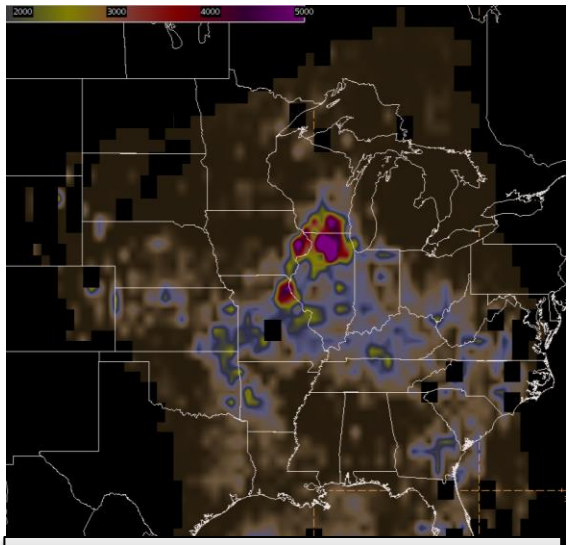
NUCAPS-Forecast Quick Guide

What is the NUCAPS-Forecast Product?

The NOAA Unique Combined Atmospheric Processing System (NUCAPS) derives atmospheric profiles of temperature and moisture using observations from the Cross-track Infrared Sounder (CrIS)—a hyperspectral sounder with 1305 channels in the infrared and near-infrared—and the Advanced Technology Microwave Sounder (ATMS)—a microwave sounder. Microwave observations are coupled with the infrared to allow for observations in partly cloudy regions. The NUCAPS-Forecast (NUCAPS-FCST) product is complementary to the Skew-T capabilities already integrated into AWIPS (NUCAPS Soundings Availability), using the same data and retrieval algorithm but advected forward in time with the HYSPLIT trajectory model. Each pixel in the product represents a single CrIS/ATMS field of regard or 50 km area covered by a NUCAPS sounding retrieval. The NUCAPS soundings are advected forward in time assuming adiabatic parcel theory with the HYSPLIT trajectory model meaning one can analyze initial and forecasted soundings. The output is gridded for plan view displays of convective indices (CAPE, CIN, LCL, LFC, and EL).



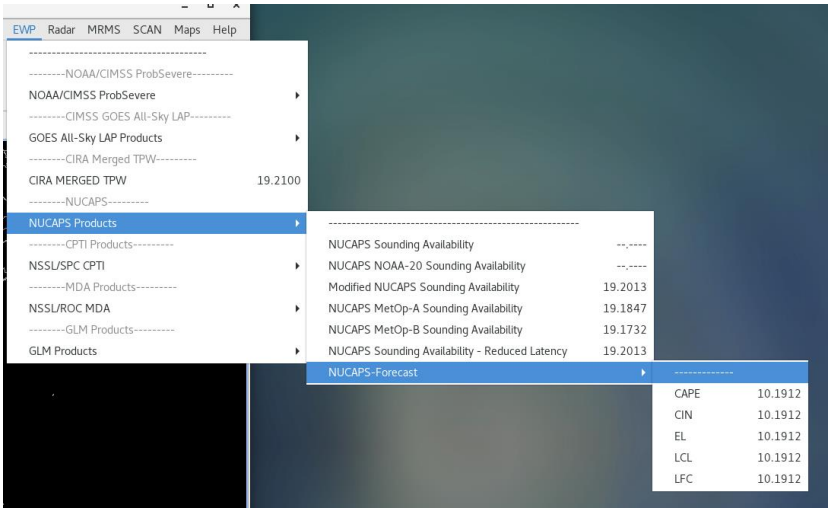
NUCAPS-FCST Most Unstable CAPE (J/kg)

How is NUCAPS-Forecast created and when is it available?

CrIS and ATMS are aboard the polar-orbiting NOAA-20 spacecraft, so NUCAPS retrievals are available 2x/day, valid approximately 1:30 AM & PM locally (slight daily orbital variation). NUCAPS-FCST is a synthesis of NUCAPS soundings that are advected forward in time using the 0.25 deg GFS (1 hour increments for a total of 6 hours). Only the 1:30 PM local time overpasses over the CONUS are processed with the steps outlined below:

GFS 0.25 deg Meteorological Data → HYSPLIT Trajectory Model at each NUCAPS Sounding location and level → Map NUCAPS T, q along HYSPLIT Trajectories → Calculate convective indices with SHARPpy → 0.5 deg Gridded convective indices for display in AWIPS

How to view NUCAPS-Forecast in AWIPS:



Last Modified April 2019

Caveats & Tips

- The parcels can move in different directions, at different speeds, and can descend or ascend in altitude depending on the synoptic situation

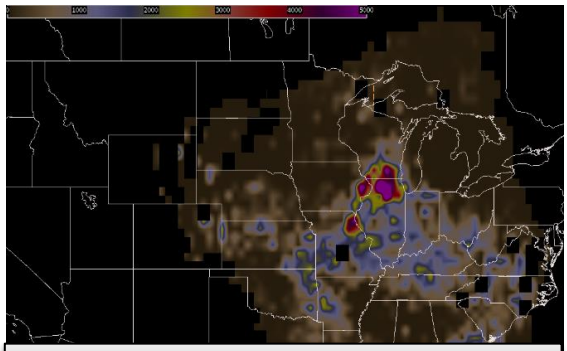
- The sounding levels are recombined at 0.5 degree resolution in each 1 hour time interval for 6 hours total in time

- The recombined soundings are used to calculate convective indices (CAPE, CIN, LCL, LFC, EL) using the most unstable parcel assumption and is the basis of the NUCAPS-FCST product

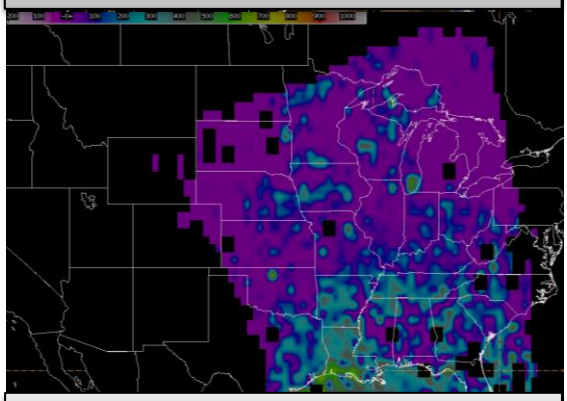
- We do not retain the quality flag that is available for each NUCAPS sounding as NUCAPS-FCST evolves over the 6 hours but the NUCAPS Soundings can be overlaid to provide the quality information of the initial time period

- The stronger the wind direction and speed shear, the more quickly adjacent soundings will blend together with time and move around

- As time moves forward, the grid elements containing valid convective indices will move in space, typically with the mean flow



NUCAPS-FCST Most Unstable CAPE (J/kg)



NUCAPS-FCST CIN (J/kg)

- If there are missing advected parcels at low or high levels in the grid element, the convective indices will not be calculated (hence missing data)

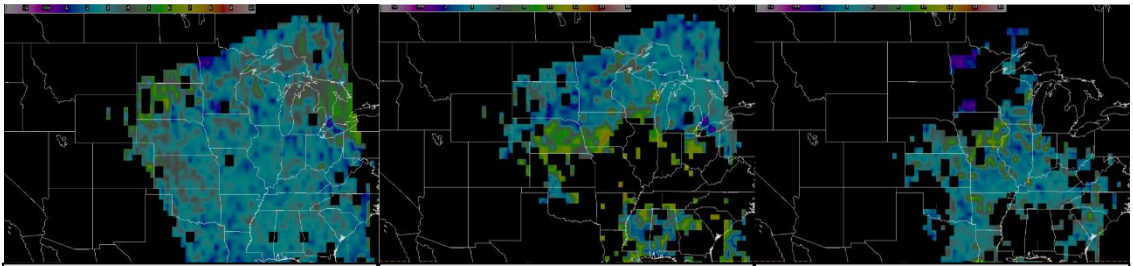
- In situations with convective initiation or severe convective weather occurring after 130 PM local time, we expect NUCAPS-FCST to offer additional skill to Gridded NUCAPS and NUCAPS soundings

We expect NUCAPS-FCST to be more precise in clear sky or in areas with shallow cumulus than extensive and persistent mid- and high-level clouds at 130 PM

The clearer the pre-convective environment, the better we expect NUCAPS-FCST to perform as thick clouds add noise/biases to NUCAPS soundings

- We expect that CAPE will increase and CIN will decrease with time in regions that are more likely to contain convective initiation

- While we expect similar trends in LCL, LFC, and EL, we are less confident in how these indices will behave in convective weather



NUCAPS-FCST LCL (km) | NUCAPS-FCST EL (km) | NUCAPS-FCST LFC (km)

- We expect some degree of differentiation in the NUCAPS-FCST convective indices among varieties of convective intensity, convective mode, and the type of severe weather produced

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