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Organization and Environmental Properties of Extreme-Rain-Producing Mesoscale Convective Systems

by

Russ Schumacher

Department of Atmospheric Science
Colorado State University

Wednesday, 5 January 2005
Foothills Lab, Building 2, Auditorium, Room 1022, 3:30 p.m.

This study examines the radar-indicated structures and other features of extreme rain events in the United States over a three-year period. A rainfall event is defined as "extreme" when the 24-h precipitation total at one or more stations surpasses the 50-yr recurrence interval for that location. This definition yields 116 such cases from 1999 to 2001 in the area east of the Rocky Mountains, excluding Florida. Two-km national composite radar reflectivity data are then used to examine the structure and evolution of each extreme rain event. Sixty-five percent of the total number of events are associated with mesoscale convective systems (MCSs). While a wide variety of organizational structures (as indicated by radar reflectivity data) are seen among the MCS cases, two patterns of organization are observed most frequently. The first type has a line, often oriented east-west, with "training" convective elements. It also has a region of adjoining stratiform rain that is displaced to the north of the line. The second type has a backbuilding or quasi-stationary area of convection that produces a region of stratiform rain downstream. Surface observations and composite analysis of RUC--2 model data reveal that training line/adjoining stratiform (TL/AS) systems typically form in a very moist, unstable environment on the cool side of a pre-existing slow-moving surface boundary. On the other hand, backbuilding/quasi-stationary (BB) MCSs are more dependent on mesoscale and storm-scale processes, particularly lifting provided by storm-generated cold pools, than on pre-existing synoptic boundaries.