

PRINCIPAL EARTHQUAKES IN NEW ZEALAND IN 1993

Warwick D. Smith¹

The largest earthquake in New Zealand in 25 years occurred in Fiordland on August 10. It had a magnitude of 7.1 (Ms), and was located near Doubtful Sound, just offshore and 20 km deep. The last earthquake to reach this magnitude in New Zealand was the Inangahua shock in May 1968.

Fiordland is a very active part of the country, where the Pacific Plate overrides the Australian Plate, the latter plunging very steeply in a south-easterly direction. This configuration is reversed in the North Island, where it is the Pacific Plate that plunges beneath the Australian Plate, towards the north-west.

Van Dissen, Cousins, Robinson and Reyners (1994) have described the strong motion data collected for this earthquake. In particular, the maximum PGA was 0.08g at Te Anau, and it exceeded 0.01g at six other sites. The earthquake was felt over most of the South Island, most strongly in Te Anau and Manapouri. It caused little damage, although there were a number of landslides in the epicentral area. Reports from Doubtful Sound indicate an intensity of MM VIII there. The nearest town of any size was Te Anau, 73 km away, and effects there were not severe.

The earthquake was followed by many thousands of aftershocks. Portable seismographs which were installed to record these in detail by augmenting the permanent network have yielded a wealth of data relevant to the process of earthquake occurrence in that part of the country.

The same evening there was an earthquake near Gisborne which did considerably more damage. Reports have been published by Read and Sritharan (1993), Chapman (1993), and Christensen (1993). It was of magnitude 6.4, so released less than 10% of the energy in the Fiordland shock. Its effects were also tempered by the fact that it occurred at a depth of about 70 km. Nevertheless, intensities reached MM VIII and there was considerable minor damage in the Gisborne area, particularly in Ormond which was close to the epicentre. Several chimneys were toppled. The maximum PGA recorded was 0.22g, in Gisborne. A number of cases of liquefaction were observed, notably near Ormond.

Portable seismographs were installed to record the aftershocks, which were relatively few because of the depth of the event: it is a well-established fact that deep earthquakes do not have large sequences of aftershocks.

One other earthquake reached magnitude 6 during the year: at Tikokino in southern Hawke's Bay on April 11 (magnitude 6.1, depth 35 km). The intensity near the epicentre was

similar to that in Gisborne (MM VIII), sufficient to bring down several chimneys. The maximum PGA recorded was 0.20g. This earthquake occurred just north of the Weber area which has been quite active in recent years (especially 1990) but seems not to be closely related to that sequence. The East Coast of the North Island is a very active area.

On May 10 an earthquake of magnitude 5.3 occurred near Otira. It was felt at modest intensities from Westport to Christchurch. A sequence of moderate earthquakes occurred midway between Christchurch and Kaikoura at the beginning of September. There was one of magnitude 5.0 on September 2, one of 5.2 on September 3, and many smaller shocks. They were felt quite sharply in Cheviot and the surrounding towns. This area is known for the magnitude 7.0 damaging shock in 1901.

Earthquakes near the Chatham Islands are rare, but one of magnitude 4.5 occurred there on 31 March. It was felt throughout the islands, dislodging some pictures and causing minor superficial damage.

Deep earthquakes are more prolific in New Zealand than shallow ones, and 1993 was no exception. The Western Bay of Plenty usually has a number between 200 and 300 km depth, and this year there were four exceeding magnitude 5.5: on January 3 (5.7), March 16 (5.8), August 3 (5.8) and October 1 (5.6). All were felt in Tauranga and the surrounding area. A number of other deep earthquakes exceeded magnitude 5.5 elsewhere in the deep earthquake zone that underlies the North Island. Southern Taranaki residents felt the magnitude 5.7 shock on March 19; it was centred 182 km deep beneath Waverley. But as expected, none of these caused any damage because they were so deep.

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¹ *Chief Seismologist, Institute of Geological and Nuclear Sciences, Wellington*