A TIME DEPENDENT INVERSION OF ONSHORE GEODETIC DATA FOR THE 2019 HIKURANGI SUBDUCTION ZONE SLOW SLIP EVENT

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Slow slip events (SSEs) have been documented at several regions of the Hikurangi subduction margin, New Zealand, over the last fifteen years. Short, shallow (< 15 km depth) SSEs recurring every one to two years have occurred off the east coast of North Island near Gisborne and Hawkes Bay. Longer duration SSEs with a recurrence period of approximately five years have been observed in central and southern North Island (the Manawatu and Kapiti regions), where the Hikurangi interface is at a depth of 40-70 km. We are currently undertaking seafloor geodetic deployments to better resolve the distribution of shallow slow slip events and seismicity at the offshore Hikurangi subduction zone. Over the last year, we have deployed 24 Absolute Pressure Gauges, 8 Ocean Bottom Seismometers, and two GPS-Acoustic arrays.

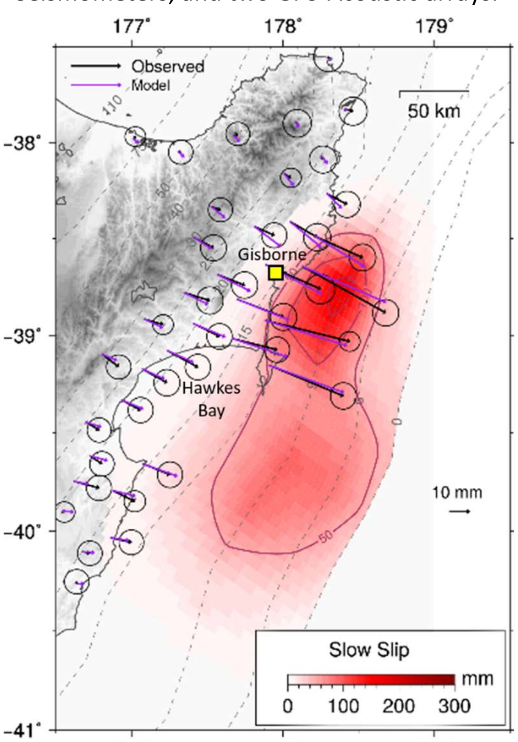

Figure. Modelled displacement of the 2019 east coast SSE shown in red, reaching a maximum of over 150 mm of slip. The black and purple vectors respectively show the observed and model horizontal displacements at the onshore GNSS stations.

The GeoNet continuous GNSS network detected a large SSE off the east coast of the North Island between mid-March and mid-May 2019, directly beneath our seafloor geodetic and ocean bottom seismic array. Data from the array will be recovered using the R/V Tangaroa in November of 2019. Using the absolute pressure gauge data, we hope to resolve cm-level vertical movement of the seafloor above the region of slow slip. To resolve the along-strike extent of the offshore slip and its temporal evolution, we use the time-dependent inversion software TDefnode to invert onshore GeoNet GNSS time series and Interferometric Synthetic Aperture Radar (InSAR) data. After the seafloor geodetic data are recovered later this year, we will incorporate these data into our inversions. Seismic swarms were observed during the slow slip event (with magnitudes up to 5.1), and our inversions reveal intriguing relationships between the seismicity and the slow slip evolution. We also hope that the improved resolution of offshore slip from the seafloor geodetic data will reveal insights into the relationship between slow slip offshore Hawkes Bay and the inferred location of past earthquake ruptures offshore Hawkes Bay determined from paleoseismic investigations.