

# *The RAP Seminar Series*



## NCAR

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### **Effects of Surface Heterogeneity on the Evolution of PBL and Precipitation**

by

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*Foothills Lab, Building 2, Room 1001*  
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Surface heterogeneities in terrain, soil moisture, and albedo modify thermodynamic structures of the boundary layer, which in turn affect the formation of clouds and precipitation. Two examples are used here to illustrate the complex interactions among surface processes, convection initiation, and precipitation. The first example concerns a convective rainfall event that produced the catastrophic 12 July 1996 Buffalo Creek flash flood in the Front Range of the Rockies Mountains. A wildfire, which devastated the Buffalo Creek area two months earlier, modified hydrophobic soil properties of the burn area, which increased the runoff/rainfall ratio. Equally important, this burn area (~50 km<sup>2</sup>) appeared, through generating small-scale surface differential heating, to influence the path of the major convective event. The second example concerns deep convection associated with the 19 June 1998 dryline from west Texas into central Oklahoma. Several scales of motions and two different mechanisms are likely to be responsible for initiating convection along the dryline. Roll-like circulations at a large-scale (100-200 km) enhanced mid-afternoon PBL growth and appeared to be the primary agent in directly initiating the deep convection in Texas. On the other hand, the solenoidal mesoscale circulation, forced by both antecedent surface cooling along the sloping terrain behind the dryline and high soil moisture content ahead of the dryline, play a critical role in the Oklahoma portion of convection. These findings invite a general expectation that forecast of this type of convection can be successful so long as we properly treat the surface physics and capture the landscape variability at fine scales. Examples that used IHOP-2002 aircraft, S-Pol radar, and surface/soil observations to explore relationship between the evolution of the PBL and fine scale heterogeneities in soil moisture and vegetation will be briefly discussed.