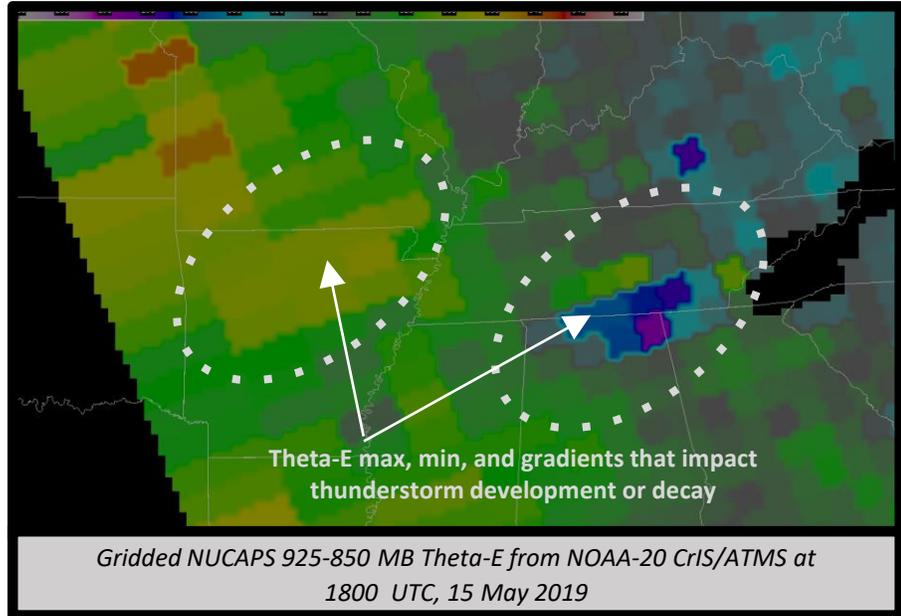


Why is Gridded NUCAPS Important?

NUCAPS Soundings are available in AWIPS and Gridded NUCAPS is the capability to view plan-view and cross-section displays. Temperature and moisture fields, as well as derived fields (e.g., lapse rate, theta-e, and precipitable water). Gridded NUCAPS has been demonstrated to diagnose (1) regions of Cold Air Aloft for aviation and (2) the characteristics of the pre-convective environment. Because ozone data is available ozone related fields and tropopause height are available to diagnose tropopause folding.



How is Gridded NUCAPS Created?

The NOAA Unique Combined Atmospheric Processing System (NUCAPS) is the algorithm used to process temperature and moisture soundings from hyperspectral infrared and microwave sounders such as CrIS and ATMS onboard S-NPP and NOAA-20. As the NUCAPS Soundings are ingested in AWIPS, the soundings are horizontally gridded and vertically interpolated to standard pressure levels. The data are treated like model data to allow for derived parameter calculations. Temperature, specific humidity, and a few pre-calculated fields of interest are ingested in AWIPS for display. Because NUCAPS also processes ozone additional products such as total ozone, ozone anomaly, and tropopause level can be viewed. There is no quality control applied but the field can be displayed or compared to the NUCAPS point Soundings. Any gaps in the data are due to the data level below the topography.

Impact on Operations

Primary Application

Pre-convective environment:

diagnosing the thermodynamic characteristics to anticipate severe weather

Cold Air Aloft: assessing upper-level regions of -65°C or less that impact aviation

Cyclogenesis/Extratropical Transition:

diagnosing the presence/depth of stratospheric air that can lead to changes in cyclone intensity

Fire Weather: assessing temperature and moisture conditions that are conducive to fire development or spread, assessing Haines Index

High Wind Events: diagnose tropopause folding that leads to downward mixing of winds



Limitations

Thick clouds: soundings are poor quality (unrealistic values) in regions of thick clouds and precipitation

Quality Control: poor quality data are not filtered out to preserve patterns and spatial gradients

Magnitude: spatial gradients and patterns are more representative than pixel values

Missing data/Topography: data at pressure levels below the surface will not display such as 850 mb in the Intermountain West

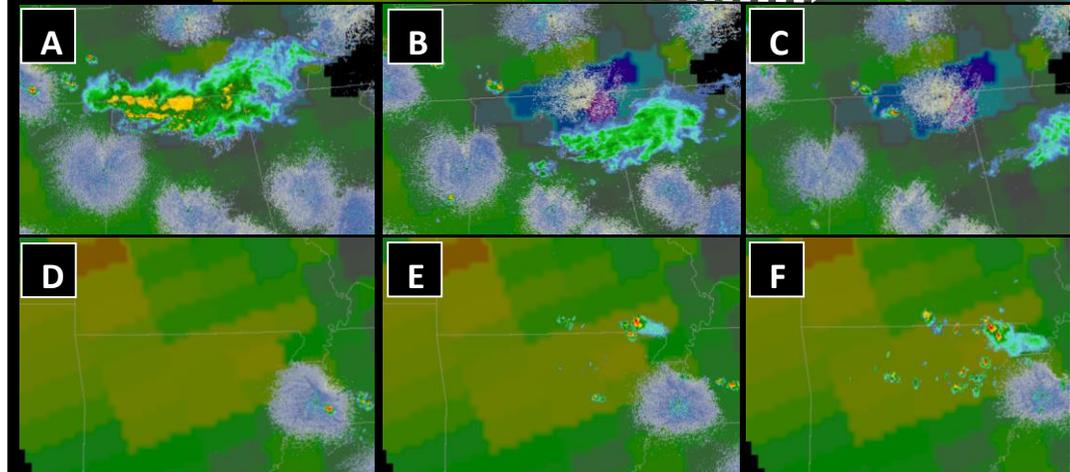
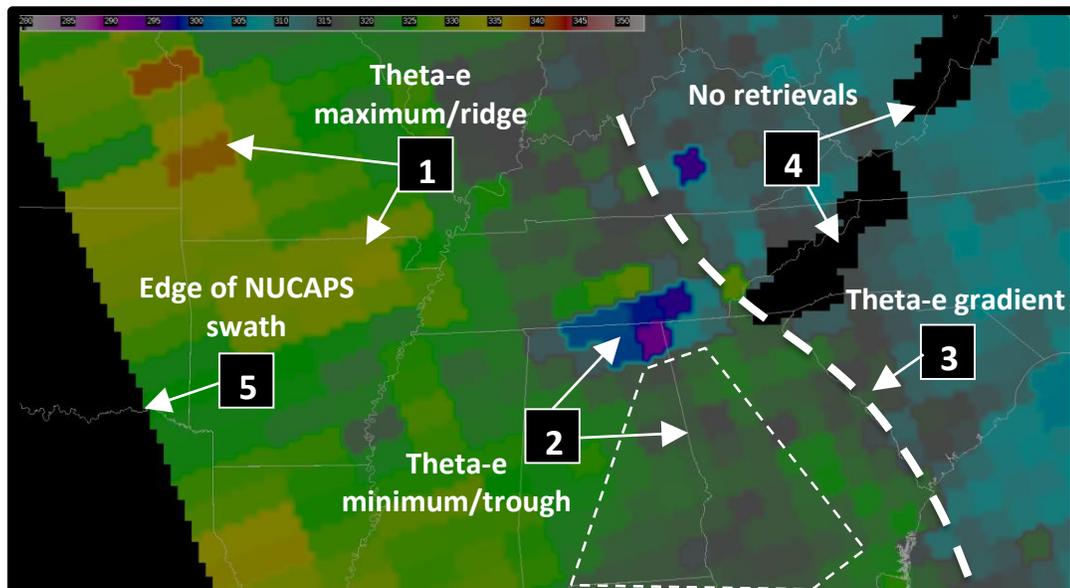
Supersaturation: regions with values above 100% relative humidity may be observed and can impact other moisture-derived fields



NUCAPS Interpretation

Example: Theta-e

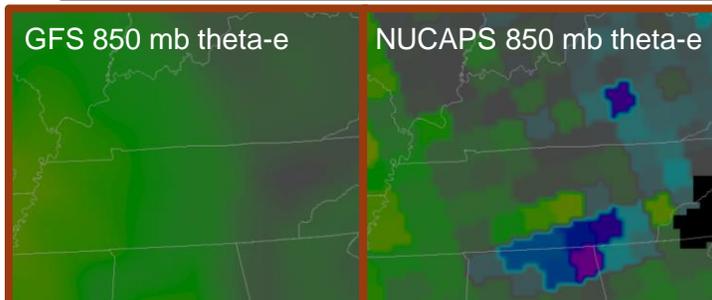
- 1** Local maxima in theta-e in NUCAPS observations can help identify areas conducive for storm development.
- 2** Local minima in theta-e may indicate areas of rain, but also areas less conducive for further storm development.
- 3** Gradients in values can help identify front locations
- 4** No data retrievals may occur in areas of higher terrain, where pressure values are below the surface
- 5** Edge of NUCAPS swath indicates the edge of the field of view for the pass



AWIPS display of Gridded NUCAPS 850 mb theta-e, 18 UTC 15 May 2019 (background images), and SE Radar Mosaic at 18 UTC (left panels), 20 UTC (middle panels), and 21 UTC (right panels). Notice that storms tend to decay in theta-e min areas (A-C), and develop in theta-e max (D-F).

NUCAPS Fast Facts

- Pixel Resolution: ~50 km at nadir, ~150 km at edge of scan
- Vertical Resolution: 1 to 2 km
- Latency: ~60 – 90 min. after satellite pass
- Availability: near global
- 3-4 CONUS overpasses:
 - Night ~6Z East to ~9Z West
 - Day ~16Z East to ~21Z West



NUCAPS Comparison to model data:

Model data, such as GFS data depicted here, will be much smoother in appearance, as NUCAPS retrievals are independent of one another and not smoothed. In AWIPS the image interpolation feature can be turned on to smooth the data.

Resources

- COMET
 - [Advanced Satellite Sounding](#)
 - ShyMet
 - [NUCAPS Introduction](#)
 - VISIT
 - [NUCAPS Soundings Quick Guide](#)
- Hyperlinks not available when viewing material in AIR Tool**