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The Alpine Fault*

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Abstract

INFORMATION on the Alpine Fault, scattered through a great deal of literature, is reviewed. The fault, which is steeply dipping, is continuous from Cook Strait to Milford Sound, and extends south-west off the Fiordland coast. It is presumed to pass through the North Island, the most probable line being north from Feilding, passing between the Rimutaka Mountains and the Kaweka Range, and thence to the coast west of Whakatane. The 300-mile horizontal shift was largely completed in the Rangitata Orogeny (late Jurassic and early Cretaceous). During the Kaikoura Orogeny (late Tertiary and Quaternary), vertical uplift in the South Island may have amounted to at least 60,000 feet in central Westland, where the amount of horizontal movement seems to have been about the same.

INTRODUCTION

It is now over 50 years since Morgan (1908), referring to the Wanganui River area of South Westland, wrote: "The coincidence of thrust or slip of the Paleozoic rocks over modern alluvia in two spots not far apart on the line of the fault furnishes food for thought". The offering was small, and as no more was forthcoming, almost a whole generation of geologists discussed the structure of New Zealand with only a passing reference to what Morgan had called "a great fault". Perhaps if Morgan had named it—he referred only to the "Gregory Valley" developed along it—perhaps too if he had made a bolder distinction between the rocks of the two sides, others would have paid more heed. Attention was directed more to other major faults—Hope and Awatere, Wellington and Wairarapa—because of historic displacements at times of destructive earthquakes. There was little to bring the Alpine Fault to the attention of most New Zealand geologists, preoccupied with problems in more populated regions.

In 1929 Henderson, in discussing the importance of faulting in the structural development of New Zealand, judged the western face of the Southern Alps to result from the vertical rising of the arcuate fronts of a series of rotating blocks, showing four major arcs (Fig. 1A). These arcs are clearly illustrative of the type of fracture he thought probable from his concepts of the mechanics of earth movements, for the Fault Map of New Zealand (Henderson, 1928), based more

* This paper is slightly expanded from the Presidential Address to the Geological Society of New Zealand, August, 1962; subsequently Mackie (1962) summarised much of the information on the Alpine Fault published up to early 1959, particularly that relating to young displacements.