

New Zealand's Long Term Tide Gauge Record and the Effect of Seismically Induced Vertical Land Motion

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SUMMARY

New Zealand's tide gauge record extends back over 100 years and is one of the oldest records in the Southern Hemisphere. The record therefore makes an important contribution to global sea level change studies. Tide gauge measurements record Relative Sea Level (RSL), which is the change between sea level and the land. Any local and/or regional vertical land motion (VLM) will affect the tide gauge and is therefore included in the tide gauge record. By measuring VLM at a tide gauge site we are able to determine true sea level changes. Typically VLM can be caused by gas/oil/water extraction, glacial isostatic adjustment or tectonic activity, which is thought to predominate in most locations in New Zealand.

In 2000, a combined Otago University and GNS Science project established continuous GPS (cGPS) at four of New Zealand's long record tide gauges, namely Auckland, Wellington, Lyttelton and Dunedin, with the specific objective of measuring the VLM at each site. The rate of VLM at these four sites, as well as regional trends determined from nearby cGPS sites, has been determined using up to 20 years of cGPS data. However, the earthquake events in Christchurch and Fiordland as well as ongoing East Coast slow slip events (SSE) in the Wellington region have had a major impact on the vertical component. As a result, determining VLM has required the development of tools to model and correct for these transient effects.

In addition to the analysis of VLM at tide gauge sites, this project provides an updated estimate of the long-term RSL change at four tide gauges in New Zealand using data through to 2013 - an additional 13 years compared to the previous study. Data from a fifth New Zealand tide gauge (New Plymouth) has now been analysed and is also included.

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