

Penn State University

Dr. Kelly Lombardo, an Associate Professor at The Pennsylvania State University: My group explores the role of atmospheric heterogeneities induced by land-sea boundaries and coastal mountain chains on mesoscale convective systems (MCSs) using cloud-resolving and mesoscale numerical models. MCSs and their associated hazards evolve in a variety of ways as they move over coastal regions, with storm response dependent on the base-state atmospheric conditions, characteristics of the marine atmospheric boundary layer (MABL) air and storm cold pool (i.e., buoyancy, depth), as well as characteristics of the coastal terrain (i.e., height, slope). We have uncovered complex, and at times counterintuitive results: the intensification of storms as they encounter and move over very cold, deep MABLs, the discrete propagation of storms under a subset of ambient conditions through several different physical mechanisms, large differences in storm evolution as they move over flat coastal land versus coastal mountains under the same base-state conditions. Our next step and natural extension of this work is to combine observations with numerical modeling experiments to validate the results from our prior work, reveal the underlying physical processes not captured in our explored parameter space, quantify the true observed heterogeneities experienced by coastal storms, and quantify storm response to these observed, and likely highly variable, atmospheric perturbations.

Dr. Paul Markowski has been on the faculty of the Department of Meteorology and Atmospheric Science at Penn State University since 2001. He is interested in a wide range of mesoscale meteorological phenomena. Although most of his research has focused on supercell storms and tornado formation using observations and numerical simulations, additional past projects include machine-learning approaches to tornado warnings, development of new lower boundary conditions and handling of near-surface turbulence in atmospheric models, and studies of mesoscale convective systems, low-level jets, and convection initiation.