Geophysical Research Abstracts, Vol. 8, 10211, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10211

A remnant summit lava dome and its influence on future eruptive hazards

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The location of an inactive, partially collapsed dome over the main stable conduit of the andesitic, Egmont Volcano (Mt. Taranaki) may have a strong bearing on the type of eruptions that could occur in the future. Dome formation has occurred at least ten times in the last 800 years. Associated explosions, over-pressurisation of the conduit and marginal dome collapse has generated a number of block-and-ash flows (BAF's) with the most recent being in 1755AD.. Seven individual BAF's have been identified with the largest of these units travelling at least 15 km from source. All BAF's of this period were confined by a breached crater wall to the NW-W sector of the edifice.

The current remnant dome has been mapped using GPS, and aerial photographs. Based on the crater and dome geomorphology the vent area can be pin pointed near a break in slope within the centre of the current crater configuration. The extrusion of viscous andesitic magma at this point during past events appears to have started on a flat crater floor, but with progressive extrusion and dome growth, lava spilled onto the upper flanks of the volcano (with slopes of around 30˚). Using GIS and a 20m resolution DEM the remnant dome ($1.5x10^6m^3$) was extracted and extrapolated to re-create the original dome ($5.9x10^6m^3$) to best fit a parabolic dome with an elliptical base, centred on the identified vent.

If future eruptions are centred in the same general vent area any dome extruded will be extremely unstable. However, the expected BAF's and the potential hazards posed by this scenario should be easily constrained by mass-flow modelling approaches.

The Titan2D program, (developed by the GMFG at SUNY Buffalo), is a "shallow water", continuum solution-based, granular-flow model. The program is adapted by the user for various flow mechanical properties by changing values for internal and basal friction as well as the dimensions of the initial pile. Before this model can be applied to the recent Taranaki BAFs, we must evaluate the input parameters. The initial collapse volume is well constrained. Internal and basal friction angles were evaluated through an iterative approach by broadly comparing modelled flow inundations with most recent mapped BAF deposit boundaries. A range of possible input parameters were determined to produce a suite of potentially inundated areas under present-day terrain. This suite of forecasts from a uniformly distributed range was then analysed statistically in a GIS to determine an overall map displaying relative probabilities of inundation by a future event of the same magnitude as previously observed.