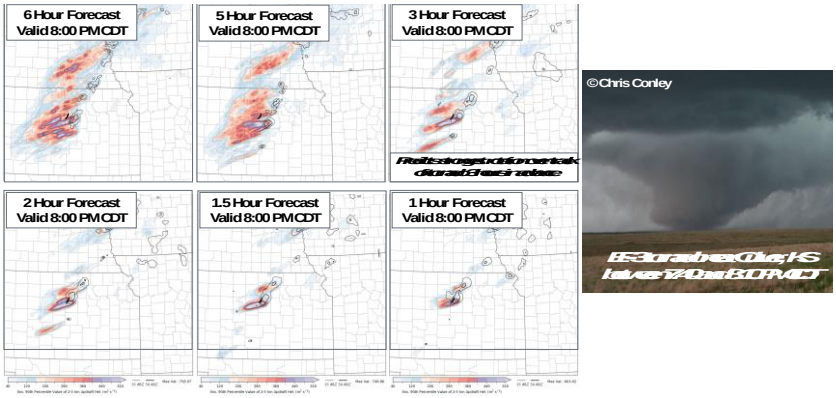
Warn-on-Forecast Process, Data Assimilation, and Modeling

The overarching goal of National Oceanic and Atmospheric Administration's (NOAA) Warn-onForecast (WoF) project is to develop and test a prototype WoF modeling system and ultimately transition the system to National Weather Service (NWS) operations. The probabilistic forecast guidance from the WoF system is critical to extending NOAA's ability to provide the public with more precise and longer warning lead-times for tornadoes, flash flood, hail, severe wind, and other high-impact weather. The CIMMS/NSSL's Warn-on-Forecast Process, Data Assimilation, and Modeling research team is developing an on-demand, regional, storm-scale (1-3 km horizontal grid spacing) ensemble modeling system. This advanced modeling system is cycled frequently by assimilating new atmospheric observations and 0-6 h forecasts are launched at sub-hourly intervals to predict the life cycle of individual thunderstorms and its associated hazards. The ensemble forecast will be post-processed using the Forecasting a Continuum of Environmental Threats (FACETs) framework to provide calibrated probabilistic guidance for the occurrence, timing, and location of severe weather hazards. The WoF guidance from realtime experiments can be found in the following websites:

https://www.nssl.noaa.gov/projects/wof/news-e/realtime/
https://www.nssl.noaa.gov/projects/wof/news-e/wpc/

2018 HWT Experiment: 1 May 2018 WoF Tornado Guidance from Watch to Warning



The three main areas of research are as follows:

Storm-scale Processes
Research to advance knowledge and understanding of the meteorological processes that produce hazardous convective weather including processes involved in storm initiation, storm intensification, precipitation production, large hail, strong winds, lightning, and tornadoes. This requires carrying out field programs to obtain improved atmospheric observation that can fill the gaps in our understanding of processes such as cloud and rain formation, and the turbulent boundary layer and also to inform and validate numerical weather prediction models.

Storm-scale Data Assimilation
Data assimilation is crucial to initialize individual thunderstorms and surrounding environments into the high-resolution WoF system. The WoF system assimilates radar, satellite, surface, and upper-air observations every 5-15 min. Both ensemble and the hybrids between ensemble and variational data assimilation techniques are under examination for WoF system.

Model Development
Implement and test the WoF system at sub-kilometer horizontal grid spacing to better resolves storm-scale structures and processes. Also assess the ability of sub-kilometer modelling to provide any additional forecast benefits.

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