4–8 November 2019, Kraków, Poland
ECSS2019-170

What is the intrinsic predictability of supercell storms?

Paul Markowski
Pennsylvania State University, Meteorology and Atmospheric Science, University Park, United States (pmarkowski@psu.edu)

The predictability of convective storms has received considerable attention in recent years, especially from those involved with the "Warn-on-Forecast" efforts. The topic of practical predictability probably has been studied more to this date, that is, the ability to predict storm behavior using the best-available techniques. Intrinsic predictability, that is, the ability to predict storm behavior if perfect procedures are used, has received less attention in the convective storms community.

In this presentation, I will present the results of a 25-member ensemble of relatively high-resolution (75-m horizontal grid spacing) simulations of supercell storms in neutrally stratified, turbulent boundary layers. The turbulence is initiated via small random temperature perturbations in the initial conditions. The turbulent boundary layers are given 12 h to evolve to a quasi-steady state before storms are initiated via the introduction of a warm bubble. The spatially averaged environments and turbulence statistics are identical within the ensemble; only the random number seed and/or warm bubble location is varied from one simulation to the next. Despite the identical mean environments, there is considerable divergence of storm behavior within just 2 h of the storm's initiation. Some storms produce tornadolike vortices; others do not. The timing, duration, and intensity of the vortices vary among the simulations in which tornadolike vortices develop. The simulation differences can only be explained by differences in how the initial warm bubbles and/or storms interact with turbulent boundary-layer structures. The results suggest very limited intrinsic predictability with respect to tornado forecasting within supercell storms.