THE IMPACTS OF HYDROMETEOR CENTRIFUGING ON TORNADO DYNAMICS

Research Challenge
To quantify, for the first time, the impacts of centrifuging precipitation on the tornado vorticity budget. Preliminary findings have removed an unrealistic build-up of precipitation in the vortex center (widely seen in tornado simulations) for both idealized vortices and simulations of an entire storm and the tornado it produces.
This knowledge will advance our understanding of tornadoes by making the simulations used to study these destructive and dangerous storms more physically realistic.

Methods & Codes
Simulations use the Cloud Model 1 (CM1) code.

Results & Impacts
A better understanding of tornado dynamics can help to minimize the loss of life caused by storms.
Simulations in the proposed research will be more consistent with what is observed in nature, particularly the unrealistic buildup of precipitation in the vortex center.

Why Blue Waters
Tornado simulations require thousands of computing cores and produce large amounts of data that must be stored and analyzed.
Additionally, the technical and visualization support available with Blue Waters greatly facilitated accomplishment of these research goals.

Rain is beginning to accumulate in the simulated tornado center (left). With centrifuging turned on (right), there is an eye-like feature in the simulated tornado center consistent with radar observations of actual tornadoes.