The Utility of NUCAPS in Operational Forecasting

2015 STAR JPSS Annual Science Team Meeting

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Hopeful Takeaways

• The Appeal of NUCAPS

• Issues for Forecasters to be aware of

• Forecasters’ sense of understanding “error”

• Ultimately...foster user-developer collaboration
  ➢ R2O
  ➢ O2R
Hopeful Takeaways

- The Appeal of NUCAPS
- Issues for Forecasters to be aware of
- Forecasters’ sense of understanding “error”
- Ultimately... foster user-developer collaboration
Day in the Life of a Forecaster in a Midwest WFO

- Convection is a common forecast problem
- Accustomed to looking at the 12Z RAOB, with density of ~ 2 per state
Convection is a common forecast problem

Accustomed to looking at the 12Z RAOB, with density of ~ 2 per state

During the pre-convective, early afternoon, I modify the 12Z RAOB for current surface conditions, and try to modify it for any changes in the airmass (from upstream)
12Z OAX RAOB
June 16, 2014
4 EF4 Tornadoes late afternoon
Day in the Life of a Forecaster in a Midwest WFO

• 18Z Special RAOB is a rare luxury (a few per year)
  – I don’t have to guess about the airmass changes
  – I typically still need to tweak the surface conditions due to the sensitivity to dewpoint
• We occasionally get an Aircraft observation
• I look at all of my data with some sense of the margin of error (and I try to learn what that margin of error is).
  – Observations from instrumentation
  – NWP
Quote from a Forecaster:

• “Last year some really smart people gave me 23 satellite sounding retrievals over my area in the 18Z-19Z timeframe!”
  – Using a new polar orbiter satellite
  – With a hyperspectral IR sounder and microwave sounder

June 2014 Proving Ground/Readiness Meeting
NUCAPS on AWIPS2 at WFO OAX
How can we take advantage of these observations???

*(Over one year later...)*

- Learned a lot from Chris Barnet and Antonia Gambocorta about the details of how the retrievals are obtained/created
  - Strengths (benefits)
  - Weaknesses (limitations)

- Beneficial training material has been developed

- Great interaction between developers and field forecasters (*and through the Hazardous Weather Testbed...*)
Issue #1: Smoothing

• Vertical resolution is a bit course
  – ~20 temperature layers
  – ~10 moisture layers
• Significant smoothing
• Identification of warm capping layers
• Identification of dry layers aloft (downburst potential)
Issue #2: Surface/BL Modification

• Modification is necessary 99+% of the time due to errors in surface T and Td

• Techniques, such as SPC’s SFCOA, have been used to objectively modifying the low levels of a sounding (RAP) using METARs

• Automation of Sounding Modification at the Surface and in the BL

“Improving NUCAPS Soundings for CONUS Severe Weather Applications via Data Fusion”
- Dan Lindsey PI
Issue #3: Clouds/Rain Errors

- Extra caution/scrutiny is needed

Excited about the recent improvements!
Why not use the NWP sounding?

- Sometimes do, but subject to NWP issues/errors
- Soundings within model convection

Convective Parameterization Schemes result in unrealistic profiles
Real vs. Modeled

**Observed GOES Visible**

- 1900 UTC June 16, 2015
- Atmosphere with clear, blue sky

**HRRR 2-hr forecast**

- 1900 UTC June 16, 2015
- Atmosphere with deep convection

2 hr fcst from 17Z run
A Case for O2R/R2O

- Forecasters are difficult to predict
- Generally, good things come from interaction between forecasters and researchers/developers
  - What the users’ needs are
  - What the developers can provide
    - Bias Tuning
    - Sources of error and improvements
- We won’t know if we can’t explore
THANK YOU for this opportunity and for this technology!

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