Geophysical Research Abstracts
Vol. 12, EGU2010-13439, 2010
EGU General Assembly 2010

High resolution measurements of aerial rainfall with X-band radars in New Zealand

Luke Sutherland-Stacey, Paul Shucksmith, and Geoff Austin
Physics Department, University of Auckland, Auckland, New Zealand, (radar@auckland.ac.nz / +64 9 373 7445)

The Atmospheric Physics Group runs a number of high resolution X-band mobile rain radars. The radars are unusual in that they operate at very high spatial and temporal resolution but short range (100m/20sec/20km) as compared with the C-band radars of the New Zealand Meteorological Service (2km/7min/240km). Portability was a key design criterion for the radars, which can either be towed by a personal four wheel drive vehicle or carted by a container truck. Past deployments include the slopes of an erupting volcano, the path of a tropical storm and overwintering in a mountain range.

It is well known that sampling and representativeness problems associated with sparse gauge networks and C-band radars can result in high uncertainty in estimates of aerial rainfall. Some of this error is associated with poor sampling of the spatial and temporal scales which are important to precipitation processes. In the case of long range radar, the beam height increase with range also introduces uncertainty when trying to infer precipitation at the ground, even after reflectivity profile correction methods are applied.

This paper describes a recently completed field campaign in a hydro power catchment in the North Island of New Zealand. The radar was deployed in a pasture on a farm overlooking the catchment which is about 15km x 10km in size. The catchment is about 150km from the nearest national C-band radar. A number of rain gauges, including high resolution drop counters, were deployed nearby. X-band and comparative C-band radar observations of particular events including orographically initiated convection, frontal systems and widespread rain types are presented. The convective events are characterised by short length scales and rapid evolution, but even the widespread rain has embedded structure.

The observations indicate that the evolution time and spatial scales associated with many of the hydrometeors observed in this work precludes aerial estimates being made with sparse gauge networks. Due to the relatively long range and lower spatial and temporal resolution the C-band images contained less information than X-band scans of the same hydrometeors. On the other hand, per event statistics indicate that the majority of variance in rain gauge measurements can be explained from the co-located X-band radar pixel. Quantitative retrieval of accumulation was possible out to about 15km range after applying range and bias correction.