

Geophysical changes and hydrothermal activity at the early stage of the White Island 2012 unrest episode

Lauriane Chardot¹, Bruce W. Christenson², Micol Todesco³, Tony Hurst⁴, Nicolas Fournier⁵

¹Dept. Geol. Sci., University of Canterbury, Private Bag 4800, Christchurch, New Zealand, ²National Isotope Centre, GNS Science, Private Bag 31-312, Lower Hutt, New Zealand, ³INGV Sezione di Bologna, via D. Creti 12 40128 Bologna, Italy, ⁴GNS Science, PO Box 30368, Lower Hutt 5040, New Zealand, ⁵GNS Science, Wairakei Research Centre, Private Bag 2000, Taupo, New Zealand

E-mail: l.chardot@gns.cri.nz

White Island volcano, one of the most active volcanoes in New Zealand, is experiencing an elevated level of unrest at the time of writing, after more than 10 years of relatively low hydrothermal activity. Some sustained periods of volcanic tremor started in June 2012, later accompanied by fluctuations of the crater lake level in July and minor eruptions from August. A small lava dome was first observed in November within the crater and the activity extended to the remnant crater lake location where currently, venting occasionally occurs. This activity is accompanied by rapid variations in the level of volcanic tremor.

The volcano hydrothermal system has most likely been disturbed by this new magmatic activity, potentially before the magma even reached the surface. It is then of paramount importance to better understand the hydrothermal system fingerprint in the early signals of volcanic unrest to better detect future activity at the volcano.

We present results from three magnetic and gravity surveys acquired prior to this unrest episode, between May 2011 and June 2012. Data were collected at the volcano crater floor on 67 magnetic pegs and 10 gravity tiles. We then compare these results with other monitoring datasets and present some preliminary results from numerical modelling (e.g. TOUGH2) in order to assess potential relationships between recorded geophysical signals and the magmatic-hydrothermal processes.