European Conference on Severe Storms 2015
14–18 September 2015, Wiener Neustadt, Austria
ECSS2015-163-1

Microphysical Pathways to Heavy Convective Rainfall

Sonia Lasher-Trapp (1), Alan Blyth (2), Jeff French (3), and David Leon (3)

(1) Department of Atmospheric Sciences, University of Illinois, Urbana, IL, United States (slasher@illinois.edu), (2) National Centre for Atmospheric Science, School of Earth and Environment, University of Leeds, Leeds, UK (Alan.Blyth@ncas.ac.uk), (3) Department of Atmospheric Science, University of Wyoming, Laramie, WY, United States (jfrench@uwyo.edu, Leon@uwyo.edu)

The peninsula of Southwestern England is well suited to the development of persistent lines of convection in the summertime, mostly likely resulting from the merging of sea breeze fronts from the north and south within the prevailing synoptic-scale southwesterly winds. When the lines are slow-moving or nearly stationary, and/or cells continue to develop and/or move along the line, flash flooding can result, such as the Boscastle flood of 2004. Interestingly, in a region of the world famous for its cool weather coupled with frequent drizzle, the rainrates from the Boscastle event sometimes exceeded 300 mm/hr.

Such events in Southwest England motivated the COnvective Precipitation Experiment (COPE), conducted in July-August 2013, to document the dynamical and microphysical evolution of these convective clouds, and provide cases for improving quantitative precipitation forecasting of heavy convective rainfall. Multiple cases of convective lines were studied with aircraft, radars (airborne and ground-based) as well as a wind profiler, ground-based aerosol system, and frequent soundings.

Some storms sampled during COPE produced up to 60 dBZ radar echoes with maximum storm top heights of 4 to 7 km MSL. The in situ microphysical data suggest a variety of “microphysical pathways” in which significant rainfall can be produced in these storms, with a variable importance of the warm rain process relative to ice processes. Here we present COPE observations and accompanying numerical simulations of some of the cases, to examine the microphysical variability producing convective rainfall, and potential reasons for that variability.