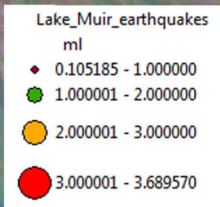
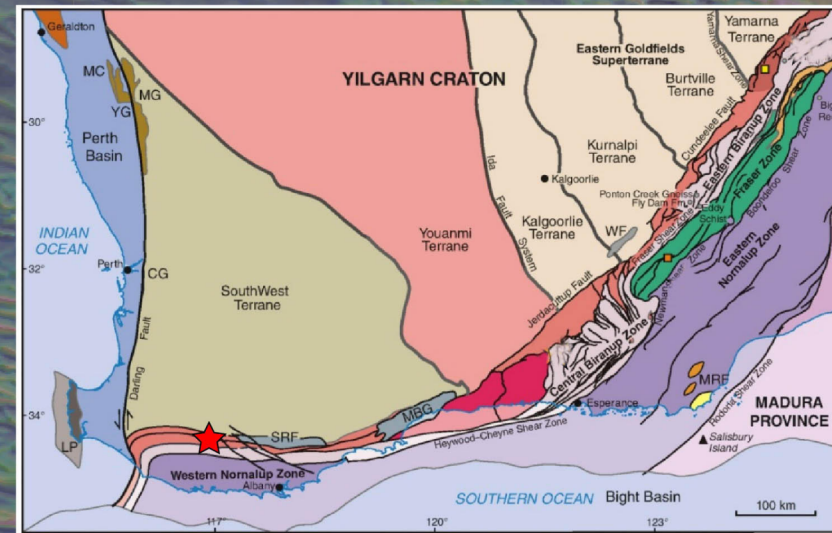


Newsletter of the Seismological Association of Australia Inc. Sep-Oct 2018



Yilgarn Craton

LM05

Yilgarn Craton reworked
in Albany-Fraser Orogeny

Albany-Fraser Orogen

LM04

LM02

2018-09-16

LM01

2018-09-16

Mw5.3 mainshock
GA 3D solution

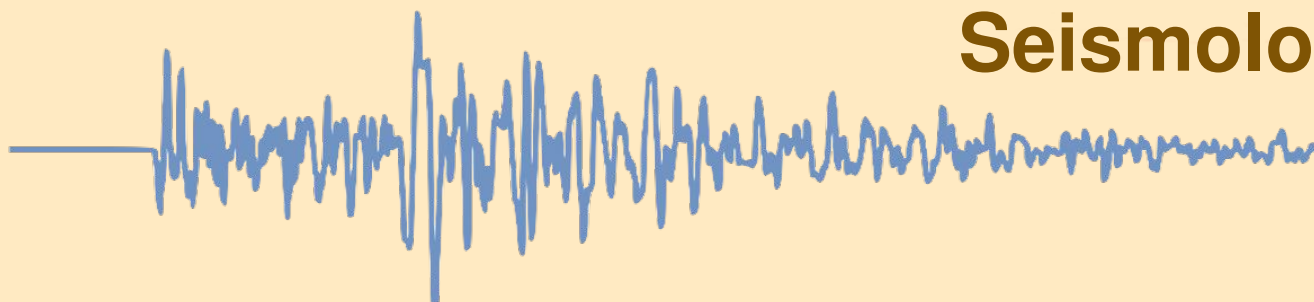


LM03

infrasound
solution

ANSN_RKGY

southern bounding thrust
of the Stirling Ranges



Seismological Association of Australia Inc.

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

Your Committee

Chairperson - Blair Lade
m: 0407 189 061 e: blairl@bettanet.net.au

Chief Seismologist - David Love
p: 08 8336 8003 e: david@earthquake.net.au

Public Officer - Paul Hutchinson
m: 0419 829 216 e: windfarmer@bigpond.com

Treasurer - Joe Grida
m: 0407 558 036 e: joe.grida@internode.on.net

Editor - Peter Gray
m: 0418 829 632 e: weaksignals@iinet.net.au

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

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.

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. Your name may be withheld only if
requested at the time of submitting. Images
should be high resolution and uncompressed,
although high resolution JPEGs are acceptable.

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

A word from the Chairman

We've successfully operated and upgraded the
network since our incorporation 18 months ago.

The transition of three South Australian sites to
GeoScience Australia has been completed.

Membership has increased, we welcome those
new members and hope that all members will
continue to support the association by renewing
their membership at the end of the year. I
encourage everyone to be active members and
also submit articles for our newsletter.

National Science Week has come and gone.
Considerable time and effort went into our stand,
which by all accounts was a success.

Our AGM will be held in late October at the
offices of [Nova Systems, 27-31 London Road,
Mile End South SA 5031](#), we'll confirm the
actual date a little later by email.

At the AGM, all SAA committee positions will be
declared vacant and elections for those positions
will take place.

cont. next page



Recent Seismic Events

A word from the Chairman cont.

The committee meet a few times a year and it's not an onerous task, I encourage you to nominate. The committee positions are:

Chair Person

Public Officer

Chief Seismologist

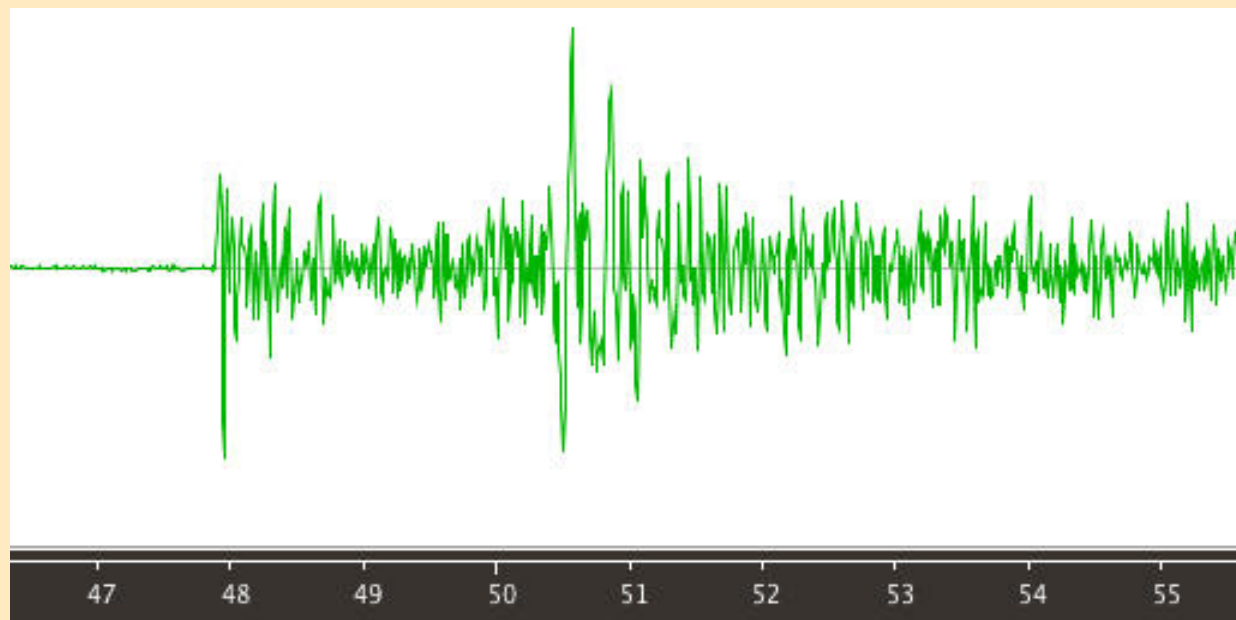
Treasurer

Editor

Secretary (unfilled this year)

On behalf of the SAA Committee and Members, I thank all those who have assisted the SAA throughout the year. Your support is essential to the ongoing success and viability of the SAA, and to those who host instruments, without you, we'd not have a network!

Blair Lade
Chairman, SAA Inc



CLV2 recording of one of the events

2018-09-19 ARNO BAY M1.2

Prepared by David Love,
Chief Seismologist, SAA.

Ear to the ground

The Cleve station registered a small swarm of tiny earthquakes on 19th and 20th September. Kevin Elson (CLV2) got on the blower, and after a bit of hunting hit the paydirt. David & Leanne Preiss near Arno Bay were noticing these bangs, and Leanne was listing them on her facebook page. Her friends thought she might be going a

bit queer, but no, she just happened to be really close to the action.

The events were really tiny; magnitude 0.1 to 1.2. Such small events are rarely noticed, but at extremely close range they sound like a gun. Occasionally she noted both the P and S waves only a fraction of a second apart.

In the wheat fields of WA many such swarms occur. In SA we occasionally have them on lower Eyre Peninsula, but elsewhere in the country they are uncommon.



Recent Seismic Events

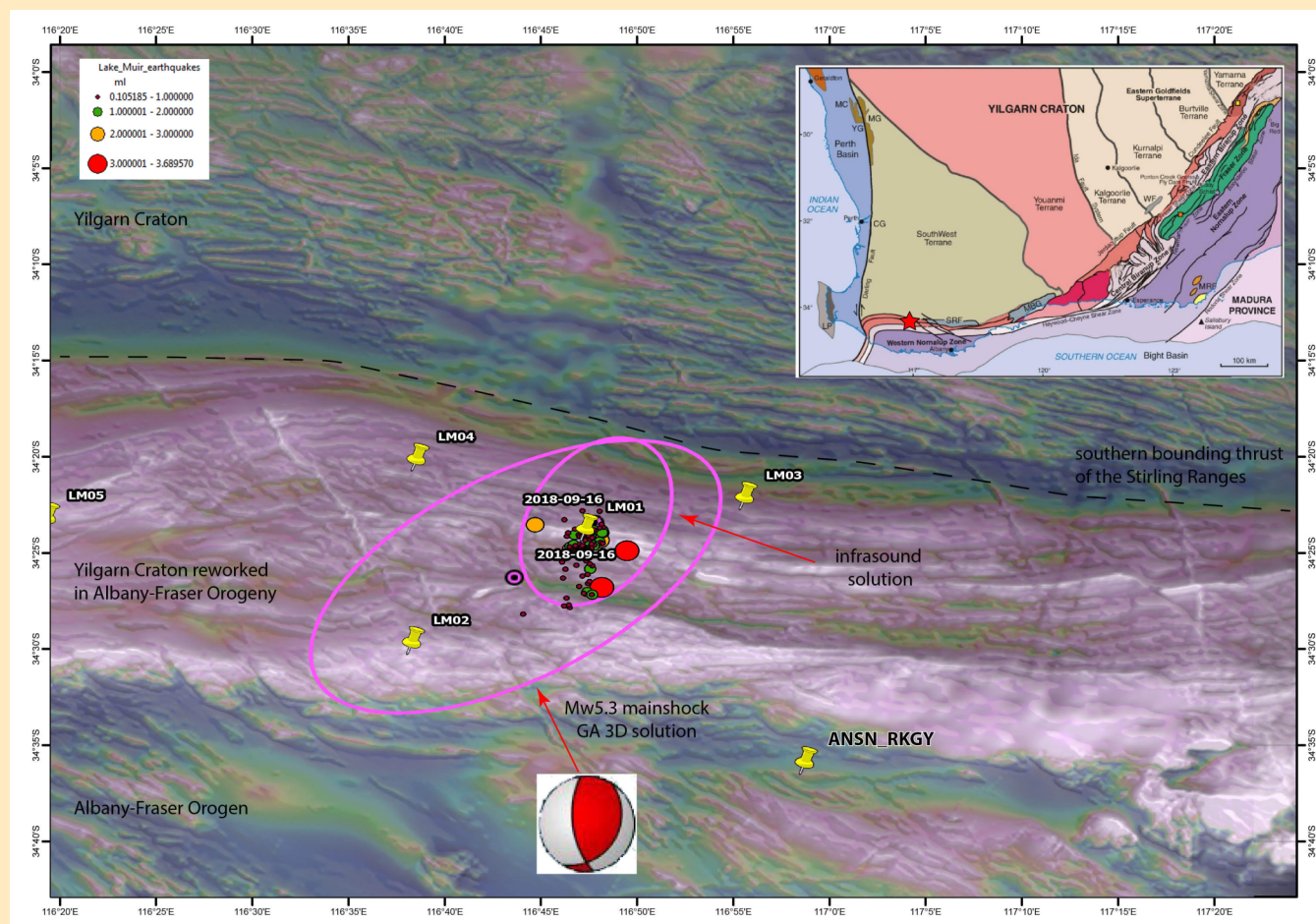
2018-09-16 LAKE MUIR M5.7

Prepared by Hugh Glanville,
Geoscience Australia

Following the Magnitude 5.7MI (5.3Mw) earthquake in the Lake Muir region of WA at 04:56 UTC, GA mobilised a multidisciplinary team to coordinate and deploy temporary seismic and geodesy monitoring equipment around the Mainshock area. A two person team from GA flew to the region the next day, and deployed the first seismic and geodesy monitoring sites on the Tuesday.

Following this a further 4 seismic monitoring and 2 geodetic monitoring sites were deployed, surrounding the suspected epicentre location by the end of the week. Seismic monitoring sites include: 4 sites with a Nanometrics Centaur digitiser with Lennartz 3D lite short period seismometer and a Nanometrics Titan accelerometer. The 5th seismic monitoring site has a Nanometrics Centaur digitiser and a Nanometrics Trillium Compact 120s broadband seismometer. All sites are currently working well and the seismic data is streaming in near real time to GA at 200sps. This is a first for Aftershock monitoring deployed in Australia with telemetered near real time high sample data and aftershock locations. The deployment will likely remain out until November or until activity reduces.

Newsletter of the SAA Inc.



The image shows both the Mainshock location and the revised 3D mainshock location using additional Infrasound station data, along with the station locations, aftershock locations and a background of Geology for context.



Recent Seismic Events

FOCAL MECHANISM FOR PALMER EARTHQUAKE

Prepared by David Love, Chief Seismologist, SAA

As reported in Newsletter #7, an earthquake occurred near Palmer on 8th August at 11:01 UTC (8.31 pm local time).

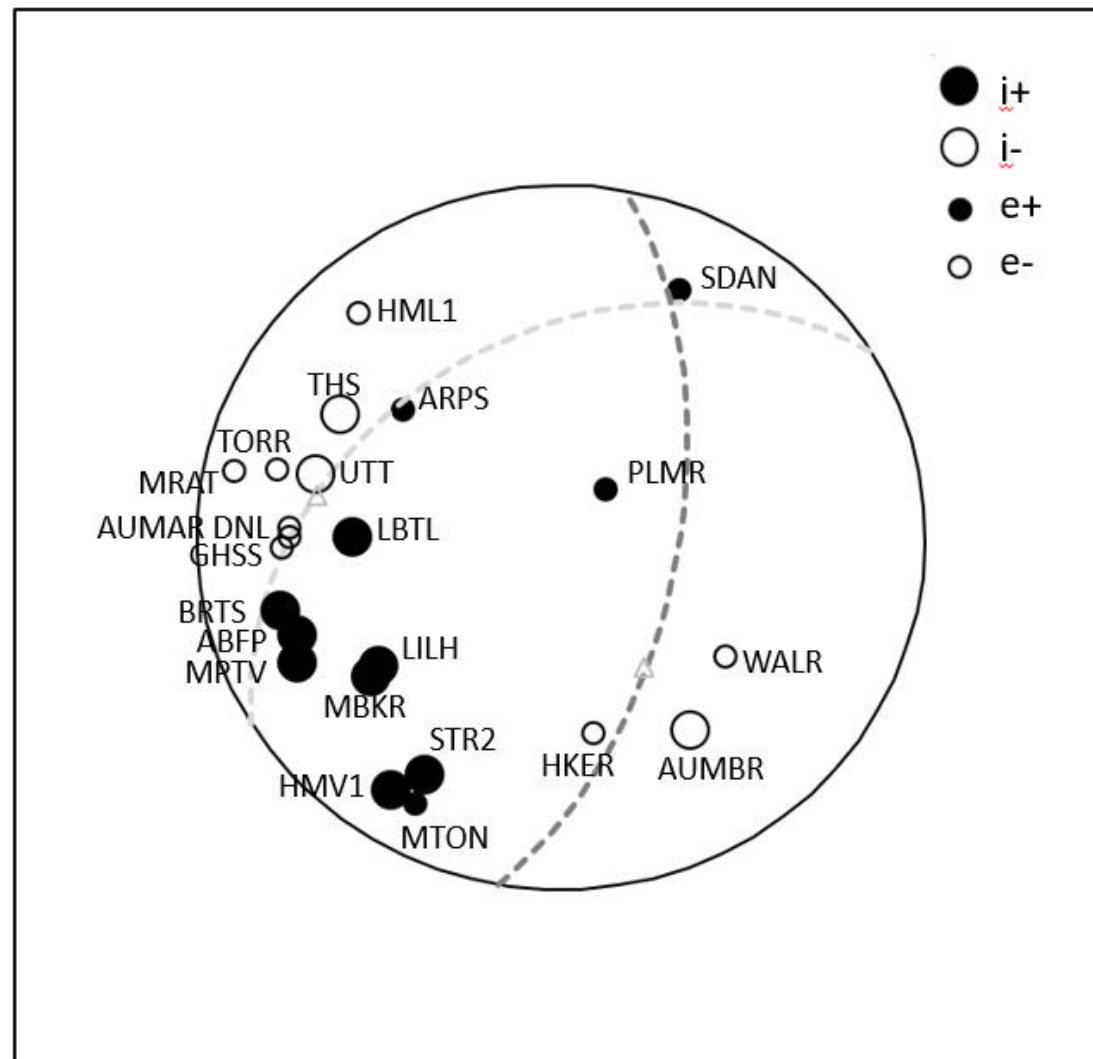
Science thrives where there is collaboration, cooperation, and openness.

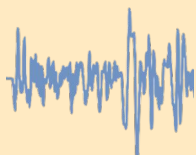
Focal mechanisms using the first motion of a seismogram require data from a considerable number of seismographs. In the Mount Lofty region near Adelaide we can now achieve this. We have freely available data from our private stations, our SAA stations, Seismometers in Schools (SiS) and Geoscience Australia (GA) stations.

We now have quite a number of focal mechanisms from small events near Adelaide, whereas interstate this is not yet happening. Occasionally for large earthquakes (mag 5.5+) it is possible to produce focal mechanisms from first motions and waveform matching, and these are the most important events, however we may still be able to learn from the many smaller mechanisms we are collecting.

Consider the focal mechanism as if it were half a beach ball over the place of the earthquake, and the points as the directions the rays go to each station. The Palmer earthquake was moderately deep (18 km), so rays are mostly coming upwards to each station. A few stations (ARPS, HKER, WALR) are a considerable distance away, so those rays go downwards first, and in the beach ball are shown in the opposite direction.

2018-08-08 1101 Palmer M2.8





Recent Seismic Events

FOCAL MECHANISM FOR PALMER EARTHQUAKE cont. The large circles are i+ and i- meaning impulsive (clear) first motion. The smaller circles e+ and e- mean emergent (not so clear) first motions. The semi-circles represent two planes, called nodal planes which should divide the first motions into ups and downs. One of these planes will be the one that moved in the earthquake. In this case it is more likely to be the darker semi-circle. This is moderately close to the position and slope of the Palmer fault. However, given the depth, it is not possible to assign it to the Palmer Fault with surety. More stations usually means more reliability in picking the nodal planes. In this case only the HKER station does not fit. This earthquake was not right in the middle of our network, but was still close enough to produce a worthwhile result.

So a big thankyou to everyone running a station.

Can you find your station?

Code	Station	Authority	Code	Station	Authority
HML1	Hamley Bridge	SAA	MPTV	Morphett Vale	Priv
THS	The Heights	SAA	LILH	Littlehampton	Priv
ARPS	Mt Arapilles	GA	MBKR	Mount Barker	Priv
MRAT	Mt Rat	SAA	HMV1	HindmarshValley	Priv
TORR	Torrens Island	SAA	MTON	Middleton	Priv
UTT	Tea Tree Gully	SAA	STR2	Strathalbyn	SAA
AUMAR	Marden Senior College	SiS	HKER	Hawker	SAA
DNL	Payneham	SAA	PLMR	Palmer	SAA
GHSS	Govt House	GA	SDAN	Sedan	GA
LBTL	Lobethal	Priv	AUMBR	Murray Bridge HS	Sis
BRTS	Brighton Sth	SAA	WALR	Wallaroo	Priv
ABFP	Aberfoyle Park	Priv			



SAA Member Activities

LOBETHAL LUNCH MEETING

On the afternoon of August 22nd we convened a lunch meeting at short notice, to coincide with one of Vic Dent's regular trips from East to West or vice versa. Jim & Lyn Deer were happy to accommodate the group who managed to attend, so we started with a good feed from the barbeque before adjourning inside for a few demos.

David Love showed some of the new capabilities available within SRC's latest Waves (Version 3) with rotation of axes being a new feature. Blair Lade demoed the jAmaseis software package, the java based version of the Amaseis program and Vic showed us some finer points available to users with password access on the ACG website.

The discussion finished up with the ongoing debate about the suitability of the Raspberry Pi for seismic monitoring with or without WinSDR for Public Seismic Network (PSN) based systems. While some problems still exist with WinSDR sending data to the ACG website, the Direct Mode capability provided by Paul Harris continues to provide a simple and reliable seismic recorder.



Standing L-R: David Wallace, Alison Wallace, Heather Love, Jim Deer, Blair Lade & Ian Anderson
Sitting L-R: David Love, Vic Dent, John Duffield & Peter Gray.



Of Ocean Tides and Earth Tides and cooperative international research

A Lippmann high resolution tiltmeter has been on the pier of The Peters Seismic Observatory (TPSO) located near Victor Harbor, SA for some years. Kindly loaned to SAA by Mr. Erich Lippmann of Germany, the instrument is specifically designed to measure the local tilt of the solid earth crust over periods of hours, days, months, years and even over decades, caused by geological forces acting deep within the Earth. This instrument is able to measure the very predictable twice a day earth tide tilts of the local solid earth crust due to the gravitational pull of the Moon the gravitational pull of the Sun and the gravitational pull of the planets as they appear to us to be going around and around the Earth. However, the software collecting the Lippmann tilt data in TPSO, consistently failed to collect any data set from the Lippman tiltmeter that was longer than about six days in length. This has up till now, prevented any meaningful long term research of this TPSO Lippmann tilt data.

The Hungarian Academy of Sciences also operates a Lippman tiltmeter on one of the piers of the prestigious Conrad Observatory in Austria. The Hungarian Academy of Sciences is a part of a team of four scientific institutes from Hungary, Austria and Finland involved in geodetic research. Dr Gabor Papp, Project Manager of this group of four geodetic institutions, together with some of his colleagues, has over the past six months provided untiring assistance in firstly identifying the multiple problems in the TPSO software and then modifying/testing the software. So that now we have reliable continuous tilt data being collected from the Lippmann tilt meter on the pier of TPSO.

The image on the next page shows GREEN the Lippmann N/S and E/W tilt at TPSO for some 16 days. The RED shows the theoretical earth tide local tilt of the solid earth crust at TPSO due to the gravitational effect of the Moon the Sun and the planets, as they appear to go around and around the Earth. The vertical GREEN line, on the third day was the M7.9 Fiji quake at 20180906 15:49:18.

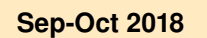
Dr. Gabor Papp has advised of an interest from some members of his group, to conduct joint research with SAA. Research using TPSO Lippmann tiltmeter data to improve the present models of the loading of ocean (water) tides upon the local solid earth crust. A high ocean water tide means greater weight, meaning greater loading (tilting) of the underlying solid earth crust.

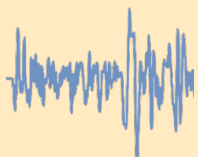
TPSO is located just some 7km from the ocean, and readily shows the effect of ocean loading (the tides of the watery ocean) upon the tilt of the solid local earth crust. Local solid earth tilts at the Conrad Observatory Austria from ocean (water) tides are not so readily apparent seeing as the observatory is located some 300 Kms from any sea. And simply having tilt data from another hemisphere to compare with tilt data from the Conrad Observatory is of scientific interest to another member of Dr. Gabor Papp's group.

Prof. Randall Peters, a founding member of SAA has an interest in analysing long term tilt data from the Conrad Observatory using Cumulative Spectral Power (an algorithm he developed himself), to specifically determine if there is any change in the energy levels of the ever occurring ultra-long period ground movements of the crust, in the period immediately prior to the occurrence of great quakes. So with an interest by Dr. Gabor Papp's group in collaborating with SAA in research involving TPSO's tilt data, then at the last SAA Executive Committee meeting it was agreed that SAA proceed in determining joint cooperation research opportunities with this group.

This international joint cooperation promises mutual benefits to both parties, and readers of the SAA Newsletter will be kept informed of developments in this area.

Submitted by Paul Hutchinson, TPSO



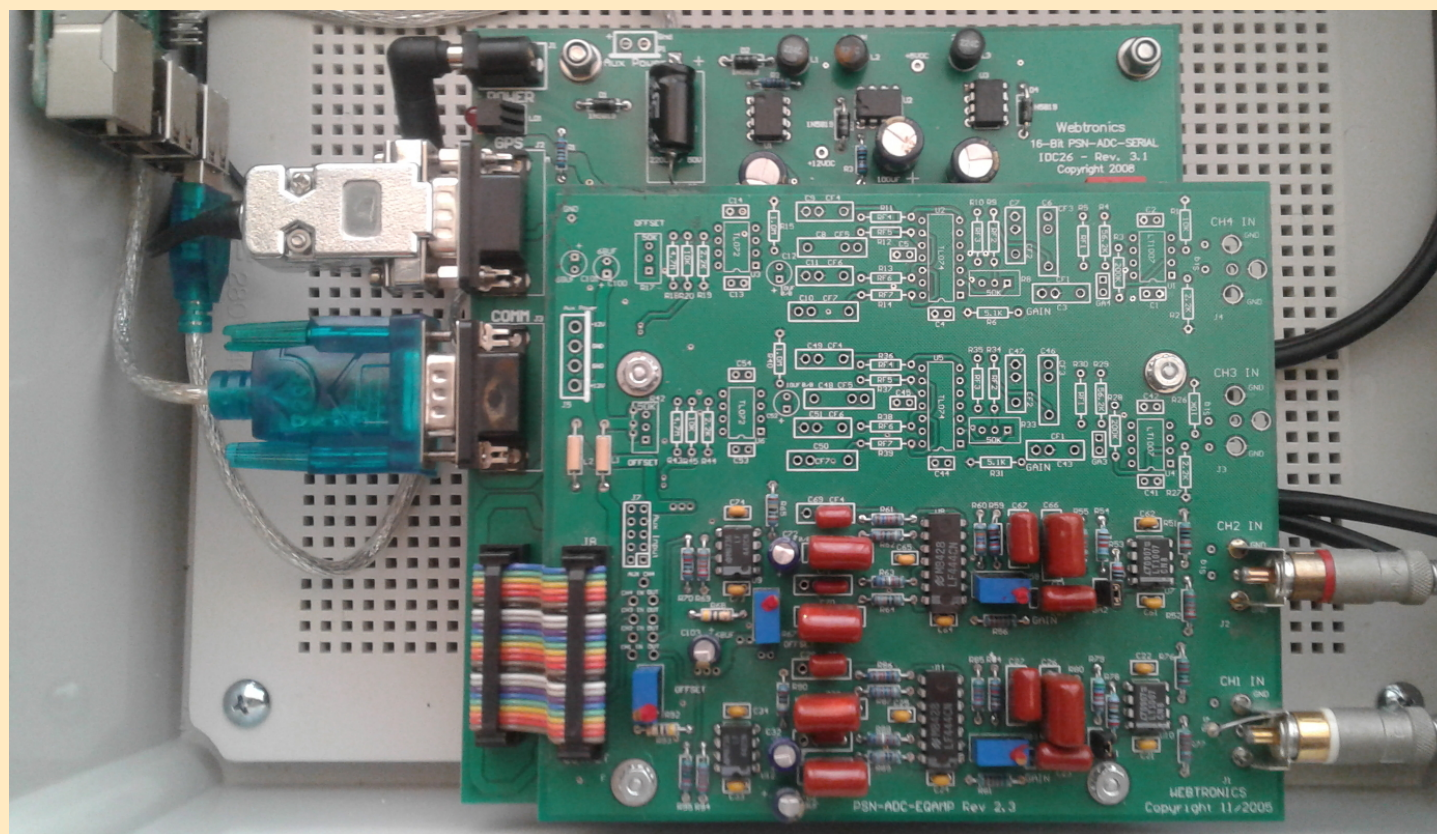


Setting PSN Gain on the 4 Ch. Amp/Filter card

UPGRADING A WEBTRONICS 16BIT ADC FOR FULL CAPABILITY

Before you read any further, resist the temptation to randomly adjust your Webtronics 4 Channel Amplifier/Filter Card gain adjustments. If you are confident that you can correctly set the gain to a valid, repeatable measurement setting then go ahead. There is not much point in changing something without a known and desirable outcome.

The requirement to adjust the gain of a 4 Channel Amplifier/Filter Card came about when I wanted to "complete" a partially assembled card. I originally purchased a 16bit ADC card and Amplifier/Filter Card from Larry Cochrane with only two channels assembled and tested. At the time, I thought that my seismic system would only ever consist of a single vertical sensor and to keep a second channel as a spare. It seemed that other people I knew were of much the same mind, with cards ranging from one to four functional channels but the majority being two channel cards. Perhaps it was a cost trade-off that limited the number of channels selected.

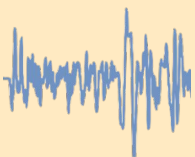


One of the partially completed 4 Channel Amplifier/Filter Cards

Upgrading to a full card

The electronic components required to populate each additional channel are easy to acquire through many of the larger electronic parts distributors. Digi-Key, RS Components, Element14 & Mouser all stock the majority of parts. The only problem parts being the original polyester capacitors made by Panasonic,

many of which are no longer manufactured. Our initial aim was to buy sufficient parts for an additional ten channels, this allows some cost savings through price breaks on minimum order quantities. Fortunately these polyester capacitors were available at the time of purchase, although some non-critical compromises on operating voltages were required.

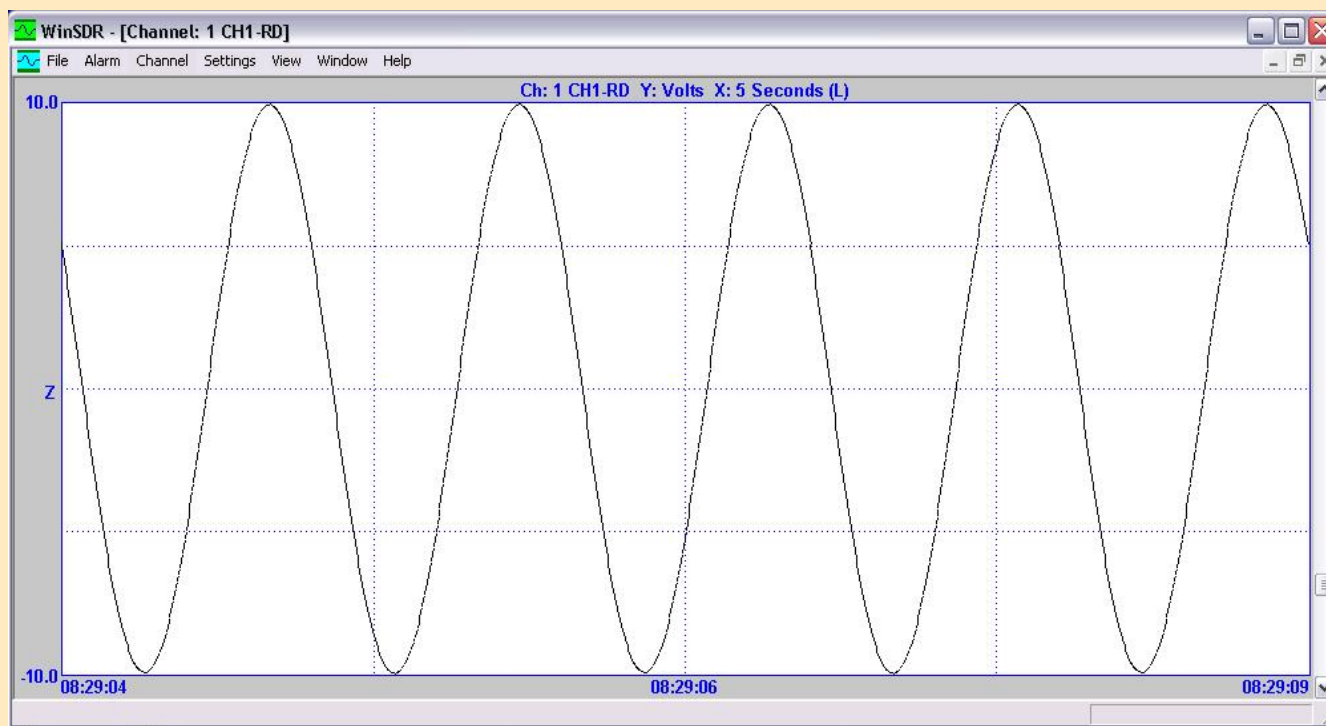


Setting PSN Gain on the 4 Ch. Amp/Filter card

Alternates from other manufacturers are available but have not been tested by me. If you choose to proceed down that path, might I suggest that you try to maintain the filter responses consistent across all channels by replacing original capacitors on all channels with your chosen alternates. I have a spreadsheet with the parts, some links to suppliers and (dated) pricing, email me if you want a copy.

Measurement Set-up

I have access to a good Function Generator with a clean sinewave output. The characteristic impedance of the Function Generator is 50 ohms. The largest error term is most likely to be the resistance of the termination used at the end of the coaxial cable connected to the Function Generator. Where possible, the best 50 ohm source match available should be located directly at the input to the ADC card. With this instrument it is possible to set an amplitude at a measureable frequency (let's say 33.9mV ACrms@100Hz) using a true RMS multimeter. The Function Generator should be able to accurately maintain this output level with a downward (lower) frequency change (lets say 33.9mV ACrms@1Hz) because there are few frequency reactive components in it's output stages. Measuring the amplitude of sub-audio frequency AC signals using traceable instruments is a problematic and expensive exercise, well outside the scope of this article.

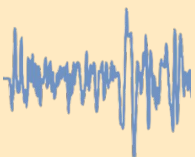


Single Line Display - Full scale deflection for Channel 1 with 96mVp-p

WinSDR allows your device to be used in a voltage/time display mode similar to an oscilloscope. In the View Menu, select Single Line Display. In the Settings Menu, select Single Line Display and under Display Settings - CH 1, change the Y-Scale to Display Mode: ADC Volts and enter 10 in the numerical box. Change the X-Scale to Time: 5 and Type: Seconds, if your seismic sensor is tuned to 1Hz. Click the OK button and the display will change

to 20Vp-p (peak to peak) for full scale deflection.

Having now upgraded several Amplifier/Filter cards, it appears (IMHO) that the gain potentiometer for each channel built by Webtronics was set to an amplification factor of approximately 200x. This has been determined by an input signal level of about 100mVp-p producing a full scale output of 20Vp-p, when the gain control JP1 is fitted (IN).



Setting PSN Gain on the 4 Ch. Amp/Filter card

With the JP1 jumper removed, the amplification factor increases to about 910x. This is determined by an input signal level of about 22mVp-p producing a full scale output of 20Vp-p,

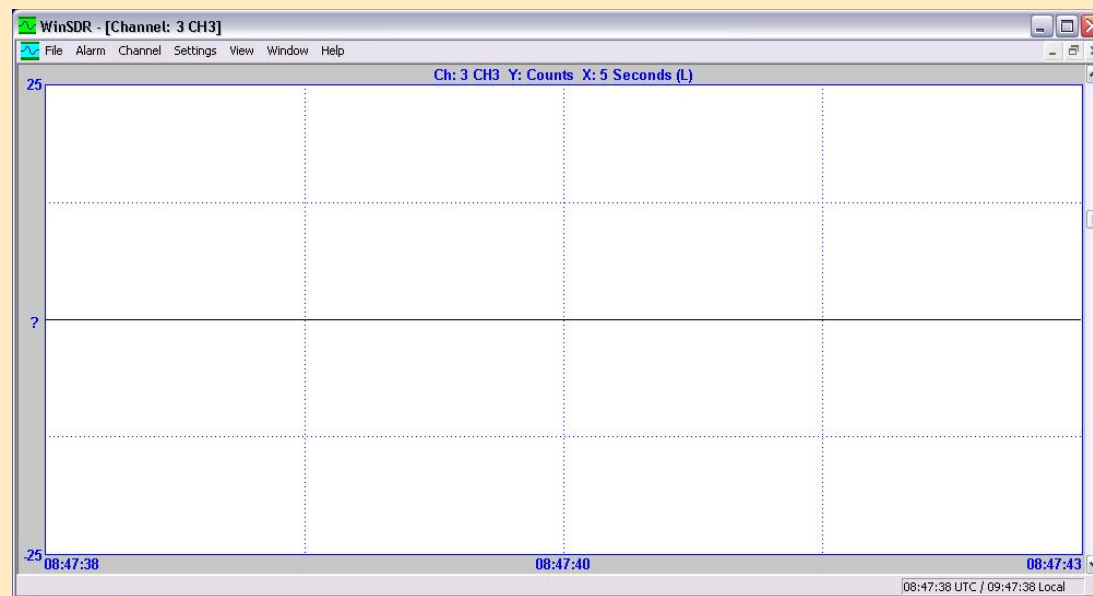
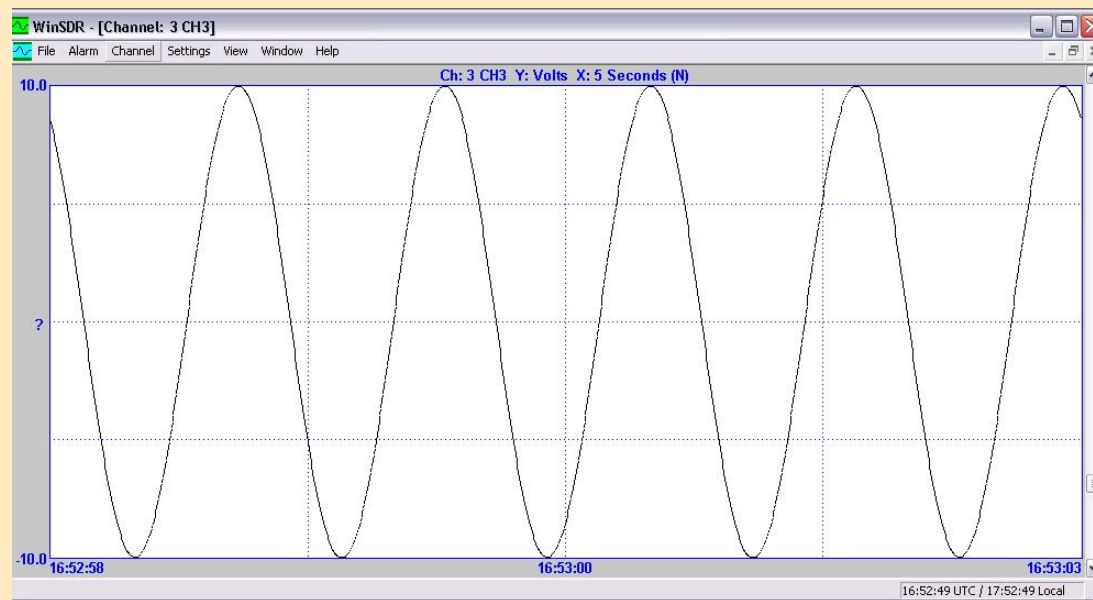
Please note the Gain & Offset potentiometers in the first and last images in the article, the original locking varnish (red blob) is intact on both pots for Channels 1 & 2. This indicates that I have not adjusted or modified either and they are probably untouched since manufacture by Webtronics.

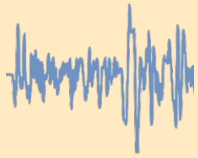
So all that needs to be done is to step through each channel and adjust the gain to be the same as Channel 1 or 2. The Offset also needs to be set but that needs no input signal, simply change the Y-Scale to back to Display Mode: Counts and enter 25 in the numerical box. You may need to enter a larger number if the trace is off scale but you should eventually get down to this level with ease. Ensure that you recheck the gain, as there will be some interaction between the two adjustments.

A simple enough exercise to make all the channels have the same gain, but is that level of gain appropriate to the seismic sensor that you happen to use. That is another story and possibly another article for the SAA Newsletter, hopefully written by someone else. Either way, you can sleep well at night in the knowledge that we have the capability to repair, modify and adjust these now largely obsolete electronic items. At present, it seems that there is no alternative solution available to us.

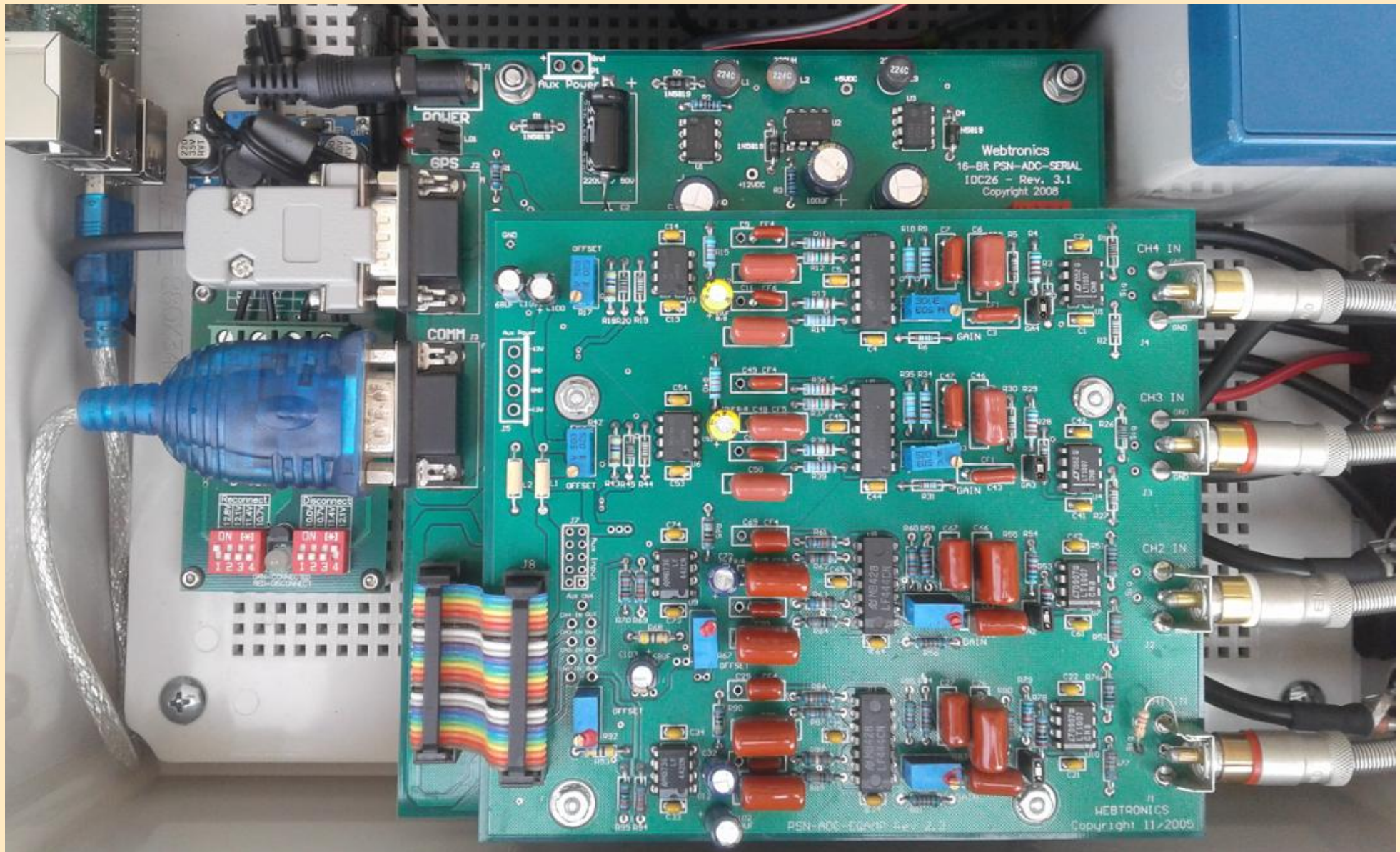
The foreseeable future of PSN seismology in Australia may well depend on this capability.

Submitted by Peter Gray
SAA Newsletter Editor





Setting PSN Gain on the 4 Ch. Amp/Filter card





SAA Member Sites

New Peake Seismic Station site

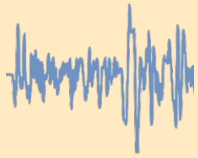
A seismic station was set up in August 2013 in the township of Peake, located 160km East of Adelaide on the Mallee Highway to fill a gap in the recording of seismic activity in the region. The site was chosen because the property is owned by Terry and Meryl Deer and the internet was easy to access. The site was discussed with David Love and Vic Dent, and although considered to be noisy due to train traffic, the Mallee Highway and grain silos being a few hundred metres away, it was considered better than no recorder at all in the area.

Vic Dent and I travelled to Peake in August 2013 to set up the equipment. Vic carried out the technical work, while Terry and I did the outside work. We were able to use a concrete bunker that was built and donated by a local businessman who at the time built stock troughs and other farm structures. We found a suitable site and set up the Wilmore. Vic did his magic and got it online. Terry and Meryl have kept the station running.

The station has had a few troubles over the years, mainly with power failures and laptop power supplies suffering - part of living in SA.



Many hands make light work, maybe another budding seismologist.



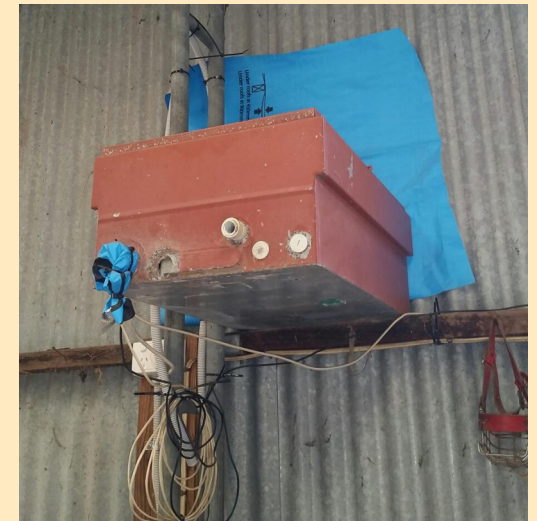
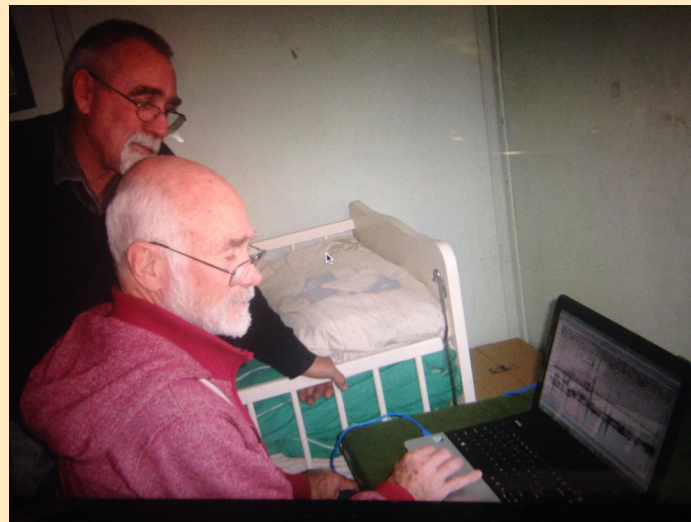
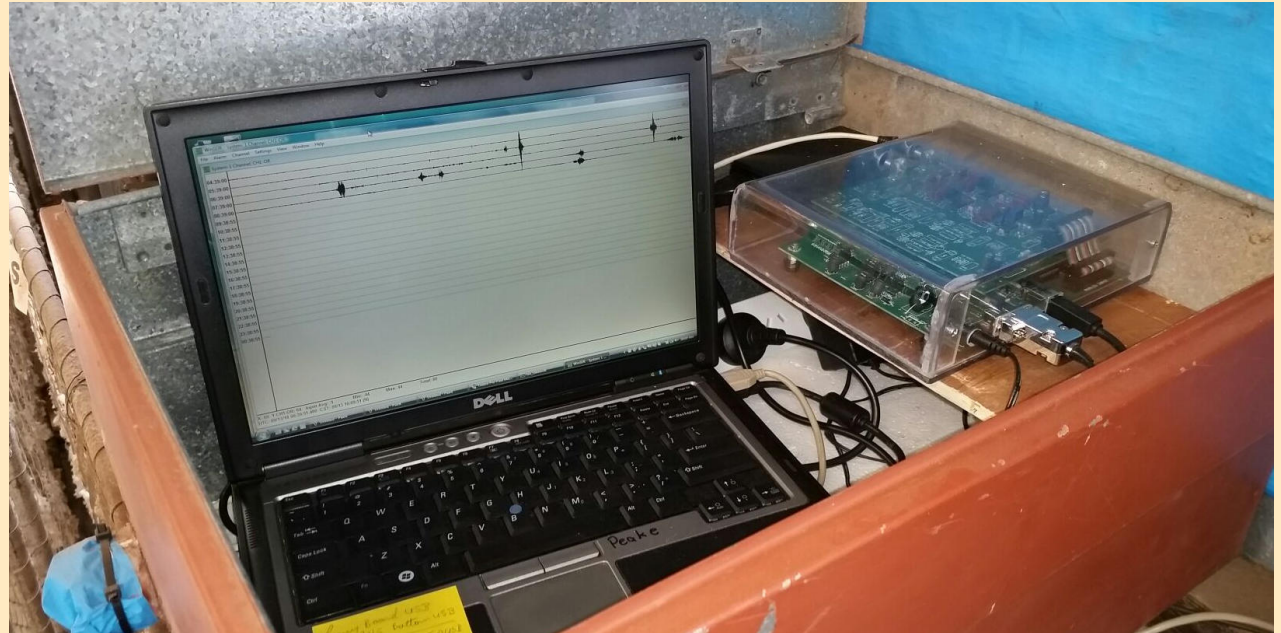
SAA Member Sites

It produced useful data for David Love and Alison Wallace when still with the SA Govt and continues to give useful data.

Terry & Meryl decided a few years later that they would move to Murray Bridge to live as retirement was getting closer so there would be no-one to be Peake resident seismologists. We began looking at other sites in the area to relocate the instrument. The good news is we have now relocated to a farm Hillsideview belonging to Andrew and Rebecca Knight, about 6km west of the township and about 3km North of the Mallee Highway and railway line. It is now set up and sending data.

The internet is via a Telstra 3G prepaid card. An external aerial had to be fitted to get a good signal. There is a poor connection between the Wilmore and the laptop that we will investigate very soon, Rebecca has had to reset the system a few times to clear this fault.

Submitted by Jim Deer





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/technical-special-	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
Regional Seismic Users Website	http://www.rsuw.daleh.id.au/index.html	PSN seismometers - RSUW
Recent SA Earthquakes	http://earthquakes.mappage.net.au/q.htm	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/technical-special-	ASSA - Seismology page
Geoscience Australia	http://www.ga.gov.au/earthquakes/initRecentQuakes.do	Our national authority on seismic events
QLD Uni Environmental & Earth Sciences	https://sees.uq.edu.au/	The University of Queensland - Col Lynham
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