Taranaki's unusual earthquakes

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New research from Victoria University of Wellington suggests a cluster of deep earthquakes beneath Taranaki may provide a vital clue to understanding how New Zealand's landmass was created.

The study, published in the United States journal *Geology*, investigated the "unusual" earthquakes that occur beneath the line that runs between the volcanoes of Mount Taranaki and Mount Ruapehu.

"The earthquakes are unusual for several reasons," explains lead author and Victoria researcher Jesse Dimech.

"They are up to 52 kilometres deep, compared to most earthquakes in regular continental regions which are restricted to the top 20 kilometres—and they also lie in the Earth's mantle, beneath the crust, defining an east-west boundary, or structure, which is in contrast to the strong northeast-southwest grain for most geological structures in New Zealand."

Professor Tim Stern, co-author of the paper and Mr Dimech's PhD supervisor, says while the earthquakes are all less than magnitude five and don't represent a significant hazard, they help to explain the rapid rise and fall of the mountain ranges of the western North Island in the last five million years.

"Geologists have long puzzled over the fact that much of central and western North Island rose above sea-level in the last few million years, whereas south of Whanganui a once high-standing mountain range now

lies underwater.

"The earthquakes are indicators of a geophysical process beneath Taranaki that is fundamental to how continental regions like New Zealand evolve and change through time.

"We know that the tectonic plates have a deeper layer of mantle rock which is actually denser than the overlying crust. We think the deep earthquakes beneath Taranaki are being triggered as this dense mantle layer peels off, and sinks into the hotter and less dense regions below.

"This process creates both uplift and subsidence at the earth's surface, as well as causing a specific type of volcanism that has been linked to zones of rich mineralisation—for example, gold and copper—elsewhere in the world."

The authors argue that the 'peeling off' process in the mantle may have been responsible for the uplift of the western and central North Island up five million years ago, from a few kilometres below sea level to average elevations of approximately 500 metres above sea-level today.

More information: Jesse-Lee Dimech et al. Mantle earthquakes, crustal structure, and gravitational instability beneath western North Island, New Zealand, *Geology* (2017). DOI: 10.1130/G38476.1

Provided by Victoria University