



Figure 2-7: Explanation of vertical land motion rates. [Source: Beaven & Litchfield (2012)].

Continuous GPS (cGPS) sensors are operated by Geonet¹¹ at Westport, Hokitika and Karangarua and can be used to observe the different components of land motion such as uplift/subsidence, (Figure 2-7). Beaven and Litchfield (2012) determined local VLM rates on the West Coast from three continuous GPS gauges located near to the coast (Table 2-6). In 2012, these gauges showed slow subsidence (-0.8 mm/year over 8 years of data) at Westport and slower uplift (+0.3 mm over 10.5 years) at both Hokitika and Karangarua.

Table 2-6: Vertical land motion rates on the West Coast. Rates reported by Beaven & Litchfield (2012) and reanalysed for this study with simple least-squares linear trend from the start of the cGPS data to the end date before active seismic activity.

Name	Location	Easting	Northing	cGPS Start date	VLM (Beaven & Litchfield, 2012) mm/year	End date of linear trend (this study)	VLM (this study) mm/year
WEST	Westport	-41.7447	171.8062	01/01/2000	-0.8	1/10/2016	-1.47
HOKI	Hokitika	-42.7129	170.9843	23/09/2004	0.3	13/11/2016	0.16
QUAR	Karangarua	-43.5317	169.8158	05/02/2000	0.3	1/04/2015	0.25

Producing updated national estimates of past and future VLM is an active research task being undertaken by NZSeaRise¹². However, until NZseaRISE produces¹³ local VLM estimates, a linear trend estimation is appropriate to infer trends and has been used elsewhere for district plan assessments (e.g., for Wellington City Council in Bell & Allis, 2021).

Here we have estimated the background trend in the VLM from the beginning of the cGPS record through to a nominated end date (Table 2-6) which corresponds with a shift to active vertical land motion from (e.g., 14 Nov 2016 Kaikoura earthquake for HOKI) which is at the beginning of a recent period of seismic fluctuations (Figure 2-8). This is different from the rate of suggested in Figure 2-7 but for the relatively short record (relative to the seismic cycle) this provides a conservative rate.

¹¹ <https://www.geonet.org.nz/data/types/geodetic>

¹² <https://www.searise.nz/>

¹³ Publication of the NZ SeaRise local projections of relative SLR projections is expected in early 2022.