



Does Ice Matter? Heavy Rainfall from Warm and Mixed-phase Convection in COPE

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The CONvective Precipitation E experiment (COPE), which took place over the southwestern peninsula of the UK in Summer 2013, was motivated by a number of convective storms that produced flash flooding, chief among them the Boscastle flood event of 2004. Cloud tops during the Boscastle flood reached temperatures of -15 to -20 °C. Coupled with possible seeding from aloft, it was reasonable to presume that ice processes played an important role in precipitation formation.

Some heavy precipitation events were sampled by the suite of ground-based and airborne instruments assembled for COPE, despite the unusually warm and dry weather in the UK at that time. Convective cells during several of these events had tops below the freezing level, or not far above where no ice was observed by the aircraft. Impressively, heavy rainfall was observed at the ground-based X-band radar with reflectivities frequently exceedeeding +60 dBZ.

Here we use new in situ observations from the University of Wyoming King Air and the Wyoming Cloud Radar to corroborate reflectivity from the ground-based X-band radar. These observations, along with atmospheric soundings and calculations from a 1D warm rain model, are also utilized to understand the dynamic, thermodynamic and microphysical structure of these heavily precipitating convective cells.

These observations lead us to question the prevalent assumption that ice processes are critical to the production of heavy convective precipitation.