THE MILFORD SOUND EARTHQUAKE OF 1976 MAY 4

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The Milford Sound earthquake of 1976 May 4 was the largest shallow earthquake in New Zealand since the Inangahua earthquake of 1968 May 23. The next previous shock of comparable size was on 1960 May 24 and also centred in Fiordland. All three shocks were assigned a magnitude (M_L) of 7.0.

Although the two earlier shocks were the subject of special field studies, it was decided on this occasion that a visit to the region and the establishment of temporary stations would not be justified, as the epicentre was off the coast, difficult terrain would have made access to suitable recording sites very difficult or perhaps totally impracticable, and there were few structures in the region that could be inspected for damage. The information collected in this note is therefore based upon the records of the permanent stations and the felt reporting system.

The usual formal details of phase-arrival times, epicentres and times of aftershocks, and summaries of the felt reports appear in the New Zealand Seismological Report for 1976 (now in the press). The principal elements of the main shock (Origin 76/381) are:

Origin Time : 1978 May $4^d13^h56^m30^s.1 \pm 0^s.6$ U.T.

($5^d01^h56^m30^s.1$ N.Z.M.T.)

Epicentre : $44^o.68S \pm 0^o.03$; $167^o.46E \pm 0^o.05$

Focal Depth : Solution restricted to 12 km.

Magnitude (M_L) : 7.0

The epicentre lies approximately 30 km west of the nearest recording station, at Milford Sound (MSZ). This distance and the fact that it lies outside the perimeter of the recording network limits the accuracy with which any depth less than about 30 km can be determined, and the computer was therefore constrained to produce a solution at the standard shallow depth of 12 km. The appearance of crustal phases in the records, the pattern of felt intensities, and the number of aftershocks makes an appreciably greater depth unlikely, though a shallower one would be possible. The standard errors of the formal solution should be interpreted as a measure of the fit of the data, and not as an estimate of the uncertainty in true position, which could be greater.

Figure 1 shows Modified Mercalli intensities based upon replies to standard questionnaires. The extent of the felt area, which covered the whole of the South Island south of a line from Westport to Banks Peninsula, is clearly limited by the fact that intensities below MM IV do not wake soundly-sleeping people. The shock was also felt on Stewart Island. The intensity of MM VI in the epicentral region should perhaps be regarded as a minimum, there being few structures or other objects that could serve as indicators of higher intensity to be found in the area. Landslides were observed on the steeper slopes, but these alone were not considered sufficient to justify a higher rating. Even allowing for some under-estimation there is little doubt that the reported intensities were some two degrees lower than might be expected for a shock of the same magnitude in the Main Seismic Region. Smith (1976) considers this phenomenon to be characteristic of earthquakes in Fiordland.

Aftershocks continued until at least the end of June, about 60 shocks above magnitude 4 occurring within the first month. The largest, of magnitude 5.4 (Origin 76/386), occurred at 14^h12^m U.T. on the same day as the main shock. This is almost half a magnitude smaller than might be expected, even bearing in mind that wide variations from the rough rule known as Båth's Law are not uncommon. A close search has not been made, but no significant foreshocks were reported.

In the absence of damage, the shock attracted little attention from the press, and the general public has remained unaware that a major earthquake occurred. Difficulty of access and the almost complete lack of permanent inhabitants are a continuing obstacle to the study of earthquakes in Fiordland.

REFERENCE

Smith, W. D., 1976: "Statistical Estimates of the Likelihood of Earthquake Shaking Throughout New Zealand", Bull. N.Z. Nat. Soc. Eq. Engng, Vol. 9, No. 4, 213-21.

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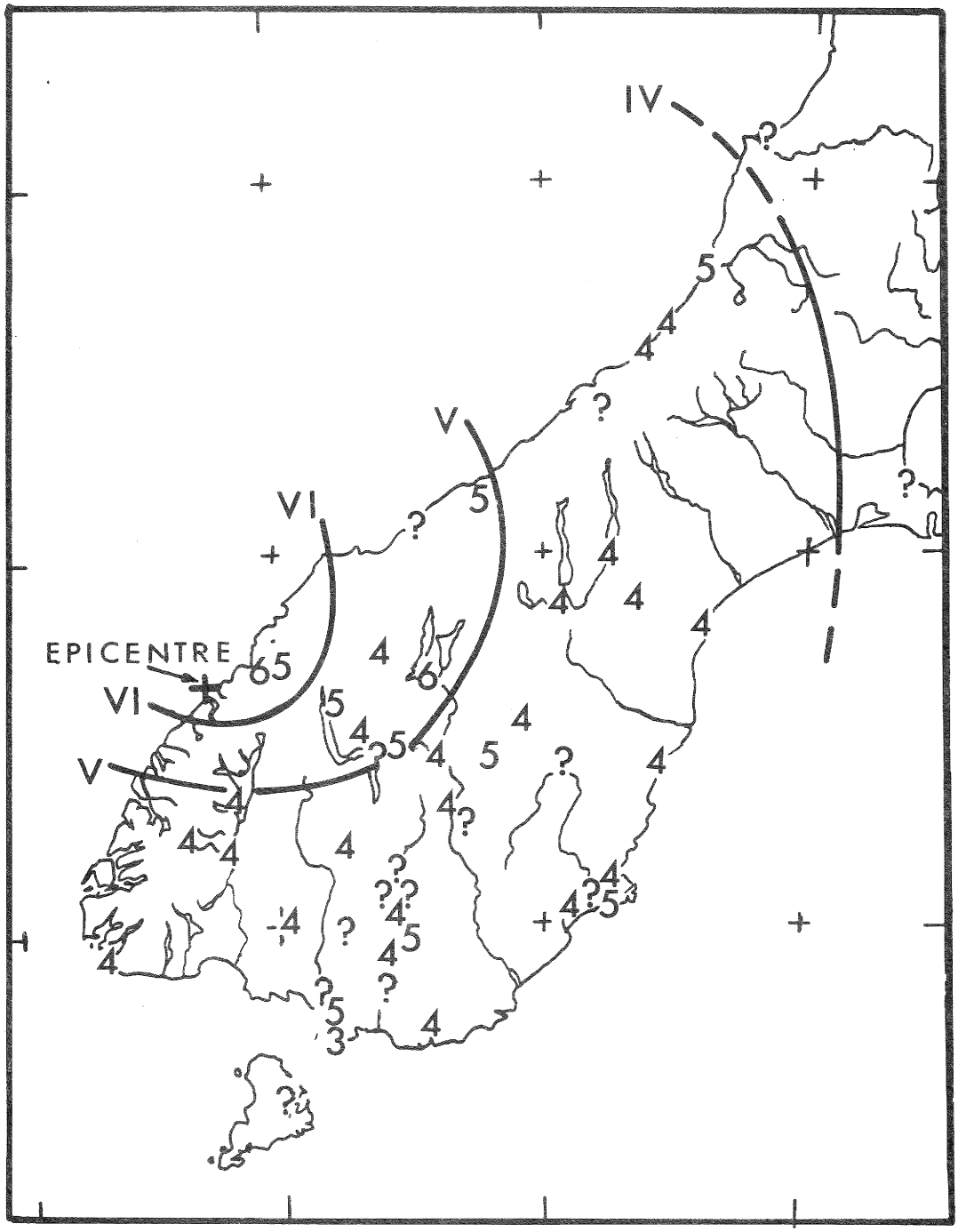

FIGURE 1: MODIFIED MERCALLI INTENSITIES FOR THE MILFORD SOUND EARTHQUAKE OF 1976 MAY 4. A ? INDICATES THAT THE SHOCK IS KNOWN TO HAVE BEEN FELT, BUT THAT INSUFFICIENT DETAILS ARE KNOWN TO YIELD A RELIABLE ESTIMATE OF INTENSITY.