Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02957, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02957
EGU General Assembly 2008

Multidisciplinary monitoring of the 25 September 2007 phreatic eruption at Mount Ruapehu, New Zealand

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Mt. Ruapehu erupted on 25 September 2007 at 8.26 pm NZDT generating a moderate steam column to about 15,000 feet, and a directed ballistic and surge deposit of coarse blocks and ash to the north of the Crater Lake. It also initiated lahars in the Whangaehu River to the south-east and the Whakapapa ski field catchment to the north. The explosion was witnessed by two climbers bivouacked in a summit shelter, one of whom was seriously injured by a volcanic block and required evacuation from the summit. A ski field groomer narrowly avoided the Whakapapa ski field lahar. Subsequent impacts of the eruption included the temporary evacuation of some ski field lodges and the temporary closure of the ski fields in the immediate aftermath of the event. The eruption was similar to the 1969, 1975 and 1988 eruptions. Seismicity for the main eruption lasted for about 4 minutes and included an explosive phase which lasted for less than 1 minute and a post-explosion phase which probably indicated resonance in the conduit, and signals generated from lahars and vent stabilisation. Following the eruption, there was an increase in the level of volcanic tremor, which declined to near background levels within 24 hours. Subsequent seismicity featured intermittent bursts of tremor for several days.

Post-eruption monitoring by *GeoNet* focused on collection of evidence to decide whether there was new magmatic activity. Visual observations conducted on 26-28 September revealed a ballistic apron extending northward as far as $\sim$2000 meters from the Crater Lake. The ballistics comprised various rock types, from old andesitic lava flows, a variety of tephra, and vent-fill debris. A number of sulphur–bearing rocks contained molten sulphur textures, indicating vent temperatures at the base of the lake in excess of 119°C. Other ballistics contained mineral cements which indicated hy-

drothermal sealing of the vent prior to the eruption. Highly mobile snow slurry lahars reached to ca. 3 km in Whakapapa catchment and beyond the *TranzRail* gauge (28 km distant) in the Whangaehu River. Observation of the Crater Lake revealed that the northern vent was vigorously discharging gas, with strong sulphur slick formation, and white frothy, gas-rich patches at the surface. Prior to the eruption (on 8 September) the lake temperature was 13˚C, increasing to 19˚C on 28 September and 37˚C by mid December. The lake level had dropped by 1-2 m as a result of the eruption, but has subsequently risen to overflow (a rise of ca. 2-3 m). Post eruption gas-geochemical values of CO_2 and SO_2 were slightly increased for a few weeks after the event, but had decreased to normal levels by November. Based on these results, the *GeoNet* team concluded that the eruption was hydrothermal in nature with no magmatic influence.