PETASCALE MODELING OF CONVECTIVE STORMS UNDER CLIMATE CHANGE AND VARIABILITY

Research Challenge
- This research seeks to answer the basic question of how present-day extreme storm events might be altered by human-induced climate change
- Part of the challenge is that such storms—and especially the attendant tornadoes, hail, damaging “straight-line” winds, lightning, and localized flooding—have spatial scales that fall below the effective resolution of typical global models

Methods & Codes
Drawing on the success of previously reported work, they have further adapted the pseudo-global warming (PGW) methodology to investigate the impact of human-induced climate change on outbreaks of severe hail and on landfalling hurricanes. Modified atmospheric states drawn from GCM output were used to constrain WRF model simulations of these events at high resolution

Results & Impact
Exemplifying the hailstorm results are the simulations of the May 19, 2013, outbreak of tornadoes, damaging wind, and hail. The radar reflectivity portrays the structure of the individual hail-producing storms in the CTRL simulation

Why Blue Waters
Accurate simulations require very large geospatial domains that have fine grid point spacings and long-time integrations with high rates of model output. Moreover, quantifications of uncertainty require that such realizations be repeated over multiple experiments. The Blue Waters allocation is providing us with the resources needed to achieve this unprecedented level of climate simulation.

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