



Why Operational Meteorologists need more Satellite Soundings

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Mitch Goldberg³

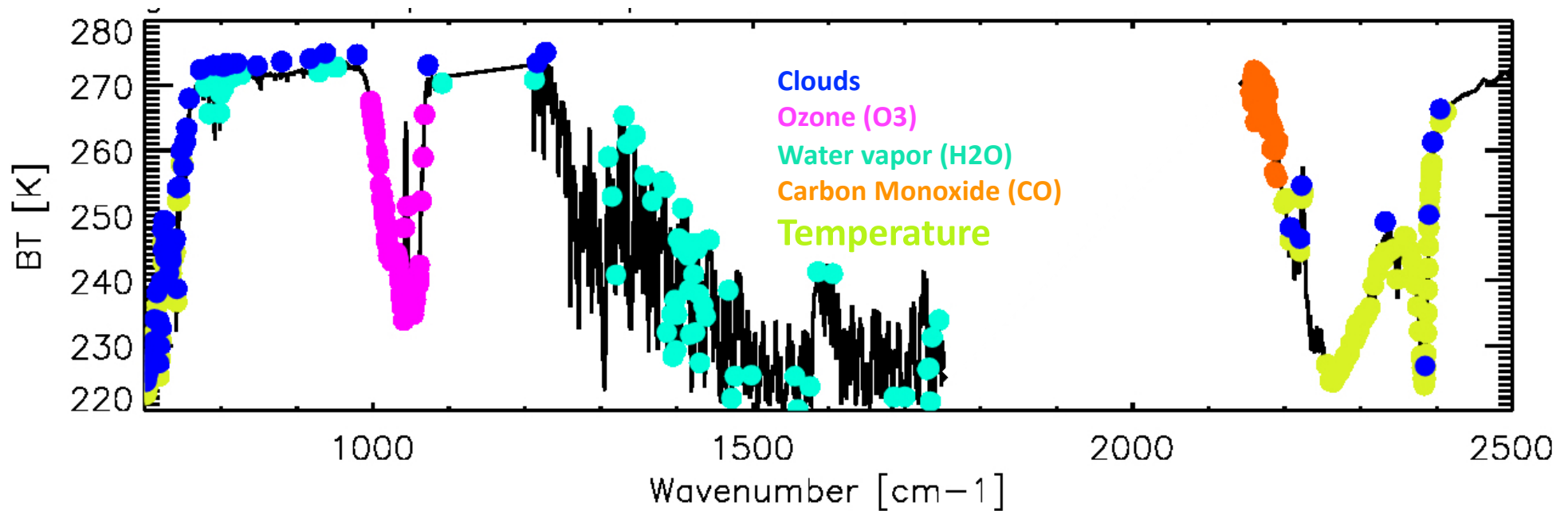
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³JPSS Program Office, Greenbelt, MD



Top of Atmosphere CrIS infrared brightness temperature measurement



NUCAPS Retrieved Observations = T + H₂O + O₃ + CO + CO₂ + ...



National Weather Forecasters now use JPSS Satellite Sounding Observations (NUCAPS) in daily operations



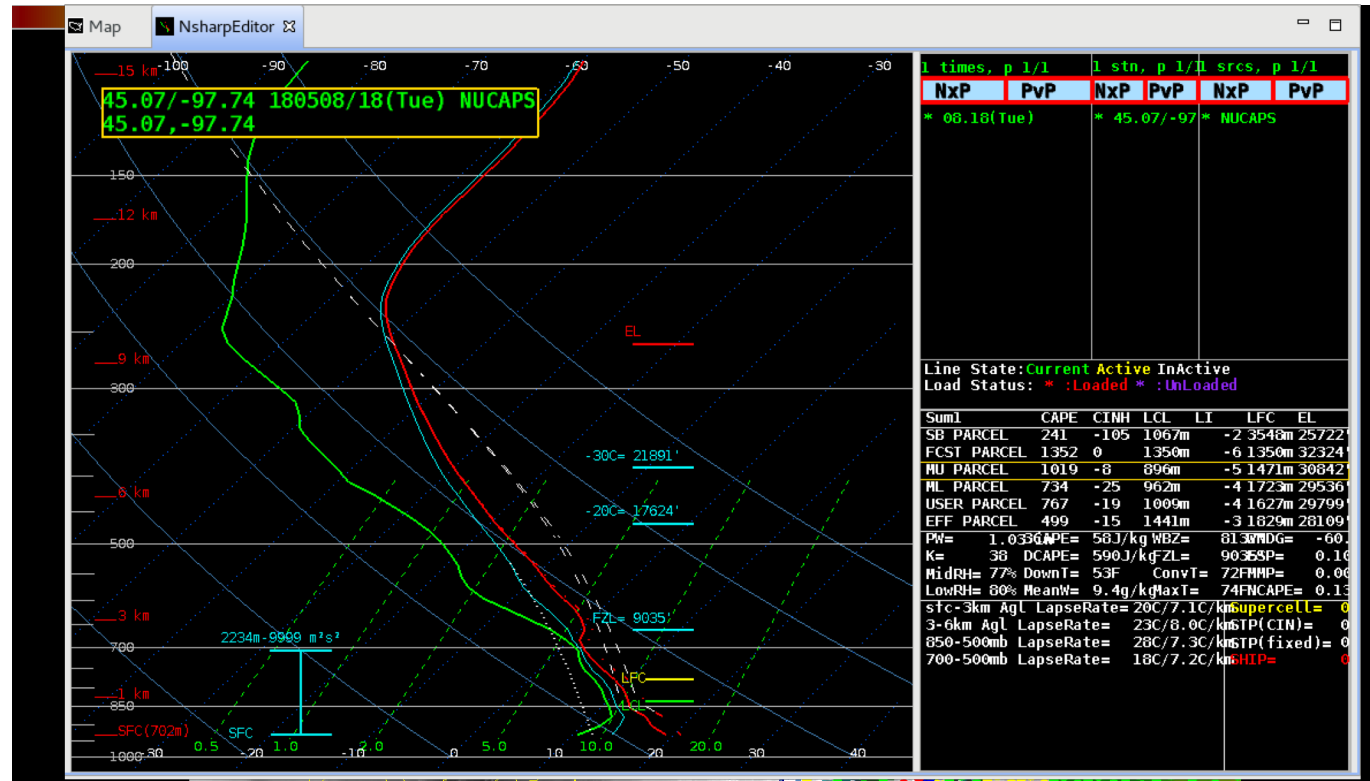
Feedback from Hazardous Weather Testbed 2018 Spring Experiment

"...I looked at mid-level lapse rates. They matched up well with mesoanalysis..."

"NUCAPS was helpful to see how the atmosphere was working up to a severe storm today"

"Utilized NUCAPS to assess atmospheric changes since the morning radiosonde release"

"NUCAPS was useful in assessing the performance of various models"



<https://goesrhwt.blogspot.com/2018/05/new-nucaps-procedures-for-hwt.html>



As long as there are multiple NWP systems and human forecasters at the helm there will be a need for observations to distinguish what is actually happening from what was forecasted to happen.

Well-characterized and trusted observations help forecasters verify the truth and guide them towards more accurate and timely watches and warnings.



The questions forecasters address with NUCAPS soundings

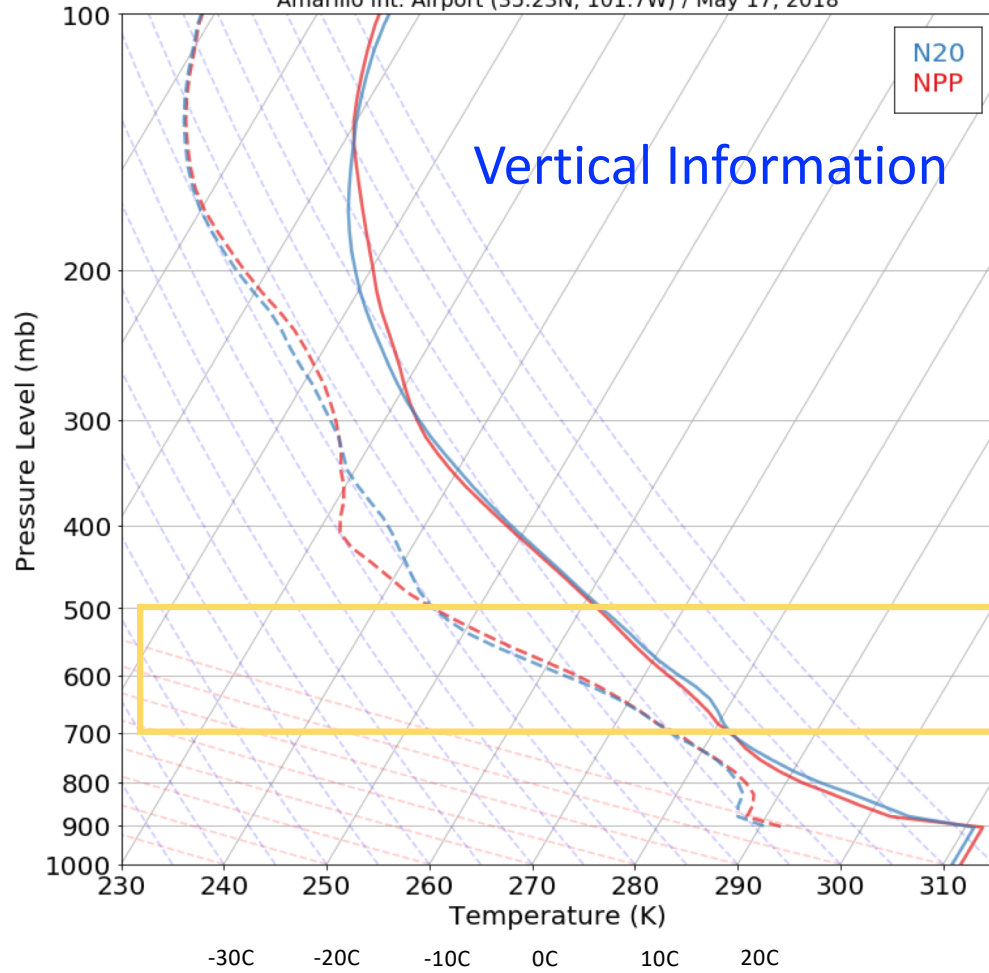
What happened? (deep-dive evaluation)

What is about to happen next? (nowcasting)

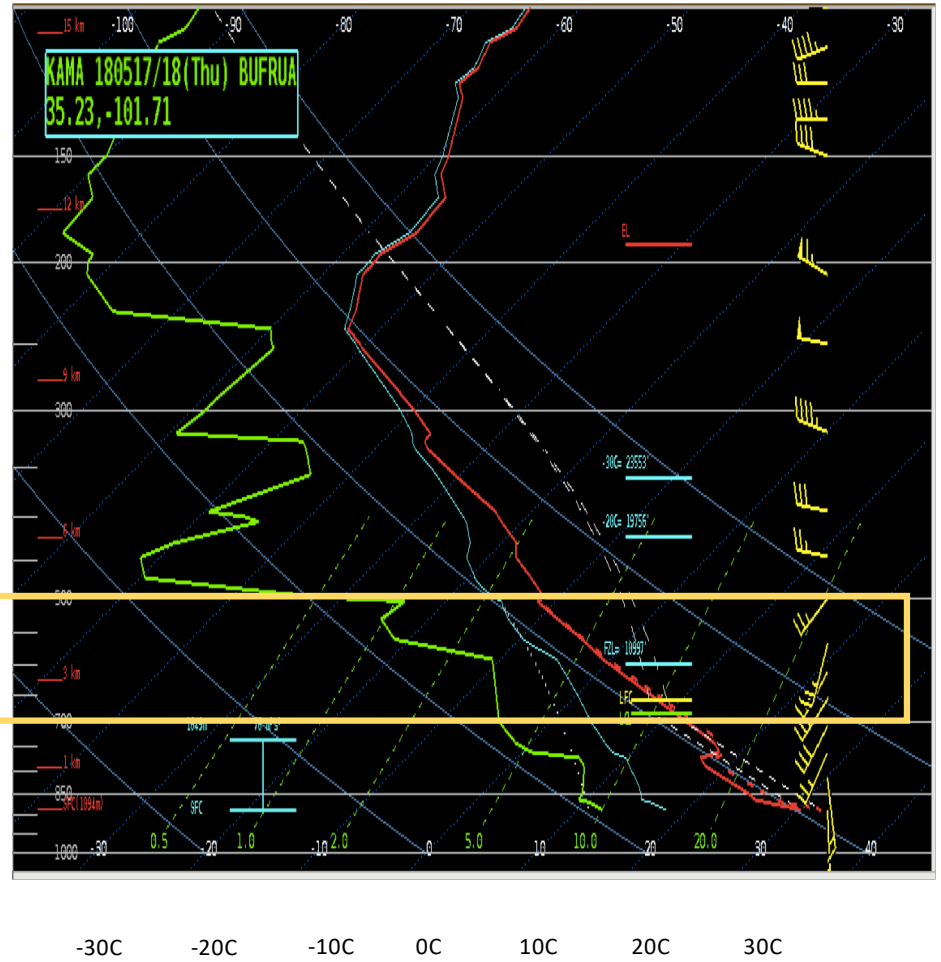
What is happening? (real-time model evaluation)

NUCAPS @ 2018-05-17 T19:28:49 (NPP) T20:18:37.00 (N20)

Amarillo Int. Airport (35.23N, 101.7W) / May 17, 2018

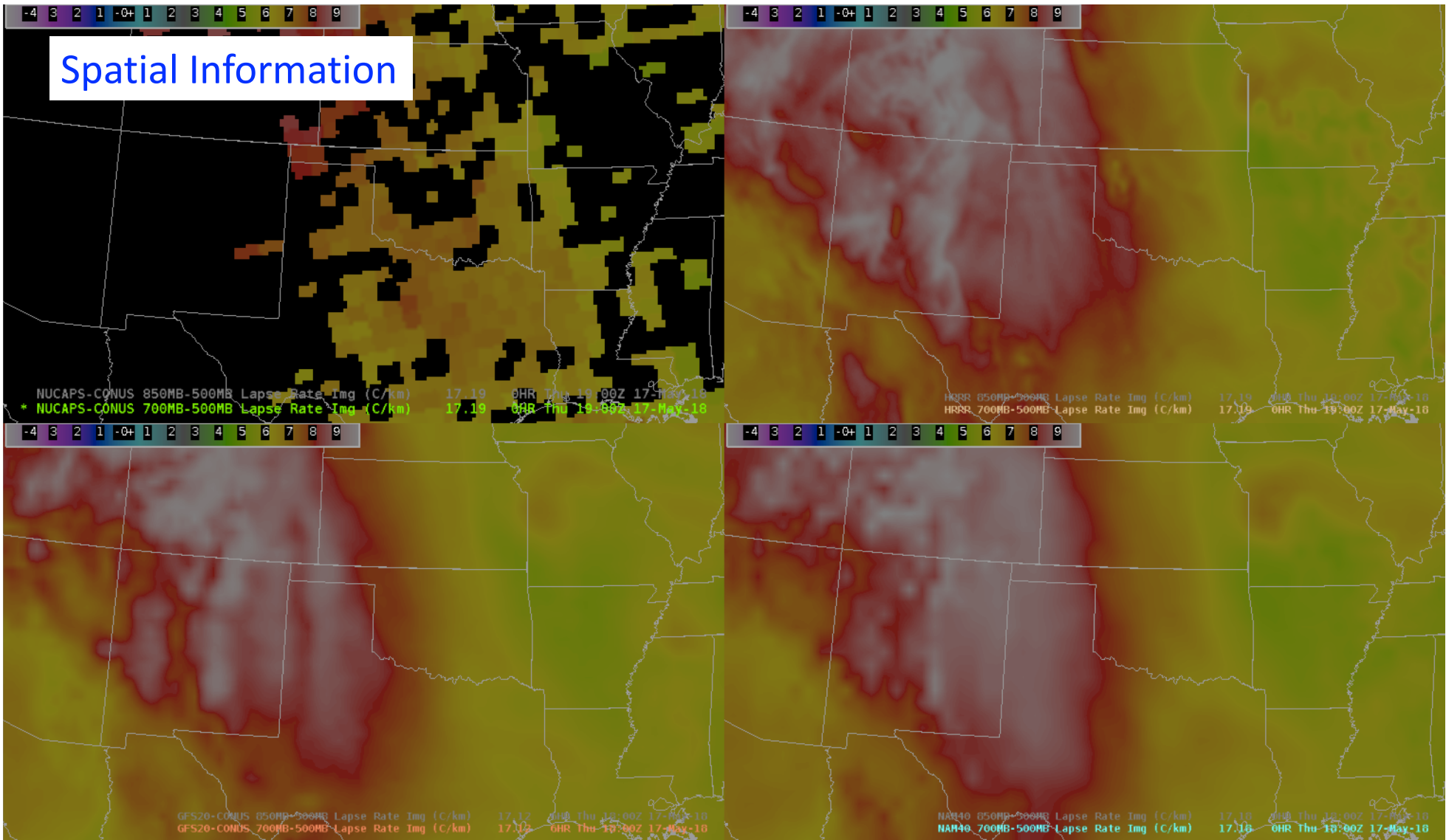


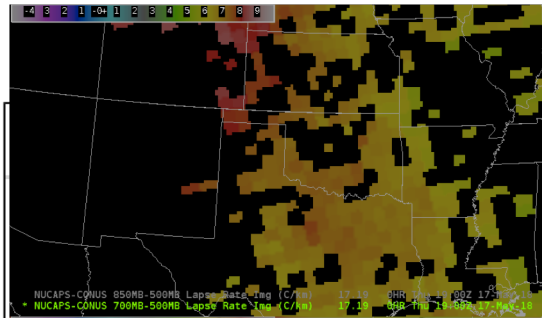
RAOB @ 2018-05-17 T18:00Z



AMA // Location: 35N, 101W

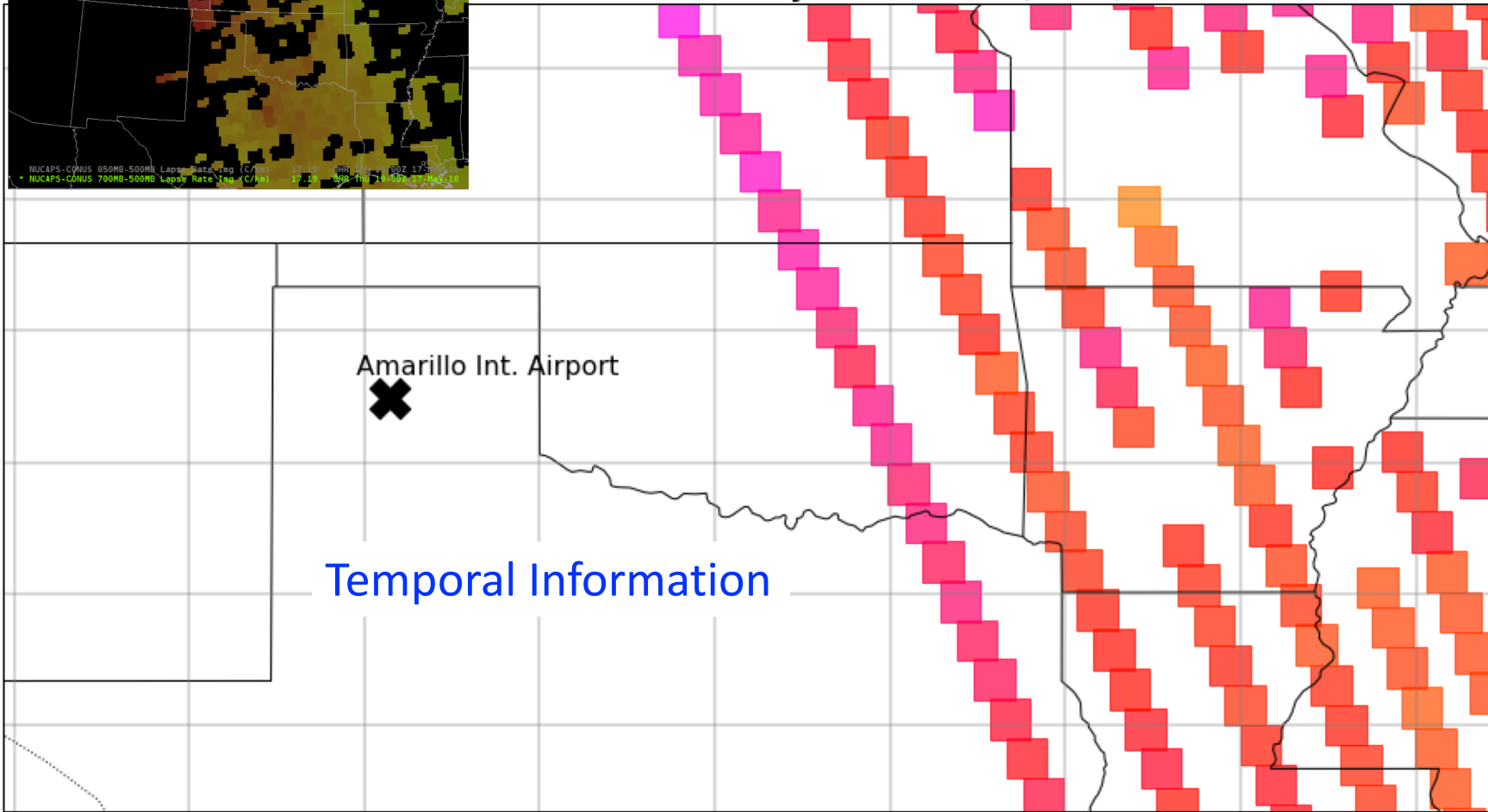
Spatial Information



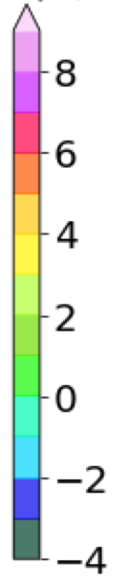


Test Case 6: May 17, 2018 (N20)

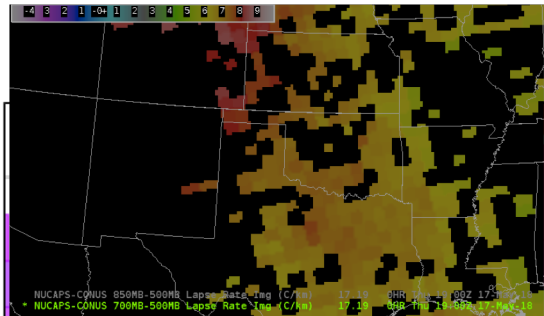
T16:58Z



700-500mb
Lapse Rate
(K/km)

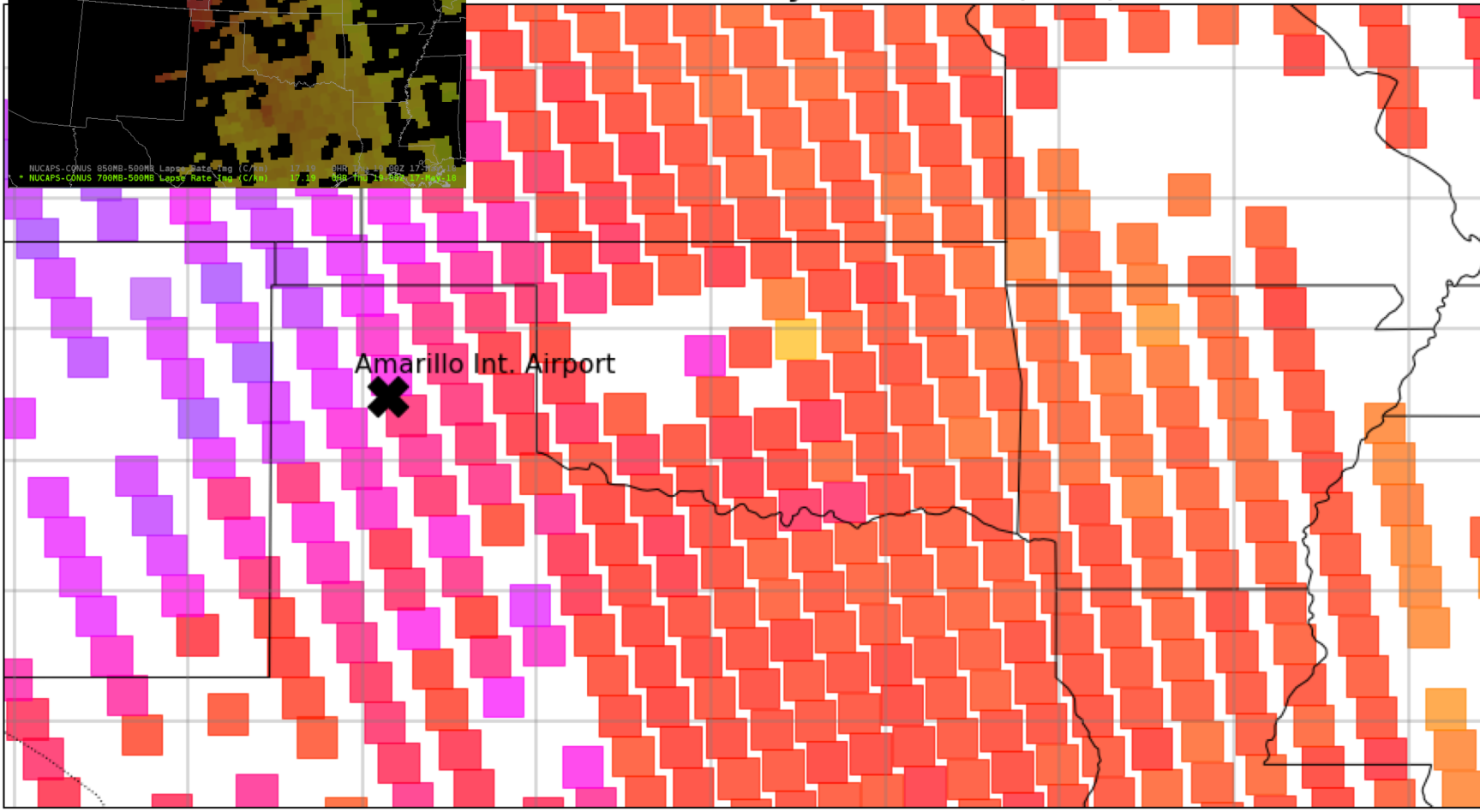


Temporal Information

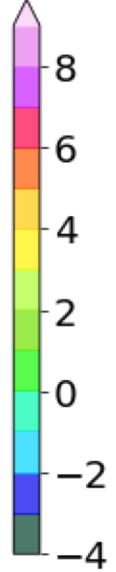


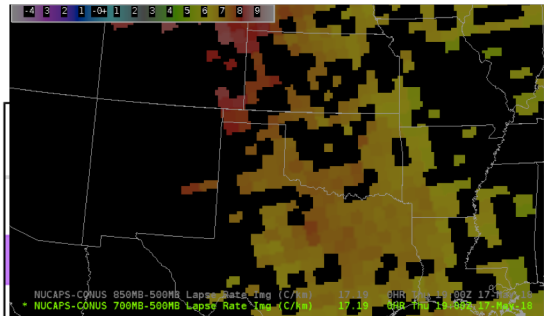
Test Case 6: May 17, 2018 (NPP)

T17:46Z



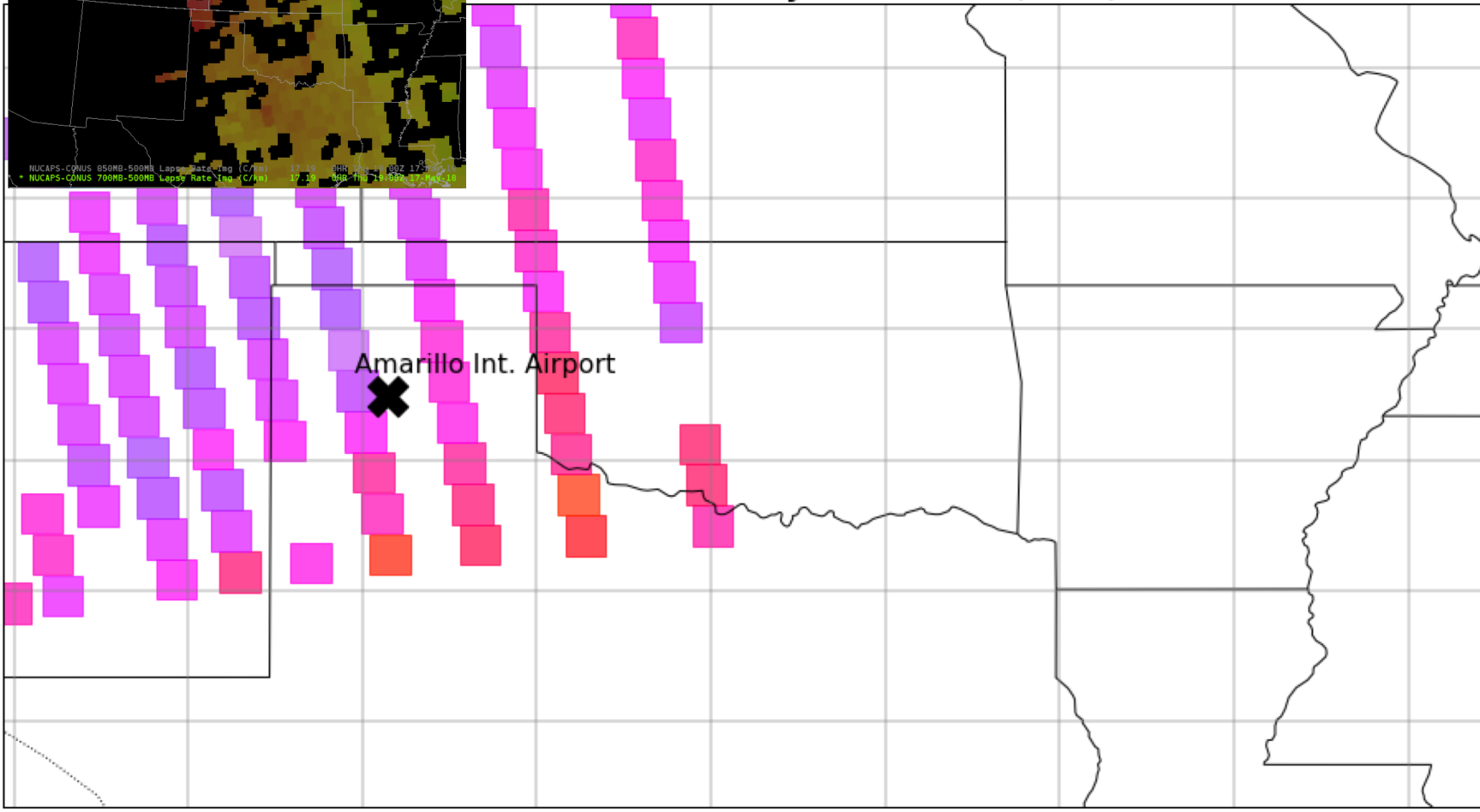
700-500mb
Lapse Rate
(K/km)



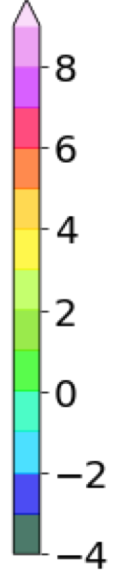


Test Case 6: May 17, 2018 (N20)

T20:22Z



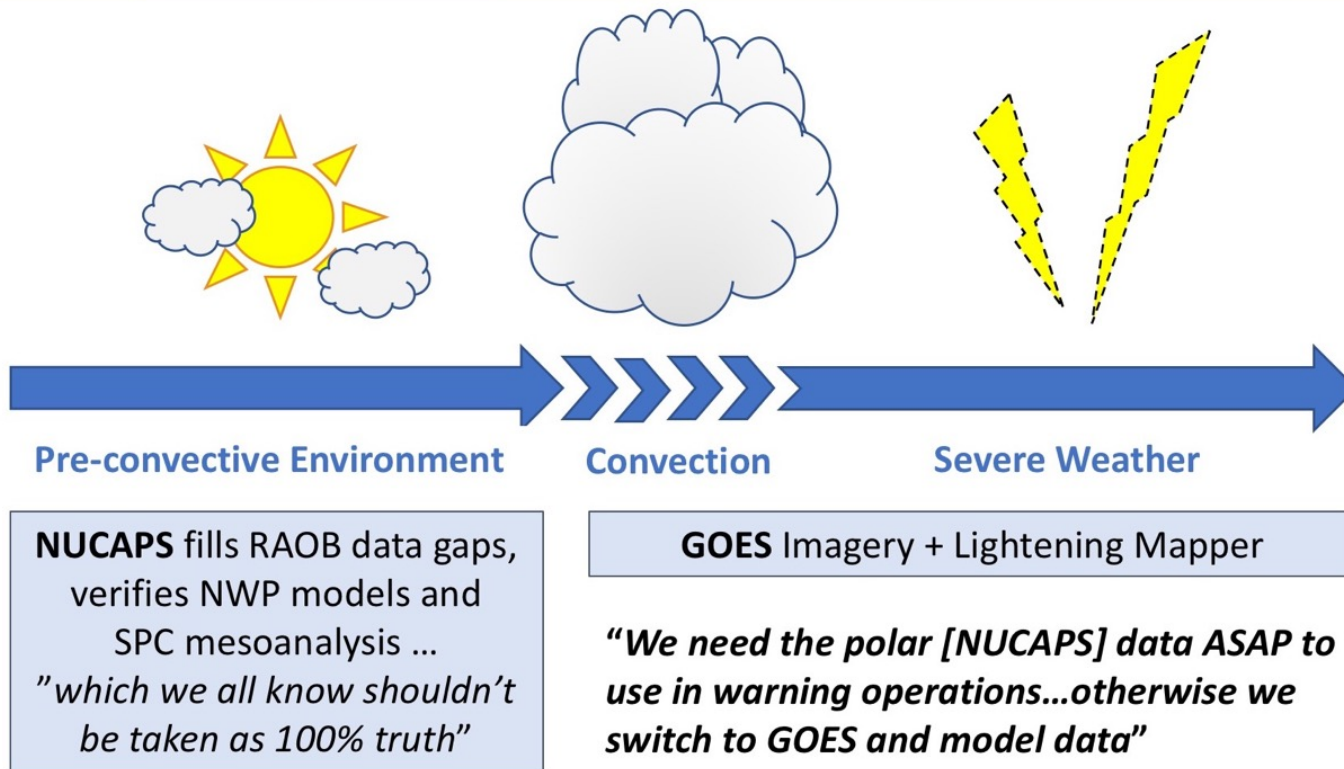
700-500mb
Lapse Rate
(K/km)



Amarillo Int. Airport



IMPROVED LATENCY ENABLES METEOROLOGISTS TO USE NUCAPS AS OBSERVATIONS OF ATMOSPHERIC (IN)STABILITY



Operational meteorologists need NUCAPS as mesoscale observations of real-time atmospheric state ahead of storm development – compare NUCAPS to NWP models and SPC mesoanalysis for **situational awareness** and **confidence in their conceptual models** of storm potential.



NUCAPS soundings differ from other measurements and models in distinct and knowable ways

Need to characterize the signal AND noise

When and where do NUCAPS soundings have high accuracy?

When and where do NUCAPS soundings fail to characterize geophysical change?

How and why do NUCAPS soundings succeed/fail?



We are moving beyond simple statistical analyses

Develop rigorous diagnostic tools to evaluate and understand these physical measurements about the physical environment

How to use satellite sounding products intelligently and correctly