

Polarimetric C-band radar imagery of a volcanic eruption in New Zealand

John Crouch

Meteorological Service of New Zealand (MetService), New Zealand

E-mail: john.crouch@metservice.com

At 11:52:18 UTC (11:52 pm NZST) on 6 August 2012, Mount Tongariro, located in the central North Island of New Zealand, erupted after three weeks of increased seismic and fumarolic activity. The eruption was short-lived, but produced an ash cloud up to about 8 km amsl, and deposited ash onto the surrounding area, especially east of the volcano.

The eruption was observed by three Meteorological Service of New Zealand (MetService) C-band weather radars, two of which are Vaisala WRM200 dual-polarisation doppler radars. This was the first time operational weather radar had observed a volcanic eruption in New Zealand, and it is believed to be one of only a small number of eruptions observed by polarimetric radar worldwide.

This talk will present polarimetric radar imagery of both the eruption and the subsequent ash transport downwind from the volcano. The imagery was recorded by a C-band dual-polarisation radar located approximately 120 km northeast of the volcano. The radar detected ash in the lowest radar beam (2.5 km amsl) for about 40 minutes after the eruption and at higher altitudes (4-6 km amsl) for 90 minutes. A comparison with sampled ash deposits showed the radar was likely detecting ash particles down to about 0.5 mm diameter.

The correlation coefficient and differential reflectivity fields recorded by the radar provided extra information about the structure and composition of both the eruption column and the ash cloud. The correlation coefficient easily discriminated between the eruption column and the ash plume, and provided some information about the diversity of ash particle size within both the ash plume and the subsequent detached ash cloud drifting downwind. The differential reflectivity showed that the larger ash particles were falling with a horizontal orientation, and also indicated that ice nucleation and aggregation of fine ash particles was probably occurring at high altitudes within 20-25 minutes of the eruption.