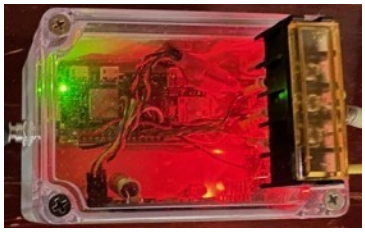
SAA Newsletter



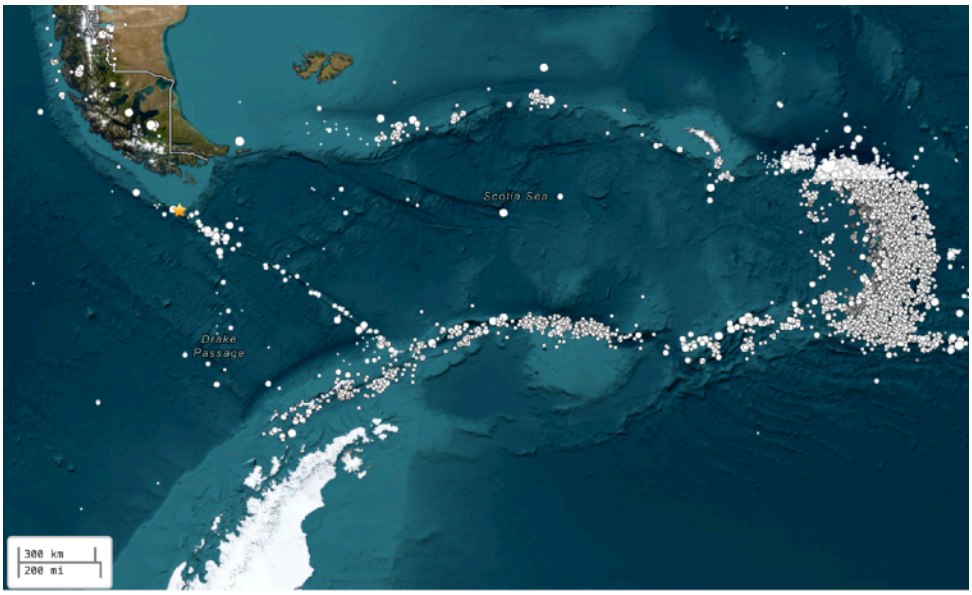
The New Peismo
150mmx50mmx50mm
#3/2025

From the Editors - Members are encouraged to submit articles with an earthquake connection of interest to members but accepting they may be edited or not published, at the discretion of the editors. Contributions to: mccue.kevin@gmail.com

Contents

Major Earthquakes Worldwide, April - June 2025

On average the world experiences one earthquake per month of magnitude 7 or more. In the second quarter of 2025, on 2nd May, there was a single major earthquake, a shallow magnitude 7.4 thrust event in Drake Passage the largest earthquake ever observed there (orange star).



A small tsunami was recorded at the Vernadsky UK station in the Antarctic at 65.2S, 64.3W at 1501 UTC, its max amplitude 0.14m.

Figure 1 shows the interesting complex plate interactions between the Pacific, South American and Antarctic plates. The South American Plate is being subducted below the very active Sandwich micro plate to the west of the Scotia Plate (in the centre of Figure 1) from which it is separated by a back-arc spreading ridge. Another micro plate apparent southwest of the Scotia Plate is known as the 'Former Phoenix' Plate.

(https://en.wikipedia.org/wiki/Phoenix_plate#References).

Major Earthquakes Worldwide, April to June 2025 - USGS

Date UTC	Time UTC	Latitude	Longitude	Depth km	Mww	Place
2025-05-02	12:58:26	-56.61	-68.10	10	7.4	Drake Passage

PEISMO NEWS The Peismo was designed by SAA member Colin Love as a single component digital recorder compatible with any passive seismometers. John Millard and Colin Love are working on a 3-component Peismo whilst John has built and upgraded fourteen Peismos for PhD student Eric Wang's Sydney seismicity study.

In the ACT a new Peismo (the fifth) was installed at the Namadgi Visitor Centre close to the northern end of Namadgi National Park. Another will soon be installed deep within the park, the first seismographs operating with the approval of the ACT Government.

Follow the project https://github.com/colinlove/peismo

Maps of Earthquakes April to June 2025 (by Clive Collins)

The plate boundaries around continental Australia, the thin red solid lines shown in Figure 2, are the USGS version. We have plotted everything above ~M4.5 on the plate boundary but above M3 in continental Australia. These limits are about what is practicable with the existing network.

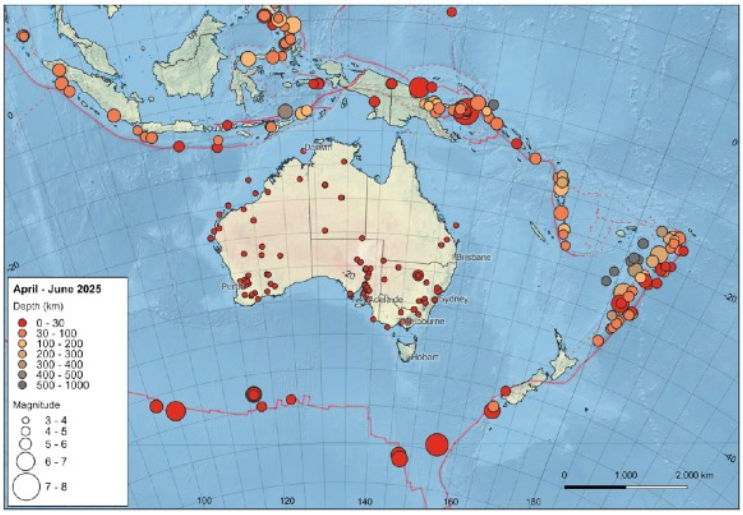


Figure 2 Australia in its Tectonic Plate setting.

In this quarter, the plate boundaries around Australia are clearly marked by earthquakes, New Zealand continued to be very quiet but several earthquakes were recorded from the boundary west of NZ through the Southern Ocean and there were the usual earthquakes in Papua New Guinea and Indonesia. Subduction west of Tonga is clear in the map.

There were some surprises in the Australian epicentral locations. The Nyngan earthquake in NSW for example, was the largest earthquake in Australia during this quarter.

Nyngan NSW earthquake

2025-05-23 at 16:36 UTC, magnitude ML5.3 (GA)

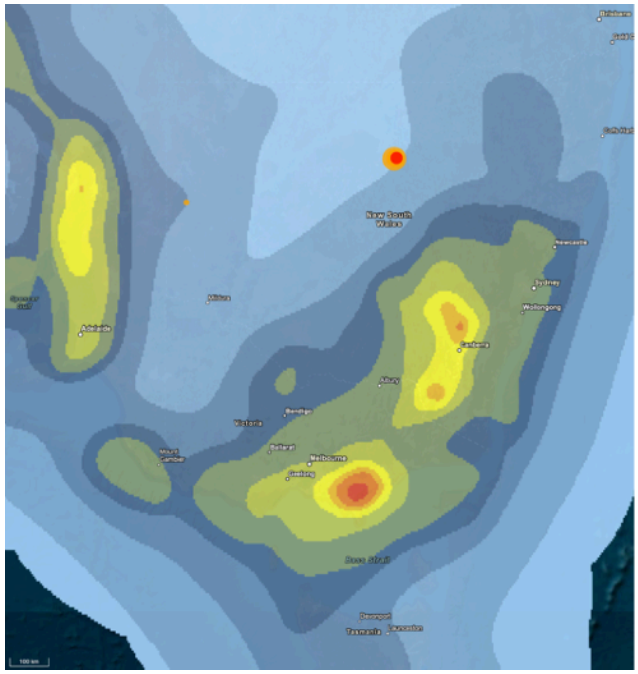


Figure 3 Mainshock epicentre and several aftershocks on GA's NSHA18 pga, 10% in 50 years map. This part of NSW has the lowest hazard rating in NSW according to GA's model.

There are few more isolated locations in NSW than the epicentre about 75km north of Nyngan NSW, far from towns and seismographs.

Shaking was felt widely about the mainshock epicentre, even some reports from Sydney, Newcastle and Broken Hill.

Aftershocks were still being recorded 12 hours after the mainshock, 4 of them of magnitude 3 or more, the largest magnitude 3.9 just 7 minutes after the mainshock.

What's to be learned?

- We don't know where the next magnitude 5 earthquake may occur in Australia
- The location is too far from the nearest accelerograph to measure useful ground motion in the epicentral region
- We are better prepared if the next earthquake is near Canberra or Sydney with the latest roll out of SAA seismographs there.

One of the felt reports came from our very own seismologist Michael Andre Philips in Coonabarabran NSW:

At around 2:38am last night ... 'I was busy Night Assisting on the AAT, I noticed that my chair appeared to be spontaneously vibrating. Then I felt the whole control console vibrating. This strange state of affairs lasted for around 20 seconds, and it was then I was pretty sure I'd just felt an earthquake. So I checked out the Geoscience Australia

Earthquakes Web page and a few minutes later a their report came through.

I don't expect that this event will have damaged anything within the AAT but there is a possibility that very twitchy instruments like Veloce could have been affected. No alarms went off so I guess we're pretty OK.' [Ed. Veloce is a stabilised, high-resolution ($\lambda/\Delta\lambda$=80,000) echelle spectrograph. Veloce uses three arms to provide single-shot wavelength coverage from 396nm to 940nm].

Reported by the Western Plains App as one of the largest earthquakes in the region's history, with people as far away as Dubbo and Narrabri, Wee Waa and Lightning Ridge, feeling the shake, residents have reported windows and floors moving, and in the Marra area one resident said items had fallen off shelves.

Likened to a loud truck passing by one Nyngan resident said it sounded more like a bomb going off, while the "What's on in Marra "Facebook page reported being woken to the sound of crashing articles and the house shaking for four or five seconds with three aftershocks over the next five to ten minutes.

A Dubbo resident posted "Honestly thought something had hit my roof, even the dogs sensed it", she wrote, with a Nyngan resident saying it felt like a train going through the house.

The earthquake struck just 3 minutes after a large M6.1 earthquake 700km west of Macquarie Island. Small earthquakes occurred within hours at Broken Hill NSW and the Flinders Ranges SA.

Followers of the ABC Western Plains Facebook page shared their experience, with hundreds leaving comments.

People reported windows rattling in Condobolin, doors shaking in Walgett, beds squeaking in Bugaldie, wooden ducks falling off shelves in Narrabri and homes creaking in Bingara and Warialda. Some around Trundle said they thought grain trucks were passing nearby, while in Dubbo, sleepers awoke to a rumble that lasted about 30 seconds. Residents reported being woken by it.

Wee Waa, while as far away as Maitland, one reported the wardrobe shaking. Another in Dubbo said it shook their home and their dogs and birds 'were going bonkers'.

Another M4.6 earthquake struck the Singleton area and was widely felt across the Newcastle and Sydney regions, with over 4,000 felt reports registered at GA in the first six hours, from Wollongong in the south to Port Macquarie in the north. Several similar earthquakes occurred between August and October last year.

Another earthquake occurred NE Albury on the NSW/Victora border, its magnitude 3.7. No damage was reported but it was felt by people in both NSW and Victoria.

There were no earthquakes of magnitude 3 or more in Victoria, or Tasmania.

In South Australia there were 4 earthquakes of magnitude 3 or more, the largest only magnitude 3.2. The epicentres were near Jamestown and three from Lake Eyre to NW of Leigh Creek.

The southwest of WA was quite active, but no earthquakes exceeded M3.7 onshore in WA or NT.

Earthquakes rattle Melbourne and Adelaide hours apart

Hundreds of residents reported feeling the ground move as two separate earthquakes struck Victoria and South Australia just hours apart overnight.

Andrew Hedgman May 6, 2025 - 8:54AM

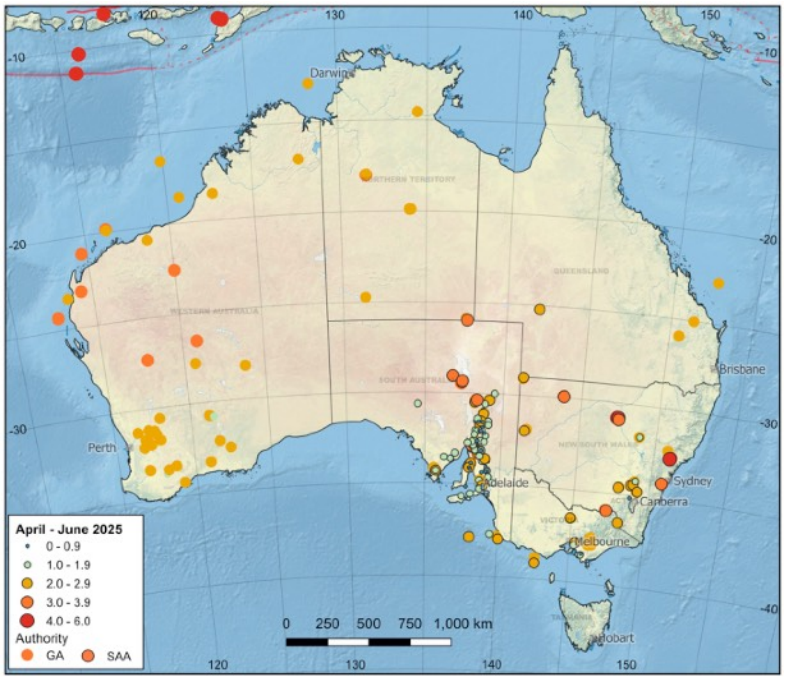


Figure 4 Earthquakes in continental Australia, only Tasmania missed out.

Melbourne was the first to feel the ground shake, a magnitude 2.4 quake striking just after 12.30am on Tuesday 6 May. The epicentre was located near Seville at a depth of 15km, the nearest station about 12km away.

According to Geoscience Australia, more than 620 people reported feeling the tremor, with reports stretching from Jam Jerrup in the south to Craigieburn in the north.

South Australia

Less than two hours after the Melbourne earthquake, Adelaide was rocked by a magnitude 2.3 quake about 2am. The tremor was centred near Mt Barker, east of

the city, at a depth of about 22km. The nearest seismograph was just 4km away. Nearly 200 residents contacted Geoscience Australia to report the event, mostly from in and around the Adelaide region.

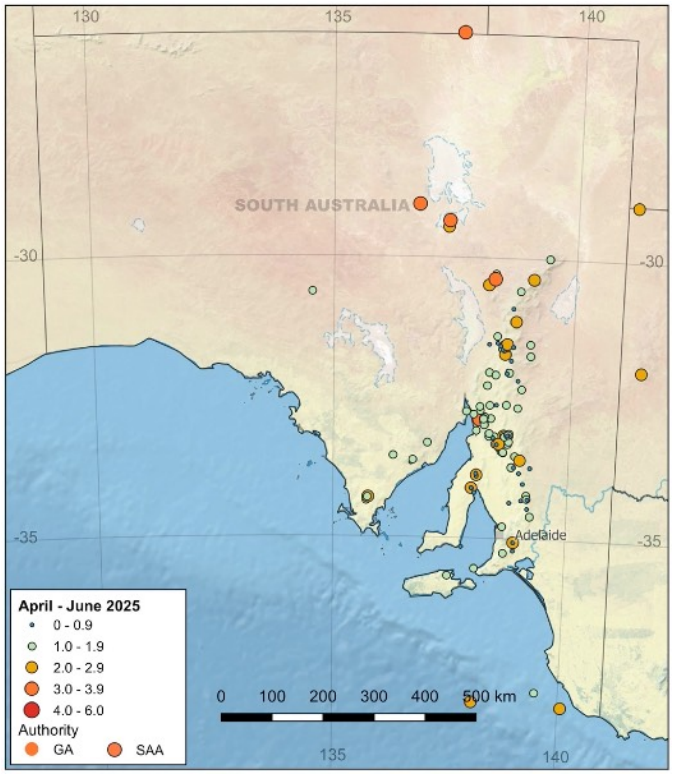


Figure 5 South Australian epicentres were in the usual places in May - June 2025; Flinders and Mt Lofy Ranges, Eyre Peninsula and the Southeast. No surprises and only 4 were of magnitude 3 or more, the largest two of magnitude 3.2, near Lake Eyre and Jamestown.

Queensland

There were 4 small earthquakes onshore and a fourth offshore.

Microearthquake sequence in the Yarrol Block, Central Queensland

by Mike Turnbull

On 26 June 2025 eight small earthquakes were recorded on Geoscience Australia's Eidsvold station EIDS. Three were recorded on sufficient stations to enable me to locate them to the Yarrol Block, between Monto and Mt Perry. The following day another 20 earthquakes were recorded on EIDS. Due to the similar value of the S-P times of all 25 unlocated events, and some trigonometric analysis of the P arrivals, I assume the 28 events occurred within close proximity of one another (Figure 8, p8)..

This prompted me to look for similar events in the same area. I found that a sequence event occurred on 28 June 2024, within 21 minutes of one another, precisely a year earlier than those on 26 June 2025.

I make no attempt to explain how or why what is being observed is occurring. The simple fact is that they occur in a consistently observable manner, and that predictive meaning can be attached to the observations.

I suggest that:

- The Yarrol Block is a special isolated fracture area that has historically generated at least four earthquakes of magnitudes ML5 or more within the past 110 years.
- These observations cannot be used to predict large earthquakes; but it seems certain that the prediction of small events within the next 1 to 24 hours in the Yarrol Block is a perfunctory exercise using the data from a seismic monitoring station within 50 km and manual scanning of the waveforms.
- Excel spreadsheets of the 2024 and 2025 events can be downloaded from my web site at https://cqsrg.org/tools/download/ as can extended Microsoft Word and PDF versions of this document

(**story continued on page 8**).

Northern Territory

Still aftershocks are shaking Tennant Creek more than 35 years after three large mainshocks ruptured the surface and caused significant damage in the township in 1988. A single earthquake on 25 May kept this record sequence going.

Western Australia

Three of the 8 earthquakes of magnitude 3 or greater were offshore, including the largest on 26 June at magnitude 3.7. One of the smaller ones, M3.1 on 20 April, was near the distinguished town named Cue.

ACT

The most interesting earthquake occurred near Wee Jasper just over the border in NSW. Interesting because it was recorded on Peter and Fran Smith's Peismo KBRI installed just a day earlier by Kevin McCue and Paul Lonergan (PFLO host) in the valley of the Goodradigbee River on the western side of the Brindabella Range.

The ACT Geological Map has sold out and the GSA ACT committee is vacillating about ordering a reprint. Modern users it seems would prefer to have it available on their mobile or tablet. That despite the advice from the Botanic Gardens bookshop that it was quite a popular seller, and, after all it has sold out. Somebody is buying it! We took the opportunity to upgrade the epicentre map insert, or rather designer Mariana Rollgejser did, not that most people would notice.

Letter from the International Science Council

IASPEI received via IUGG a letter from the International Science Council (ISC) issued as response to global challenges on science. IASPEI would like to share this letter with all its members.

Dear ISC Member,

Please find below a letter from the ISC President, Sir Peter Gluckman, and the ISC President-elect, Prof. Robbert Dijkgraaf, addressed to the membership of the International Science Council.

With best regards, Anne

Anne Thieme | Membership Liaison Officer

International Science Council (ISC)

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Paris, France

Dear Members,

We are writing to you when many of you are looking to the International Science Council for guidance on responses to global challenges to science.

It is only a decade since the Sustainable Development Goals were launched, the Sendai Framework agreed, and the Paris climate accord reached. In the early years of this last decade we saw a remarkable growth in global scientific collaboration, a growing focus on the issues affecting the global commons, an increasing contribution of science from less developed and emerging countries, a far greater diversity within the research community, enhanced moves to open science and open data, and the emergence of trans-disciplinary research bringing the natural and social sciences and other forms of knowledge closer together. There was a sense that while there were many challenges, scientists across the world could work with governments, foundations, business and societies to tackle these urgent issues, especially those of the global commons.

In one sense the COVID-19 pandemic was a demonstration of what could be done but it also accelerated perceptional change. The previous investments in life sciences had allowed for remarkable and unprecedented cooperation to develop new effective class of vaccine. But on the other hand it increased tensions between the major technopoles, there was discord between the global north and south related to technology and intellectual property, the multilateral system was seen by some to have been ineffective or politicised, and in some countries, science became a political tool and the tension between science as a source of knowledge and a tool of power became obvious. COVID had financial and social consequences that are still playing out.

But even before COVID came, we had seen the emergence of the so-called post-truth era. Trust in many of the institutions of society had declined. Rapid sociological, demographic, geopolitical, environmental and technological change was unsettling. Dissatisfaction was fuelled by many unresolved issues and growing inequalities in many societies.

The changed information environment with the explosion of social media did not help and allowed people to reinforce their biases and ignore inconvenient evidence. It has fueled the transmission of disinformation and conspiracy theories. These have helped undermine the capacity of societies to use scientific knowledge well. It altered public decision making. The pandemic further fueled the populist turn impacting on the role of science. For at its heart, populism rejects organised science from having any privilege in defining truths and from having any privilege in decision making.

As the geopolitical landscape has changed, countries are now rapidly shifting resources to support defence and security. This shift, combined with the economic challenges that flow from the pandemic, from emerging tariff barriers and a retreat from globalisation, may drive countries to be less committed to funding the needed global efforts, because they are now focused more on their own more utilitarian needs. In this context international science cooperation has been put at a greater risk.

At the same time and driven by the same factors, we have seen a growing assault on science, universities and academic freedom, not only in one country or in one continent. Sadly, much of that attack is on the issues and science that matters most: climate change, pandemic risks, social science, environmental sustainability, natural capital and more. These are the very domains which are most relevant for society and the global challenges. There has been a growing rejection of evidence in informing policy in some countries.

The global support for international science cooperation has been shifting. Science is defined by its principles, principles that make it a universal language. And science is needed to address so many of the issues we face at every level from local to global. It is critically important at this time that the science community comes together and does not let short-termism and nationalism get in the way of providing the evidence to address those issues that will determine our future on this planet.

The International Science Council is the most comprehensive international science organisation and unique in its composition and mission. Its priorities must be shaped by this changing milieu.

Firstly, while the multilateral system may be weakened, it remains the only structure by which global policies can be influenced and effected. Over the past two years the ISC has been investing to ensure that the voice of the global science community can better assist both the policy and technical agencies in using science in these challenging and urgent times. A critical part of this is helping to shape the global research agenda. We will continue to expand our efforts here it must be a core priority.

Secondly, as an organisation uniquely placed because of our global membership to play a role in informal or so-called track 2 science diplomacy where science helps promote peaceful dialogue between countries, we are working with other partners to try and promote science as a global public good and where possible, as a way to reduce tensions. We need to renew our efforts for countries to understand that it is in the direct national interests to support urgent action on the issues of the global commons.

Thirdly, the importance of promoting international science cooperation remains, both because the world needs it and because it is a glue to help keep the world from fracturing further. We are doing so in multiple ways: promoting the values and principles that allow scientists to cooperate across cultures and contexts, defending open science, and supporting our Affiliated Bodies who play such a critical role in the organisation and coordination of international science. Some of these now face real challenges because of recent events and this changed milieu and the ISC is working to help protect and develop them. We will be making further internal changes to be more effective in these roles. Our expanded platform of regional offices is a further step we have taken to promote regional cooperation.

Fourthly, we must reexamine the social contract for science and recognise that greater efforts are needed to protect trust in science and for it to be perceived as trustworthy. There are gaps in the normative framework for scientific research that must be addressed, and we need to better understand why scientific knowledge can be rejected rather than used.

And in that context, we must be clear: science has a unique and critical capacity to give knowledge about our world. As a universal knowledge system, we know that science can contribute so much to finding a safer and better path for all of us on this planet and protect the planets biota. We have a responsibility to focus on where we can make a difference.

Addressing the worrying and multifaceted named above issues is a complex and sensitive agenda for a small international organisation, even with our extensive and influential membership. But we must. For we are uniquely placed and therefore have large responsibilities. How we do so, must be nuanced and principled. Our membership in every country and across every scientific discipline gives us a unique asset. But the ISC will be most effective when every eligible scientific organisation becomes a member.

Like other parts of the science system, we are resource limited so we must prioritise. Protecting global science for the global public good, enabling international science cooperation, using our capacities to assist the vulnerable international system and promoting diplomacy towards a better planet must be our primary goals. This sharpens our strategic framework even more than we suggested in Oman.

Clearly, the ISCs effectiveness would be enhanced by access to more resources. We hope, even in these difficult times, that donor countries, foundations or private donors can see the value of what the ISC is doing. In the meantime, we will be undertaking internal change to focus on the highest priority tasks.

While the ISC is uniquely placed, it has a unique burden. These are very challenging times for international science. It is critical that we find ways to be more effective. We are confident we are on the right path to do so.

Sir Peter Gluckman

ISC President

Prof. Robbert Dijkgraaf

ISC President-elect

A 'silent' earthquake below Hawke's Bay NZ

(https://www.geonet.org.nz/about/earthquake/sse)

We've been tracking a slow-slip event (or 'silent' earthquake) in the Hawke's Bay region since the beginning of May. Our instruments have measured approximately 2 cm of eastward motion over the past two weeks. To put this in perspective, 2 cm represents approximately six months worth of plate motion in only two weeks.

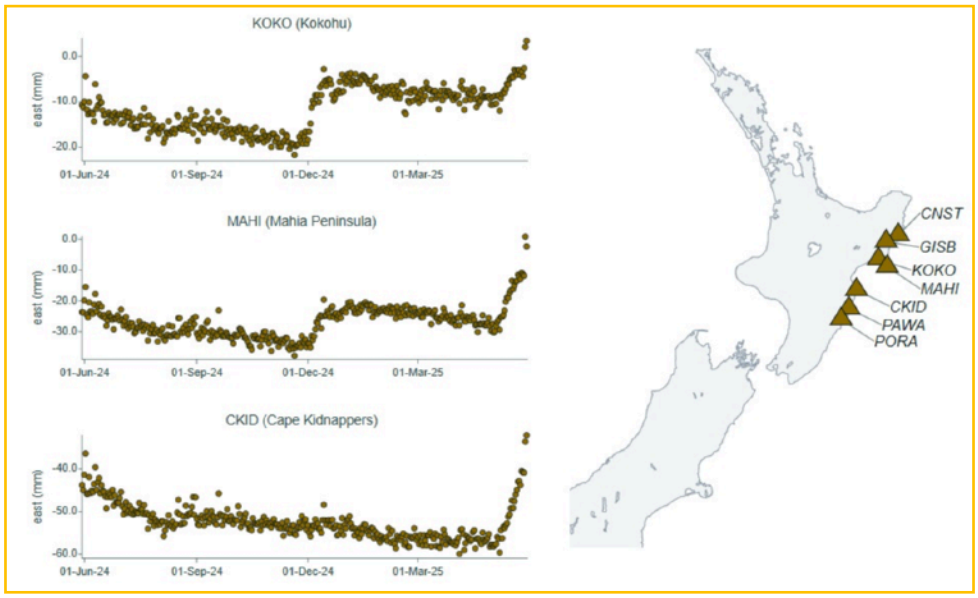
Unlike 'usual earthquakes', slow-slip events unfold over weeks or months rather than seconds. As this release of energy takes place slowly, it doesn't cause shaking that is felt by people, or even by our seismographs. Instead, it is our continuously operating Global Navigation Satellite System (GNSS) stations (commonly referred to as GPS) that track millimeter-level movement of the land on a daily basis, that allow us to see events like this unfold.

Slow-slip events themselves don't pose a risk to people, but they are a major part of our growing understanding of how tectonic plates move in a subduction zone. If we can better understand slow-slip events, we can better understand the earthquake potential of subduction zones.

Slow-slip events are a good reminder that we live on a very active tectonic plate boundary. The best thing you can do now is refresh yourself on earthquake preparedness information, you can find some links at the bottom of this page. Our team will continue to keep an eye on this slow slip activity, and we will keep you updated as new data comes in.t two weeks.

That's the equivalent of around six months of plate motion condensed into 14 days.

GNS' science operations technical lead Elisabetta D'Anastasio said the slow release of energy meant it did not cause shaking noticeable by people or



seismographs. "When slow-slip events occur, they relieve a lot of pent-up stress on the subduction plate boundary. At the same time, they can increase stress on other nearby portions of the plate boundary, so they are occasionally accompanied by an increase in smaller earthquakes that may be felt by the public."

As a result, more than 100 earthquakes had been located in the central Hawke's Bay region since the beginning of May. The largest event has been a 3.1 magnitude earthquake on May 17.

Slow-slip events were common in the Gisborne and Hawke's Bay area, D'Anastasio said. "The most recent was reported in December last year offshore the Gisborne region, between Mahia Peninsula and Tolaga Bay – that lasted about a month." She said the current event was picked up between the GNSS stations at Cape Kidnappers and the Mahia Peninsula. "Based on our observations of past Hawke's Bay slow-slip events, this one is likely to continue for the next few weeks."

Note: (Ed.) Near Hollister Ca, USA, slow slip or creep has been monitored and documented on the Calaveras Fault for more than 50 years

Figure 6 GNSS evidence provided by GNS NZ in support of the occurrence of a 'slow' earthquake off the east coast of the North Island of NZ.

A 'T' phase

Of the various phases observed on seismographs around the world, the 'T' phase attracts a lot of interest but its usage is limited to locating small earthquakes on the mid-ocean ridges.

Below is a record of selected SAA seismograms in SE Australia of 29 April 2025. All but the 3-comp RNDA are Peismos. The P, S and T phases are marked. Stations BAMB (Bruce Boreham), CLIL (Clive Collins) and RNDA (Kevin McCue) are all in the ACT about 10km apart. PFLO (Paul Lonergan) is just south of the ACT, S88P Gary Gibson's station is further southwest at Sandon in central Victoria and WEPH is Eric Wang's station in Sydney..

The earthquake was a large M6.2 shallow earthquake SW of New Zealand on the Macquarie Ridge, the mechanism strike-slip.

By convention the arrival time of the T-phase is measured at the peak of the coda.

The relative amplitude T/P is similar across SE Australia and the amplitude on the RNDA horizontal components is very similar to that on the vertical.

T waves propagate in the so-called SOFAR channel (Sound Fixing and Ranging) at around 1200m depth, where acoustic energy has wavelengths shorter than its width, in practice with frequencies greater than 2.5 Hz. (from Okal, 2008. The generation of T waves by earthquakes. Advances in Geophysics 49, pp. 1-65).

T phases are recorded in all Australian States on near-coastal seismographs but they are more common in southeastern states.

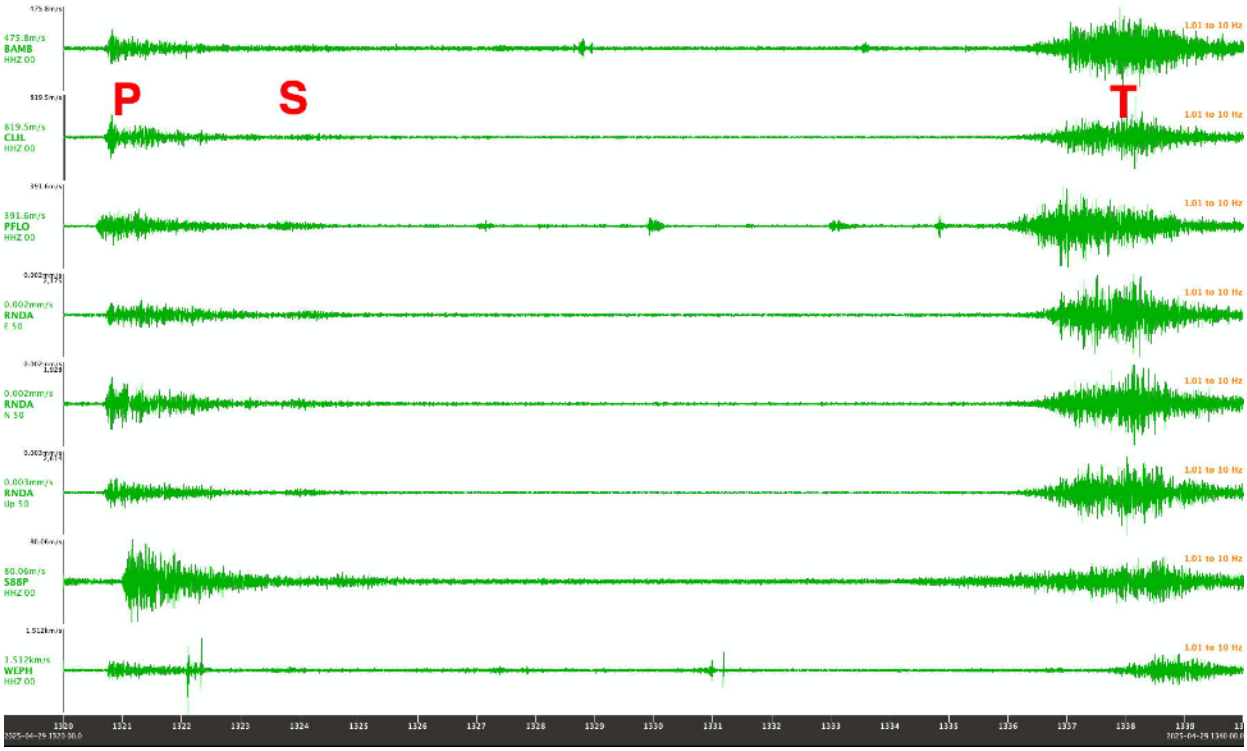


Figure 7 P, S and T phases recorded on SE Australia seismographs from an earthquake on the Macquarie Ridge south of NZ.

(**cont. from Page 4 - Microearthquake sequence** by Mike Turnbull).

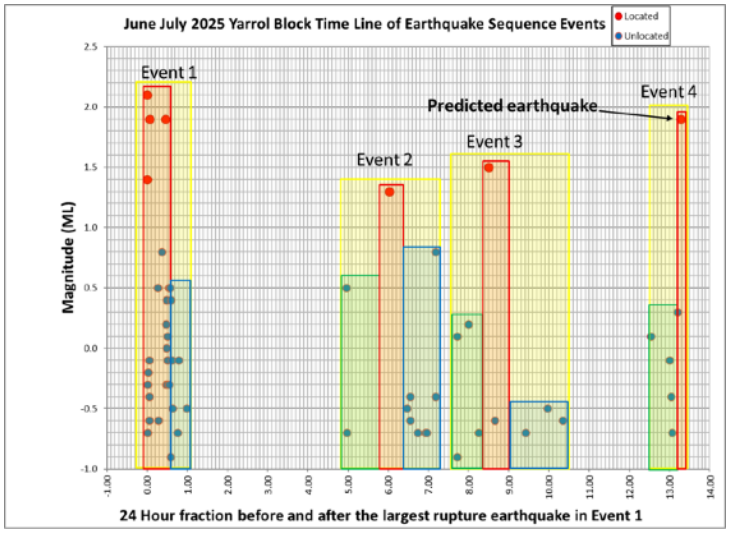


Figure 8 The four June/July 2025 events.

By manual scanning the EIDS records over the 13 days following 26 June 2025 I was able to detect three subsequent microearthquake sequence events, and these are shown in Figure 8. Then I took the bold step of advising Kevin McCue: "… that the Yarrol Block will have an ML 1 to 1.5 within the next 24 to 36 hours."

Within an hour of event 3 a ML1.9 earthquake occurred (see Figure 7, Event 4) - as predicted.

The Seismological Association of Australia Inc.

PO Box 682, Mylor SA 5153
website: https://earthquake.net.au/

Membership of the SAA is open to anyone interested in earthquakes and applies for the calendar year (January through to December)

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