

Special Seminar

Rebecca Adams-Selin

Visiting from Atmospheric and Environmental Research (AER)

Development, Verification, and Application of the One-Dimensional Hail Growth Model HAILCAST

Hosted by Russ Schumacher

**3 p.m. Monday, March 18
ATS 101**

Development: CAM-HAILCAST is a one-dimensional hail growth model designed to be embedded within a convection allowing model (CAM) and predict hail size at the surface. By embedding the hail model within a CAM, the convective updraft characteristics simulated by the CAM can be used, instead of relying upon estimates of updraft strength from a proximity sounding. Its internal hail growth model includes variable hail density in both wet and dry growth regimes, temperature-dependent ice collection efficiency, mass growth by vapor deposition or condensation, an improved liquid water shedding threshold, and use of multiple initial embryo sizes. The CAM updraft is also modified through use of an updraft multiplier that parameterizes advection of the hail embryo across an updraft and retrieval of an adiabatic liquid water profile.

Verification: HAILCAST has been run as part of the Hazardous Weather Testbed (HWT) Spring Forecasting Experiments (2014-2018) within the NSSL WRF-ARW Ensemble, the CAPS Storm-Scale Ensemble Forecast (SSEF), the Community Leveraged Unified Ensemble (CLUE), and the NCAR WRF ensemble. Subjective and objective feedback from HAILCAST's performance each year is used to drive the improvements in the hail model physics listed above. HAILCAST's performance from 2014-2016 is also compared to hail size forecasts generated using surrogate severe fields including updraft helicity, maximum column updraft speed, and column-integrated graupel, as well as Day 1 convective outlooks issued by the Storm Prediction Center. A range of thresholds for the surrogate severe fields are used for verification. Evaluation efforts reveal the importance of multiple verification metrics, including both object-based and more traditional grid-based neighborhood verification.

Application: Ten years of convective-season HAILCAST retrospective hail size forecasts are currently being produced using WRF-ARW to dynamically downscale ERA-Interim data. Retrospective forecasts from April-June 2010-2013, validated using the Respond radar-estimated hail size product, show positive skill and offer improvement over maximum updraft speed as a storm surrogate. Potential climatologies of hail density are also available.