# Implementation and Testing of FV3-HAILCAST at the NOAA HWT

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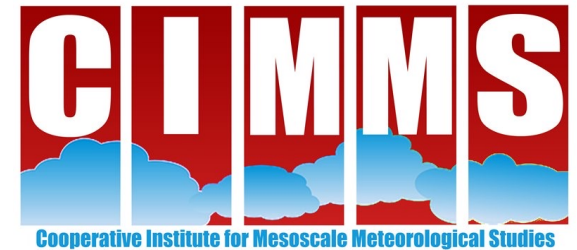
HAILCAST Description

- 1D hail model designed to be implemented within a grid column of any convective-permitting model (e.g., WRF-ARW, CAPS-FV3, NSSL-FV3, COSMO) to produce *a forecast of hail size at the surface*
  - Uses temperature, moisture profile from model
  - Parameterizes hail trajectory across the updraft

- Has been running annually at the NOAA Hazardous Weather Testbed since 2014
  - WRF-HAILCAST: 2014-current
  - FV3-HAILCAST: 2019-current

- WRF-HAILCAST was implemented operationally as part of HRRR v4 in December 2020 (RL-9)

- FV3-HAILCAST was added to NSSL FV3 LAM repository and regularly used for runs (RL-7)
  - incorporated into NGGPS diagnostics module so readable by UPP
  - independent of model physics routines
 - *ready to implement in RRFS*

Validation

- Validated using Multi-Radar Multi-Sensor (MRMS) Maximum Estimated Size of Hail (MESH) radar product.
  - Maximum size hail swaths over 1-, 6-, and 24-h time periods matched using MET's Method for Object-based Diagnostic Evaluation (MODE), shown below
- Traditional neighborhood grid-based verification performed as well

2019 HWT members

2020 HWT members
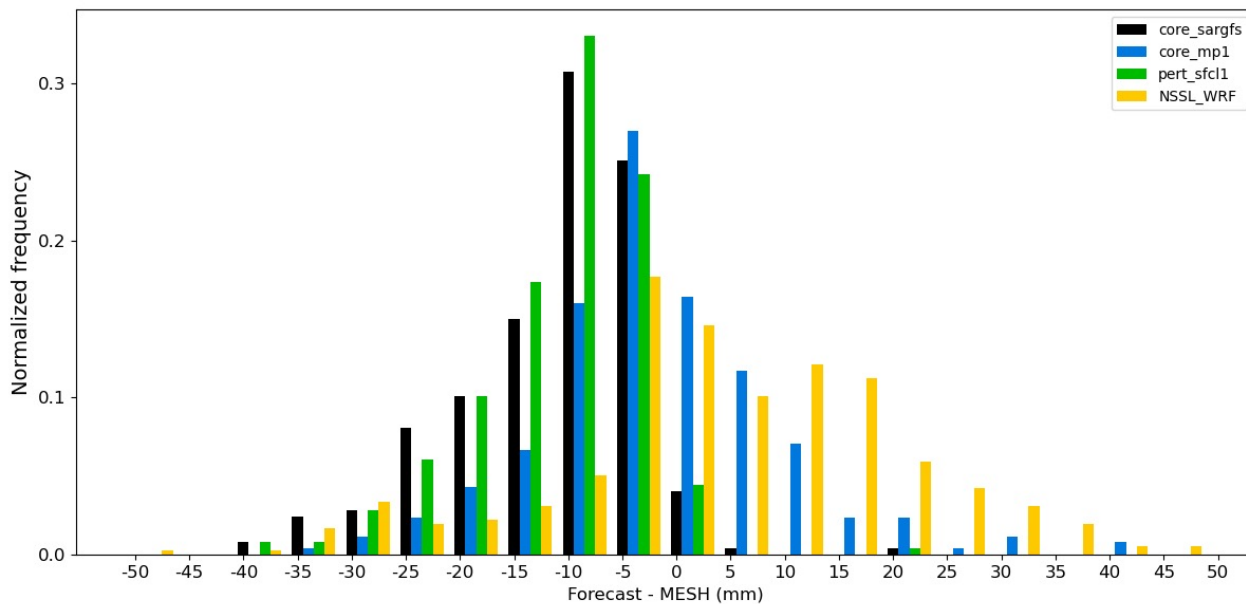
Normalized frequency of difference between 90th percentile from matched swaths
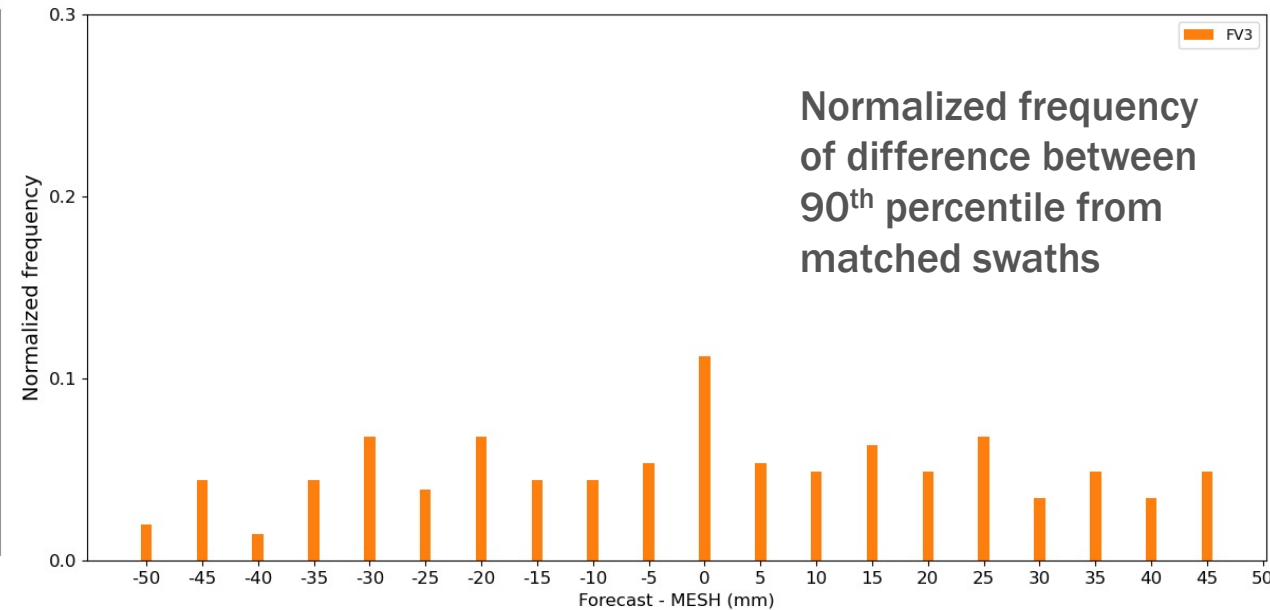
While 2019 saw highly variable performance resulting from underlying variability in updraft speed (similar to results seen by Reames and Wicker 2020, *AMS Annual Meeting;* Gallo et al. 2021, *Wea. Forecasting*), results from 2020 were less biased and showed overall forecasting skill of 25- and 50-mm hail on par with the WRF-HAILCAST forecasts from the HRRR-E.