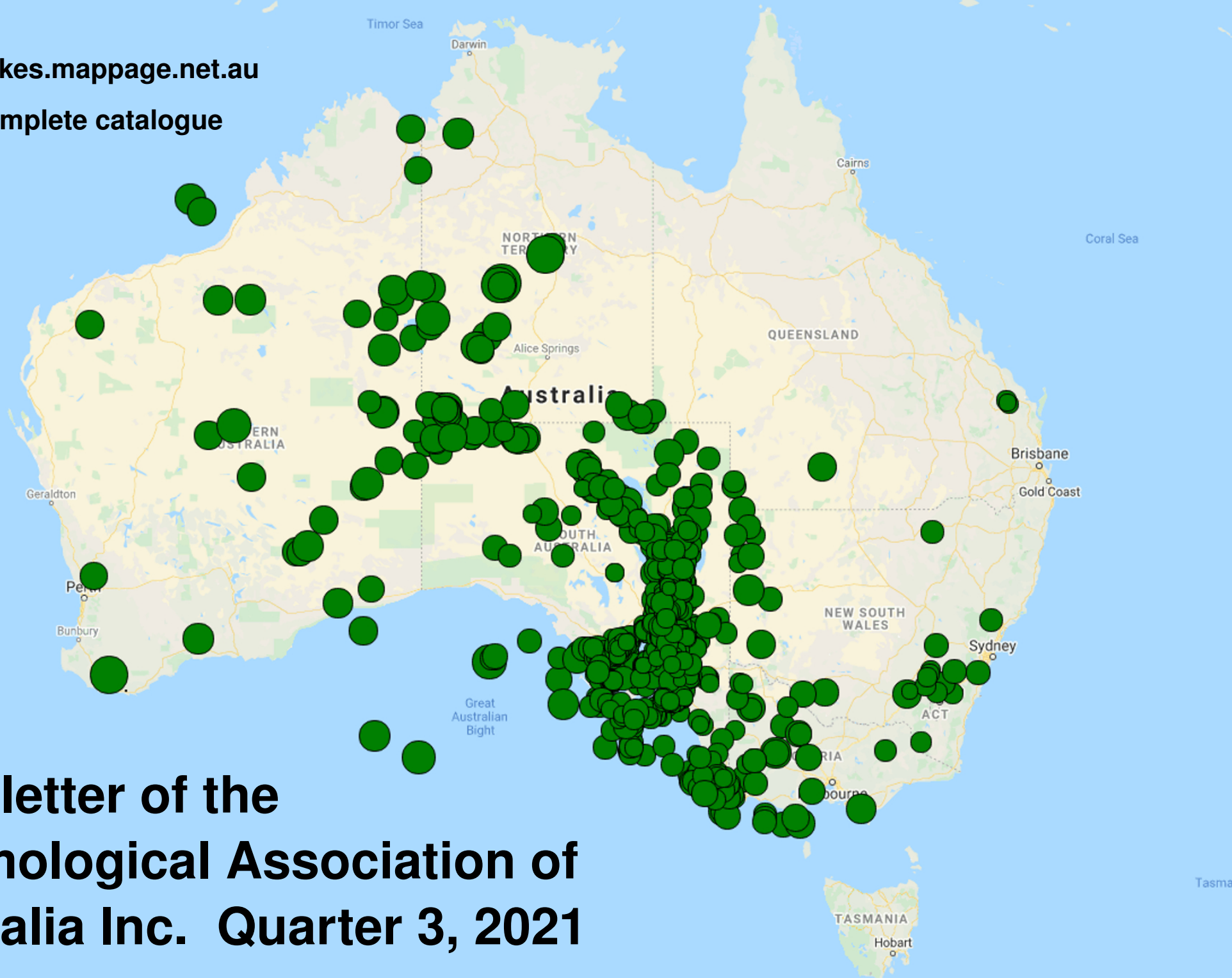


earthquakes.mappage.net.au

the complete catalogue



**Newsletter of the
Seismological Association of
Australia Inc. Quarter 3, 2021**



Welcome to the Newsletter of the
Seismological Association of Australia Inc.
PO Box 682, Mylor SA 5153

Membership of the SAA is open to all, with the only prerequisite being an interest in seismology. Membership applies for the calendar year. (January through to December)

Membership fees are: Full member \$50

A Membership application form can be obtained from the Treasurer by email or [you may download it here](#).

Member Submissions

Submissions for inclusion in the Newsletter are welcome from all members; please note that submissions may be held over for later editions. Wherever possible, text submissions should be sent via email in almost any word processing format. Images should be high resolution and uncompressed, although high resolution JPEGs are acceptable. Your name may be withheld only if requested at the time of submitting.

All enquiries and submissions should be addressed to the Editor and preferably sent by email to weaksignals@iinet.net.au

Your Committee

Chairperson - Blair Lade

mobile: 0407 189 061 email: blairl@bettanet.net.au

Chief Seismologist - David Love

phone: 08 8336 8003 email: david@earthquake.net.au

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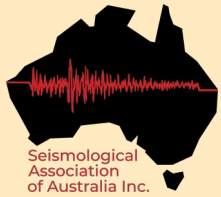
Committee Member - Kevin McCue

email: mccue.kevin@gmail.com

Editor - Peter Gray

mobile: 0418 829 632 email: weaksignals@iinet.net.au

The SAA can be contacted by post to the address above, or by email to any member of the Committee.



SAA News

Members Meetings - On Monday, June 14th, the third of this year's General Meetings was held via Zoom. Adam Pascale from the Seismology Research Centre (SRC) presented a demonstration of the latest version of their earthquake waveform viewer software, Waves 4.0. This latest release includes earthquake location functionality. Some additional enhancements were recently incorporated in Waves 4.1. If you missed the presentation at the meeting back in June, the [SRC YouTube channel](#) has what you want to know about it. Members are reminded of the final General Meetings via Zoom being held on Monday, August 9th. You should receive an invitation to participate in a few days. The 2021 AGM is currently scheduled for October 25th.

Science Alive 2021 - Science Alive in Adelaide has been postponed until November 2021 due to a recent COVID-19 outbreak and subsequent 7 day lockdown in late July. Further details on the rescheduled event will be emailed to Adelaide/SA members and other interested members later in the year

GPS Week Number Rollover (WNRO) - This really is the gift that just keeps on giving. Another batch of our EchoPros have developed timing problems recently and require an upgrade to the newer Condor C2626 GPS modules that we covered back in Newsletter #13, Jul-Aug 2019. The seismic stations at Hindmarsh Valley (HMV1), Palmer (PLMR) and Penwortham (PENW) have already been completed. Tea Tree Gully (UTT) and Hamley Bridge (HML1) should be completed soon, now that we're allowed to move around again. The remaining faulty stations at Brighton (BRTS), Hawker (HKER), Robe (ROBE), and Willalooka (WKA) will be modified as opportunities to visit these sites present themselves. While it's not a major effort to modify/change the GPS in the EchoPro, it's another matter when you consider where they're located and the time and costs associated to travel out to do the upgrade and return home.

Station Upgrades - The Peters Seimological Observatory was recently connected to NBN Fixed Wireless using a pair of Ubiquity NanoStation LocoM2 Wi-Fi links between the TPSO and the house. This helps reduce the SAA's reliance on 850MHz 3G technology, Telstra 3G will be shutdown in 2024. Another 8 port ethernet switch was introduced to allow multiple connections to this service. For the short term, the TPSO EchoPro will continue to use the Maxon Unimax+ Ethernet 3G modem to send the STS-2 data to Melbourne Uni and IRIS (DU network). The HMV1 EchoPro and other data/services have now been shifted to the NBN Fixed Wireless connection. Once we're confident the new service is sufficiently stable, this situation may change. While we were at it, a GPS-NTP Time Server and a Personal Weather Station were installed as well. The Time Server reduces our reliance on external NTP sources and/or individual instrument GPS receivers. The weather station allows us to [remotely monitor the temperature, humidity and barometric pressure](#) within the seismic vault. Finally, we conducted a bit of a clean up within the outer office, just in case we have guests over. I should have taken a picture.



Spreading our wings

Kindly submitted by David Love
Chief Seismologist, SAA
and Kevin McCue, CQSRG

SAA's mappage website expands to the east

Over recent months we have begun to include a few events in southern New South Wales. This has been spurred on by Kevin's new station at Bega, a proposed new station at Bredbo, and another proposed station at Lockhart, 60km west of Wagga Wagga.

The increased ease of incorporating PSN data has also helped. These new locations make use of Shakes, PSNs, Seismometers in Schools data to supplement Geoscience Australia data.

AUSTRALIAN EARTHQUAKES [List](#)

1 7 30 All

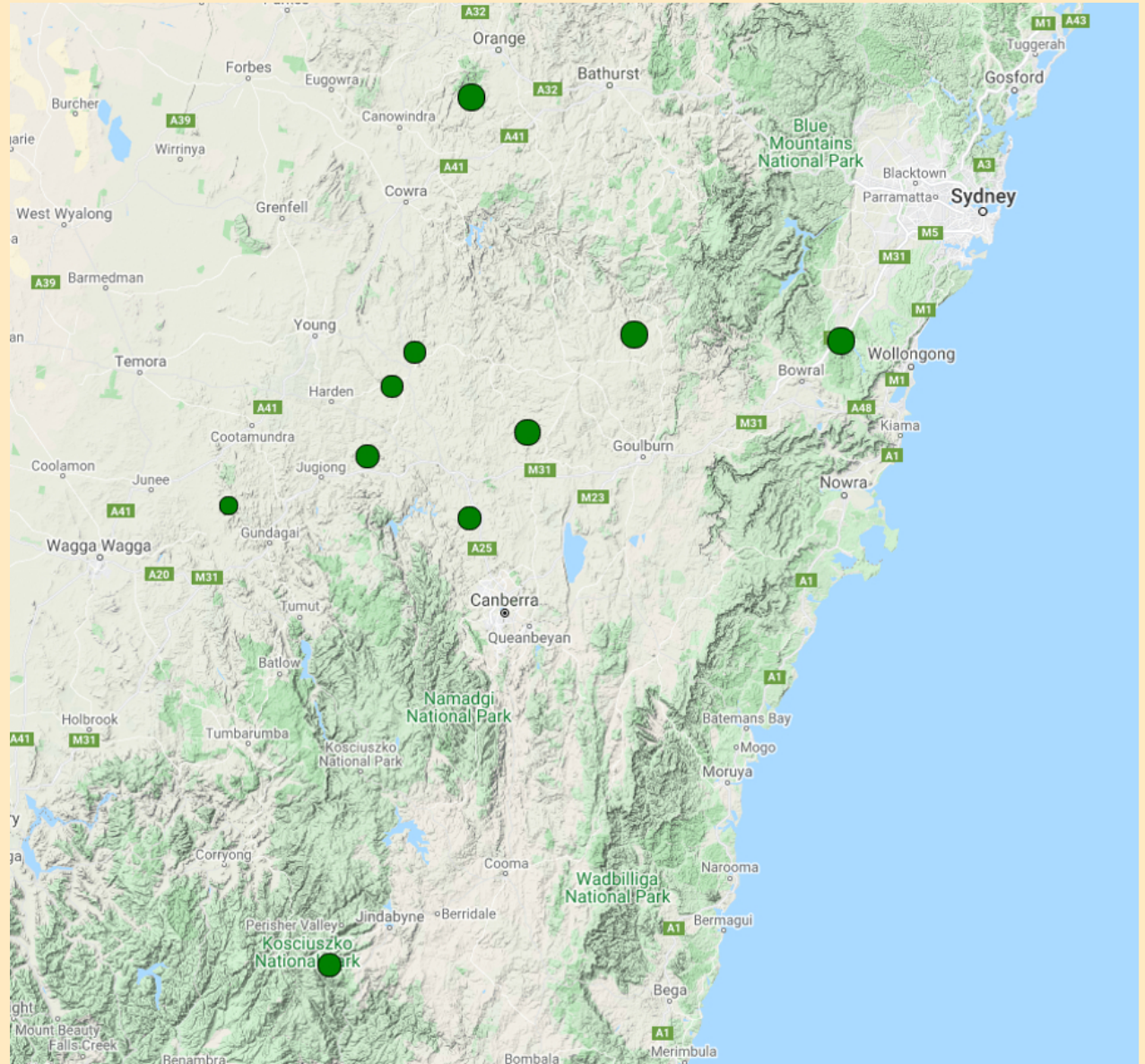
2021-01-01 00:01 < Date <

< Mag <

☐ Quake ☐ Man-made ☒ Both | Filter by map ☒

Event	Mag	E	L
2021-07-26 12:36 Wollongong 30km NW	2.4 MLv		2140
2021-07-20 18:44 Young 36km SE	1.4 MLv		2108
2021-07-20 12:28 Goulburn 50km N	2.4 MLv		2119
2021-07-14 18:09 Gundagai 22km NW	0.7 MLv		2106
2021-07-01 17:59 Cadia Induced?	2.5 MLv		2105
2021-06-05 15:01 Boorowa 7km N	1.4 MLv		2094
2021-04-27 23:44 Yass 37km W	1.7 MLv		2093
2021-03-29 15:45 MT KOSCIUSZKO NSW	1.7 ML		1910
2021-03-17 13:18 MURRUMBATEMAN NSW	1.7 ML		1890
2021-03-16 16:19 DALTON NSW	2.2 ML		1889

Showing 10 of 10

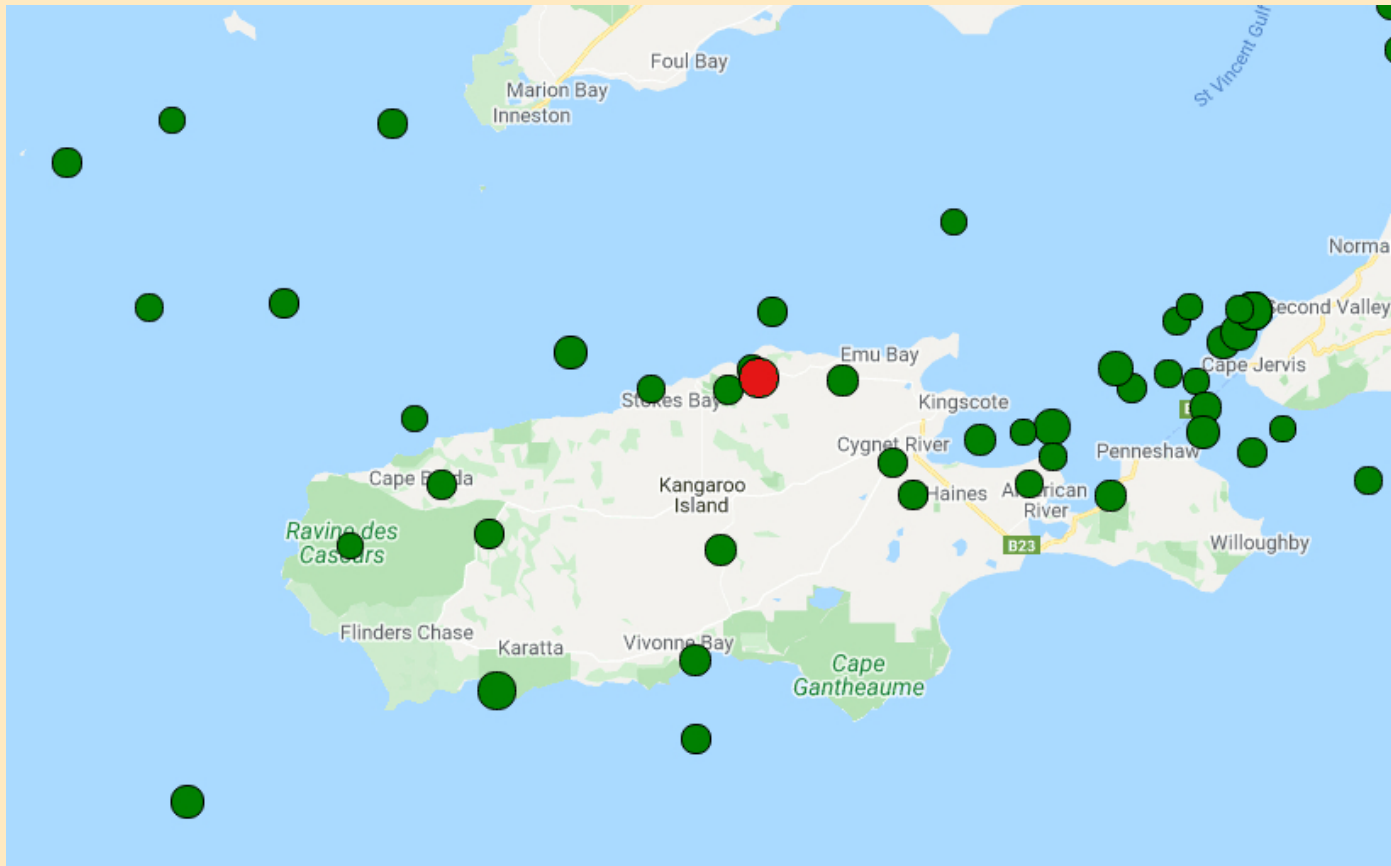




Earthquake Clusters

Kindly submitted by Kevin McCue, CQSRG
David Love, SAA Chief Seismologist
and Gary Gibson, University of Melbourne

A small earthquake near Kingscote Kangaroo Island on the evening of 7th July was reported felt by quite a few local people. The map of recent earthquakes in South Australia <https://earthquakes.mappage.net.au/q.php> shows it was just the latest of a number of earthquakes in the Kangaroo Island region of late. This clustering of earthquakes in time in a defined space is an acknowledged but poorly understood feature of seismicity and other natural phenomena worldwide. Clustering in time is a result of the maths of independent events. They are unrelated (acausal), and the time between events is negative exponentially distributed, so short time intervals are more likely than long time intervals between events. Aftershocks or swarms are causal and different to clusters.



It doesn't tell us what will happen next but the clustering process predicts that quiet years are most likely to be followed by quiet years and active years by active years (Goltz 1997). Australia's earthquake history is short but we can see extreme cases of this behaviour in the earthquakes of Tasmania and southern South Australia.

Map of Kangaroo Island showing earthquakes from June, 2017 to the present day.

The 2021-07-07 event occurred at 09:03UT & had a magnitude of 3.0MLv

This event is marked with a red circle, approx 29km west of Kingscote.



Earthquake Clusters

A most remarkable sequence of earthquakes occurred in Tasmania in the years 1883 to 1892. Some 2500 earthquakes were reported felt, four of them of magnitude 6 or more felt in Melbourne and as far north as Kiama in NSW. The sequence created so much interest worldwide that the Circum-Pacific seismic belt was deviated to encompass NE Tasmania. A decade-long aftershock sequence was generated by the 1897 Kingston earthquake, magnitude 6.5, in SE South Australia. This was followed by a magnitude 6 earthquake in Gulf St Vincent SW of Adelaide in 1902 and there were 5 to 10 years of enhanced activity around these large earthquakes. The 1902 event had relatively few aftershocks compared with the earlier Kingston earthquake..

Notably both of these regions have been relatively quiet, earthquake-wise, ever since apart from a magnitude 5.5 earthquake off Robe in 1948. So we might conclude that next year is unlikely to see a reemergence of strong activity and, like this year, will be relatively quiet. But for how long? We haven't been around long enough to find out how much longer the quiet periods are between the short active periods, i.e. when will the next active cluster occur?

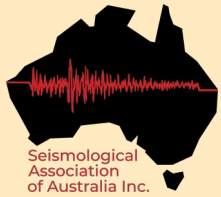
If you engaged an expert team to study the earthquake hazard in Adelaide or Kingston or Launceston, and if they used as their basis just a record of modern earthquakes (post-1965) then their results would, unsurprisingly, reflect the low hazard in all regions. But they would be providing a disservice to society! At some stage the quiet period will change to an active period and society will be caught out. We need to be making better hazard assessments by utilising the historical record but even that is too short. The Kingston and Gulf St Vincent earthquakes were both offshore so current paleoseismology studies, powerful as they are for onshore studies, will not identify the location of past large submarine earthquakes. A forthcoming tomographic study of South-east South Australia may cast some light on the sub-surface structure off Kingston, and the volcanoes there but the resolution will not identify a recent fault rupture.

Designing buildings for at least some minimum level of ground shaking will benefit the occupants and urban rescue teams enormously and compensate for our lack of knowledge of the long-term earthquake process.

The authors wish to acknowledge Professor Bruce Boreham for his assistance with this article.

Reference

Goltz, C. 1997. Fractal and Chaotic Processes of Earthquakes. Springer-Verlag, Berlin.



Addendum to A Mathematical Paradox

Kindly submitted by Mike Turnbull
Lead Seismologist, Central Queensland
Seismology Research Group (CQSRG)

The consequences of $0.\dot{9}$ being numerically equivalent to 1.0

Introduction

In the last newsletter I presented an article discussing a paradox that results from accepting the apparent proof that the infinitely repeating decimal fraction $0.\dot{9}$ is equal in value to 1.0 .

That article contained a mathematical error. In the penultimate section I presented the following equation.

$$1.0 - 0.\dot{1} = 0.\dot{8} \quad \text{Equation 3.3}$$

It didn't take David Love long to email me that this is incorrect. What David said was:

"Subtracting .11111 from 1.0 is not .9999. It is .88888."

Thank you, David, for the deserved reprimand. However, we need to examine this a bit further, and go deeper into the wormhole.

Revisiting the Paradox

What do we mean by Infinity?

The meaning that may be given to the concept of infinity is twofold:

1. Some people claim that infinity is a number. In this interpretation it is represented by the symbol ∞ . We will discuss this further below.
2. The other interpretation of the term infinity is as it applies to a sequence of things or objects that continues ad infinitum – that is, the sequence continues without end.



Addendum to A Mathematical Paradox

Infinity as a Number

In mathematics numbers have very specific and consistent properties. Briefly, and without going into the intricacies of ring theory, to be considered a well behaved number an object must have the following properties.

- Reflexive property. $a = a$
- Symmetric property. If $a = b$, then $b = a$
- Transitive property. If $a = b$ and $b = c$, then $a = c$
- Commutative property of addition. $a + b = b + a$
- Commutative property of multiplication. $a * b = b * a$
- Associative property of addition. $(a + b) + c = a + (b + c)$
- Associative property of multiplication. $(a * b) * c = a * (b * c)$
- Additive identity. $a + 0 = a$
- Multiplicative identity. a times 1 equals a
- Additive inverse property. $a + (-a) = 0$
- Non-zero multiplicative inverse property. $a * 1/a = 1$ for all numbers except zero
- Distributive property. $a * (b + c) = a * b + a * c$
- Multiplicative property of zero. $a * 0 = 0$
- Zero-product property. If $a * b = 0$, then a or b is zero

When these algebraic rules for numbers were being developed, the ancients found a problem with considering zero as a number because it did not conform to the multiplicative inverse property. Even though zero conformed with all other conditional requirements to be a number, no multiplicative inverse could be found for zero. In the end the ancients decided that zero was a special number that did not have to conform to the multiplicative inverse condition. Therefore, it is now referred to as the “Non-zero multiplicative inverse property”.



Addendum to A Mathematical Paradox

Note that matrices do not conform to the commutative rule of multiplication, and are therefore not considered numbers – but complex numbers do comply with all of the rules, and are therefore numbers.

If we examine infinity as a number (∞) we find some inconsistencies, two of which will be discussed below, that preclude ∞ being regarded as a number.

∞ fails the reflex property

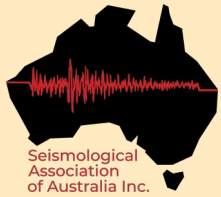
If ∞ is a number then it has to be a specific and consistent value. It cannot be two or more values.

It may be argued that the number ∞ is THE largest value number that can possibly exist. The only way that such a number could be conceived is to consider the largest value digit in whatever number base system you are considering and repeat it ad infinitum. For examples: $\dot{9}$ for the decimal system, \dot{F} for the hexadecimal system; and, ultimately $\dot{\infty}$ for the infinity based number system, where $\dot{\infty}$ represents the final digit in that number system. However, because an infinite sequence has no end, it has no such ultimate digit. This situation presents two inconsistencies.

1. The conceptual value for ∞ as a number is different in every number base system and therefore cannot comply with the reflexive condition. While it is possible to convert numbers from one number based system to another, it is not possible to convert the number ∞ in the ∞ base number system into any other number base system
2. The numerical value of ∞ has to be defined in terms of ∞ itself, thus creating an infinitely recursive definition – presumably not possible.

∞ is ambiguous in relation to the Non-zero multiplicative inverse property and the Multiplicative property of zero. When using ∞ in algebraic manipulations we often see the following.

$$\frac{a}{\infty} \simeq 0$$



Addendum to A Mathematical Paradox

We also see the following (even though this operation is not really defined in the mathematical field).

$$\frac{a}{0} \simeq \infty$$

Which begs the question: which of the following statements is correct – if indeed one is correct?

$$\frac{\infty}{\infty} = 1 \quad \text{or} \quad \frac{\infty}{\infty} \simeq 0 \quad \text{or} \quad \frac{\infty}{\infty} \simeq \infty$$

Infinity as it is applied to a sequence of things or objects that continues ad infinitum.

It has to be observed that any adequately defined infinite sequence of digits (such as $0.\dot{8}$ or $0.\dot{9}$ that is extended ad infinitum, has no ultimate or penultimate or ante-penultimate symbol in the sequence. It also needs to be observed that the sequence is not built up digit by digit, by appending another digit to some previous incomplete sequence – the infinite sequence immediately exists in toto, and is not constructed one digit at a time!

Therefore, going back to my arithmetic mistake in my previous article the following correction is warranted:

$$0.\dot{9} - 0.\dot{1} = 0.\dot{8} \quad \text{Equation 3.2}$$

$$1.0 - 0.\dot{1} = 0.\dot{8} \quad \text{Equation 3.3}$$

Not:

$$1.0 - 0.\dot{1} = 0.\overline{88888888} \dots 9$$



Addendum to A Mathematical Paradox

And this situation is consistent no matter what number base system is used (except impossible number systems such as unary, zeroary, and infinitary systems).

In conclusion, mea culpa. The paradox, as I presented it, is not a paradox at all; but that does not put infinity in the clear. There are still plenty of difficulties with infinity both as an ad infinitum sequence and as a number concept.

I do hope that these discussions have stirred your curiosity.

Michael Lloyd Turnbull BAppSc(Distinction) QUT, MAppSc CQU.

Lead Seismologist, Central Queensland Seismology Research Group (CQSRG).

Adjunct Research Fellow, CQUniversity Australia (CQU).

Member of the Australian Earthquake Engineering Society (Since 1997).

Foundation Member of the Seismological Association of Australia (SAA)

Retired Member of the Australian National Committee on Large Dams (ANCOLD)

Member of the Royal Society of Queensland

<http://www.cqsrg.org/>



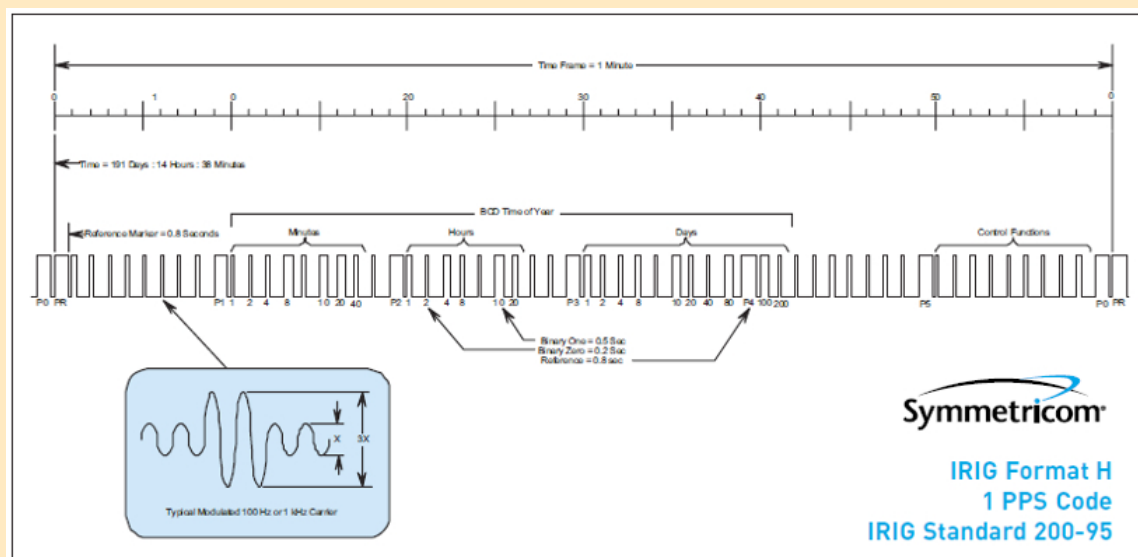
Raspberry Shake time accuracy

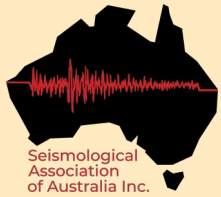
Kindly submitted by Blair Lade
SAA Chairperson, with some
assistance from the Editor

One of the SAA Development Raspberry Shake RJAMs landed on my desk this week, we had planned on using it for demonstration purposes during this year's Science Alive in August. As I write this, Science Alive has been postponed to November due to a recent COVID-19 outbreak/lockdown in South Australia.

Out of the box, the 'shakes' use Network Time Protocol (NTP) as a time reference source. USB GPS receivers are an option, if required. I took the opportunity to test the 'shake' for time stamp timing accuracy by applying a time signal derived from a Symmetricom TS2100 Time Server to an analogue input of the 'shake'.

The time signal is in the format of IRIG H, we call it 'slow code' as the rate is one pulse per second (PPS) and it contains information in its pulse width that allows the time of day and the day of year to be recorded onto slow sampling recorders such as tape machines, chart recorders and things like seismic data recorders.





Raspberry Shake time accuracy

The rising edge of my time code is within a micro second of the rising edge of the 1 PPS signal from a GPS signal and is therefore ideal for testing the accuracy of digitally recorded time stamps on logging equipment. Details about the different IRIG time codes is in [this excellent booklet from Symmetricom](#). IRIGH was used at the Warramunga Seismic Station on the 24 track logging tape recorders in the 1970's. The station master clock was 'set' every day by tuning a shortwave radio to the now defunct [VNG time service](#) broadcast from Lyndhurst Victoria. It was a sad day when VNG closed down.

As part of the testing, I looked at where the time on the 'shake' is downloaded from in the NTP configuration file on the 'shake', being located at /etc/ntp.conf . The time servers listed were all overseas and it is logical to use closer time servers in Australia. Here are several that we use:

- server 1.debian.pool.ntp.org iburst (one of the original servers)
- server 0.au.pool.ntp.org iburst (Australian 'pool' time servers)
- server 1.au.pool.ntp.org iburst
- server 2.au.pool.ntp.org iburst
- server 3.au.pool.ntp.org iburst
- server ntp.internode.on.net (internode's server in Adelaide)
- server tic.ntp.telstra.net (Telstra's servers)
- server toc.ntp.telstra.net

A save and reboot gets the 'shake' onto the new time servers. I left the 'shake' working for a few hours so that NTP could 'do it's thing' and tune the time.

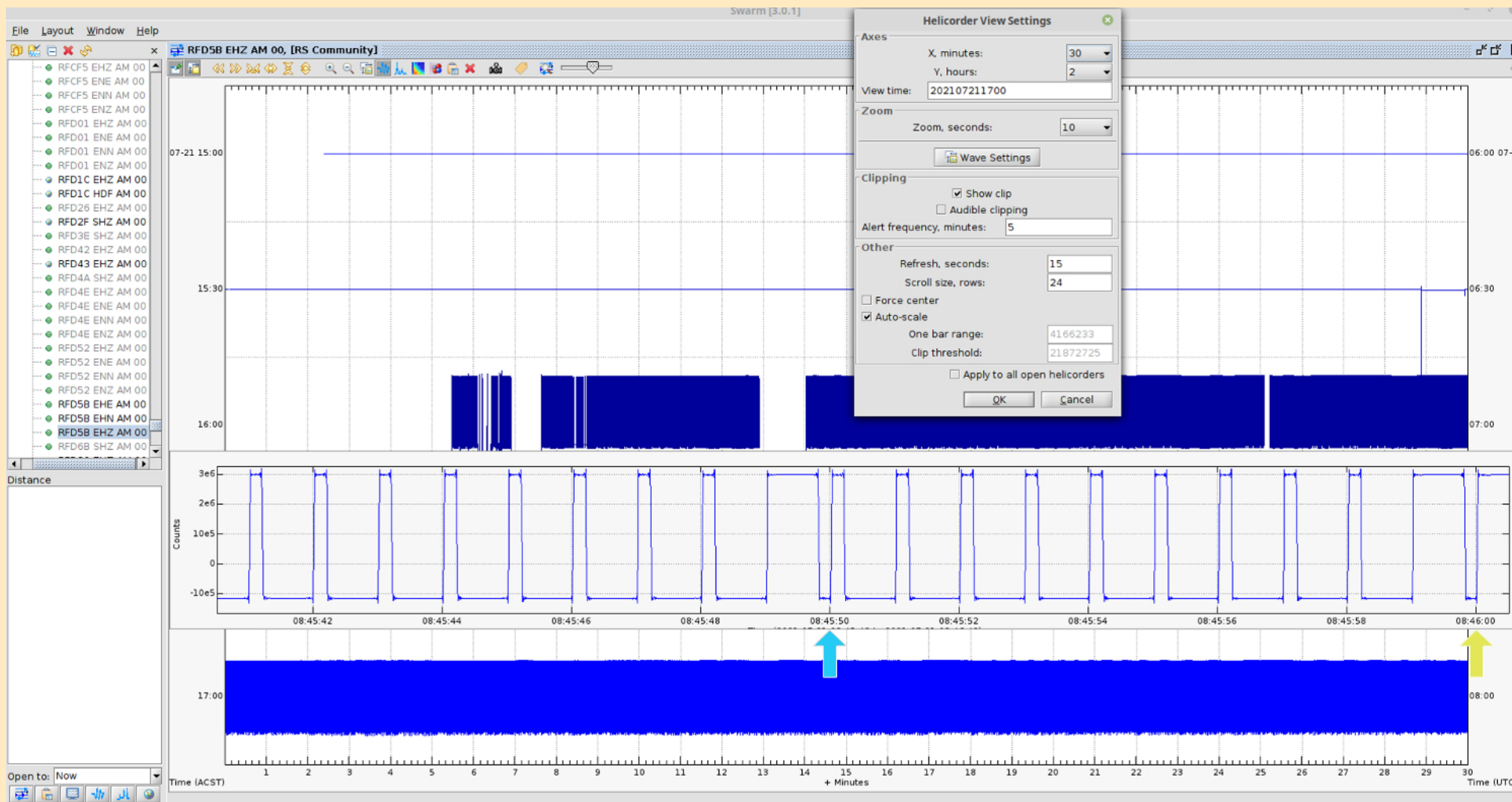
Connecting my time signal was pretty straight forward as I regularly connect it to Echo recorders for checking that replacement GPS are working correctly when I change them and Peter has set up the 'shakes' to replicate the connections of an Echo recorder.

While playing with the 'shake' and a Raspberry Pi 4 set up to run RSUDP as a local display, I noticed that the timestamp didn't always line up perfectly with the time scale on the 'local' display, but that's not an issue as we wouldn't be extracting arrival times that way.

Onto the data.

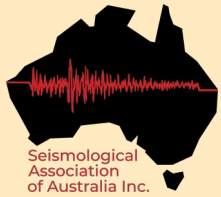


Raspberry Shake time accuracy



You can see the varying width time code in the above screenshot, the Blue triangle shows the 50th second marker and the Yellow triangle shows the double 1 minute marker. Both are 'where they should be'

[illegible]



Raspberry Shake time accuracy

We can see that the rising (LHS) edge is concurrent with the seconds marker on the time line. This is an excellent result, however, I'm mindful that it is only one sample point and ideally, we should run the recorder for many days and randomly check over a long period for continued accuracy. This data shows that the timestamping on the Shake recorders seems to be excellent. There are some 'interesting artefacts' either side of the rising and falling edges and we'll talk about what those might be another time.



Bowen Sequence Update

**Kindly submitted by Mike Turnbull
Lead Seismologist, Central Queensland
Seismology Research Group (CQSRG).**

On the following page is the most recent version of my Whitsunday Passage reactivation series up to the end of June 2021.

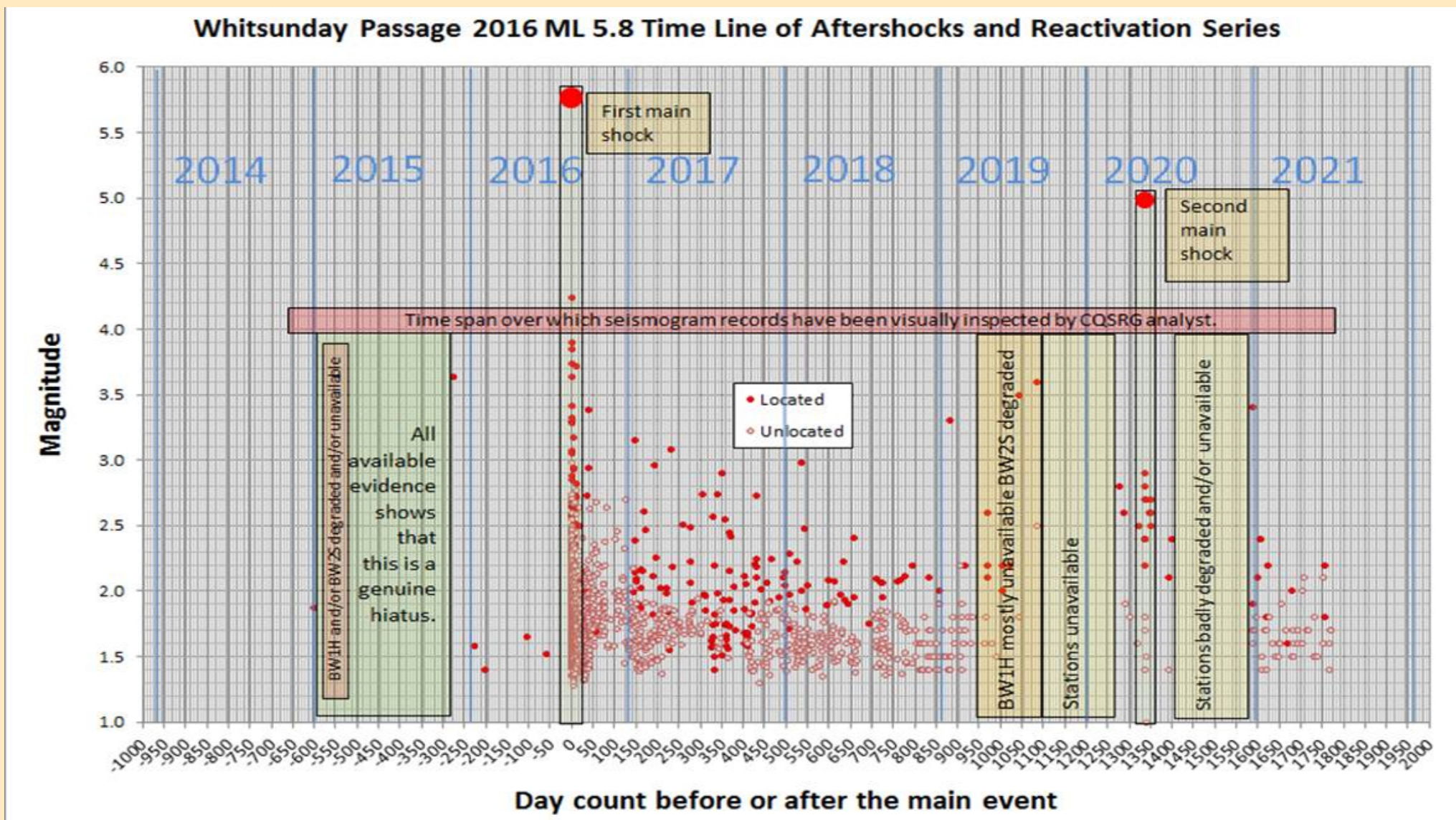
The Whitsunday Passage area is generating regular earthquakes up to ML2.4 and it does not look as though this activity will abate over the foreseeable future. Indications are that there will be the periodic larger events up to about ML3.5 at least every year, and possibly larger events up to about ML5 less frequently.

The graph shows events that I have detected and located (solid red dots), and those that I have detected but not located due to lack of recordings (unfilled red dots). Currently I have been adding the located events to my earthquake catalogue (available online at <http://cqsrq.org/catalogue/>) but not the unlocated ones. I am considering adding all of the unlocated events to my catalogue as the occurrence of these events is important data to be taken into consideration for assessing the regional hazard in the future.

The magnitudes I have allocated to events that have occurred subsequent to the GA upgrade of the Bowen stations are currently under review and the magnitudes shown on the accompanying graph since about February 2021 may be slightly exaggerated. When this review has been completed the online graph at <http://cqsrq.org/bowen/> will be updated with the new values.



Bowen Sequence Update

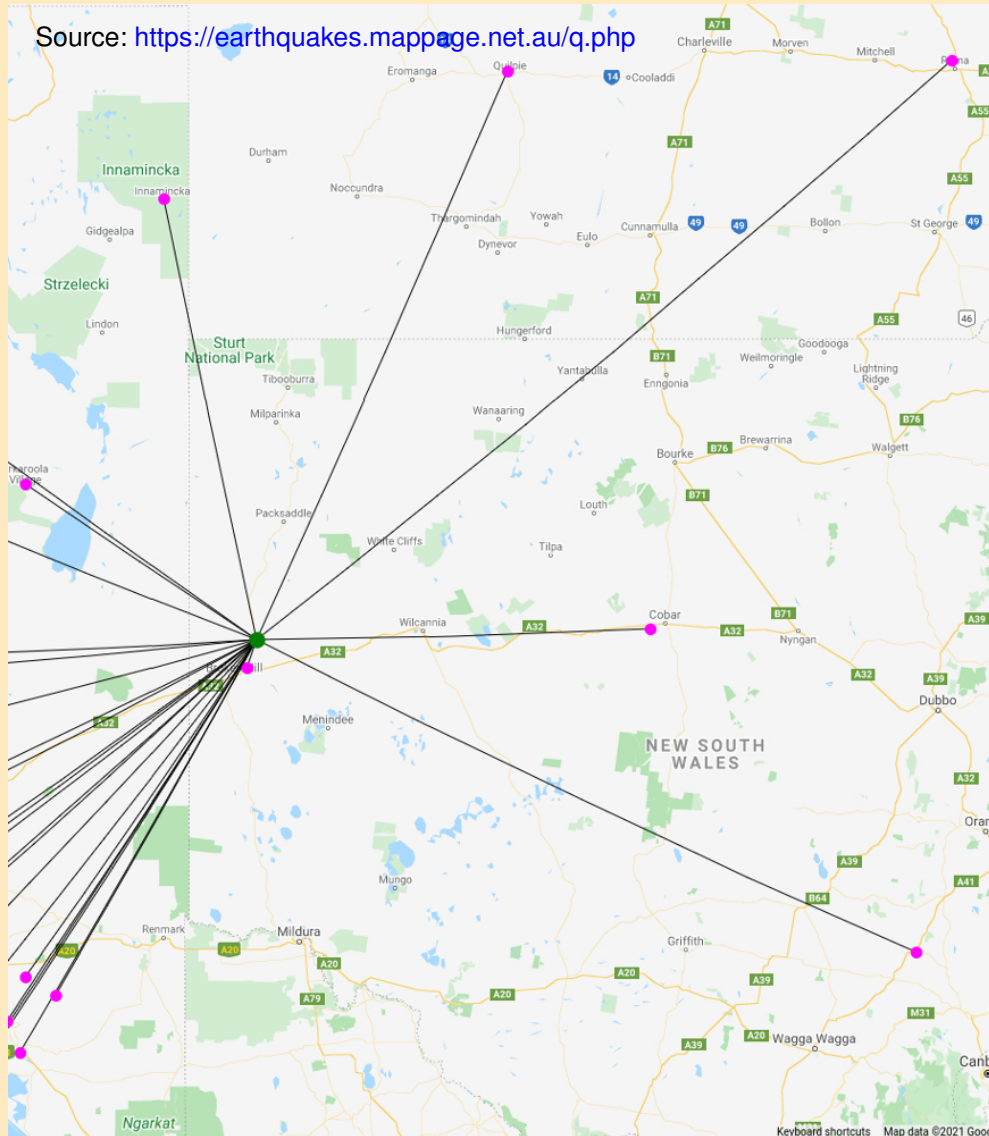




Recent Seismic Activity - New South Wales

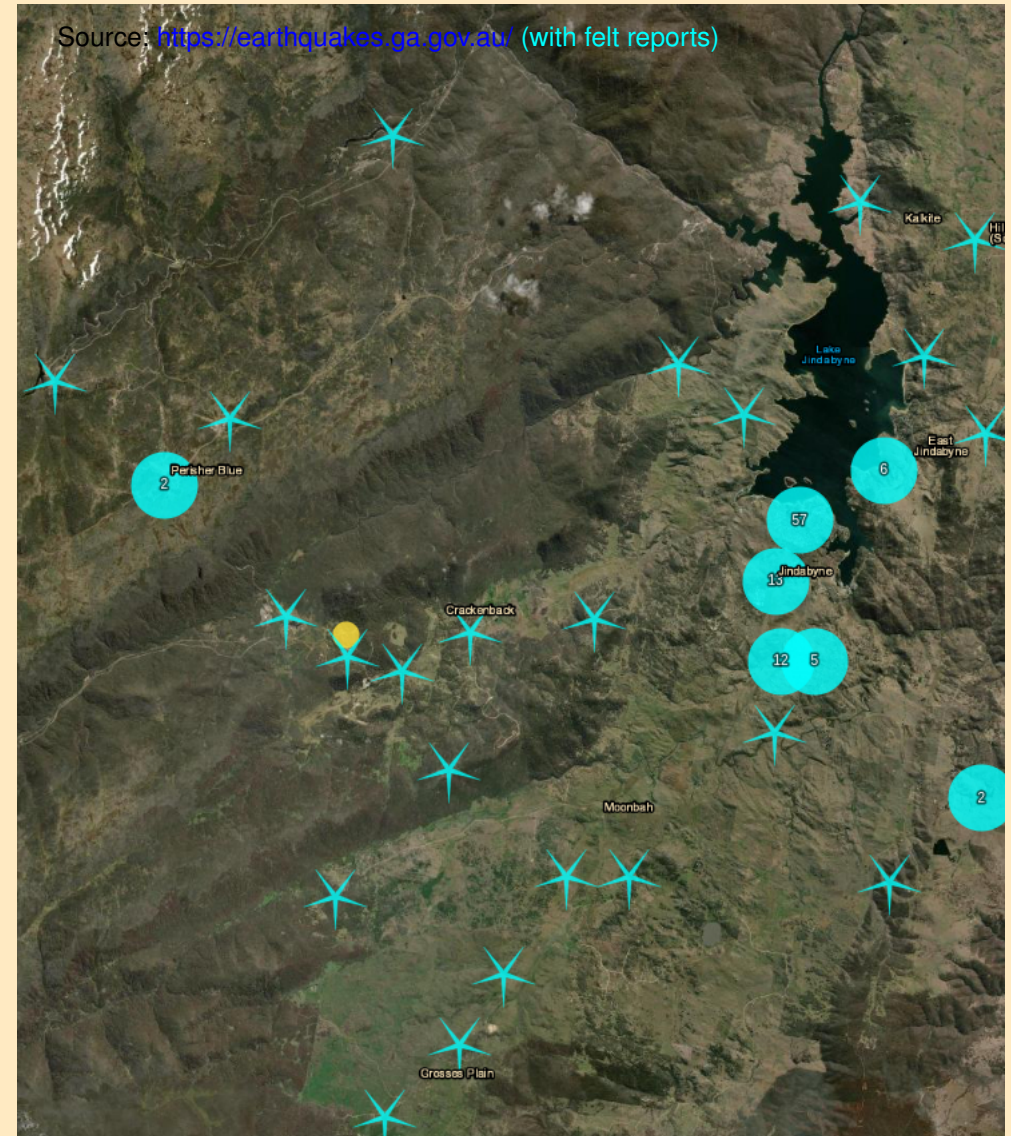
2021-06-24 18:30 NE of Broken Hill -31.6388, 141.693 4.0MLv

Source: <https://earthquakes.mappage.net.au/q.php>



2021-05-05 00:15 Jindabyne -36.45, 148.47 3.0ML

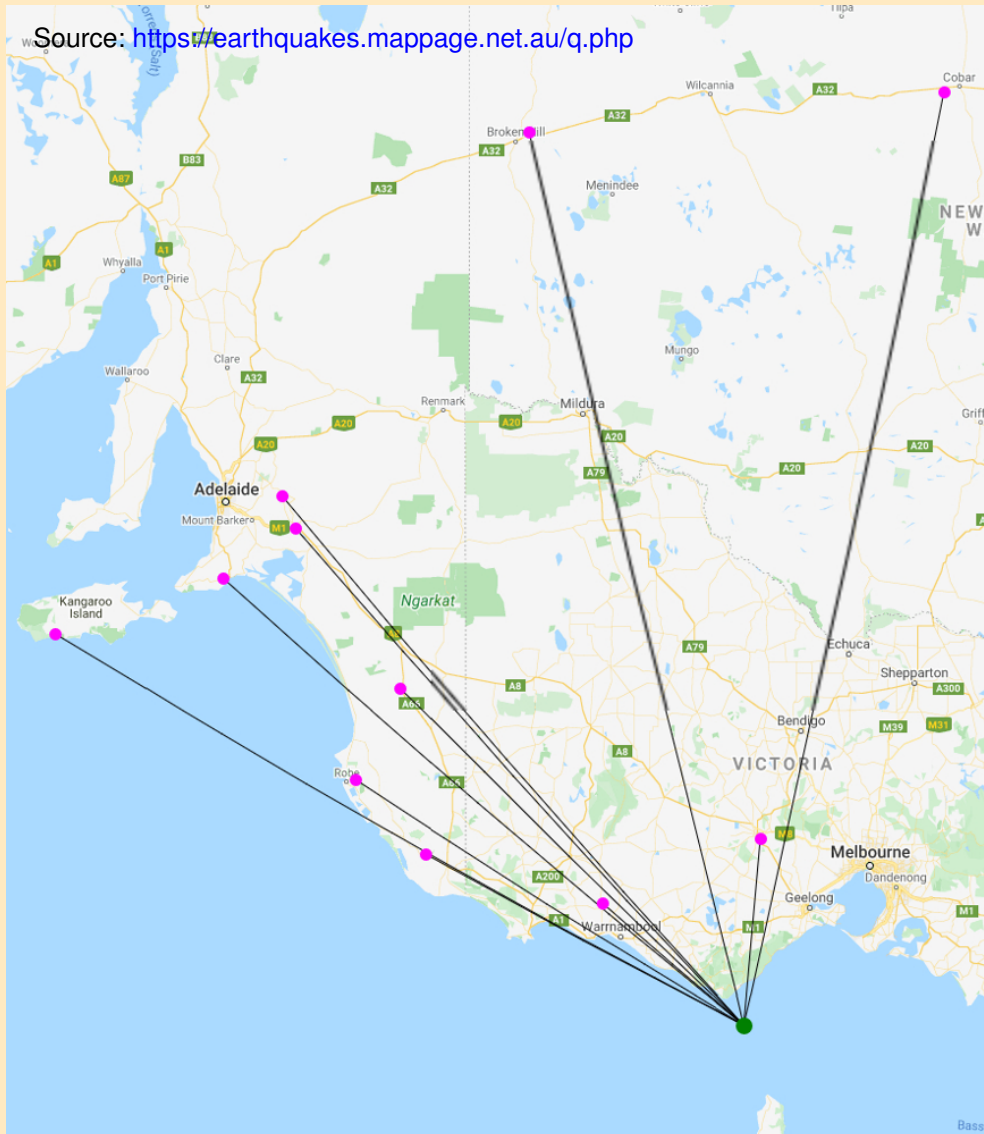
Source: <https://earthquakes.ga.gov.au/> (with felt reports)



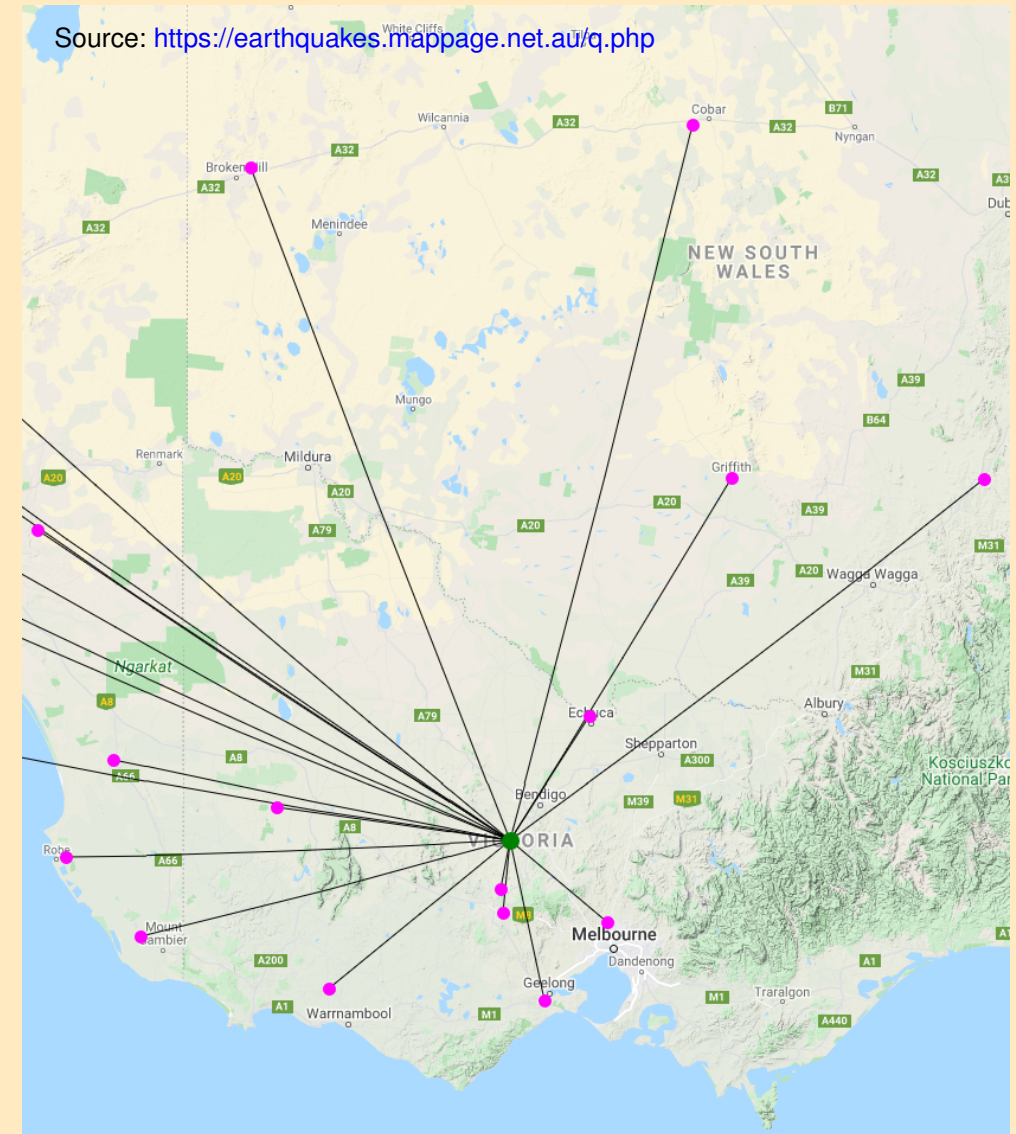


Recent Seismic Activity - Victoria

2021-06-24 09:09 S of Cape Otway -39.0504, 143.715 3.8MLv



2021-05-27 00:46 Maldon -37.0174, 143.998 3.0MLv





Recent Seismic Activity - Queensland

2021-07-13 01:36 Offshore Bowen -19.82, 148.71 3.4ML

Source: <https://earthquakes.ga.gov.au/> (with felt reports)



2021-06-17 11:12 Offshore Innisfail -17.29, 146.60 2.6ML

Source: <https://earthquakes.ga.gov.au/>





Recent Seismic Activity - Western Australia

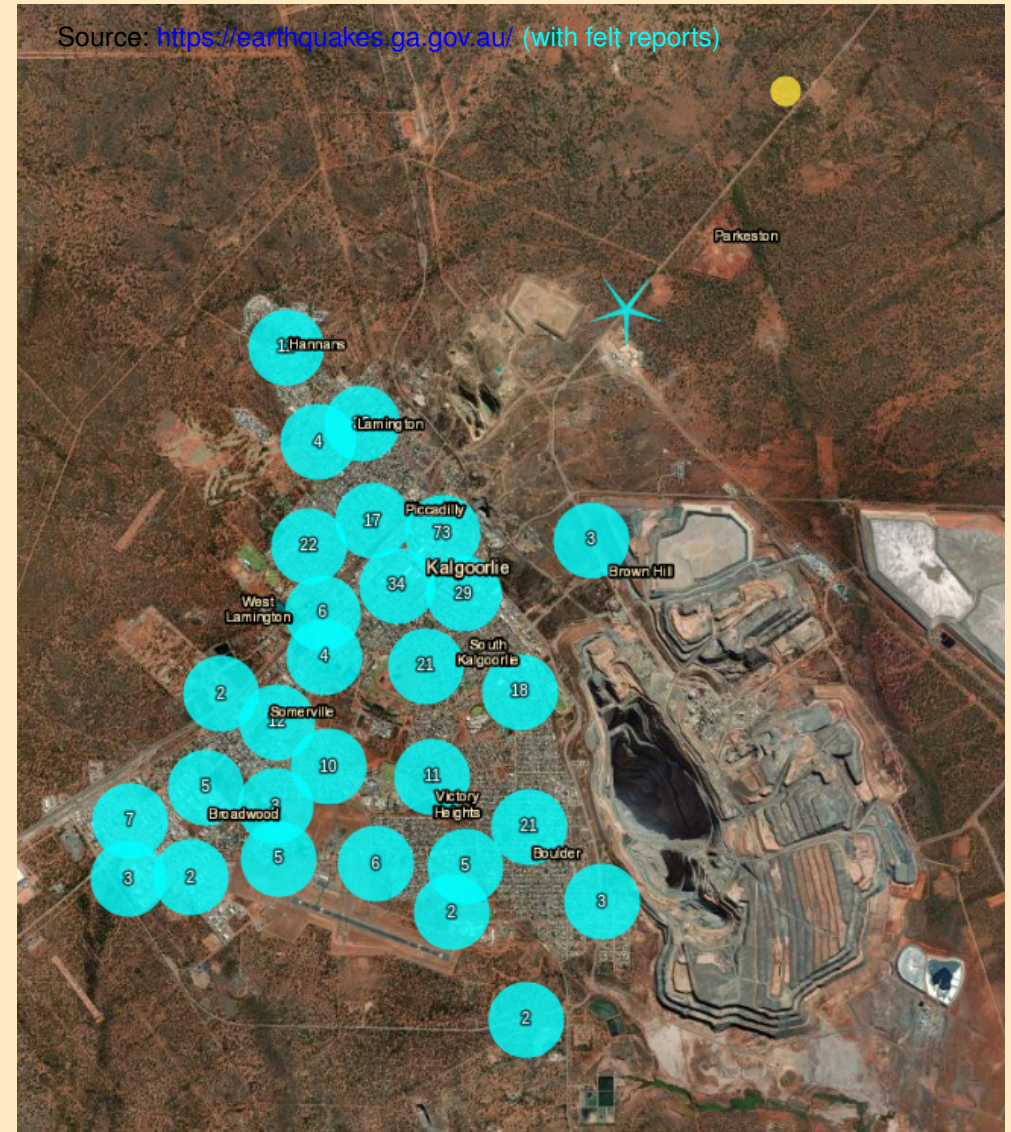
2021-06-26 22:12 N of Coral Bay -22.96, 113.86 4.7ML

Source: <https://earthquakes.ga.gov.au/> (with felt reports)



2021-05-04 07:14 Kalgoorlie-Boulder -30.69, 121.52 3.2ML

Source: <https://earthquakes.ga.gov.au/> (with felt reports)

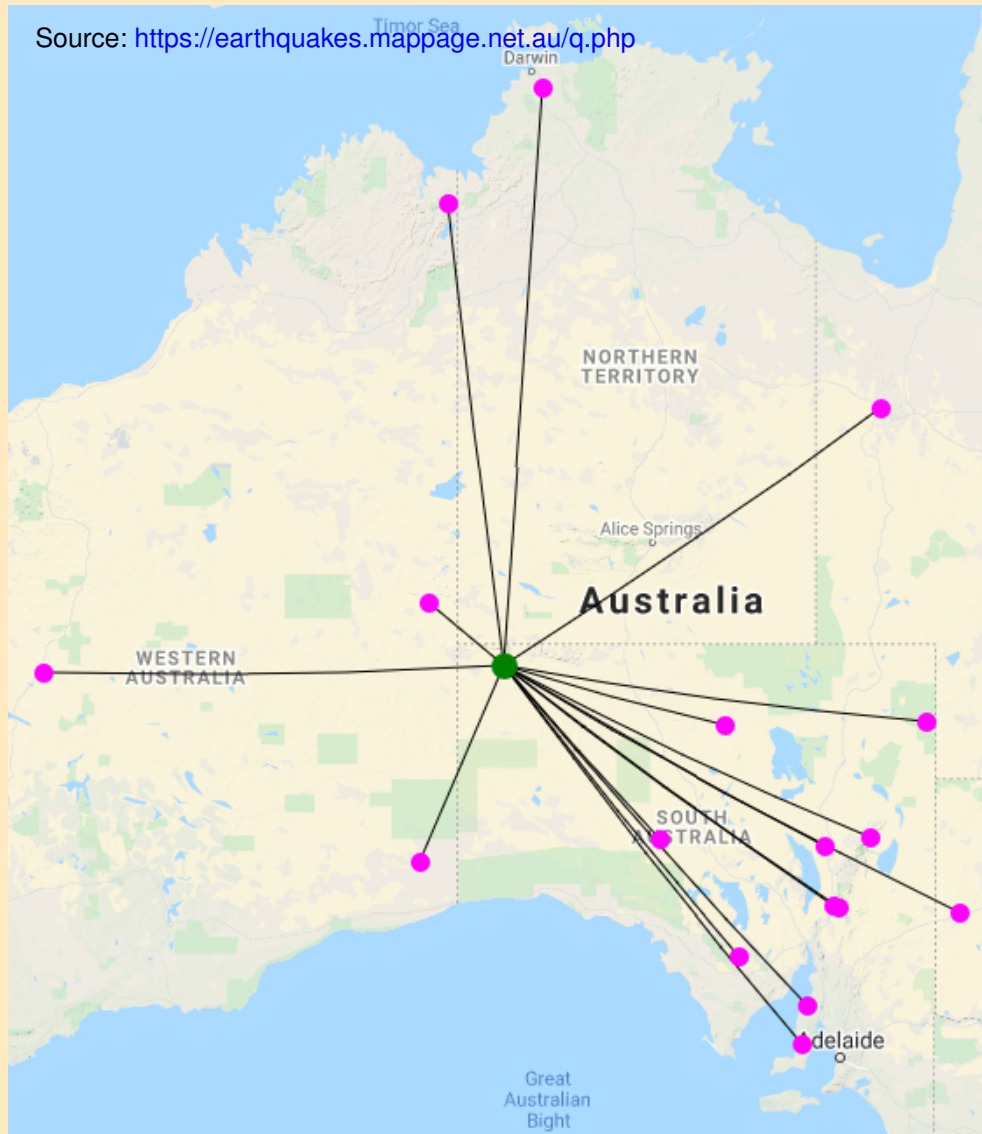




Recent Seismic Activity - South Australia

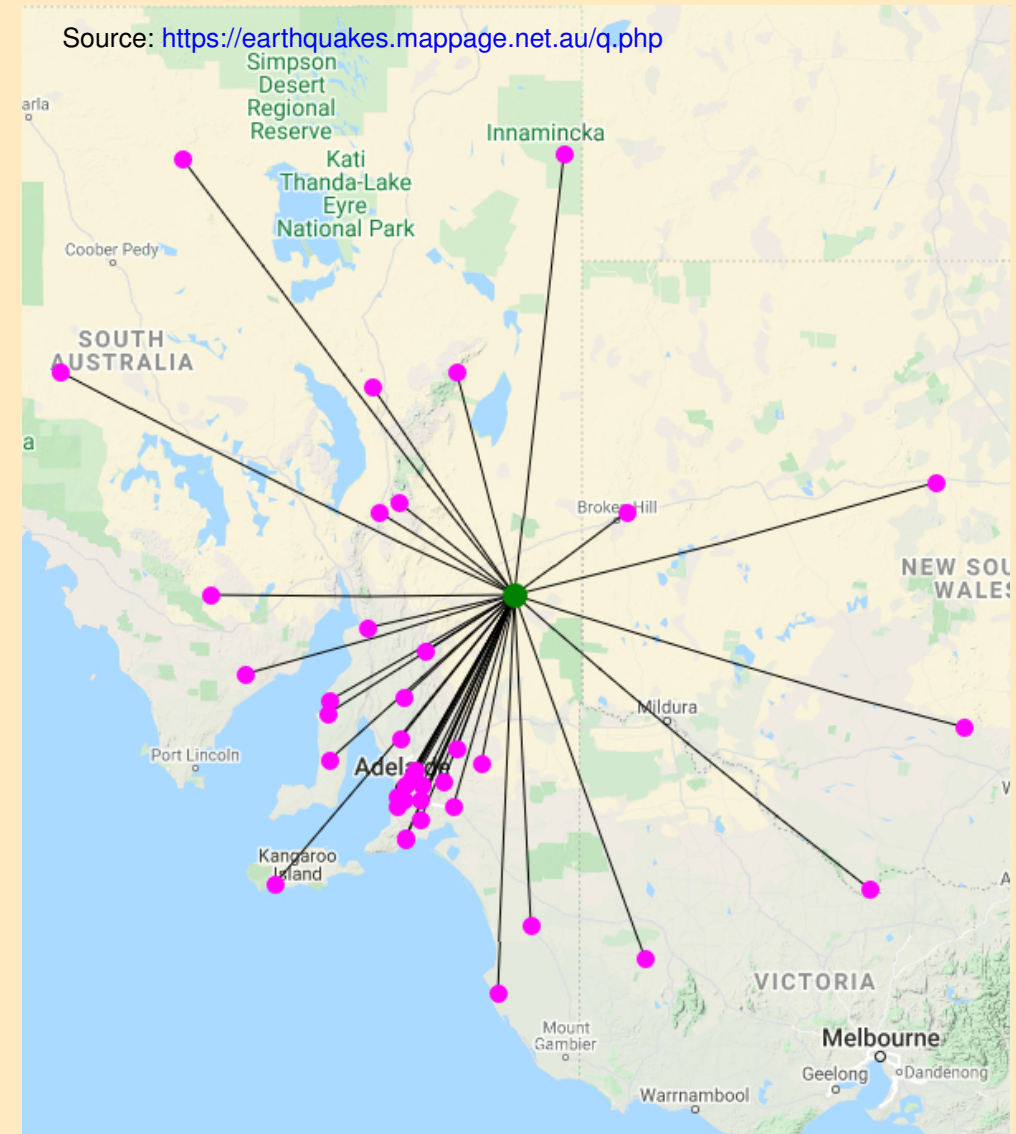
2021-07-19 15:54 APY Lands -26.4656, 130.15 3.5MLv

Source: <https://earthquakes.mappage.net.au/q.php>



2021-05-06 17:33 S of Manna Hill -32.8134, 140.103 3.1MLv

Source: <https://earthquakes.mappage.net.au/q.php>

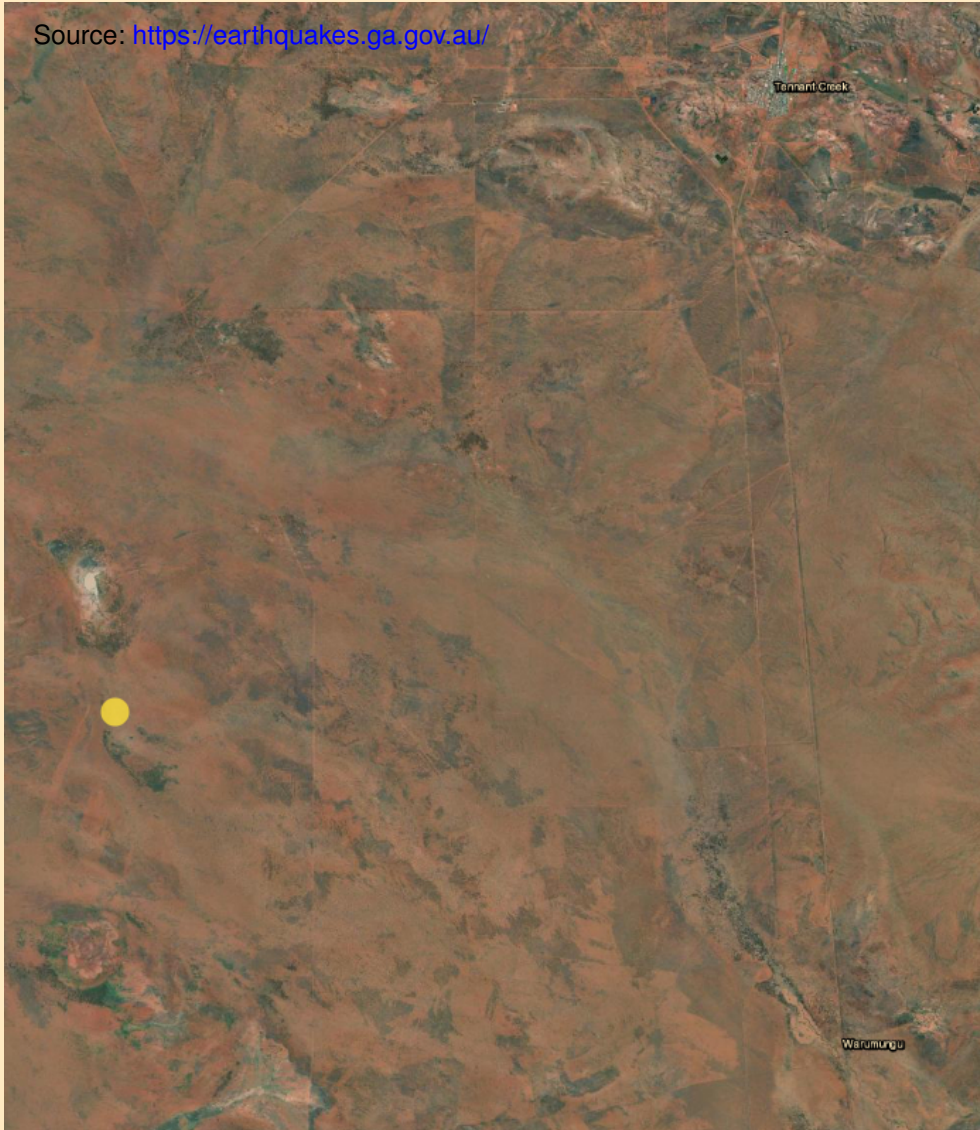




Recent Seismic Activity - Northern Territory

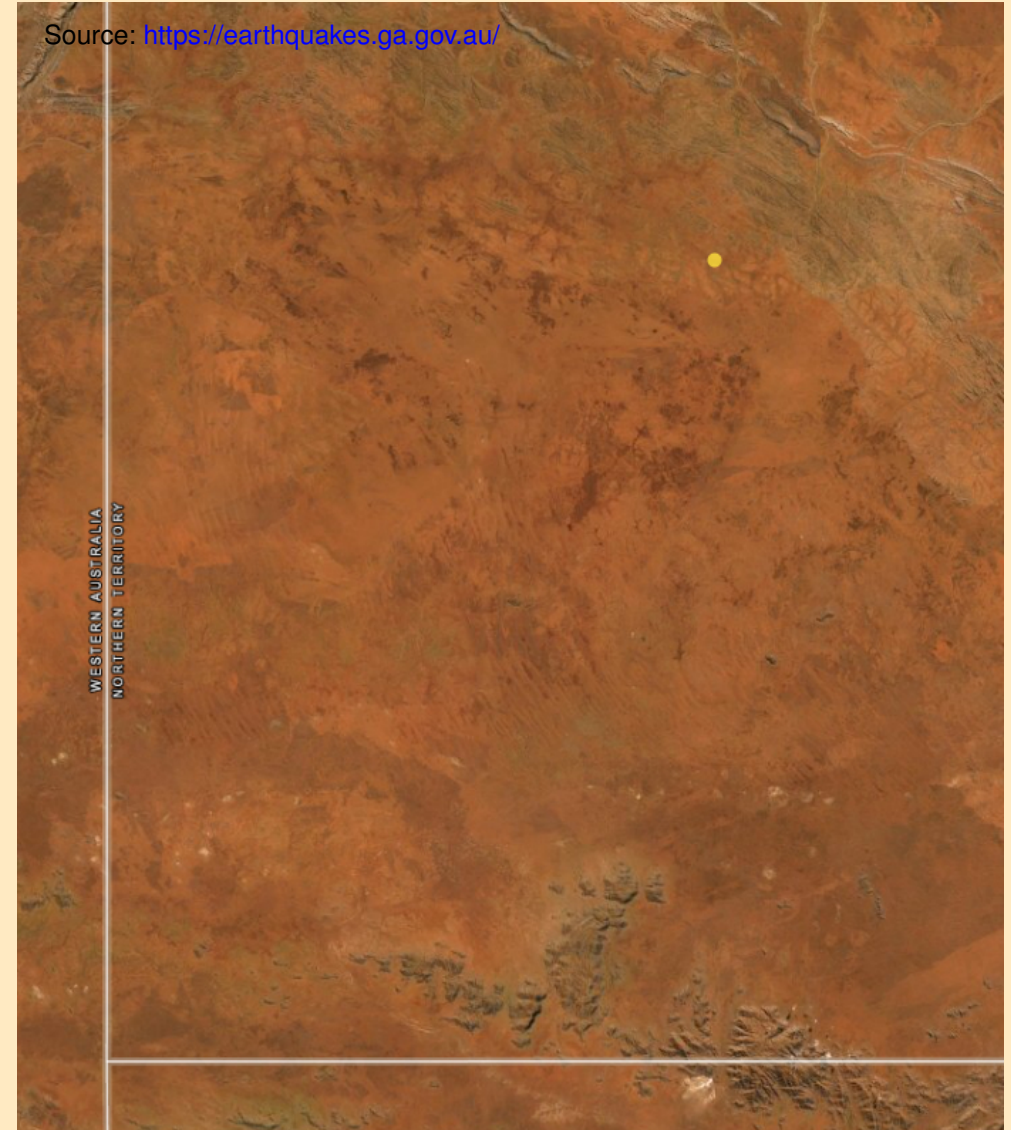
2021-06-21 20:18 SW of Tennant Creek -19.85, 133.96 3.1ML

Source: <https://earthquakes.ga.gov.au/>



2021-06-27 18:44 Kaltukatjara -25.26, 129.62 2.9ML

Source: <https://earthquakes.ga.gov.au/>





THE CASE OF THE LOST EARTHQUAKE

Kindly submitted by David Love
Chief Seismologist, SAA

Tamarah King, an earthquake geologist from Melbourne Uni and currently working at Oxford, found a reference to an earthquake magnitude 5.2 in the Northern Territory in 1985 in the Geoscience Australia (GA) database. However the event was not listed in the annual BMR report for 1985 (BMR became GA).

So began an interesting email trail. It appears that the event was listed at one stage in the International Seismological Bulletin (ISC), but it now no longer exists; the reverse of the GA situation! There were suggestions as to how the event got there. Was it an automatic system event from elsewhere that was absorbed into a catalogue when it should not have been? How would we check? Almost everything was analogue in those days, and the records are not easy to access. Was it related to another event?

Col Lynam went straight to the horse's mouth and received a "mea culpa" reply from ISC, with an explanation for the event history.

ISC director Dmitry Storchak writes...

Sadly, this "earthquake" was inadvertently "invented" by my predecessors at the ISC. There was/is a routine operational process called "search" at the ISC where our analysts are trying to make use of all remaining station readings (reported to us) that haven't been associated to any already reported earthquakes. Sadly, on this occasion the ISC analysts of 1987 vintage did not recognise that many of the station readings of this "event" were in fact readings of secondary seismic waves from the preceding real moderate earthquake in New Britain Region that in 1987 was known to be recorded by 238 stations....

The change in the ISC Bulletin has come as part of the Rebuild mega-project that we ran at the ISC for 10 years and completed in 2020. The phantom M5.2 "event" of interest has been banished whilst the majority of its "station readings" re-associated with the real event in New Britain that now has 274 associated station readings instead of 238 in the past....

This explains why you can no longer find the 1985/09/10 M5.2 event in the rebuilt ISC Bulletin. If GA still has a record of this earthquake with reference to the ISC, then we apologise for being a cause and kindly ask GA to remove it.

I did not mean to criticise my colleagues-predecessors at the ISC. Back in 1987 they had very little chance of catching this "event" automatically. Sadly, this event passed their manual review on some sunny Friday afternoon. At the ISC, we now have a dedicated process that aims to identify and catch similar instances before their publication.

Many thanks to all who added a piece to this episode. Many thanks to ISC (<http://www.isc.ac.uk/>) for their mammoth effort in collecting data. As at 2019, their bulletin included 7.6 million events, and 256 million associated station readings for those events!



Resources & useful links

Description	URL / Webpage	Notes
SAA Membership Application	https://www.assa.org.au/media/74629/saa-membership-	Join up with the SAA using this form
SAA Flier	https://www.assa.org.au/media/74629/saa-membership-	Our current brochure - flier, saying what we do
SAA Newsletters	https://www.assa.org.au/resources/seismology/saa-	Download any SAA Newsletter from this site
SAA EqServer	http://ade-eqserver.dyndns.org:8080/eqserver/	South Australian miniseed seismometers
Melbourne University EqServer	http://meiproc.earthsci.unimelb.edu.au/eqserver/	Australian miniseed seismometers
Regional Seismic Network	http://www.regional-seismic.net/	PSN seismometers - Aust. Centre for Geomechanics
Australian Public Seismic Network	http://cqsrq.org/psn/stations/	Australian PSN seismometers
Recent SA Earthquakes	https://earthquakes.mappage.net.au/q.php	Data & summaries of recent SA quakes
Central QLD Seismology Research Group	http://www.cqsrq.org/	CQSRG - Kevin McCue
Astronomical Society of SA	https://www.assa.org.au/resources/seismology/	ASSA - Seismology page
Geoscience Australia	http://www.ga.gov.au/earthquakes/initRecentQuakes.do	Our national authority on seismic events
Earthquake Services	https://www.researchgate.net/profile/Colin_Lynam	Citizen Science Consultant - Col Lynam
Seismic Research Centre	https://www.src.com.au/	OEM of seismic instruments & software
symCDC	http://symcdc.com/	OEM of seismic instruments & software
IRIS Seismic Monitor	http://ds.iris.edu/seismon/	Global seismic events
Joint Australian Tsunami Warning Centre	http://www.bom.gov.au/tsunami/	Bureau of Meteorology site
Australian Earthquake Engineers Society	https://aees.org.au/	An organisation with similar interests
Atlas of the Underworld	http://www.atlas-of-the-underworld.org/	Mapping the Earth's mantle
Atlas of Living Australia	https://www.ala.org.au/	A Citizen Science initiative