

PRINCIPAL NEW ZEALAND EARTHQUAKES IN 1987

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Any account of the principal earthquakes in New Zealand in 1987 must begin with the Edgcumbe earthquake of March 2. With a magnitude of 6.3, it caused extensive damage in the towns of Edgcumbe, Te Teko and Kawerau in the Bay of Plenty, and was felt as far afield as Hamilton, Taupo, Napier and Gisborne. There were also isolated reports of its being felt at greater distances. Intensities reached MMIX near the epicentre, making it the most severe earthquake in New Zealand since that at Inangahua in 1968. Apart from Inangahua, it was the most damaging earthquake since the 1942 Wairarapa shock which severely affected Masterton and Wellington. It should not be necessary to resort to statistical analysis to make the point that New Zealand has been let off rather lightly in the last 45 years.

A substantial reconnaissance report on the Edgcumbe earthquake has been published (Pender and Robertson, 1987), as has a preliminary scientific report (DSIR staff, 1987). There are plans to publish definitive studies of the earthquake within the next year. These studies will cover all scientific aspects of the earthquake: many papers from various Divisions of the DSIR and some from other organisations. There is therefore little point in giving details here, except to say that this is no doubt the best-studied New Zealand earthquake to date.

Because of the generally tensional nature of ground deformation in that part of the country, the earthquake opened up a rift 1 metre wide and 7 km long, snaking across the Rangitaiki Plains. There was slumping of up to 2 metres on the downthrown side.

Strong motion instruments at the Matahina Dam, some 23 km from the epicentre but rather closer to the nearest point of the main rift, recorded a peak acceleration comparable with the design level for the dam. This is the first time such records have been obtained in New Zealand.

The earthquake was preceded by a series of foreshocks in two locations: at the coast near Thornton and north-west of there, near Matata. A long series of aftershocks followed: more than 200 were felt, and four reached magnitude 5, which would be

expected after a mainshock exceeding 6.0. One foreshock also exceeded magnitude 5. This occurred only seven minutes before the main shock and was largely responsible for the evacuation of buildings which collapsed or were severely damaged in the main shock. There were in fact no casualties.

The month of March also brought the next most damaging earthquake of the year. It occurred in Pegasus Bay on March 9, and was of magnitude 5.4. It was felt strongly in Christchurch, only 50 km away. There is a report of cracked pavement at Brighton. A number of houses in North Canterbury suffered chimney damage and had items knocked off shelves. The earthquake was felt as far away as Greymouth and Wellington.

On March 15 an earthquake of magnitude 5.2 occurred inland from Westport, and was felt from Greymouth to Wellington. And on March 23 a deep earthquake of magnitude 6.0 occurred, just north of Te Puke. With a focal depth of 350 km, epicentral intensities were not high, but the shock was felt all the way south from the Bay of Plenty to Nelson and Marlborough.

A number of other earthquakes exceeded magnitude 5.0 during the year: none was felt particularly strongly or caused significant damage. On January 5 an earthquake of magnitude 5.2 occurred off the Wairarapa coast, 100 km east of Waipukurau. It was reported felt in Palmerston North. Another on July 4 was further south and further offshore; it was not reported felt. The area off the southern Wairarapa Coast experienced another on August 8, of magnitude 5.1; this one was felt slightly in Palmerston North. On June 23 an earthquake of magnitude 5.1 occurred near the Lewis Pass, where it brought goods off shelves. It was also felt in Christchurch and throughout North Canterbury. On October 27 there was an earthquake of magnitude 5.2 off the Marlborough Coast, felt most strongly at Ward.

The normal high seismicity to the north-east of the North Island continued with an earthquake of magnitude 5.7 in the Bay of Plenty on June 26, one of magnitude 5.0 off the Gisborne coast on June 28, one of magnitude 5.2 on July 6, 100 km north of East Cape, and another of magnitude 5.6 off East Cape on August 8. Only the second of

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these has been reported felt, very slightly in Gisborne.

Deep earthquakes are often felt, sometimes quite sharply and usually over a wide area. Such were those on May 4 of magnitude 5.0, centred near Wanganui but 240 km deep and reported felt in Wellington; on July 29 of magnitude 5.0 just north of D'Urville Island in Cook Strait and 150 km deep, felt in Wellington; on September 2 some 200 km north of Wanganui, of magnitude 5.6 and 150 to 200 km deep; on September 22 of magnitude 5 with epicentre near Havelock in the Marlborough Sounds and focus 107 km deep, felt sharply in Nelson, Blenheim and Wellington; another beneath the central North Island on November 6 which was felt in Taupo and south as far as Wellington.

Smaller earthquakes can be felt strongly or even do damage in the immediate vicinity of the epicentre, if they are shallow. An example is that on March 12 in the western Bay of Plenty, of magnitude 4.8, which was felt at intensity MM6 at Waihi. And even the magnitude 3.8 to 4 shock on September 30, 15 km north of Taupo, knocked goods off shelves at Wairakei. Many of the Edgecumbe earthquakes were in this category: very shallow (less than 10 km depth) and felt strongly in the immediate vicinity.

Two features of 1987 seismicity make the year somewhat unusual. The first is of course the Edgecumbe earthquake sequence. The second is the apparent lack of earthquakes over magnitude 5.0 in Fiordland. Only when the definitive solutions are available will it be clear whether or not this is a real phenomenon. The activity in the remainder of the country is entirely as expected: a broad band of shallow earthquakes and a more confined band of deeper earthquakes, the latter extending from Nelson/Marlborough north-eastwards through the central North Island and on towards the Kermadecs.

REFERENCES

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