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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

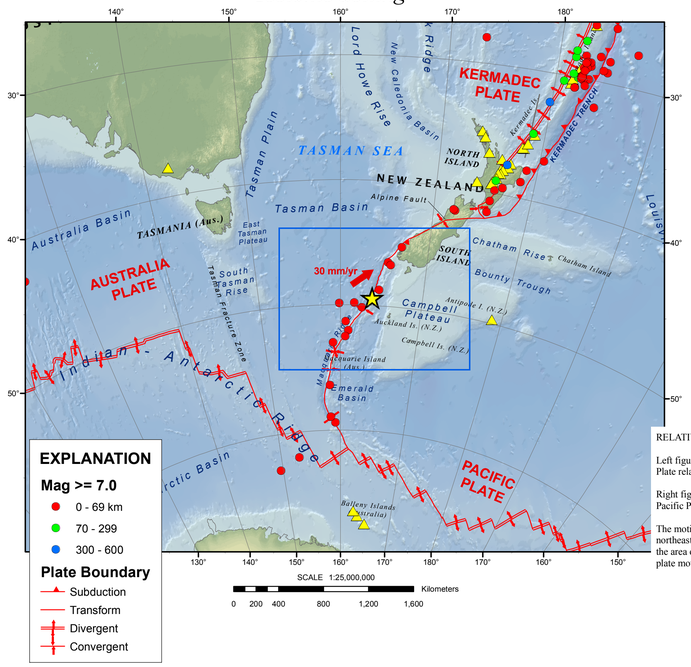
EARTHQUAKE SUMMARY MAP XXX

M7.4 Auckland Islands, New Zealand, Earthquake 30 September 2007

Prepared in cooperation with the Global Seismographic Network

GSN

Tectonic Setting



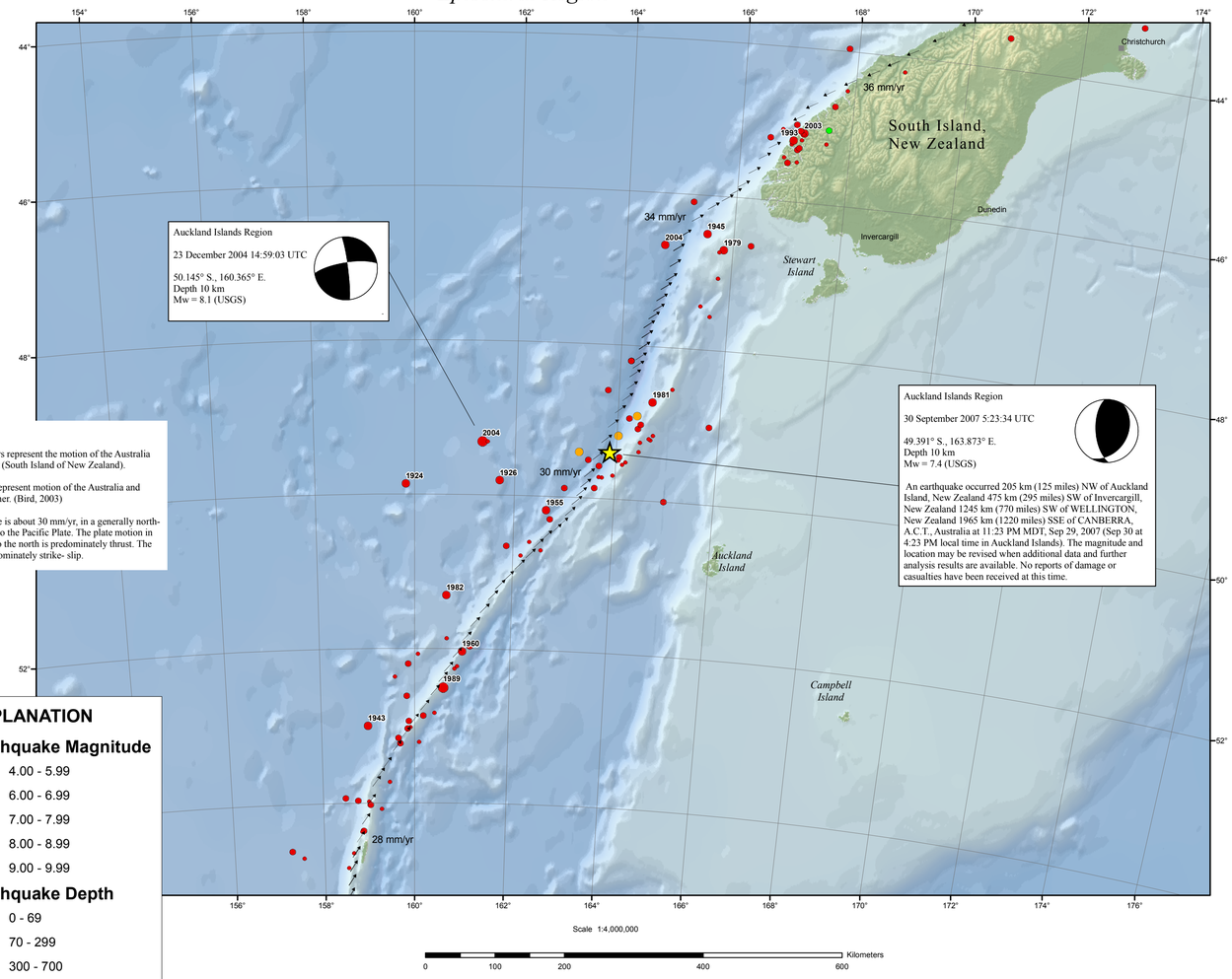
RELATIVE PLATE MOTIONS

Left figure: The broad red vectors represent the motion of the Australia Plate relative to the Pacific Plate (South Island of New Zealand).

Right figure: The black arrows represent motion of the Australia and Pacific Plates relative to each other. (Bird, 2003)

The motion of the Australia Plate is about 30 mm/yr, in a generally north-northeast direction with respect to the Pacific Plate. The plate motion in the area of this earthquake and to the north is predominately thrust. The plate motion to the south is predominately strike- slip.

Epicentral Region



EXPLANATION

Earthquake Magnitude

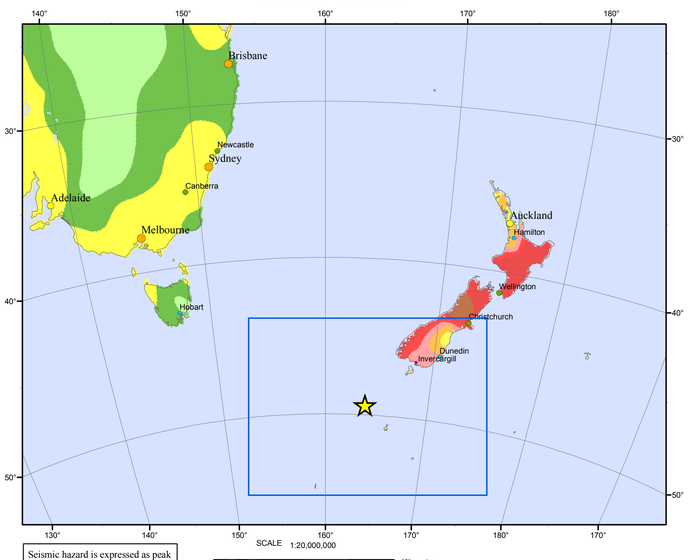
- 4.00 - 5.99
- 6.00 - 6.99
- 7.00 - 7.99
- 8.00 - 8.99
- 9.00 - 9.99

Earthquake Depth

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

Plate Motion Vector

Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

DISCUSSION

The magnitude 7.4 earthquake west of the Auckland Islands on September 30, 2007 indicates thrust faulting on the boundary between the Australian and Pacific Plates. The earthquake is located at the southeast end of the small Puysegur subduction zone where a segment of the Australian plate subducts to the NNE beneath the South Island of New Zealand (Pacific plate) at approximately 32 mm/yr. Its location is immediately north of the transition from dominantly strike-slip plate motions along the Macquarie Ridge to the south, to the subduction related thrusting to the north. This plate boundary transition is well delineated by numerous earthquakes of both thrust and strike-slip orientation, although this is the largest earthquake in the region since the magnitude 7.6 strike-slip event less than 100 km to the north in May 1981.

The Australia:Pacific plate boundary region west of the Auckland Islands has a history of large earthquakes both along the plate boundary proper and also west of the plate boundary internal to the Australian Plate. The September 30th event is approximately 200 km east of the magnitude 8.1 earthquake of December 2004, which occurred within the oceanic lithosphere of the Australian Plate, and about 450 km northeast of the magnitude 8.0 earthquake of May 1989 that occurred along the Macquarie Ridge plate boundary itself.

Significant Earthquakes Mag >= 7.0

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1924	07	24	0455	-49.862	159.824	35	7.0
1926	10	03	1938	-49.809	161.703	15	7.3
1943	09	06	0341	-53.000	159.000	0	7.6
1945	09	01	2244	-46.500	165.500	0	7.1
1955	01	05	0050	-50.180	162.647	25	7.1
1960	12	13	0736	-52.036	160.996	35	7.2
1979	10	12	1025	-46.695	165.826	5.9	7.3
1981	05	25	0525	-48.721	164.658	8.6	7.6
1982	07	07	1043	-51.307	160.653	4.4	7.2
1989	05	23	1054	-52.507	160.602	4.3	8.1
1993	08	10	0051	-45.207	166.958	28	7.0
2003	08	21	1212	-45.104	167.144	28	7.5
2004	11	22	2026	-46.676	164.721	10	7.1
2004	12	23	1459	-49.312	161.345	10	8.1

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.

REFERENCES

Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027- 80.

Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity: 1900 - 1999, chap. 41 of Lee, W.H.K., and others,eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academeic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Amer., v. 88, p. 722-743.

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
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)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Finite Fault Model, Chen Ji, UC Santa Barbara (2007)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

Map prepared by U.S. Geological Survey
National Earthquake Information Center
2007
Map not approved for release by Director USGS