

# **HISTORICAL EARTHQUAKES; THE 1920s IN SOUTH AUSTRALIA**

**Kevin McCue**

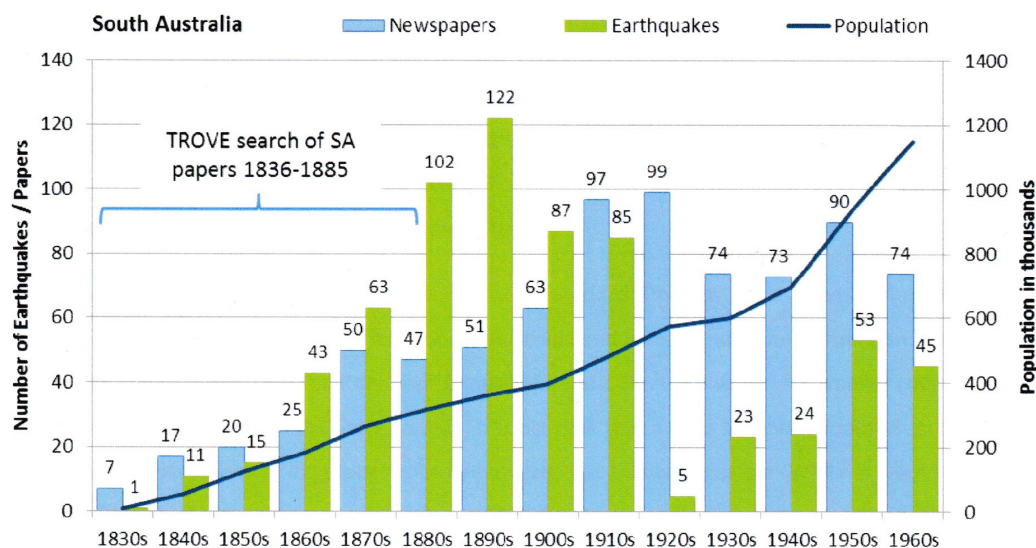
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## **Abstract**

Newspaper searches following new scans by the Australian National Library have recovered 40 previously undocumented earthquakes in South Australia and information to revise known historical earthquakes over the decade of the 1920s. Date, origin time, epicentre location and magnitude have been assigned to these earthquakes. There are fewer than expected based on the frequency of earthquakes there in the instrumental period (Love, 1996). These historical earthquakes add to the remarkable database compiled by Dix (2013) who predicted that more earthquakes would be found in the 1920s, 1930s and 1940s. The detailed information gathered about them strengthens the imperative for earthquake hazard modellers to make use of this extensive database; they add to the debate about the frequency of large earthquake clusters.

## Introduction

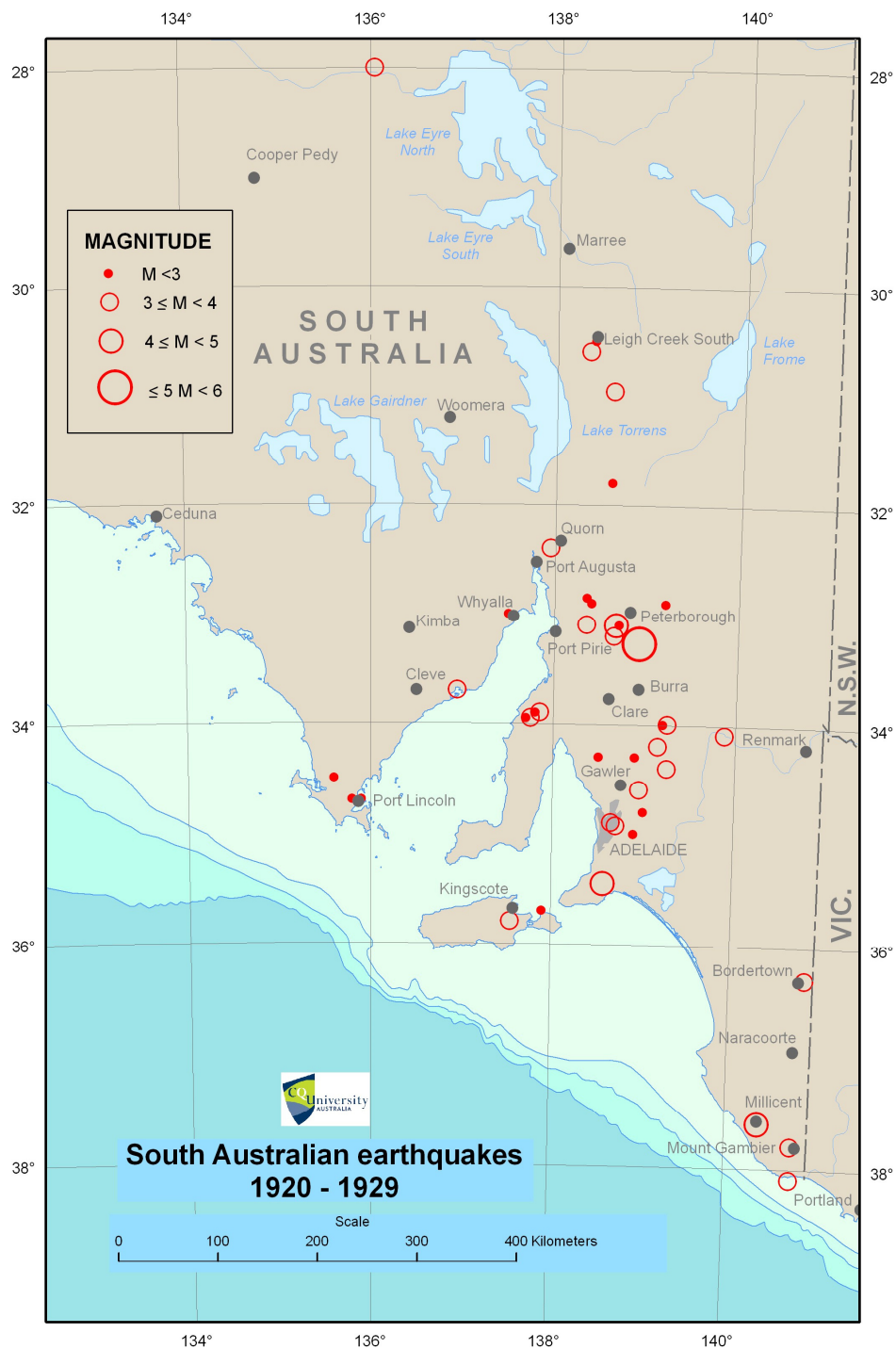
Dix (2013), formerly Malpas, used newspapers and then Trove (Australian National Library scanning system) to search for previously undocumented earthquakes in South Australia. Figure 2.7 from her thesis is reproduced below which shows a rapidly increasing number of earthquakes found per decade, matching the population growth, but peaking in the 1880s and 1890s then decreasing from the 1920s though the population continued to grow. Part of this peak can be explained by aftershocks of the magnitude 6.5, 1897 Kingston and the magnitude 6, 1902 Warooka earthquakes. There were just a few very small aftershocks of the destructive 1954 earthquake under Adelaide but even so a small increase in the overall number of earthquakes that year. Dix (as Malpas 1991, 1993) encouraged by David Love, Bierbaum (1994), McCue (2012) and Alison McArdle (pers. comm.), had previously done manual searches of newspapers (pre-Trove) which is enormously time demanding and impossible to do exhaustively. A limitation of Trove searches is that ANL has not yet completed the scanning of old newspapers so potentially more earthquakes will be revealed. Researchers need a number of different search strategies with Trove to ensure maximum returns; journalists refer to earthquakes as earthquakes, earth shocks, earthshocks or earth tremors at different times.



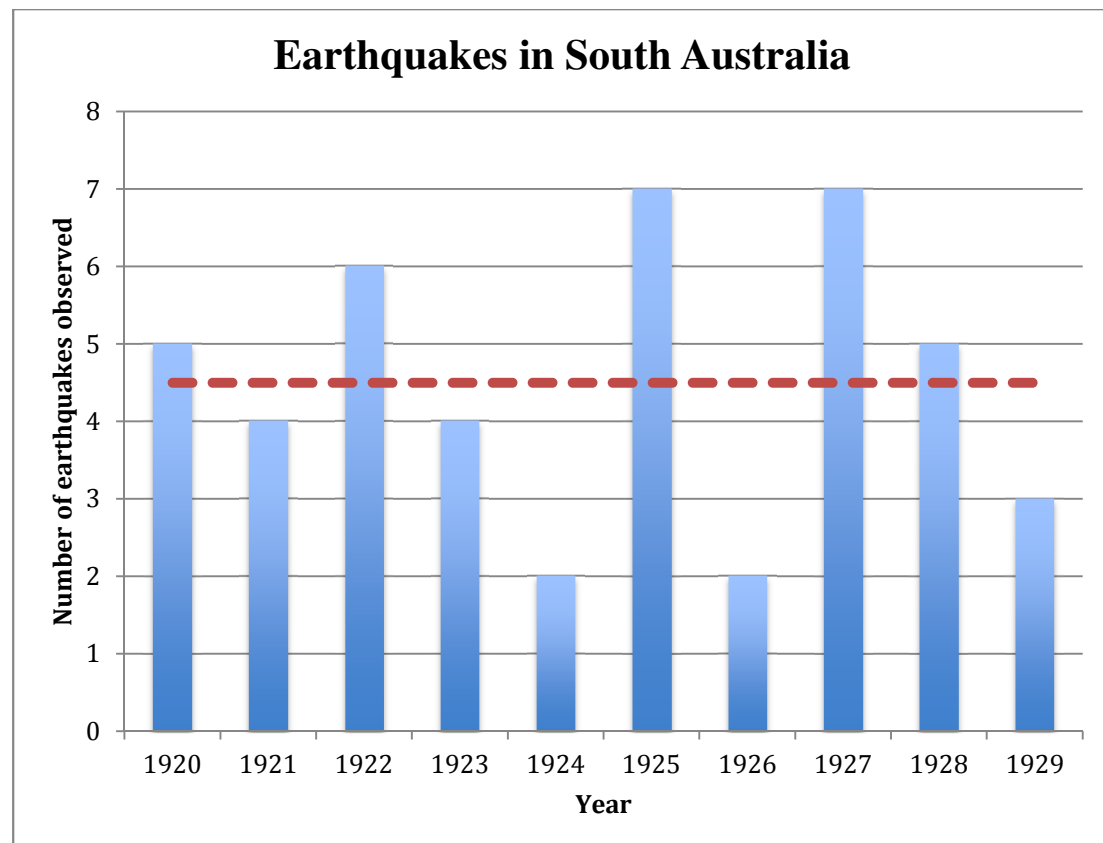
**Figure 1** Earthquake numbers South Australia (green rectangle) per decade (from Dix (2013)). The blue columns are SA newspapers, a surprising number. The increasing population indicates the trend of earthquake risk.

To check the hypothesis that the dearth of earthquakes is related to the lack of access to newspapers, rather than a lack of earthquakes, I have examined newspapers now available for those years where Dix had fewer than average finds – the 1920's seemed a good test. The process was made simple by using Dix's appendix B which lists each event found, sorted by date.

Figures 2 and 3 show the distribution of epicentres and the number of earthquakes discovered searching the scanned newspapers on-line, 45 events including the five already identified by Dix (2013), an average of between 4 and 5 per year. In some years, 1925 and 1927, there were nearly 4 times as many earthquakes as in others, 1924 and 1926. Some of the printed stories are attached in the Appendix.

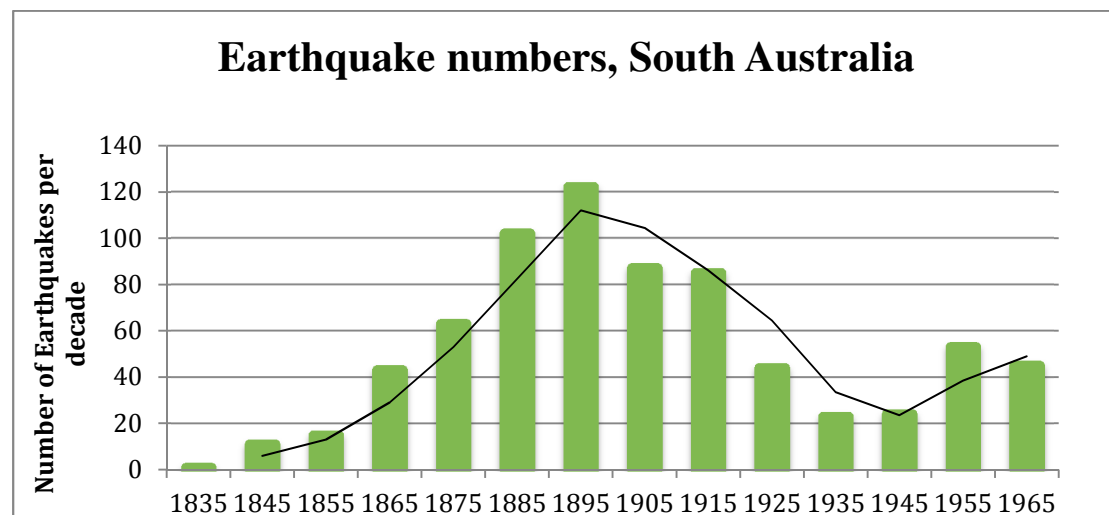


**Figure 2** Known seismicity of South Australia, 1920-1929, derived from newspaper reports for this paper. The epicentre pattern was very similar then to what it has been since the year 2000. Most of the earthquakes were in the Mt. Lofty – Flinders Ranges, the South-east and Eyre Peninsula zones. Future searches may uncover more stories from the 1920s, more observations not captured in the newspapers scans available to August 2017 but this apparent spatial stationarity of the seismicity is not likely to change.



**Figure 3** Earthquakes numbers per year in South Australia in the 1920s.

This revised number has been added to the number plotted by Dix (2013), Figure 4, where the running average is also plotted, but the trend is still the same, there were fewer earthquakes in the 1920s.



**Figure 4** Earthquake numbers in South Australia with the revised numbers for the decade of the 1920s from Figure 2.

The printed stories provide not just a way of estimating magnitudes and epicentres but can be interpreted to improve the recurrence information, describe aftershock sequences and earthquake behaviour, document building damage, and point out areas of enhanced shaking. The stories also cast light on the human impact which databases rarely capture. It is

interesting that, even then, there were amateur seismologists out there: *Mr. F. Spencer, our local jeweller, may prove of interest to readers* (Burra Record, 27 April 1921): — *In reference to the severe earth-shock experienced on Sunday, the seismograph I have under construction records that the direction of the movement was from north to south, the first shock being very severe.*

No details of this seismograph have been found, not yet.

A search in August 2017 of the Geoscience Australia on-line earthquake database yielded zero entries in South Australia for the decade of the 1920s.

## Intensity

The only measure of these pre-instrumental earthquakes is the intensity, as assessed here using the Modified Mercalli scale. With enough distributed reports, an isoseismal map can be drawn up. If only one or two reports are available it can be assumed that the earthquake was limited to the area bound by towns where it was not reported felt. The epicentre is taken to be the centre of the felt area and the magnitude computed from the area over which the earthquake was felt (see Richter page 353). Earthquakes below magnitude 2 are not normally felt. The scale is not linear, up to MM5 it is based on human responses - how strongly the shaking was felt, beyond MM5 it is assessed on building damage.

Magnitudes given here are likely to be underestimated as many observers may not have reported to newspapers or authorities that an earthquake was felt. A case in point is the Koorunga earthquake of 25 July 1885 which Dix (2013) assigned a magnitude of 3.3 based on the radius of a circle equal in area to the felt area, the radius of perceptibility  $R_p$ . Re-evaluation with new information and an isoseismal map shows that  $R_p$  is nearly 50km, not 20 km, and the revised magnitude is at least 4.1.

There was minor damage at Jamestown during the nearby magnitude 5.1 earthquake on 23 April 1921, Dix (2013) assigned the maximum intensity there as MM6, in the isoseismal map she drew up. This earthquake was recorded on the Adelaide seismograph:

*“(says an official statement). The respective times of the commencement of the first and second phases were 4h. 30m. 38s. a.m. and 4h. 30m. 57s. a.m. The long waves began at 4h. 31m. 9s. and attained a maximum of 0.9mm. amplitude at 4h. 31m. 18s. The duration of the tremor was approximately 10 minutes, the boom of the seismograph coming to rest again at 4h. 40m. a.m.. The record shows that .....the distance of the seat of the disturbance from Adelaide was approximately 103 miles (165km)”.*

Jamestown, ~30km north of the macroseismic epicentre, is 190km north of Adelaide so the distance agreement is good, the centre of the felt area is a good proxy for the epicentre in places like South Australia where earthquakes are quite shallow.

Other isoseismal maps, Figure 6, are presented: for the magnitude 4.0 earthquake on 23 October 1923, also near Jamestown, though the intensity did not exceed MM4+ so it wasn't right under the town or there would have been minor damage at this magnitude; the magnitude 3.7 earthquake on 8 April 1927 south of Truro; and the magnitude 4.8 earthquake on 10 October 1922 south of Adelaide near Inman Valley.

## Results

This study has uncovered 40 additional earthquakes in the 1920s, but not including some of the aftershocks because the time wasn't given, bringing to 45 the known earthquakes for the decade, 9 times as many earthquakes as documented by Dix (2013) in South Australia. It is slightly less than the average over the period 1830 to 1970 of about 48 per decade but demonstrates the efficacy of Trove and progress by the NLA in scanning old newspapers and

making them available on line via Trove. The number of reported felt earthquakes in the populated part of South Australia in the 1920s is about the same number as found for the 1860s and 1870s and then again in the 1950s and 1960s. The count could be limited to say magnitude 3 and greater and the plot redone, but a tantalising glimpse of a periodic fluctuation can be seen in Dix's plot (Figure 1).

The GA database was interrogated to estimate the expected annual frequency of earthquake for South Australia for 1965 – 2016. Aftershocks were not flagged. By 1965 reasonable seismograph coverage had been established in the southern part of South Australia by David Sutton at Adelaide University. The results (green squares) shown in Figure 5 can be represented by the following equation (rounded to 1 decimal point):

$$\log N_c = 3.8 - 0.9M$$

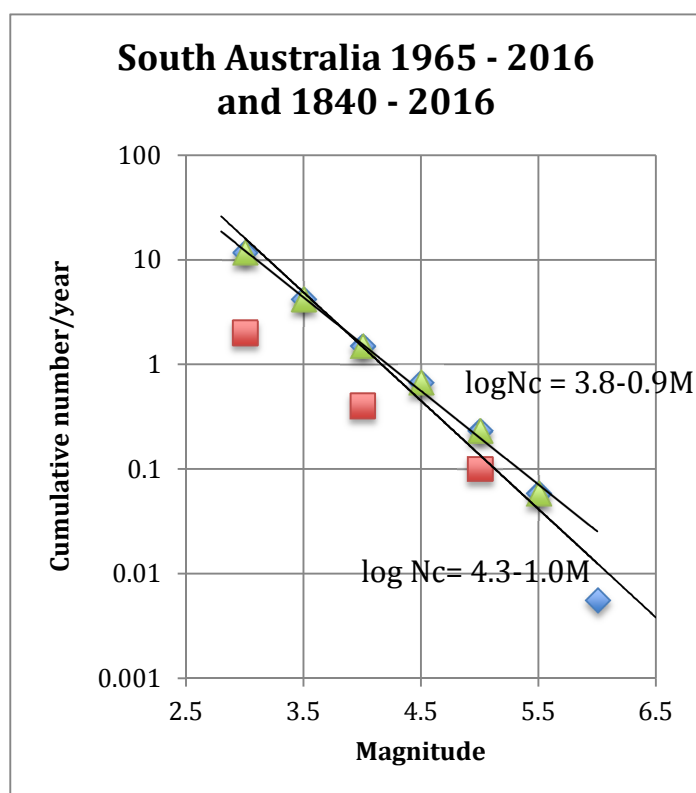
where  $N_c$  is the cumulative number of earthquakes per year of magnitude  $M$  or more.

If the two magnitude 6+ earthquakes of 1897 and 1902 are included, the period now 1840 – 2016, then the equation (blue diamonds in Figure 5) is slightly different favouring the large earthquakes over the smaller ones (again rounded):

$$\log N_c = 4.3 - 1.0M$$

These formulae yield a once-per-year earthquake of 4.2 or 4.3 and an average of 12 to 20 earthquakes per year above magnitude 3. The once-per-decade earthquake is 5.3 and the return period for a magnitude 6 earthquake is less than 100 years. These are comparable to the values computed by Love (1996) for the Flinders / Mt Lofty zone and using the South Australian network and magnitudes, not Geoscience Australia data:

$$\log N_c = 3.48 - 0.94M$$



On the same plot, the level of activity over the 1920s decade is plotted as the red squares, the largest earthquake was the magnitude 5.1 earthquake near Jamestown on 23 April 1923 and there were only four of magnitude 4 or more and twenty of magnitude 3 or more, so either:

- the magnitudes listed here are understated or many earthquakes were not felt or not reported felt or
- the seismicity of the 1920s decade was below average. It could be argued that in the 1920s, few european settlements existed outside the southeast quarter of the state, but even today that is where the seismographs are concentrated.

**Figure 5** Recurrence of SA earthquakes computed using the Geoscience Australia on-line database 1965-2016 (green dots), for  $M \geq 6$ , 1840-2016 (blue diamonds), for the 1920s the red squares.

A possible swarm has been flagged (Table 1) in October 1925 near Copley, only the larger felt events of the swarm have been noted.

There are no surprises in the locations, all the decade-long events occurred where most earthquakes were subsequently located using the SA seismograph network post-1960; the Flinders and Mt Lofty Ranges, Eyre Peninsula and the South-east.

Focal depths could not be estimated from the felt information as is the case again post-2017 with modern seismographic data following the decimation of the SA state seismological network. We assume they are all within the upper half of the crust as are most of the well located events.

### **Earthquakes felt in Adelaide**

Earthquake risk in South Australia is dominated by the risk to Adelaide, a damaging earthquake recurring there needs to be planned for, the hazard reliably assessed and the risk mitigated by adequate building design and construction. During the 1920s three of the earthquakes were felt in Adelaide.

- On 5 November 1920 even the Government Astronomer (Mt Dodwell), who was responsible for maintaining the seismograph at Adelaide, felt the shaking from a nearby small earthquake, in fact he thought there were two.
- Newspapers were searched for the earthquake reported to be felt in Kensington, a suburb of Adelaide (Dix, 2013), on 11 November 1920 but nothing was found.
- The Jamestown earthquake of 23 April 1921 shook Adelaide quite noticeably though the epicentre was about 160km away. People were woken and windows rattled.
- An earthquake near Inman Valley at 2:45 a.m. on 10 October 1922 was also felt in Adelaide. Based on the isoseismal map (Figure 6), the magnitude has been revised up to 4.8, it was felt from Kingscote to Gawler, in Murray Bridge and throughout the metropolitan area. The lack of higher intensities would seem to indicate a source in the middle to lower crust.

### **Discussion**

A set of interesting earthquakes has been re-discovered in South Australia in each year of the 1920s, an average of 4.5 per year (an earthquake near Hawker was discovered after the draft paper was prepared). Additional earthquakes may be found in this decade as Trove continues to scan papers but they are unlikely to be significant events. On the results of this study it would be worth investigating the decades of the 1930s and 1940s to find whether there are more earthquakes in South Australia waiting to be found, perhaps they were unimportant news stories compared with the depression and World War II. It would also be worthwhile focussing on the aftershocks and associated earthquakes of the 1897 and 1902 earthquakes.

In deriving the recurrence relation, aftershocks have been ignored as there were very few of them in the GA database. Even the largest earthquake in South Australia in the post-1965 period, the Ms 5.8 Marryat Ck earthquake, had only 5 locatable aftershocks in the following week.

The reduction in earthquake numbers following two large magnitude 6+ earthquakes in 1897 and 1902 is interesting and also happened in Tasmania following the remarkable swarm there in the 1880s and 1890s. This begs the question of how long before the next large earthquake cluster strikes South Australia, or NE Tasmania or anywhere else in Australia for that matter where previous large earthquakes have occurred. This is an important consideration (the expert-opinion card) in earthquake hazard assessments.

The earthquake details published by Dix (2013) and here, should be added to the national earthquake database and used for earthquake hazard assessments, without them such assessments should not be accepted as best practice.

## References

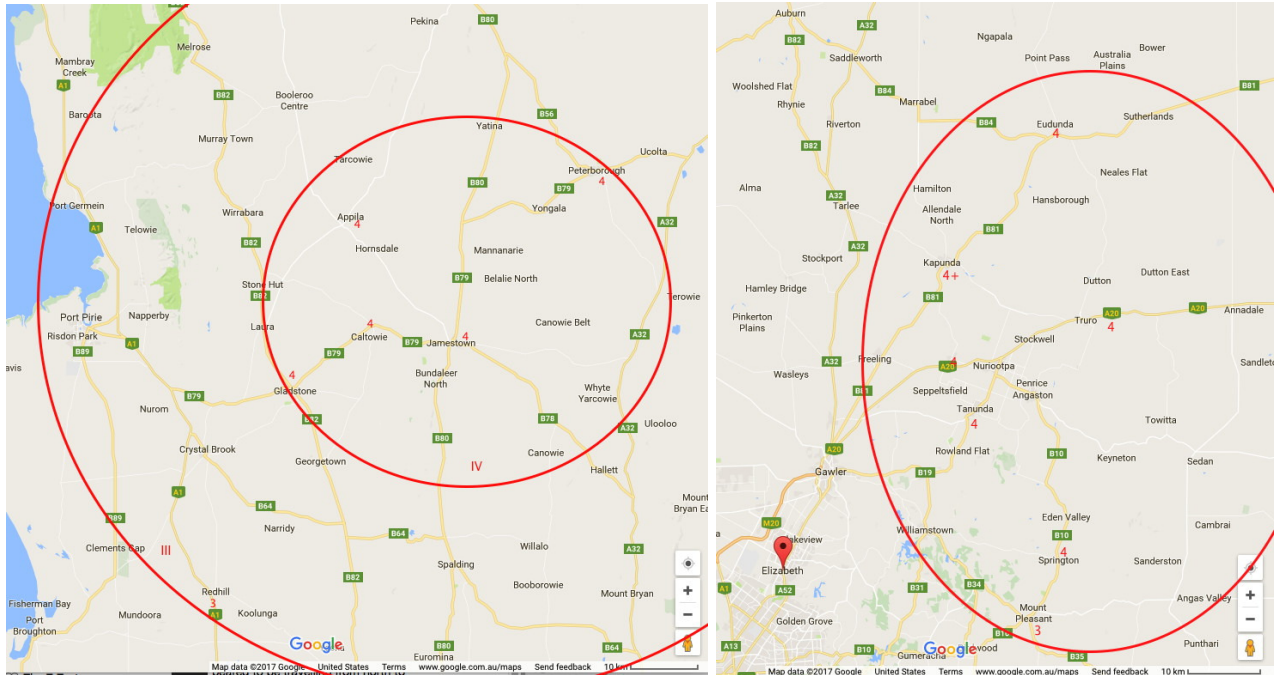
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**Table 1** The 45 South Australian earthquakes, omitting some aftershocks, in the decade of the 1920s, including the 5 listed by Dix (2013).

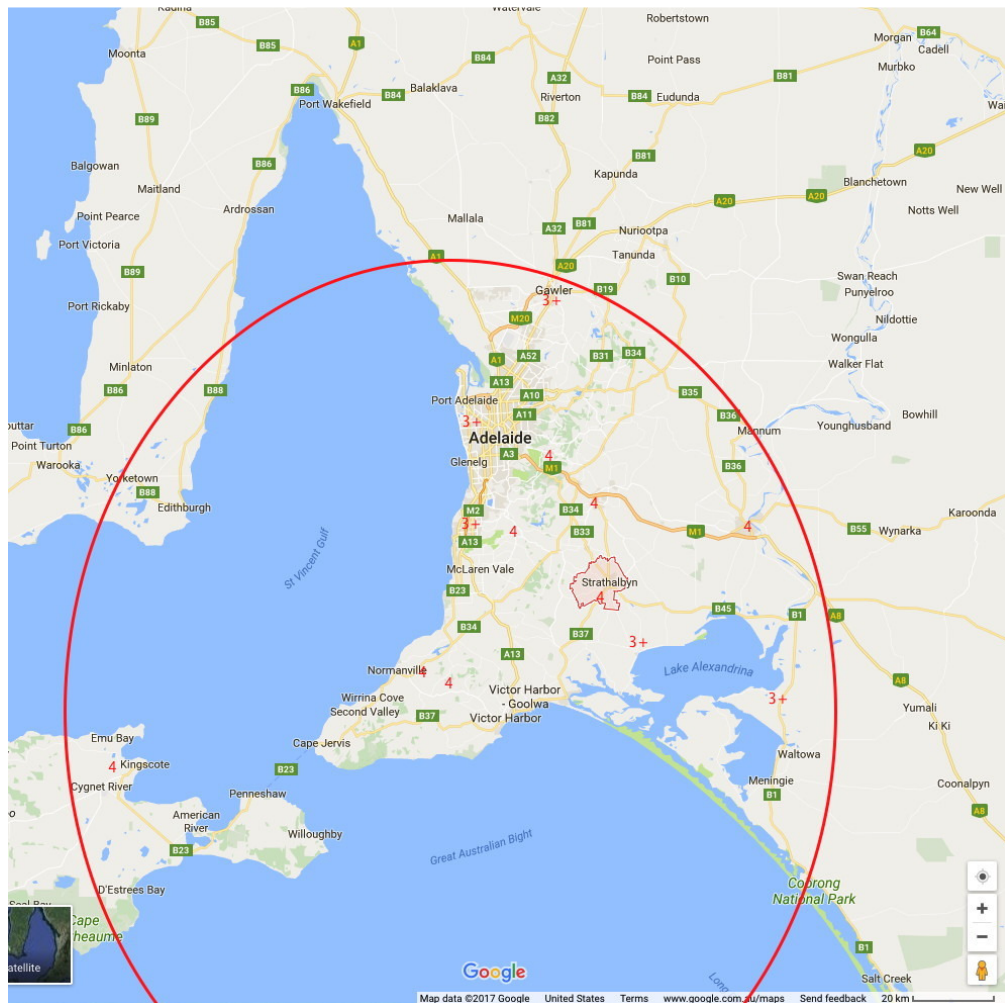
Date	Time UTC	Lat	Long	ML	Place	Comment
1920 04 21	10:00	-33.7	136.9	3.0	Cowell	Felt over Council area
1920 06 25	09:40	-37.6	140.3	4.5	Mt Gambier	Widely felt
1920 10 07	11:00	-30.96	138.56	3.6	Moolooloo and Beltana	See Dix
1920 11 03	11:53	-34.9	138.6	3.0	Adelaide	2 events; Metropolitan area and observatory
1920 11 11	12:25	-34.93	138.65	3.1	Kensington	See Dix
1921 01 27	06:30	-30.6	138.3	3.0	Wooltana east of Leigh Creek	Severe
1921 03 09	12:45	-28	136	3.5	Warrina north of Williams Creek	Four aftershocks
1921 04 23	19:00	-33.27	138.83	5.1	Jamestown	See Dix
1921 09 01	12:48	-34.09	139.17	3.1	Eudunda	See Dix
1922 01 10	11:15	-34.3	138.9	2.5	Kapunda	possible thunderstorm
1922 01 16	06:10	-36.3	140.8	3.0	Bordertown and Wirrega	
1922 05 21	21:00	-37.8	140.7	3.5	Mt Gambier	No damage but picture off wall
1922 07 09	18:10	-32.85	138.35	2.5	Booleroo Centre, Rockwood	Doors, windows rattled
1922 10 10	16:58	-35.45	138.5	4.8	Inman Valley	Modified from Dix



1922 11 24	17:40	-32.9	138.4	2.5	Rockwood	Small
1923 03 03	11:30	-35.8	137.5	3.2	Kangaroo Island	Felt strongly, 2 shocks, wall cracked
1923 05 08	08:00	-32.4	137.9	3.2	Quorn to Port Augusta	Two felt at Albury Creek
1923 08 12	08:35	-33.1	138.3	3.6	Port Pirie, Horns-dale, Jamestown	Clearly felt 10s duration
1923 10 28	16:00	-33.1	138.6	4.0	Jamestown, Gladstone, Red Hill Peter-borough, Cal-towie, Hornsdale	Widely felt (see map)
1924 04 06	09:35	-34.2	139.1	3.0	Eudunda	5s duration
1924 10 26	20:30	-38.1	140.7	3.0	Port MacDonnell	Crockey and windows rattled
1925 01 16	14:15	-35.0	138.9	2.5	Mt Barker and Tweedale	
1925 02 22	10:50	-33.95	137.7	2.5	Kadina	2 events
1925 03 03	04:30	-33.95	137.7	3.5	Kadina	Residents vacated homes
1925 03 31	-	-34.7	135.9	2.5	S Eyre Peninsula	No details
1925 07 23	17:30	-34.3	138.5	2.5	Owen	Residents disturbed
1925 07 23	18:40	-34.3	138.5	2.5	Owen	
1925 10 28	-	-30.5	138.4	2.5	Copley	Possible swarm
1926 06 18	14:30	-34.8	139.0	2.5	Birdwood	
1926 10 09	05:00	-33.2	138.6	3.2	Jamestown and Georgetown	Plaster shaken from walls at Jamestown
1927 04 08	10:00	-34.4	139.2	3.7	Tanunda, Truro Greenoch, Kap-unda, Eudunda, Springton, Mount Pleasant	No damage
1927 04 27	21:00	-33.0	137.5	2.5	Whyalla	Slight
1927 05 19	14:10	-35.7	137.9	2.5	Penneshaw	Booming noise, date uncertain
1927 05 19	16:55	-34.0	139.2	3.5	Robertstown and Eudunda	Three quakes recorded on seismograph
1927 05 19	23:46	-34.0	139.2	2.5	“	aftershock
1927 05 20	00:44	-34.0	139.2	2.5	“	aftershock
1927 11 19	23:15	-34.6	138.9	3.0	Williamstown Kapunda and Chain of Ponds	Widely felt
1928 04 07	21:25	-31.8	138.6	2.5	Hawker	Windows and doors shook and rattled
1928 04 12	03:00	-33.9	137.8	2.5	Kadina	Three shocks felt
1928 05 31	11:40	-34.5	135.6	2.5	Edillilie, Wanilla Eyre Peninsula	slight
1928 09 05	13:32	-33.9	137.8	3.2	Kadina	severe
1928 09 18	21:50	-34.3	138.9	2.5	Kapunda	Small
1929 03 15	03:40	-32.9	139.2	2.0	Oodlawirra	Small
1929 10 02	21:15	-34.7	135.8	2.5	Port Lincoln	Small
1929 11 29	03:30	-33.1	138.7	2.5	Belalie North	Severe



**Figure 6** Isoseismal maps: 28 October 1923 earthquake (left) near Jamestown, 8 April 1927 near Truro (top right) and 10 October 1922 near the Inman Valley (below).



**Appendix Earthquakes South Australia 1920 -1929 inclusive of those listed by Dix (2013) - The Newspaper accounts.**

**1920 Earthquakes South Australia**

Eyre's Peninsula Tribune (Cowell, SA : 1910 - 1950), Thursday 25 April 1940, page 1.

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Twenty Years Ago

From the "Tribune."

April 23, 1920

A very distinct earth tremor was felt throughout the Franklin Harbour District on Wednesday evening at about 7.30 p.m. [Ed. - The Franklin Harbour is at Cowell, Eyre Peninsula.]

Journal (Adelaide, SA : 1912 - 1923), Tuesday 29 June 1920, page 1.

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**EARTH TREMOR.**

In Mount Gambier District.

Our Mount Gambier correspondent telegraphs:—" A slight earth tremor was felt on Friday night about 7.10, by people in the north parts of the town. The shock was more severely felt in Kongorong." A message from Narracoorte states:—" A slight earth shock was felt here shortly after 7 o'clock on Friday evening. It was accompanied by a rumbling noise, and was so slight that many residents did not notice it. Reports from the surrounding country, however, state that the tremor was clearly felt."

Register (Adelaide, SA : 1901 - 1929), Monday 31 January 1921, page 7.

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[By Herbert M. Hale.]

Owienagin Gap. — After an enjoyable week at Moolooloo, our luggage was packed and we moved on to Owienagin Gap, where we had previously decided to make our camp. .... On several occasions during the nights we heard loud rumbles, seemingly a long way off, but one evening as we sat around the fire this noise commenced and quickly increased in intensity; soon we experienced an earth tremor, which, we were told later, was quite sufficient to rock the shearers' huts at Moolooloo.

Register (Adelaide, SA : 1901 - 1929), Friday 5 November 1920, page 6.

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**TWO EARTH TREMORS.** Two slight but distinct earthshocks were felt by residents of the metropolitan area on Wednesday evening. The first was at 9.23 o'clock, and the second, of less intensity, occurred a little later. The Government Astronomer (Mr. G. F. Dodwell, B.A.), when spoken to on Thursday, said that he had felt the first shock at the time mentioned, and that he had thought a second one occurred. The seismograph record at the Observatory was developed on Tuesdays and Fridays; so that if the tremors were recorded thereon the fact will be revealed to-day.

**1921 Earthquakes South Australia**

Chronicle (Adelaide, SA : 1895 - 1954), Saturday 12 February 1921, page 9.

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**COUNTRY NEWS. AN EARTHQUAKE.**

**LEIGH'S CREEK,** February 3.— Last Thursday, at 4 p.m., an earth shock was felt at a camp about 10 miles east of here. Mr. H. Fergusson, a teamster, who was camped at the Nepowie wool wash on Wooltana run, says the shocks were severe there. The ground shook several times and tins rattled. There were noises louder than any thunder he ever heard. The rumbling was heard for some time.

Daily Herald (Adelaide, SA : 1910 - 1924), Friday 11 March 1921, page 4.

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#### EARTHQUAKE SHOCK.

A telegram was received from the postmaster at Warrina yesterday stating that a severe shock of earthquake was experienced at 10.15 p.m. the previous day, followed by four slighter shocks. The direction of the disturbance was from north-west to south-east.

Daily Herald (Adelaide, SA : 1910 - 1924), Monday 25 April 1921, page 2 (Dix)

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#### EARTH TREMOR

##### SUNDAY MORNING OCCURRENCE.

Reports came to hand on Sunday of an earth tremor which occurred at 4.30 o'clock in the morning. It seems to have been felt for periods ranging from 30 seconds to a minute, and to have been experienced as far north as Peterborough. In some parts it was accompanied by a rumbling sound. Houses shook, beds rocked, and ornaments rattled. Light sleepers wondered what it was all about. Their more fortunate brethren did not know anything about it. The tremor was recorded at the Adelaide Observatory, and reports of its occurrence were made from St. Peters and North Adelaide.

Mr. E. W. Bramble (Deputy Postmaster-general) received the following reports from the acting postmaster at Clare and postmaster at Peterborough: —Clare—Respectfully advise earthquake at 4.50 this morning, lasting one minute." Peterborough—"Severe earth shock here, 4.30 Sunday morning. Lasted 30 seconds. Unable to say direction travelling. Loud rumbling noise. Building shaken. No damage done."

Postmaster, Kadina, reported: —A very sharp earth tremor, accompanied by rumbling sounds, experienced here at 4.40 this morning, lasting several seconds. Houses shook, beds rocked, ornaments, &c., rattled for several seconds after tremor ceased. Apparently travelling east to west.

Register (Adelaide, SA : 1901 - 1929), Monday 25 April 1921, page 7.

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#### AN EARTH TREMOR.

##### City and Country Reports.

There was a distinct **earth tremor in Adelaide** and suburbs— also in various parts of the country — early on Sunday morning. Several households were disturbed by a rumbling noise, but, generally, little notice was taken of the occurrence. Other reports came from Norwood, St. Peters, and Unley. The seismograph at the Adelaide Observatory is constructed primarily for recording long-distance shocks, and it is possible that the instrument did not register this tremor. The record, however, will not be developed until Tuesday. Conclusive evidence was nevertheless provided by the barograph— a self-recording barometer—which is affixed to the wall of the Weather Office at the Adelaide General Post Office. On Sunday the State Meteorologist (Mr. E. Bromley) told a reporter that, although it was really outside his department, he probably had the only record of the earth shock. The mechanism of the barograph, he explained, traces an almost horizontal line of the record, but at 4.30 a.m. a sharp vertical line had interrupted the steady progress of the needle.

—Viceregal Household Disturbed.—

His Excellency the Governor (Sir Archibald Weigall), when questioned on Sunday concerning the effects of the earth tremor, said that it had not been severely felt at Government House, but that it had awakened some of the members of the household. His Excellency, with a smile, said that he supposed it was "another of those Australian thrills." — Doctors' Statements. — Dr. Basedow reported that the shock was quite noticeable at Kent Town, and it lasted for well over a minute. The windows of his house were rattled considerably. In conversation with a reporter on Sunday evening Dr. E. Angas Johnson said that, although a heavy sleeper, he was awakened suddenly. His wardrobe door, which had been left open, was violently slammed, and then the wardrobe itself began to shake. His first

impression when awakened was that he was on board a ship. Dr. Johnson smilingly said that the experience was reminiscent of the days when he was in New Zealand, and that this shock was, from his personal experience, the most severe that the State has had for many years.

—A Forecast Recalled.—

This shock is one of several which have occurred in and around Adelaide within the last decade or two. The last one of importance was in 1902. Years ago Professor David prophesied that minor earthquakes would be experienced in Adelaide from time to time. Owing to the character of the surrounding country Adelaide would be subject to these tremors.

#### COUNTRY EXPERIENCES.

KOORINGA, April 24.—A violent earth shock occurred here at 4.40 this morning, accompanied by a loud rumbling noise, with tremendous vibration; increasing as it approached. Buildings were shaken to their foundations. Windows and doors were rattled violently. The disturbance appeared to be travelling from north-west to south-east. The tremor lasted fully 90 seconds.

KADINA, April 24.—A very sharp earth tremor, accompanied by rumbling sound, was experienced here at 4.40 a.m. It lasted several seconds. Houses shook, beds rocked, and ornaments and so on were disturbed and rattled for several seconds after the tremor ceased. The movement was apparently travelling east to west.

MORGAN, April 24.—A most severe earth shock was experienced here at about 4.31 this morning. Its duration was about 45 seconds, and it appeared to travel to the north-west. Houses rocked, roofing creaked, and furniture and crockeryware rattled. In one residence glassware was thrown down and broken. Many of the people were unnerved by the occurrence. Mount Mary and Cadell also felt the tremor at about the same hour. At the latter place the shock was very pronounced.

MURRAY BRIDGE, April 24.—Two earth shocks occurred at 4.30 this morning. The direction of the shock was towards the east.

PORT PIRIE, April 24.—A powerful earth tremor, lasting about 10 seconds, preceded by a loud rumbling noise, was experienced here about 4.30 this morning. The sound and effect appeared to be travelling from east to west. Numbers of people were awakened by what appeared to be the subsidence of the foundations in stone buildings and the vibration in wood and iron houses. Crockery and ornaments on shelves were shaken. Persons sleeping on balconies and under verandahs were especially alarmed. No damage is reported.

CLARE, April 24.—An earthquake was experienced at 4.30 this morning, lasting one minute.

PETERBOROUGH, April 24.—A severe earth shock occurred here at 4.30 a.m. on Sunday. It lasted 30 seconds. It was accompanied by a loud rumbling noise. Buildings were shaken, but no damage was done.

Observer (Adelaide, SA : 1905 - 1931), Saturday 30 April 1921, page 28.

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#### THE EARTHQUAKE.

The earth tremor **felt in Adelaide** on Sunday morning was recorded by the seismograph at the Adelaide Observatory (says an official statement). The respective times of the commencement of the first and second phases were 4h. 30m. 38s. a.m. and 4h. 30m. 57s. a.m. The long waves began at 4h. 31m. 9s. and attained a maximum of 0.9mm. amplitude at 4h. 31m. 18s. The duration of the tremor was approximately 10 minutes, the boom of the seismograph coming to rest again at 4h. 40m. a.m. The period during which the vibrations would be perceptible would, of course, be much shorter than this. The record shows that the tremor was not of a very violent nature, and that the distance of the seat of the disturbance from Adelaide was approximately 108 miles.

Transcontinental (Port Augusta, SA : 1914 - 1954), Friday 29 April 1921, page 1

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An Earthquake.

A very sharp earth tremor, accompanied by a rumbling sound, was experienced by residents of this town at 4.30 Sunday morning. It lasted for nearly a minute. Numbers of people were awakened by the noise and vibration. Houses shook, beds rocked, windows, crockery and ornaments rattled for several seconds after the tremor ceased. No damage was done. It was apparently travelling from north-east to south-west.

Burra Record (SA : 1878 - 1954), Wednesday 27 April 1921, page 3.

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An Earth-shock.

On Sunday morning last, most of the residents of Burra were suddenly awakened at 4.40 a.m., by a peculiar vibration accompanied by a loud rumbling. By the time folk were fully awake, the noise had become much louder, the vibration had increased and for about ten seconds buildings were shaken, causing the windows, doors and roofs to rattle. It then gradually died away. From the time the vibration was first felt, until it passed, a fraction over a minute elapsed. Several reports are to hand of cracked walls and fallen plaster but no serious damage was done. The atmospheric conditions of Saturday night were noted by several who remarked that it felt like "earthquake" weather. The following report of Mr. F. Spencer, our local jeweller, may prove of interest to readers : — "In reference to the severe earth-shock experienced on Sunday, the seismograph I have under construction records that the direction of the movement was from north to south, the first shock being very severe. It continued with some force for 30 seconds then gradually ceased. It lasted in all 80 seconds. The portion of seismograph which shows direction gives the first movement as coming from the north-east, which is very decided. Thereafter it settles down to a snake-like movement from direct north to south. Our Farrell's Flat correspondent writes : — "A severe earth tremor passed over the town at 4.30 a.m. Sunday morning, preceded by a strong wind which blew things about. The shock, which lasted fully a minute, rattled crockery and shook things in general and passed on in a north-easterly direction."

## **1922 Earthquakes South Australia**

Kapunda Herald (SA : 1878 - 1951), Friday 13 January 1922, page 2.

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News of the Week. An earth Tremor.

A slight earth tremor was felt in Kapunda at about 8.45 on Tuesday evening. A distinct rumble was heard, and was mistaken by many for thunder, but very little vibration was noticeable.

Register (Adelaide, SA : 1901 - 1929), Tuesday 17 January 1922, page 6. (see Dix)

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EARTH TREMORS IN THE COUNTRY. A telegram was received at the General Post Office on Monday from the post-master at Bordertown which stated:— "Slight earth shocks were felt here at 3.40 p.m. They were apparently traveling from the north-west. Wirrega reports that two distinct shocks were experienced there. The disturbance lasted for approximately six seconds. The Government Astronomer (Mr. G. F. Dodwell) stated that the seismograph at the Observatory had developed no signs of the shock. It was not likely to do so as it was set for long-distance tremors. However, the Weather Office had reported that a slight indication had been recorded on its instrument.

Register (Adelaide, SA : 1901 - 1929), Friday 26 May 1922, page 6.

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EARTH TREMOR AT MOUNT GAMBIER.

Our Mount Gambier correspondent writes:— An earth tremor, slight but distinct, was experienced here at 6.20 a.m. on Monday. People asleep in bed were awakened by a loud rumbling noise, accompanied by the unmistakable vibrations of a seismic disturbance. Crockery rattled, and in one instance a picture fell from the wall, but apart from this no



damage was done. It is just a little more than 25 years since the severest earthquake ever experienced in Mount Gambier occurred. That was on May 10, 1897, and the oscillation of the earth on that occasion cracked buildings, levelled chimneys, twisted at least one church spire, and brought down elevated pinnacles on the taller buildings in the town.

Times and Northern Advertiser, Peterborough, South Australia (SA : 1919 - 1950), Friday 14 July 1922, page 2.

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#### BOOLEROO CENTRE.

July 10, 1922.

An earth tremor passed over the district at 3.40 a.m., doors and windows rattling severely. The shock was of short duration.

Observer (Adelaide, SA : 1905 - 1931), Saturday 14 October 1922, page 31. see Dix

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#### AN EARTH TREMOR.

A sharp earth tremor was felt in Adelaide and suburbs at about 2.45 a.m. on Wednesday. It lasted for six or seven seconds, and appeared to be travelling from west to east. The vibration was distinctly perceptible. The Acting Deputy Postmaster-General (Mr. Monfries) advised on Wednesday evening that Yankalila had reported that a sharp earth tremor had been felt in that locality at about 2.45 a.m. on that day.

Mount Barker Courier and Onkaparinga and Gumeracha Advertiser (SA : 1880 - 1954), Friday 13 October 1922, page 2.

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#### THE EARTH TREMOR.

Residents of Mount Barker and district were aroused from their slumbers about 2.30 on Wednesday morning by an earth tremor. Those who slept soundly were sceptical when others spoke of the shock, but Thursday's daily paper announced that the barograph at the Adelaide Observatory had recorded the shock about 2.30 a.m. At Murray Bridge and Kangarilla it was also felt more severely than in the city, and in Mount Barker the rattling of windows and articles in homes proved that the shock was fairly severe. The times of the shock recorded at various places differ, which is quite in accordance with such tremors travelling from one direction to another.

Kangaroo Island Courier (Kingscote, SA : 1907 - 1951), Saturday 14 October 1922, page 2.

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#### Earthquake.

An earth tremor was felt at Kingscote at about 3 a.m. on Wednesday morning. The shock lasted several seconds and was accompanied by a dull rumbling noise. It was the most severe experienced on the Island for many years.

Journal (Adelaide, SA : 1912 - 1923), Tuesday 28 November 1922, page 1.

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#### A LITTLE QUAKE.

Felt at Rockwood.

Another earth tremor was experienced in the Rockwood district at about 10 past 3 o'clock on Saturday morning. Although not so severe as that felt in October there were a loud rumbling sound and a distinct vibration. The disturbance apparently was travelling in the same direction as the former one—from south-west to north-east.

### 1923 Earthquakes South Australia

Kangaroo Island Courier (Kingscote, SA : 1907 - 1951), Saturday 10 March 1923, page 2.

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#### Earth Shocks.

Two distinct earth tremors were noted at various parts of the Island on Saturday last at about 9 p.m. At Hawks Nest the shocks were preceded by a loud rumbling noise, and these conditions were also experienced at the Salt Lake, we understand. Mr Wohlack, of MacGillivray, reports that the shock was severe there and cracked the kitchen wall in two places.

Transcontinental (Port Augusta, SA : 1914 - 1954), Friday 11 May 1923, page 1.

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#### Earth Tremor.

Quite a distinct earth tremor was felt at the residence of Mr G. Fitzgerald, of Albury Creek, at 5.30.p.m. last Tuesday, The shock lasted several seconds and crockery and windows rattled, the tremor was accompanied by a rumbling noise.

Residents at Woolshed Flat and Quorn also felt the tremor. On April 23, about 2 a.m., an earthquake was also felt at Mr Fitzgerald's residence.

Several residents of Port Augusta state that beds, crockery and windows rattled on Tuesday evening last.

Chronicle (Adelaide, SA : 1895 - 1954), Saturday 25 August 1923, page 13

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#### PORT PIRIE.

August 14. — An earth shock was experienced by residents at about 6.5 on Sunday evening. The direction seemed to be from west to east, and the tremor was of about ten seconds' duration. Houses were shaken and crockery and glassware on shelves rattled.

Register (Adelaide, SA : 1901 - 1929), Wednesday 31 October 1923, page 8.

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#### NORTHERN EARTH TREMORS.

The earth tremors reported to have occurred at Jamestown and Gladstone on Monday, were stated by the Government Astronomer (Mr. G. F. Dodwell) on Tuesday to have been only slight, and were not recorded on the seismograph at the Adelaide Observatory. Mr. Dodwell added that a slight shock had also occurred at Redhill, and the tremors appeared to be confined to the southern portion of the Flinders Range. Such shocks were occasionally reported in consequence of local earth movements in the range areas.

Observer (Adelaide, SA : 1905 - 1931), Saturday 3 November 1923, page 32.

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#### EARTH TREMOR IN THE NORTH.

The Jamestown correspondent of The Register reported on October 29:—"At 1.30 a.m. on Monday residents here were disturbed from their slumbers by a rather severe earth shock, which was accompanied by a loud rumbling noise. Doors and windows were shaken perceptibly." A message from Gladstone states:—"A sharp earth tremor was experienced here about 1.25 a.m. on Monday. It seemed to travel in an easterly direction. It was sufficiently strong to cause windows and crockery to rattle." The Government Astronomer (Mr. G. F. Dodwell) states that the tremors at Jamestown and Gladstone were only slight, and were not recorded on the seismograph at the Adelaide Observatory. Mr. Dodwell added that a slight shock had also occurred at Redhill, and the tremors appeared to be confined to the southern portion of the Flinders Range. Such shocks were occasionally reported, in consequence of local earth movements in the range areas.

PETERBOROUGH, October 29.—This morning about 1.40 a.m., a severe earthquake was experienced, travelling in a north-easterly direction.

CALTOWTE, October 29.—A severe earthshock was experienced here shortly before 3 a.m. this morning, the rumblings of which could be heard for a considerable time. It appeared to be travelling in a south-easterly direction.



HORNSDALE, October 29.—An earth tremor was felt here at 2.25 a.m. this morning, lasting two seconds. It appeared to be travelling from north to south.

### **1924 Earthquakes South Australia**

Register (Adelaide, SA : 1901 - 1929), Wednesday 9 April 1924, page 11

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#### **AN EARTH TREMOR.**

Our Eudunda correspondent states that at 7.5 p.m. on Monday an earth shock was felt by many residents. The tremor was of about five seconds' duration, and appeared to be travelling, in a southerly direction. Windows and crockery rattled.

Chronicle (Adelaide, SA : 1895 - 1954), Saturday 2 August 1924, page 44.

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The Government Astronomer states that he has no record of an earth tremor at Carrieton on the seismograph, which seems to indicate that the tremor was slight, and confined to the locality of Carrieton. He has not had any information from other residents of the district, and will keep a copy of the details with the records for future reference.

Border Watch (Mount Gambier, SA : 1861 - 1954), Tuesday 28 October 1924, page 3.

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An Earth Tremor is reported to have taken place yesterday, the effects of which were felt at Port MacDonnell about 6 a.m., when crockery and windows rattled. The tremor, which travelled from north-west to south-east, lasted for about 30 seconds.

### **1925 Earthquakes South Australia**

Mount Barker Courier and Onkaparinga and Gumeracha Advertiser (SA : 1880 - 1954), Friday 23 January 1925, page 2.

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#### **EARTH TREMOR FELT.**

Those not abed and other aroused from their slumbers at Mount Barker distinctly felt the earth tremor, which has been reported at about midnight in various localities of the State. Although, of short duration, there was no mistaking the nature of the "quake."

Bunyip (Gawler, SA : 1863 - 1954), Friday 6 March 1925, page 6

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#### **EARTH SHOCK AT KADINA.**

Residents of Kadina and particularly Kadina South and Newtown, were alarmed on Tuesday, when a particularly severe earth shock was experienced. The occurrence took place at precisely 2 o'clock, and the shock rattled doors, windows and roofs, and in some ways resembled an earth tremor. Accounts of the disturbance differ, some people likening it to a blast as felt in a quarry, others attributing it to a severe thunder clap. In each instance it caused residents to vacate their homes, and compare the happening with the observations of their neighbors and fears were expressed that it was the precursor of an earthquake, such as took place several years ago. It was then recollected that several slight shocks had been noted during the past few months, the latest being on Sunday last, when two distinct shocks, one about a second after the other, were felt at 8.20 p.m. The shock on Tuesday was felt all over the town, and at Jerusalem, and the mineral leases in the vicinity of Jericho, where the ground shook considerably. The occurrence is attributed to a caving in at the mines, which are within a quarter of a mile of Kadina, and that the rising water in the abandoned shafts is responsible.

News (Adelaide, SA : 1923 - 1954), Tuesday 14 April 1925, page 2.

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Eyre Peninsula Tremors \_\_\_\_\_ From enquiries made at the Adelaide Observatory today it was learned that little importance was attached to the reports concerning earth tremors on Southern Eyre Peninsula on March 31. The records on which the disturbance would be indicated had not yet been developed. The seismograph at the Observatory is of the Milne 1904 type, and does not record local tremors so well as it does those which occur in distant parts of the world. Since 1904 much scientific data has been gathered and a thoroughly up-to-date Milne-Shaw seismograph will be installed at the Observatory in the near future.

Advertiser (Adelaide, SA : 1889 - 1931), Saturday 25 July 1925, page 13.

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#### EARTH TREMORS.

At 3 a.m. and again at 4.10 a.m. on Friday, residents of Owen were disturbed by earth tremors. The noise seemed to be travelling from north to south.

Chronicle (Adelaide, SA : 1895 - 1954), Saturday 1 August 1925, page 45

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#### NEWS

At 3 a.m., and again at 4.10 a.m. on July 24, residents of Owen were disturbed by earth tremors. The noise seemed to be travelling from north to south.

Advertiser (Adelaide, SA : 1889 - 1931), Friday 30 October 1925, page 12.

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#### COPLEY EARTHQUAKE.

Mr. G. H. Dodwell, the State Government Astronomer, stated on Thursday that no record of the earthquake shock reported at Copley on Wednesday was shown on the seismographic instruments at the Observatory. This indicated that the shocks were local, and not of a serious nature.

### **1926 Earthquakes South Australia**

Register (Adelaide, SA : 1901 - 1929), Tuesday 22 June 1926, page 8.

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EARTH TREMOR AT BIRDWOOD. Our Birdwood correspondent writes:— On Friday evening, at about midnight, a number of residents of the district, who happened to be awake at the time, observed a slight earth tremor. A low, rumbling noise was heard, and continued for some time, and, in a number of instances, buildings shook, and crockery and other loose articles in the homes rattled in an alarming manner.

South Eastern Times (Millicent, SA : 1906 - 1954), Friday 9 July 1926, page 2.

At 11 o'clock on Wednesday evening mild thunderstorm passed over Millicent. Several blinding flashes of lightning were followed by loud peals of thunder. At 11.15 p.m. a weird, rumbling noise was heard. The reverberation lasted on an even key for about ten seconds, and ceased quickly as it had commenced. A slight tremor that accompanied the noise led many residents to the conclusion that an earth shock had occurred, and opinions are about evenly divided as to whether the disturbance was of atmospheric or seismic origin.

(Ed. — If in doubt don't!)

News (Adelaide, SA : 1923 - 1954), Saturday 9 October 1926, page 1.

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#### EARTH TREMOR Reported Shake at Jamestown

HOUSES RATTLED Advice by telephone from Dr. Brian (?) Hamilton, at Jamestown, indicated that there was a slight earth tremor at the northern town about 2.30 this afternoon. Dr. Hamilton stated that although the tremor was not severe it caused pieces of plaster to fall from walls and made doors and windows of houses rattle. It was accompanied by a slight muffled sound and lasted for a few seconds. He thought that the tremor was travelling from east to west.

Areas' Express (Booyoolie, SA : 1877 - 1948), Friday 15 October 1926, page 3.

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Georgetown News.

October 13 th.

Many people were alarmed shortly after 2 p.m. on Saturday by the occurrence of a slight earth tremor. Windows shook and crockery rattled on the shelves and the tremor underfoot was distinctly felt.

### **1927 Earthquakes South Australia**

Advertiser (Adelaide, SA : 1889 - 1931), Saturday 9 April 1927, page 14.

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#### **EARTH TREMOR AT TANUNDA.**

An earth tremor occurred at Tanunda at 7.30 p.m. on Friday. It was travelling in an easterly direction. Its duration was about 5 seconds. No reports of damage were made. When passing through Mount Pleasant a little earlier the tremor was very slight, and many residents were unaware that it had occurred.

Leader (Angaston, SA : 1918 - 1954), Thursday 14 April 1927, page 3.

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#### **EARTH TREMOR FELT AT GREENOCK.**

A very sharp earthquake shock was felt here at 7.30 p.m., on Friday last, writes our Greenock correspondent. The first shock was sharp, but did not last long. A minor tremor, however, prevailed for several seconds and caused a creepy unnatural feeling to pervade one's anatomy. The atmosphere was very calm at the time.

Register (Adelaide, SA : 1901 - 1929), Tuesday 12 April 1927, page 11.

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#### **COUNTRY NEWS.**

TRURO, April 11.—A severe earth tremor was felt by the residents of Truro about 7.30 p.m. Friday. The approach was distinctly heard for a few seconds before the actual earth tremors were felt. Tanks, roofs, and walls rattled and trembled, and dwellers made stampedes for the open. Many residents heard the noise of the approach, but mistook it for a motor lorry. It was travelling in a northerly direction, and the rumble could be heard passing through the hills to the north of the town. The tremor lasted about 30 seconds.

Observer (Adelaide, SA : 1905 - 1931), Saturday 16 April 1927, page 46

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#### **SEVERE EARTHSHOCK.**

Reports from the Country.

Reports of a very severe earth tremor were received from country centres on April 8:—

SPRINGTOWN.—At about 7.35 p.m. a severe earthshock was felt, accompanied by a noise and vibration as if a 10-ton lorry were passing. Crockery and windows were shaken, and fowls jumped off their perches. The shock lasted about five seconds.

KAPUNDA.—A very severe earthshock, accompanied by loud rumbling, occurred here at 7.32 p.m., and lasted about 10 seconds. It appeared to travel from south-east to north-west.

Windows and crockery were shaken. The shock was the most severe one felt for many years.

EUDUNDA.—A severe earth tremor was felt here about 7.30 this evening, accompanied by very loud rumbling. Windows and doors were shaken.

Register (Adelaide, SA : 1901 - 1929), Saturday 9 April 1927, page 13.

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#### **SEVERE EARTHSHOCK.**

Reports from the Country.

SPRINGTOWN.— At about 7.35 p.m. a severe earthshock was felt, accompanied by a noise and vibration as if a 10 ton lorry were passing. Crockery and windows were shaken, and fowls jumped off their perches. The shock lasted about five seconds.

Recorder (Port Pirie, SA : 1919 - 1954), Friday 29 April 1927, page 1.

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#### EARTH TREMOR.

Felt Over Gulf.

WHYALLA, Thursday.

A slight earth tremor was felt here this morning at about 6.30 o'clock. It appeared to be travelling from north to south.

Advertiser (Adelaide, SA : 1889 - 1931), Saturday 21 May 1927, page 13.

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#### EARTH TREMORS.

Earth tremors were reported from the country on Friday morning, and officials at the Observatory stated that three slight shocks of short duration had been recorded. The first occurred at 2.25 a.m., the second at 9.16, and the third at 10.14. Word was received that a heavy tremor was experienced at Robertstown at 2.30 a.m., and the residents of Eudunda reported that they had also felt distant earth shocks.

Observer (Adelaide, SA : 1905 - 1931), Saturday 4 June 1927, page 8.

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KINGSCOTE May 21.—On Friday last at 1.40 a.m. at Penneshaw, there was an earthquake shock felt for a few seconds only. The local tremor lasting about one and a half seconds, came first. It passed at incredible speed in a north-westerly direction, booming and vibrating as though in a vast subterranean cavern.

Chronicle (Adelaide, SA : 1895 - 1954), Saturday 26 November 1927, page 48

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#### EARTH TREMOR.

Williamstown, November 21.

An earth tremor occurred here on Sunday, at 8.45 a.m. Windows shook, ceilings creaked, and crockery rattled. It appeared to be travelling from east to west.

Register (Adelaide, SA : 1901 - 1929), Wednesday 23 November 1927, page 9

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#### AN EARTH TREMOR.

KAPUNDA, November 22.— Referring to the earth shock reported by the Chain of Ponds correspondent as having been felt there on Sunday morning at 8.30, a slight tremor was noticed here at 08.40, so apparently it was travelling from south to north. It was of only a few seconds duration, and was accompanied by low rumbling.

### **1928 Earthquakes South Australia**

Advertiser (Adelaide, SA : 1889 - 1931), Monday 16 April 1928, page 13.

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#### EARTH SHOCKS AT KADINA

About 12.30 a.m. on April 12, three distinct earth shocks were noted at Kadina, particularly in the vicinity of Wallaroo Mines and Lipson-avenue, Kadina South. The second shock was especially severe, and the buildings gave a distinct tremor. It is stated as the cause, that several of the drives and cross-cuts in the nearby mines are caving in, and that this subsidence is responsible for the shocks that have been experienced from time to time.

Observer (Adelaide, SA : 1905 - 1931), Saturday 21 April 1928, page 8.

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HAWKER, April 8.—An earth tremor was felt here at 6.55 a.m. this morning, the windows and doors shook and rattled.

Observer (Adelaide, SA : 1905 - 1931), Saturday 16 June 1928, page 19.

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**AN EARTH TREMOR.**

Felt on Eyre's Peninsula.

EDILLILIE, June 5.—A slight earth tremor was felt by a number of residents on May 31 between 9.10 and 9.15 p.m. The disturbance lasted several minutes.

Kadina and Wallaroo Times (SA : 1888 - 1954), Saturday 8 September 1928, page 2

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**EARTH SHOCK AT KADINA.**

Residents at Kadina were alarmed at a few minutes after eleven o'clock on Wednesday night, when a severe earth shock was experienced in the town and vicinity. The shock was unheralded by any rumble or tremor and was the severest felt here for a long time. A distinct swaying motion was noted; doors swung outwards, crockery clattered on shelves and windows rattled loudly. In Kadina south, while alarm was occasioned at the Ideal Picture Theatre, and in various private houses over a radius of miles. At a residence near Matta Flat, chairs were displaced and pictures swung out of alignment and the inhabitants were fearful of a real earthquake. It is conjectured in some quarters that a subsidence of certain strata took place accounting for the shock, while others are of the opinion that the workings of the copper mines are caving in as the result of accumulations of water and gases. As some of the drives and shafts are over 2,000 ft. down this explanation is not accepted by a large number of people, although it is a fact that a large area subsided in the neighborhood of one of the main shafts two years ago.

Kapunda Herald (SA : 1878 - 1951), Friday 21 September 1928, page 2

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**EARTH TREMOR.**

As earth tremor was felt in Kapunda on Wednesday morning at about 7.20. It was only of short duration, and was accompanied by a low rumbling noise.

**1929 Earthquakes South Australia**

Register News-Pictorial (Adelaide, SA : 1929 - 1931), Friday 22 March 1929, page 27.

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OODLAWIRRA.— At 1.10 p.m. on Friday an earth tremor was felt.

Port Lincoln Times (SA : 1927 - 1954), Friday 4 October 1929, page 1

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**EARTH TREMORS**

A slight earthquake was felt in Port Lincoln about 6.45 a.m. on Thursday. The tremors lasted about half-a-minute, and were accompanied by a rumbling noise.

**Acknowledgments**

Katherine Dix (previously Malpas) and her family did a very thorough job trowelling through the old South Australian newspapers, a thankless but useful task. Before her Alison McArdle and Bierbaum also spent considerable time on this historical project. David Love kindly read and commented on a draft of the paper. Cartographer Gayle Young, at a moments notice, generated Figure 2.