Milind Sharma

Milind is a doctoral candidate in the Department of Earth, Atmospheric, and Planetary Sciences, where he is mentored by Dr. Robin Tanamachi. His research focuses on severe storms and their lightning characteristics, studied through the lens of weather radars and numerical weather prediction models. During his tenure as a graduate student at Purdue, he has participated in an NSF-funded field program to collect high-resolution polarimetric phased-array radar data in potentially tornadic storms over The Great Plains. He is the recipient of many EAPS and College of Science travel awards, which helped him present his research work at several national and international conferences. Prior to Purdue, he earned his bachelor's and master's degrees in Civil Engineering in India. He joined the ESE program in Fall 2016 as a Lynn Fellow and is soon moving to Texas A&M University as a postdoctoral research associate to work on the DOE TRACER field project.

The Relationship Between Cloud Microphysics and Electrification in Southeast U.S. Storms Investigated Using Polarimetric, Cold pool, and Lightning Characteristics

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ABSTRACT

Rapid intensification of low-level rotation in non-classic tornadic storms in southeastern United States, often at time scales shorter than the volume updates from existing operational radars, calls for a deeper understanding of storm-scale processes. Highly nonlinear interactions between vertical wind shear and cold pools regulate the intensity of downdrafts, low- and mid-level updrafts, and thus tornadic potential in supercells. Tornado-strength circulations are more likely associated with cold pools of intermediate strength. The microphysical pathway leading to storm electrification also plays a major role in the regulation of cold pool intensity. Storm electrification and subsequent lightning initiation are a by-product of charging of ice hydrometeors in the mixed-phase updrafts. In the first part of the study, we analyze polarimetric fingerprints in three high-shear low-CAPE (HSLC) cases (one tornadic and one non-tornadic supercell, and a quasi-linear convective system) in Northern Alabama. In all three cases, the K_{DP} column volume had a stronger correlation with total flash rates than the Z_{DR} column volume. In the second part, we simulate ice mass fluxes, cold pool intensity, and noninductive charging rates using a numerical weather prediction model. We find that greater updraft mass flux, supercooled liquid water concentration, and non-precipitation mass flux explain the higher total flash rate in the non-tornadic supercell. At zero time lag, horizontal buoyancy gradients associated with surface cold pool were not found to be linearly correlated with either charging rates of the updraft/precipitation mass flux.