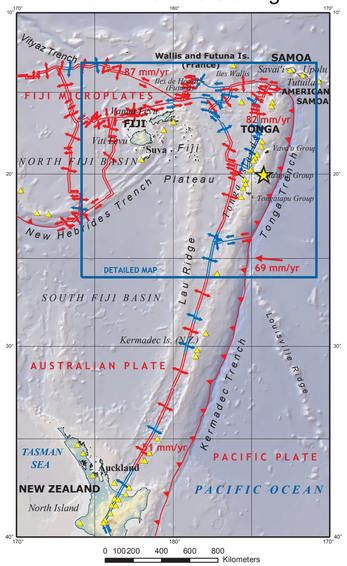
M7.9 Tonga Region Earthquake of 3 May 2006

Plate Tectonic Setting



RELATIVE PLATE MOTIONS

The relative motion of adjacent tectonic plates is depicted on the map by short vectors shown at selected locations on the plate boundary. In this presentation, the Australian plate is defined as the reference plate. The vector therefore represents the direction of motion of the adjacent plate relative to the Australian plate. The rate of relative motion is labeled next to the vector.

The components of the vector perpendicular and parallel to the plate margin approximate convergent/divergent and transverse direction of motion between the plates, respectively. As viewed from the Australian plate, an inward directed component suggests convergence at and near the plate boundary that may be expressed as crustal folding, uplift, thrust faulting, or plate subduction. Similarly, an outward directed component suggests plate divergence such as would be expected at a zone of crustal spreading. Transcurrent or transform faulting would be expected when the dominant vector component is parallel to the plate margin.

EXPLANATION

Main Shock

3 May 2006

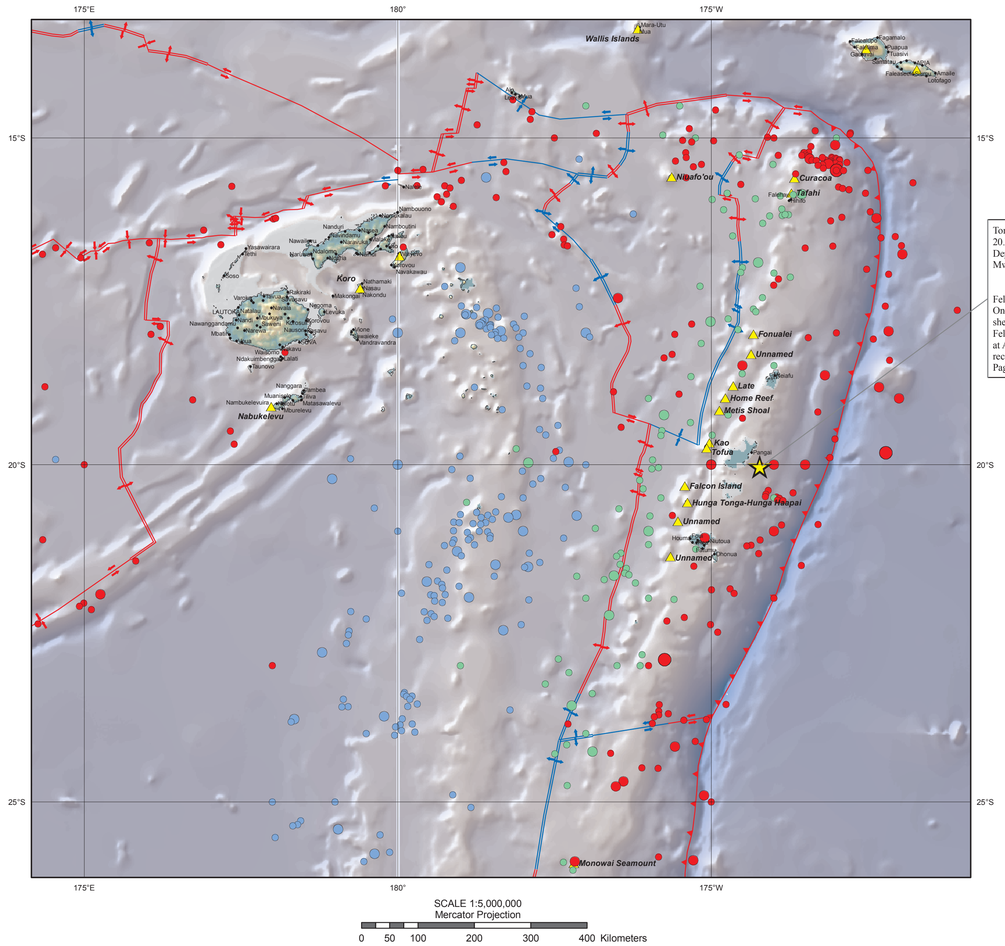
Earthquakes M ≥ 6 1900 - 2006

- 0 - 69 km
- 70 - 299
- 300 - 700

Plate Boundaries

- Continental Convergent
- Continental Rift
- Continental Left Lateral
- Continental Right Lateral
- Oceanic Convergent
- Oceanic Spreading Ridge
- Oceanic Left Lateral
- Oceanic Right Lateral
- Subduction
- Volcanoes

EPICENTRAL AREA



Tonga Region 3 May 2006
20.088°S, 174.219°W
Depth 55 km
Mw 7.9

Felt Reports
One person injured, windows broken and items knocked from shelves (VIII) at Nuku'alofa. Felt at Hihifo, Neiafu and Vaini. Felt (III) at Apia, Samoa. Felt at Atiu and Avarua, Cook Islands; at Alofi, Niue; at Mulifanua, Samoa. A tsunami generated with recorded wave heights (peak-to-trough) of 0.30 meters at Pago Pago, American Samoa and 0.42 meters on Niue.

EXPLANATION

Main Shock

3 May 2006

Earthquakes 1964 - 2006

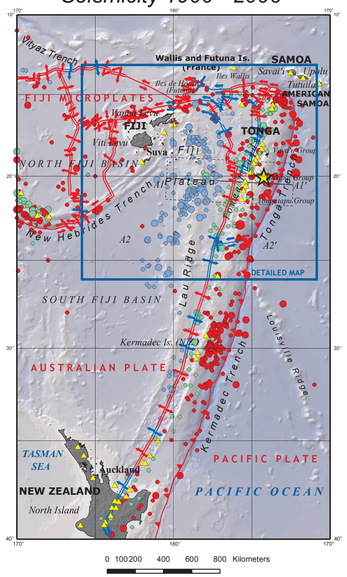
- 0 - 69 km
- 70 - 299
- 300 - 700

Magnitude Classes

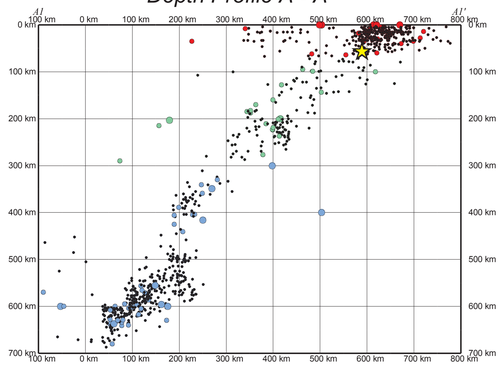
- 6.00 - 7.00
- 7.01 - 8.00
- 8.01 - 9.00

Volcanoes

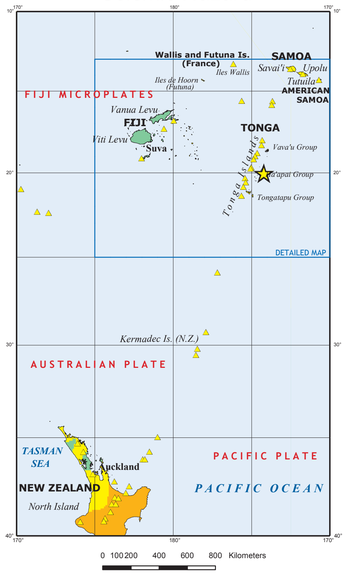
Seismicity 1900 - 2006



Depth Profile A - A'



Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec^2, expected to be exceeded in a 50-yr period with a probability of 10 percent.

EXPLANATION

Main Shock

3 May 2006

Seismic Hazard

- 0.8 - 1.6
- 1.6 - 3.2
- 3.2 - 4.3

Volcanoes

Tectonic Summary

The broad-scale tectonics of the earthquake region are dominated by the relative convergence of the Pacific and Australia plates. The Pacific plate subducts westward beneath the Australia plate at the Tonga trench. At the latitude of the earthquake, the Pacific plate moves westward with respect to the interior of the Australia plate at a velocity of about 77 mm/year. The eastern edge of the broad Australia plate may itself be viewed as a collection of small plates or microplates that move with respect to each other and with respect to the Pacific plate and the Australia plate interior.

In terms of numbers of earthquakes, the broad-scale Australia/Pacific plate boundary is one of the most active in the world. Earthquakes occur on the thrust-fault boundary between the Australia and Pacific plates, within the Pacific plate, and within and on the boundaries of the small plates that together compose the eastern edge of the overall Australia plate. On the basis of currently available information, we infer that the earthquake of May 3, 2006, occurred within the subducted Pacific plate beneath the overriding eastern edge of the Australia plate.

DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.

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DATA SOURCES

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- USGS, National Earthquake Information Center
- NOAA, National Geophysical Data Center
- IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villaseñor, 2002)
- HDF (unpublished earthquake catalog) (Engdahl, 2003)
- USGS (2003), National Seismic Hazard Maps
- Global Seismic Hazard Assessment Program (GSHAP, 1999)

PLATE TECTONICS
- PB2002 (Bird, 2003)

VOLCANOES
- Smithsonian Institution, Global Volcano Program

BASE MAP
- ESRI (1992), Digital Chart of the World
- GLOBE (1999)
- IOC, IHO, and BODC (2003)

Map prepared by U.S. Geological Survey
National Earthquake Information Center
4 May 2006
Map not approved for release by Director USGS