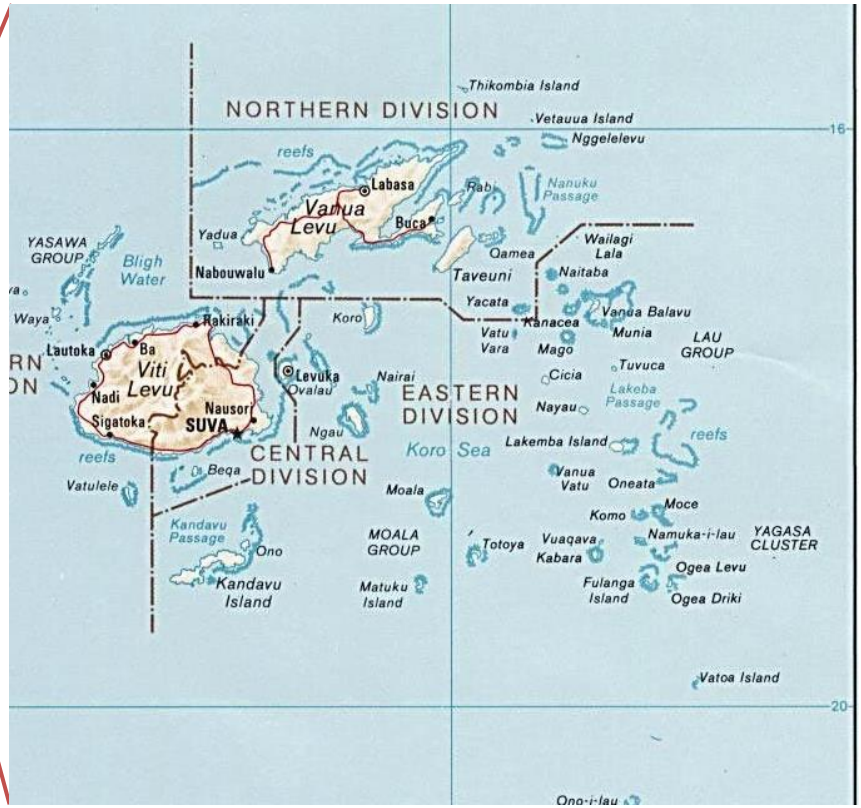
Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC

Latitude 22.982° S
Longitude 177.208° W
Depth 167.4 km

A magnitude 7.2 earthquake occurred south of the Fiji Islands at a depth of 167.4 km (104 miles). There is no threat of a tsunami and no reports of damage or injuries.

Fiji consists of an archipelago of more than 330 islands—of which about 110 are permanently inhabited—and more than 500 islets, amounting to a total land area of about 18,300 square km (7,100 sq miles).



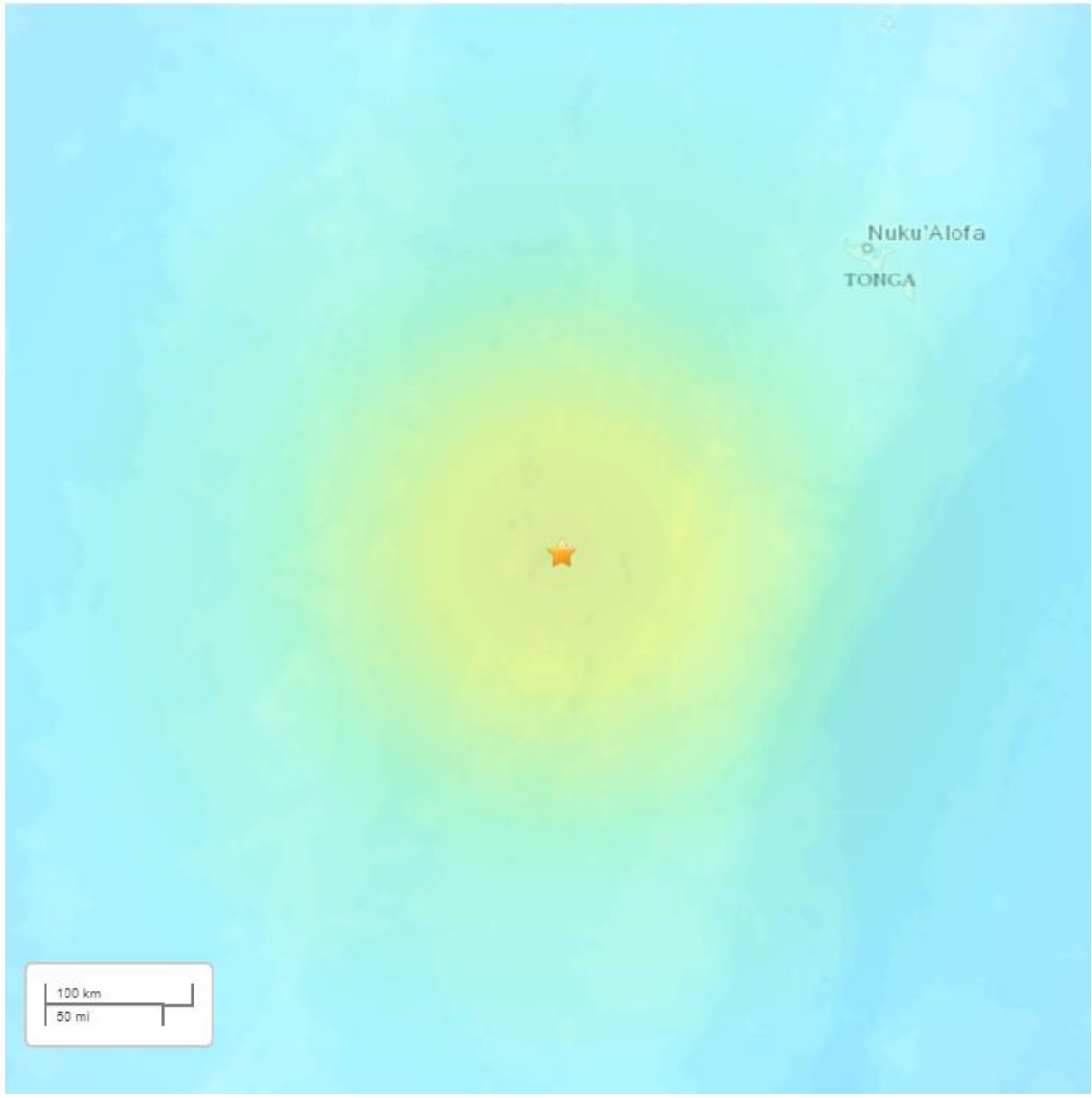
Islands and islets of Fiji

Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC

The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale, from I to X, that indicates the severity of ground shaking. Intensity is based on observed effects and is variable over the area affected by an earthquake. Intensity is dependent on earthquake size, depth, distance, and local conditions.

MMI	Perceived Shaking
X	Extreme
IX	Violent
VIII	Severe
VII	Very Strong
VI	Strong
V	Moderate
IV	Light
II-III	Weak
I	Not Felt



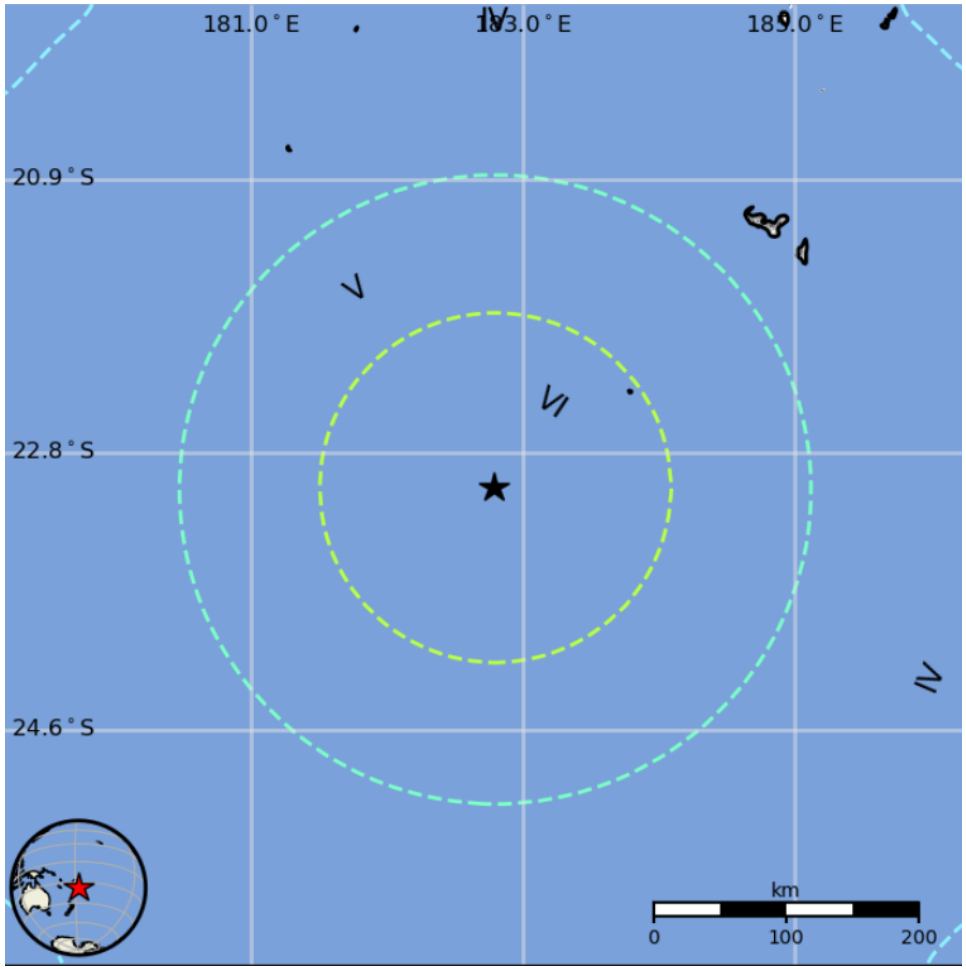
USGS estimated shaking intensity from M 7.2 Earthquake

Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC

The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels. The USGS estimates 93,000 people felt light shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	0 k*
IV	Light	93 k*
V	Moderate	0 k
VI	Strong	0 k
VII	Very Strong	0 k
VIII	Severe	0 k
IX	Violent	0 k
X	Extreme	0 k

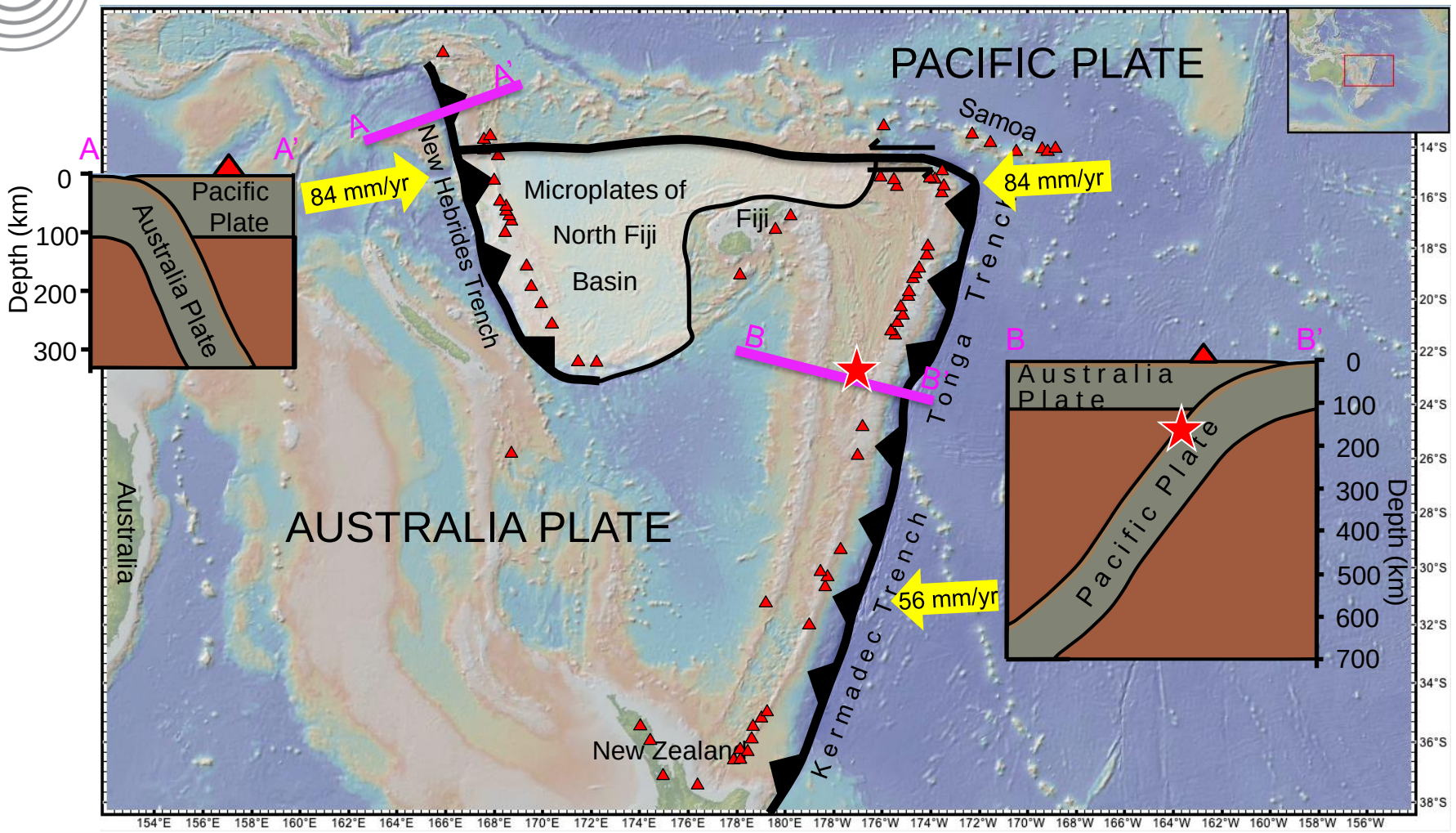


The color-coded contour lines outline regions of MMI intensity. The total population exposure to a given MMI value is obtained by summing the population between the contour lines. The estimated population exposure to each MMI Intensity is shown in the table.

Image courtesy of the US Geological Survey

Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC



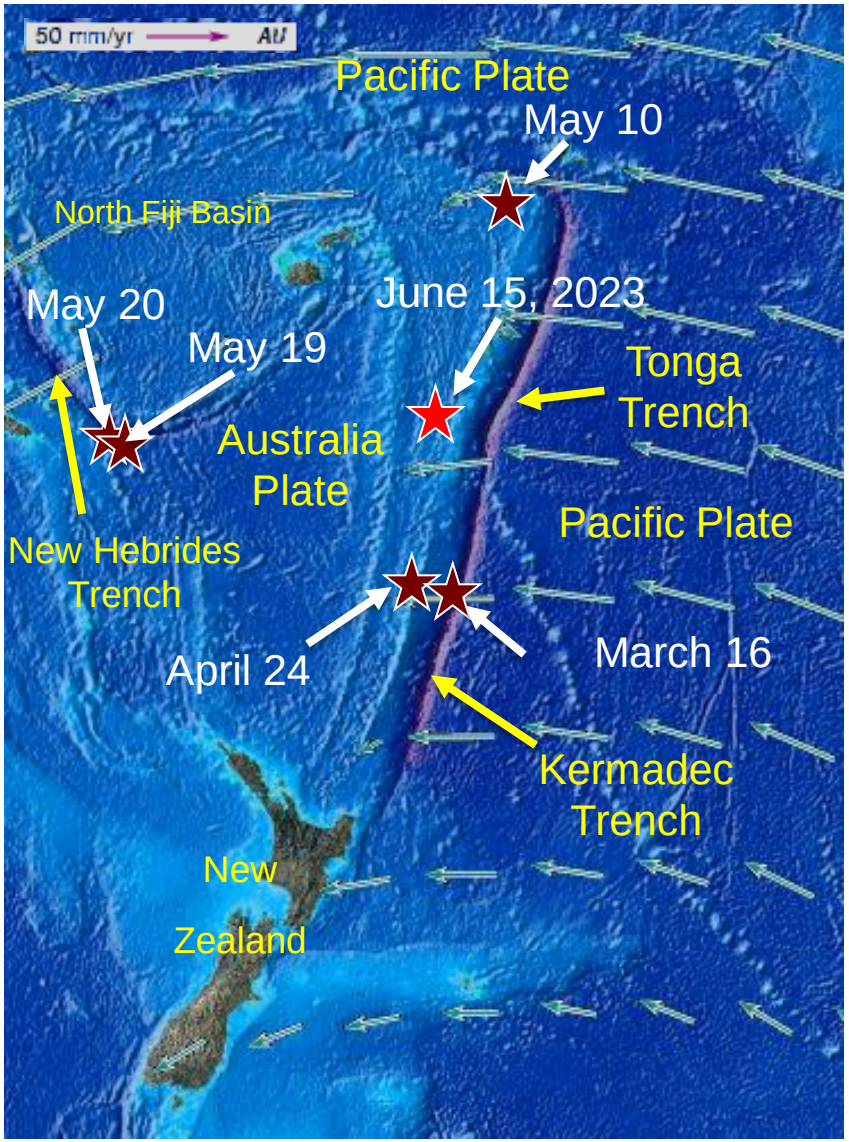
North of New Zealand, two subduction zones accommodate convergence between the Pacific and Australia plates. At the New Hebrides Trench, the Australia Plate subducts toward the east beneath the Pacific Plate and microplates of the North Fiji Basin. At the Tonga and Kermadec trenches, the Pacific Plate subducts toward the west beneath the Australia Plate. Rates of plate motions are shown by the yellow arrows. Representative cross sections are shown for the locations indicated by pink lines. The June 15 earthquake (star) occurred near the southern end of the Tonga subduction zone within the upper part of the subducting Pacific Plate.

Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC

At the Tonga and Kermadec trenches, lithosphere of the Pacific Plate subducts in a westerly direction beneath the Australia Plate. The rate of plate convergence increases from 46 mm/yr in the southern Kermadec Trench to 84 mm/yr in the northern Tonga Trench.

The red star indicates the epicenter of the June 15, 2023 earthquake located in the southern part of the Tonga Trench. Epicenters of five other major earthquakes that have occurred during 2023 along the Tonga, Kermadec, and New Hebrides subduction zones are shown by darker red stars.



Arrows show motion of Pacific Plate relative to the Australia Plate.

Magnitude 7.2 SOUTH OF FIJI

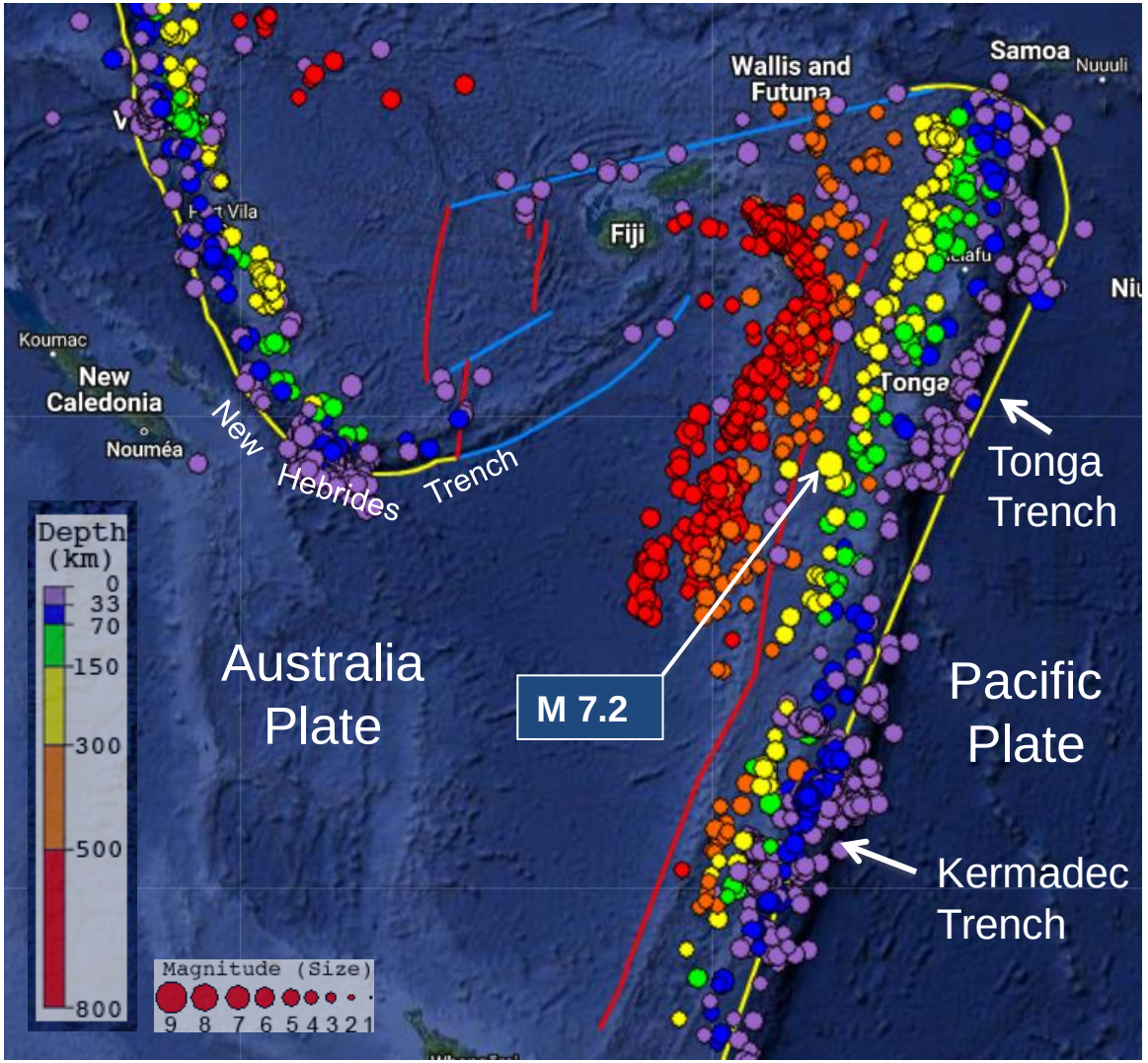
Thursday, June 15, 2023 at 18:06:27 UTC

This earthquake is labeled on this seismicity map showing the most recent 2000 magnitude 4 or larger earthquakes in this region of convergence between the Australia and Pacific plates.

Across the Kermadec and Tonga trenches, earthquake depths increase from east to west as the Pacific Plate subducts beneath the Australia Plate.

Notice that the depths of the deepest earthquakes increase from south to north along the Kermadec and Tonga trenches.

The next slide describes the depth discrepancy in cross sections through the trenches.

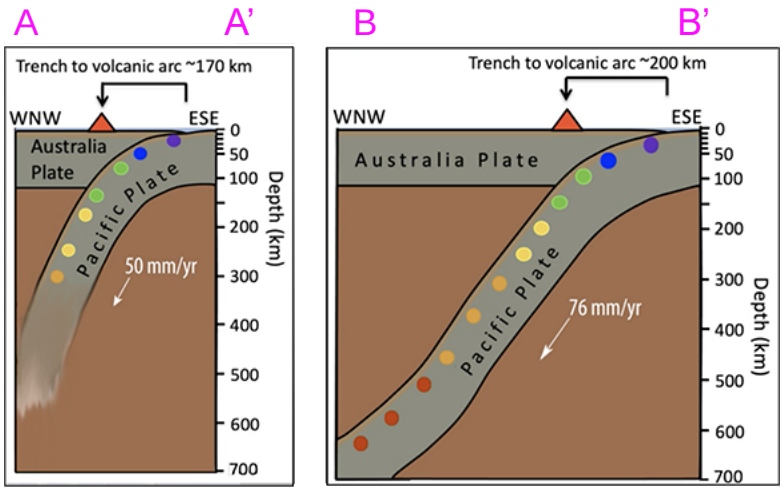


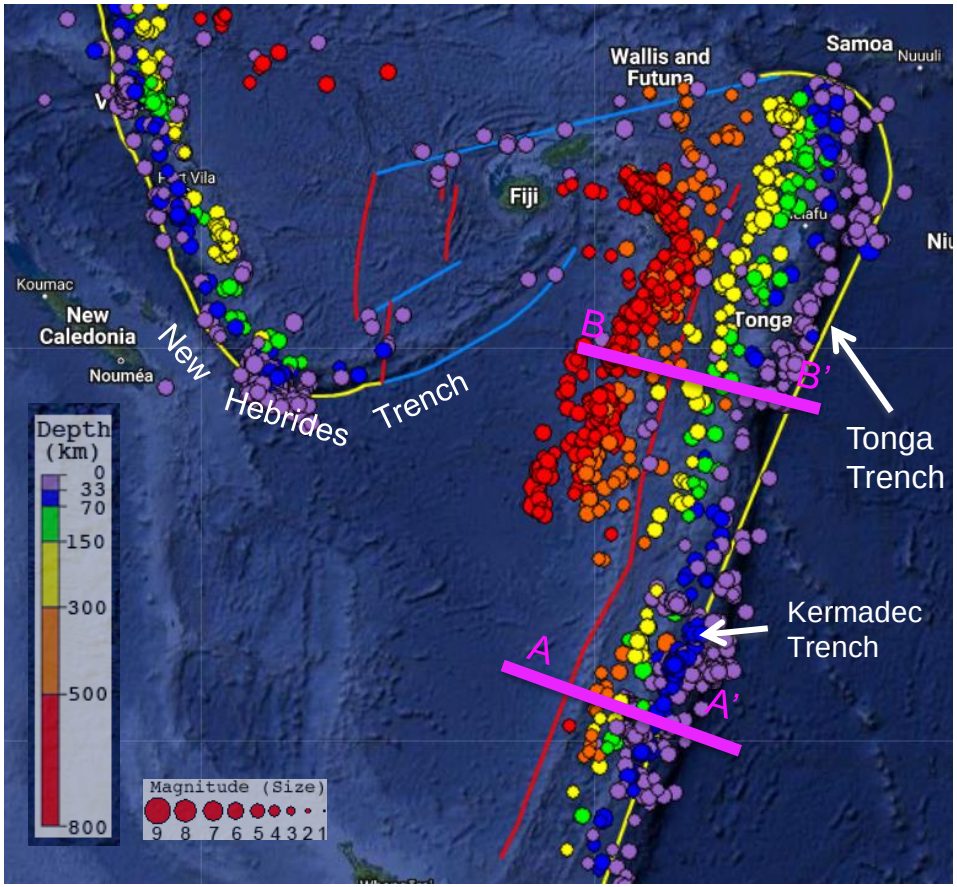
Map created with the Interactive Earthquake Browser

Magnitude 7.2 SOUTH OF FIJI
Thursday, June 15, 2023 at 18:06:27 UTC

The cross sections below show the difference in earthquake depth between the two trenches. In the central Kermadec Trench, the Pacific Plate subducts into the hot mantle at a rate of 50 mm/yr. Earthquakes are limited to less than 300 km depth because, at deeper levels, the plate has warmed and is no longer brittle.

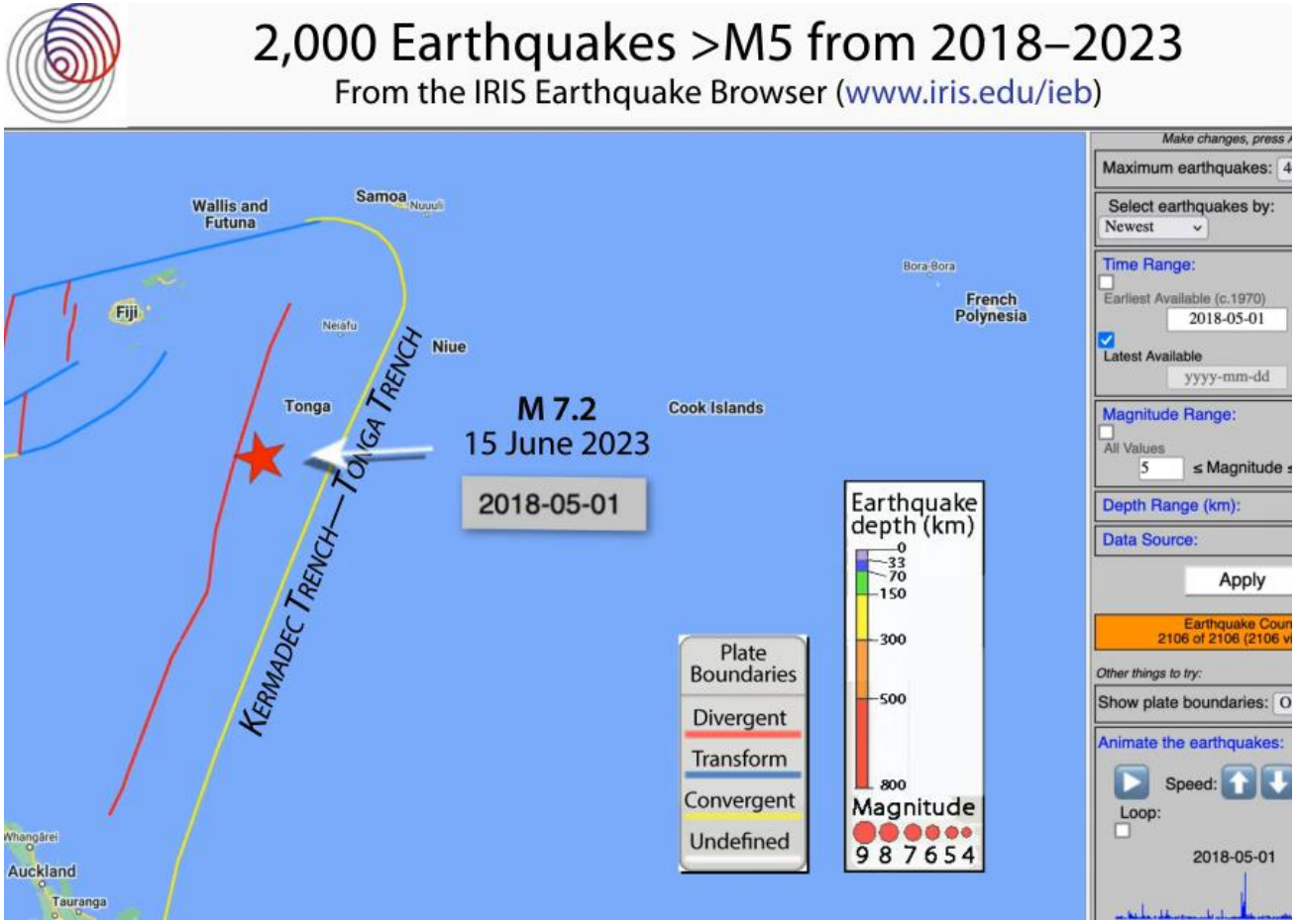
In the Tonga Trench, the Pacific Plate subducts at a faster 76 mm/yr. So, the subducting lithosphere reaches 700 km depth while still cool enough to be brittle and produce earthquakes.





Magnitude 7.2 SOUTH OF FIJI
Thursday, June 15, 2023 at 18:06:27 UTC

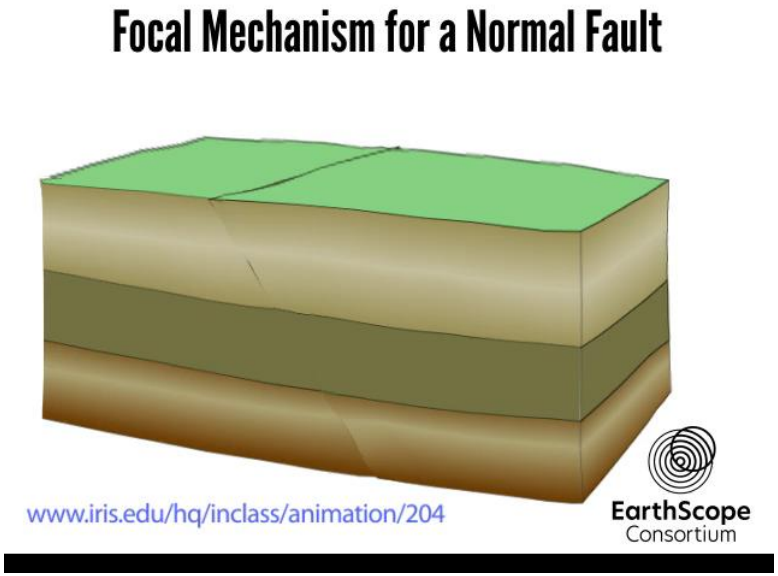
This animation explores the regional historical seismicity using only earthquakes > M5 for the past 5 years as the Pacific Plate subducts beneath the Australia Plate.

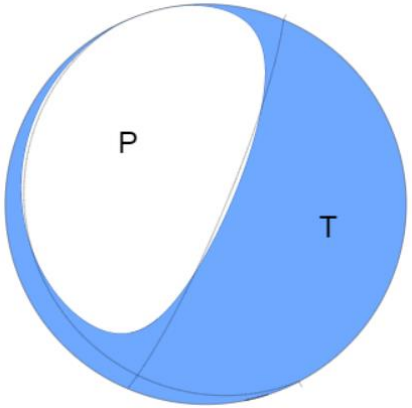


Graphics created with the Interactive Earthquake Browser

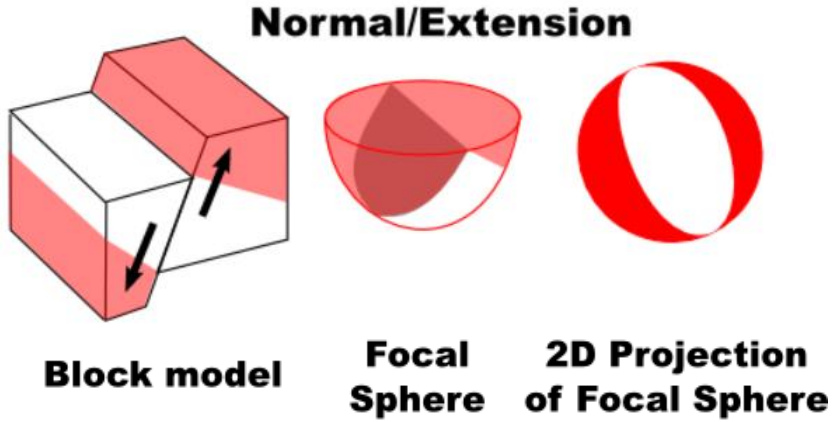
Magnitude 7.2 SOUTH OF FIJI
Thursday, June 15, 2023 at 18:06:27 UTC

The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation of these quadrants determined from recorded seismic waves determines the type of fault that produced the earthquake.





USGS W-phase Moment Tensor Solution

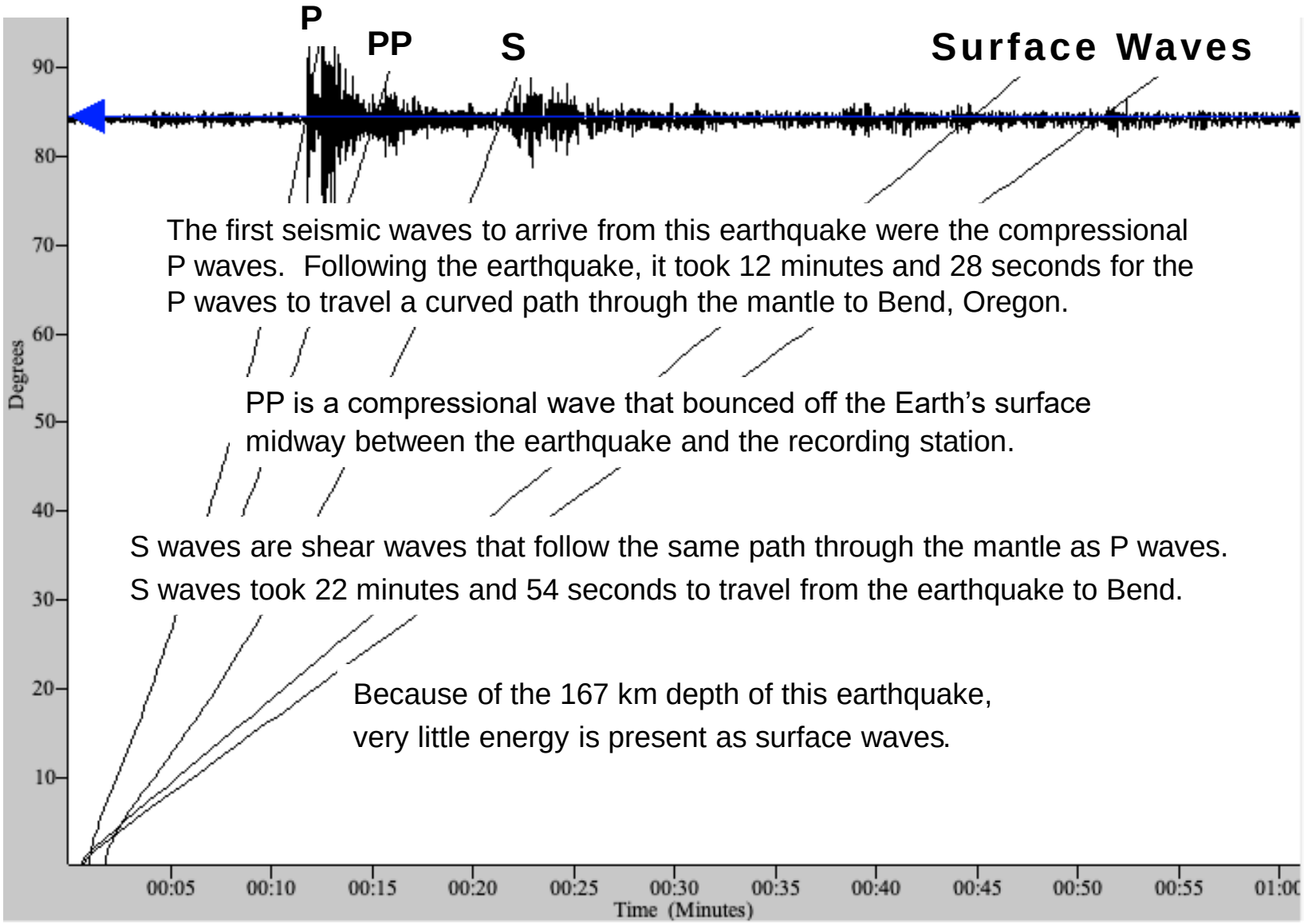


The tension axis (T) reflects the minimum compressive stress direction.
The pressure axis (P) reflects the maximum compressive stress direction.

Magnitude 7.2 SOUTH OF FIJI

Thursday, June 15, 2023 at 18:06:27 UTC

The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 9,367 km (5,821 miles, 84.4˚) from the location of this earthquake.



The first seismic waves to arrive from this earthquake were the compressional P waves. Following the earthquake, it took 12 minutes and 28 seconds for the P waves to travel a curved path through the mantle to Bend, Oregon.

PP is a compressional wave that bounced off the Earth's surface midway between the earthquake and the recording station.

S waves are shear waves that follow the same path through the mantle as P waves. S waves took 22 minutes and 54 seconds to travel from the earthquake to Bend.

Because of the 167 km depth of this earthquake, very little energy is present as surface waves.

Teachable Moments are a service of

The EarthScope Consortium
and
The University of Portland

Please send feedback to tammy.bravo@earthscope.org

To receive automatic notifications of new Teachable Moments
send a blank email to earthquakes+subscribe@earthscope.org

GAGE
SAGE
Operated by

EarthScope
Consortium

These resources have been developed as part of the SAGE facility operated by the EarthScope Consortium via support from the National Science Foundation.