Australian Government
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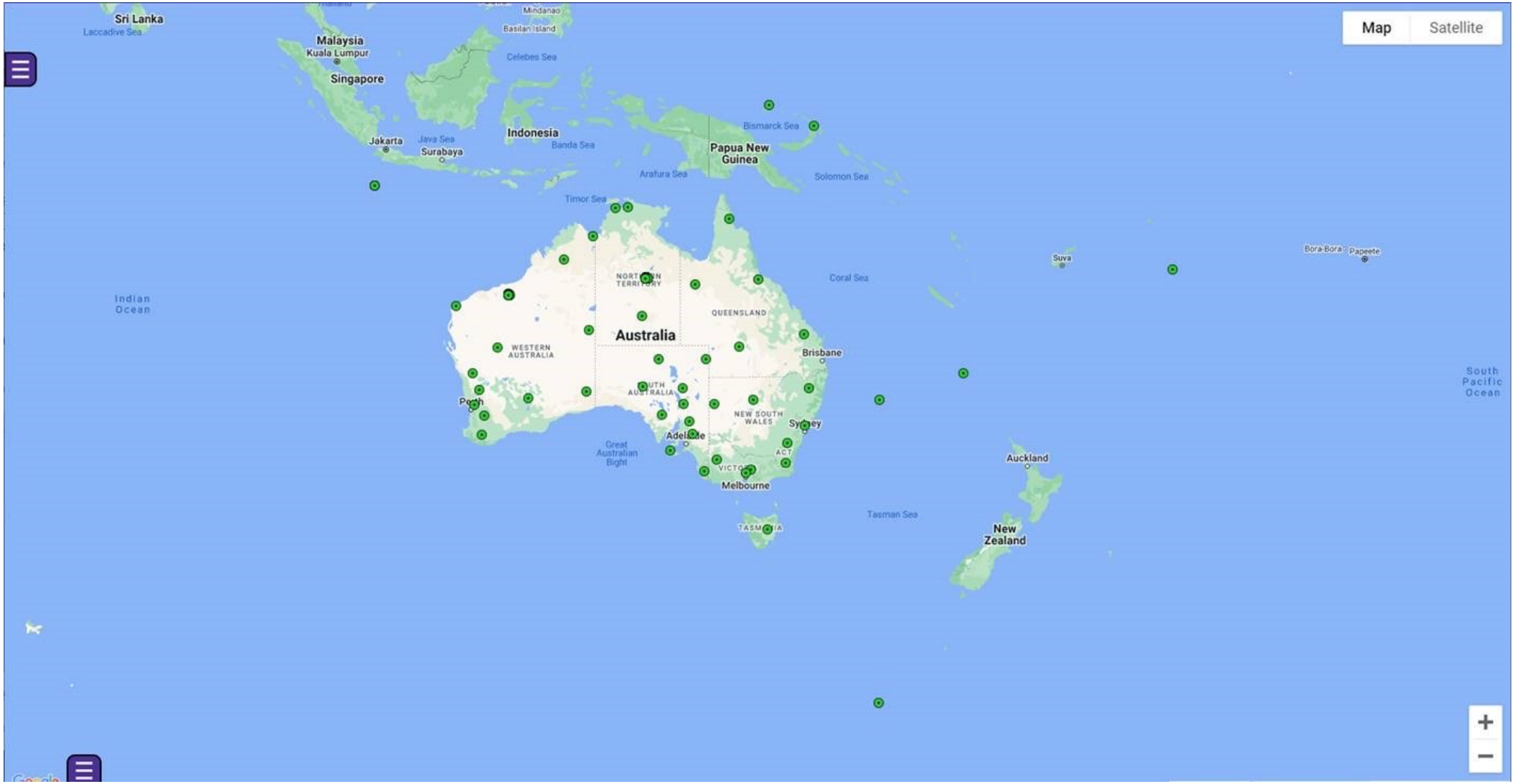
PTWS Task Team on Data Sharing in the Southwest Pacific

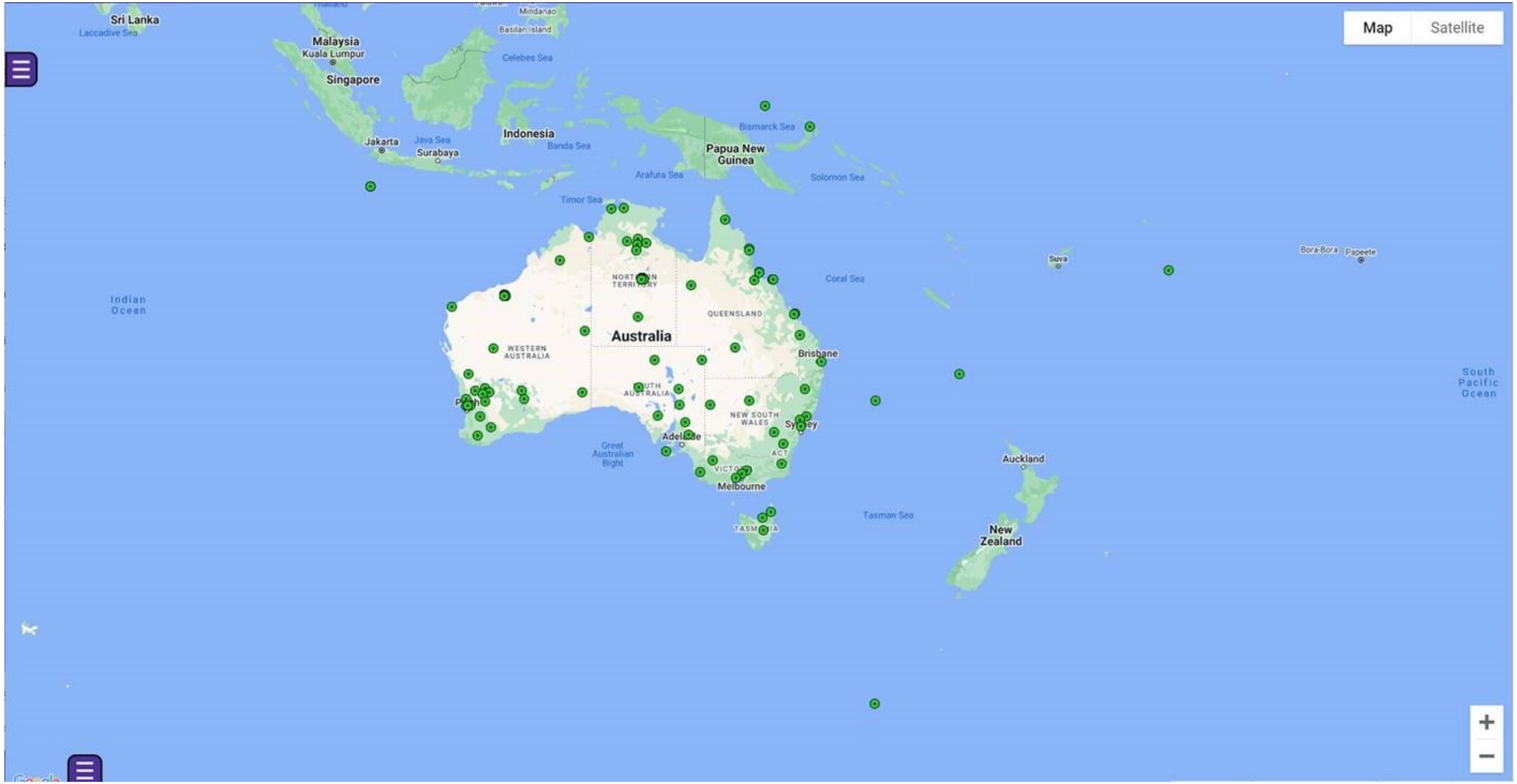
Nuku'alofa, Tonga, 20 October 2022

Adrienne Moseley | Co-Director, Joint Australian Tsunami Warning Centre

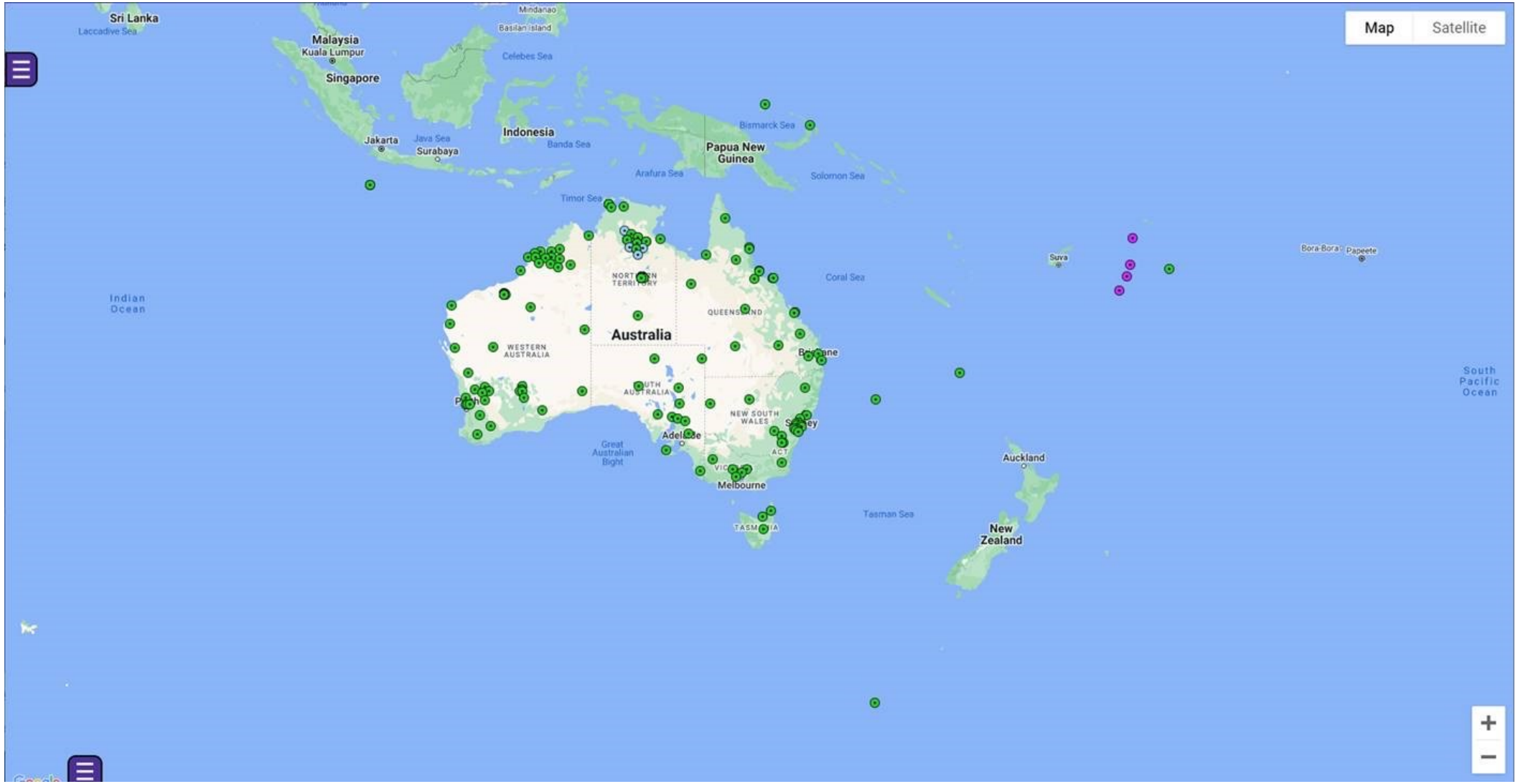
Australian National Seismograph Network (ANSN) BH – 2019



ANSN BH & HH – 2022



ANSN and collaborations – 2022



PNG and Australia – data sharing

Australian Government
Geoscience Australia

DMPGM

ARRANGEMENT

BETWEEN

The Department of Mineral Policy and Geohazards Management (DMPGM) on behalf of the Port Moresby Geophysical Observatory (PMGO)

AND

GEOSCIENCE AUSTRALIA

CONCERNING THE EXCHANGE OF SEISMIC DA
WARNING PURPOSES

The Department of Mineral Policy and Geohazards Manageme
Port Moresby Geophysical Observatory (PMGO) has authority
Government of Papua New Guinea to enter into this bi-lateral
Geoscience Australia, and to advise Oceania Regional Seismic
the host agency, French Institute for Research and Developm
New Guinea's continuous, real-time seismic data to Geoscienc
purpose of tsunami early warning.

GA operates the National Earthquake Alerts Centre, which is
component of the Joint Australian Tsunami Warning Centre
Australia's National Tsunami Warning Centre (NTWC).

ORSNET / IRD provides seismic data aggregation, disseminatio
ORSNET member countries. ORSNET / IRD undertakes to prov
time, on a best efforts basis.

Definition:

For the purposes of this agreement 'data' will be defined as be
Primary seismic data encompasses detailed station metadata
seismic waveform data, in a digital form that is accessible and
analysis. Principally, in format endorsed by the International
Seismograph Networks (FDSN), streamed in real-time.

Australian Earthquake Engineering Society 2018 Conference, Nov 16-18, Perth, WA

A low-cost seismic network for Papua New Guinea

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2. Rabaul Volcanological Observatory, Rabaul, PNG
3. Port Moresby Geophysical Observatory, Port Moresby, PNG

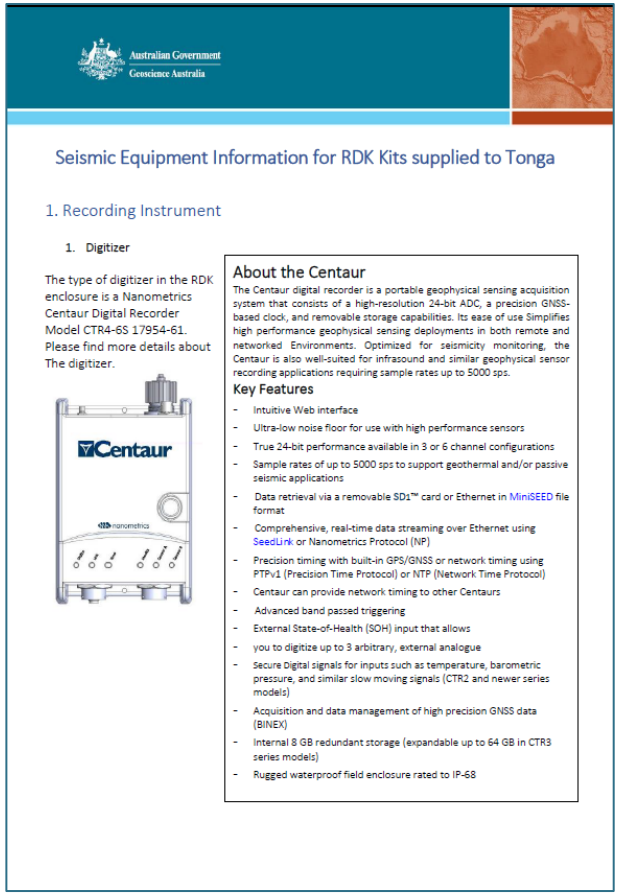
Abstract

Papua New Guinea (PNG) is situated at the edge of the Pacific "ring of fire" and is exposed to frequent large earthquakes and volcanic eruptions. Earthquakes in PNG, such as 2018 Hela Province event (M7.5), continue to cause loss of life and widespread damage to buildings and infrastructure. Given its high seismic hazard, PNG would benefit from a dense seismic monitoring network for rapid (near real-time), as well as long-term, earthquake hazard and risk assessment. Geoscience Australia (GA) is working with technical agencies of PNG Government to deliver a Department of Foreign Affairs and Trade (DFAT) funded technical disaster risk reduction (DRR) program to increase community resilience on the impact of natural hazards and other secondary hazards.

As part of this program, this study explores the feasibility of establishing a low-cost, community-based seismic network in PNG by first verifying the performance of the low-cost *Raspberry Shake* 4D seismograph, which includes a three-component strong-motion MEMs accelerometer and one (vertical) short-period geophone. A *Shake* device was deployed at the Rabaul Volcanological Observatory (RVO) for a period of one month (May 2018), relaying data in real-time via a 3G modem. To assess the performance of the device, it was co-located with global seismic network-quality instruments that included a three-component broadband seismometer and a strong motion accelerometer operated by GA and RVO, respectively. A key challenge for this study was the rather poor data service by local telecommunication operators as well as frequent power outages which caused repeated data gaps. Despite such issues, the *Shake* device successfully recorded several earthquakes with magnitudes as low as m_b 4.0 at epicentral distances of 600 km, including earthquakes that were not reported by international agencies. The time-frequency domain comparisons of the recorded waveforms with those by the permanent RVO instruments reveal very good agreement in a relatively wide frequency range of 0.1-10 Hz. Based on the estimated noise model of the *Shake* device (seismic noise as well as instrument noise), we explore the hypothetical performance of the device against typical ground-motion amplitudes for various size earthquakes at different source-to-site distances..

Tonga and Australia – gifted equipment

- 4 of GA rapid deployment kit (RDK):
  - Nanometrics Trillium 120 compact PH seismometer
  - Nanometrics Titan accelerometer
  - Nanometrics Centaur Digital Recorder
  - All instrument cables
  - GPS antenna
  - SD card (32 GB)
  - Solar regulator / battery charger
  - 4G modem
  - Monocrystalline Solar Panel (portable)
  - Pelican Storm Case
- 4 of GA RaspberryShake kit (RS):
  - RaspberryShake RS4D
  - SD card (32 GB)
  - Solar regulator / battery charger
  - 4G modem
  - Monocrystalline Solar Panel (portable)
  - Pelican Storm Case



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Seismic Equipment Information for RDK Kits supplied to Tonga

1. Recording Instrument

1. Digitizer

The type of digitizer in the RDK enclosure is a Nanometrics Centaur Digital Recorder Model CTR4-6S 17954-61. Please find more details about The digitizer.

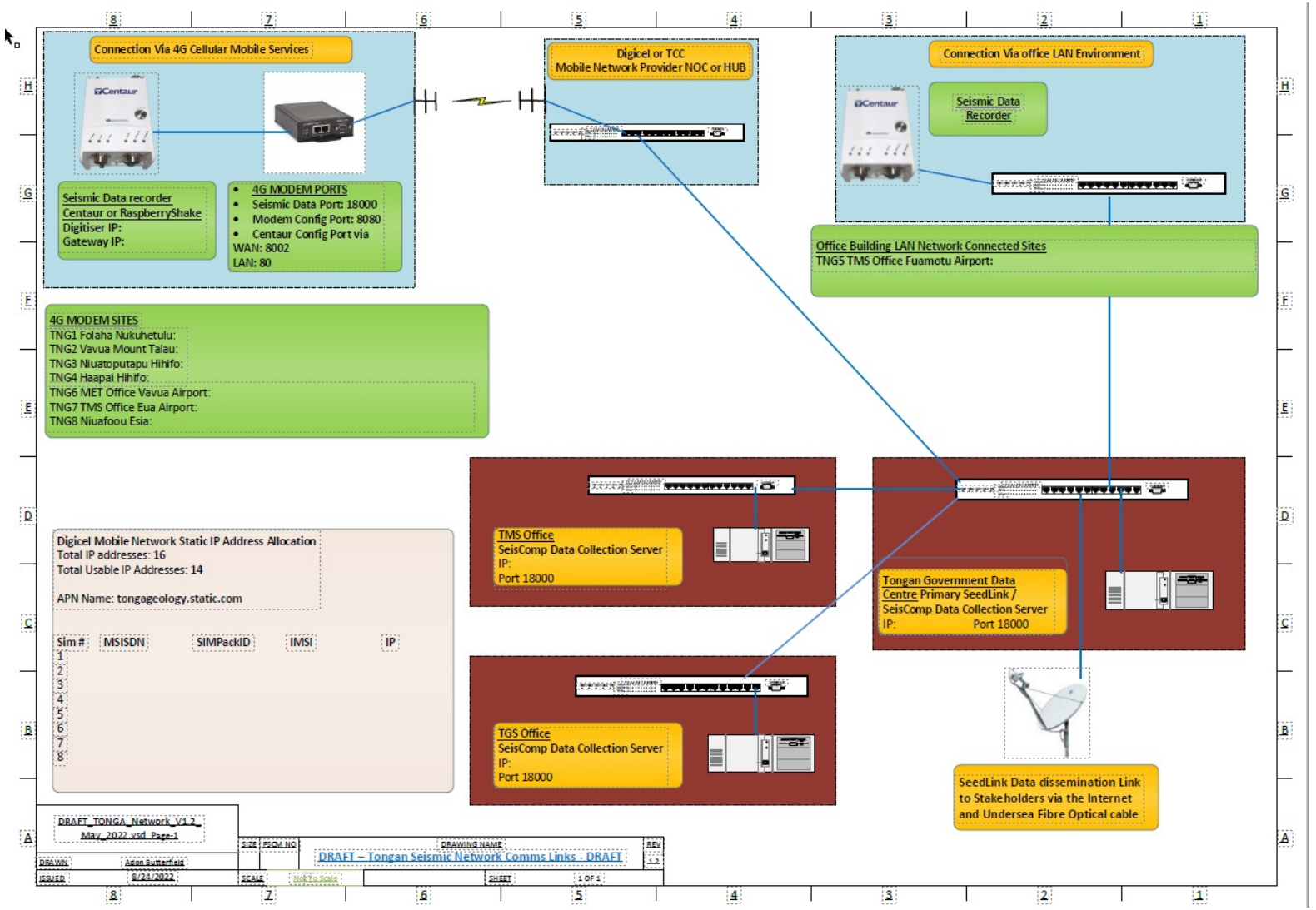
About the Centaur

The Centaur digital recorder is a portable geophysical sensing acquisition system that consists of a high-resolution 24-bit ADC, a precision GNSS-based clock, and removable storage capabilities. Its ease of use Simplifies high performance geophysical sensing deployments in both remote and networked Environments. Optimized for seismicity monitoring, the Centaur is also well-suited for infrasound and similar geophysical sensor recording applications requiring sample rates up to 5000 sps.

Key Features

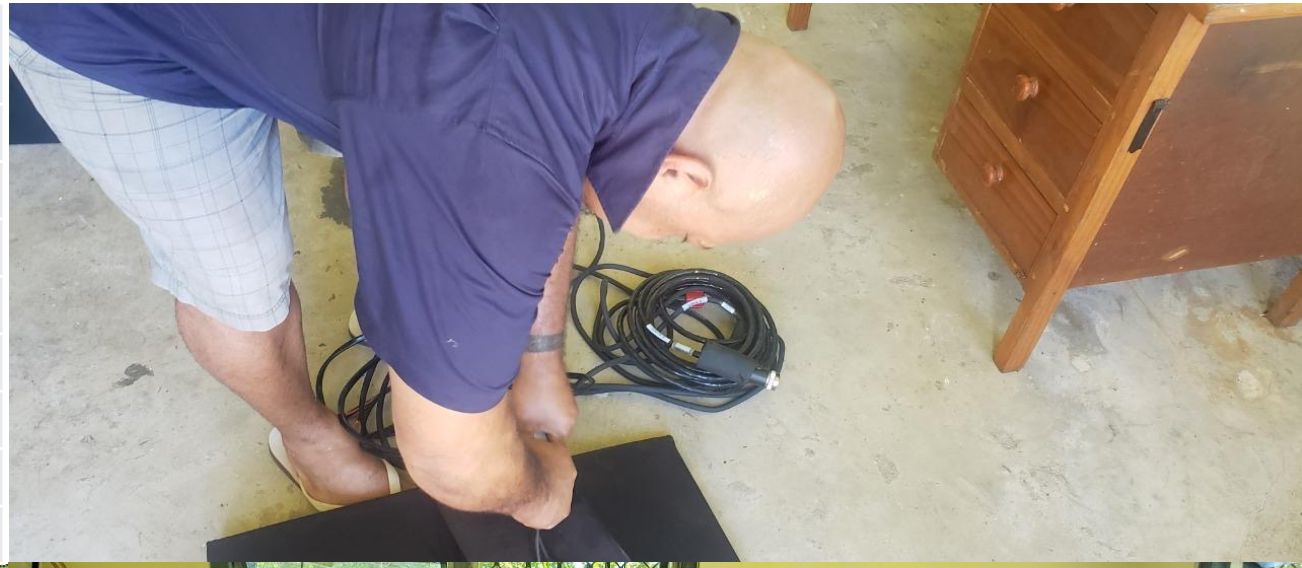
- Intuitive Web interface
- Ultra-low noise floor for use with high performance sensors
- True 24-bit performance available in 3 or 6 channel configurations
- Sample rates of up to 5000 sps to support geothermal and/or passive seismic applications
- Data retrieval via a removable SD1™ card or Ethernet in MiniSEED file format
- Comprehensive, real-time data streaming over Ethernet using SeedLink or Nanometrics Protocol (NP)
- Precision timing with built-in GPS/GNSS or network timing using PTPv1 (Precision Time Protocol) or NTP (Network Time Protocol)
- Centaur can provide network timing to other Centaurs
- Advanced band passed triggering
- External State-of-Health (SOH) input that allows
- you to digitize up to 3 arbitrary, external analogue
- Secure Digital signals for inputs such as temperature, barometric pressure, and similar slow moving signals (CTR2 and newer series models)
- Acquisition and data management of high precision GNSS data (BINEX)
- Internal 8 GB redundant storage (expandable up to 64 GB in CTR3 series models)
- Rugged waterproof field enclosure rated to IP-68

Tonga and Australia – temporary seismic network topology

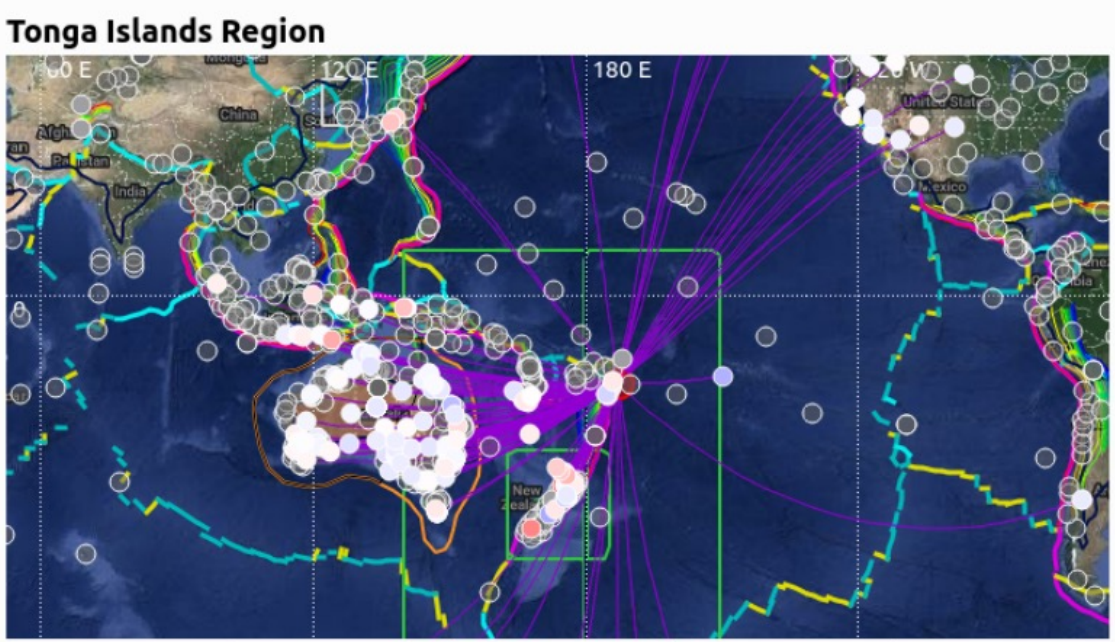


Tonga and Australia – installation, ongoing support, future plans

Site/Kit Name	Location
TNG1	Folaha (Nukuhetulu)
TNG2	Vavau (Mount Talau)
TNG3	Niuatoputapu (Hihifo)
TNG4	Haapai (Hihifo)
TNG5	TMS Office (Fuamotu Airport)
TNG6	MET Office (Vavau Airport)
TNG7	TMS Office (Eua Airport)
TNG8	Niuafoou (Esia)



Tonga and Australia – data sharing



Time: **2022-10-15 02:41:30**
Depth: **34** km +/- 6 km
Lat: **18.9320** °S +/- 2 km
Lon: **172.8925** °W +/- 3 km
Phases: **141** / 148
RMS Res.: 0.8 s
Az. Gap: 42 °
Min. Dist.: 1.1 °

EventID: ga2022uhatre
Agency: **GA**
Author: [redacted]
Evaluation: reviewed (M)
Method: LOCSAT
Earth model: iasp91
Updated: 2022-10-18 23:45:40

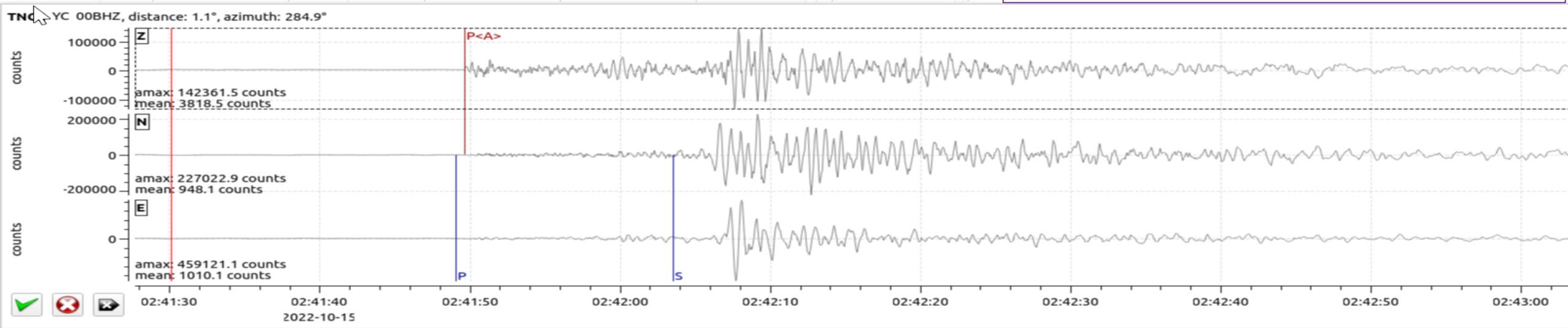
DATA INSTRUMENTATION EDUCATION ABOUT

Context

YC (2022-01-01 - 2027-12-31)

Network YC Map DOI
Description Tonga Eruption Response
Start 2022-01-01 (001)
End 2027-12-31 (365)
Data Center IRISDMC
Stations 8

Station	Data Center	Start	End	Site	Latitude	Longitude	Elevation
TNG1	IRISDMC	2022-04-30	2027-12-31	Folaha (Nukuhetulu)	-21.169722	-175.203642	8.0
TNG2	IRISDMC	2022-04-30	2027-12-31	Vavau (Talau)	-18.648556	-174.000069	118.0
TNG3	IRISDMC	2022-03-08	2027-12-31	Niuatoputapu (Hihifo)	-15.960867	-173.792447	10.0
TNG4	IRISDMC	2022-04-30	2027-12-31	Haapai (Hihifo)	-19.824881	-174.350011	110.0
TNG5	IRISDMC	2022-05-16	2027-12-31	TMS Office (Fuamotu Airport)	-21.243872	-175.137056	4.0
TNG6	IRISDMC	2022-05-16	2027-12-31	MET Office (Vavau Airport)	-18.585703	-173.968883	70.0
TNG7	IRISDMC	2022-05-16	2027-12-31	TMS Office (Eua Airport)	-21.376775	-174.957006	110.0
TNG8	IRISDMC	2022-05-16	2027-12-31	Niuafoou (Esia)	-15.575981	-175.629956	90.0



Thank you