LATE QUATERNARY TECTONIC DEFORMATION

The principal evidence of Late Quaternary deformation is provided by fault traces on Late Quaternary deposits or topographic features no older than Late Quaternary. These fault traces are shown in Figure 2, compiled by G. J. Lensen from published and unpublished data. To illustrate all that are known, the lengths of some short traces have been exaggerated diagrammatically.

The coverage of the country cannot be perfectly uniform from area to area; fault traces can be easily seen in open country but not in bush country; not all the country is covered by aerial photographs, nor has every photograph been examined. The four-mile mapping programme of the N.Z. Geological Survey has, however, now largely covered the country, and field work and air photograph study have been an essential part of this programme. It is confidently believed that the relative densities of fault traces from region to region will not be significantly changed by further work.

There are two main groups of fault traces. The first covers the central volcanic district and extends south-west to include the set of traces in the Wanganui region. The second group comprises the major transcurrent faults (faults with dominantly horizontal movement) and a great number of minor traces. The greatest of the transcurrent faults is the Alpine Fault, which is active at points along its full length from the Wairau River to Milford Sound and probably further south-westwards just off the Fiordland coast.

The first group differs from the second in that the faulting is dominantly tensional instead of dominantly transcurrent. The tectonic setting of this group is one of tension and volcanic activity; that of the second is one of horizontal shear. Both groups, in different tectonic settings, are adjacent, and show that even a country as small as New Zealand cannot be regarded as a single entity from a tectonic—and hence seismic—point of view.

One consequence of the contrast in tectonic settings is that surface displacement can occur with lower magnitude earthquakes in the tensional region. Thus surface faulting accompanied the Taupo (1922) earthquake of magnitude less than 6, while in the shear region surface faulting is not known to have occurred during earthquakes of magnitudes less than 7. [Magnitude (M), which indicates the amount of energy released at the focus of an earthquake, is distinct from the felt intensity at any particular place, which is measured on the Modified Mercalli (MM) scale.]

In the South Island, comparatively few Late Quaternary fault traces are known north-west of the Alpine Fault, but warping and tilting of Late Quaternary surfaces indicate that several of the major folded structures of north Westland and southern Nelson are active. Although no traces are known from the Grey River to the Cascade River in Westland, elevated marine shorelines show that this part of the region west of the Alpine Fault is also unstable. South and east of the Alpine and Hope faults over 90 per cent of the fault traces lie within 80 miles of these faults. South-east of this 80-mile belt only the trace on the Akatore Fault, south-west of Dunedin, is definitely Recent. Other traces in South Canterbury and North Otago are late Quaternary in age but not Recent.

In the North Island, north-west of the central volcanic district, only a few traces are known, the furthest north-west being those at Bombay, south of Auckland (Schofield, 1958) which are almost certainly associated with local volcanic activity. In the lower Mokau River two parallel traces are the only Recent ones known west of the central volcanic district.