	2011249	15:10		NAPP	3 S and 3A	
2736406	6/09/2011	2011249	17:12	1.9	NAPP	3 S and 3A	Yongala SA
2736408	6/09/2011	2011249	22:00	2.2	NAPP	3 S and 3A	Yongala SA
	10/09/2011	2011250	15:56		NAPP	3 S and 3A	
	10/09/2011	2011250	22:28		NAPP	3 S and 3A	
411582	17/09/2011	2011260	16:26	4.0	EIDS	3 S and 3A	Bowen QLD
411582	17/09/2011	2011260	16:26	4.0	QLP	3 S and 3A	Bowen QLD
411582	17/09/2011	2011260	16:26	4.0	RK1H	3 S and 3A	Bowen QLD
411582	17/09/2011	2011260	16:26	4.0	RK2S	3 S and 3A	Bowen QLD
	21/09/2011	2011264	21:37		YNG	6	
2737069	15/10/2011	2011288	10:38	4.3	BBOO	3 S and 3A	Carrieton SA
2737069	15/10/2011	2011288	10:38	4.3	GHSS	3 S and 3A	Carrieton SA
2737069	15/10/2011	2011288	10:38	4.3	HTT	3 S and 3A	Carrieton SA
2737069	15/10/2011	2011288	10:38	4.3	NAPP	3 S and 3A	Carrieton SA
2737069	15/10/2011	2011288	10:38	4.3	PTPS	3 S and 3A	Carrieton SA
2737069	15/10/2011	2011288	10:38	4.3	TWOA	3 S and 3A	Carrieton SA
420226	18/10/2011	2011291	15:52	3.4	GHSS	3 S and 3A	Blackwood SA
420226	18/10/2011	2011291	15:52	3.4	HTT	3 S and 3A	Blackwood SA
420226	18/10/2011	2011291	15:52	3.4	NAPP	3 S and 3A	Blackwood SA
420226	18/10/2011	2011291	15:52	3.4	PTPS	3 S and 3A	Blackwood SA
420226	18/10/2011	2011291	15:52	3.4	TWOA	3 S and 3A	Blackwood SA

GA rapid earthquake response deployment activity 2011

Guiding Principles

In the event of a large ($>ML\ 4.5$) or an otherwise significant earthquake occurring it may be considered desirable to deploy a temporary array of recording instruments in the epicentral region to determine accurate hypocentres of aftershocks. These can be used to more precisely locate the main shock, and to delineate the faults associated with the earthquake. It also presents an opportunity to acquire strong motion data close to epicentres. Both these results are important constraints on determining the local seismic hazard. A similar deployment may be undertaken in areas of earthquake swarm activity. The deployment of an array will accurately locate the hypocentres of the swarm events and help to identify the association with any tectonic features and any the spatial and temporal behaviour of the swarm.

Rapid Earthquake Response Deployments

Triggers for Rapid Deployments

A rapid aftershock deployment should be considered if an earthquake occurs which is:

1. Larger than magnitude ($>ML\ 4.5$) and it:
 - a) Occurs within or close to a population centre.
 - b) Occurs close to major infrastructure (eg, large dam; energy facility; etc).

Field Deployment

- a) At least 4 seismic recorders should be deployed within 24 to 36 hours around the earthquake epicentre
- b) One should be placed as close to the known epicentre as possible and have both seismometer and accelerometer recording.
- c) The other three should be approximately 5 km, 10 km and 15 km radial distance from the epicentre unit at equal 120 degree azimuths.
- d) One of these recorders should be at a location where data can be downloaded at short notice to enable active monitoring of aftershocks.
- e) The data should be downloaded and analysed frequently when possible if aftershocks are occurring. If the data cannot be accessed remotely, the recorders will have to be visited regularly to download the data for analysis. The preferred option is to an active communication link with the station.
- f) Maintenance of the recorders should be undertaken at intervals no greater than the onboard storage capacity of memory. This is generally 30 days for 2 Gb memory for 6 ch @ 100sps on a Kelunji Echo recorder.

Duration of Deployments.

A review of deployments should be undertaken after 21 days to determine whether the activity falls to near-background levels and recovery made at 30 days. If instruments have additional storage capacity then a second review should be done to determine whether a service or recovery is appropriate. For prolonged deployments then the activity changes to a long term temporary deployment which will require planned resourcing and additional or different equipment. An example of such an activity is the current GA Sydney deployment which commenced in 2006 and is still active.

2011 GA capacity

In 2011 GA have a total of 12 rapid deployment kits consisting of a Kelunji Echo, a Lennartz LE-3D seismometer and solar panel each in a Pelican case (total weight 20 kg for airline baggage limits)

There are 4 kits stored in GA in Canberra, 4 at the GSWA Core store at Carlisle in Perth and 4 at PIRSA Glenside in Adelaide. All deployments undertaken in 2011 had instruments installed within 36 hours of events using either GA or PIRSA staff.

Rapid Earthquake Response deployments 1 January 2011 to 30 October 2011

Event: Bowen, Queensland. M5.3 on 16 April 2011

GA references:

<http://www.ga.gov.au/earthquakes/getQuakeDetails.do?quakeId=3025605>

General information TRIM folder 2011/2002

Field Operations D2011-109824

Deployment 18th to 21st April 2011
Service visit 10th to 12th May 2011
Recovery 1st to 3rd June 2011

Station	Lat	Long	Note
BOW1	-20.269430	147.556230	
BOW2	-19.833710	147.834930	
BOW3	-20.137790	147.843990	
BOW4	-20.488040	148.001920	

(Coordinates in WGS84)

High sample rate data for this event from surrounding permanent stations was recovered by GA.

Event: Korumburra, Victoria. M4.4 on 5 July 2011

GA references:

<http://www.ga.gov.au/earthquakes/getQuakeDetails.do?quakeId=3070945>

General information TRIM folder 2011/3273

Field Operations D2011-204172

Deployment 6th to 7th July 2011
Recovery 27th to 28th July 2011

Station	Lat	Long	Note
KOR1	-38.44730	145.88157	Upslope from 2009 site
KOR2	-38.47355	145.81829	Adjacent to 2009 site
KOR3	-38.35521	145.75542	Same as 2009 site
KOR4	-38.32042	145.96894	New site

(Coordinates in WGS84)

High sample rate data for this event from surrounding permanent stations was recovered by GA.

Event: Yongala, South Australia. M3.8 on 4 September 2011

GA references:

<http://www.ga.gov.au/earthquakes/getQuakeDetails.do?quakeId=3102130>

General information TRIM folder 2011/4096
Field Operations D2011-193257
Deployment 5th & 23rd to 24th September 2011
Service 22nd September
Recovery 22nd September & 15th October

Station	Lat	Long	Note
KLG4	-33.03427	138.71455	
YON1	-33.03175	138.66750	
KLG5	-32.96670	138.72825	
KLG1	-33.04995	138.77027	
YON2	-33.08825	138.71542	
YON3	-33.06673	138.67909	
YON4	tba	tba	
YON5	-33.07504	138.69939	
YON6	-33.11238	138.64267	
YON7	-33.05432	138.69783	

(Coordinates in WGS84)

High sample rate data for this event from surrounding permanent stations was recovered by GA.

Geoscience Australia Seismic Data Downloading Procedure using SEEDLINK

Purpose

This guideline describes the process of downloading Geoscience Australia (GA) Australian National Seismograph Network (ANSN) seismic data with freeware software using the SEEDLINK protocol. At present, GA is looking to streamline its approach for preparing seismic data for use by external clients that does not have the overheads associated with the autoDRM client currently used. International users of GA seismic data with Antelope licenses retrieve GA data using orb2orb processes using SEEDLINK protocol.

GA has developed the process described in this document, using freely downloadable software, to obtain real-time data feeds, locally store, manage and analyse data acquired by the ANSN.

Definitions

GA	Geoscience Australia
SEEDLINK	A robust data transmission protocol intended for use on the internet or private circuits that support TCP/IP
Real-time	Continuous data with latency typically less than one minute
Antelope	Seismic program produced by Boulder Real Time Technologies (BRTT) which is an integrated collection of programs for real-time data collection and seismic analysis
autoDRM	Automatic Data Request Manager is a software package that allows email to retrieve seismic data packets from a collection agency
Watcom	Compiler
Slinktool	Command line SEEDLINK client
SeisGram2K	Java based interactive visualization and analysis of earthquake seismograms

Procedure

Installation

- I. Go to “My Documents” on a windows based pc and make a new folder called “GA Data” (or whatever name you want to call it). Double click on this directory and make another file called “archive”.
- II. **If using on a windows based pc**, connect to the internet and visit <http://www.openwatcom.org/index.php/Download> . Scroll down and click on “ftp” from the openwatcom.org mirror site for the installer’s version.
- III. Download open-watcom-c-win32-1.8.exe and save in the GA Data directory in My Documents. This may take some time as the file is 77Mb.
- IV. Go back to the GA Data directory and click on the executable (*.exe file). Click I Agree and allow the program to save to the C drive. Allow a selective install, click next, next and next. Allow to modify local machine environment variables and allow to modify associations. Click OK when finished and reboot your pc.
- V. Once rebooted, go back to the internet and download <http://www.iris.edu/pub/programs/SeedLink/slinktool-4.1b.tar.gz> and save in the GA Data directory.
- VI. Go to this file in the GA Data directory and right click. If you have an extraction program such as 7-zip or WinZip, extract here should unzip and untar the file and make a slinktool folder. The file slinktool-4.1b.zip can also be downloaded and unzipped if you come across problems. These same commands can be done in a Unix/Linux environment using gunzip and tar -xvf on the file.
- VII. Open up a command prompt window (Programs – Accessories – Command Prompt) in windows, type in cd c:WATCOM to change into the compiler directory. Type dir to do a listing of what is available in this directory. Type owsetenv.bat to start the watcom environment.
- VIII. Type cd .. to get out of WATCOM and then cd Documents and Settings\local admin\My Documents\GA Data\slinktool . The tab key will write the rest of each line (i.e Docu(Tab) will write out Documents and Settings).
- IX. Type wmake -f Makefile.wat to compile the slinktool program. After about one minute, an executable file will be created. In LINUX, a “make gcc” or in UNIX, a “make” will also compile the program. If using a solaris UNIX system, read the README file to locate a line which must be unhashed in the src/Makefile file.
- X. To view the waveforms that you have downloaded, go to http://alomax.free.fr/seisgram/ver53/SeisGram2K_install.html and click on SeisGram2K53.jar and save in GA Data. This file will be an executable java file and can be run just by double clicking. If it doesn’t, update your java version.
- XI. All of the compiling has taken place and only will need to be completed if reinstalling – not starting a new download screen

Configuration

- I. In a command prompt window, type c:Documents and Settings\local admin\My Documents\GA Data\slinktool . Type in slinktool -h to access a help file with all of the possible options.
- II. A simple line for downloading direct from the GA Seismic SEEDLINK server is
slinktool [options] [host][:][port]
- III. For our data, an example is
 - slinktool -S “AU_PTPS”, “AU_BBOO”, “AU_WHYH” -SDS \archive 192.104.43.82:18000
 - slinktool -S “AU_BBOO” -BUD \archive 192.104.43.82:18000

The program will start storing data into the archive directory after about 20 seconds. The line will appear as though nothing is happening – this is what you want. Error messages will come up if a particular station is down or the command line is typed incorrectly.

- IV. On average, each channel will download between 3 and 6 Megabytes per day or for 50 stations over an entire year, approximately 230 Gigabytes. If you have download usage allowances, please be aware. If you have download space restrictions, burning to a DVD once per week will keep your archive size small.
- V. Using the SDS file structure, data can be viewed in newer versions of EQSuite by ES&S. More testing of other seismogram viewers will be carried out later.
- VI. Other options in slinktool can also be played around with that could improve its capabilities. The network timeout could be very useful for flaky or dial-up connections.
- VII. To stop the acquisition of data, type Control+C.

Stations Exported through SEEDLINK

- I. The easiest way to see what stations are coming through via SEEDLINK protocol is to visit <http://www.iris.edu/mda/AU>.
- II. Updates to the station list (and associated metadata) are always occurring so regularly check this list.
- III. Stations recently upgraded will be offline for several weeks before all QA/QC tests have been completed and station has been implemented into the production environment for dissemination through SEEDLINK.
- IV. Web accessible station status, descriptions and locations are currently not available in the public domain for JUMP stations, other station information is available through IRIS links at http://www.iris.washington.edu/bud_stuff/dmc/.

Limitations

- I. As this software is free, there is no guarantee on the programs involved being problem free.
- II. Where the SEEDLINK server has crashed, data will not backfill using this process (only real time). For research purposes, backup data can be requested from IRIS. GA is currently looking into the viability of being able to perform this function in the distant future.

IRIS Seismic Data Downloading Procedure using SEEDLINK

Purpose

This guideline describes the process of downloading Incorporated Research Institutions for Seismology (IRIS) Seismic data using freeware software using the SEEDLINK protocol. At present, GA is looking to aid the collection and analysis of seismic data for its external clients to use within their own warning and research centres. International users of GA seismic data with antelope licenses have been able to pull data using orb2orb processes using SEEDLINK protocol. GA has now come up with a process, using freely downloadable software, to grab a feed of the real-time data, store, manage and analyses the data currently being produced.

Definitions

GA	Geoscience Australia
SEEDLINK	A robust data transmission intended for use on the internet or private circuits that support TCP/IP
Real-time	Continuous data with less than one minute latency
Antelope	Seismic program which is an integrated collection of programs for data collection and seismic analysis
autoDRM	Automatic Data Request Manager is a software package that allows email to retrieve seismic data packets from a collection agency
Watcom	Compiler
Slinktool	Command line SEEDLINK client
SeisGram2K	Java based interactive visualization and analysis of earthquake seismograms

Procedure

Installation

- I. Go to "My Documents" on a windows based pc and make a new folder called "IRIS Data" (or what ever name you want to call it). Double click on this directory and make another file called "archive".
- II. **If using on a windows based pc**, connect to the internet and visit <http://www.openwatcom.org/index.php/Download> . Scroll down and click on "ftp" from the openwatcom.org mirror site for the installer's version.
- III. Download open-watcom-c-win32-1.8.exe and save in the IRIS Data directory in My Documents. This may take some time as the file is 77Mb.
- IV. Go back to the IRIS Data directory and click on the executable (*.exe file). Click I Agree and allow the program to save to the C drive. Allow a selective install, click next, next and next. Allow to modify local machine environment variables and allow to modify associations. Click OK when finished and reboot your pc.
- V. Once rebooted, go back to the internet and download <http://www.iris.edu/pub/programs/SeedLink/slinktool-4.1b.tar.gz> and save in the IRIS Data directory.
- VI. Go to this file in the IRIS Data directory and right click. If you have an extraction program such as 7-zip or WinZip, extract here should unzip and untar the file and make a slinktool folder. The file slinktool-4.1b.zip can also be downloaded and unzipped if you come across problems. These same commands can be done in a Unix/Linux environment using gunzip and tar -xvf on the file.
- VII. Open up a command prompt window (Programs – Accessories – Command Prompt) in windows, type in cd c:WATCOM to change into the compiler directory. Type dir to do a

listing of what is available in this directory. Type `owsetenv.bat` to start the watcom environment.

- VIII. Type `cd ..` to get out of WATCOM and then `cd Documents and Settings\local admin\My Documents\IRIS Data\slinktool`. The tab key will write the rest of each line (i.e. Docu(Tab) will write out Documents and Settings).
- IX. Type `wmake -f Makefile.wat` to compile the slinktool program. After about one minute, an executable file will be created. In LINUX, a “make gcc” or in UNIX, a “make” will also compile the program. If using a solaris UNIX system, read the README file to locate a line which must be unhashed in the `src/Makefile` file.
- X. To view the waveforms that you have downloaded, go to http://alomax.free.fr/seisgram/ver53/SeisGram2K_install.html and click on `SeisGram2K53.jar` and save in IRIS Data. This file will be an executable java file and can be run just by double clicking. If it doesn't, update your java version.
- XI. All of the compiling has taken place and only will need to be completed if reinstalling – not starting a new download screen

Configuration

- I. In a command prompt window, type `c:\Documents and Settings\local admin\My Documents\IRIS Data\slinktool`. Type in `slinktool -h` to access a help file with all of the possible options.
- II. A simple line for downloading direct from the IRIS Seismic SEEDLINK server is `slinktool [options] [host][:][port]`
- III. For IRIS data, an example is
 - `slinktool -S "IU_KNTN","AU_BBOO","NZ_WPVZ" -SDS \archive rtserve.iris.washington.edu:18000`
 - `slinktool -S "AU_BBOO" -BUD \archive rtserve.iris.washington.edu:18000`The program will start storing data into the archive directory after about 20 seconds. The line will appear as though nothing is happening – this is what you want. Error messages will come up if a particular station is down or the command line is typed incorrectly.
- IV. On average, each channel will download between 3 and 6 Megabytes per day or for 50 stations over an entire year, approximately 230 Gigabytes. If you have download usage allowances, please be aware. If you have download space restrictions, burning to a DVD once per week will keep your archive size small.
- V. Using the SDS file structure, data can be viewed in newer versions of EQSuite by ES&S. More testing of other seismogram viewers will be carried out later.
- VI. Other options in `slinktool` can also be played around with that could improve its capabilities. The network timeout could be very useful for flaky or dial-up connections.
- VII. To stop the acquisition of data, type `Control+C`.

Stations Exported through SEEDLINK

- V. The easiest way to see what stations are coming through via SEEDLINK protocol is to visit <http://www.iris.edu/mda/>.
- VI. Updates to the station list (and associated metadata) are always occurring so regularly check this list.
- VII. Stations recently upgraded will be offline for several weeks before all QA/QC tests have been completed and station has been implemented into the production environment for dissemination through SEEDLINK.

Limitations

- III. As this software is free, there is no guarantee on the programs involved being problem free.
- IV. Where the SEEDLINK server has crashed, data will not backfill using this process (only real time). For research purposes, backup data can be requested from IRIS.

Australian Centre for Geomechanics/ Public Seismic Network

Vic Dent, Paul Harris, Dale Hardy, John Harris, Blair Lade

This network had its beginnings in WA in 2006, with a station in the Geology Dept at the University of WA. It has now expanded significantly across Australia, and its success is due largely to a small group of dedicated volunteers. It uses hardware and software supplied by the Webtronics company in Redwood City, California, which is also used by a loosely-knit world-wide community, known as the Public Seismic Network or PSN. It also has been given access to communications and web-based analytical software developed by the Australian Centre for Geomechanics (ACG), Perth. The seismographs have often been sited in schools, to take advantage of improved security, and access to power and the internet.

Most of the stations in this network collect data at 200 samples per second, and have GPS controlled timing. The sensors deployed are mostly Willmore Mark II seismometers, or Mark Products L15B geophones, as indicated in the accompanying table. The network expanded significantly in 2011, with the installation of 7 new stations, across all states except Tasmania and the Northern Territory;

The network allows identification and approximate location of many small earthquakes, as well as approximate magnitude determination, often before they are listed on the Geoscience Australia website.

In NSW, a new station was installed at Tallong Primary School on 17th February 2011 (replacing a test station at Wingello), using a Mark Products geophone, and later upgraded with a Willmore Mk II seismometer (20th July). The seismograph at Crookwell High school, initially installed in 2010, did not collect data consistently until serviced on 21st February. New stations were also installed at James Sheahan College, Orange, in May 2011 and Dungog Senior High School in October 2011. The Redhead seismic station was upgraded to include a home-built Force Balance (vertical) sensor, with excellent response at long wavelengths, with data on-line from 15th November. The station at Katoomba High School was closed on 6th September because of excessive background noise.

In South Australia, seismographs were installed at Peterborough and Jamestown high schools on 29th June 2011. A Willmore Mk II was used at Peterborough, while a single component geophone was used at Jamestown. The DMITRE (S. A. Govt.) station at Modbury Heights (THS), which had been out of service since 6th January 2011, was converted to a PSN station on 24th June 2011.

In Western Australia, a new station was installed at Lake Grace District High School on 28th January 2011. Glen Forrest was closed on 6th June, and a new station installed at Northampton District High School on 25th July. The station at Beacon Primary School (installed March 2009) was upgraded to a Willmore on 29th August. A new station was set up north of Koorda on 11th November 2011, to monitor an eq swarm occurring there. YORK was closed on 28th November 2011. In the far southwest of the state, an area of poor seismograph coverage, a test station was set up at Dunsborough Primary School. It operated between October 2010 and March 2011, but site difficulties meant its operation could not be continued.

In Queensland, a new station was set up on 6th August to run in parallel with a seismograph (FS03) already operated by Mike Turnbull, near Gin Gin (about 100 km west of Bundaberg).

A station was installed on 27th September at Sandon, Victoria (near Bendigo) to run in parallel with a station operated by Gary Gibson (S88B).

More information on the network, and current seismograms from some stations, can be found at www.rsuw.daleh.id.au.

Table 9: Stations operating in 2011.

Location	State	Lat (S)	Long(E)	Opened	sensor	Code [!]	remarks
Gin Gin	QLD	25.1045	151.8670	06-08-2011*	geophone	FS03	
Dungog	NSW	32.3971	151.7495	07-10-2011	geophone		
Redhead	NSW	33.0197	151.697	01-12-2008	Willmore	REDH	
Orange	NSW	33.3019	149.0937	02-05-2011	Willmore	ORNG	
Katoomba	NSW	33.7284	150.3140	06-05-2010	geophone		Closed Sep 6 th
Tallong	NSW	34.7152	150.0846	17-02-2011	Willmore	TLNG	
Crookwell	NSW	34.4523	149.4658	21-02-2011	geophone		
Gundaroo	NSW	35.0320	149.2680	26-01-2008	Willmore	GUND	
Kambah	ACT	35.3892	149.0768	01-02-2010*	geophone	KBH	
Sandon	Vic	37.1674	144.0516	27-09-2011*	Willmore		
Peterborough	SA	32.9787	138.8357	29-06-2011	Willmore	PBR1	
Jamestown	SA	33.2045	138.6092	29-06-2011	geophone	JMS1	
Modbury	SA	34.7417	138.7733	24-06-2011*	Willmore	THS	
Morphett Vale	SA	35.1303	138.8599	27-05-2010	Willmore	MPTV	
Broome	WA	17.9559	122.2325	27-06-2006	Willmore		
Northampton	WA	28.3538	114.6470	25-07-2011	Willmore		
Beacon	WA	30.4511	117.8687	19-03-2009	Willmore	BEAC	
Koorda	WA	30.6307	117.6041	11-11-2011	geophone		
York	WA	31.5933	116.7603	15-05-2007	geophone		closed Nov 28
Glen Forrest	WA	31.9076	116.0909	05-10-2009	geophone		closed Jun 7 th
UWA museum	WA	31.9850	115.820	27-04-2006	geophone		
Pinjarra	WA	32.6331	115.8723	18-02-2010	geophone		closed Nov 8 th
Lake Grace	WA	33.1036	118.459	28-01-2011	geophone	LKGR	
Gnowangerup	WA	33.8728	117.8999	27-01-2008	geophone	GNOW	
Gnowangerup "B"	WA	33.8796	118.2491	18-08-2008	Willmore		

* denotes a prior-operating seismograph, added to PSN network on this data

! ISC registered codes

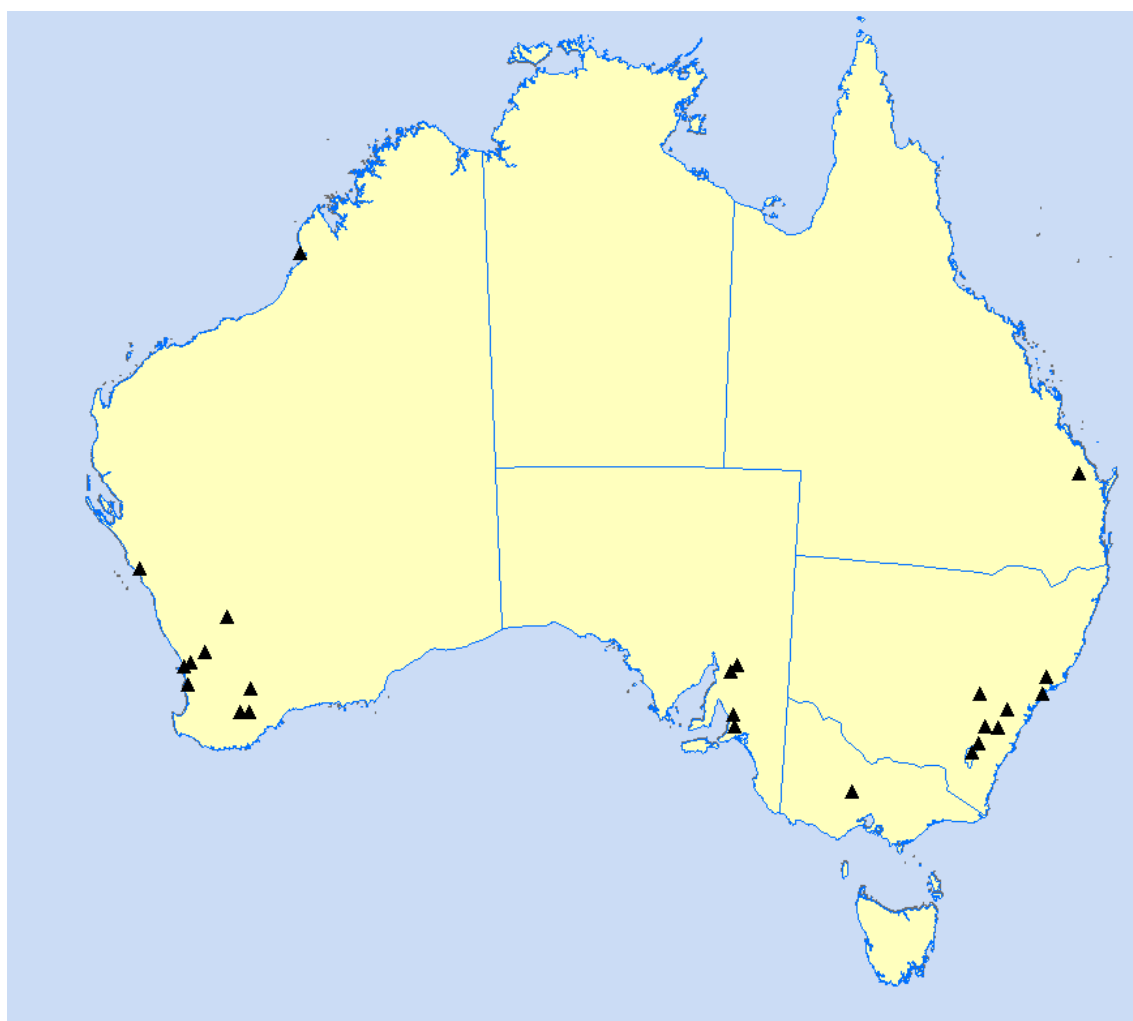


Figure 4: *Map of Public Seismic Network Stations*

Australian Seismometers in Schools Network (AuSIS)

Natalie Balfour

The aim of AuSIS is to install 40 seismometers in schools around Australia to promote careers in geoscience and to give students the opportunity to be involved in a national science experiment in conjunction with collecting valuable data for the seismological community. So far this year we have installed two seismometers in schools in the ACT and one at the Mt Stromlo seismic vault as part of the project's pilot. The data from these stations will be available from IRIS in the near future. Once the data connection with IRIS is established, the data will be sent there in near real-time and available publically. These stations will run for the duration of the project and we hope well beyond as they have been set up to require minimal maintenance. AuSIS is a four-year project (2011-2014) funded by the Geophysical Education Observatory component of AuScope Australian Geophysical Observing System (AGOS). For recent updates on the project see our facebook page www.facebook.com/ausisnetwork, our website www.ausis.edu.au (soon to be launched) or email ausis@anu.edu.au

Table 10: Station Information

Net	Station Code	Lat.	Lon.	Elev. (m)	Install	Instrument	Sam. rate
S	AUMTS	-35.3188	148.9964	667	09/11	CMG-6TD	100
S	AUMHS	-35.3635	149.0888	615	12/11	CMG-6TD	100
S	AUDAR	-35.2530	149.1377	575	04/12	CMG-6TD	100

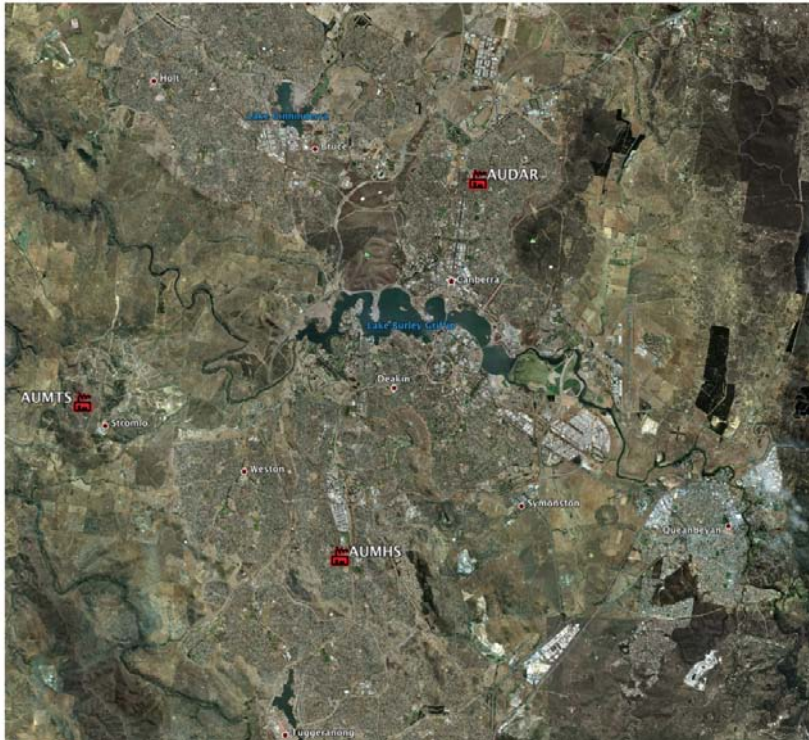


Figure 5: Map of stations

Australian Capital Territory

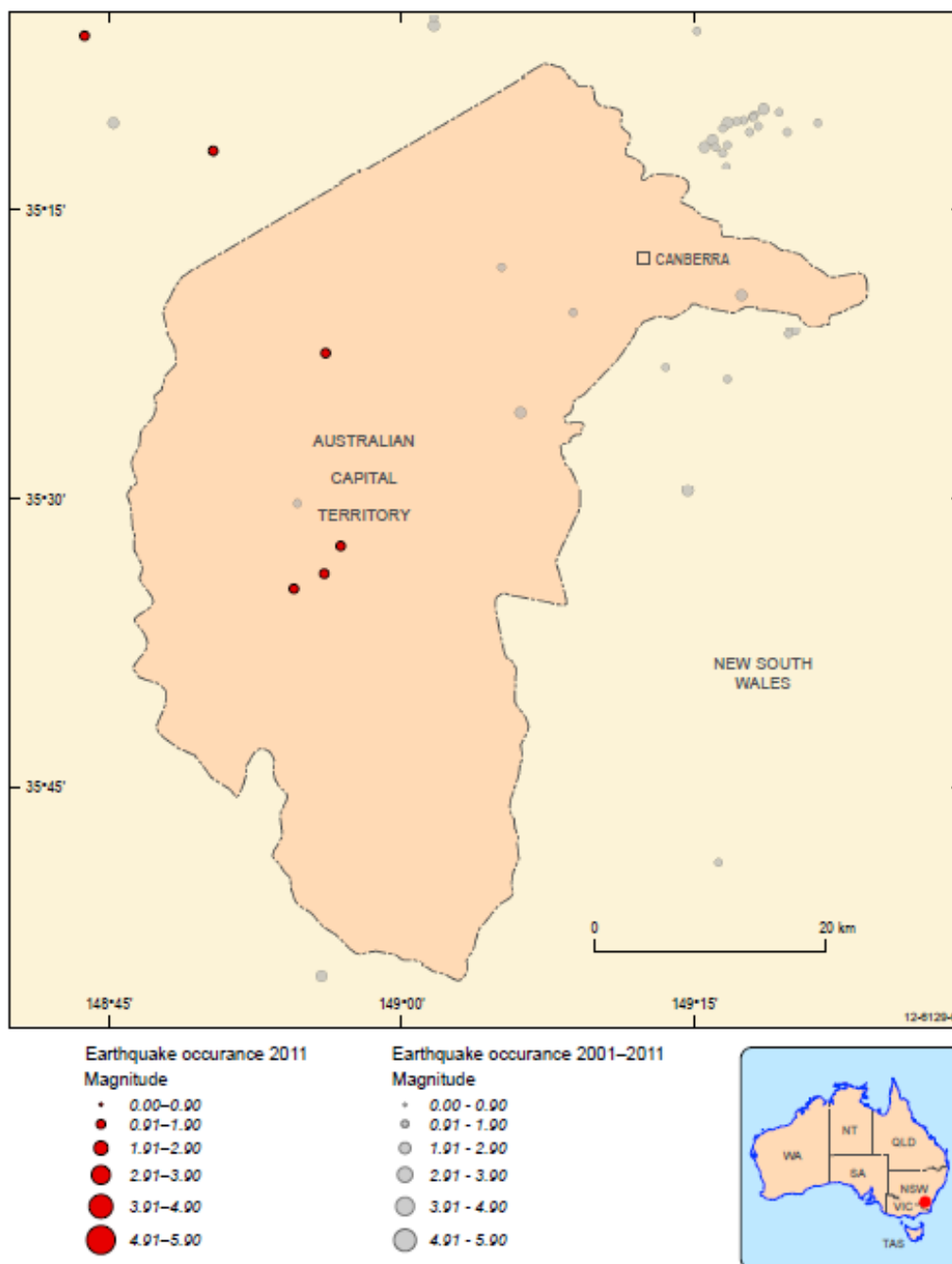


Figure 6: Map of 2011 Australian Capital Territory Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 11: Australian Capital Territory Top 9 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
3.0	25-Apr-1970	10:54:50	-35.430	149.100	18	ACT
3.0	19-Aug-1998	11:12:44	-35.654	148.951	0	ACT
2.9	23-Oct-2000	1:20:25	-35.472	148.837	1	ACT
2.8	10-Jan-1976	1:27:46	-35.610	149.030	13	ACT
2.5	21-Jun-1999	13:59:35	-35.193	149.164	7	ACT
2.5	19-Feb-1972	5:18:49	-35.360	149.010	4	ACT
2.5	7-Dec-1975	10:31:26	-35.340	149.090	0	ACT
2.5	12-Feb-1977	11:56:46	-35.540	148.850	13	ACT
2.5	19-Sep-1976	2:04:52	-35.900	149.000	20	ACT

Table 12: Australian Capital Territory Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
1.6	ML	28-May-11	12:00:54	-35.374	148.935	10	Pierces Creek, ACT.
1.5	ML	11-Sep-11	19:27:55	-35.578	148.908	0	Near Tharwa, ACT.
1.4	ML	11-Sep-11	19:28:47	-35.565	148.934	0	Near Tharwa, ACT.
1.2	ML	11-Sep-11	19:29:38	-35.541	148.948	0	Near Tharwa, ACT.

New South Wales

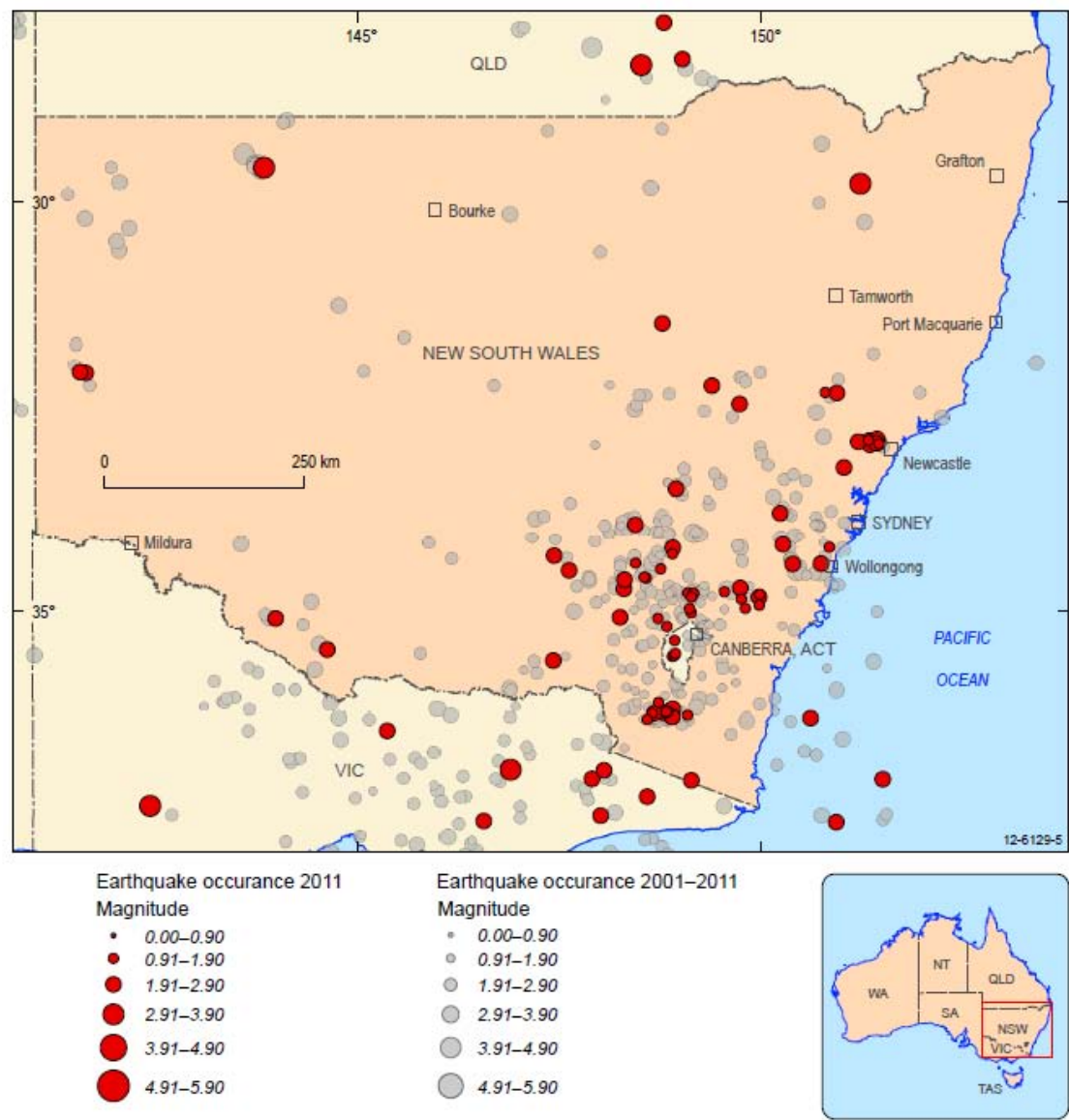


Figure 7: Map of 2011 New South Wales Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 13: New South Wales Top 7 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
5.8	21-May-1961	21:40:03	-34.547	150.503	19	Bowral, NSW.
5.7	27-Dec-1989	23:26:57	-32.946	151.607	11	Newcastle, NSW.
5.6	18-Nov-1934	21:58:41	-34.800	149.200	10	Gunning, NSW.
5.5	29-Nov-1886	17:00:00	-34.750	148.800	0	Bowning, NSW.
5.5	30-May-1921	14:51:59	-35.000	145.000	0	Hay, NSW.
5.5	10-Mar-1949	22:30:33	-34.740	149.200	0	Dalton, NSW.
5.5	9-Mar-1973	19:09:14	-34.170	150.320	21	Picton, NSW.

Table 14: New South Wales Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.6	ML	06-Jan-11	10:00:54	-35.489	144.623	0	West of Deniliquin, NSW.
1.7	ML	11-Jan-11	02:40:48	-34.931	149.986	6	SE of Goulburn, NSW.
1.9	ML	11-Jan-11	19:21:35	-36.301	148.658	12	N of Jindabyne, NSW.
2.7	ML	24-Jan-11	13:05:49	-35.097	143.984	10	Moulamein, NSW.
2.6	ML	25-Jan-11	11:28:52	-33.485	148.953	5	Near Orange, NSW.
2.3	ML	28-Jan-11	10:43:03	-33.789	150.246	10	Katoomba area, NSW.
2.4	ML	28-Jan-11	11:47:08	-36.362	150.625	10	E of Narooma, NSW.
2.6	ML	29-Jan-11	15:29:33	-31.466	148.784	10	NE of Gilgandra, NSW.
2.2	ML	01-Feb-11	08:15:47	-34.416	150.402	10	NW of Bowral, NSW.
2.4	ML	09-Feb-11	14:41:04	-32.939	151.361	13	S of Cessnock, NSW.
2.4	ML	09-Feb-11	16:51:13	-32.915	151.462	0	Mount Vincent, NSW.
1.7	ML	09-Feb-11	17:02:44	-32.929	151.472	0	Mount Vincent, NSW.
2.2	ML	10-Feb-11	23:33:06	-32.873	151.449	0	SE of Cessnock, NSW.
2.1	ML	15-Feb-11	04:00:46	-37.16	149.143	0	Bondi Forest, NSW.
1.5	ML	22-Feb-11	09:31:40	-35.029	149.143	7	Near Murrumbateman, NSW.
2.2	ML	27-Feb-11	13:29:00	-32.922	151.437	0	Mount Vincent, NSW.
2.3	ML	31-Mar-11	11:46:19	-34.727	148.306	1	Young area, NSW.
1.8	ML	31-Mar-11	19:32:44	-34.594	148.586	0	Young area, NSW.
1.3	ML	04-Apr-11	11:36:39	-34.974	149.12	0	Near Murrumbateman, NSW.
1.9	ML	15-Apr-11	14:09:16	-34.404	148.452	3	NE of Kingsvale, NSW.
1.7	ML	21-Apr-11	03:53:39	-34.795	149.994	0	E of Dalton, NSW.
1.7	ML	01-May-11	15:17:57	-34.289	148.911	4	Frogmore, NSW.
2	ML	04-May-11	20:13:16	-34.716	149.75	2	Goulburn, NSW.
2.5	ML	16-May-11	14:47:13	-37.701	150.942	20	Offshore, SE of Eden, NSW.
2.4	ML	18-May-11	13:34:08	-32.31	150.95	1	SE of Muswellbrook, NSW.
2.6	ML	24-May-11	16:13:56	-35.63	147.428	0	Holbrook area, NSW.
2.0	ML	15-Jun-11	08:13:30	-34.611	148.315	0	SW of Harden, NSW.
2.2	ML	16-Jun-11	18:18:34	-33.933	148.448	0	E of Grenfell, NSW.
1.9	ML	17-Jun-11	00:19:24	-34.778	149.099	0	Jerrawa, NSW.
2.5	ML	17-Jun-11	10:39:27	-32.443	149.742	10	NE of Mudgee, NSW.
1.9	ML	21-Jun-11	03:12:34	-34.855	149.766	10	S of Goulburn, NSW.
1.7	ML	27-Jun-11	19:47:05	-36.381	148.596	0	Jindabyne, NSW.
1.4	ML	02-Jul-11	10:26:59	-34.763	149.555	0	West of Goulburn, NSW.

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2.7	ML	05-Jul-11	16:02:10	-32.219	149.398	0	NW of Gulgong, NSW.
1.9	ML	09-Jul-11	17:55:23	-34.787	149.17	5	Oolong, NSW.
1.9	ML	09-Jul-11	17:59:16	-34.785	149.171	0	Oolong, NSW.
2.6	ML	11-Jul-11	13:28:33	-32.065	141.624	0	SE of Broken Hill, NSW.
1.9	ML	13-Jul-11	19:04:30	-36.293	148.83	2	Near Berridale, NSW.
2.2	ML	14-Jul-11	10:57:27	-36.293	148.801	0	Near Berridale, NSW.
1.9	ML	14-Jul-11	18:41:30	-36.274	148.855	2	Near Berridale, NSW.
2.0	ML	15-Jul-11	13:41:24	-36.343	148.898	2	Near Berridale, NSW.
2.2	ML	18-Jul-11	17:58:47	-34.311	147.44	0	Temora, NSW.
2.0	ML	19-Jul-11	03:01:43	-36.346	148.907	0	Near Berridale, NSW.
2.2	ML	22-Jul-11	06:00:30	-36.263	148.89	0	Near Berridale, NSW.
1.9	ML	22-Jul-11	22:02:00	-34.829	149.144	10	Oolong, NSW.
3.0	ML	29-Jul-11	03:37:30	-29.604	143.839	15	NW of Bourke, NSW.
2.0	ML	07-Aug-11	09:00:33	-34.166	150.281	10	Near Lake Burragorang, NSW.
2.4	ML	11-Aug-11	17:09:16	-32.905	151.216	10	Millfield, NSW.
1.8	ML	14-Aug-11	01:32:32	-32.303	150.805	0	Near Muswellbrook, NSW.
1.6	ML	16-Aug-11	02:57:39	-34.972	149.812	12	SW of Bungonia, NSW.
2.1	ML	24-Aug-11	14:04:17	-34.497	147.627	7	Near Temora, NSW.
1.4	ML	03-Sep-11	04:00:58	-35.1	148.729	0	Wee Jasper, NSW.
2.2	ML	19-Sep-11	00:01:26	-36.243	148.914	11	NE of Berridale, NSW.
1.5	ML	23-Sep-11	18:24:53	-35.199	148.839	6	Near Uriarra, NSW.
1.9	ML	02-Oct-11	16:11:36	-36.324	149.094	10	S of Cooma, NSW.
2.0	ML	15-Oct-11	12:40:09	-35.085	148.258	6	Near Gundagai, NSW.
1.9	ML	24-Oct-11	15:22:41	-32.887	151.343	10	Ellalong, NSW.
2.1	ML	26-Oct-11	00:42:21	-33.22	151.037	0	NE of St Albans, NSW.
2.0	ML	01-Nov-11	16:22:12	-34.413	150.755	0	NW of Mount Kembla, NSW.
1.9	ML	02-Nov-11	15:15:48	-34.476	148.763	0	Near Boorowa, NSW.
1.5	ML	05-Nov-11	13:50:40	-34.582	148.557	12	Galong, NSW.
2.0	ML	10-Nov-11	02:41:10	-34.829	149.985	10	SE of Goulburn, NSW.
3.4	ML	13-Nov-11	00:05:07	-29.792	151.241	6	W of Inverell, NSW.
1.9	ML	14-Nov-11	09:45:56	-36.276	148.831	0	Near Berridale, NSW.
1.9	ML	14-Nov-11	10:09:46	-36.159	148.735	0	Near Lake Eucumbene, NSW.
2.5	ML	23-Nov-11	16:57:42	-32.891	151.356	9	S of Cessnock, NSW.
2.3	ML	24-Nov-11	17:03:40	-37.147	151.519	0	E of Eden, NSW.
1.9	ML	26-Nov-11	13:40:49	-34.204	150.857	15	E of Appin, NSW.
2.0	ML	04-Dec-11	06:55:38	-36.296	148.684	31	NW of Berridale, NSW.
2.1	ML	04-Dec-11	14:52:52	-34.211	148.912	0	Frogmore, NSW.
2.2	ML	11-Dec-11	15:48:29	-32.054	141.556	6	SE of Broken Hill, NSW.

New South Wales Seismicity Report

Environmental Systems and Services

Compiled by Elodie Borleis



Network

The New South Wales seismic monitoring network operated by the ES&S Seismology Research Centre now comprises 37 seismographs and accelerographs throughout New South Wales.

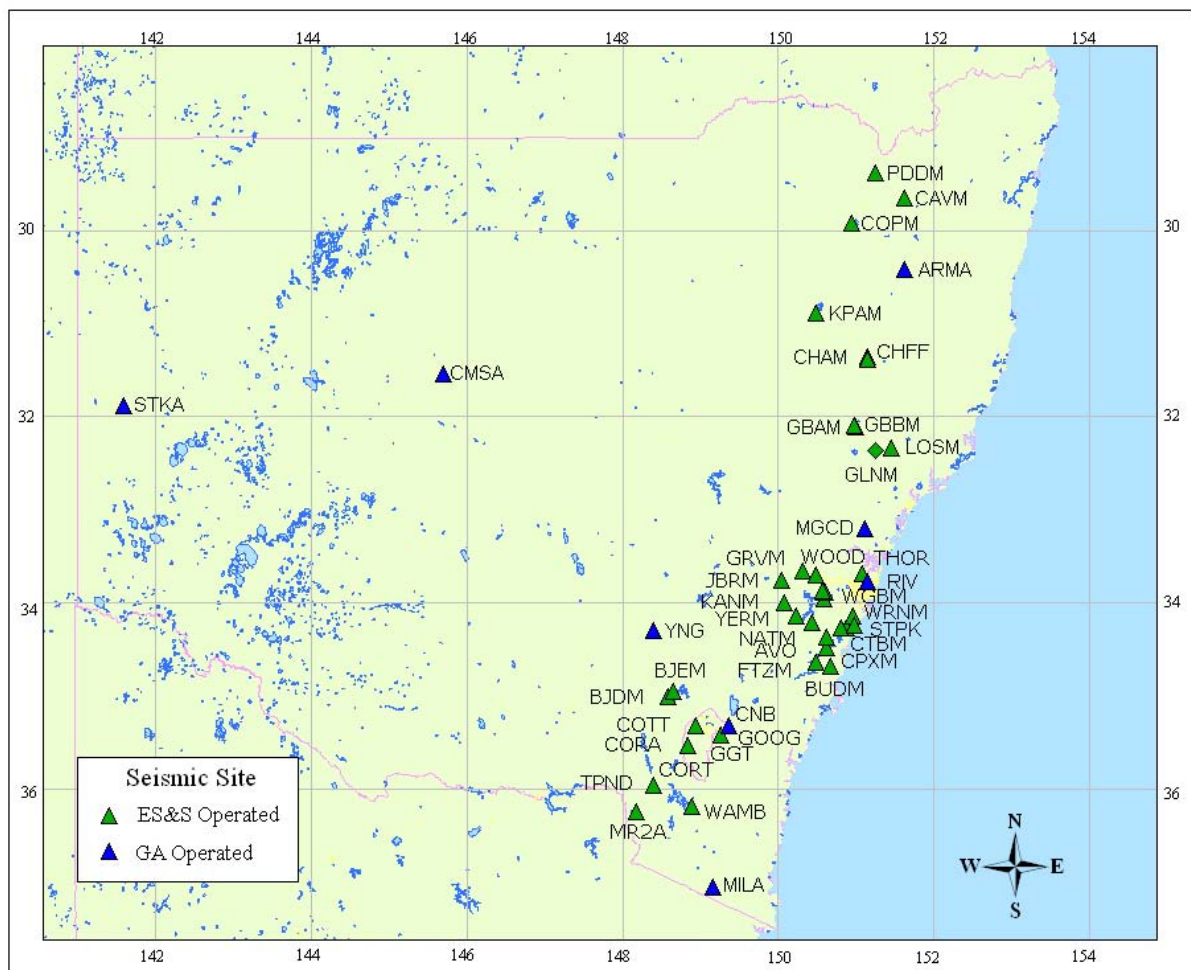


Figure 8: ES&S New South Wales Seismic Network

In December 2011 a new site was installed at Stanwell Park (STPK), funded by Rail Corporation New South Wales. This site was installed to provide a ground motion reference for any seismic activity in the area of the Stanwell Park viaduct. This site transmits continuously to the ES&S lab in Richmond, Victoria.

Seismicity

255 earthquakes were recorded in New South Wales by ES&S in 2011, ten greater than or equal to magnitude ML 2.5. Three magnitude ML 3.0 earthquakes were recorded near Cadia, Inverell and Barraba respectively. An aftershock of magnitude ML 2.5 occurred near Barraba on November 26th.

Table 15: New South Wales magnitude ML 2.5+ earthquakes recorded by Environmental Systems & Services

DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	MAG	IMX	ACC	LOCATION
25-Jan-11	11:28	-33.491	148.988	2	3.0	0	D	Cadia
29-Jan-11	15:29	-31.604	148.878	10	2.9	0	D	Dunedoo
09-Feb-11	14:41	-32.846	151.401	10	2.5	0	D	Cessnock
01-May-11	18:37	-32.249	150.934	10	2.7	0	E	Muswellbrook
07-May-11	19:02	-32.109	151.051	2	2.7	0	C	Scone
17-Jun-11	10:39	-32.765	149.606	10	2.8	0	E	Mudgee
11-Aug-11	17:09	-32.874	151.343	0	2.7	0	D	Cessnock
13-Nov-11	00:05	-29.827	151.211	10	3.0	0	DX	Inverell
13-Nov-11	00:10	-30.127	150.819	10	3.0	0	D	Barraba
26-Nov-11	15:13	-30.075	150.823	10	2.7	0	D	Barraba

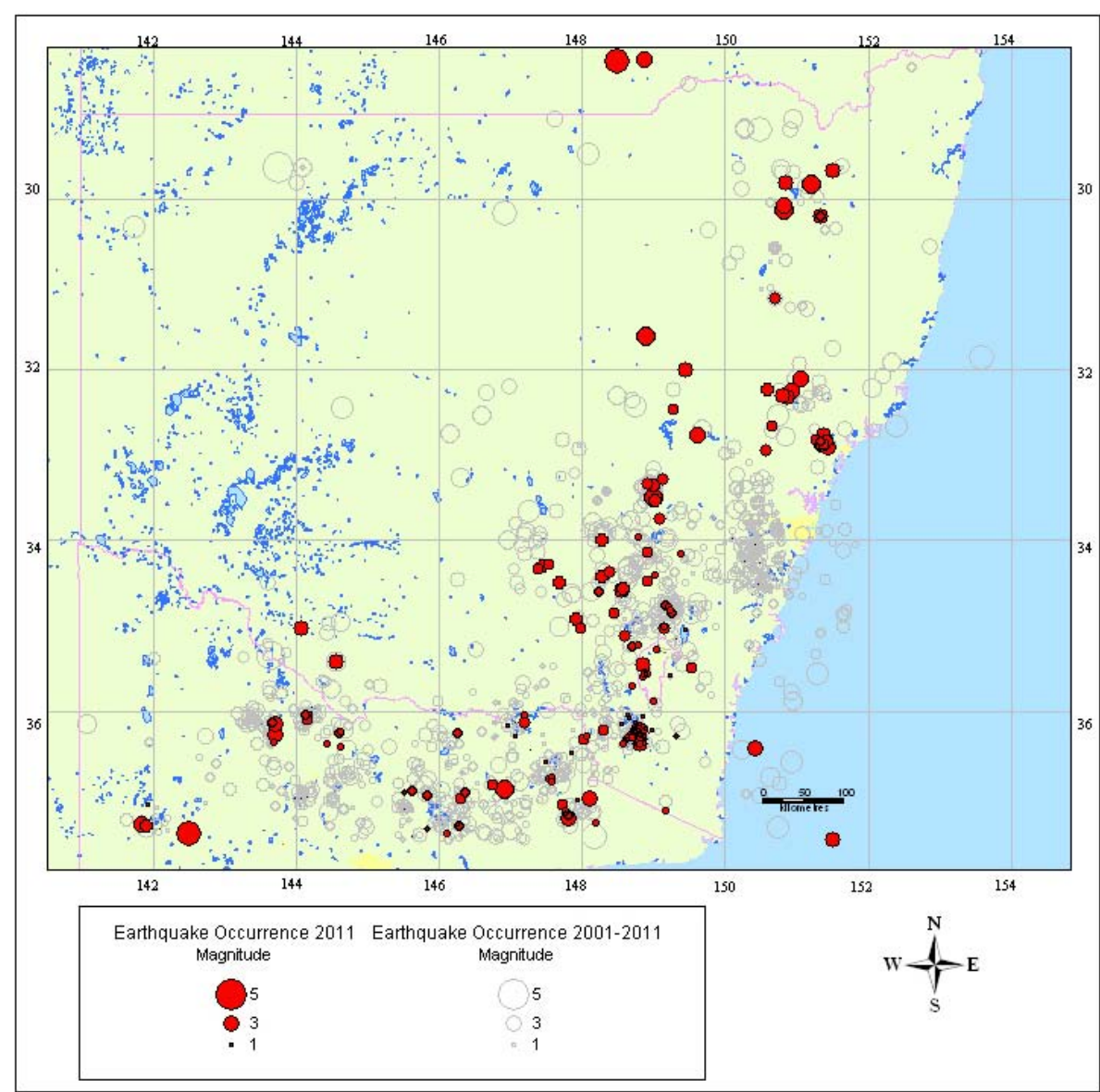


Figure 9: Map of 2011 New South Wales Earthquakes recorded by ES&S (magnitude sized circles with subdued historical seismicity).

Northern Territory

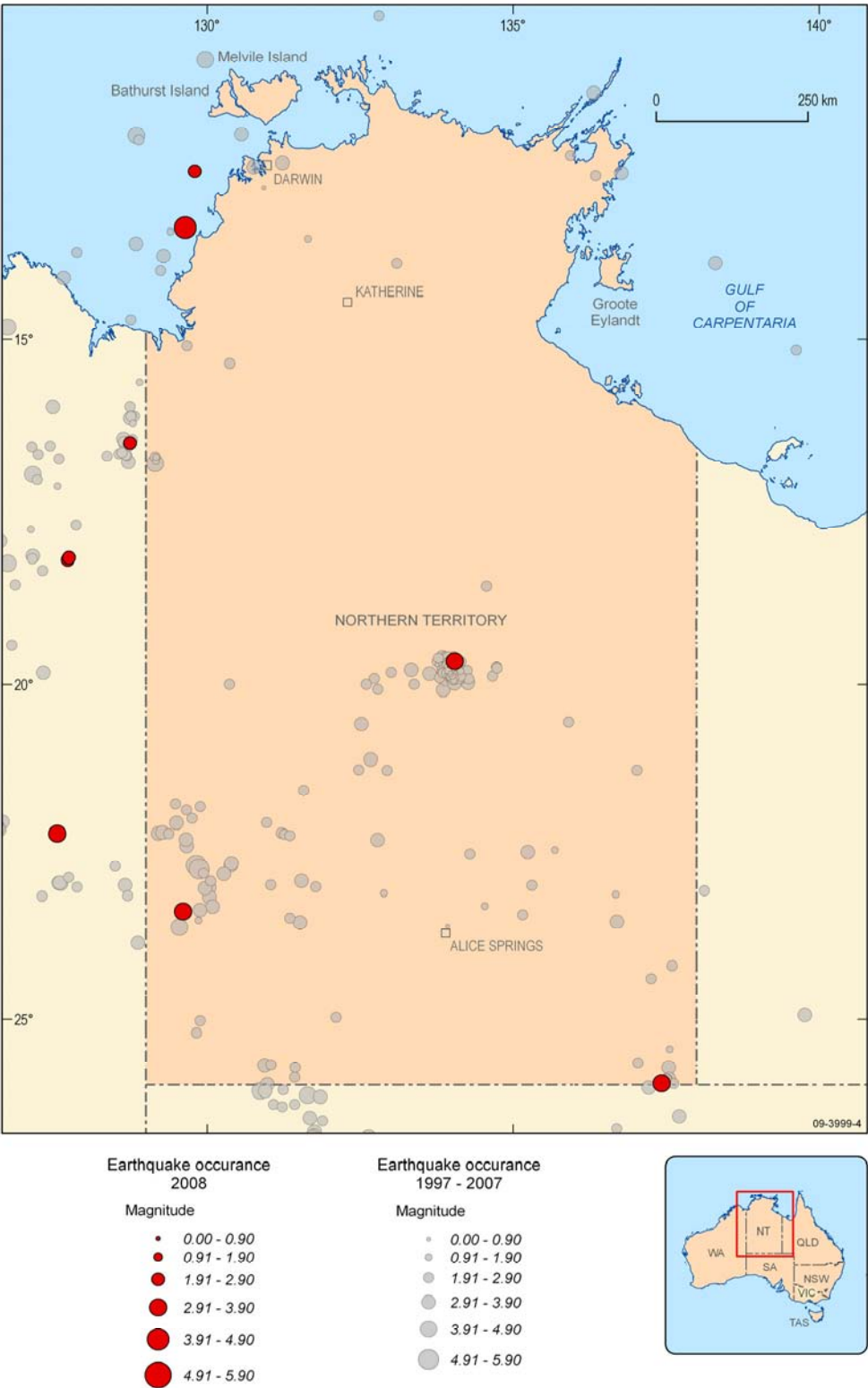


Figure 10: Map of 2011 Northern Territory Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 16: Northern Territory Top 9 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
6.7	22-Jan-1988	12:05:00	-19.838	133.994	5	Tennant Creek, NT.
6.5	27-Jun-1941	7:55:49	-25.950	137.340	0	Simpson Desert, NT.
6.4	22-Jan-1988	3:57:28	-19.826	133.984	4	Tennant Creek, NT.
6.3	22-Jan-1988	0:36:01	-19.812	133.975	6	Tennant Creek, NT.
6.0	15-Dec-1873	4:00:00	-26.250	127.500	0	Gibson Desert, NT.
6.0	20-Dec-1937	22:35:02	-25.400	136.500	33	Simpson Desert, NT.
5.9	17-Apr-1938	8:56:22	-25.500	137.200	0	Simpson Desert, NT.
5.8	22-Jan-1988	20:54:05	-19.887	134.084	3	Tennant Creek, NT.
5.8	12-Mar-1999	0:29:14	-11.119	130.666	100	Arafura Sea.

Table 17: Northern Territory Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.4	ML	04-Jan-11	22:35:22	-11.327	130.182	0	Bathurst Island, NT.
1.8	ML	05-Jan-11	17:42:57	-11.337	130.357	6	Bathurst Island, NT.
1.9	ML	06-Feb-11	01:17:11	-19.699	134	0	Tennant Creek area, NT.
1.2	ML	15-Feb-11	06:35:31	-22.528	135.501	0	NE of Mount Swan, NT.
4.4	ML	21-Feb-11	21:59:36	-20.903	135.42	1	Hatches Creek, NT.
3.6	ML	07-Mar-11	04:20:37	-19.89	134.073	8	Tennant Creek, NT.
2.4	ML	09-Mar-11	20:27:46	-11.753	129.938	10	Bathurst Island, NT.
2.8	ML	10-Apr-11	16:12:18	-13.296	131.513	0	SE of Batchelor, NT.
3.0	ML	01-May-11	21:40:20	-19.876	133.928	5	Near Tennant Creek, NT.
3.3	ML	29-Aug-11	19:54:08	-25.919	137.471	10	Near Poeppel's Corner, NT.
3.4	ML	30-Aug-11	02:42:13	-25.943	137.378	10	Near Poeppel's Corner, NT.
1.9	ML	05-Dec-11	18:33:53	-19.873	133.933	0	SW of Tennant Creek, NT.
3.1	ML	29-Dec-11	08:57:26	-19.857	133.992	0	Tennant Creek, NT.

Queensland

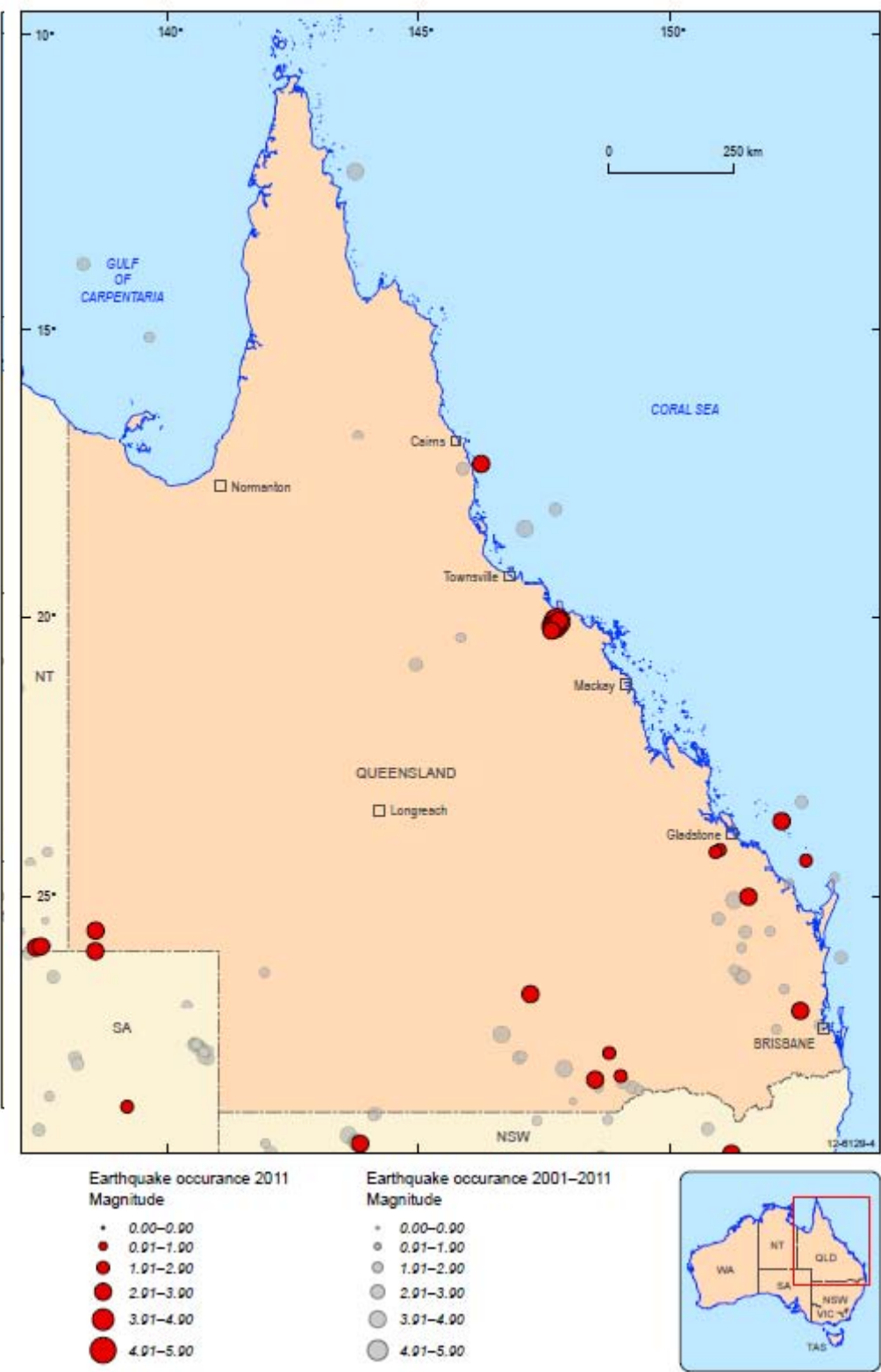


Figure 11: Map of 2011 Queensland Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 18: Queensland Top 8 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
6.0	06-Jun-1918	18:14:24	-23.500	152.500	15	East of Rockhampton, QLD.
5.7	18-Dec-1913	13:54:00	-20.000	147.000	33	Charters Towers, QLD.
5.7	06-Jun-1918	19:20:00	-23.500	152.500	0	East of Rockhampton, QLD.
5.7	14-May-1928	02:46:55	-15.000	144.000	10	Lakefield National Park, QLD.
5.6	28-Aug-1883	16:55:00	-25.500	151.670	20	Gayndah, QLD.
5.5	06-Jun-1918	18:23:00	-23.500	152.500	0	East of Rockhampton, QLD.
5.5	04-May-1925	11:28:48	-16.000	140.000	10	NE of Mornington Island, QLD
5.5	12-Apr-1935	01:32:24	-25.500	151.670	10	Gayndah, QLD.

Table 19: Queensland Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
3.3	ML	23-Jan-11	19:40:16	-28.393	148.522	10	St George, QLD.
2.6	ML	06-Feb-11	08:05:45	-28.326	149.031	10	St George area, QLD.
2.5	ML	04-Mar-11	19:00:00	-27.897	148.803	10	St George area, QLD.
3.6	ML	15-Mar-11	06:07:59	-17.327	146.253	0	Offshore Innisfail, Qld.
5.3	ML	16-Apr-11	05:31:18	-20.085	147.764	7	Near Bowen, QLD.
4.1	ML	16-Apr-11	07:06:52	-20.17	147.679	0	Near Bowen, QLD.
3.2	ML	16-Apr-11	13:06:44	-20.191	147.692	0	Near Bowen, QLD.
3.4	ML	16-Apr-11	15:33:19	-20.128	147.759	4	Near Bowen, QLD.
3.2	ML	17-Apr-11	01:35:55	-20.174	147.668	0	Near Bowen, QLD.
3.2	ML	19-Apr-11	07:38:05	-20.067	147.81	6	Near Bowen, QLD.
2.4	ML	19-Apr-11	20:13:39	-24.353	152.722	10	SE of Gladstone, QLD.
3.1	ML	05-May-11	05:35:05	-20.242	147.651	0	SW of Bowen, Qld.
2.5	ML	08-May-11	05:49:00	-24.159	151.008	8	E of Dumgree, QLD.
3.3	ML	13-May-11	23:25:55	-25.014	151.579	1	W of Moolboolaman, QLD.
3.4	ML	26-May-11	12:28:45	-26.801	147.232	10	SE of Charleville, QLD.
3.0	ML	26-Jun-11	20:32:14	-27.111	152.611	0	West of Mount Mee, QLD.
2.5	ML	02-Aug-11	01:20:15	-24.2	150.919	10	NE of Biloela, QLD.
4.0	ML	17-Sep-11	16:28:27	-20.184	147.728	6	SW of Bowen, QLD.
3.7	ML	02-Nov-11	16:32:53	-23.64	152.241	10	Offshore E of Gladstone, QLD.
3.8	ML	26-Nov-11	15:30:20	-25.631	138.567	10	SW of Lake Machattie, QLD.

Queensland Seismicity Report

Environmental Systems and Services

Russell Cuthbertson



Seismicity

This report deals primarily with the area covered by the ES&S Queensland network – i.e. eastern Queensland, from Cairns in the north to just into NSW in the south.

The largest event for the year in this area was a magnitude 5.3 earthquake (2011-Apr-16) west of Bowen (near Dalbeg and Millaroo) in north Queensland. This event was followed by a protracted series of aftershocks – including a magnitude 4.2, 95 minutes after the mainshock, and a magnitude 4.0, 5 months later (2011-Sep-17). Within 4 days of the mainshock GA installed a network of four recorders to study the aftershock sequence (Matthews et al, 2011).

Thirty-five events with magnitude greater than or equal to 2.0 were located in eastern Queensland by ES&S. Excluding aftershocks from the Bowen earthquake there were 9 of magnitude 3+. This compares with the average annual number of 2 to 3. Again excluding aftershocks there were two events of 4+. This size event would normally be expected only once every 2 years.

Network

During 2011 ES&S were responsible for analysing data from 17 stations in eastern Queensland (including 6 SEQWater sites). Data was also obtained for relevant events from GA national and JUMP sites (via autoDRM), as well as from two sites operated by UQ (MNT and BRSA). Data from stations operated by ES&S in northern NSW were also used for some events.

Procedures

Standard procedures for earthquake location are:

- Unusual, abnormal or unknown blasts are sometimes located and included in the catalogue (with a code to indicate the source type)
- Overseas events are not located
- Events outside the network operated by ES&S (in eastern Australia) are occasionally located.
- Events that trigger the ES&S alarm service (operating in eastern Australia) are typically located within 30 minutes.
- More detailed analyses of these events, as well as smaller events that did not trigger the alarm, are generally conducted within a week.
- Data from GA sites and other independent stations are obtained whenever possible.

Locations are calculated using eqFocus software.

Table 20: Queensland Magnitude 2.0+ earthquakes recorded by ES&S

Date	Time	Latitude	Longitude	Depth	Mag	Acc	Place
2011-01-23	1940	-28.386	148.475	18	3.9	D	St. George
2011-01-30	2245	-21.139	146.669	4	2.2	D	Dawson Vale
2011-02-06	0805	-28.374	148.869	10	2.7	EX	St. George
2011-02-16	2125	-25.434	151.550	10	2.1	C	Mundubbera
2011-02-21	2243	-24.131	153.132	5	3.7	C	Off Bundaberg
2011-02-24	1307	-29.805	150.845	10	2.3	C	Copeton
2011-03-04	1900	-27.895	148.903	17	2.2	EX	St George
2011-03-13	0332	-23.890	152.595	5	3.0	C	Off Bundaberg
2011-03-15	0608	-17.304	146.231	10	4.0	EX	Off Innisfail
2011-03-24	0720	-23.676	153.716	10	2.6	DX	Off Bundaberg
2011-04-16	0531	-20.055	147.718	10	5.3	C	Millaroo
2011-04-16	0539	-20.198	147.759	10	2.2	F	Millaroo
2011-04-16	0613	-20.153	147.762	10	3.1	F	Millaroo
2011-04-16	0623	-20.173	147.770	10	2.3	F	Millaroo
2011-04-16	0706	-20.097	147.733	10	4.2	D	Millaroo
2011-04-16	1306	-20.151	146.496	10	2.6	F	Millaroo
2011-04-16	1533	-20.173	147.759	10	2.9	F	Millaroo
2011-04-17	0135	-20.174	147.757	10	2.8	F	Millaroo
2011-04-19	0738	-20.161	147.735	10	3.1	D	Millaroo
2011-04-19	2013	-24.394	152.325	5	2.9	C	Off Bundaberg
2011-05-09	2225	-20.169	147.747	10	2.7	F	Dalbeg
2011-05-13	2325	-25.003	151.692	8	3.6	C	Mt Perry
2011-05-14	1511	-25.058	151.698	10	2.1	E	Monto
2011-05-22	0643	-20.096	147.693	10	2.4	E	Mt. Abbot
2011-06-26	2032	-27.168	152.463	8	2.7	C	Ottaba
2011-07-08	0032	-17.024	146.146	10	2.5	D	Off Gordonvale
2011-07-09	1648	-25.151	151.405	10	2.0	E	Monto
2011-07-09	1812	-25.167	151.333	10	2.0	C	Mount Perry
2011-07-14	0452	-24.621	152.913	10	2.3	D	Off Bundaberg
2011-09-17	1628	-20.130	147.772	23	4.0	C	Dalbeg
2011-09-18	0317	-24.908	152.012	5	2.1	C	Fred Haigh dam
2011-09-24	0738	-29.669	151.495	10	2.3	XD	Glen Innes
2011-11-02	1632	-23.664	152.254	10	3.6	D	Off Gladstone
2011-11-13	0005	-29.827	151.211	10	3.0	DX	Inverell
2011-12-31	2026	-17.852	145.934	10	3.0	D	Tully

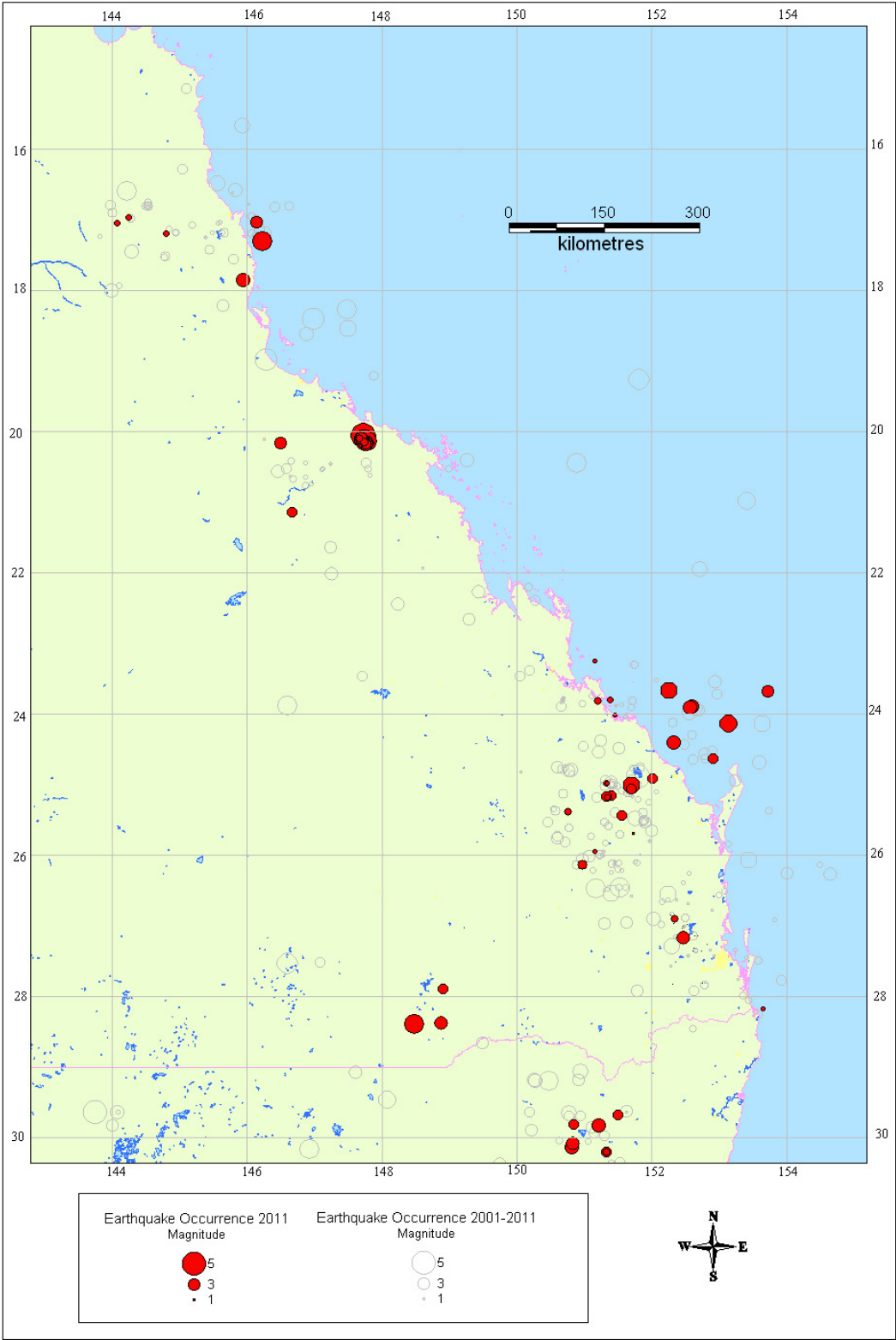


Figure 12: Map of 2011 Queensland Earthquakes detected by ES&S

South Australia

Table 21: South Australian Top 10 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
6.5	10-May-1897	05:26:00	-37.333	139.750	0	Beachport, SA.
6.0	30-Mar-1986	08:53:48	-26.333	132.517	5	Marryat Creek, SA.
6.0	19-Sep-1902	10:35:00	-35.000	138.000	14	Warooka, SA.
5.8	26-Mar-1939	03:56:00	-32.000	138.000	0	Motpena, SA.
5.8	04-May-1941	22:07:30	-26.300	136.900	33	Simpson Desert, SA.
5.7	16-Apr-1887	22:10:00	-34.300	135.800	10	Eyre Peninsula, SA.
5.6	04-May-1941	22:23:57	-26.300	136.900	33	Simpson Desert, SA.
5.6	06-Aug-1948	03:29:23	-37.360	139.680	18	Robe, SA.
5.5	26-Oct-1911	10:00:00	-33.667	136.417	0	Cleve, SA.
5.5	18-Apr-1972	22:20:39	-31.580	138.620	12	Wilpena, SA.

Table 22: South Australian Earthquakes 2011 Recorded by Geoscience Australia

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.3	ML	02-Jan-11	00:21:21	-31.966	139.505	11	North of Yunta, SA.
3.5	ML	04-Jan-11	16:40:12	-34.058	135.55	0	NW of Cummins, SA.
2.2	ML	04-Jan-11	22:37:13	-34.01	135.585	0	NW of Cummins, SA.
3.0	ML	06-Jan-11	01:01:59	-36.5	121.957	10	South of Esperance, SA.
2.2	ML	08-Jan-11	07:46:29	-34.062	135.506	0	NW of Cummins, SA.
1.8	ML	08-Jan-11	19:29:32	-33.175	138.676	0	Near Jamestown, SA.
1.7	ML	08-Jan-11	19:49:03	-33.167	138.665	0	Near Jamestown, SA.
1.9	ML	09-Jan-11	01:40:08	-32.81	138.169	15	NW of Melrose, SA.
2.3	ML	09-Jan-11	06:44:53	-33.009	139.478	10	E of Peterborough, SA.
3.9	ML	15-Jan-11	00:38:01	-33.573	136.467	1	Cleve, SA.
2.0	ML	17-Jan-11	10:08:49	-33.18	138.686	0	NE of Jamestown, SA.
2.6	ML	25-Jan-11	23:57:57	-32.105	139.608	10	E of Hawker, SA.
2.1	ML	26-Jan-11	07:52:34	-33.545	138.558	10	Spalding area, SA.
2.3	ML	29-Jan-11	00:17:49	-33.679	136.765	10	E of Cleve, SA.
2.3	ML	05-Feb-11	20:27:38	-32.139	139.581	10	North of Yunta, SA.
2.3	ML	05-Feb-11	20:29:14	-32.285	139.652	10	North of Yunta, SA.
2.5	ML	08-Feb-11	16:03:26	-32.223	139.572	8	North of Yunta, SA.
2.3	ML	13-Feb-11	14:48:09	-33.21	138.625	2	E of Jamestown, SA.
2.1	ML	14-Feb-11	01:08:41	-33.561	138.314	5	Koolunga, SA.
1.9	ML	14-Feb-11	15:48:10	-33.231	138.6	5	S of Jamestown, SA.
2.0	ML	15-Feb-11	20:48:39	-32.723	138.269	10	Willowie area, SA.
2.5	ML	19-Feb-11	07:15:37	-31.61	138.749	10	NE of Hawker, SA.
3.0	ML	20-Feb-11	15:30:34	-32.606	138.501	0	Coomooroo, SA.
2.0	ML	26-Feb-11	03:53:46	-33.17	137.121	4	SW of Whyalla, SA.
2.2	ML	02-Mar-11	23:02:55	-34.025	135.941	10	SE of Brooker, SA.
2.1	ML	13-Mar-11	14:28:07	-32.616	138.407	10	Hammond, SA.
2.4	ML	21-Mar-11	16:35:18	-31.488	138.659	18	Wilpena Pound, SA.

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3.4	ML	26-Mar-11	19:22:46	-27.482	135.489	10	NE of Coober Pedy, SA.
2.4	ML	27-Mar-11	11:30:09	-33.246	138.506	7	Jamestown, SA.
3.7	ML	31-Mar-11	20:27:39	-36.726	132.03	0	Great Australian Bight.
2.3	ML	02-Apr-11	03:27:36	-31.876	139.188	0	Near Baratta Hill, SA.
2.0	ML	05-Apr-11	14:47:47	-33.775	138.68	4	NE of Clare, SA.
2.1	ML	09-Apr-11	08:54:49	-34.395	139.553	0	SW of Blanchetown, SA.
1.9	ML	12-Apr-11	11:33:34	-33.464	138.288	5	SE of Crystal Brook, SA.
2.0	ML	16-Apr-11	22:08:16	-34.076	135.98	10	Moody, SA.
2.3	ML	22-Apr-11	15:18:14	-33.2	139.304	9	E of Jamestown, SA.
1.9	ML	22-Apr-11	18:25:35	-34.15	138.895	10	Marrabel, SA.
2.8	ML	23-Apr-11	02:22:52	-31.031	138.858	10	Blinman area, SA.
2.5	ML	28-Apr-11	19:57:56	-32.712	140.379	10	Wadnaminga area ,SA.
3.3	ML	04-May-11	12:29:17	-32.273	137.931	0	NW of Quorn, SA.
2.3	ML	15-May-11	09:31:02	-32.129	139.52	10	NW of Manna Hill, SA.
2.7	ML	16-May-11	03:30:36	-31.386	139.133	10	NE of Hawker, SA.
2.8	ML	18-May-11	20:41:04	-30.878	138.879	10	NE of Blinman, SA.
2.0	ML	22-May-11	16:25:49	-33.114	138.364	10	E of Port Pirie, SA.
2.6	ML	22-May-11	18:16:18	-33.261	139.33	10	E of Terowie, SA.
2.4	ML	23-May-11	04:18:34	-33.196	139.247	2	E of Terowie, SA.
3.2	ML	23-May-11	13:47:13	-26.002	131.424	0	SE of Yulara, SA.
1.7	ML	24-May-11	05:54:01	-32.82	137.768	6	S of Blanche Harbor, SA.
3.7	ML	24-May-11	10:27:16	-33.167	139.271	0	E of Terowie, SA.
3.6	ML	24-May-11	12:45:51	-33.172	139.318	5	E of Terowie, SA.
2.5	ML	24-May-11	16:42:24	-32.25	138.861	0	Bendelby Ranges, SA.
2.2	ML	24-May-11	21:26:31	-35.198	139.226	0	Murray Bridge area, SA.
2.7	ML	25-May-11	22:05:20	-32.341	138.823	0	NE of Ororoo, SA.
2.2	ML	25-May-11	22:19:20	-32.434	138.911	10	NE of Ororoo, SA.
3.2	ML	28-May-11	10:34:55	-33.28	139.349	10	SE of Terowie, SA.
2.4	ML	05-Jun-11	07:06:39	-33.26	139.324	10	SE of Terowie, SA.
2.4	ML	05-Jun-11	20:37:22	-34.526	136.446	10	NE of Port Lincoln, SA.
2.1	ML	09-Jun-11	00:14:49	-33.76	138.893	15	SW of Burra, SA.
2.3	ML	13-Jun-11	17:22:46	-34.251	135.486	0	E of Cummins, SA.
2.0	ML	15-Jun-11	18:58:57	-32.801	138.215	6	NE of Melrose, SA.
2.2	ML	21-Jun-11	14:06:29	-32.719	138.357	12	NE of Melrose, SA.
2.7	ML	22-Jun-11	13:03:53	-33.813	135.232	0	Sheringa, SA.
2.1	ML	28-Jun-11	08:34:35	-32.651	138.267	10	NE of Melrose, SA.
2.9	ML	11-Jul-11	12:19:29	-30.202	139.729	4	E of Leigh Creek, SA.
2.9	ML	13-Jul-11	16:30:12	-29.968	139.721	4	NE of Arkaroola Village, SA.
2.7	ML	15-Jul-11	06:06:26	-30.319	139.714	0	E of Arkaroola Village, SA.
2.4	ML	19-Jul-11	05:52:58	-31.286	138.617	0	S of Blinman, SA.
1.6	ML	23-Jul-11	09:29:20	-33.527	138.69	0	Spalding area, SA.
2.8	ML	23-Jul-11	20:47:55	-31.945	138.788	20	E of Hawker, SA.
2.0	ML	27-Jul-11	22:27:40	-32.493	138.842	10	NE of Ororoo, SA.
2.2	ML	29-Jul-11	18:08:51	-35.595	138.187	15	E of Cape Jervis, SA.
2.2	ML	02-Aug-11	00:53:50	-32.511	138.406	20	Near Hammond, SA.
1.6	ML	03-Aug-11	14:06:43	-33.339	138.499	14	Bundaleer Gardens, SA.
2.1	ML	05-Aug-11	16:46:39	-34.417	139.255	21	E of Truro, SA.
2.2	ML	07-Aug-11	07:28:25	-33.6	138.021	4	E of Port Broughton, SA.
2.4	ML	11-Aug-11	11:51:37	-32.095	138.672	12	SE of Hawker, SA.
1.6	ML	13-Aug-11	00:50:49	-33.44	138.498	9	NW of Spalding, SA.

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3.1	ML	18-Aug-11	04:46:38	-36.965	139.95	10	NE of Robe, SA.
2.3	ML	28-Aug-11	08:29:51	-32.812	138.36	18	E of Melrose, SA.
2.3	ML	29-Aug-11	05:33:12	-32.612	138.513	4	Near Orroroo, SA.
2.2	ML	04-Sep-11	10:52:40	-33.074	138.701	0	Near Jamestown, SA.
3.8	ML	04-Sep-11	11:15:11	-33.079	138.713	2	Near Jamestown, SA.
1.8	ML	04-Sep-11	11:26:02	-33.092	138.686	0	Near Jamestown, SA.
2.0	ML	04-Sep-11	11:45:45	-33.123	138.629	7	Near Jamestown, SA.
1.8	ML	04-Sep-11	13:19:52	-33.117	138.684	0	Near Jamestown, SA.
2.2	ML	04-Sep-11	16:13:50	-33.125	138.673	0	Near Jamestown, SA.
2.2	ML	04-Sep-11	16:19:59	-33.142	138.665	3	Near Jamestown, SA.
2.0	ML	04-Sep-11	16:21:28	-33.132	138.657	0	Near Jamestown, SA.
2.7	ML	04-Sep-11	23:46:59	-33.11	138.693	0	Near Jamestown, SA.
2.7	ML	04-Sep-11	23:48:55	-33.04	138.733	0	Near Yongala, SA.
2.0	ML	04-Sep-11	23:54:19	-33.149	138.665	0	Near Jamestown, SA.
2.1	ML	05-Sep-11	00:41:23	-33.193	138.656	12	Near Jamestown, SA.
1.8	ML	05-Sep-11	00:42:55	-33.027	138.73	0	Near Yongala, SA.
2.3	ML	05-Sep-11	01:03:42	-33.046	138.727	0	Near Yongala, SA.
2.1	ML	05-Sep-11	01:49:39	-33.108	138.692	1	Near Yongala, SA.
2.2	ML	05-Sep-11	02:50:19	-33.066	138.717	2	Near Yongala, SA.
2.0	ML	05-Sep-11	03:09:50	-33.04	138.776	5	Near Yongala, SA.
2.3	ML	05-Sep-11	09:02:51	-33.049	138.735	0	Near Yongala, SA.
2.1	ML	06-Sep-11	05:24:16	-33.044	138.774	0	Near Yongala, SA.
1.9	ML	06-Sep-11	12:41:41	-33.163	138.701	10	Near Jamestown, SA.
1.9	ML	06-Sep-11	17:11:27	-33.073	138.713	0	Near Yongala, SA.
2.2	ML	06-Sep-11	21:29:05	-33.123	138.746	1	Near Yongala, SA.
2.2	ML	06-Sep-11	21:55:15	-33.099	138.718	0	Near Yongala, SA.
2.6	ML	07-Sep-11	06:51:08	-33.085	138.667	0	SW of Yongala, SA.
2.2	ML	07-Sep-11	12:39:27	-33.104	138.696	2	Near Yongala, SA.
2.2	ML	07-Sep-11	15:56:00	-33.041	138.72	3	Near Yongala, SA.
2.3	ML	09-Sep-11	04:54:20	-33.175	138.662	10	Near Jamestown, SA.
3.5	ML	09-Sep-11	22:24:40	-26.81	136.326	10	Simpson Desert, SA.
2.0	ML	12-Sep-11	03:22:43	-33.111	138.726	0	Near Yongala, SA.
2.3	ML	14-Sep-11	08:29:22	-33.154	138.669	8	Near Jamestown, SA.
2.0	ML	14-Sep-11	08:46:58	-33.17	138.651	9	Near Jamestown, SA.
2.1	ML	14-Sep-11	22:56:43	-33.107	138.716	0	Near Yongala, SA.
2.6	ML	18-Sep-11	19:13:26	-32.21	138.236	7	NE of Quorn, SA.
1.9	ML	19-Sep-11	14:00:34	-33.517	137.923	0	Fisherman's Bay, SA.
2.4	ML	19-Sep-11	14:50:09	-33.056	138.719	2	Near Yongala, SA.
2.1	ML	19-Sep-11	15:01:35	-33.089	138.737	0	Near Yongala, SA.
1.9	ML	19-Sep-11	15:32:56	-33.071	138.653	0	Near Yongala, SA.
2.4	ML	19-Sep-11	18:16:38	-33.079	138.697	4	Near Yongala, SA.
2.2	ML	22-Sep-11	19:32:24	-33.201	138.664	15	Jamestown, SA.
3.3	ML	23-Sep-11	16:42:12	-32.626	138.565	6	NW of Orroroo, SA.
2.8	ML	24-Sep-11	13:14:02	-32.614	138.562	4	NW of Orroroo, SA.
2.8	ML	26-Sep-11	16:24:20	-28.905	139.195	10	N of Arkaroola, SA.
1.8	ML	07-Oct-11	20:34:32	-33.094	138.682	0	SW of Yongala, SA.
1.9	ML	09-Oct-11	14:35:18	-33.086	138.681	1	Yongala, SA.
1.9	ML	10-Oct-11	16:19:33	-34.705	137.933	28	NE of Port Vincent, SA.
1.6	ML	12-Oct-11	12:48:49	-34.026	139.235	4	E of Robertstown, SA.
1.7	ML	12-Oct-11	17:50:39	-34.041	139.616	8	W of Morgan, SA.

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4.3	ML	15-Oct-11	10:38:10	-32.286	138.819	0	Near Carrieton, SA.
2.0	ML	16-Oct-11	02:26:13	-33.602	136.807	10	NE of Cleve, SA.
2.6	ML	16-Oct-11	05:38:59	-31.549	138.591	10	S of Wilpena Pound, SA.
3.4	ML	18-Oct-11	15:52:24	-35.072	138.65	24	Near Blackwood, SA.
3.1	ML	22-Oct-11	17:18:31	-32.025	139.564	10	N of Yunta, SA.
1.5	ML	26-Oct-11	11:38:20	-33.788	138.544	0	NW of Clare, SA.
2.4	ML	01-Nov-11	17:48:04	-33.007	138.74	2	Yongala, SA.
2.0	ML	03-Nov-11	17:24:46	-35.58	138.667	1	SE of Victor Harbor, SA.
2.1	ML	03-Nov-11	20:15:51	-33.126	138.683	5	Near Jamestown, SA.
1.6	ML	08-Nov-11	09:25:57	-34.017	139.203	4	Near Robertstown, SA.
2.3	ML	11-Nov-11	12:11:47	-30.834	138.41	10	Beltana, SA.
2.0	ML	12-Nov-11	16:39:40	-33.086	138.066	0	NE of Port Flinders, SA.
1.6	ML	12-Nov-11	20:25:13	-33.685	138.444	10	NW of Clare, SA.
2.0	ML	13-Nov-11	03:08:33	-33.422	138.079	15	SW of Crystal Brook, SA.
2.2	ML	13-Nov-11	06:48:38	-31.919	138.272	10	W of Hawker, SA.
1.7	ML	16-Nov-11	10:24:15	-33.388	138.207	18	S of Crystal Brook, SA.
2.4	ML	19-Nov-11	23:38:33	-35.807	137.954	5	Kangaroo Island, SA.
1.7	ML	21-Nov-11	07:53:27	-33.526	138.388	10	SE of Crystal Brook, SA.
2.0	ML	22-Nov-11	01:50:30	-33.444	138.408	8	SE of Crystal Brook, SA.
1.4	ML	24-Nov-11	18:20:46	-33.198	136.522	10	Kimba, SA.
2.0	ML	25-Nov-11	09:28:22	-32.69	138.027	0	Near Wilmington, SA.
1.7	ML	26-Nov-11	20:29:36	-33.464	138.435	15	SE of Crystal Brook, SA.
3.5	ML	26-Nov-11	20:59:43	-26.007	138.56	0	Simpson Desert, SA.
1.6	ML	29-Nov-11	17:52:39	-33.362	136.915	0	SE of Kimba, SA.
2.0	ML	01-Dec-11	15:06:08	-33.115	138.521	12	Near Jamestown, SA.
2.0	ML	05-Dec-11	14:48:27	-33.148	139.326	5	E of Franklyn, SA.
1.9	ML	07-Dec-11	06:40:39	-33.189	138.689	11	NE of Jamestown, SA.
1.7	ML	11-Dec-11	08:25:40	-33.175	138.523	13	Near Jamestown, SA.
2.4	ML	12-Dec-11	03:03:42	-33.263	138.665	12	SE of Jamestown, SA.
1.7	ML	12-Dec-11	14:47:05	-32.845	138.104	5	Near Melrose, SA.
2.4	ML	16-Dec-11	10:40:37	-35.662	138.123	14	S of Cape Jervis, SA.
2.4	ML	17-Dec-11	03:24:34	-32.864	138.473	7	E of Booleroo Centre, SA.
2.0	ML	31-Dec-11	20:24:51	-33.208	138.685	0	Jamestown, SA.

South Australia Seismicity Report



Government of South Australia
Department for Manufacturing,
Innovation, Trade, Resources and Energy

David Love
Alison Wallace

Seismicity

Earthquake activity was higher than 2010 (see Australian Seismological Report 2010). 461 events were located by DMITRE, four greater than magnitude 4, and thirty four greater than magnitude 3. Of the 461 events, 131 were from a sequence at Yongala.

The Blackwood earthquake of 19th October was the most newsworthy event. At magnitude 3.4 it was smaller than the Mt Barker earthquake of the previous year, but again it was felt widely over the metropolitan area. The depth was again deep, at 23.4 km. No aftershocks were recorded.

The Yongala sequence, starting on 4th September, prompted an aftershock survey. Nine portable seismographs from Geoscience Australia and Defence Science and Technology Organisation and DMITRE were installed with assistance from Blair Lade. Prior to the activity, private equipment (ACG-PSN) had been installed at Peterborough and Jamestown Schools. A focal mechanism was produced from a small aftershock. Many events were felt.

A geothermal project, Paralana (Beach Energy and Petratherm) carried out a fracture stimulation east of Arkaroola from 11th to 13th July. A number of small events up to approximately magnitude 2.8 were recorded by the SA network, but have not been included in our database. The detailed data from the project will remain confidential for 2 years.

Network

The Modbury Heights analogue recorder was turned off on 6th January. It has since been brought back on as an ACG-PSN station. The Strathalbyn station STR2 was refurbished after flooding in 2010, and water level warnings were installed. Willalooka WKA analogue station was converted from analogue to digital on 6th December. The analogue records had been handled by the Fraser family since 1978. The Mount Osmond TUK accelerometer (originally JUMP) was removed.

The PIRSA network now comprises 6 analogue stations, 4 dial-up stations, 12 continuous real-time stations, and 1 visit and download station (suburban). GA has 7 stations within the state and there are 5 private stations.

A system has been developed to display a delayed digital record on an analogue drum, using data from any GA sites available via seedlink.

Procedures

There were no significant changes to procedures during 2011

Standard procedure for earthquake location is:

Blasts are usually not located, and are not included in the catalogue.

Overseas events are not located.

Interstate events are occasionally located.

Local events triggering the central computer are reviewed as soon as possible using eqFocus.

This preliminary review may contain data from non-DMITRE sites.

Reviewed events are put on the PIRSA website as soon as possible.

Final locations are calculated using the old software Eqlocl, one to two months after actual date, using all available data, including data from Geoscience Australia, Environmental Systems and Services, and ACG-PSN data.

Final locations are uploaded overnight to the DMITRE spatial library and are publicly available on the SARIG website.

GA data is requested via AutoDRM, and ACG-PSN phases are read from a waveform display.

Initial magnitudes are calculated using the Richter formula. 8 stations are calibrated for this method. Final magnitudes are calculated using the Greenhalgh formula. 5 stations are calibrated for this method. If the GA magnitude is significantly different, the preferred magnitude is listed between the two values.

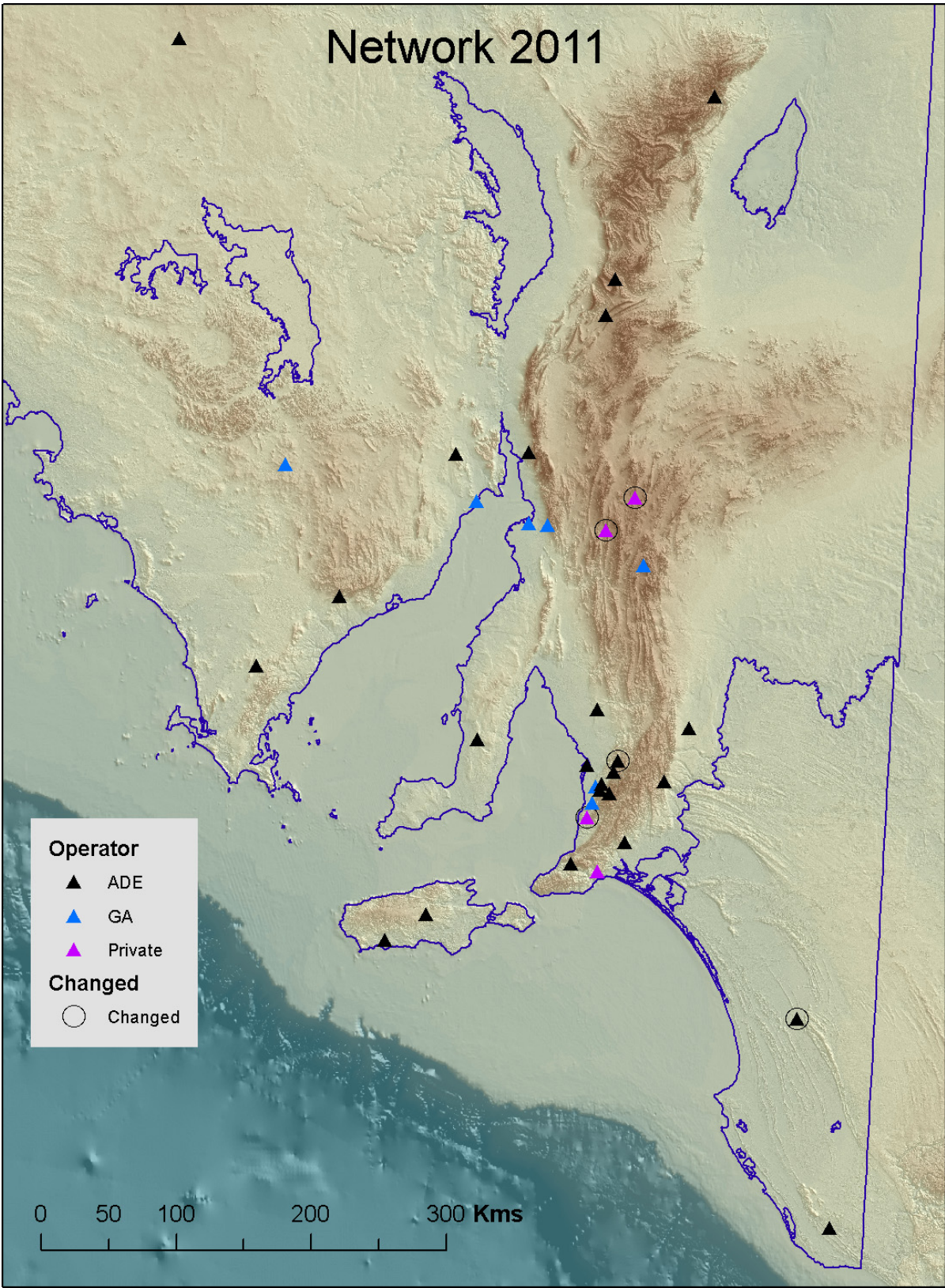


Figure 13: South Australian seismographs in 2011. Circles showing where changes have occurred.

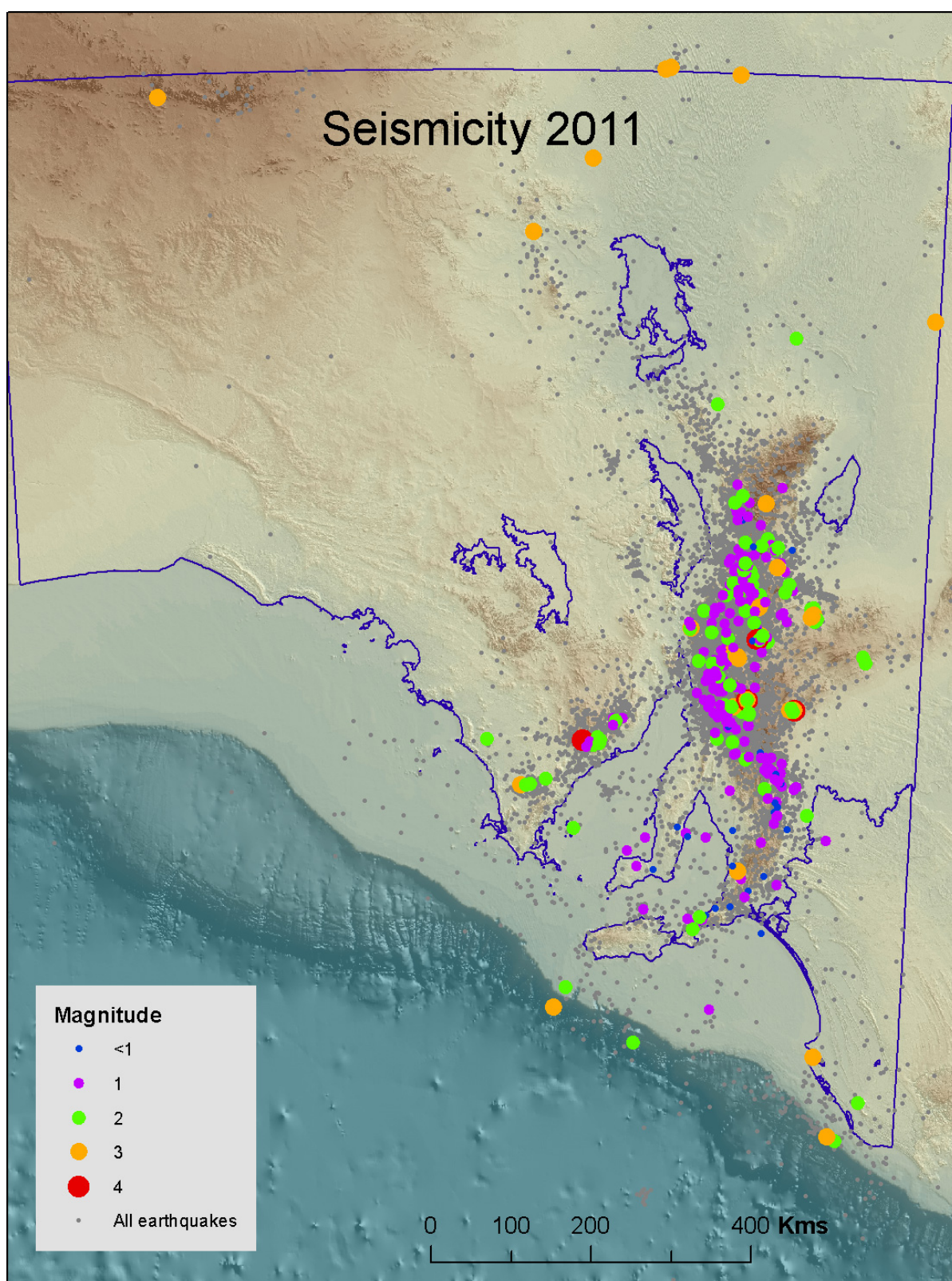


Figure 14: Seismicity for 2011 detected by DMITRE. 2011 seismicity shown in colour, and the complete catalogue of earthquakes (from 1840) shown in grey.

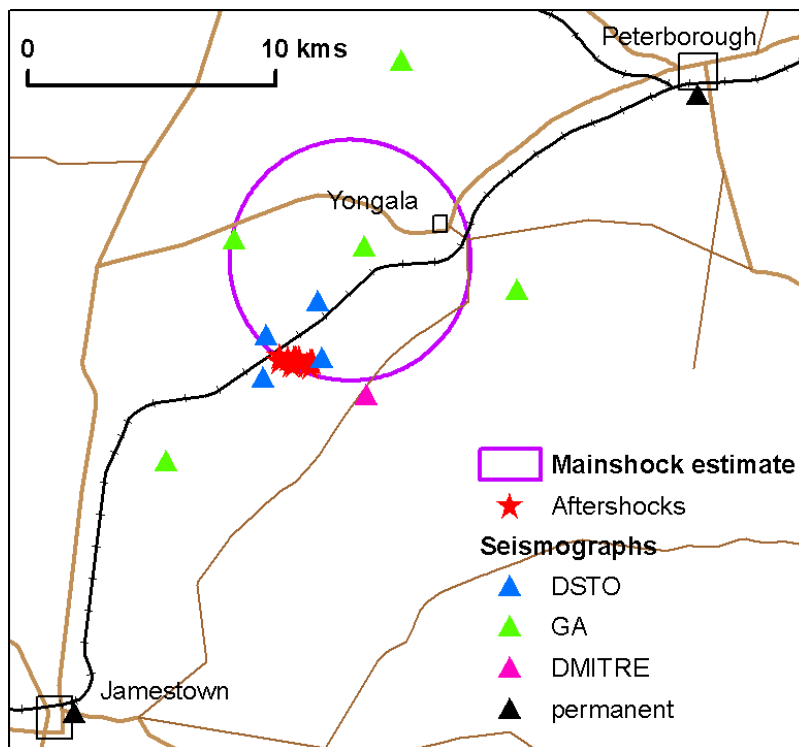


Figure 15: Yongala aftershock deployment

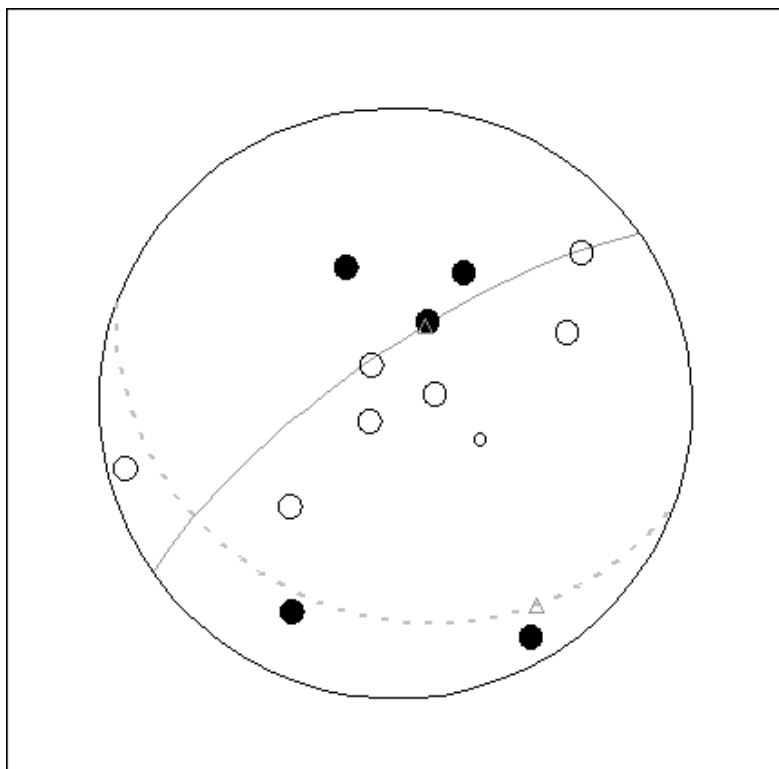


Figure 16: Focal mechanism (upper hemisphere) for Yongala aftershock 7th October 2011, with nodal planes: strike 55° dip 75° SE, strike 110° dip 25° N

Table 23: Magnitude 2.5+ Seismicity located by DMITRE.

	Time			Depth				Acc	
Date	UTC	Long	Lat	km	Place	Mag	MMI	A-F	Stns
2011-01-04	1640	135.653	-34.104	10.7	CUMMINS 19KM N	3.8	3	C	26
2011-01-15	0038	136.497	-33.586	27.3	CLEVE 11KM N	4.0	4	C	26
2011-01-25	2357	139.502	-32.123	3.9	YUNTA 50KM N	3.0		C	15
2011-01-29	0017	136.627	-33.640	26.9	CLEVE 16KM NE	2.5		D	17
2011-02-08	1603	139.534	-32.093	9.2	CURNAMONA HMSTD 49KM S	3.0		D	16
2011-02-13	1448	138.699	-33.202	8.2	PETERBOROUGH 28KM SW	2.8	3	C	18
2011-02-14	0108	138.306	-33.539	12.2	CLARE 44KM NW	2.5		C	17
2011-02-19	0715	138.712	-31.779	21.4	HAWKER 29KM NE	2.5		D	8
2011-02-20	1530	138.436	-32.571	10.9	PETERBOROUGH 58KM NW	3.4		C	20
2011-03-02	2302	135.988	-34.032	6.9	CUMMINS 35KM NE	2.8		D	18
2011-03-26	1922	135.777	-27.828	36.0	OODNADATTA 46KM SE	3.2		E	15
2011-03-27	1130	138.511	-33.175	13.3	PETERBOROUGH 37KM SW	3.1	4	C	21
2011-04-02	0327	139.183	-31.819	9.8	CURNAMONA HMSTD 39KM SW	2.5		D	11
2011-04-22	1518	139.328	-33.191	4.6	PETERBOROUGH 52KM SE	2.7		C	20
2011-04-23	0222	138.889	-31.249	12.4	HAWKER 83KMNE	2.8		C	18
2011-04-28	1957	140.257	-32.622	4.5	MANNA HILL 34KM SE	2.6		C	16
2011-05-04	1229	137.908	-32.287	11.4	PORT AUGUSTA 26KM NE	3.7	3	C	20
2011-05-16	0330	139.035	-31.570	18.5	HAWKER 68KM NE	3.0		D	15
2011-05-18	2041	138.850	-30.855	10.5	LEIGH CREEK 58KM SE	3.4		C	19
2011-05-22	1816	139.322	-33.199	6.3	PETERBOROUGH 52KM SE	3.0		C	19
2011-05-23	0418	139.322	-33.198	5.8	PETERBOROUGH 52KM SE	2.6		C	16
2011-05-23	1347	131.059	-26.250	10.0	AMATA 14KM SW	3.2		E	11
2011-05-24	1027	139.331	-33.182	6.5	PETERBOROUGH 52KM SE	4.0		C	23
2011-05-24	1245	139.327	-33.191	6.4	PETERBOROUGH 52KM SE	3.9		C	23
2011-05-24	1642	138.849	-32.326	0.2	HAWKER 62KM SE	2.5		D	11
2011-05-25	2205	138.848	-32.349	4.3	HAWKER 64KM SE	3.2		D	12
2011-05-25	2219	138.825	-32.333	3.0	HAWKER 62KM SE	2.6		D	10
2011-05-28	1034	139.264	-33.190	11.2	PETERBOROUGH 47KM SE	3.7		C	20
2011-07-11	1328	141.553	-32.048	1.6	BROKEN HILL MINE INDUCED	2.6		D	18
2011-07-19	0553	138.600	-31.295	21.2	PARACHILNA 27KM SE	2.5	3	D	16
2011-07-21	1418	140.938	-28.710	10.0	CAMERON CORNER	3.0		E	7
2011-07-23	2047	138.816	-32.026	10.1	HAWKER 40KM E	3.3		D	18
2011-08-18	0446	139.788	-37.095	22.2	ROBE 8KM N	3.1	3	D	18
2011-08-28	0829	138.305	-32.839	13.3	PORT PIRIE 49KM NE	2.7	3	C	18
2011-08-29	1954	137.470	-25.954	10.0	POEPPPEL CORNER 53KM W	3.3		E	16
2011-08-30	0242	137.405	-25.967	20.0	POEPPPEL CORNER 55KM W	3.4		E	9
2011-09-03	1316	138.547	-30.776	16.0	LEIGH CREEK 35KM S	2.6		D	14
2011-09-04	1052	138.693	-33.086	3.9	YONGALA 7KM SW	2.7	3	C	22
2011-09-04	1114	138.693	-33.086	4.0	YONGALA 7KM SW	2.5		D	12
2011-09-04	1115	138.693	-33.086	4.0	YONGALA 7KM SW	4.1	4	C	24
2011-09-04	2347	138.693	-33.086	4.0	YONGALA 7KM SW	2.9		C	22
2011-09-04	2348	138.693	-33.086	4.0	YONGALA 7KM SW	3.3		C	24
2011-09-05	0902	138.693	-33.086	4.0	YONGALA 7KM SW	2.9		C	22
2011-09-05	2318	139.579	-32.161	4.5	YUNTA 47KM N	2.5		C	13
2011-09-06	0524	138.693	-33.086	4.0	YONGALA 7KM SW	2.5		C	20

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2011-09-07	0651	138.693	-33.086	4.0	YONGALA 7KM SW	3.1		C	23
2011-09-07	2228	136.132	-36.602	14.9	PT LINCOLN 210KM S	3.5		E	21
2011-09-09	0454	138.693	-33.086	4.0	YONGALA 7KM SW	2.5		C	18
2011-09-09	2224	136.522	-26.987	31.3	SIMPSON DESERT	3.7		E	13
2011-09-18	1913	138.193	-32.328	14.0	PORT AUGUSTA 44KM NE	2.8		C	19
2011-09-19	1450	138.693	-33.086	4.0	YONGALA 7KM SW	2.9		C	22
2011-09-19	1816	138.693	-33.086	4.0	YONGALA 7KM SW	2.7		C	20
2011-09-23	1642	138.559	-32.626	3.4	PETERBOROUGH 47KM NW	3.4	4	C	22
2011-09-24	1314	138.535	-32.592	8.0	PETERBOROUGH 51KM NW	3.2		C	23
2011-09-26	1624	139.171	-28.973	27.4	ARKAROOA 146KM S	2.8		E	7
2011-10-15	1038	138.799	-32.390	4.7	PETERBOROUGH 65KM N	4.4	4	C	24
2011-10-16	0539	138.591	-31.617	20.2	HAWKER 34KM NE	2.5		C	17
2011-10-18	1552	138.637	-35.030	23.4	BLACKWOOD 2KM SE	3.4	4	C	22
2011-10-22	1718	139.518	-32.115	4.0	YUNTA 52KM N	3.4		C	22
2011-11-01	1748	138.693	-33.086	4.0	YONGALA 7KM SW	2.8		C	21
2011-11-02	0241	136.730	-33.581	7.4	CLEVE 26KM NE	2.8		D	16
2011-11-03	0141	140.030	-37.976	35.7	MILLCENT 51KM SW	3.1		D	17
2011-11-03	0615	136.292	-36.384	7.7	KINGSCOTE 145KM SW	2.9		D	16
2011-11-03	2015	138.693	-33.086	4.0	YONGALA 7KM SW	2.5		C	18
2011-11-05	2252	140.454	-37.579	18.3	MILLCENT 9KM E	2.9		D	16
2011-11-08	0934	138.176	-29.746	14.1	LEIGH CREEK 85KM N	2.8		D	14
2011-11-25	0928	138.022	-32.671	11.8	PORT AUGUSTA 31KM SE	2.5		C	19
2011-11-26	2059	138.351	-26.012	28.2	POEPEL CORNER 35KM E	3.5		E	19
2011-12-05	1448	139.285	-33.168	7.9	PETERBOROUGH 47KM SE	2.5		C	19
2011-12-12	0303	138.726	-33.250	7.3	PETERBOROUGH 32KM S	2.9		C	21
2011-12-16	1040	138.136	-35.563	17.1	CAPE JERVIS 6KM NE	2.6		C	26
2011-12-17	0324	138.458	-32.931	14.7	PETERBOROUGH 35KM W	2.8	3	C	18
2011-12-31	2024	138.693	-33.086	4.0	YONGALA 7KM SW	2.7		C	20

Tasmania

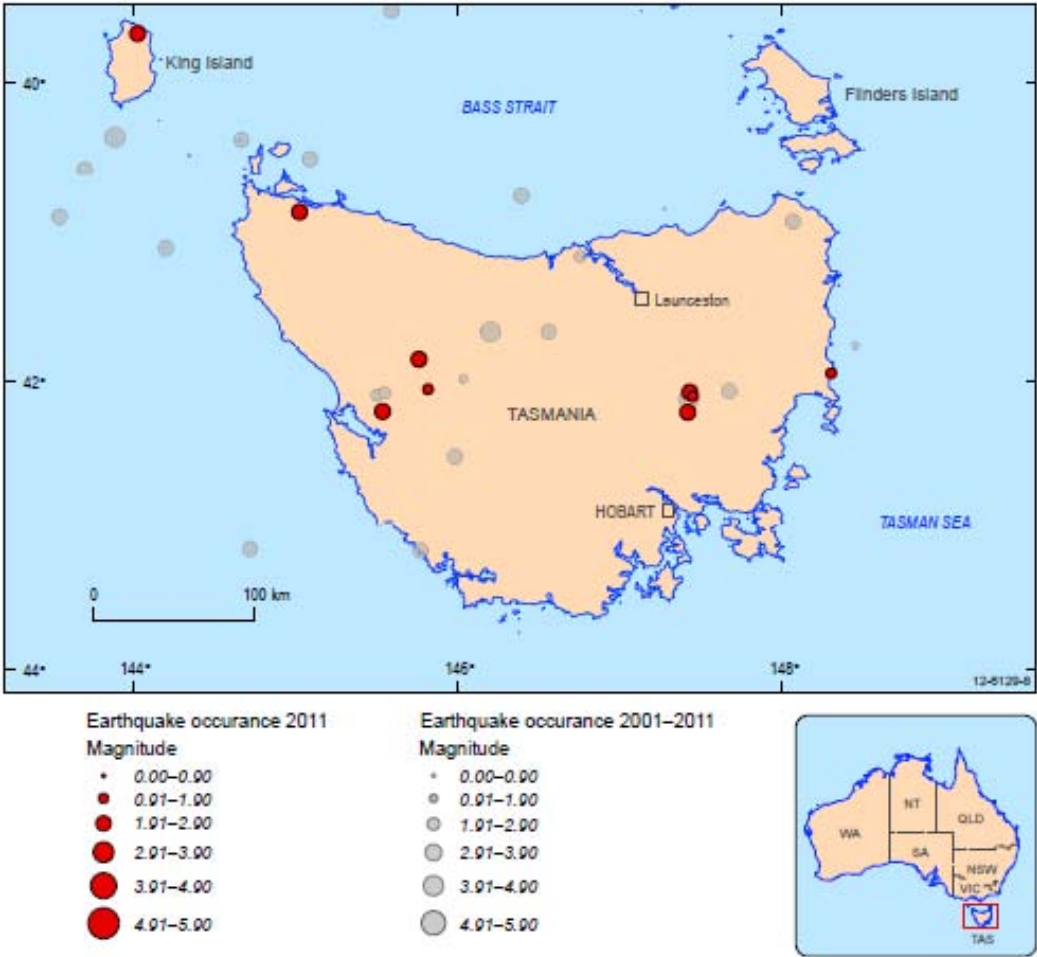


Figure 17: Map of 2011 Tasmanian Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 24: Tasmanian Top 10 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
6.9	26-Jan-1892	16:48:00	-40.400	149.500	0	Tasman Sea NE TAS.
6.4	13-Jul-1884	3:55:00	-40.500	148.500	0	Cape Barren Island NE TAS.
6.4	19-Sep-1884	10:27:00	-40.800	149.500	0	NE of Gladstone, TAS.
5.9	28-Mar-1884	13:12:00	-41.200	148.900	0	E of Bay of Fires, TAS.
5.9	10-May-1884	21:30:00	-41.200	148.900	0	E of Bay of Fires, TAS.
5.9	09-Jun-1884	9:20:00	-40.800	149.500	0	NE of Gladstone, TAS.
5.9	20-Mar-1885	23:03:00	-40.500	149.500	0	E of Cape Barren Isl, TAS.
5.4	28-Dec-1929	01:22:00	-39.690	149.450	10	Flinders Island, TAS.
5.3	10-Apr-1922	20:47:00	-40.000	147.500	33	Cape Barren Island, TAS.
5.3	01-Jan-1958	10:07:22	-42.200	146.100	10	Near Lake St. Clair, TAS.

Table 25: Tasmanian Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.7	ML	12-Apr-11	10:29:45	-42.207	145.54	0	South of Queenstown, TAS.
1.7	ML	24-May-11	17:11:19	-41.948	148.302	0	Bichino area, Tas.
2.3	ML	07-Jul-11	20:59:28	-42.214	147.419	0	Oatlands, Tas.
1.9	ML	26-Jul-11	05:07:16	-42.056	145.82	0	Near Queenstown, TAS.
2.1	ML	12-Sep-11	16:33:34	-40.857	145.028	14	Near Smithton, Tas.
2.9	ML	14-Nov-11	02:43:03	-42.077	147.431	2	Near Ross, TAS.
2.9	ML	21-Nov-11	20:11:43	-41.853	145.764	0	Queenstown, TAS.
1.6	ML	23-Nov-11	19:39:17	-42.105	147.449	15	Near Ross, TAS.
2.7	ML	26-Nov-11	18:41:44	-39.673	144.031	10	King Island, TAS.

Tasmania Seismicity Report

Environmental Systems and Services

Compiled by Elodie Borleis



Network

The Tasmanian seismic monitoring network operated by the ES&S Seismology Research Centre now comprises 8 seismographs and accelerographs throughout Tasmania. All sites except SCOT are continuously telemetered.

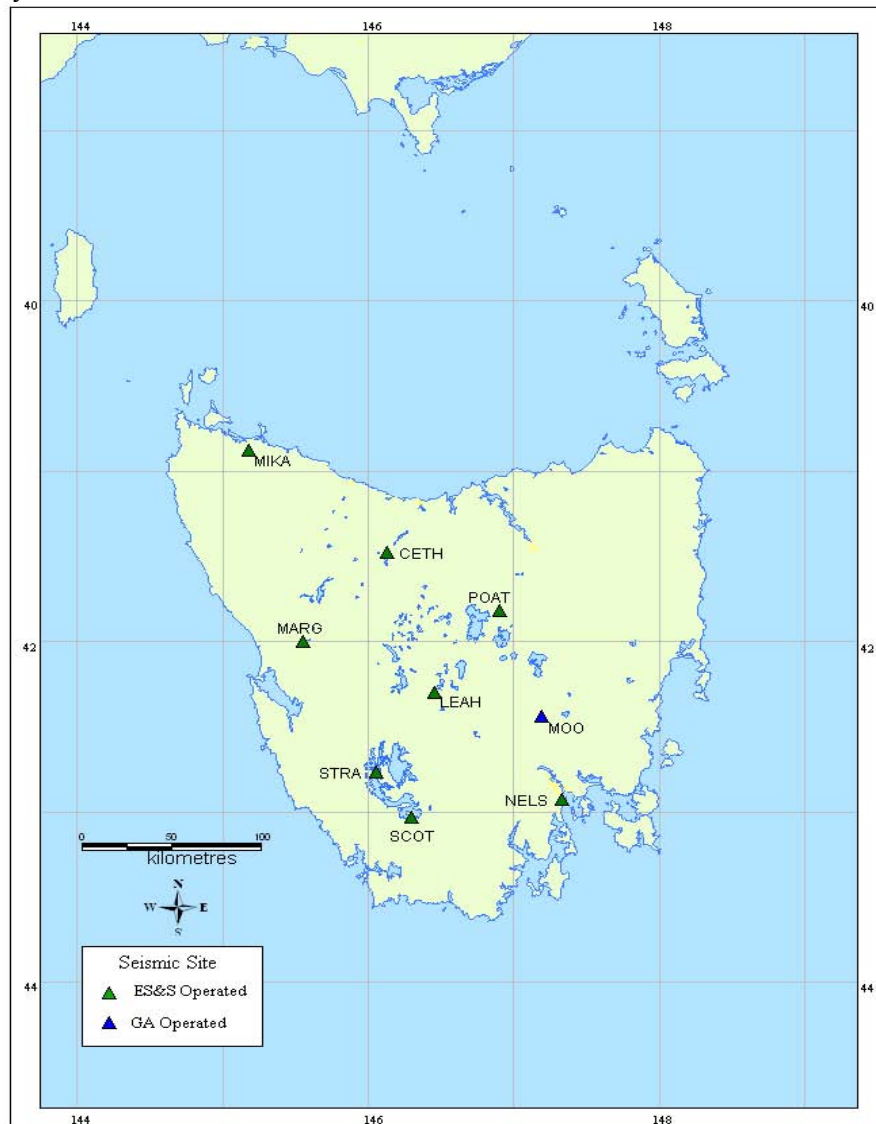


Figure 18: ES&S Tasmanian Seismic Network

Seismicity

50 earthquakes were recorded in Tasmania by ES&S in 2011, eleven greater than magnitude ML 2.5, five greater than or equal to magnitude ML 3.0. The largest recorded was a magnitude ML 3.8 on November 14th approximately 20 kilometres north of Oatlands, 85 kilometres north of Hobart.

Table 26: Tasmanian magnitude ML 2.5+ earthquakes recorded by Environmental Systems & Services

DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	MAG	IMX	ACC	LOCATION
04-Jan-11	17:55	-43.776	146.484	10	3.3	0	E	Off Southern Tasmania
17-Jan-11	19:29	-40.394	144.633	10	2.8	0	E	Off Hunter Island
30-Jan-11	20:00	-40.953	144.713	10	2.8	0	E	Smithton
12-Apr-11	10:29	-42.243	145.531	12	3.4	0	D	Queenstown
15-Apr-11	13:37	-39.994	145.772	10	3.0	0	D	Bass Strait
29-Apr-11	22:26	-40.709	144.970	14	3.5	0	D	Robbins Island
07-Jul-11	20:59	-42.168	147.123	10	2.9	0	C	Oatlands
23-Oct-11	14:56	-41.539	144.367	10	2.6	0	E	Off West Tasmania
25-Oct-11	23:32	-42.195	147.622	10	2.6	0	C	Oatlands
14-Nov-11	2:43	-42.107	147.393	10	3.8	0	C	Oatlands
21-Nov-11	20:11	-42.082	145.523	1	2.9	4	D	Queenstown

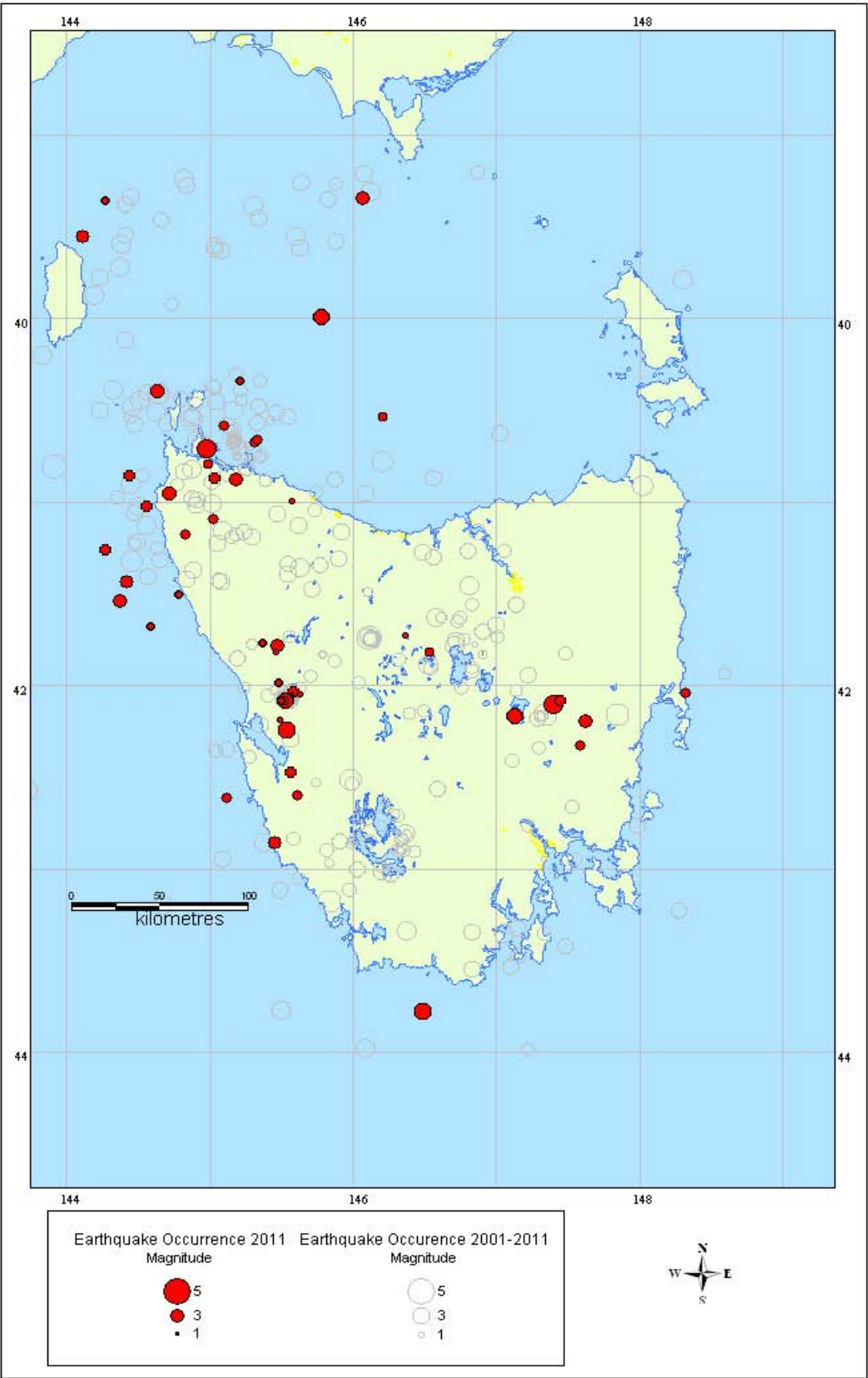


Figure 19: Map of 2011 Tasmanian Earthquakes detected by ES&S (magnitude sized circles with subdued historical seismicity).

Victoria

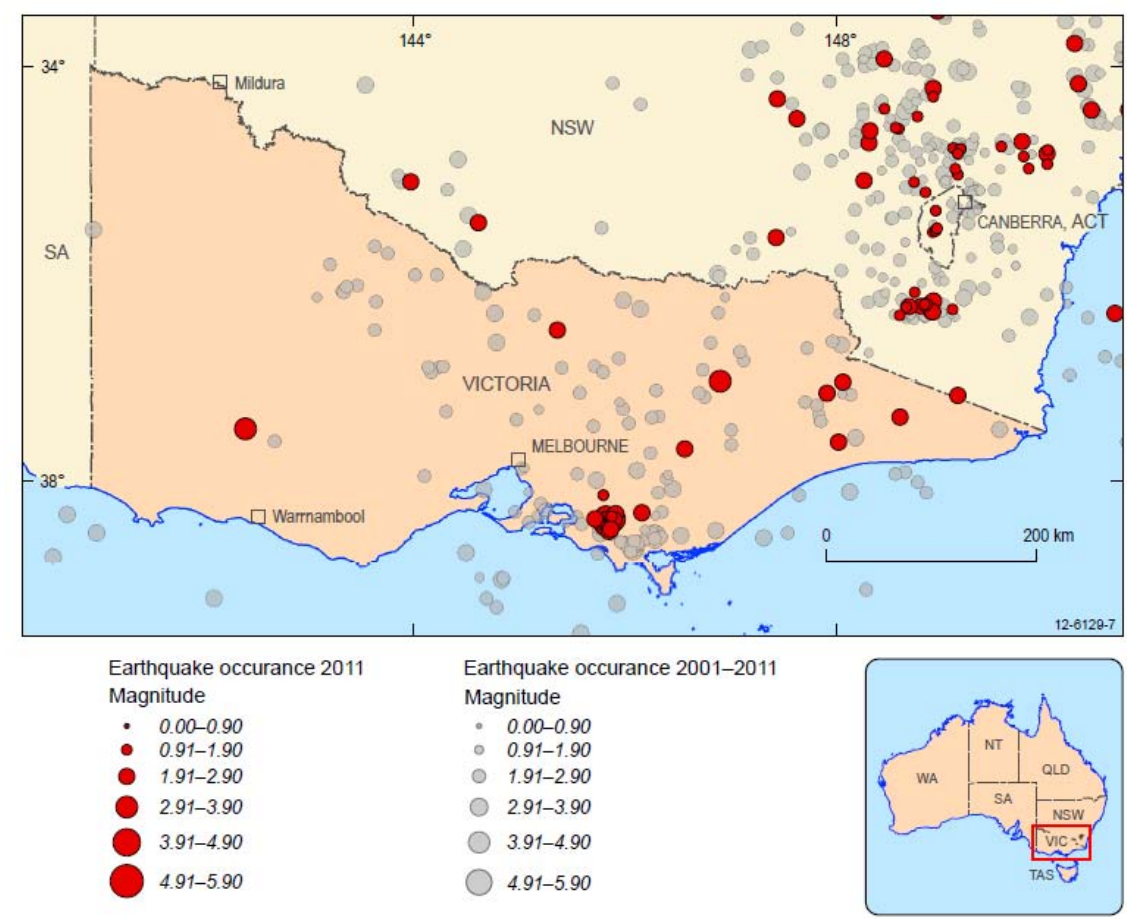


Figure 20: Map of 2011 Victorian Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 27: Victorian Top 7 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
5.7	02-Jul-1885	16:03:00	-39.000	146.000	0	Cape Liptrap, VIC.
5.7	14-Sep-65	12:53:13	-38.700	144.300	10	Bass Strait, VIC.
5.7	3-May-66	19:07:54	-37.100	147.170	24	Mt Hotham, VIC.
5.4	21-Nov-82	11:34:18	-37.205	146.956	17	NW of Dargo, VIC.
5.3	14-Jul-03	10:29:00	-38.430	142.530	0	Warrnambool, VIC.
5.3	24-Dec-60	16:42:10	-38.880	143.590	0	Cape Otway, VIC.
5.3	20-Jun-69	11:15:28	-38.470	146.300	19	Boolarra, VIC.

Table 28: Victorian Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
2.3	ML	11-Feb-11	11:28:50	-37.14	147.91	0	Mt Nugong, Vic.
2.4	ML	26-Feb-11	00:46:39	-37.687	146.567	10	Near Licola, Vic.
2.4	ML	25-Mar-11	02:40:31	-38.384	145.818	11	Near Korumburra, VIC.
2.4	ML	08-Apr-11	19:51:33	-38.503	145.852	0	Near Korumburra, VIC.
3.8	ML	01-Jun-11	03:29:04	-37.49	142.425	2	Grampians National Park, VIC.
4.4	ML	05-Jul-11	01:32:11	-38.412	145.839	2	Korumburra, Vic.
3.3	ML	05-Jul-11	02:37:16	-38.404	145.888	0	Korumburra, Vic.
3.7	ML	05-Jul-11	09:16:26	-38.412	145.806	6	Korumburra, Vic.
3.3	ML	05-Jul-11	17:03:09	-38.45	145.835	3	Korumburra, Vic.
3.0	ML	07-Jul-11	17:49:50	-38.359	145.823	7	Korumburra, Vic.
2.1	ML	09-Jul-11	00:46:30	-38.38	145.721	0	Korumburra, Vic.
3.1	ML	10-Jul-11	03:32:37	-37.023	146.901	0	S of Bright, Vic.
2.2	ML	28-Jul-11	20:41:33	-37.373	148.597	10	NE of Orbost, Vic.
2.3	ML	03-Aug-11	21:56:53	-38.389	145.835	10	Korumburra, Vic.
2.0	ML	04-Aug-11	14:21:09	-38.48	145.871	10	SE of Korumburra, Vic.
2.2	ML	06-Aug-11	18:14:48	-37.618	148.018	0	NE of Bruthen, Vic.
2.1	ML	28-Aug-11	01:50:02	-38.328	145.917	7	Near Korumburra, Vic.
3.1	ML	09-Sep-11	13:39:19	-38.413	145.848	0	Korumburra, Victoria.
2.2	ML	05-Oct-11	09:47:25	-38.384	145.885	1	Near Korumburra, VIC.
2.5	ML	08-Oct-11	21:40:30	-38.317	146.163	4	SW of Moe, Vic.
2.4	MS	13-Oct-11	09:58:43	-38.378	145.848	5	Near Korumburra, VIC.
2.1	ML	13-Oct-11	11:15:18	-38.386	145.901	1	Near Korumburra, Vic.
1.9	ML	20-Oct-11	20:06:56	-38.355	145.88	10	Korumburra, VIC.
3.1	ML	21-Oct-11	22:52:59	-38.381	145.907	0	Near Korumburra, VIC.
2.2	ML	25-Oct-11	22:18:30	-37.031	148.058	11	NE of Omeo, VIC.
2.0	ML	11-Dec-11	08:43:23	-36.523	145.368	10	S of Shepparton, VIC.
1.7	ML	23-Dec-11	16:54:24	-38.143	145.8	5	Near Garfield, VIC.

Victoria Seismicity Report

Environmental Systems and Services

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Network

The Victorian seismic monitoring network operated by the ES&S Seismology Research Centre now comprises 36 seismographs and accelerographs throughout Victoria.

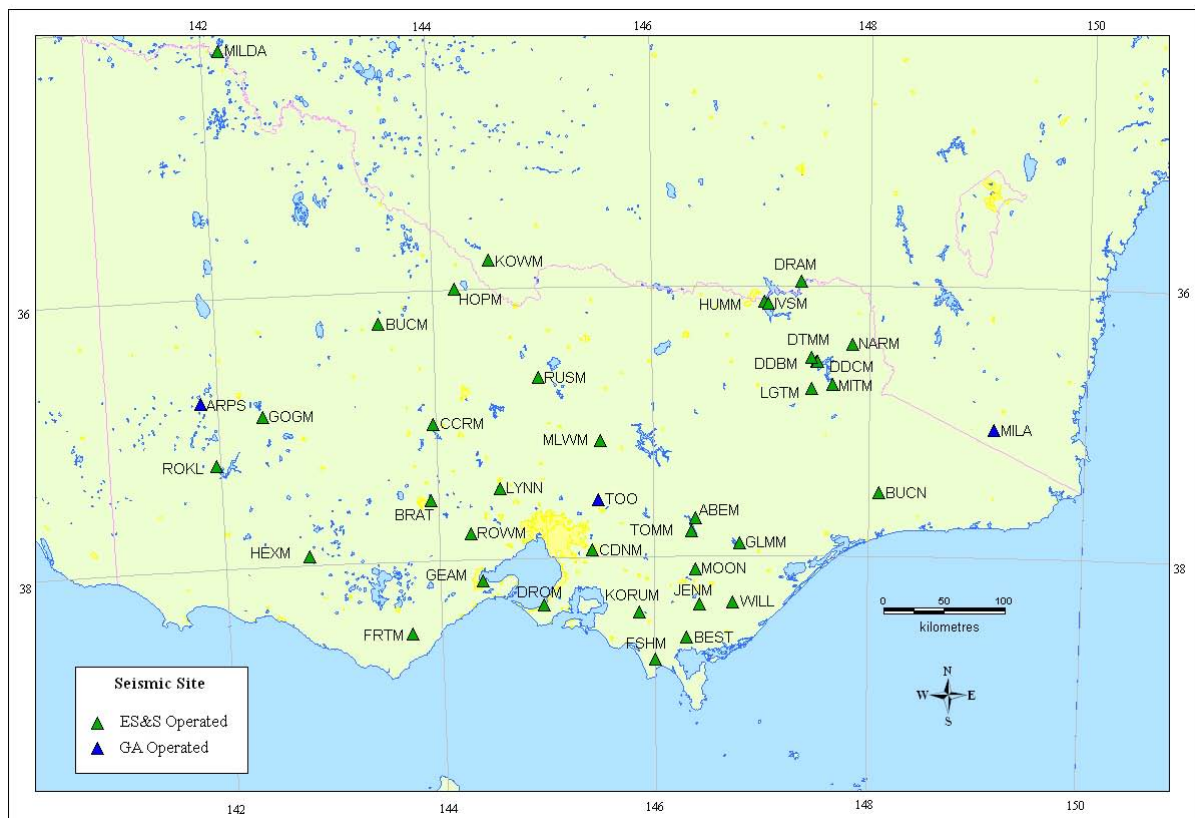


Figure 21: ES&S Victorian Seismic Network

The KORUM temporary site installed in 2009, after the magnitude ML 4.7 Korumburra earthquake, has been left there throughout 2011 and is continuously transmitting data back to the ES&S lab in Richmond, Victoria.

Seismicity

279 earthquakes were recorded in Victoria by ES&S in 2011, eighteen greater than magnitude ML 2.5, nine greater than or equal to magnitude ML 3.0, and two greater than or equal to magnitude ML 4.0. The Southern Grampians June 1st magnitude ML 4.0 event was widely felt, with reports in Dunkeld, Halls Gap and at Mount Zero. No aftershocks were recorded however for this event.

From 2009 to present there has been an exceptionally high occurrence of seismicity related to significant earthquakes recorded in Gippsland, Victoria. The fault ruptured along a region approximately five kilometres northeast of Korumburra, 100 kilometres southeast of Melbourne. There have been over 260 earthquakes recorded of which 4 were significant earthquakes. The largest recorded in 2011 was a magnitude ML 4.2 on July 5th, this was widely felt in varying locations across Gippsland and suburban Melbourne. Data from the intensity reports sent to ES&S for the July 5th Korumburra earthquake was used to create an isoseismal map

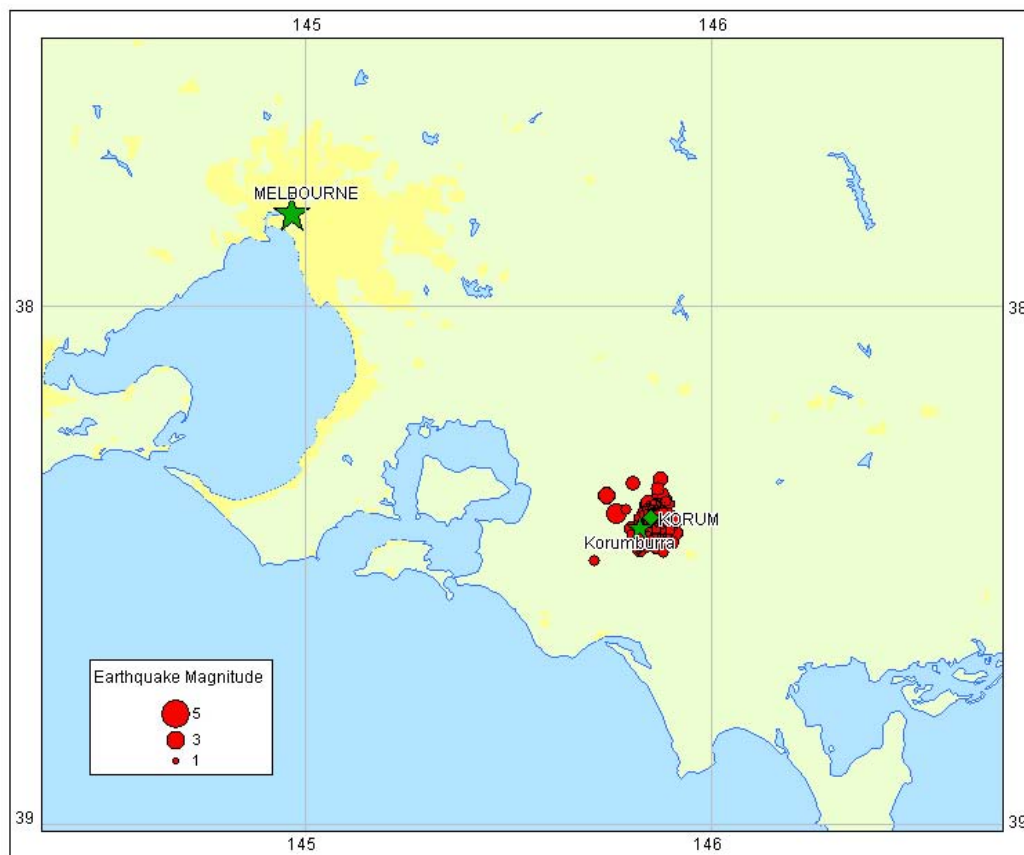


Figure 22: Overview map of Korumburra earthquakes in relation to Melbourne

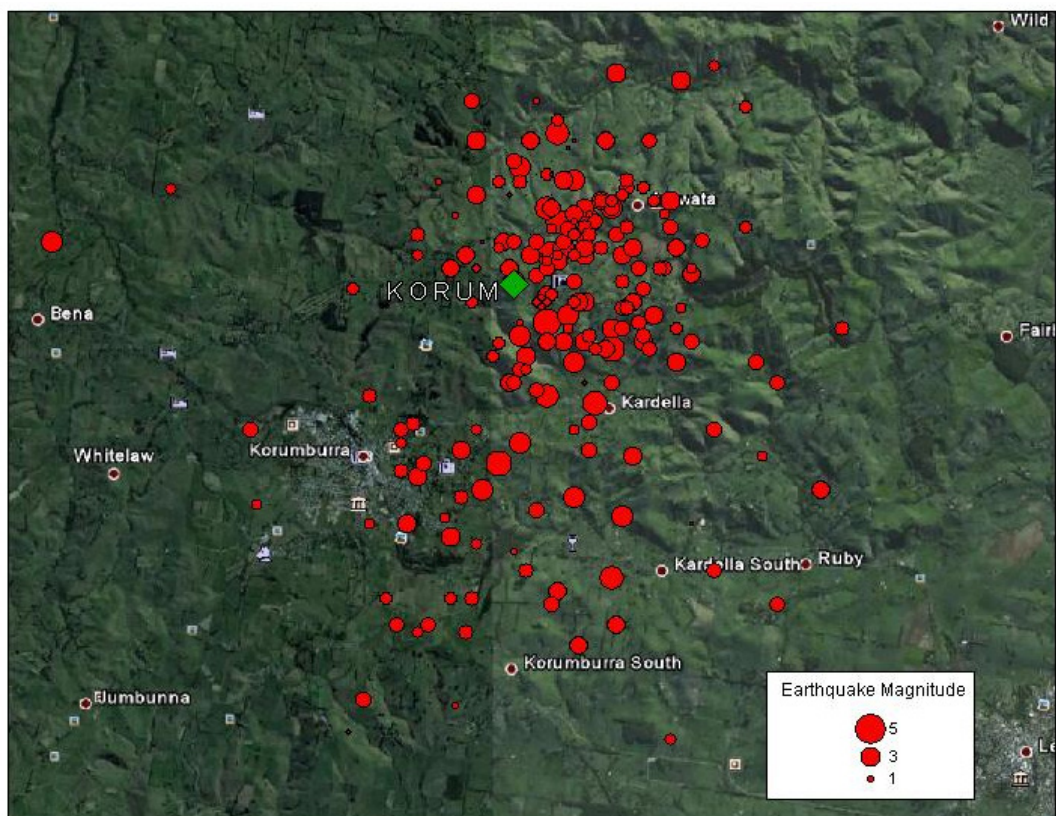
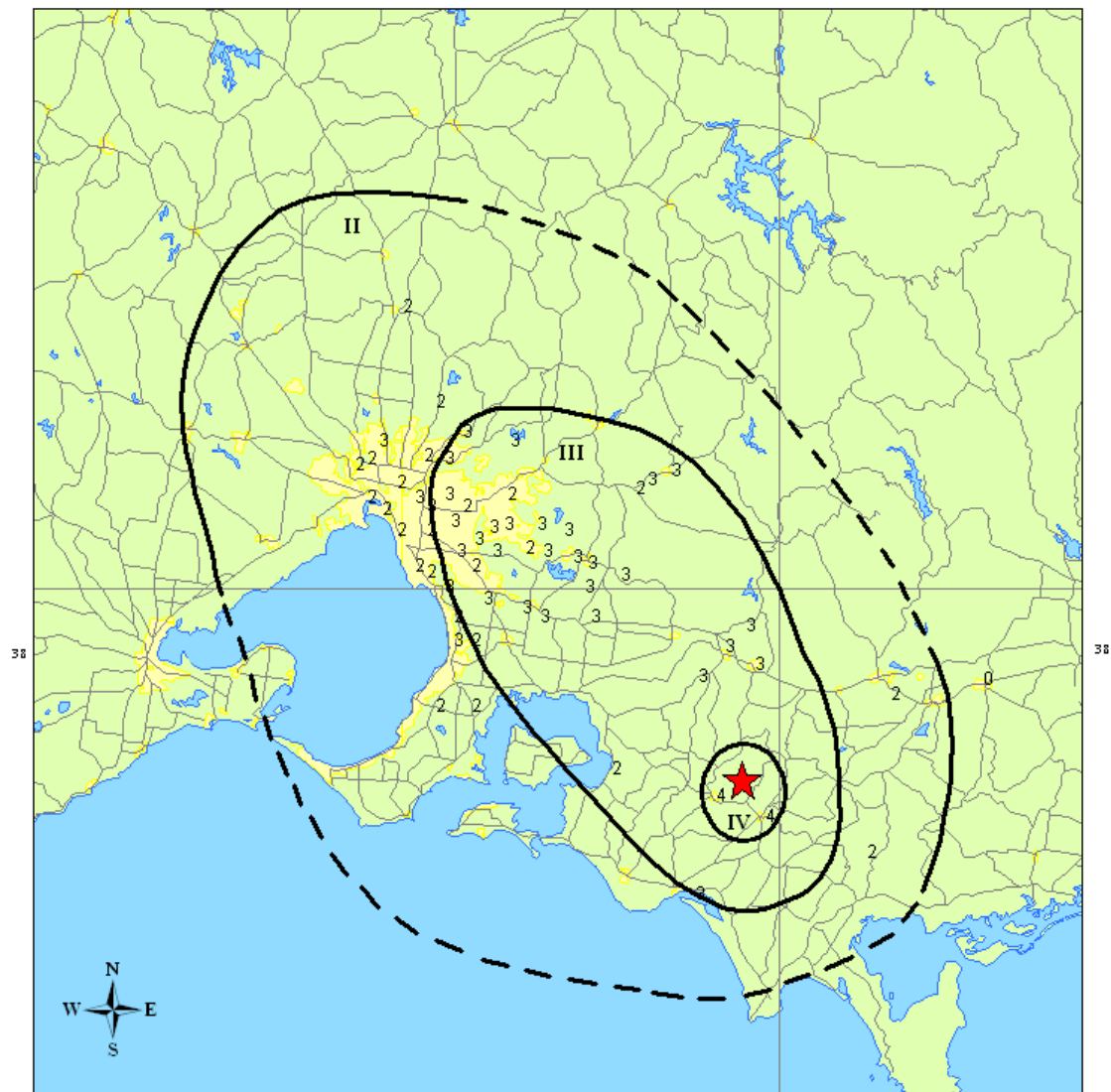


Figure 23: Magnified view of Korumburra and surrounding districts showing earthquake activity detected by ES&S from 2009-present

ISOSEISMAL MAP OF THE KORUMBURRA EARTHQUAKE

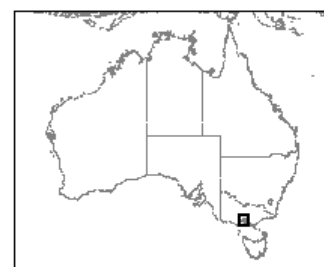
5 July 2011



Date: 5 July 2011
 Time: 0132 UTC
 Magnitude: ML 4.2
 Epicentre: 145.9° E, -38.4° S
 Depth: 10.0 km

SCALE 1: 500,000

- ★ Mainshock Epicentre
- 4 Earthquake felt (MMI)
- 0 Earthquake not felt
- IV Zone intensity designation



Intensity Data collected SRC

Figure 24: Isoseismal map of the July 5th ML 4.2 Korumburra earthquake

Table 29: Victorian magnitude ML 2.5+ earthquakes recorded by Environmental Systems & Services

DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	MAG	IMX	ACC	LOCATION
26-Feb-11	00:46	-37.605	146.535	8	2.6	0	C	Aberfeldy
25-Mar-11	02:40	-38.437	145.845	9	2.6	0	B	Korumburra
15-Apr-11	13:37	-39.994	145.772	10	3.0	0	D	Bass Strait
01-Jun-11	03:29	-37.430	142.491	15	4.0	3	C	Southern Grampians
05-Jul-11	01:32	-38.417	145.872	10	4.2	4	B	Korumburra
05-Jul-11	01:45	-38.441	145.871	10	2.6	0	B	Korumburra
05-Jul-11	02:37	-38.420	145.847	9	3.1	0	B	Korumburra
05-Jul-11	09:16	-38.434	145.848	10	3.8	0	B	Korumburra
05-Jul-11	17:03	-38.397	145.865	10	3.2	0	C	Korumburra
07-Jul-11	17:49	-38.438	145.862	8	3.1	0	C	Korumburra
10-Jul-11	03:32	-36.913	146.909	10	2.9	3	D	Beveridges
20-Jul-11	19:19	-38.951	143.600	10	2.7	0	C	Off Cape Otway
03-Aug-11	21:56	-38.400	145.765	10	2.8	0	D	Korumburra
09-Sep-11	00:18	-38.436	145.869	8	2.5	0	B	Korumburra
09-Sep-11	13:39	-38.426	145.878	11	3.0	0	B	Korumburra
13-Oct-11	09:58	-38.406	145.870	10	2.7	0	C	Korumburra
13-Oct-11	11:15	-38.428	145.881	14	2.6	0	C	Korumburra
21-Oct-11	22:53	-38.425	145.866	10	3.4	0	C	Korumburra

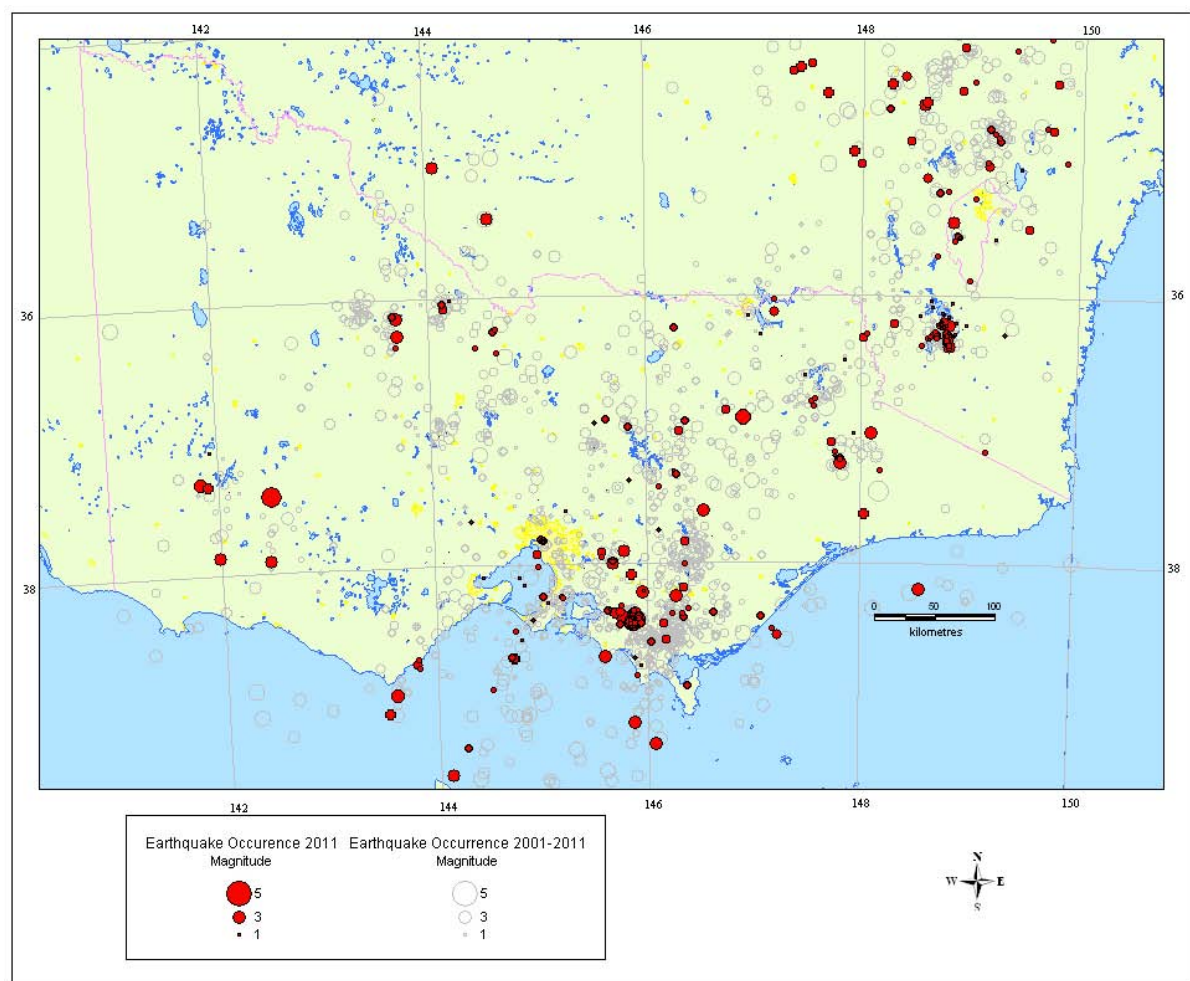


Figure 25: Map of 2011 Victorian Earthquakes detected by ES&S (magnitude sized circles with subdued historical seismicity).

Western Australia

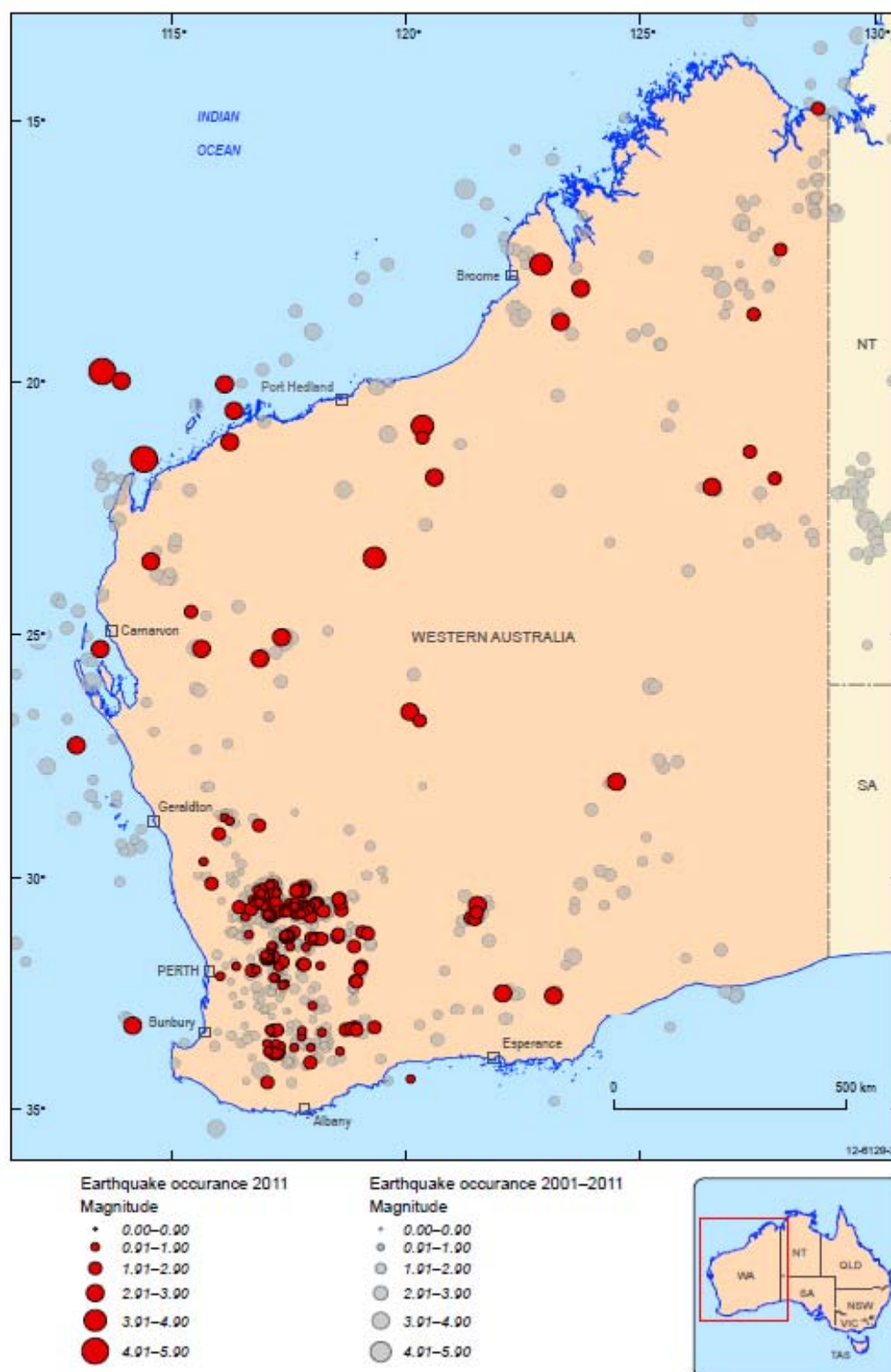


Figure 26: Map of 2011 Western Australian Earthquakes (magnitude sized circles with subdued historical seismicity).

Table 30: Western Australian Top 10 Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
5.3	MB	17-Apr-11	18:41:20	-19.803	113.525	30	North of Exmouth, WA.
5.1	ML	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.
4.5	MB	20-May-11	20:03:29	-23.46	119.332	9	SW of Newman, WA.
4.5	ML	14-Jul-11	05:51:36	-20.865	120.356	12	NE of Marble Bar, WA.
4.3	ML	28-Oct-11	09:08:41	-39.964	126.44	0	Great Australian Bight.
4.0	ML	07-May-11	05:23:36	-17.735	122.881	10	NE of Broome, WA.
3.8	ML	01-Sep-11	01:56:51	-18.845	123.3	10	Inland of Broome, WA.
3.7	ML	02-Apr-11	06:07:03	-25.055	117.345	0	Mount Clere, WA.
3.6	ML	23-Mar-11	03:27:50	-29.23	110.53	28	Offshore West of Geraldton, WA.
3.6	ML	14-Apr-11	01:18:22	-18.197	123.73	20	South of Derby, WA.
3.6	ML	20-Apr-11	19:23:04	-19.987	113.932	15	N of Exmouth, WA.

Table 31: Western Australian Top 11 Earthquakes

MAGNITUDE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
7.3	29-Apr-1941	1:35:39	-26.920	115.800	0	Meeberrie WA.
6.9	14-Oct-1968	2:58:50	-31.620	116.980	10	Meckering WA.
6.7	24-Mar-1970	10:35:17	-22.050	126.610	8	L McKay WA.
6.6	16-Aug-1929	21:28:23	-16.990	120.660	33	Broome WA.
6.6	23-Apr-1979	5:45:10	-16.660	120.270	26	Broome WA.
6.5	05-Jan-1885	14:25:00	-29.000	114.000	0	Near Geraldton, WA.
6.3	10-Aug-1997	9:20:31	-16.050	124.423	10	Collier Bay, WA.
6.2	8-Feb-1920	5:24:30	-35.000	111.000	33	Offshore WA.
6.2	6-May-1978	19:52:19	-19.550	126.560	17	L McKay WA.
6.2	2-Jun-1979	9:47:59	-30.827	117.179	3	Cadoux WA.

Table 32: Western Australian Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
1.6	ML	05-Jan-11	22:39:39	-30.761	117.767	1	NW of Bencubbin, WA.
2.7	ML	08-Jan-11	12:57:19	-14.771	128.795	10	Offshore, N of Kununurra, WA.
3.5	ML	11-Jan-11	03:11:39	-27.997	124.491	0	Lake Yeo, WA.
1.9	ML	11-Jan-11	10:00:42	-32.259	117.424	0	S of Quairading, WA.
1.3	ML	12-Jan-11	06:12:47	-32.298	117.37	0	East of Brookton, WA.
2.6	ML	13-Jan-11	07:26:00	-36.911	122.615	0	Offshore, S of Esperance, WA.
1.8	ML	15-Jan-11	17:23:55	-30.502	117.637	19	W of Beacon, WA.
2.2	ML	16-Jan-11	01:11:55	-30.474	116.964	0	NE of Ballidu, WA.
3.1	ML	16-Jan-11	06:26:39	-21.872	120.609	10	SE of Marble Bar, WA.
1.4	ML	19-Jan-11	02:39:39	-33.643	117.622	0	NE of Katanning, WA.
2.3	ML	22-Jan-11	01:35:06	-31.675	117.114	6	SE of Meckering, WA.

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2.2	ML	22-Jan-11	10:40:51	-30.82	117.968	9	E of Bencubbin, WA.
2.0	ML	24-Jan-11	13:47:02	-31.672	117.17	12	SW of Cunderdin, WA.
1.7	ML	25-Jan-11	04:45:27	-30.727	117.838	8	Bencubbin area, WA.
2.5	ML	28-Jan-11	09:11:09	-33.97	117.962	0	Gnowangerup area, WA.
2.2	ML	29-Jan-11	20:38:36	-30.578	118.045	0	SE of Beacon, WA.
2.5	ML	29-Jan-11	22:42:33	-21.893	127.867	15	NW of Lake Mackay, WA.
1.8	ML	29-Jan-11	23:18:39	-33.723	118.594	10	NE of Ongerup, WA.
2.4	ML	30-Jan-11	04:59:12	-30.545	118.083	0	Beacon area, WA.
2.5	ML	30-Jan-11	08:57:03	-30.535	118.105	0	Beacon area, WA.
1.9	ML	31-Jan-11	01:05:25	-30.679	117.924	10	NE of Bencubbin, WA.
2.4	ML	06-Feb-11	01:07:30	-30.681	118.629	3	SE of Bonnie Rock, WA.
2.3	ML	06-Feb-11	16:44:47	-31.88	119.049	10	NE of Hyden, WA.
2.2	ML	06-Feb-11	16:48:50	-31.928	119.03	10	NE of Hyden, WA.
2.0	ML	12-Feb-11	19:23:57	-30.45	118.563	0	NE of Bonnie Rock, WA.
1.6	ML	13-Feb-11	06:05:59	-31.688	117.06	0	Meckering, WA.
1.6	ML	15-Feb-11	09:46:58	-31.275	118.022	10	NW of Merredin, WA.
1.5	ML	16-Feb-11	06:59:20	-31.881	116.384	9	Woottating, WA.
2.1	ML	23-Feb-11	03:19:32	-30.667	117.442	8	N of Koorda, WA.
3.0	ML	24-Feb-11	02:26:20	-26.564	120.084	10	Near Wiluna, WA.
1.9	ML	27-Feb-11	10:39:57	-30.676	117.452	3	North of Koorda, WA.
3.4	ML	28-Feb-11	16:31:09	-20.564	116.333	6	NW of Dampier, WA.
1.5	ML	02-Mar-11	23:48:35	-30.763	117.102	9	NW of Cadoux, WA.
1.0	ML	03-Mar-11	03:36:51	-30.769	117.057	0	Cadoux, WA.
2.0	ML	03-Mar-11	05:07:55	-30.283	117.696	6	NW of Beacon, WA.
1.4	ML	04-Mar-11	03:59:27	-32.097	116.039	9	NW of Roleystone, WA.
2.3	ML	06-Mar-11	05:10:25	-31.252	118.545	4	East of Goomarin, WA.
2.3	ML	07-Mar-11	18:04:19	-30.443	118.582	0	Bonnie Rock area, WA.
1.2	ML	09-Mar-11	04:51:10	-33.276	117.785	0	Near Dumbleyung, WA.
1.5	ML	12-Mar-11	22:11:20	-30.323	117.244	10	NE of Kalannie, WA.
3.6	ML	23-Mar-11	03:27:50	-29.23	110.53	28	Offshore West of Geraldton, WA.
1.9	ML	27-Mar-11	01:21:54	-34.333	120.101	10	S of Hopetoun, WA.
1.6	ML	30-Mar-11	11:50:09	-31.639	116.994	0	Meckering, WA.
3.7	ML	02-Apr-11	06:07:03	-25.055	117.345	0	Mount Clere, WA.
1.6	ML	04-Apr-11	10:16:59	-30.743	117.405	7	NW of Koorda, WA.
2.7	ML	04-Apr-11	12:03:04	-17.452	127.984	0	W of Purnululu, WA.
1.6	ML	05-Apr-11	14:53:25	-33.313	118.21	0	Merilup, WA.
2.0	ML	07-Apr-11	04:41:05	-30.704	118.245	0	SW of Bonnie Rock, WA.
2.0	ML	11-Apr-11	12:47:54	-30.576	117.534	10	NE of Koorda, WA.
3.6	ML	14-Apr-11	01:18:22	-18.197	123.73	20	South of Derby, WA.
2.2	ML	15-Apr-11	10:06:19	-30.258	116.962	2	NW of Kalannie, WA.
1.0	ML	15-Apr-11	10:56:01	-30.325	116.913	2	NW of Kalannie, WA.
1.4	ML	15-Apr-11	18:33:48	-30.256	116.828	0	E of Dalwallinu, WA.
1.7	ML	16-Apr-11	11:33:37	-31.869	118.179	13	Bruce Rock, WA.
1.6	ML	16-Apr-11	12:59:16	-30.157	117.107	0	N of Kalannie, WA.
1.9	ML	17-Apr-11	14:13:05	-32.733	118.003	0	Kulin, WA.
5.3	MB	17-Apr-11	18:41:20	-19.803	113.525	30	North of Exmouth, WA.
2.2	ML	19-Apr-11	07:30:59	-31.707	117.076	6	Near Meckering, WA.
3.6	ML	20-Apr-11	19:23:04	-19.987	113.932	15	N of Exmouth, WA.
1.1	ML	22-Apr-11	17:44:56	-30.522	116.867	10	NE of Ballidu, WA.

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1.5	ML	23-Apr-11	19:16:24	-33.552	117.04	0	Beaufort River, WA.
2.1	ML	24-Apr-11	19:29:08	-30.532	118.6	10	E of Bonnie Rock, WA.
1.4	ML	25-Apr-11	01:42:44	-33.403	117.774	10	S of Dumbleyung, WA.
1.8	ML	26-Apr-11	11:31:01	-30.516	116.843	0	Ballidu, WA.
3.4	ML	26-Apr-11	14:27:52	-30.508	117.155	0	Burakin, WA.
1.7	ML	26-Apr-11	14:36:11	-30.507	116.844	0	Ballidu, WA.
1.7	ML	26-Apr-11	22:11:50	-30.501	116.837	0	Ballidu, WA.
2.0	ML	27-Apr-11	10:40:48	-30.737	121.511	0	Near Kalgoorlie, WA.
1.8	ML	27-Apr-11	16:40:58	-30.504	116.841	0	Ballidu, WA.
2.0	ML	30-Apr-11	13:00:47	-30.26	116.91	0	NW of Kalannie, WA.
1.7	ML	06-May-11	12:52:04	-30.539	116.789	7	North of Ballidu, WA.
1.7	ML	06-May-11	20:08:17	-30.486	116.89	2	NE of Ballidu, WA.
4.0	ML	07-May-11	05:23:36	-17.735	122.881	10	NE of Broome, WA.
2.3	ML	08-May-11	18:55:18	-34.408	117.045	0	N of Rocky Gully, WA.
1.7	ML	08-May-11	23:15:31	-33.607	117.329	0	NW of Katanning, WA.
3.5	ML	09-May-11	08:18:10	-27.25	112.972	10	Off Kalbarri, WA.
1.6	ML	10-May-11	13:29:21	-32.121	117.185	0	SW of Quairading, WA.
1.5	ML	10-May-11	13:36:46	-32.125	117.186	2	SW of Quairading, WA.
3.1	ML	12-May-11	18:36:54	-32.463	122.068	19	SE of Norseman, WA.
2.0	ML	13-May-11	18:19:25	-30.258	117.676	10	NW of Beacon, WA.
2.2	ML	13-May-11	23:21:29	-30.3	117.197	11	NE of Kalannie, WA.
1.9	ML	15-May-11	20:33:20	-31.471	117.869	0	E of Kellerberrin, WA.
1.4	ML	16-May-11	08:55:17	-33.555	117.228	7	E of Beaufort River, WA.
4.5	MB	20-May-11	20:03:29	-23.46	119.332	9	SW of Newman, WA.
2.2	ML	21-May-11	01:57:57	-30.575	116.994	0	SW of Burakin, WA.
2.5	ML	22-May-11	01:40:31	-33.2	119.328	10	SE of Newdegate, WA.
1.3	ML	30-May-11	11:48:33	-30.6	116.972	10	E of Ballidu, WA.
2.2	ML	03-Jun-11	17:18:19	-31.181	119.191	10	NW of Southern Cross, WA.
1.5	ML	04-Jun-11	20:24:14	-31.955	116.81	0	Gwambygine, WA.
2.0	ML	05-Jun-11	04:09:47	-30.519	116.848	2	NE of Ballidu, WA.
1.5	ML	05-Jun-11	05:04:26	-30.446	116.878	0	NE of Ballidu, WA.
1.9	ML	12-Jun-11	00:35:51	-31.703	117.073	0	Meckering, WA.
2.4	ML	14-Jun-11	11:51:29	-30.49	116.776	0	N of Ballidu, WA.
1.8	ML	14-Jun-11	22:33:40	-30.491	116.875	0	NE of Ballidu, WA.
1.6	ML	17-Jun-11	16:17:23	-30.494	116.875	0	NE of Ballidu, WA.
1.7	ML	18-Jun-11	19:57:53	-32.145	117.227	0	SW of Quairading, WA.
2.0	ML	20-Jun-11	12:42:46	-30.386	116.944	0	Kalannie area, WA.
2.3	ML	20-Jun-11	15:58:06	-31.808	117.325	12	Youndegin, WA.
3.1	ML	21-Jun-11	20:03:26	-25.292	113.481	0	W of Carnarvon, WA.
1.2	ML	23-Jun-11	20:01:59	-30.804	117.107	0	Cadoux, WA.
3.5	ML	27-Jun-11	22:18:34	-25.283	115.643	0	SE of Gascoyne Junction, WA.
1.6	ML	04-Jul-11	21:16:16	-32.131	117.206	0	SW of Quairading, WA.
1.7	ML	04-Jul-11	21:39:58	-32.132	117.216	1	SW of Quairading, WA.
1.9	ML	06-Jul-11	15:50:23	-30.809	117.038	0	Manmanning, WA.
2.8	ML	07-Jul-11	00:01:59	-30.832	121.473	0	Kalgoorlie, WA.
3.5	ML	11-Jul-11	19:39:58	-20.051	116.135	33	NW of Dampier, WA.
3.4	ML	14-Jul-11	02:35:53	-33.165	114.173	0	W of Bunbury, WA.
4.5	ML	14-Jul-11	05:51:36	-20.865	120.356	12	NE of Marble Bar, WA.
2.7	ML	14-Jul-11	10:27:45	-21.093	120.351	11	E of Marble Bar, WA.

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2.2	ML	14-Jul-11	22:49:50	-28.903	116.867	0	S of Yalgoo, WA.
2.1	ML	17-Jul-11	00:17:43	-31.843	117.836	0	S of Kellerberrin, WA.
1.5	ML	17-Jul-11	00:43:07	-33.72	117.067	0	NW of Kojonup, WA.
2.5	ML	17-Jul-11	01:22:28	-31.837	117.8	2	S of Kellerberrin, WA.
1.5	ML	21-Jul-11	18:23:11	-30.575	116.987	0	SW of Burakin, WA.
2.4	ML	21-Jul-11	18:33:02	-31.151	119.072	10	N of Moorine Rock, WA.
1.7	ML	22-Jul-11	07:53:46	-31.896	117.281	0	Youndegin, WA.
3.2	ML	24-Jul-11	13:16:30	-23.533	114.557	10	SE of Giralia, WA.
1.9	ML	27-Jul-11	00:20:03	-30.615	117.668	0	SW of Beacon, WA.
3.3	ML	27-Jul-11	04:02:42	-30.573	121.529	0	Kalgoorlie, WA.
2.6	ML	30-Jul-11	14:27:02	-31.288	118.074	0	Merredin area, WA.
2.6	ML	30-Jul-11	21:18:45	-31.295	118.05	5	NW of Merredin, WA.
2.5	ML	30-Jul-11	23:10:48	-31.277	117.991	2	NW of Merredin, WA.
2.5	ML	31-Jul-11	13:50:22	-30.122	115.855	16	SW of Marchagee, WA.
2.3	ML	31-Jul-11	16:53:46	-30.189	117.827	0	N of Beacon, WA.
2.1	ML	31-Jul-11	17:04:00	-30.273	117.804	0	N of Beacon, WA.
2.1	ML	31-Jul-11	17:07:31	-30.271	117.809	0	N of Beacon, WA.
2.3	ML	31-Jul-11	18:23:49	-31.296	118.196	0	N of Merredin, WA.
2.7	ML	05-Aug-11	09:47:50	-33.201	118.915	10	SW of Newdegate, WA.
2.7	ML	05-Aug-11	09:58:29	-33.227	118.852	10	SW of Newdegate, WA.
2.6	ML	05-Aug-11	10:55:56	-33.252	118.719	10	SW of Newdegate, WA.
2.5	ML	06-Aug-11	08:23:45	-33.243	118.831	2	SW of Newdegate, WA.
2.0	ML	08-Aug-11	08:38:14	-29.083	116.009	0	Near Morawa, WA.
2.0	ML	10-Aug-11	01:48:39	-30.668	116.699	0	Ballidu, WA.
2.6	ML	11-Aug-11	17:53:52	-18.698	127.42	4	SW of Halls Creek, WA.
2.1	ML	17-Aug-11	18:01:32	-30.619	116.438	0	W of Ballidu, WA.
3.1	ML	18-Aug-11	09:42:41	-21.177	116.25	0	Near Mardie, WA.
2.4	ML	19-Aug-11	07:38:26	-33.258	118.946	0	Newdegate, WA.
1.7	ML	26-Aug-11	18:29:01	-31.715	117.08	6	SE of Meckering, WA.
3.8	ML	01-Sep-11	01:56:51	-18.845	123.3	10	Inland of Broome, WA.
2.0	ML	04-Sep-11	02:52:25	-30.274	117.665	0	NW of Beacon, WA.
1.8	ML	08-Sep-11	15:09:08	-31.617	117.098	5	Near Meckering, WA.
2.4	ML	09-Sep-11	23:12:33	-31.973	116.718	0	NW of York, WA.
1.8	ML	12-Sep-11	17:08:03	-31.456	117.526	0	NW of Kellerberrin, WA.
1.6	ML	15-Sep-11	14:03:41	-30.446	116.896	0	NE of Ballidu, WA.
2.2	ML	22-Sep-11	04:46:06	-33.724	117.111	0	Near Katanning, WA.
3.4	ML	22-Sep-11	04:51:58	-33.733	117.217	5	Near Katanning, WA.
1.7	ML	22-Sep-11	22:07:03	-30.474	116.903	12	NE of Ballidu, WA.
2.2	ML	23-Sep-11	22:09:54	-33.737	117.24	7	NE of Kojonup, WA.
3.0	ML	24-Sep-11	02:33:06	-25.486	116.885	10	NW of Meekatharra, WA.
2.0	ML	27-Sep-11	16:09:15	-31.274	117.493	3	SE of Wyalkatchem, WA.
3.1	ML	27-Sep-11	19:13:38	-30.642	117.8	2	SW of Beacon, WA.
2.2	ML	27-Sep-11	22:17:17	-30.678	117.769	10	SW of Beacon, WA.
2.2	ML	28-Sep-11	22:38:03	-30.651	117.761	0	SW of Beacon, WA.
2.1	ML	29-Sep-11	02:08:14	-30.599	117.834	10	SW of Beacon, WA.
2.0	ML	29-Sep-11	02:16:54	-30.627	117.719	10	SW of Beacon, WA.
1.8	ML	29-Sep-11	03:27:46	-30.772	117.022	10	Cadoux, WA.
1.9	ML	01-Oct-11	17:17:10	-31.242	117.473	0	SE of Wyalkatchem, WA.
2.0	ML	02-Oct-11	14:21:12	-30.757	117.675	6	NW of Bencubbin, WA.
1.8	ML	02-Oct-11	15:10:56	-31.234	117.455	7	SE of Wyalkatchem, WA.

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1.9	ML	02-Oct-11	18:52:31	-31.248	117.44	1	SE of Wyalkatchem, WA.
1.9	ML	02-Oct-11	19:41:48	-31.247	117.431	5	SE of Wyalkatchem, WA.
1.9	ML	02-Oct-11	21:54:42	-31.273	117.418	0	SE of Wyalkatchem, WA.
2.0	ML	04-Oct-11	12:24:24	-30.633	117.789	0	SW of Beacon, WA.
2.2	ML	05-Oct-11	12:10:49	-30.608	117.917	0	S of Beacon, WA.
3.5	ML	05-Oct-11	17:06:17	-33.73	117.236	16	Near Kojonup, WA.
2.0	ML	06-Oct-11	14:22:33	-30.649	117.755	11	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:08:22	-30.708	117.735	1	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:11:06	-30.647	117.799	2	SW of Beacon, WA.
2.0	ML	06-Oct-11	15:16:14	-30.71	117.736	12	SW of Beacon, WA.
1.9	ML	07-Oct-11	17:01:43	-28.744	116.134	0	N of Morawa, WA.
1.9	ML	07-Oct-11	23:48:03	-28.811	116.243	0	N of Morawa, WA.
1.5	ML	08-Oct-11	04:01:51	-30.426	116.911	0	SW of Kalannie, WA.
2.0	ML	10-Oct-11	00:17:02	-31.68	117.038	0	Meckering, WA.
2.1	ML	10-Oct-11	09:28:39	-31.2	118.56	15	Near Westonia, WA.
2.7	ML	11-Oct-11	21:22:23	-30.161	117.135	11	N of Kalannie, WA.
2.4	ML	13-Oct-11	16:19:46	-31.459	118.894	16	E of Merredin, WA.
2.8	ML	14-Oct-11	01:09:30	-33.716	117.2	15	Near Kojonup, WA.
2.7	ML	14-Oct-11	05:20:15	-30.734	117.236	4	Near Cadoux, WA.
2.3	ML	18-Oct-11	15:00:35	-30.651	117.814	4	SW of Beacon, WA.
2.1	ML	19-Oct-11	02:22:24	-30.782	117.103	8	Cadoux, WA.
1.8	ML	19-Oct-11	21:13:15	-33.642	117.974	10	Near Katanning, WA.
2.8	ML	21-Oct-11	07:45:42	-24.538	115.418	10	NE of Gascoyne Junction, WA.
1.7	ML	22-Oct-11	13:48:16	-31.619	117.078	12	NE of Meckering, WA.
1.6	ML	26-Oct-11	05:46:27	-30.6	117.625	0	SW of Beacon, WA.
3.1	ML	27-Oct-11	07:05:55	-22.061	126.529	10	E of Tobin Lake, WA.
2.2	ML	27-Oct-11	20:13:34	-30.599	117.563	10	NE of Cadoux, WA.
4.3	ML	28-Oct-11	09:08:41	-39.964	126.44	0	Great Australian Bight.
2.1	ML	28-Oct-11	21:00:02	-30.805	117.11	0	Cadoux, WA.
2.8	ML	29-Oct-11	07:48:33	-36.357	117.874	10	S of Albany, WA.
1.8	ML	29-Oct-11	10:16:01	-30.833	116.577	0	NW of Wongan Hills, WA.
2.5	ML	01-Nov-11	01:11:42	-31.151	117.611	10	Near Wyalkatchem, WA.
2.3	ML	01-Nov-11	02:40:47	-31.246	117.46	9	Wyalkatchem, WA.
2.0	ML	01-Nov-11	04:38:14	-31.225	117.479	8	Wyalkatchem, WA.
2.4	ML	01-Nov-11	05:27:14	-31.222	117.486	10	Wyalkatchem, WA.
2.5	ML	02-Nov-11	03:32:49	-30.871	121.474	4	Kalgoorlie, WA.
1.5	ML	03-Nov-11	18:21:34	-31.217	117.412	0	Wyalkatchem, WA.
1.7	ML	03-Nov-11	19:55:04	-30.613	117.599	1	NE of Koorda, WA.
2.3	ML	04-Nov-11	19:32:52	-30.75	117.845	0	N of Bencubbin, WA.
1.7	ML	05-Nov-11	08:10:55	-31.21	117.492	0	E of Wyalkatchem, WA.
1.7	ML	06-Nov-11	03:19:31	-31.212	117.499	2	SE of Wyalkatchem, WA.
2.2	ML	06-Nov-11	18:50:08	-30.261	117.81	10	N of Beacon, WA.
2.0	ML	07-Nov-11	12:47:37	-30.583	117.668	10	SW of Beacon, WA.
2.3	ML	07-Nov-11	13:38:37	-30.605	117.636	15	SW of Beacon, WA.
2.3	ML	08-Nov-11	10:54:01	-30.636	117.579	0	NE of Koorda, WA.
2.2	ML	08-Nov-11	14:58:22	-30.605	117.616	0	NE of Koorda, WA.
1.8	ML	08-Nov-11	16:54:40	-30.634	117.586	13	NE of Koorda, WA.
2.1	ML	08-Nov-11	19:30:15	-31.787	117.366	0	SE of Cunderdin, WA.
1.8	ML	08-Nov-11	20:29:55	-31.521	117.114	8	NE of Meckering, WA.

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2.3	ML	09-Nov-11	02:33:07	-31.257	117.44	0	Wyalkatchem, WA.
1.9	ML	09-Nov-11	08:50:49	-31.247	117.415	6	Wyalkatchem, WA.
2.1	ML	09-Nov-11	13:38:41	-30.636	117.583	3	NE of Koorda, WA.
1.8	ML	09-Nov-11	20:56:50	-31.45	117.171	1	NE of Meckering, WA.
2.8	ML	11-Nov-11	19:43:53	-21.368	127.337	15	Lake Mackay, WA.
1.9	ML	11-Nov-11	20:25:22	-31.254	117.447	0	SE of Wyalkatchem, WA.
1.9	ML	13-Nov-11	02:52:48	-29.66	115.684	0	Yarra Yarra Lakes, WA.
1.3	ML	14-Nov-11	02:10:25	-30.806	117.139	0	S of Cadoux, WA.
1.8	ML	16-Nov-11	15:05:36	-31.442	117.138	10	NE of Meckering, WA.
1.4	ML	23-Nov-11	16:42:57	-31.204	116.652	2	NE of Bolgart, WA.
2.6	ML	24-Nov-11	04:11:48	-30.626	117.578	10	NE of Koorda, WA.
2.4	ML	24-Nov-11	04:21:09	-30.636	117.586	4	NE of Koorda, WA.
1.6	ML	24-Nov-11	06:58:18	-30.729	117.459	0	N of Koorda, WA.
2.7	ML	24-Nov-11	17:57:20	-30.846	121.39	19	SW of Kalgoorlie, WA.
2.8	ML	27-Nov-11	06:21:00	-30.61	117.572	0	Near Koorda, WA.
2.1	ML	27-Nov-11	06:37:42	-30.625	117.564	0	Near Koorda, WA.
2.7	ML	27-Nov-11	06:54:25	-30.633	117.56	0	Near Koorda, WA.
2.0	ML	27-Nov-11	16:20:42	-30.668	117.536	0	Near Koorda, WA.
2.7	ML	28-Nov-11	02:27:42	-30.586	117.656	18	NE of Koorda, WA.
5.1	ML	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.
3.4	ML	14-Dec-11	05:49:15	-32.513	123.152	15	Near Balladonia, WA.
2.0	ML	14-Dec-11	10:47:51	-33.276	117.166	12	NW of Wagin, WA.
1.8	ML	16-Dec-11	11:07:17	-33.255	117.092	13	NE of Brookton, WA.
2.0	ML	16-Dec-11	12:22:04	-33.256	117.252	17	NE of Brookton, WA.
1.8	ML	16-Dec-11	15:12:52	-33.261	117.109	12	NE of Brookton, WA.
2.0	ML	21-Dec-11	04:37:37	-30.684	117.639	0	SW of Beacon, WA.
1.8	ML	22-Dec-11	11:31:02	-30.678	117.571	2	NE of Koorda, WA.
2.2	ML	24-Dec-11	13:04:53	-32.197	118.926	14	N of Hyden, WA.
2.2	ML	24-Dec-11	15:33:04	-32.214	118.946	15	N of Hyden, WA.
2.0	ML	25-Dec-11	20:08:19	-31.722	117.031	8	Meckering, WA.
2.7	ML	27-Dec-11	14:10:50	-26.741	120.296	10	Near Wiluna, WA.
2.0	ML	28-Dec-11	17:05:20	-31.702	117.057	11	SE of Meckering, WA.

Australian Region

Geoscience Australia detects and locates earthquakes of magnitude 5 or higher in the Australian region, which for earthquakes encompasses Latitude 10° to -70° and Longitude 85° to -150°.

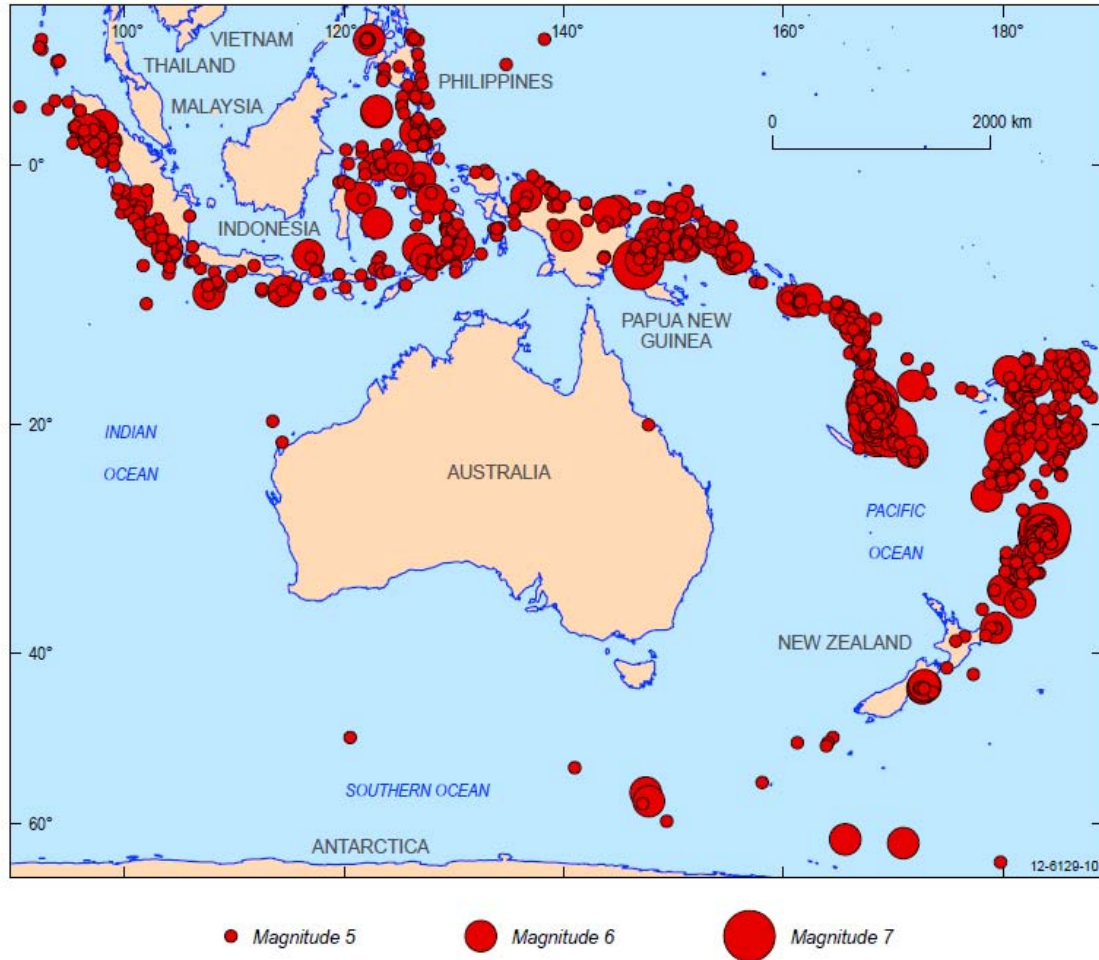


Figure 27: Map of 2011 Magnitude 5+ Australian Region Earthquakes.

Table 33: Australian Region Top 10 Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
7.8	Mwp	06-Jul-11	19:03:22	-29.181	-176.24	37	Kermadec Islands Region.
7.5	Mwp	20-Aug-11	16:55:01	-18.462	168.09	3	Vanuatu Islands.
7.4	Mwp	20-Aug-11	18:19:26	-18.361	168.215	35	Vanuatu Islands.
7.3	Mwp	21-Oct-11	17:57:19	-28.705	-176.132	53	Kermadec Islands Region.
7.2	Mwp	13-Jan-11	16:16:43	-20.6	168.596	17	Loyalty Islands.
7.2	Mwp	15-Sep-11	19:31:00	-21.468	-179.272	599	Fiji Islands Region.
7.2	Mwp	14-Dec-11	05:04:57	-7.568	146.811	128	Eastern New Guinea Region, PNG.
7.1	Mwp	10-May-11	08:55:14	-20.291	168.314	52	Loyalty Islands.
7.0	Mwp	09-Jan-11	10:03:46	-19.208	168.315	39	Vanuatu Islands Region.
7.0	Mwp	03-Sep-11	22:55:37	-20.643	169.846	154	Vanuatu Islands.

Table 34: Australian Region Earthquakes (Magnitude 5+) 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
5.3	MB	01-Jan-11	23:35:33	-19.394	167.677	76	Vanuatu Islands Region.
5.0	MB	03-Jan-11	16:43:36	-59.766	149.427	68	West of Macquarie Island.
6.3	Mwp	05-Jan-11	06:46:14	-22.248	171.78	115	SE of the Loyalty Islands.
5.5	MB	05-Jan-11	10:15:33	-2.727	99.865	0	Southern Sumatra, Indonesia.
5.3	MB	06-Jan-11	00:23:59	-4.272	142.158	107	New Guinea, PNG.
5.3	MB	06-Jan-11	16:17:56	-19.387	168.595	40	Vanuatu Islands Region .
5.6	MB	07-Jan-11	03:10:00	4.344	90.514	23	Off W Coast of Northern Sumatra.
5.3	MB	07-Jan-11	05:55:12	-19.893	168.404	85	Vanuatu Islands.
5.3	MB	07-Jan-11	19:09:14	-19.996	168.206	82	Vanuatu Islands.
6.0	Mwp	08-Jan-11	04:10:56	-0.105	124.955	59	Southern Molucca Sea.
5.0	MB	08-Jan-11	08:15:16	-1.308	119.975	40	Sulawesi, Indonesia.
7.0	Mwp	09-Jan-11	10:03:46	-19.208	168.315	39	Vanuatu Islands Region.
5.0	MB	09-Jan-11	14:22:46	-18.732	168.7	101	Vanuatu Islands.
5.5	MB	09-Jan-11	14:54:47	-19.313	168.573	37	Vanuatu Islands.
5.2	MB	09-Jan-11	15:55:13	-19.288	168.147	107	Vanuatu Islands.
5.0	MB	09-Jan-11	16:56:38	-19.461	167.955	208	Vanuatu Islands Region.
5.3	MB	09-Jan-11	16:58:09	-19.164	168.545	79	Vanuatu Islands Region.
6.5	Mwp	09-Jan-11	17:22:01	-19.235	168.227	48	Vanuatu Islands Region.
5.4	MB	09-Jan-11	18:21:12	-19.305	168.301	61	Vanuatu Islands Region.
5.4	MB	09-Jan-11	19:24:34	-19.621	168.358	85	Vanuatu Islands Region.
6.1	MB	10-Jan-11	02:10:15	-19.552	-169.55	50	Tonga Islands Region, Kermadec - Tonga - Samoa Area.
5.8	Mwp	10-Jan-11	02:11:06	-19.536	-175.809	204	Tonga Islands.
5.1	MB	10-Jan-11	08:35:35	0.692	123.178	77	Minahassa Peninsula, Sulawesi.
5.2	MB	11-Jan-11	00:26:29	-5.336	129.99	199	Banda Sea, Sunda Arc.
5.1	MB	11-Jan-11	07:39:17	-19.458	167.944	18	Vanuatu Islands Region.
5.6	MB	11-Jan-11	09:16:08	-13.162	167.403	213	Vanuatu Islands.

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5.1	MB	12-Jan-11	01:45:28	3.477	126.804	79	Talaud Islands, Indonesia.
5.2	MB	12-Jan-11	13:05:19	-57.224	147.229	75	West of Macquarie Island.
5.3	MB	13-Jan-11	06:00:40	-18.913	169.561	248	Vanuatu Islands.
5.0	MB	13-Jan-11	10:20:42	6.116	127.162	85	Philippine Islands Region.
5.2	MB	13-Jan-11	10:41:40	-22.196	-179.015	551	South of Fiji Islands.
7.2	Mwp	13-Jan-11	16:16:43	-20.6	168.596	17	Loyalty Islands.
5.3	MB	13-Jan-11	16:30:39	-20.289	169.043	144	Loyalty Islands.
5.2	MB	13-Jan-11	16:34:47	-20.699	168.093	139	Loyalty Islands.
6.0	MB	13-Jan-11	16:43:07	-20.568	168.506	0	Loyalty Islands.
5.2	MB	13-Jan-11	16:57:37	-20.759	168.681	103	Loyalty Islands.
5.2	MB	13-Jan-11	17:20:33	-20.56	168.382	89	Loyalty Islands.
5.4	MB	13-Jan-11	17:26:10	-20.617	168.559	41	Loyalty Islands.
5.0	MB	13-Jan-11	18:59:03	-5.176	130.811	29	Banda Sea, Sunda Arc.
5.3	MB	13-Jan-11	21:32:48	-20.56	168.512	108	Loyalty Islands.
5.0	MB	13-Jan-11	22:58:04	-21.983	166.925	0	Loyalty Islands.
5.4	MB	14-Jan-11	02:35:14	-20.646	168.824	17	Loyalty Islands.
5.2	MB	14-Jan-11	08:58:22	-20.84	169.444	0	Vanuatu Islands.
5.4	MB	14-Jan-11	10:45:58	-20.542	168.458	48	Loyalty Islands.
5.4	MB	14-Jan-11	16:39:29	-7.08	129.132	169	Banda Sea, Sunda Arc.
5.3	MB	14-Jan-11	16:55:31	-0.699	133.175	0	Irian Jaya Region, Indonesia.
5.3	MB	14-Jan-11	20:44:16	-20.984	167.862	0	Loyalty Islands.
5.2	MB	14-Jan-11	23:46:11	-2.02	151.303	58	New Ireland Region, PNG.
5.2	MB	15-Jan-11	01:39:53	-20.749	168.581	70	Loyalty Islands.
5.1	MB	15-Jan-11	06:09:12	-14.722	167.25	207	Vanuatu Islands.
5.8	MB	15-Jan-11	11:23:56	2.518	96.389	45	Northern Sumatra, Indonesia.
5.3	MB	15-Jan-11	12:56:26	-5.726	130.207	196	Banda Sea.
5.3	MB	15-Jan-11	16:26:08	2.347	96.343	26	Northern Sumatra, Indonesia.
5.3	MB	15-Jan-11	18:53:57	-17.037	-174.294	105	Tonga Islands.
5.3	MB	16-Jan-11	11:59:52	-6.636	128.929	209	Banda Sea.
5.5	MB	16-Jan-11	18:42:22	-20.688	-174.618	36	Tonga Islands.
5.1	MB	17-Jan-11	11:19:23	-3.631	100.526	0	Southern Sumatra, Indonesia.
6.1	Mwp	17-Jan-11	19:20:58	-5.051	102.631	47	Southern Sumatra, Indonesia.
5.0	MB	18-Jan-11	11:15:09	-8.131	124.07	186	Timor Region, Sunda Arc.
6.0	Mwp	18-Jan-11	11:33:49	2.642	96.504	63	Northern Sumatra, Indonesia.
5.2	MB	19-Jan-11	19:13:38	-19.914	-175.681	152	Tonga Islands.
5.4	MB	21-Jan-11	08:11:08	1.409	127.218	113	Halmahera, Indonesia.
5.3	MB	21-Jan-11	13:03:58	-5.098	154.082	129	Solomon Islands.
5.5	MB	22-Jan-11	07:34:17	2.828	95.452	30	Simeulue, Indonesia.
5.4	MB	22-Jan-11	07:38:56	2.866	95.594	20	Simeulue, Indonesia.
5.5	MB	22-Jan-11	13:21:24	-0.458	132.868	13	Irian Jaya Region, Indonesia.
5.3	Mwp	22-Jan-11	14:18:17	-4.81	129.249	217	Banda Sea, Sunda Arc.
5.2	MB	22-Jan-11	14:56:10	2.429	128.304	172	Halmahera, Indonesia.
5.4	MB	23-Jan-11	09:05:33	-4.425	101.991	39	Southern Sumatra, Indonesia.
6.0	Mwp	23-Jan-11	19:15:38	-20.293	-176.165	185	Fiji Islands Region.
5.6	MB	24-Jan-11	01:02:02	-19.34	-173.58	10	Tonga Islands.
5.1	MB	24-Jan-11	06:28:07	6.34	123.538	591	Mindanao, Philippines.
5.1	MB	24-Jan-11	14:44:27	-5.855	151.399	50	New Britain Region, PNG.
5.0	MB	25-Jan-11	08:30:07	-20.564	168.433	30	Loyalty Islands.

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5.7	Mwp	25-Jan-11	13:18:12	-29.826	-177.812	52	Kermadec Islands, New Zealand.
5.1	MB	25-Jan-11	17:02:57	-8.366	119.573	160	Flores Region, Indonesia.
5.3	MB	26-Jan-11	08:01:29	-5.534	147.141	205	Eastern New Guinea Region, PNG.
5.3	MB	26-Jan-11	12:05:55	-18.932	168.2	94	Vanuatu Islands.
6.1	Mwp	26-Jan-11	15:42:34	2.369	96.964	57	Northern Sumatra, Indonesia.
5.9	Mwp	26-Jan-11	17:03:32	-11.028	166.374	165	Santa Cruz Islands.
5.4	MB	27-Jan-11	00:59:42	-15.559	-173.481	30	Tonga Islands.
5.5	MB	27-Jan-11	04:00:37	-11.676	166.317	72	Santa Cruz Islands.
5.1	MB	27-Jan-11	09:08:55	-3.077	139.5	5	Irian Jaya, Indonesia.
5.4	MB	27-Jan-11	15:02:38	-38.46	176.563	103	North Island, New Zealand.
5.2	MB	27-Jan-11	16:17:15	-19.032	-173.312	10	Tonga Islands.
5.3	MB	28-Jan-11	12:37:17	-21.249	-178.504	552	Fiji Islands.
5.5	MB	28-Jan-11	12:41:01	-19.072	-178.002	614	Fiji Islands.
5.3	MB	28-Jan-11	15:45:46	2.077	96.793	42	Northern Sumatra, Indonesia.
5.1	MB	28-Jan-11	16:35:38	-5.174	154.138	147	Solomon Islands.
5.0	MB	28-Jan-11	20:03:11	-17.579	173.413	77	Fiji Islands Region.
5.2	MB	29-Jan-11	02:41:19	-17.949	-177.828	615	Fiji Islands Region.
5.2	MB	29-Jan-11	11:58:18	-62.649	-164.141	10	Pacific-Antarctic Ridge.
5.2	MB	29-Jan-11	23:38:41	-7.76	147.741	53	Eastern New Guinea Region.
5.3	MB	30-Jan-11	16:41:22	0.434	128.628	12	Halmahera, Indonesia.
5.1	MB	30-Jan-11	17:05:37	-2.994	99.965	3	Southern Sumatra, Indonesia, Sunda Arc.
5.1	MB	30-Jan-11	18:27:41	-14.751	167.32	130	Vanuatu Islands.
6.0	Mwp	31-Jan-11	06:03:24	-21.858	-175.41	48	Tonga Islands.
5.1	MB	31-Jan-11	18:29:19	-3.57	101.4	59	Southern Sumatra, Indonesia.
5.2	MB	01-Feb-11	17:50:37	-19.659	-175.772	206	Tonga Islands.
5.4	MB	02-Feb-11	16:38:11	-24.488	-179.936	517	South of Fiji Islands.
5.5	MB	03-Feb-11	03:23:00	-14.61	166.69	79	Vanuatu Islands.
5.2	MB	03-Feb-11	20:25:39	-16.166	-174.049	143	Tonga Islands.
5.7	Mwp	04-Feb-11	14:21:00	-14.214	166.507	41	Vanuatu Islands Region.
5.0	MB	04-Feb-11	15:00:02	-14.431	166.055	107	Vanuatu Islands Region.
5.2	MB	04-Feb-11	15:23:19	-14.07	166.764	39	Vanuatu Islands Region.
5.0	MB	04-Feb-11	16:21:17	-14.102	166.814	20	Vanuatu Islands Region.
5.0	MB	05-Feb-11	06:21:53	-13.469	166.944	0	Vanuatu Islands Region.
5.6	MB	06-Feb-11	11:21:14	-8.298	104.055	0	South of Sumatra, Indonesia.
5.2	MB	06-Feb-11	16:47:35	-20.609	168.327	37	Loyalty Islands.
5.5	MB	07-Feb-11	08:08:39	0.689	98.823	88	Northern Sumatra, Indonesia.
6.4	Mwp	07-Feb-11	19:53:44	-7.157	155.394	438	Solomon Islands.
5.2	MB	08-Feb-11	15:26:59	-10.064	113.732	52	South of Java, Indonesia.
5.4	MB	09-Feb-11	14:51:19	-16.111	166.997	62	Vanuatu Islands.
6.5	Mwp	10-Feb-11	14:39:29	4.027	123.026	534	Celebes Sea.
6.7	Mwp	10-Feb-11	14:42:00	3.93	122.991	529	Celebes Sea.
5.7	MB	10-Feb-11	20:28:07	5.279	126.258	63	Mindanao, Philippines.
5.1	MB	11-Feb-11	02:46:16	-20.656	-174.509	0	Tonga Islands.
5.2	MB	11-Feb-11	03:31:29	-23.238	-179.513	551	South of Fiji Islands.
5.0	MB	11-Feb-11	03:54:46	-6.536	130.392	129	Banda Sea.
5.4	MB	12-Feb-11	03:03:01	-31.067	-177.355	0	Kermadec Islands Region.
5.1	MB	12-Feb-11	08:20:04	-6.584	154.39	46	Solomon Islands.

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5.6	Mwp	12-Feb-11	11:55:25	1.968	127.01	48	Northern Molucca Sea, Indonesia.
6.2	Mwp	12-Feb-11	17:57:54	-20.817	-175.464	70	Tonga Islands.
6.2	Mwp	15-Feb-11	13:33:53	-2.53	121.54	24	Sulawesi, Indonesia.
5.4	MB	16-Feb-11	02:15:39	-6.265	149.478	61	New Britain Region, PNG.
5.2	MB	16-Feb-11	15:56:02	-20.206	-177.753	529	Fiji Islands Region.
5.3	MB	17-Feb-11	20:51:09	-14.263	166.263	38	Vanuatu Islands.
5.3	MB	17-Feb-11	22:33:24	-21.168	-173.223	0	Tonga Islands.
5.2	MB	18-Feb-11	04:23:20	-4.755	153.168	72	New Ireland Region, PNG.
5.3	Mwp	18-Feb-11	23:12:07	2.061	98.017	68	Northern Sumatra, Indonesia.
5.2	MB	19-Feb-11	03:12:49	3.144	126.595	84	Talaud Islands, Indonesia.
5.2	MB	20-Feb-11	09:17:16	-7.506	155.057	64	Solomon Islands.
5.3	ML	20-Feb-11	14:32:24	1.382	97.182	39	Northern Sumatra, Indonesia.
5.4	MB	20-Feb-11	17:52:54	-7.967	122.797	229	Flores Sea.
6.6	Mwp	21-Feb-11	10:57:52	-25.924	178.58	566	South of Fiji Islands.
5.1	MB	21-Feb-11	12:26:33	-10.205	161.583	89	Solomon Islands.
6.3	Mwp	21-Feb-11	23:51:43	-43.6	172.71	5	SE of Christchurch, New Zealand.
5.7	MB	22-Feb-11	00:04:00	-43.6	172.63	6	10 km south of Christchurch.
5.5	MB	22-Feb-11	01:50:00	-43.62	172.72	5	Within 5 km of Lyttelton, NZ.
5.1	MB	22-Feb-11	11:49:30	-4.013	129.297	111	Banda Sea.
5.7	MB	24-Feb-11	03:01:13	-17.652	-174.289	97	Tonga Islands.
5.4	MB	24-Feb-11	18:32:01	-18.016	-178.117	642	Fiji Islands Region.
5.8	Mwp	26-Feb-11	02:10:26	-10.603	164.967	71	Santa Cruz Islands.
5.3	Mwp	26-Feb-11	16:03:13	-16.13	-176.412	361	Fiji Islands Region.
5.4	MB	28-Feb-11	23:10:28	4.084	95.988	78	Northern Sumatra, Indonesia.
5.1	MB	03-Mar-11	08:12:12	-6.503	130.105	171	Banda Sea.
5.0	MB	03-Mar-11	09:09:36	9.563	126.444	47	Mindanao, Philippines.
5.6	MB	03-Mar-11	12:52:09	4.946	126.691	79	Talaud Islands, Indonesia.
5.6	MB	03-Mar-11	15:12:02	9.428	126.235	57	Mindanao, Philippines.
5.9	Mwp	04-Mar-11	04:07:45	-8.918	157.475	0	Solomon Islands.
5.0	MB	04-Mar-11	14:52:29	-7.081	155.756	92	Solomon Islands.
5.0	MB	04-Mar-11	15:46:09	-49.913	163.944	0	Auckland Islands, New Zealand Region.
5.4	MB	06-Mar-11	23:45:01	-30.596	-178.419	114	Kermadec Islands, New Zealand.
6.3	Mwp	07-Mar-11	00:09:39	-10.349	160.859	41	Solomon Islands.
5.0	MB	07-Mar-11	12:32:04	-5.554	102.551	35	Southern Sumatra, Indonesia.
5.2	MB	09-Mar-11	13:51:30	-19.981	-174.066	36	Tonga Islands.
5.3	MB	09-Mar-11	13:57:25	8.725	92.509	6	Nicobar Islands, India Region.
6.5	Mwp	09-Mar-11	21:24:53	-6.112	149.668	62	New Britain Region, PNG.
6.2	MB	10-Mar-11	17:08:36	-6.885	116.812	501	Bali Sea, Sunda Arc.
5.6	MB	12-Mar-11	01:19:10	-17.084	-173.484	15	Tonga.
5.2	MB	12-Mar-11	04:04:49	-3.189	139.107	46	New Britain Region, PNG.
5.3	MB	14-Mar-11	03:16:55	-17.438	-174.888	154	Tonga Islands.
5.0	MB	16-Mar-11	14:01:55	-18.698	-177.428	616	Fiji Islands Region.
6.5	Mwp	17-Mar-11	02:48:05	-17.321	167.725	42	Vanuatu Islands.
6.0	Mwp	17-Mar-11	08:03:06	-17.223	167.908	49	Vanuatu Islands.
5.4	MB	19-Mar-11	02:33:49	0.939	97.527	48	Nias region, Indonesia.
5.1	MB	19-Mar-11	12:11:23	-19.473	167.862	89	Vanuatu Islands Region.

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5.3	MB	19-Mar-11	16:11:59	-6.154	149.477	58	New Britain Region, PNG.
5.7	MB	20-Mar-11	11:47:33	-18.8	-174.681	50	Tonga Islands.
5.1	MB	20-Mar-11	14:05:07	-3.773	145.644	35	Near N Coast of New Guinea, PNG.
5.0	MB	20-Mar-11	15:20:31	-30.786	-179.644	343	Kermadec Islands Region.
5.1	Mwp	23-Mar-11	14:06:29	-2.087	139.108	29	Near North Coast of Irian Jaya.
5.1	Mwp	23-Mar-11	14:14:39	-20.844	-178.499	564	Fiji Islands Region.
5.4	MB	23-Mar-11	23:01:21	-32.439	-179.774	49	South of Kermadec Islands.
5.0	MB	25-Mar-11	01:15:06	4.372	125.284	272	Talaud Islands, Indonesia.
5.2	MB	25-Mar-11	09:14:30	1.134	99.061	115	Northern Sumatra, Indonesia.
5.1	MB	25-Mar-11	13:23:13	-8.18	130.201	19	Tanimbar Islands region, Indonesia.
5.2	MB	26-Mar-11	01:15:56	-17.831	-178.556	575	Fiji Islands Region.
6.1	Mwp	26-Mar-11	22:49:42	-15.867	-179.413	6	Fiji Islands Region.
5.3	MB	27-Mar-11	10:59:25	-23.889	179.994	515	South of Fiji Islands.
5.1	MB	28-Mar-11	14:13:15	-20.361	-174.18	24	Tonga Islands Region.
5.0	MB	29-Mar-11	10:48:28	-20.462	-178.468	597	Fiji Islands Region.
5.0	MB	30-Mar-11	06:37:19	-22.014	-179.521	597	South of Fiji Islands.
6.3	Mwp	31-Mar-11	00:12:05	-16.754	-177.593	60	Fiji Islands Region.
5.0	MB	01-Apr-11	06:17:38	-0.893	137.208	2	Irian Jaya Region, Indonesia.
5.4	MB	02-Apr-11	06:05:00	-5.618	153.977	50	New Ireland Region, PNG.
5.1	MB	02-Apr-11	18:50:25	-24.462	-179.571	527	South of Fiji Islands.
6.4	Mwp	03-Apr-11	14:07:05	-17.59	-178.39	500	Fiji Island Region.
6.7	Mwp	03-Apr-11	20:06:38	-9.823	107.72	1	South of Java, Indonesia.
5.9	Mwp	05-Apr-11	04:10:07	-17.591	-178.449	555	Fiji Islands Region.
5.7	Mwp	05-Apr-11	04:34:42	-7.392	105.979	36	Java, Indonesia.
5.3	MB	05-Apr-11	07:46:28	2.618	127.125	89	Northern Molucca Sea.
5.4	MB	05-Apr-11	11:14:18	3.012	127.097	52	S of Talaud Islands, Indonesia.
5.4	MB	06-Apr-11	11:25:55	-31.235	-176.636	44	Kermadec Islands Region.
6.1	Mwp	06-Apr-11	14:01:48	1.814	97.31	59	Northern Sumatra, Indonesia.
5.2	MB	07-Apr-11	07:16:12	-42.179	177.35	6	Off East Coast of the South Island, New Zealand.
5.3	MB	08-Apr-11	00:56:52	-7.947	123.355	230	Banda Sea.
5.2	MB	10-Apr-11	16:18:19	-23.434	179.92	520	South of Fiji.
5.2	MB	11-Apr-11	13:33:42	-29.183	-176.709	65	Kermadec Islands Region.
5.0	MB	13-Apr-11	01:51:43	-12.569	166.443	86	Santa Cruz Islands.
5.2	MB	13-Apr-11	04:18:31	-5.221	151.605	120	New Britain Region, PNG.
5.0	MB	13-Apr-11	09:57:01	-4.625	126.616	409	Banda Sea.
5.0	MB	13-Apr-11	12:51:17	-17.463	177.203	20	Fiji Islands.
5.7	Mwp	14-Apr-11	05:45:31	-32.998	-178.01	165	South of Kermadec Islands.
5.3	MB	14-Apr-11	16:11:56	5.836	126.241	173	Mindanao, Philippines.
5.6	MB	15-Apr-11	02:06:25	-15.368	-173.107	0	Tonga Islands.
5.3	MB	15-Apr-11	09:05:07	-5.765	151.082	69	New Britain Region, PNG.
5.8	Mwp	15-Apr-11	21:46:20	-18.653	-175.234	197	Tonga Islands.
5.3	ML	16-Apr-11	05:31:18	-20.085	147.764	7	Near Bowen, QLD.
5.2	MB	16-Apr-11	05:49:22	-43.626	172.837	9	South Island, NZ.
5.1	MB	17-Apr-11	13:02:07	-20.24	-178.603	589	Fiji Islands region.
5.3	MB	17-Apr-11	18:41:20	-19.803	113.525	30	North of Exmouth, WA.
6.7	Mwp	18-Apr-11	13:03:05	-34.115	-179.941	100	South of the Kermadec Islands.

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5.3	MB	18-Apr-11	22:40:37	0.629	98.96	80	Northern Sumatra, Indonesia.
5.0	MB	19-Apr-11	11:33:12	-21.36	170.287	0	Southeast of Loyalty Islands.
5.0	MB	19-Apr-11	15:30:09	-19.904	-177.521	410	Fiji Islands Region.
5.3	MB	20-Apr-11	03:09:06	-20.747	-175.419	46	Tonga Islands.
5.4	MB	22-Apr-11	17:14:48	-22.558	-174.62	0	Tonga Islands Region.
6.7	Mwp	23-Apr-11	04:16:59	-10.45	161.341	121	Solomon Islands.
5.2	MB	23-Apr-11	21:09:09	-16.371	-179.357	500	Fiji Islands Region.
6.2	Mwp	24-Apr-11	23:07:53	-4.45	123.024	39	Sulawesi, Indonesia.
5.5	MB	25-Apr-11	04:13:34	-17.893	-177.791	619	Fiji Islands Region.
5.2	MB	25-Apr-11	13:38:55	-15.641	173.169	29	Fiji Islands Region.
5.8	MB	26-Apr-11	06:39:33	-8.18	108.233	68	Java, Indonesia.
5.5	Mwp	26-Apr-11	21:43:46	-9.156	125.658	0	Timor Region.
5.2	MB	27-Apr-11	23:35:07	-17.972	-178.283	603	Fiji Islands Region.
5.8	Mwp	28-Apr-11	07:42:34	-10.138	160.423	4	Solomon Islands.
5.8	MB	29-Apr-11	08:56:50	4.037	95.895	63	Off W Coast of Northern Sumatra.
5.2	MB	29-Apr-11	13:08:40	-19.323	167.964	105	Vanuatu Islands Region.
5.3	MB	30-Apr-11	05:45:38	-3.321	148.761	45	Bismarck Sea.
5.3	MB	01-May-11	11:06:53	6.553	127.034	61	Philippine Islands Region.
6.0	Mwp	01-May-11	16:12:44	-7.032	155.925	72	Solomon Islands.
5.0	MB	02-May-11	10:59:07	-5.478	149.182	266	New Britain Region, PNG.
5.3	MB	02-May-11	13:20:56	-15.632	-174.169	0	Tonga Islands.
5.3	MB	02-May-11	15:42:37	-3.471	135.576	24	Irian Jaya Region, Indonesia.
5.2	MB	04-May-11	04:50:11	-48.969	120.589	56	Western Indian-Antarctic Ridge.
5.2	MB	04-May-11	10:07:02	-15.178	167.826	195	Vanuatu Islands.
5.8	Mwp	04-May-11	16:13:28	-20.28	-178.283	582	Fiji Islands Region.
5.6	Mwp	04-May-11	17:38:34	-5.02	101.64	15	Southwest of Sumatra, Indonesia.
5.2	MB	05-May-11	08:45:28	-0.316	124.578	67	Southern Molucca Sea.
5.3	MB	05-May-11	16:15:24	-25.065	-176.964	202	South of Fiji Islands.
5.5	Mwp	06-May-11	06:46:25	-0.268	122.876	99	Minahassa Peninsula, Sulawesi.
5.0	MB	08-May-11	08:05:15	-7.683	111.857	220	Java, Indonesia.
6.2	Mwp	09-May-11	18:54:45	-56.89	147.789	36	West of Macquarie Island.
5.4	MB	09-May-11	19:13:27	5.47	126.647	41	Mindanao, Philippines.
5.1	MB	09-May-11	22:02:28	-19.196	169.03	223	Vanuatu Islands.
7.1	Mwp	10-May-11	08:55:14	-20.291	168.314	52	Loyalty Islands.
5.7	MB	10-May-11	10:24:24	-20.371	168.389	60	Loyalty Islands.
5.2	MB	10-May-11	10:37:17	-20.338	168.345	49	Loyalty Islands.
5.2	MB	10-May-11	10:44:14	-20.329	168.428	64	Loyalty Islands.
5.2	MB	10-May-11	11:32:02	-21.624	169.521	174	Loyalty Islands.
5.3	MB	10-May-11	12:00:34	-20.021	168.441	50	Loyalty Islands.
5.1	MB	11-May-11	00:48:05	-18.87	-176.239	334	Fiji Islands Region.
6.0	Mwp	11-May-11	08:19:40	-20.318	168.436	64	Loyalty Islands.
5.3	MB	11-May-11	09:16:30	-20.218	168.33	78	Vanuatu Islands.
5.1	MB	11-May-11	09:21:41	-20.454	168.4	78	Loyalty Islands.
5.4	MB	11-May-11	09:43:34	-20.369	168.341	66	Loyalty Islands.
5.2	MB	11-May-11	15:21:29	-6.688	147.98	81	Eastern Papua New Guinea.
5.1	MB	11-May-11	15:33:11	-6.636	147.998	71	New Britain Region.
5.1	MB	12-May-11	12:29:23	-19.686	-177.872	567	Fiji Islands Region.

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5.4	MB	13-May-11	15:55:48	-11.533	165.494	40	Santa Cruz Islands.
5.2	MB	13-May-11	21:43:22	-9.926	107.696	20	South of Java, Indonesia.
5.2	MB	14-May-11	01:42:13	-8.277	123.524	15	Flores Region, Indonesia.
5.1	MB	14-May-11	07:06:08	-20.218	168.493	84	Loyalty Islands.
5.0	MB	15-May-11	06:29:13	-7.22	129.035	146	Banda Sea.
5.6	Mwp	15-May-11	06:47:04	-3.202	139.662	80	Irian Jaya, Indonesia.
6.5	Mwp	15-May-11	18:37:10	-6.128	154.647	48	Solomon Islands.
5.3	MB	15-May-11	23:25:08	-7.077	155.003	27	Solomon Islands.
5.1	MB	16-May-11	02:35:20	-2.945	136.501	20	Irian Jaya Region, Indonesia.
5.3	MB	16-May-11	19:14:11	-20.36	168.307	60	Loyalty Islands.
5.3	MB	16-May-11	19:18:28	-20.376	168.317	68	Loyalty Islands.
5.7	Mwp	17-May-11	00:14:58	-9.64	112.542	43	South of Java, Indonesia.
5.5	MB	17-May-11	10:35:23	-15.511	-174.836	0	Tonga Islands.
5.1	MB	18-May-11	05:01:40	-9.456	112.541	36	South of Java, Indonesia.
5.2	MB	18-May-11	18:29:02	-6.688	147.987	58	Eastern New Guinea Region, PNG.
5.4	MB	18-May-11	18:51:26	-6.67	148.019	51	New Britain Region, PNG.
5.5	Mwp	19-May-11	06:33:11	-7.04	123.334	627	Banda Sea.
6.0	Mwp	20-May-11	19:43:17	-7.249	147.081	21	Eastern New Guinea Region, PNG.
5.0	MB	21-May-11	09:53:53	-7.199	146.968	41	Eastern New Guinea Region, PNG.
5.3	MB	21-May-11	14:23:49	-7.29	127.24	0	Banda Sea.
5.8	MB	21-May-11	21:17:02	-30.842	-177.656	50	Kermadec Islands, New Zealand.
5.0	MB	21-May-11	21:37:10	-5.852	129.427	238	Banda Sea.
5.3	MB	22-May-11	19:07:47	5.972	125.839	195	Mindanao, Philippines.
5.0	MB	22-May-11	20:58:54	-20.292	168.335	72	Vanuatu Islands.
5.0	MB	23-May-11	06:50:47	-1.519	120.498	51	Sulawesi, Indonesia.
5.1	MB	24-May-11	08:11:10	-5.249	102.38	37	Southern Sumatra, Indonesia.
5.5	MB	26-May-11	02:10:25	-17.9	-171.894	0	Tonga Islands region.
5.4	MB	26-May-11	08:57:31	-8.417	121.589	9	Flores Region, Indonesia.
5.0	MB	27-May-11	01:06:44	-21.547	-179.068	603	Fiji Islands Region.
5.2	MB	27-May-11	05:39:30	1.449	123.958	279	Minahassa Peninsula, Sulawesi.
5.6	MB	27-May-11	18:47:22	-4.399	144.014	130	New Guinea Region, PNG.
5.0	MB	28-May-11	06:42:15	-20.045	168.479	109	Vanuatu Islands.
5.0	MB	28-May-11	16:47:19	-11.781	165.229	57	Santa Cruz Islands.
5.8	Mwp	28-May-11	17:07:42	-5.74	103.455	36	Southern Sumatra, Indonesia.
5.5	MB	28-May-11	18:35:53	-27.199	-178.049	330	Kermadec Islands Region.
5.4	MB	28-May-11	18:37:35	-27.106	-178.164	324	Kermadec Islands Region.
5.6	MB	28-May-11	20:17:13	4.615	127.708	86	Talau Islands, Indonesia.
5.2	MB	28-May-11	20:28:51	-8.965	108.508	9	Java, Indonesia.
5.4	MB	29-May-11	07:33:13	-5.859	149.334	119	New Britain Region, PNG.
5.4	MB	29-May-11	13:44:21	-6.623	129.826	153	Banda Sea.
5.8	MB	29-May-11	18:24:00	-7.682	101.743	2	Southwest of Sumatra, Indonesia.
5.1	MB	30-May-11	00:06:22	-15.195	-173.3	0	Tonga Islands.
5.0	MB	30-May-11	00:42:25	-38.35	178.462	33	E. Coast of N. Island, New Zealand.
5.0	MB	30-May-11	17:55:04	-7.057	129.439	186	Banda Sea, Indonesia.

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5.3	MB	31-May-11	07:59:44	-9.221	108.822	48	South of Java, Indonesia.
5.2	MB	31-May-11	11:12:29	-8.898	108.47	37	South of Java, Indonesia.
5.1	MB	01-Jun-11	02:30:30	-18.04	168.3	87	Vanuatu Islands.
5.1	MB	01-Jun-11	02:53:38	-7.112	147.688	83	Eastern New Guinea Region, PNG.
5.1	MB	01-Jun-11	19:21:46	-31.718	-177.669	24	Kermadec Islands Region.
5.1	MB	02-Jun-11	06:47:34	-10.416	161.504	164	Solomon Islands.
5.1	MB	03-Jun-11	04:07:12	-20.156	168.424	89	Loyalty Islands.
5.3	MS	03-Jun-11	07:27:11	9.462	92.461	56	Nicobar Islands, India Region.
5.2	MB	04-Jun-11	01:03:31	-4.91	129.372	196	Banda Sea, Indonesia.
5.4	MB	05-Jun-11	07:02:06	-3.726	152.244	3	New Ireland Region, PNG.
5.2	MB	05-Jun-11	07:46:26	3.276	126.644	58	Talau Islands, Indonesia.
6.5	Mwp	05-Jun-11	11:51:17	-55.711	147.491	50	West of Macquarie Island.
5.4	MB	05-Jun-11	16:35:02	-14.843	-177.728	0	Fiji Islands Region.
5.1	MB	05-Jun-11	16:55:49	-14.945	-177.585	0	Fiji Islands region.
5.5	ML	05-Jun-11	21:09:53	-43.61	172.41	15	South west of Christchurch, New Zealand.
5.2	MB	05-Jun-11	23:43:32	-24.208	-178.516	402	South of Fiji Islands.
5.2	MB	07-Jun-11	02:54:22	1.214	96.704	27	Off W Coast of Northern Sumatra.
5.4	MB	08-Jun-11	04:27:52	-20.267	168.474	60	Loyalty Islands.
5.0	MB	08-Jun-11	15:40:14	-4.594	149.969	510	New Britain Region, PNG.
5.4	MB	08-Jun-11	16:32:20	1.194	96.736	35	Off W Coast of Northern Sumatra, Indonesia.
5.3	MB	08-Jun-11	21:46:07	-20.29	168.369	78	Loyalty Islands.
5.0	MB	09-Jun-11	11:46:59	-15.941	-174.188	170	Tonga Islands.
5.1	MB	09-Jun-11	18:34:09	-16.129	-170.474	0	Samoa Islands region.
5.6	MB	09-Jun-11	20:16:25	-30.165	-177.76	14	Kermadec Islands, NZ.
5.5	MB	10-Jun-11	00:11:25	-6.871	147.908	58	Eastern New Guinea.
5.3	MB	10-Jun-11	00:58:57	-6.854	150.564	27	New Britain Region, PNG.
5.1	MB	10-Jun-11	14:31:01	-14.886	171.309	650	Vanuatu Islands Region.
5.0	MB	11-Jun-11	18:59:57	-6.869	129.475	0	Banda Sea.
5.3	MB	11-Jun-11	19:17:47	-7.044	129.392	0	Banda Sea.
5.1	MB	12-Jun-11	19:52:30	-4.741	143.684	103	Papua New Guinea.
5.7	ML	13-Jun-11	01:01:00	-43.577	172.756	9	South Island, New Zealand.
6.3	ML	13-Jun-11	02:20:49	-43.564	172.743	6	South Island, New Zealand.
5.0	MB	13-Jun-11	06:38:43	-15.78	-172.57	85	Samoa Islands Region.
5.4	MB	13-Jun-11	12:46:00	-19.089	-177.399	572	Fiji Islands Region.
6.3	Mwp	13-Jun-11	14:31:24	2.414	126.527	75	Northern Molucca Sea.
5.2	MB	13-Jun-11	15:46:36	-8.104	110.623	153	Java, Indonesia.
5.5	MB	14-Jun-11	00:08:40	1.632	99.268	77	Northern Sumatra, Indonesia.
5.7	MB	14-Jun-11	03:01:32	1.904	99.231	42	Northern Sumatra, Indonesia.
5.3	MB	14-Jun-11	07:13:07	-5.092	153.388	57	New Ireland Region, PNG.
5.0	ML	14-Jun-11	18:27:24	-43.646	172.838	6	South Island, New Zealand.
5.1	MB	15-Jun-11	02:34:16	-7.9	106.946	15	Java, Indonesia.
5.0	MB	15-Jun-11	03:06:44	-1.955	102.119	204	Southern Sumatra, Indonesia.
5.1	MB	15-Jun-11	07:20:39	-14.951	167.105	207	Vanuatu Islands.
6.5	Mwp	16-Jun-11	00:03:42	-6.221	151.118	66	New Britain Region, PNG.
5.0	MB	16-Jun-11	00:36:21	-5.87	151.252	63	New Britain Region, PNG.
5.0	MB	16-Jun-11	01:25:14	-6.063	151.213	67	New Britain Region, PNG.

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5.1	MB	16-Jun-11	01:46:14	-6.115	151.139	47	New Britain Region, PNG.
5.1	MB	16-Jun-11	06:55:58	-6.119	151.243	76	New Britain Region, PNG.
5.3	MB	17-Jun-11	01:15:31	-6.771	104.609	1	Southwest of Sumatra, Indonesia.
5.4	MB	17-Jun-11	03:12:16	-6.07	151.316	44	New Britain Region, PNG.
5.1	MB	18-Jun-11	11:56:39	-6.416	146.5	54	Eastern New Guinea Region, PNG.
5.3	MB	18-Jun-11	11:58:01	1.581	99.103	22	Northern Sumatra, Indonesia.
5.3	MB	18-Jun-11	15:48:37	-6.003	151.256	44	New Britain Region, PNG.
5.4	MB	18-Jun-11	20:04:18	-19.437	-175.691	222	Tonga Islands.
5.6	MB	19-Jun-11	04:15:59	-3.226	101.362	57	Southern Sumatra, Indonesia.
5.1	MB	19-Jun-11	21:26:39	-14.971	-177.934	0	Fiji Islands Region.
5.2	MB	20-Jun-11	18:13:26	-13.346	167.23	261	Vanuatu.
5.1	MB	20-Jun-11	22:05:49	-4.572	135.58	0	Irian Jaya Region, Indonesia.
6.2	Mwp	21-Jun-11	02:04:21	-11.483	165.619	58	Santa Cruz Islands, Solomon Islands.
5.4	ML	21-Jun-11	10:34:23	-43.599	172.525	8	South Island, New Zealand.
5.1	MB	21-Jun-11	11:47:26	-30.622	-177.467	20	Kermadec Islands, New Zealand.
5.3	MB	21-Jun-11	16:25:07	-1.983	99.995	23	Southern Sumatra, Indonesia.
5.4	MB	22-Jun-11	22:16:54	-21.573	-179.017	544	Fiji Islands Region.
5.8	Mwp	24-Jun-11	06:33:06	-10.905	166.053	65	Santa Cruz Islands, Solomon Islands.
5.0	MB	24-Jun-11	13:18:16	-32.195	-177.466	114	South of Kermadec Islands, New Zealand.
5.3	MB	24-Jun-11	17:23:43	6.62	123.616	593	Mindanao, Philippines.
5.7	MB	25-Jun-11	21:16:56	-24.387	179.57	540	South of Fiji Islands.
6.5	Mwp	26-Jun-11	12:16:38	-2.396	136.621	22	Irian Jaya Region, Indonesia.
5.4	MB	26-Jun-11	15:03:21	-2.429	136.696	13	Irian Jaya Region, Indonesia.
5.3	MB	27-Jun-11	00:30:23	-17.11	-173.527	0	Tonga.
5.4	MB	27-Jun-11	13:39:15	-32.948	-178.777	55	South of Kermadec Islands, New Zealand.
5.8	Mwp	27-Jun-11	16:47:14	-9.112	122.436	122	Savu Sea.
5.2	MB	27-Jun-11	20:31:37	-66.544	179.817	0	Balleny Islands region.
5.3	MB	28-Jun-11	07:07:17	-17.037	-176.976	12	Fiji Islands Region.
5.4	MB	28-Jun-11	09:50:05	4.572	125.284	58	Talau Islands, Indonesia.
5.0	MB	28-Jun-11	17:25:54	-15.164	-173.258	0	Samoa Islands.
5.3	MB	29-Jun-11	04:19:37	-5.178	101.639	10	Southwest of Sumatra, Indonesia.
5.1	MB	30-Jun-11	04:30:53	-23.219	-175.289	59	Tonga Islands Region.
5.4	MB	30-Jun-11	09:09:16	-23.324	-175.274	55	Tonga Islands Region.
5.2	MB	30-Jun-11	09:47:08	-23.411	-175.19	67	Tonga Islands Region.
5.1	MB	30-Jun-11	14:16:18	-23.199	-175.3	67	Tonga Islands Region.
5.0	MB	30-Jun-11	17:19:28	-2.641	121.808	8	Sulawesi, Indonesia.
5.1	MB	01-Jul-11	02:38:49	0.878	121.693	60	Minahassa Peninsula, Sulawesi.
5.7	Mwp	01-Jul-11	16:25:51	-6.823	147.869	62	Eastern New Guinea Region, PNG.
5.2	MB	02-Jul-11	17:22:59	-6.31	148.015	60	New Britain Region, PNG.
5.0	MB	02-Jul-11	17:58:38	-6.247	146.65	111	Eastern New Guinea Region, PNG.
5.2	MB	03-Jul-11	14:13:00	-6.009	130.497	127	Banda Sea.

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5.4	MB	04-Jul-11	19:00:59	1.543	97.124	50	Northern Sumatra, Indonesia.
5.4	MB	05-Jul-11	03:36:21	-38.884	175.742	100	North Island, New Zealand.
5.3	MB	05-Jul-11	19:02:33	-14.597	-175.621	0	Samoa Islands Region.
5.1	MB	05-Jul-11	19:09:19	1.58	97.344	67	Northern Sumatra, Indonesia.
5.4	MB	06-Jul-11	06:50:46	-5.741	148.483	189	New Britain Region, PNG.
5.4	MB	06-Jul-11	08:00:02	-1.746	138.687	16	Near North Coast of Papua, Indonesia.
5.4	MB	06-Jul-11	14:46:37	-16.546	-177.415	0	Fiji Islands Region.
5.4	MB	06-Jul-11	16:41:55	-1.819	138.615	10	Near North Coast of Papua, Indonesia.
7.8	Mwp	06-Jul-11	19:03:22	-29.181	-176.24	37	Kermadec Islands Region.
5.3	MB	06-Jul-11	20:35:36	-29.124	-175.9	0	Kermadec Islands Region.
5.4	MB	06-Jul-11	21:04:11	-29.293	-176.408	68	Kermadec Islands Region.
5.0	MB	06-Jul-11	21:25:04	-28.885	-175.569	44	Kermadec Islands Region.
5.0	MB	07-Jul-11	03:41:40	-29.2	-176.152	34	Kermadec Islands Region.
5.3	MB	07-Jul-11	04:40:19	-29.627	-176.113	45	Kermadec Islands Region.
6.1	Mwp	07-Jul-11	09:10:54	-28.818	-176.577	43	Kermadec Islands Region.
5.6	MB	07-Jul-11	09:29:53	-28.888	-176.492	8	Kermadec Islands Region.
5.3	MB	07-Jul-11	13:07:21	-28.968	-176.353	36	Kermadec Islands Region.
5.2	MB	07-Jul-11	14:53:50	-33.497	-178.201	30	South of Kermadec Islands, NZ.
5.6	MB	07-Jul-11	19:08:33	-17.792	-178.448	546	Fiji Islands Region.
5.3	MB	07-Jul-11	21:03:44	-29.307	-176.273	77	Kermadec Islands Region.
5.2	MB	07-Jul-11	23:27:16	-29.024	-176.701	96	Kermadec Islands Region.
5.2	MB	08-Jul-11	03:40:45	-29.135	-176.722	237	Kermadec Islands Region.
5.1	MB	08-Jul-11	05:12:13	-28.876	-176.325	74	Kermadec Islands Region.
5.4	MB	08-Jul-11	05:22:41	0.025	123.349	163	Minahassa Peninsula, Sulawesi.
5.2	MB	08-Jul-11	20:54:06	-17.879	-178.382	591	Fiji Islands Region.
5.3	MB	08-Jul-11	23:31:25	-17.45	-178.852	550	Fiji Islands Region.
5.2	MB	09-Jul-11	00:53:15	-28.662	-176.452	24	Kermadec Islands Region.
5.3	MB	09-Jul-11	05:51:39	-4.156	129.493	33	Banda Sea.
6.1	Mwp	09-Jul-11	06:53:43	-20.939	-174.446	0	Tonga.
5.2	MB	09-Jul-11	07:08:19	-20.931	-174.306	20	Tonga.
5.0	MB	09-Jul-11	12:54:21	-29.053	-175.786	30	Kermadec Islands Region.
5.9	Mwp	09-Jul-11	13:54:21	-29.079	-176.924	23	Kermadec Islands Region.
5.2	MB	09-Jul-11	14:05:05	-28.887	-177.093	90	Kermadec Islands Region.
5.2	MB	09-Jul-11	14:12:23	-29.689	-177.445	18	Kermadec Islands Region.
5.5	MB	09-Jul-11	14:40:46	-35.888	178.164	14	Off East Coast of North Island, NZ.
5.9	Mwp	09-Jul-11	15:02:24	-29.176	-176.413	10	Kermadec Islands Region.
5.0	MB	09-Jul-11	15:17:24	-29.657	-177.192	88	Kermadec Islands Region.
5.1	MB	09-Jul-11	15:25:41	-29.408	-176.859	96	Kermadec Islands Region.
5.3	MB	09-Jul-11	16:17:39	-29.172	-176.539	81	Kermadec Islands Region.
5.2	MB	09-Jul-11	19:02:55	-7.533	128.609	142	Banda Sea.
5.2	MB	09-Jul-11	19:34:44	-28.989	-176.744	69	Kermadec Islands Region.
5.6	MB	09-Jul-11	19:35:27	-29.152	-176.502	105	Kermadec Islands Region.
5.5	MB	10-Jul-11	06:57:28	-32.294	-178.071	37	Kermadec Islands Region.
5.1	MB	10-Jul-11	12:08:02	-32.596	-178.162	20	Kermadec Islands Region.
5.3	MB	10-Jul-11	16:43:05	9.427	122.326	81	Negros, Philippines.
5.3	MB	11-Jul-11	00:27:26	-3.375	146.52	22	Bismarck Sea.

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5.1	MB	11-Jul-11	05:38:09	-29.14	-176.322	59	Kermadec Islands Region.
5.5	MB	11-Jul-11	06:37:29	-29.209	-177.206	78	Kermadec Islands Region.
5.9	Mwp	11-Jul-11	07:15:50	-29.133	-176.586	51	Kermadec Islands Region.
6.6	Mwp	11-Jul-11	20:47:06	9.456	122.349	45	Sulu Sea, Philippines.
5.1	MB	11-Jul-11	21:03:37	9.581	122.163	176	Sulu Sea, Philippines.
5.2	MB	11-Jul-11	22:50:04	9.458	122.258	89	Sulu Sea, Philippines.
5.2	MB	12-Jul-11	00:10:38	9.23	122.042	81	Sulu Sea, Philippines.
5.0	MB	12-Jul-11	01:35:55	9.468	122.117	39	Sulu Sea, Philippines.
5.1	MB	12-Jul-11	04:13:54	-18.28	-177.923	497	Fiji Islands Region.
5.3	MB	12-Jul-11	08:56:21	9.518	122.249	63	Sulu Sea, Philippines.
5.2	MB	12-Jul-11	10:09:42	-15.374	-173.014	0	Tonga Islands.
6.0	Mwp	12-Jul-11	21:06:13	-6.122	130.511	133	Banda Sea.
5.1	MB	12-Jul-11	22:27:31	1.624	127.345	144	Northern Molucca Sea.
5.3	MB	13-Jul-11	05:06:51	-29.035	-176.488	40	Kermadec Islands Region.
5.3	MB	13-Jul-11	07:25:11	-21.475	-173.859	0	Tonga Islands.
5.0	MB	13-Jul-11	15:27:05	-32.616	-176.824	9	Kermadec Islands Region.
5.1	MB	14-Jul-11	18:49:31	9.444	122.014	70	Sulu Sea, Philippines.
5.1	MB	15-Jul-11	05:27:45	-24.385	179.987	533	South of Fiji Islands.
5.3	MB	15-Jul-11	05:50:29	-29.475	-176.453	56	Kermadec Islands Region.
5.0	MB	15-Jul-11	08:42:21	-30.025	-177.226	110	Kermadec Islands region.
5.6	MB	15-Jul-11	15:00:49	-17.231	167.535	36	Vanuatu Islands.
5.3	MB	15-Jul-11	21:45:08	-29.165	-176.317	53	Kermadec Islands Region.
5.8	Mwp	16-Jul-11	07:03:30	-22.232	-174.417	9	Tonga Islands Region.
5.0	MB	16-Jul-11	09:36:59	8.883	92.289	126	Nicobar Islands region, India.
5.0	MB	16-Jul-11	13:31:35	-17.439	167.008	37	Vanuatu Islands.
6.0	Mwp	16-Jul-11	17:06:40	-7.189	127.517	276	Banda Sea, Indonesia.
5.2	MB	16-Jul-11	18:09:46	-18.914	169.459	306	Vanuatu Islands.
5.2	MB	16-Jul-11	21:54:12	-29.904	-176.76	70	Kermadec Islands region.
5.3	MB	17-Jul-11	11:39:37	-35.376	-178.403	43	E of North Island, N.Z.
5.1	MB	18-Jul-11	16:03:51	-29.129	-176.267	46	Kermadec Islands Region.
5.2	MB	19-Jul-11	02:20:49	-30.792	-178.034	108	Kermadec Islands Region.
5.3	MB	19-Jul-11	03:18:35	-1.306	137.816	0	Near the North Coast of Papua, Indonesia.
5.2	MB	19-Jul-11	07:15:56	-23.378	179.223	588	South of the Fiji Islands.
5.2	MB	19-Jul-11	18:20:29	-24.906	178.874	582	South of Fiji Islands.
5.2	MB	20-Jul-11	11:54:52	-28.831	-176.276	35	Kermadec Islands Region.
6.0	Mwp	20-Jul-11	22:05:02	-10.248	162.193	56	Solomon Islands.
5.0	MB	21-Jul-11	04:46:52	-15.328	-173.081	0	North of Tonga.
5.3	MB	21-Jul-11	06:48:07	0.177	98.003	0	Northern Sumatra, Indonesia.
5.1	MB	21-Jul-11	15:35:29	-24.08	-174.659	46	South of Tonga Islands.
5.0	MB	21-Jul-11	19:12:04	-29.095	-176.476	62	Kermadec Islands Region.
6.0	Mwp	21-Jul-11	23:01:44	-62.587	165.677	27	Balleny Islands region, Southern Ocean.
6.0	Mwp	22-Jul-11	06:56:39	-20.126	-178.41	595	Fiji Islands region.
5.4	MB	23-Jul-11	04:40:21	-24.098	-178.595	383	South of Fiji Islands.
5.4	MB	23-Jul-11	14:24:43	-7.605	128.415	143	Banda Sea.
5.3	MB	24-Jul-11	08:23:32	-7.351	106.29	28	Java, Indonesia.
6.3	Mwp	25-Jul-11	00:50:52	-3.323	150.524	40	New Ireland Region, PNG.
5.2	MB	25-Jul-11	05:30:21	-21.076	-174.16	2	Tonga Islands Region.
5.0	MB	25-Jul-11	11:59:06	-8.062	117.603	34	Sumbawa Region, Indonesia.

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5.1	MB	26-Jul-11	07:08:10	-19.751	-177.871	589	Fiji Islands Region.
5.2	MB	26-Jul-11	08:02:30	7.457	126.895	52	Mindanao, Philippines.
5.4	MB	26-Jul-11	17:40:52	-3.214	150.832	37	New Ireland Region, PNG.
5.3	MB	27-Jul-11	05:05:56	-7.721	130.272	20	Tanimbar Islands Region, Indonesia.
5.0	MB	27-Jul-11	20:03:34	-21.8	170.222	152	Loyalty Islands Region, New Caledonia.
5.4	MB	28-Jul-11	04:26:20	-29.058	-176.282	63	Kermadec Islands Region, New Zealand.
5.1	MB	28-Jul-11	23:56:25	-6.586	129.064	194	Banda Sea, Sunda Arc.
6.5	Mwp	29-Jul-11	07:42:23	-23.516	-179.842	523	South of Fiji Islands.
5.3	MB	29-Jul-11	07:50:53	-23.59	-179.787	554	South of Fiji Islands.
6.3	Mwp	31-Jul-11	14:34:50	-16.977	171.837	29	Vanuatu Islands Region.
6.6	Mwp	31-Jul-11	23:38:57	-3.541	144.874	17	Near N Coast of New Guinea, PNG.
5.9	MB	31-Jul-11	23:56:34	-0.104	99.109	46	Northern Sumatra, Indonesia.
5.4	MB	01-Aug-11	00:09:41	-32.452	-178.666	7	South of Kermadec Islands.
5.2	MB	01-Aug-11	03:03:41	-2.106	139.118	22	N Coast of Papua, Indonesia.
5.1	MB	02-Aug-11	01:44:18	-6.471	151.84	68	New Britain Region, PNG.
5.4	MB	02-Aug-11	05:09:24	-6.934	130.031	109	Banda Sea.
5.7	MB	02-Aug-11	19:18:47	-23.803	179.303	544	South of Fiji Islands.
5.1	MB	03-Aug-11	03:20:17	-16.797	-176.996	0	Fiji Islands Region.
5.0	MB	03-Aug-11	04:51:55	-19.299	-177.72	599	Fiji Islands Region.
5.2	MB	03-Aug-11	14:34:57	-3.655	99.78	0	Southwest of Sumatra, Indonesia.
5.2	MB	03-Aug-11	19:23:08	-29.999	-175.552	50	Kermadec Islands Region.
5.4	MB	03-Aug-11	20:02:20	0.983	98.868	93	Northern Sumatra, Indonesia.
5.3	MB	03-Aug-11	20:39:41	-16.146	167.889	203	Vanuatu Islands Region.
6.1	Mwp	03-Aug-11	22:39:26	-5.193	148.312	39	New Britain Region, PNG.
5.5	MB	03-Aug-11	22:48:16	-5.361	148.021	42	New Britain Region, PNG.
5.2	MB	03-Aug-11	22:52:21	-0.384	125.274	61	Southern Molucca Sea.
6.0	Mwp	04-Aug-11	00:16:09	-2.82	101.152	54	Southern Sumatra, Indonesia.
5.1	MB	04-Aug-11	05:47:44	-17.943	-177.725	620	Fiji Islands Region.
5.1	MB	05-Aug-11	01:13:31	-10.465	164.871	90	Santa Cruz Islands.
5.4	MB	05-Aug-11	16:08:47	-29.665	-176.245	29	Kermadec Islands Region.
5.6	Mwp	06-Aug-11	02:45:56	-3.073	100.989	36	Southern Sumatra, Indonesia.
5.1	MB	06-Aug-11	17:17:26	-4.371	152.91	82	New Britain Region, PNG.
5.7	MB	07-Aug-11	06:22:33	-11.778	168.428	392	Santa Cruz Islands Region.
5.3	MB	07-Aug-11	07:01:44	-20.163	179.715	13	South of Fiji Islands.
5.2	MB	07-Aug-11	23:05:10	-5.383	133.924	6	Aru Islands region, Indonesia.
5.2	MB	08-Aug-11	03:34:14	-6.306	149.215	77	New Britain Region, PNG.
5.2	MB	09-Aug-11	00:12:52	-28.992	-176.852	9	Kermadec Islands Region.
5.3	MB	09-Aug-11	04:43:41	-4.379	102.385	53	Southern Sumatra, Indonesia.
5.0	MB	09-Aug-11	11:11:21	-20.472	-178.241	556	Fiji Islands Region.
5.2	MB	10-Aug-11	18:06:17	-7.318	155.28	48	Solomon Islands.
5.2	MB	10-Aug-11	19:39:22	-16.218	-173.672	101	Tonga Islands.
5.5	MB	11-Aug-11	01:13:41	-24.556	-179.952	498	South of Fiji Islands.
5.2	MB	11-Aug-11	19:48:00	-4.828	133.992	5	Irian Jaya Region, Indonesia.

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5.1	MB	12-Aug-11	03:15:08	-21.788	-176.494	240	Fiji Islands Region.
5.3	MB	12-Aug-11	10:46:29	-6.053	147.238	56	Eastern New Guinea Region, PNG.
5.3	MB	12-Aug-11	16:30:41	-3.334	148.717	53	Bismarck Sea.
5	MB	12-Aug-11	23:43:37	-23.812	-176.077	92	South of Fiji Islands.
5.5	MB	13-Aug-11	07:14:49	-30.456	-176.871	52	Kermadec Islands Region.
5.1	MB	13-Aug-11	15:42:24	-15.256	-173.781	125	Tonga Islands.
5.0	MB	13-Aug-11	16:11:56	-4.125	100.929	0	Southwest of Sumatra, Indonesia.
5.1	MB	13-Aug-11	21:31:20	-6.652	129.833	170	Banda Sea.
5.4	MB	14-Aug-11	12:58:24	-22.684	-179.369	557	South of Fiji Islands.
5.1	MB	14-Aug-11	17:38:46	-23.278	-179.471	599	South of Fiji Islands.
6.3	Mwp	16-Aug-11	11:03:58	-2.648	128.022	40	Ceram Sea.
5.9	Mwp	16-Aug-11	17:33:08	-5.619	147.181	185	Eastern New Guinea Region, PNG.
5.6	Mwp	17-Aug-11	10:49:09	-12.359	166.513	57	Santa Cruz Islands, New Hebrides Islands.
5.1	MB	18-Aug-11	21:42:43	-7.272	106.378	63	Java, Indonesia.
6.2	Mwp	19-Aug-11	03:54:24	-16.599	-176.978	372	Fiji Islands.
5.5	MB	19-Aug-11	07:48:08	-7.915	123.259	207	Banda Sea, Indonesia.
5.7	Mwp	20-Aug-11	01:24:57	-22.017	-174.475	2	Tonga Islands Region.
7.5	Mwp	20-Aug-11	16:55:01	-18.462	168.09	3	Vanuatu Islands.
5.3	MB	20-Aug-11	17:02:52	-18.592	168.094	73	Vanuatu Islands.
5.2	MB	20-Aug-11	17:08:37	-31.33	-179.686	138	Kermadec Islands Region.
6.0	MB	20-Aug-11	17:13:10	-18.312	168.16	62	Vanuatu Islands.
5.4	MB	20-Aug-11	18:02:04	-18.462	167.874	59	Vanuatu Islands.
7.4	Mwp	20-Aug-11	18:19:26	-18.361	168.215	35	Vanuatu Islands.
5.2	MB	20-Aug-11	19:23:12	-18.102	168.085	111	Vanuatu Islands.
5.3	MB	20-Aug-11	21:38:26	-18.196	168.138	83	Vanuatu Islands.
5.1	MB	21-Aug-11	00:09:28	-18.271	167.479	40	Vanuatu Islands.
5.8	Mwp	21-Aug-11	00:23:38	-18.087	168.146	38	Vanuatu Islands.
5.6	MB	21-Aug-11	01:24:14	-18.311	168.436	77	Vanuatu Islands.
5.5	MB	21-Aug-11	02:09:19	-18.544	168.352	80	Vanuatu Islands.
5.0	MB	21-Aug-11	04:44:15	-11.067	162.831	211	Solomon Islands.
5.0	MB	21-Aug-11	06:45:27	-2.163	128.001	48	Ceram Sea.
5.5	MB	21-Aug-11	08:18:18	4.726	94.961	61	Off W Coast of Northern Sumatra.
5.1	MB	21-Aug-11	09:03:56	-18.624	168.155	98	Vanuatu Islands.
5.8	MB	21-Aug-11	13:04:12	-5.724	151.067	66	New Britain Region, P.N.G..
5.0	MB	22-Aug-11	02:52:58	-18.775	166.418	262	Vanuatu Islands Region.
5.9	Mwp	22-Aug-11	06:04:55	-17.422	167.298	20	Vanuatu Islands.
6.0	Mwp	22-Aug-11	09:38:39	-28.82	-176.413	31	Kermadec Islands Region.
5.1	MB	22-Aug-11	14:55:33	-7.553	128.123	169	Banda Sea, Sunda Arc.
6.1	Mwp	22-Aug-11	20:12:22	-6.459	103.924	44	Southwest of Sumatra, Indonesia.
5.2	MB	22-Aug-11	22:18:52	-18.275	-177.809	632	Fiji Islands Region.
5.0	MB	23-Aug-11	00:41:13	-22.073	-178.988	529	South of Fiji Islands.
5.1	MB	23-Aug-11	19:01:53	1.1	120.209	67	Minahassa Peninsula, Sulawesi.
5.5	MB	23-Aug-11	19:29:59	-6.304	147.491	64	Eastern New Guinea Region, PNG.
5.1	MB	24-Aug-11	12:05:22	-9.004	158.063	20	Solomon Islands.
6.4	Mwp	24-Aug-11	23:06:21	-18.111	167.808	49	Vanuatu Islands.

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5.8	Mwp	25-Aug-11	10:39:56	-13.617	167.062	144	Vanuatu Islands.
5.4	MB	25-Aug-11	14:23:50	-18.204	167.777	85	Vanuatu Islands.
5.2	MB	25-Aug-11	15:16:24	-18.794	167.067	94	Vanuatu Islands.
5.4	MB	25-Aug-11	18:21:34	-18.164	167.922	45	Vanuatu Islands.
5.0	MB	26-Aug-11	11:36:21	-18.073	168.098	106	Vanuatu Islands.
5.2	MB	27-Aug-11	09:42:14	-17.183	176.266	13	Fiji Islands Region.
5.2	MB	27-Aug-11	12:07:34	-18.004	168.521	57	Vanuatu Islands.
6.0	Mwp	27-Aug-11	20:31:55	-24.332	-179.885	524	South of Fiji Islands.
5.1	MB	28-Aug-11	12:09:55	2.259	126.459	89	Northern Molucca Sea.
5.5	MB	29-Aug-11	18:57:39	-16.306	168.047	205	Vanuatu Islands.
6.9	Mwp	30-Aug-11	06:57:41	-6.422	126.781	465	Banda Sea.
5.4	MB	30-Aug-11	09:14:10	-18.143	167.879	80	Vanuatu Islands.
5.8	Mwp	30-Aug-11	09:16:58	-18.203	167.819	67	Vanuatu Islands.
5.4	MB	30-Aug-11	09:26:03	-17.911	168.275	19	Vanuatu Islands.
5.0	MB	30-Aug-11	11:36:53	-49.562	161.3	23	North of Macquarie Island, New Zealand.
5.5	MB	30-Aug-11	15:00:48	-6.152	147.206	46	Eastern New Guinea Region.
5.1	MB	30-Aug-11	21:19:11	-18.148	168.206	83	Vanuatu Islands.
5.1	MB	31-Aug-11	03:08:30	2.547	96.35	45	Northern Sumatra, Indonesia.
5.1	MB	31-Aug-11	09:56:23	-18.782	167.578	62	Vanuatu Islands.
5.8	Mwp	31-Aug-11	10:46:44	-5.901	153.322	5	New Ireland Region, PNG.
6.2	Mwp	01-Sep-11	06:14:42	-12.494	166.571	61	Santa Cruz Islands, Solomon Islands.
5.1	MB	01-Sep-11	12:30:01	-18.094	167.297	57	Vanuatu Islands.
5.4	MB	01-Sep-11	20:08:54	-18.338	168.555	67	Vanuatu Islands.
5.2	MB	02-Sep-11	20:19:01	2.652	128.683	217	Halmahera, Indonesia.
5.7	Mwp	03-Sep-11	01:06:58	-12.901	166.7	115	Santa Cruz Islands.
7.0	Mwp	03-Sep-11	22:55:37	-20.643	169.846	154	Vanuatu Islands.
6.3	Mwp	04-Sep-11	21:44:25	-19.145	168.872	108	Vanuatu Islands Region.
6.2	Mwp	05-Sep-11	09:51:55	-15.281	-173.53	0	Tonga Islands.
6.6	Mwp	05-Sep-11	17:55:09	2.931	98.047	68	Northern Sumatra, Indonesia.
5.0	MB	05-Sep-11	22:33:16	-24.483	-179.051	537	South of Fiji Islands.
5.6	MB	06-Sep-11	10:51:36	-34.147	179.291	15	South of Kermadec Islands.
5.0	MB	06-Sep-11	15:13:38	-10.856	163.91	61	Solomon Islands.
5.4	MB	07-Sep-11	06:07:26	9.823	126.116	2	Mindanao, Philippines.
5.1	MB	07-Sep-11	07:29:32	-4.876	133.964	109	Near the South coast of Papua, Indonesia.
5.2	MB	07-Sep-11	10:16:38	-17.866	-178.314	604	Fiji Islands Region.
5.1	MB	08-Sep-11	21:03:50	-19.238	167.771	72	Vanuatu Islands Region.
5.3	MB	09-Sep-11	19:26:00	-49.553	164.103	0	Auckland Islands Region, New Zealand.
6.1	Mwp	11-Sep-11	23:37:39	-18.081	167.722	56	Vanuatu Islands.
5.2	MB	12-Sep-11	07:30:34	5.018	127.46	116	Philippine Islands region.
5.4	MB	12-Sep-11	18:23:56	-6.529	103.472	26	Southwest of Sumatra, Indonesia.
6.3	Mwp	12-Sep-11	22:44:32	-3.678	144.14	40	Near N Coast of New Guinea, PNG.
5.1	MB	13-Sep-11	07:56:08	-7.007	143.744	0	New Guinea, PNG.
5.7	MB	14-Sep-11	13:36:37	-34.743	-178.767	34	E of North Island, NZ.
5.3	MB	14-Sep-11	15:54:51	-6.283	103.527	44	SW of Sumatra, Indonesia.
6.2	Mwp	15-Sep-11	07:53:14	-35.233	-178.427	0	E of North Island, NZ.
7.2	Mwp	15-Sep-11	19:31:00	-21.468	-179.272	599	Fiji Islands Region.

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5.6	MB	16-Sep-11	18:23:27	-20.64	169.912	129	Vanuatu Islands.
5.2	MB	16-Sep-11	22:09:30	-5.152	129.389	229	Banda Sea.
5.1	MB	17-Sep-11	01:32:56	-12.023	166.039	64	Santa Cruz Islands.
5.1	MB	18-Sep-11	18:35:25	-10.515	161.489	83	Solomon Islands.
5.4	MB	18-Sep-11	23:09:22	-2.151	125.188	37	Ceram Sea, Borneo - Celebes.
5.2	MB	20-Sep-11	03:48:50	-3.668	135.492	50	Papua, Indonesia.
5.1	MB	20-Sep-11	21:28:29	-18.683	169.298	230	Vanuatu Islands.
5.2	MB	20-Sep-11	22:44:41	-21.995	-176.442	36	Fiji Islands Region.
5.3	MB	21-Sep-11	04:40:04	-6.787	132.524	56	Tanimbar Islands Region, Indonesia.
5.2	MB	21-Sep-11	19:52:29	-9.824	117.804	22	Sumbawa Region, Indonesia.
5.4	MB	22-Sep-11	10:20:31	-4.134	103.058	96	Southern Sumatra, Indonesia.
6.2	Mwp	22-Sep-11	23:07:00	-15.388	-174.883	0	Tonga Islands.
5.1	MB	24-Sep-11	02:57:52	-6.48	151.697	68	New Britain Region, PNG.
5.1	MB	25-Sep-11	02:03:01	-21.446	-179.168	610	Fiji Islands Region.
5.5	MB	26-Sep-11	03:39:24	-7.382	123.056	562	Banda Sea, Indonesia.
5.2	MB	26-Sep-11	07:27:52	-16.783	-173.04	51	Samoa Islands Region.
5.6	MB	27-Sep-11	00:37:28	-17.534	-177.978	454	Fiji Islands Region.
5.0	MB	27-Sep-11	12:34:33	-24.237	-174.708	102	South of Tonga.
5.3	MB	27-Sep-11	17:42:37	-22.693	172.217	86	Southeast of Loyalty Islands, New Caledonia.
5.1	MB	27-Sep-11	20:35:12	-22.948	171.973	0	Southeast of Loyalty Islands, New Caledonia.
5.2	MB	27-Sep-11	21:13:43	-23.097	172.021	0	Southeast of Loyalty Islands, New Caledonia.
5.4	MB	28-Sep-11	17:36:16	-22.802	171.978	46	Southeast of Loyalty Islands, New Caledonia.
5.3	MB	28-Sep-11	17:56:32	-23.035	171.96	0	Southeast of Loyalty Islands, New Caledonia.
5.4	MB	30-Sep-11	05:19:23	-22.537	171.792	15	Southeast of Loyalty Islands, New Caledonia.
5.2	MB	30-Sep-11	13:05:57	8.341	126.764	0	Mindanao, Philippines.
5.3	MB	01-Oct-11	04:21:51	7.25	123.69	617	Mindanao, Philippines.
5.2	MB	01-Oct-11	10:16:46	-17.109	-175.062	244	Tonga Islands.
5.7	MB	01-Oct-11	10:54:28	-48.943	164.558	0	Off W Coast of S Island, NZ.
5.1	MB	01-Oct-11	23:20:16	-24.956	-179.896	509	South of Fiji Islands.
5.3	MB	02-Oct-11	14:57:01	1.327	126.315	60	Northern Molucca Sea.
5.0	MB	03-Oct-11	06:36:17	-4.959	129.962	13	Banda Sea.
5.1	MB	03-Oct-11	08:57:47	-5.146	152.758	25	New Britain Region, PNG.
5.2	MB	03-Oct-11	14:19:00	-10.567	164.831	78	Santa Cruz Islands Region.
5.1	MB	03-Oct-11	22:08:05	-9.349	120.151	69	Sumba Region, Indonesia.
5.0	MB	04-Oct-11	21:00:27	-21.503	170.11	63	Southeast of Loyalty Islands.
5.0	MB	05-Oct-11	07:34:49	5.118	126.551	99	Mindanao, Philippines.
5.6	Mwp	06-Oct-11	07:37:08	9.494	138.276	84	W. Caroline Islands, Micronesia.
5.2	MB	06-Oct-11	15:26:28	-14.874	167.428	203	Vanuatu Islands.
5.7	MB	07-Oct-11	06:30:16	-22.202	171.316	88	Southeast of Loyalty Islands.
6.0	Mwp	07-Oct-11	08:58:28	-32.421	-178.246	55	South of Kermadec Islands.
5.2	MB	07-Oct-11	12:14:41	-32.527	-178.07	63	South of Kermadec Islands.
5.5	MB	08-Oct-11	05:38:53	-4.79	134.212	0	Irian Jaya Region, Indonesia.
6.1	Mwp	08-Oct-11	08:53:15	-20.783	-173.739	0	Tonga Islands.

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5.4	MB	08-Oct-11	15:08:32	-17.808	-178.372	587	Fiji Islands Region.
5.2	MB	10-Oct-11	00:54:13	-14.527	167.957	75	Vanuatu Islands.
5.3	MB	10-Oct-11	04:43:17	-4.972	151.506	168	New Britain Region, PNG.
5.1	MB	10-Oct-11	18:14:23	-29.25	-176.124	46	Kermadec Islands Region.
5.1	MB	11-Oct-11	10:25:11	-7.019	103.343	0	Southwest of Sumatra, Indonesia.
5.1	MB	11-Oct-11	11:16:51	-29.082	-176.164	34	Kermadec Islands Region.
5.9	Mwp	11-Oct-11	13:05:46	-2.315	138.861	4	Papua, Indonesia.
5.2	MB	12-Oct-11	08:59:56	-3.553	100.753	26	Southern Sumatra, Indonesia.
5.0	MB	12-Oct-11	14:51:02	0.04	123.453	7	Minahassa Peninsula, Sulawesi.
6.3	Mwp	13-Oct-11	03:16:27	-9.639	114.537	16	South of Bali, Indonesia.
5.1	MB	13-Oct-11	07:52:47	-9.576	114.441	52	South of Bali, Indonesia.
5.2	MB	13-Oct-11	15:05:21	-3.912	105.967	60	Southern Sumatra, Indonesia.
6.5	Mwp	14-Oct-11	03:35:17	-6.707	147.864	70	Eastern New Guinea Region, PNG.
5.1	MB	14-Oct-11	18:00:45	-28.883	-175.906	25	Kermadec Islands region.
5.4	MB	15-Oct-11	22:24:46	-25.663	-176.436	173	South of Fiji Islands.
5.2	MB	16-Oct-11	01:21:43	-31.39	-179.619	233	Kermadec Islands Region.
5.4	MB	16-Oct-11	04:24:48	-19.975	169.227	117	Vanuatu Islands.
5.5	MB	16-Oct-11	17:16:20	2.394	96.154	41	Northern Sumatra, Indonesia.
5.2	MB	17-Oct-11	19:51:54	-5.909	151.2	49	New Britain Region, PNG.
6.3	Mwp	18-Oct-11	05:05:09	-5.922	151.081	51	New Britain Region, PNG.
5.3	MB	20-Oct-11	03:38:55	-29.709	-176.018	11	Kermadec Islands Region.
5.0	MB	20-Oct-11	16:07:31	-52.551	141.036	97	West of Macquarie Island, Australia.
5.3	MB	21-Oct-11	02:55:59	-6.773	129.974	115	Banda Sea.
7.3	Mwp	21-Oct-11	17:57:19	-28.705	-176.132	53	Kermadec Islands Region.
5.0	MB	22-Oct-11	00:18:00	-7.796	104.165	0	Southwest of Sumatra, Indonesia.
5.0	MB	22-Oct-11	08:34:27	-4.593	101.351	40	Southern Sumatra, Indonesia.
5.4	MB	22-Oct-11	09:38:45	-28.39	-175.992	0	Kermadec Islands Region.
5.5	MB	23-Oct-11	03:26:31	7.574	134.793	72	W Caroline Islands, Micronesia.
5.0	MB	24-Oct-11	11:49:54	-29.324	-175.963	19	Kermadec Islands Region.
5.1	MB	24-Oct-11	17:34:58	-31.641	-178.761	106	Kermadec Islands Region.
5.2	MB	25-Oct-11	19:34:20	-15.162	167.346	146	Vanuatu Islands.
5.4	MB	26-Oct-11	03:38:54	-2.294	100.025	48	Southern Sumatra, Indonesia.
5.8	Mwp	27-Oct-11	00:15:23	-17.918	-179.314	595	Fiji Islands Region.
5.1	MB	28-Oct-11	05:57:11	-10.472	161.581	49	Solomon Islands.
5.1	MB	28-Oct-11	08:14:19	4.81	93.704	0	Northern Sumatra, Indonesia.
5.7	MB	28-Oct-11	11:06:53	-28.296	-175.822	35	Kermadec Islands Region.
5.0	MB	28-Oct-11	16:50:40	-7.115	143.694	39	New Guinea, PNG.
5.4	MB	28-Oct-11	23:50:58	-3.128	129.651	41	Seram, Indonesia.
5.2	MB	30-Oct-11	05:09:07	5.109	125.354	217	Mindanao, Philippines.
5.6	MB	30-Oct-11	11:52:30	-3.211	101.495	64	Southern Sumatra, Indonesia.
5.2	MB	01-Nov-11	01:03:55	-0.066	123.418	168	Minahassa Peninsula, Sulawesi.
5.3	MB	01-Nov-11	22:02:15	2.62	97.229	69	Northern Sumatra, Indonesia.

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5.3	MB	01-Nov-11	23:21:20	-7.189	129.098	181	Banda Sea, Sunda Arc.
5.2	MB	04-Nov-11	14:59:52	-9.3	115.661	50	South of Bali, Indonesia.
5.8	Mwp	04-Nov-11	15:43:45	-15.13	167.51	151	Vanuatu Islands.
5.3	MB	04-Nov-11	21:31:31	-7.188	103.778	9	Southwest of Sumatra, Indonesia.
6.2	Mwp	05-Nov-11	01:49:20	-18.236	168.437	51	Vanuatu Islands.
5.0	MB	05-Nov-11	12:09:40	-4.597	139.057	16	Irian Jaya, Indonesia.
5.1	MB	05-Nov-11	16:49:33	-28.757	-176.149	51	Kermadec Islands Region.
5.2	MB	05-Nov-11	23:28:01	6.613	123.749	570	Mindanao, Philippines.
5.1	MB	06-Nov-11	00:46:30	-8.328	127.984	55	Timor Sea.
5.2	MB	06-Nov-11	04:41:57	-6.258	106.234	160	Java, Indonesia.
5.2	MB	07-Nov-11	01:44:06	-5.162	148.774	187	Bismarck Sea.
5.2	MB	07-Nov-11	04:01:57	-4.636	149.125	135	Bismarck Sea.
5.4	MB	07-Nov-11	04:44:39	-3.622	149.687	66	Bismarck Sea.
5.1	MB	07-Nov-11	09:43:17	7.406	125.063	39	Mindanao, Philippines.
6.0	Mwp	07-Nov-11	16:51:24	-63.173	170.95	0	Balleny Islands Region.
5.0	MB	07-Nov-11	22:04:28	-8.103	117.425	0	Bali Sea.
5.0	MB	08-Nov-11	18:54:46	-14.783	-173.389	44	Samoa Islands Region.
5.0	MB	09-Nov-11	02:58:56	-4.547	130.412	68	Banda Sea.
5.4	MB	10-Nov-11	02:34:52	-1.848	138.444	8	Near North Coast of Papua, Indonesia.
5.2	MB	10-Nov-11	07:51:25	-21.284	170.029	93	Southeast of Loyalty Islands.
5.2	MB	11-Nov-11	14:00:07	-3.402	135.528	20	Irian Jaya Region, Indonesia.
5.8	MB	11-Nov-11	15:02:15	-17.575	-172.412	0	Tonga Islands Region.
5.3	MB	11-Nov-11	19:00:33	-21.422	170.009	113	Southeast of Loyalty Islands.
5.1	MB	13-Nov-11	19:21:31	-17.459	-172.38	0	Tonga Islands Region.
6.6	Mwp	14-Nov-11	04:05:14	-0.982	126.962	40	Southern Molucca Sea, Indonesia.
5.6	Mwp	15-Nov-11	07:56:03	-7.627	127.87	182	Banda Sea.
5.6	Mwp	15-Nov-11	10:43:52	-0.199	121.895	275	Minahassa Peninsula, Sulawesi, Indonesia.
6.0	Mwp	15-Nov-11	23:42:32	-5.379	140.31	38	Irian Jaya, Indonesia.
5.3	MB	18-Nov-11	02:43:55	-37.691	179.392	18	Off East Coast of North Island, NZ.
5.6	Mwp	18-Nov-11	04:34:03	-37.668	179.489	0	Off East Coast of North Island, NZ.
6.1	Mwp	18-Nov-11	07:51:25	-37.617	179.419	16	Off East Coast of North Island, NZ.
5.1	MB	18-Nov-11	08:56:09	-6.32	149.162	41	New Britain Region, PNG.
5.2	MB	19-Nov-11	01:21:52	-32.649	-177.163	7	South of Kermadec Islands.
5.1	MB	19-Nov-11	01:58:11	-7.466	128.322	139	Banda Sea.
5.0	MB	19-Nov-11	06:22:39	-20.274	-177.528	507	Fiji Islands Region.
5.4	MB	20-Nov-11	14:09:27	-22.799	-174.829	19	Tonga Islands Region.
5.2	MB	20-Nov-11	16:31:43	-3.004	142.014	38	Near North Coast of New Guinea.
5.1	MB	20-Nov-11	18:00:19	-2.905	142.039	53	Near North Coast of New Guinea.
5.0	MB	21-Nov-11	01:39:10	-22.748	-178.764	431	South of Fiji Islands.
5.3	MB	21-Nov-11	19:38:36	-37.612	178.94	45	Off East Coast of North Island, New Zealand.
5.3	MB	22-Nov-11	05:06:15	-1.863	99.478	68	Southern Sumatra, Indonesia.
5.0	MB	22-Nov-11	15:30:19	-17.033	-179.044	519	Fiji Islands Region.

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5.4	MB	22-Nov-11	16:45:16	-2.165	99.437	4	Southern Sumatra, Indonesia.
5.4	MB	22-Nov-11	16:54:02	-2.282	99.405	0	Southern Sumatra, Indonesia.
5.0	MB	23-Nov-11	07:14:41	-22.998	-174.844	35	Tonga Islands Region.
5.0	MB	23-Nov-11	22:06:00	1.336	121.667	50	Minahassa Peninsula, Indonesia.
5.2	MB	24-Nov-11	03:55:31	-8.508	109.829	51	Java, Indonesia.
5.2	MB	24-Nov-11	10:23:51	-21.869	-179.32	602	Fiji Islands Region.
5.3	MB	24-Nov-11	18:41:07	-16.048	-173.571	80	Tonga Islands.
5.1	MB	24-Nov-11	23:18:42	-2.443	140.099	18	Near North Coast of Papua, Indonesia.
5.0	MB	26-Nov-11	09:16:27	-14.582	167.418	186	Vanuatu Islands.
5.0	MB	27-Nov-11	09:12:49	-30.33	-177.122	39	Kermadec Islands, New Zealand.
5.5	MB	27-Nov-11	11:01:08	0.398	98.234	33	Northern Sumatra, Indonesia.
5.3	MB	27-Nov-11	14:41:00	-18.618	-174.341	92	Tonga Islands.
5.1	MB	27-Nov-11	17:48:04	-12.464	165.758	69	Santa Cruz Islands.
5.4	MB	27-Nov-11	19:59:44	1.977	127.012	83	Halmahera, Indonesia.
5.1	MB	28-Nov-11	01:44:17	-24.676	179.994	471	South of Fiji Islands.
5.6	Mwp	28-Nov-11	09:13:10	-7.063	117.014	610	Bali Sea.
6.0	Mwp	28-Nov-11	12:26:49	-5.619	153.623	54	New Ireland Region, PNG.
5.2	MB	28-Nov-11	14:27:57	-5.66	153.702	49	New Ireland Region, PNG.
5.1	MB	29-Nov-11	07:38:19	-1.261	126.677	47	Southern Molucca Sea.
5.2	MB	29-Nov-11	17:01:48	-54.402	158.093	0	Macquarie Island Region.
5.4	MB	29-Nov-11	17:43:28	-4.338	102.031	45	Southern Sumatra, Indonesia.
5.4	MB	29-Nov-11	23:44:23	-19.868	-175.737	201	Tonga Islands.
5.5	MB	30-Nov-11	14:57:39	-21.828	-176.454	129	Fiji Islands Region.
5.6	MB	30-Nov-11	19:42:37	7.871	94.068	45	Nicobar Islands, India Region.
5.1	MB	01-Dec-11	16:26:02	-14.816	167.3	170	Vanuatu Islands.
5.5	MB	01-Dec-11	20:21:44	-17.832	-178.44	569	Fiji Islands Region.
5.6	MB	01-Dec-11	22:53:41	-0.775	121.931	43	Minahassa Peninsula, Sulawesi.
5.8	MB	02-Dec-11	05:19:29	0.021	120.426	95	Minahassa Peninsula, Sulawesi.
5.0	MB	02-Dec-11	13:42:31	-18.772	-177.439	620	Fiji Islands Region.
5.3	MB	02-Dec-11	19:37:49	7.753	93.889	46	Nicobar Islands, India Region.
5.2	MB	03-Dec-11	06:19:05	-41.52	174.908	37	Cook Strait, New Zealand.
5.4	MB	03-Dec-11	12:26:14	-0.598	132.01	0	Irian Jaya Region, Indonesia.
5.2	MB	04-Dec-11	14:45:33	-30.538	-177.861	96	Kermadec Islands, New Zealand.
5.2	MB	04-Dec-11	18:09:47	1.603	95.334	36	Off W Coast of Northern Sumatra, Indonesia.
5.4	MB	04-Dec-11	18:53:03	-5.465	140.353	32	Irian Jaya, Indonesia.
5.3	MB	04-Dec-11	21:45:27	-4.04	127.658	184	Banda Sea, Sunda Arc.
5.1	ML	05-Dec-11	19:10:00	-21.514	114.416	15	NE of Exmouth, WA.
5.7	MB	05-Dec-11	19:28:36	-4.912	133.662	16	Irian Jaya Region, Indonesia.
5.1	MB	06-Dec-11	15:04:20	1.477	127.273	130	Halmahera, Indonesia.
5.3	MB	07-Dec-11	04:08:27	-20.481	-173.488	0	Tonga Islands.
5.8	Mwp	07-Dec-11	13:38:29	-1.524	126.524	42	Southern Molucca Sea.
5.0	MB	08-Dec-11	09:25:24	3.846	125.482	131	Sangihe Ridge, Indonesia.

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5.0	MB	11-Dec-11	01:57:00	-4.58	149.491	577	Bismarck Sea, Papua New Guinea.
5.7	MB	11-Dec-11	05:30:57	-23.966	178.732	552	South of Fiji Islands.
5.1	MB	11-Dec-11	20:18:15	-5.981	130.644	131	Banda Sea.
5.2	MB	11-Dec-11	21:56:04	-7.024	155.586	97	Solomon Islands.
5.1	MB	12-Dec-11	15:02:05	-12.158	167.027	235	Santa Cruz Islands.
5.2	MB	12-Dec-11	15:43:40	0.003	123.407	162	Minahassa Peninsula, Sulawesi.
5.2	MB	13-Dec-11	01:20:45	3.003	128.404	118	North of Halmahera, Indonesia.
6.3	Mwp	13-Dec-11	07:52:13	-0.068	123.148	182	Minahassa Peninsula, Sulawesi, Indonesia.
5.2	MB	14-Dec-11	00:48:07	-15.257	-174.469	0	Tonga Islands.
7.2	Mwp	14-Dec-11	05:04:57	-7.568	146.811	128	Eastern New Guinea Region, PNG.
5.3	MB	15-Dec-11	07:12:04	-29.021	-176.115	11	Kermadec Islands Region.
6.1	Mwp	15-Dec-11	10:10:13	-32.312	-178.704	83	South of the Kermadec Islands.
5.0	MB	16-Dec-11	15:12:45	7.818	94.064	48	Nicobar Islands, India Region.
5.2	MB	16-Dec-11	19:30:14	4.163	93.051	0	Off W Coast of Northern Sumatra, Indonesia.
5.0	MB	16-Dec-11	20:34:31	-21.679	170.676	160	Southeast of Loyalty Islands.
5.2	MB	16-Dec-11	23:18:01	-10.603	102.032	0	Southwest of Sumatra, Indonesia.
5.3	MB	17-Dec-11	10:18:24	-32.706	-178.426	48	South of Kermadec Islands.
5.0	MB	18-Dec-11	20:08:43	-6.66	147.979	181	Eastern New Guinea Region, PNG.
5.7	MB	19-Dec-11	01:23:28	-1.347	119.57	42	Sulawesi, Indonesia.
5.2	MB	19-Dec-11	05:32:40	-29.325	-177.335	193	Kermadec Islands, New Zealand.
5.4	MB	20-Dec-11	18:45:34	-7.258	127.501	259	Banda Sea.
5.7	MB	21-Dec-11	13:37:27	-32.784	-178.707	110	South of Kermadec Islands.
5.3	MB	22-Dec-11	08:18:13	-3.323	135.646	21	Irian Jaya Region, Indonesia.
5.0	MB	22-Dec-11	12:11:54	-9.205	107.631	28	South of Java, Indonesia.
6.1	Mwp	23-Dec-11	00:58:39	-43.391	172.995	9	Off E Coast of S Island of NZ.
6.1	Mwp	23-Dec-11	02:18:07	-43.292	172.864	27	Off E Coast of S Island NZ.
5.4	MB	23-Dec-11	10:52:11	-33.36	-178.114	41	South of Kermadec Islands.
5.0	MB	23-Dec-11	14:54:13	-3.237	148.24	70	Bismarck Sea.
5.1	MB	23-Dec-11	17:37:26	-44.009	173.622	0	Off East Coast of South Island, NZ.
5.1	MB	24-Dec-11	17:14:14	-5.087	153.642	61	New Ireland Region, PNG.
6.0	Mwp	26-Dec-11	04:48:06	-16.209	-173.613	76	Tonga Islands.
5.1	MB	26-Dec-11	13:05:29	-18.241	-177.628	581	Fiji Islands Region.
5.6	MB	26-Dec-11	16:12:35	-19.098	168.806	62	Vanuatu Islands.
5.0	MB	26-Dec-11	17:55:47	-4.776	153.722	74	New Ireland Region, PNG.
5.1	MB	26-Dec-11	18:31:38	-22.283	171.995	42	Southeast of Loyalty Islands.
5.1	MB	26-Dec-11	20:34:39	9.406	126.776	43	Mindanao, Philippines.
5.1	MB	28-Dec-11	04:53:31	-5.151	129.884	210	Banda Sea.
5.3	MB	28-Dec-11	06:38:57	-21.769	-179.327	596	Fiji Islands Region.
5.7	MB	28-Dec-11	17:33:55	1.575	127.564	161	Halmahera, Indonesia.
5.0	MB	28-Dec-11	21:55:44	-17.791	-174.846	223	Tonga Islands.
5.6	MB	29-Dec-11	20:05:51	-18.648	168.333	51	Vanuatu Islands.
5.4	MB	29-Dec-11	22:25:50	-4.688	155.288	507	Solomon Islands.

5.3	MB	30-Dec-11	08:51:59	-5.754	104.394	67	Southern Sumatra, Indonesia.
5.0	MB	30-Dec-11	17:29:47	-32.566	-177.104	0	South of Kermadec Islands.
5.2	MB	30-Dec-11	21:43:05	-32.569	-176.632	0	South of Kermadec Islands.
5.3	Mwp	31-Dec-11	00:44:46	-43.593	172.899	9	South Island of New Zealand.
5.2	MB	31-Dec-11	04:05:44	-1.144	126.867	23	Southern Molucca Sea.
5.0	MB	31-Dec-11	06:14:39	-1.119	126.855	24	Southern Molucca Sea.

World

Geoscience Australia detects and locates any earthquakes in the World of Magnitude 6 or higher.

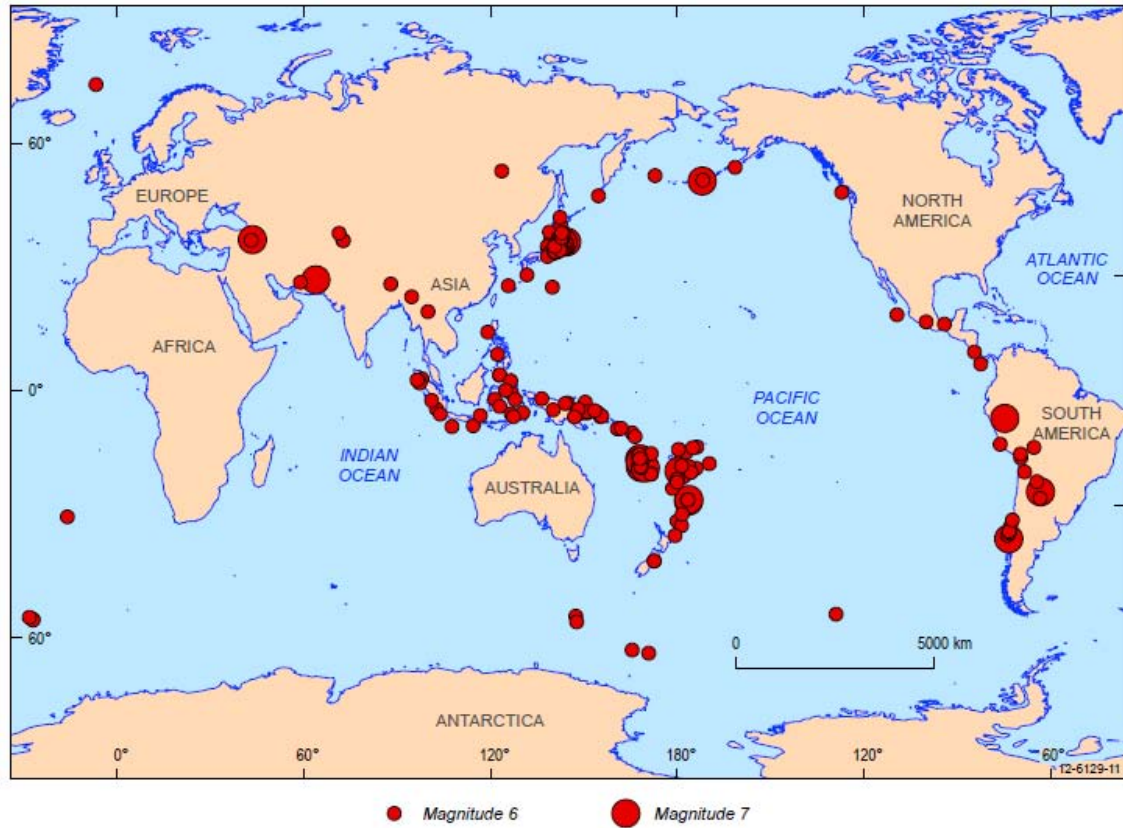


Figure 28: Map of 2011 Magnitude 6+ World Earthquakes.

Table 35: World Top 5 Earthquakes 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME(UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
9.0	Mw	11-Mar-11	05:46:24	38.322	142.369	32	Near East coast of Honshu, Japan.
7.8	Mwp	06-Jul-11	19:03:22	-29.181	-176.24	37	Kermadec Islands Region.
7.5	Mwp	20-Aug-11	16:55:01	-18.462	168.09	3	Vanuatu Islands.
7.4	Mwp	20-Aug-11	18:19:26	-18.361	168.215	35	Vanuatu Islands.
7.3	Mwp	21-Oct-11	17:57:19	-28.705	-176.132	53	Kermadec Islands Region.

Table 36: World Earthquakes Magnitude 6+ 2011

MAGNITUDE	MAGNITUDE TYPE	DATE	TIME (UTC)	LATITUDE	LONGITUDE	DEPTH (KM)	APPROXIMATE LOCATION
7.0	Mwp	01-Jan-11	09:56:58	-26.79	-63.07	577	Santiago Del Estero, Argentina.
7.2	Mwp	02-Jan-11	20:20:18	-38.354	-73.275	25	Araucania, Chile.
6.3	Mwp	05-Jan-11	06:46:14	-22.248	171.78	115	SE of the Loyalty Islands.

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6.1	Mwp	05-Jan-11	06:46:15	-22.286	171.723	119	SE of the Loyalty Islands.
6.0	Mwp	08-Jan-11	04:10:56	-0.105	124.955	59	Southern Molucca Sea.
7.0	Mwp	09-Jan-11	10:03:46	-19.208	168.315	39	Vanuatu Islands Region.
6.5	Mwp	09-Jan-11	17:22:01	-19.235	168.227	48	Vanuatu Islands Region.
6.1	MB	10-Jan-11	02:10:15	-19.552	-169.55	50	Tonga Islands Region.
6.5	Mwp	12-Jan-11	21:32:55	26.944	140.006	520	Bonin Islands, Japan Region.
7.2	Mwp	13-Jan-11	16:16:43	-20.6	168.596	17	Loyalty Islands.
6.0	MB	13-Jan-11	16:43:07	-20.568	168.506	0	Loyalty Islands.
6.1	Mwp	17-Jan-11	19:20:58	-5.051	102.631	47	Southern Sumatra, Indonesia.
6.0	Mwp	18-Jan-11	11:33:49	2.642	96.504	63	Northern Sumatra, Indonesia.
7.2	Mwp	18-Jan-11	20:23:26	28.838	63.947	84	South-western Pakistan.
6.0	Mwp	23-Jan-11	19:15:38	-20.293	-176.165	185	Fiji Islands Region.
6.1	MB	24-Jan-11	02:45:28	38.5	72.6	86	Tajikistan.
6.1	MB	24-Jan-11	02:45:31	38.461	72.753	99	Tajikistan.
6.1	Mwp	26-Jan-11	15:42:34	2.369	96.964	57	Northern Sumatra, Indonesia.
6.0	Mwp	27-Jan-11	08:38:29	28.185	58.968	11	South-eastern Iran.
6.1	Mwp	29-Jan-11	06:55:27	70.965	-6.778	10	Jan Mayen Island Region.
6.0	Mwp	31-Jan-11	06:03:24	-21.858	-175.41	48	Tonga Islands.
6.3	Mwp	04-Feb-11	13:53:48	24.515	94.759	100	Myanmar-India Border Region.
6.4	Mwp	07-Feb-11	19:53:44	-7.157	155.394	438	Solomon Islands.
6.5	Mwp	10-Feb-11	14:39:29	4.027	123.026	534	Celebes Sea.
6.7	Mwp	10-Feb-11	14:42:00	3.93	122.991	529	Celebes Sea.
6.8	Mwp	11-Feb-11	20:05:30	-36.344	-72.959	18	Offshore Bio-Bio, Chile.
6.1	Mwp	12-Feb-11	01:17:03	-36.985	-73.077	15	Bio-Bio, Chile.
6.2	Mwp	12-Feb-11	17:57:54	-20.817	-175.464	70	Tonga Islands.
6.0	Mwp	13-Feb-11	10:35:06	-36.623	-73.165	13	Offshore Bio-Bio, Chile.
6.6	Mwp	14-Feb-11	03:40:11	-35.433	-72.739	25	Offshore Maule, Chile.
6.2	Mwp	15-Feb-11	13:33:53	-2.53	121.54	24	Sulawesi, Indonesia.
6.6	Mwp	21-Feb-11	10:57:52	-25.924	178.58	566	South of Fiji Islands.
6.3	Mwp	21-Feb-11	23:51:43	-43.6	172.71	5	SE of Christchurch, New Zealand.
6.2	Mwp	06-Mar-11	12:31:58	-18.115	-69.391	101	Tarapaca, Chile.
6.5	Mwp	06-Mar-11	14:32:36	-56.387	-27.019	84	South Sandwich Islands Region.
6.3	Mwp	07-Mar-11	00:09:39	-10.349	160.859	41	Solomon Islands.
7.2	Mwp	09-Mar-11	02:45:18	38.51	142.792	32	Near East coast of Honshu, Japan.
6.1	Mwp	09-Mar-11	18:16:15	38.378	142.506	22	Near East coast of Honshu, Japan.
6.0	Mwp	09-Mar-11	18:44:35	38.502	143.199	23	Near East coast of Honshu, Japan.
6.1	Mwp	09-Mar-11	21:22:18	38.385	142.642	23	Near East coast of Honshu, Japan.
6.5	Mwp	09-Mar-11	21:24:53	-6.112	149.668	62	New Britain Region, PNG.
6.2	MB	10-Mar-11	17:08:36	-6.885	116.812	501	Bali Sea, Sunda Arc.
9.0	Mwp	11-Mar-11	05:46:24	38.322	142.369	32	Near East coast of Honshu, Japan.
6.4	Mwp	11-Mar-11	06:06:11	39.025	142.316	25	Near East coast of Honshu, Japan.
6.4	Mwp	11-Mar-11	06:07:22	36.401	141.862	35	Near East coast of Honshu, Japan.
6.8	Mwp	11-Mar-11	06:15:40	36.186	141.192	35	Near East coast of Honshu, Japan.
7.1	Mwp	11-Mar-11	06:25:51	38.106	144.553	20	Near East coast of Honshu,

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							Japan.
6.3	Mwp	11-Mar-11	06:48:47	37.993	142.764	22	Near East coast of Honshu, Japan.
6.3	Mwp	11-Mar-11	06:57:15	35.758	140.992	30	Near East coast of Honshu, Japan.
6.3	Mwp	11-Mar-11	07:14:59	36.648	141.811	25	Near East coast of Honshu, Japan.
6.1	Mwp	11-Mar-11	07:25:33	37.916	144.621	15	Near East coast of Honshu, Japan.
6.1	Mwp	11-Mar-11	07:28:12	36.802	141.911	24	Near East coast of Honshu, Japan.
6.2	Mwp	11-Mar-11	08:12:05	36.606	141.557	20	Near East coast of Honshu, Japan.
6.2	Mwp	11-Mar-11	08:15:41	37.034	144.612	28	Near East coast of Honshu, Japan.
6.5	Mwp	11-Mar-11	08:19:24	36.2	142	20	Near East coast of Honshu, Japan.
6.1	Mwp	11-Mar-11	08:31:08	37.428	141.2	25	Near East coast of Honshu, Japan.
6.0	Mwp	11-Mar-11	10:10:35	39.248	142.779	29	Near East coast of Honshu, Japan.
6.5	Mwp	11-Mar-11	11:36:39	39.276	142.521	12	Near East coast of Honshu, Japan.
6.2	Mwp	11-Mar-11	15:13:15	35.997	141.796	19	Near East coast of Honshu, Japan.
6.2	Mwp	11-Mar-11	18:59:15	37.037	138.355	10	Near West coast of Honshu, Japan.
6.1	Mwp	11-Mar-11	19:02:59	39.372	142.9	25	Near East coast of Honshu, Japan.
6.6	Mwp	11-Mar-11	19:46:49	40.472	139.07	10	Near West coast of Honshu, Japan.
6.3	Mwp	11-Mar-11	20:11:23	39.025	142.645	9	Near East coast of Honshu, Japan.
6.0	Mwp	12-Mar-11	01:34:10	38.748	142.853	25	Near East coast of Honshu, Japan.
6.2	Mwp	12-Mar-11	01:46:21	37.354	141.998	25	Near East coast of Honshu, Japan.
6.8	Mwp	12-Mar-11	01:47:16	37.588	142.682	25	Near East coast of Honshu, Japan.
6.4	Mwp	12-Mar-11	13:15:42	37.261	141.175	38	Near East coast of Honshu, Japan.
6.0	Mwp	12-Mar-11	17:19:24	36.573	142.645	4	Near East coast of Honshu, Japan.
6.3	Mwp	12-Mar-11	22:12:46	37.662	141.959	14	Near East coast of Honshu, Japan.
6.1	Mwp	12-Mar-11	23:24:50	37.981	141.849	25	Near East coast of Honshu, Japan.
6.2	Mwp	13-Mar-11	01:26:07	35.742	141.731	25	Near East coast of Honshu, Japan.
6.2	Mwp	13-Mar-11	02:23:37	36.354	142.287	25	Near East coast of Honshu, Japan.
6.0	Mwp	13-Mar-11	11:37:32	37.348	142.416	25	Off East coast of Honshu, Japan.
6.0	Mwp	14-Mar-11	06:12:36	37.8	142.505	14	Off East coast of Honshu, Japan.
6.0	Mwp	15-Mar-11	09:49:54	37.348	142.406	15	Off the East coast of Honshu, Japan.
6.2	Mwp	15-Mar-11	13:31:47	35.3	138.7	10	Eastern Honshu, Japan.
6.1	Mwp	15-Mar-11	15:23:54	40.33	143.271	19	Off the East coast of Honshu, Japan.
6.0	Mwp	16-Mar-11	03:52:06	35.795	140.804	25	Near the East coast of Honshu, Japan.

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6.5	Mwp	17-Mar-11	02:48:05	-17.321	167.725	42	Vanuatu Islands.
6.0	Mwp	17-Mar-11	08:03:06	-17.223	167.908	49	Vanuatu Islands.
6.1	Mwp	19-Mar-11	09:56:51	36.81	140.375	25	Near the east coast of Honshu, Japan.
6.6	Mwp	22-Mar-11	07:18:48	37.249	143.956	27	Off the east coast of Honshu, Japan.
6.4	Mwp	22-Mar-11	09:19:06	37.334	141.861	27	Near the East Coast of Honshu, Japan.
6.6	Mwp	22-Mar-11	09:44:30	39.863	143.436	16	Off East Coast of Honshu, Japan.
6.1	Mwp	22-Mar-11	13:31:29	-33.085	-15.979	12	Southern Mid-Atlantic Ridge.
6.8	Mwp	24-Mar-11	13:55:12	20.705	99.949	10	Myanmar.
6.4	Mwp	25-Mar-11	11:36:25	38.763	141.942	39	Near The East Coast of Honshu, Japan.
6.1	Mwp	26-Mar-11	22:49:42	-15.867	-179.413	6	Fiji Islands Region.
6.1	Mwp	27-Mar-11	22:23:59	38.402	142.102	17	Off the East Coast of Honshu, Japan.
6.1	Mwp	29-Mar-11	10:54:33	37.417	142.269	14	Off the East Coast of Honshu, Japan.
6.0	Mwp	30-Mar-11	05:29:56	36.135	142.433	30	Off East Coast of Honshu, Japan.
6.3	Mwp	31-Mar-11	00:12:05	-16.754	-177.593	60	Fiji Islands Region.
6.2	Mwp	31-Mar-11	07:15:30	38.954	142.017	40	Near the East Coast of Honshu, Japan.
6.4	Mwp	03-Apr-11	14:07:05	-17.59	-178.39	500	Fiji Island Region.
6.7	Mwp	03-Apr-11	20:06:38	-9.823	107.72	1	South of Java, Indonesia.
6.1	Mwp	06-Apr-11	14:01:48	1.814	97.31	59	Northern Sumatra, Indonesia.
6.5	Mwp	07-Apr-11	13:11:25	17.431	-93.978	167	Veracruz, Mexico.
7.1	Mwp	07-Apr-11	14:32:42	38.253	141.64	49	Near East coast of Honshu, Japan.
6.1	Mwp	09-Apr-11	12:57:49	30.013	131.81	21	Kyushu, Japan.
6.6	Mwp	11-Apr-11	08:16:13	37.007	140.477	10	Eastern Honshu, Japan.
6.2	Mwp	11-Apr-11	23:08:16	35.406	140.542	13	Near East coast of Honshu, Japan.
6.0	Mwp	12-Apr-11	05:07:42	37	140.7	11	Eastern Honshu, Japan.
6.1	Mwp	13-Apr-11	19:57:24	39.587	143.357	11	Off East Coast of Honshu, Japan.
6.7	Mwp	18-Apr-11	13:03:05	-34.115	-179.941	100	South of the Kermadec Islands.
6.1	Mwp	21-Apr-11	13:37:04	35.617	140.452	43	Near East coast of Honshu, Japan.
6.7	Mwp	23-Apr-11	04:16:59	-10.45	161.341	121	Solomon Islands.
6.0	Mwp	23-Apr-11	10:12:49	39.164	142.892	39	Near East coast of Honshu, Japan.
6.2	Mwp	24-Apr-11	23:07:53	-4.45	123.024	39	Sulawesi, Indonesia.
6.0	Mwp	30-Apr-11	08:19:17	6.878	-82.287	10	South of Panama, Central America.
6.0	Mwp	01-May-11	16:12:44	-7.032	155.925	72	Solomon Islands.
6.1	Mwp	05-May-11	14:58:21	38.173	144.04	24	Off the east coast of Honshu, Japan.
6.2	Mwp	09-May-11	18:54:45	-56.89	147.789	36	West of Macquarie Island.
7.1	Mwp	10-May-11	08:55:14	-20.291	168.314	52	Loyalty Islands.
6.0	Mwp	11-May-11	08:19:40	-20.318	168.436	64	Loyalty Islands.
6.0	Mwp	13-May-11	22:47:55	10.105	-84.261	70	Costa Rica.
6.2	Mwp	13-May-11	23:35:53	37.383	141.405	38	Near East Coast of Honshu, Japan.
6.5	Mwp	15-May-11	18:37:10	-6.128	154.647	48	Solomon Islands.
6.0	Mwp	20-May-11	19:43:17	-7.249	147.081	21	Eastern New Guinea Region, PNG.

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6.2	Mwp	01-Jun-11	12:55:22	-37.545	-73.663	15	Offshore Bio-Bio, Chile.
6.3	Mwp	03-Jun-11	00:05:04	37.294	143.912	31	Off East Coast of Honshu, Japan.
6.5	Mwp	05-Jun-11	11:51:17	-55.711	147.491	50	West of Macquarie Island.
6.0	Mwp	08-Jun-11	03:06:18	-17.059	-69.498	101	Southern Peru.
6.3	ML	13-Jun-11	02:20:49	-43.564	172.743	6	South Island, New Zealand.
6.3	Mwp	13-Jun-11	14:31:24	2.414	126.527	75	Northern Molucca Sea.
6.5	Mwp	16-Jun-11	00:03:42	-6.221	151.118	66	New Britain Region, PNG.
6.5	Mwp	20-Jun-11	16:36:01	-21.681	-68.187	127	Antofagasta, Chile.
6.2	Mwp	21-Jun-11	02:04:21	-11.483	165.619	58	Santa Cruz Islands, Solomon Islands.
6.7	Mwp	22-Jun-11	21:50:48	39.98	142.247	32	Near East Coast of Honshu, Japan.
7.2	Mwp	24-Jun-11	03:09:40	52.008	-171.859	63	Fox Islands, Aleutian Islands, Alaska.
6.5	Mwp	26-Jun-11	12:16:38	-2.396	136.621	22	Irian Jaya Region, Indonesia.
7.8	Mwp	06-Jul-11	19:03:22	-29.181	-176.24	37	Kermadec Islands Region.
6.1	Mwp	07-Jul-11	09:10:54	-28.818	-176.577	43	Kermadec Islands Region.
6.1	Mwp	09-Jul-11	06:53:43	-20.939	-174.446	0	Tonga.
7.0	Mwp	10-Jul-11	00:57:13	38.04	143.287	18	Off East Coast of Honshu, Japan.
6.6	Mwp	11-Jul-11	20:47:06	9.456	122.349	45	Sulu Sea, Philippines.
6.0	Mwp	12-Jul-11	21:06:13	-6.122	130.511	133	Banda Sea.
6.0	Mwp	16-Jul-11	00:26:14	-33.798	-72.074	23	Off shore Valparaiso, Chile.
6.0	Mwp	16-Jul-11	17:06:40	-7.189	127.517	276	Banda Sea, Indonesia.
6.1	Mwp	16-Jul-11	19:59:15	54.895	-161.267	48	Alaska Peninsula.
6.1	Mwp	19-Jul-11	19:35:43	40.151	71.426	16	Kyrgyzstan.
6.0	Mwp	20-Jul-11	22:05:02	-10.248	162.193	56	Solomon Islands.
6.0	Mwp	21-Jul-11	23:01:44	-62.587	165.677	27	Balleny Islands region, Southern Ocean.
6.0	Mwp	22-Jul-11	06:56:39	-20.126	-178.41	595	Fiji Islands region.
6.4	Mwp	23-Jul-11	04:34:24	38.932	141.907	39	Near East Coast of Honshu, Japan.
6.2	Mwp	24-Jul-11	18:51:25	37.758	141.54	36	Near the east coast of Honshu, Japan.
6.3	Mwp	25-Jul-11	00:50:52	-3.323	150.524	40	New Ireland Region, PNG.
6.5	Mwp	29-Jul-11	07:42:23	-23.516	-179.842	523	South of Fiji Islands.
6.4	Mwp	30-Jul-11	18:53:52	36.966	141.058	44	Near East Coast of Honshu, Japan.
6.3	Mwp	31-Jul-11	14:34:50	-16.977	171.837	29	Vanuatu Islands Region.
6.6	Mwp	31-Jul-11	23:38:57	-3.541	144.874	17	Near N Coast of New Guinea, PNG.
6.2	Mwp	01-Aug-11	14:58:09	34.635	138.443	10	Near the south coast of Honshu, Japan.
6.1	Mwp	03-Aug-11	22:39:26	-5.193	148.312	39	New Britain Region, PNG.
6.0	Mwp	04-Aug-11	00:16:09	-2.82	101.152	54	Southern Sumatra, Indonesia.
6.3	Mwp	04-Aug-11	13:51:36	48.784	154.835	49	Kuril Islands.
6.3	Mwp	16-Aug-11	11:03:58	-2.648	128.022	40	Ceram Sea.
6.2	Mwp	17-Aug-11	11:44:08	36.776	143.773	10	Off the east coast of Honshu, Japan.
6.2	Mwp	19-Aug-11	03:54:24	-16.599	-176.978	372	Fiji Islands.
6.3	Mwp	19-Aug-11	05:36:33	37.673	141.716	0	Near East Coast of Honshu, Japan.
7.5	Mwp	20-Aug-11	16:55:01	-18.462	168.09	3	Vanuatu Islands.
6.0	MB	20-Aug-11	17:13:10	-18.312	168.16	62	Vanuatu Islands.
7.4	Mwp	20-Aug-11	18:19:26	-18.361	168.215	35	Vanuatu Islands.

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6.0	Mwp	22-Aug-11	09:38:39	-28.82	-176.413	31	Kermadec Islands Region.
6.1	Mwp	22-Aug-11	20:12:22	-6.459	103.924	44	Southwest of Sumatra, Indonesia.
7.0	Mwp	24-Aug-11	17:46:12	-7.644	-74.506	145	Northern Peru.
6.4	Mwp	24-Aug-11	23:06:21	-18.111	167.808	49	Vanuatu Islands.
6.0	Mwp	27-Aug-11	20:31:55	-24.332	-179.885	524	South of Fiji Islands.
6.9	Mwp	30-Aug-11	06:57:41	-6.422	126.781	465	Banda Sea.
6.2	Mwp	01-Sep-11	06:14:42	-12.494	166.571	61	Santa Cruz Islands, Solomon Islands.
6.8	Mwp	02-Sep-11	10:55:54	52.185	-171.684	36	Fox Islands, Aleutian Islands, Alaska.
6.7	Mwp	02-Sep-11	13:47:11	-28.422	-63.146	592	Santiago Del Estero, Argentina.
6.2	Mwp	03-Sep-11	04:49:01	-56.551	-27.039	106	South Sandwich Islands Region.
7.0	Mwp	03-Sep-11	22:55:37	-20.643	169.846	154	Vanuatu Islands.
6.3	Mwp	04-Sep-11	21:44:25	-19.145	168.872	108	Vanuatu Islands Region.
6.2	Mwp	05-Sep-11	09:51:55	-15.281	-173.53	0	Tonga Islands.
6.6	Mwp	05-Sep-11	17:55:09	2.931	98.047	68	Northern Sumatra, Indonesia.
6.4	Mwp	09-Sep-11	19:41:35	49.493	-126.967	11	Vancouver Island, Canada Region.
6.1	Mwp	11-Sep-11	23:37:39	-18.081	167.722	56	Vanuatu Islands.
6.3	Mwp	12-Sep-11	22:44:32	-3.678	144.14	40	Near N Coast of New Guinea, PNG.
6.1	Mwp	14-Sep-11	18:10:07	53.138	173.022	1	Near Islands, Aleutian Islands, Alaska.
6.2	Mwp	15-Sep-11	07:53:14	-35.233	-178.427	0	E of North Island, NZ.
6.2	Mwp	15-Sep-11	08:00:07	36.289	141.308	10	Near the east coast of Honshu, Japan.
7.2	Mwp	15-Sep-11	19:31:00	-21.468	-179.272	599	Fiji Islands Region.
6.7	Mwp	16-Sep-11	19:26:42	40.303	142.801	38	Near the E coast of Honshu, Japan.
6.0	Mwp	16-Sep-11	21:08:06	40.221	143.05	20	Off the E coast of Honshu, Japan.
6.9	Mwp	18-Sep-11	12:40:48	27.723	88.064	20	Sikkim, India.
6.2	Mwp	22-Sep-11	23:07:00	-15.388	-174.883	0	Tonga Islands.
6.2	Mwp	06-Oct-11	11:12:29	-24.181	-64.25	10	Jujuy, Argentina.
6.0	Mwp	07-Oct-11	08:58:28	-32.421	-178.246	55	South of Kermadec Islands.
6.1	Mwp	08-Oct-11	08:53:15	-20.783	-173.739	0	Tonga Islands.
6.3	Mwp	13-Oct-11	03:16:27	-9.639	114.537	16	South of Bali, Indonesia.
6.5	Mwp	14-Oct-11	03:35:17	-6.707	147.864	70	Eastern New Guinea Region, PNG.
6.1	MB	14-Oct-11	06:10:15	54.114	123.724	15	Amurskaya Oblast', Russia.
6.3	Mwp	18-Oct-11	05:05:09	-5.922	151.081	51	New Britain Region, PNG.
6.1	Mwp	21-Oct-11	08:02:38	43.889	142.477	185	Hokkaido, Japan Region.
7.3	Mwp	21-Oct-11	17:57:19	-28.705	-176.132	53	Kermadec Islands Region.
7.2	Mwp	23-Oct-11	10:41:21	38.628	43.486	20	Eastern Turkey.
6.0	Mwp	23-Oct-11	20:45:37	38.555	43.161	10	Eastern Turkey.
6.9	Mwp	28-Oct-11	18:54:34	-14.515	-76.009	24	Near the Coast of Central Peru.
6.3	Mwp	01-Nov-11	12:32:00	19.891	-109.216	5	Revilla Gigedo Islands Region.
6.2	Mwp	02-Nov-11	14:59:26	-55.303	-128.795	1	Pacific-Antarctic Ridge.
6.2	Mwp	05-Nov-11	01:49:20	-18.236	168.437	51	Vanuatu Islands.
6.0	Mwp	07-Nov-11	16:51:24	-63.173	170.95	0	Balleny Islands Region.
6.9	MB	08-Nov-11	02:59:07	27.291	125.868	209	Northeast of Taiwan.
6.6	Mwp	14-Nov-11	04:05:14	-0.982	126.962	40	Southern Molucca Sea, Indonesia.
6.0	Mwp	15-Nov-11	23:42:32	-5.379	140.31	38	Irian Jaya, Indonesia.

6.1	Mwp	18-Nov-11	07:51:25	-37.617	179.419	16	Off East Coast of North Island, NZ.
6.6	Mwp	22-Nov-11	18:48:15	-15.345	-65.11	533	Beni, Bolivia.
6.1	Mwp	23-Nov-11	19:24:32	37.373	141.387	33	Near East Coast of Honshu, Japan.
6.2	Mwp	24-Nov-11	10:25:35	41.877	142.71	42	Hokkaido, Japan.
6.0	Mwp	28-Nov-11	12:26:49	-5.619	153.623	54	New Ireland Region, PNG.
6.2	Mwp	30-Nov-11	00:27:08	15.325	119.204	18	Luzon, Philippines.
6.5	Mwp	11-Dec-11	01:47:26	18.038	-99.796	65	Guerrero, Mexico.
6.2	Mwp	11-Dec-11	09:54:55	-55.98	-28.238	115	South Sandwich Islands Region.

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