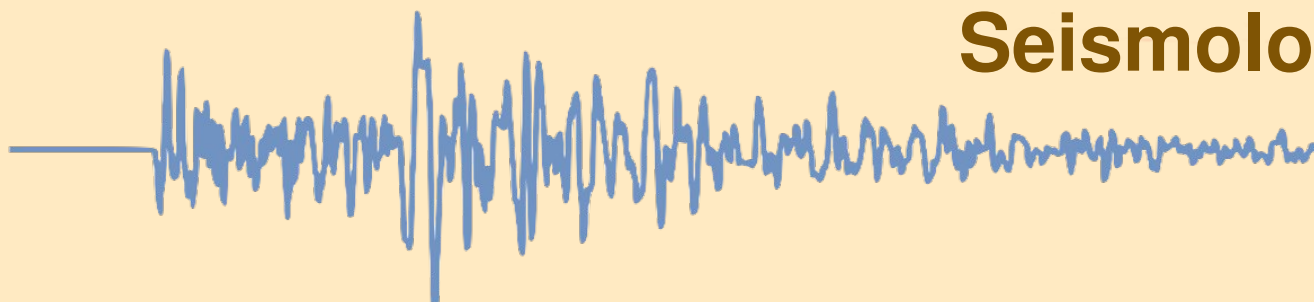


Newsletter of the Seismological Association of Australia Inc. May-Jun 2020





Seismological Association of Australia Inc.

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

Your Committee

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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)

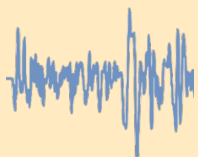
Membership fees are:
Full member \$50

A Membership application form can be obtained
from the Treasurer by email or [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. 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



SAA News

Just when you think that nothing is happening... You might just be surprised. As opportunities have presented themselves during this period of self isolation, we've been visiting some of our seismic sites to rectify some problems and as often happens, introduce a couple of new ones. Our newest site, Sunnysdale (SUND) continues to test our resolve and despite a recent visit for a new PC installation and some additional site works to reduce cultural noise, it's still playing up. Another visit in the near future will hopefully remedy the problem(s). Strathalbyn (STR2) now has a rebuilt EchoPro and a new battery but the DC wiring from the solar panels to the regulator still needs replacing. This should be carried out shortly. THS has recently gone offline with a suspected DC Power problem, occasionally it comes back online for a short time and disappears again. Due to location of the THS station seismometer, a 4WD vehicle is required to visit the site.

Been surfing the net lately? (and who hasn't)

If so, you may have noticed a few changes at our affiliated websites

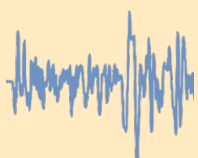
earthquakes.mappage.net.au - David and Eric Love have been busy upgrading seismic stations on the national map page (the one featured on the cover of Newsletter #15). Most of the major seismic networks in the country have been added/completed including GA sites, ANU Seismology In Schools sites, Melbourne Uni & SAA eqServer and known Raspberry Shakes. MiniSEED data from IRIS, eqServer or FDSN can be downloaded for any functional site by selecting a valid date, time and duration

CQSRG - The PSN pages of the Central Queensland Seismic Research Group have been going through a bit of an upgrade recently. Some new site pages have been added and the image format has been modified to suit widescreen monitors. The images uploaded from contributor's seismic stations have traditionally been generated by Larry Cochrane's WinSDR software. Three of the new sites look a little different to the others. They have been generated by Raspberry Shakes using Tom Parker's (USGS) swarmPlotter software. We're looking forward to new additions coming onboard soon and don't mind if you use the older or newer method, it's all good.

Zoom meetings

You should have received an email or two recently inviting you to attend a virtual SAA meeting via Zoom, the cloud platform for video and audio conferencing, chat, and webinars across mobile, desktop, and room systems. In order to use this service and attend online you only need to follow a link and enter a password, both will be sent to you just prior to each meeting if you indicate to us that you wish to attend.

For the foreseeable future, this will be the SAA's method of keeping you "in the loop" and up to date. Of course, if you don't want to join in these events, there will still be an SAA Newsletter every two months, as usual.



Recent Seismic Activity

CLARE 2020-05-14 05:53 4.2MLv

It's been a while since we've had a > 4.0MLv quake on the ground in SA. Within the last year there's been three events offshore in the Great Australian Bight and one just over the Northern Territory border in early October, 2019. So when two separate events occurred on the same day (UT), there was bound to be a bit of a stir. The first was close enough to Adelaide to be felt in the northern suburbs and with so many people stuck at home in the middle of this COVID-19 pandemic, there was an understandable response from the public with over 580 felt reports. Jack Pappin won the sweep, the Ranger SS-1 at Penwortham (PENW) was the closest instrument at 27km, south-southwest. Hallet (HTT) was also close at 35km, but there were no prizes for runners up.

The second event, at 4.1MLv and located about 35km south-east of William Creek, only appears to have upset some pelicans in the lower reaches of Lake Eyre.

The main event inspired the SAA to trial another Zoom meeting, this time with all members on the invite list and Hugh Glanville as the guest speaker. After a delay due to illness, the meeting was rescheduled to another day but forty minutes prior to the beginning of the meeting, some nasty weather took out David Love's dodgy internet at Payneham. Fortunately, Joe Grida was able to arrange an alternate meeting and we were up and running just after the scheduled start time.

Hugh spent some time explaining some of the upgraded functions available on the GA website, particularly the "felt report" and how it can be used effectively. David presented some event location solutions derived from several different sources and models used. Some debate ensued on the merits or otherwise of each method and the sources of uncertainty associated with each one. We called it a night soon after, our thanks to Hugh for taking the time to speak to the group attending.

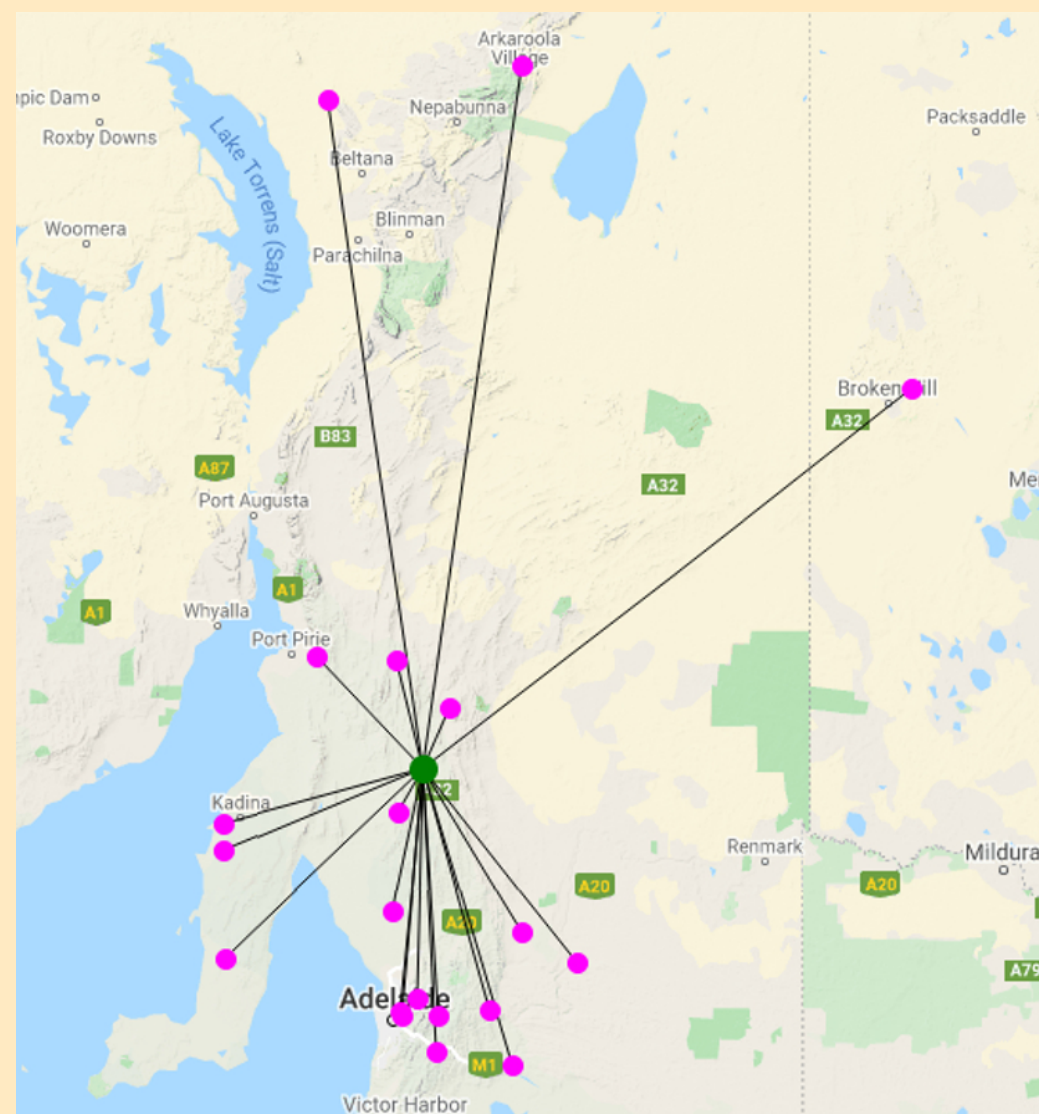
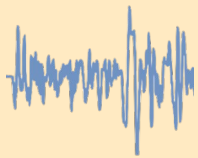


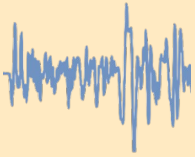
Image from the earthquakes.mappage.net.au Phases page, showing the stations used to determine the epicentre NE of Clare.



Recent Seismic Activity

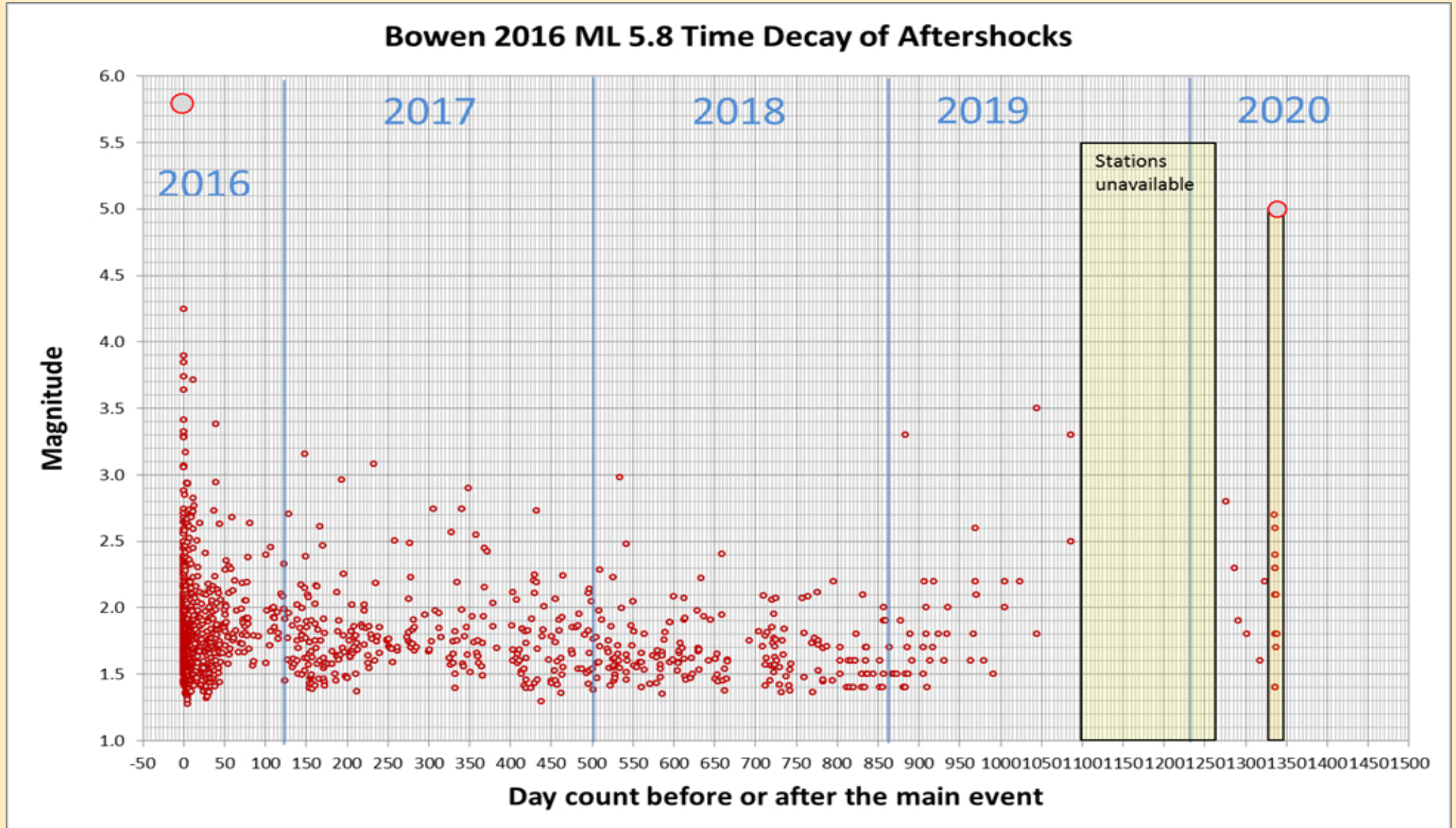
If you think this Zoom screenshot looks a little like a Brady Bunch reunion - 50 years on, you're not the only one!

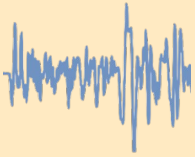




Bowen 2016 aftershocks

Kindly submitted by Mike Turnbull, [CQSRG](#)





Bowen 2016 aftershocks

I've managed to catch up with most of the Bowen 2016 aftershocks, including the ML 5.0 that occurred on April 14th, 2020 - in precisely the same location as the 2011 event. With only the fuzzy signal from the Bowen soft site to use for detection of events, I can reasonably identify events down to about ML 1.2. Below that is a bit iffy.

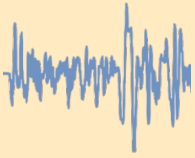
As you can see from the graph on the previous page, the aftershock events from the original August 2016 ML5.8 are still ongoing. There is a hiatus in detection between August 2019 to February 2020 when both Bowen stations were off the air. The soft site is back up (most of the time) but the hard site is still down.

As can be seen in the graph, the 15 April 2020 ML 5.0 has commenced a renewal of the aftershock activity; so, what we now have is a mixed sequence of aftershocks from both the 2016 and 2020 events.

It is clear that aftershocks of magnitude ML 1.6 and greater have continued through the station outage hiatus. The absence of data from the Bowen hard site makes it difficult to say for certain, but I am of the opinion that aftershocks of magnitude less than ML 1.6 have also continued to the present time. Only the restoration of data from the Bowen hard site will confirm that speculation - however, the occurrence of the recent ML 5.0 will now make it impossible to discriminate between the 2016 aftershocks and the 2020 aftershocks. From here on the sequence has to be attributed to both main events.

All indications are that the sequence will continue for a number of years, probably with the odd injection of large magnitude events such as the recent one.

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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)
619 Horsecamp Road, Horse Camp QLD 4671
<http://www.cqsrg.org/>



Our mission entrusted to us by Commander Love

Kindly submitted by Alison & David Wallace



With David doing the grunt work and Alison on the camera, the EchoPros are swapped and a brand new battery fitted, at last

"Undertake a maintenance trip to STR2, as soon as possible or sooner and preferably before it rains."

Armed with detailed directions from David L, we arranged to meet Geoff Bridgman who would guide us to the previously unseen (by David W and I) STR2 site on his property on the outskirts of Strathalbyn. After passing through the third gate (with all closed safely behind us to secure the wandering stock), we could finally see the site up on the hill to our right.

Luckily for us, Geoff as our forward scout, was able to persuade the anxious 1.5metre red bellied black snake (guarding our site) to move away. After an hour and a half chat with Geoff (ensuring social distancing) we set about our task.

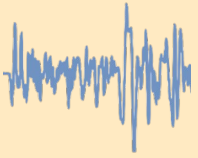
At this point we remembered David L had told us when he delivered the replacement equipment to our home, that we could expect, all sorts of bugs, red back spiders and snakes or other vermin to be living in the pit. Therefore, we were happy when Geoff lifted the lid to the pit and yes, there were many strange and previously unseen "bug type creatures" in the bottom of the pit and of course the obligatory red back spiders; in fact, some of the biggest we had seen anywhere.

First task was to rid the pit of these hazards, and we gave them the choice of either vacating the pit immediately, or rapidly visiting the "pearly gates" Unfortunately for them, they all choose the latter! We looked at the depth of the pit and wished we had a small ladder, although David L assured us that he doesn't use one, so we can only assume that he's obviously super fit after taking gym classes in his spare time.....!



Our mission entrusted to us by Commander Love





Our mission entrusted to us by Commander Love

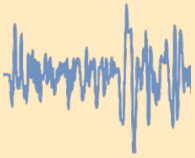
After vacuuming out the pit and removing the “dust and dead bodies” (yes: armed with generator and vacuum cleaner and killing stick), we commenced the task given to us. We began the procedure armed with a detailed order of work provided by David L. We replaced the 2 old faulty batteries with one new battery and replaced the EchoPro with the GPS Week Number Rollover issue, with an upgraded unit.

At this time, I think it is good to point out that when tasked with this type of work, it definitely pays to take a (un)willing volunteer, to undertake all of the work within the pit, especially when unbolting the EchoPro from its position, where unseen spiders could be hiding. Once again, David L had prepared us for any problem that may be encountered, and suggested that we should take a drill with us in case we had to redrill the mounting holes. Yes, the previous 3mm holes had to be enlarged to 6.5mm to accept the new unit.

Another critical task undertaken, was to tap the S side of the seismometer to restore the NS channel, which had not been working recently. This was achieved on the first and only tap. We attacked our task with due care and took considerably longer than we expect David L or others would have taken, but knew that we were under constant surveillance by our commander. He was monitoring our every move from his mission control centre. This was much appreciated, as we were able to ensure that everything was working perfectly as specified. We then re-covered and secured the pit and left the site in a very clean state.



Mission accomplished



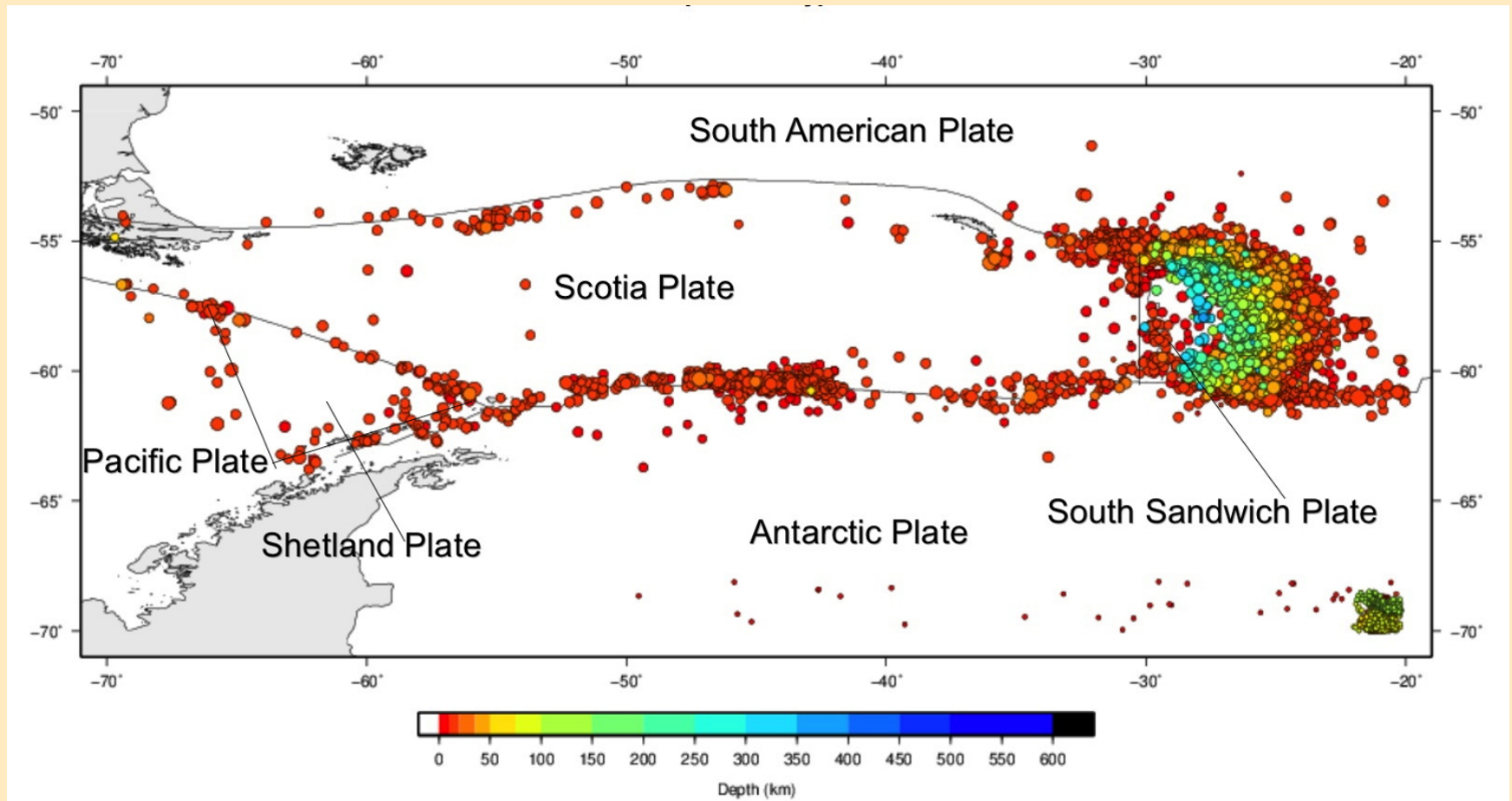
The Scotia Plate up close

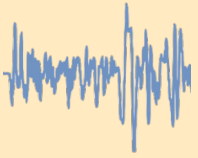
Kindly submitted by Kevin McCue

Recently (March 2020) I visited the Antarctic Peninsula on board the Ocean Atlantic.

The seismicity and tectonics here are interesting (Figure 1). Our voyage criss-crossed the Scotia Plate that is mainly oceanic crust but contains continental fragments that forty million years ago formed a continuous landmass from Patagonia in South America to the Antarctic Peninsula along an active subduction margin. The opening of Drake Passage between South America and Antarctica has profoundly influenced the onset and development of the Antarctic Circumpolar Current and migration of marine and terrestrial biota. The plate is almost completely below sea level now, only the southern tip of South America and South Georgia on its northeastern edge and the islands of the South Shetland Group in the south-west are above sea level.

Figure 1





The Scotia Plate up close

Figure 2:

The Scotia Plate with
our proposed route
superimposed.

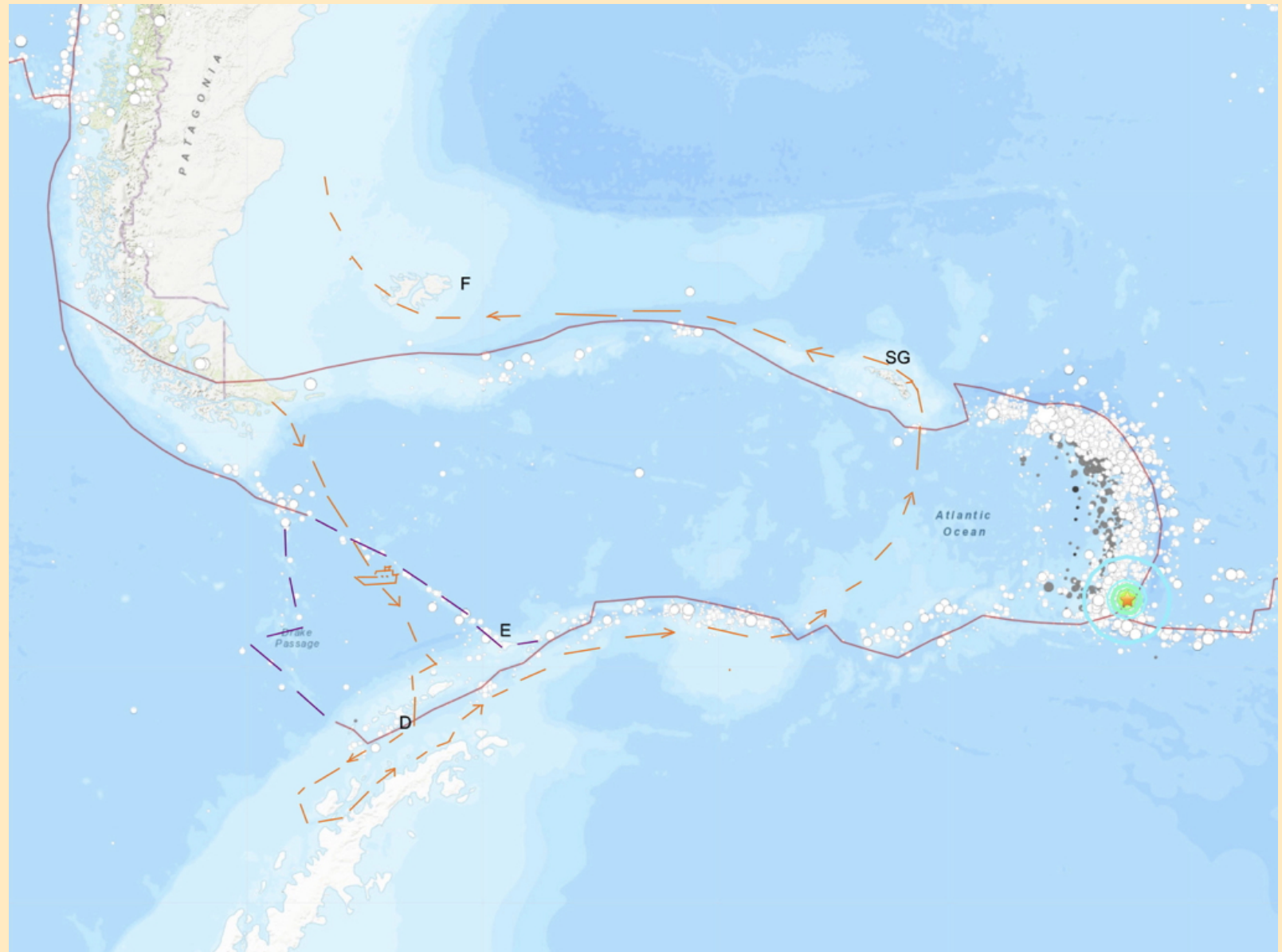
SG: South Georgia,

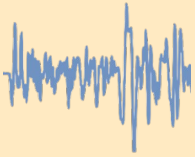
E: Elephant Island

D: Deception Island

F: Falkland Islands.

We actually went
straight to
South Georgia from
Elephant Island, as
did Shackleton, more
than 100 years earlier.





The Scotia Plate up close

The Scotia Plate is wedged between the Antarctic, Pacific and South American Plates, the plate boundaries defined by earthquake epicentres from the ISC. In Figure 2, I have superposed the Ocean Atlantic's approximate path onto the seismicity of the last 20 years from the USGS. Naturally, since our ship was frequently crossing or on the boundary, I was hoping we would experience an earthquake.

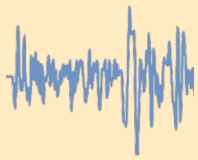
There are three small tectonic plates here, the easternmost end of the Scotia Plate is a separate and quite active Sandwich Plate reminding me of the Solomon Sea Plate in PNG, a spreading centre at its western end and active subduction of the South American Plate beneath the South Sandwich Plate at the eastern end, an active volcanic arc. Deep earthquakes here are clearly recorded on our seismographs in SE Australia.

The Scotia Plate is about 3000 km long east-west and 800 km wide north-south. It is moving slowly at ~20mm/yr to the south-west. In contrast, the South Sandwich Plate, one of the smallest geologic plates at about 800 km by 200 km and less than 8 million years old is moving rapidly east at about 50 mm per year. The volcanic arc is thought to be younger than 5 million years old.

We boarded the Ocean Atlantic cruise ship at Ushuaia and sailed south from the Beagle Channel to the vicinity of Elephant Island (labelled E in Figure 2) where more than 100 years ago, Shackleton left one of his whaleboats and most of the crew, taking the larger one, the James Caird and 5 additional crew north, ending up on the south-west coast of South Georgia. This island is upthrown, strongly tilted basaltic oceanic crust just like Macquarie Island and evidence that this northern boundary of the Scotia Plate, mapped as a transform fault, has a significant thrust component in places. It is at a similar latitude to Macquarie and Heard Islands with similarly abundant wildlife.

I was hoping we would call into Deception Island, the harbour a breached caldera of an active volcano, like Rabaul. About 10,000 years ago, a violent explosive eruption ejected about 30 km³ of rock and ash from the island and subsequent collapse formed the caldera. The volcano was active during the 18th and 19th centuries and between 1906-1910 and 1967-1970. Spain and Argentina deploy a network of seismographs and distance measuring equipment there in summer months as seen in Figure 3. The island is seismically active and inflating at about 10mm/year as it builds to the next eruption.

From Elephant Island we motored down the western side of the Antarctic Peninsula, landing in several places before rounding the tip and doing the same down the east coast to about 64.1°S, our southernmost latitude. Shackleton and crew drifted north past here in 1915/16, held firmly in thick pack ice. One of our stops off the tip of the Peninsula was the volcano known as Paulet Island with a small summit crater. The island is composed of lava flows and has a well-preserved cinder cone that we climbed. The island is notably ice free throughout the year due to the heat from the volcano.

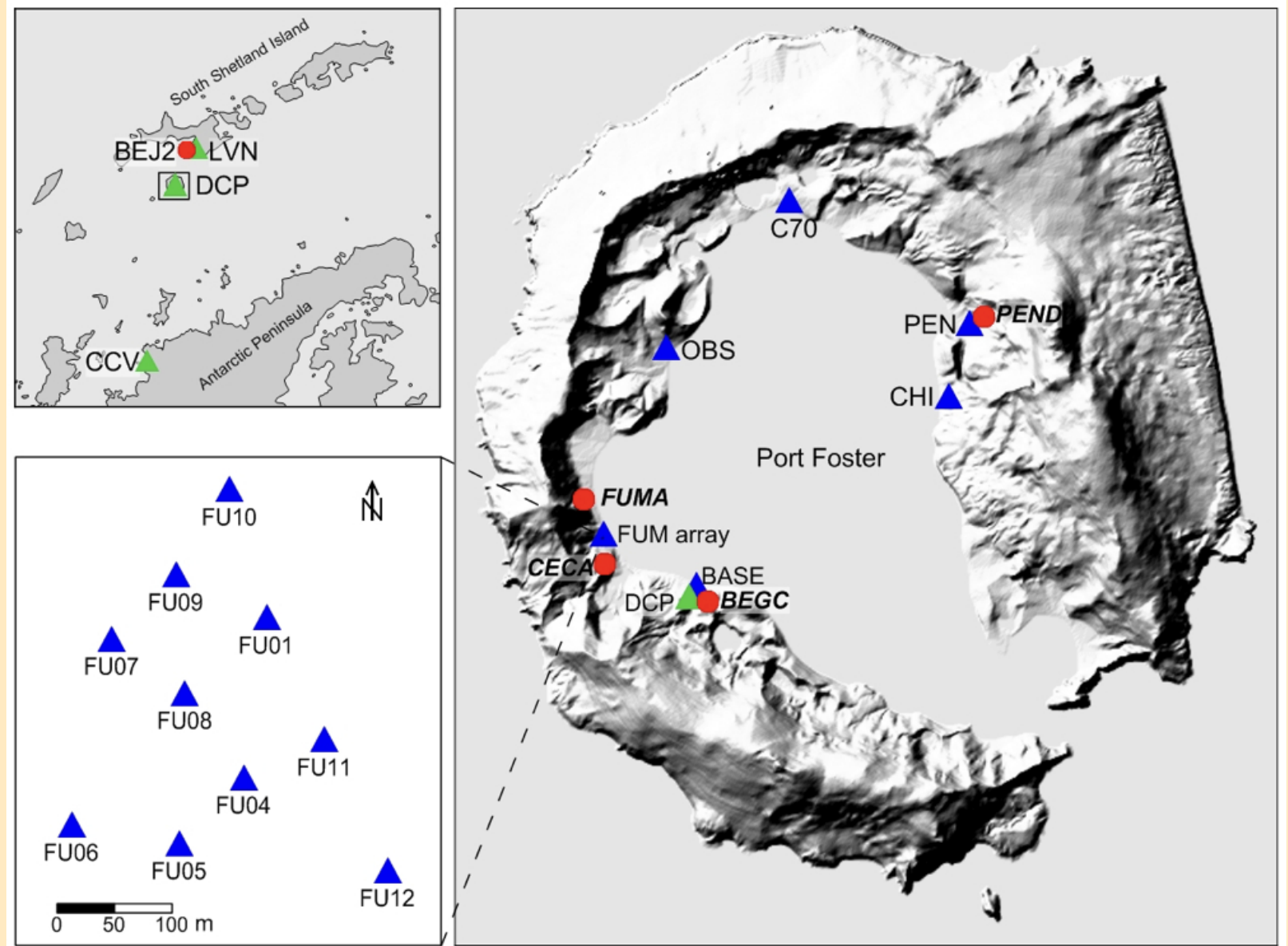


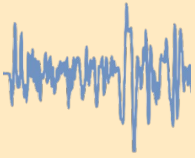
The Scotia Plate up close

Figure 3:

The summer earthquake monitoring network on Deception Island.

(D in Figure 2)





The Scotia Plate up close

We stopped off at Elephant Island on our way north to South Georgia and visited Shackleton's campsite where his crew waited four and a half months for his return aboard a Chilean naval rescue boat. Heroic they all were. And like him we sailed to South Georgia. Here we struck the looming crisis of Covid-19, the UK Government refusing to allow our visits to the Maldives or to the settlement at Grytviken on the central east coast of South Georgia where Shackleton raised a rescue party and is now buried. We did go ashore in Zodiacs at other locations around the island, including the Shackleton campsite from where he set out to walk across the mountainous island draped in glaciers to Grytviken for help.

Magnitude 5 earthquakes occurred in the South Sandwich Islands just before and just after our visit. We had to be content with a couple of calving glaciers which were a useful analogue for my talk to the ~200 Ocean Atlantic passengers and crew on the Scotia Plate.

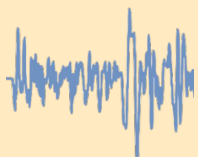
We heard the ice break with a bang, saw the displacement of ice, then experienced the subsequent tsunami that rocked our Zodiacs.



The birds, whales and seals were spectacular, one of my other reasons for joining the tour, but that's another story.

Figure 4 & Cover Page

Uplifted, tilted rock on South Georgia.



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
Australian Public Seismic Network	http://cqsrg.org/psn/stations/	Australian PSN seismometers
Recent SA Earthquakes	http://earthquakes.mappage.net.au/q.htm	Data & summaries of recent SA quakes
Central QLD Seismology Research Group	http://www.cqsrg.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
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