Why Operational Meteorologists need more Satellite Soundings

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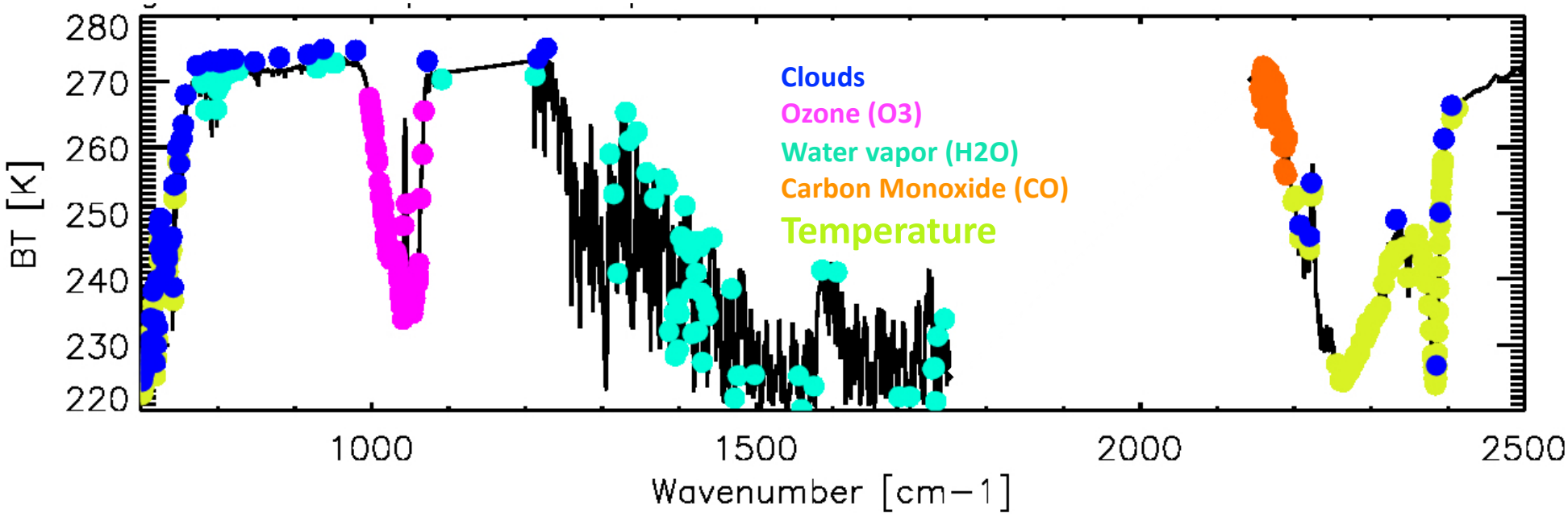
Top of Atmosphere CrIS infrared brightness temperature measurement



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

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

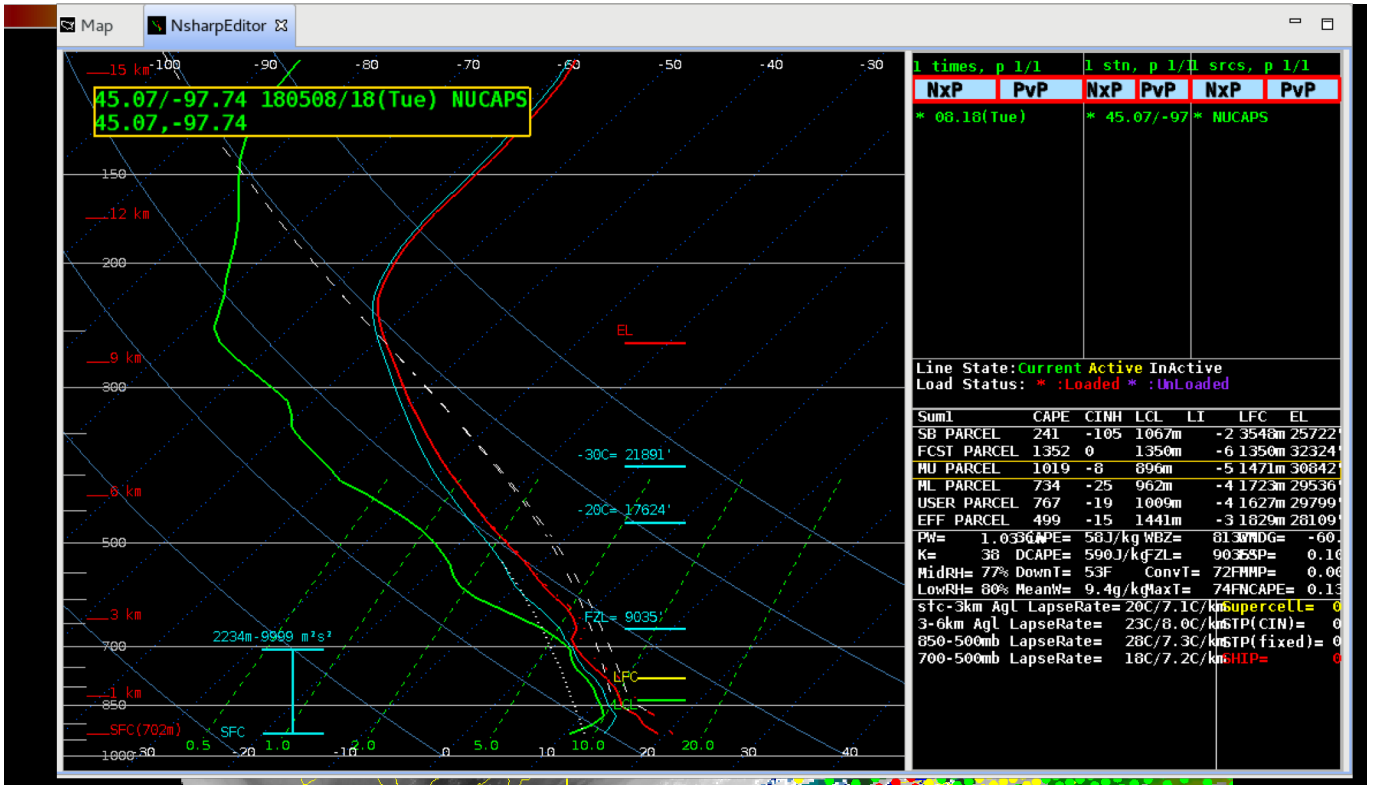
Feedback from Hazardous Weather Testbed 2018 Spring Experiment

"…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

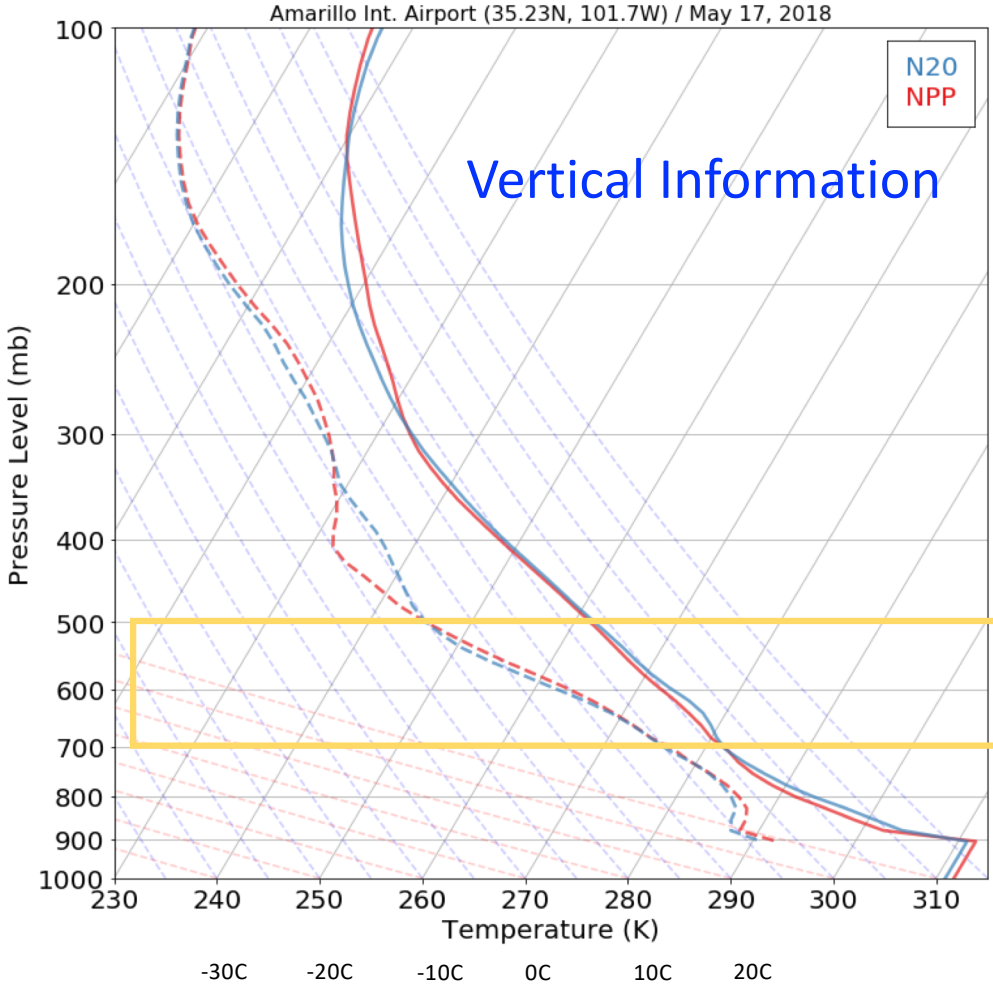
What happened? (deep-dive evaluation)

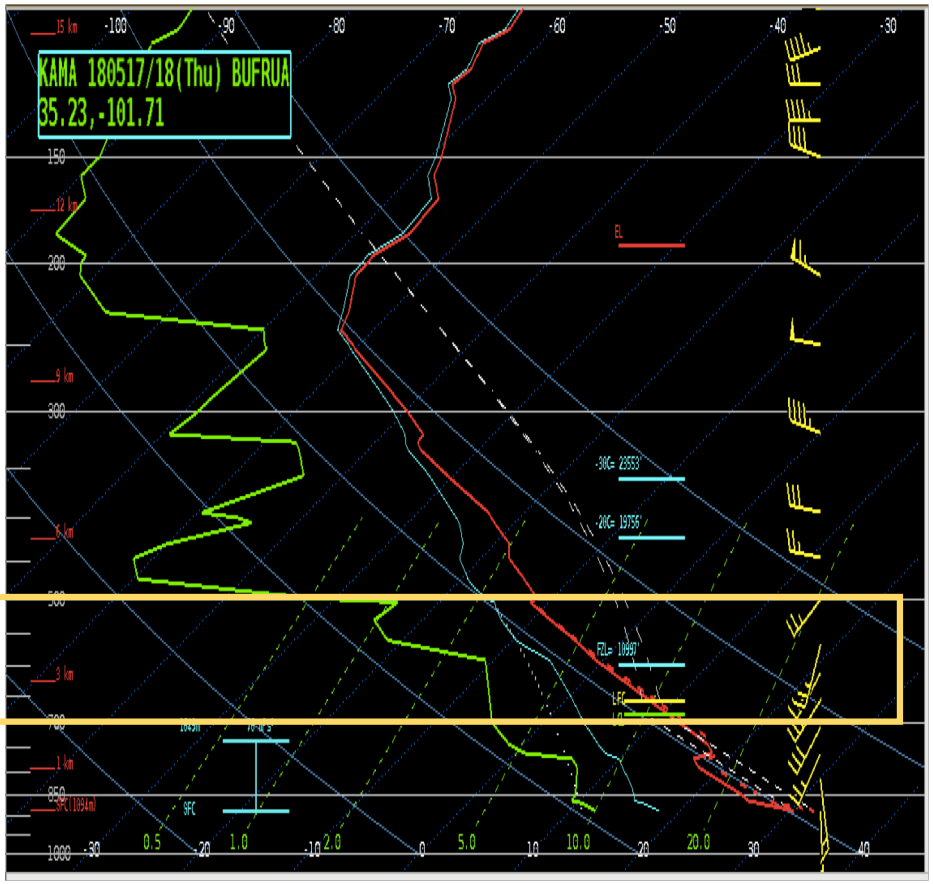
What is about to happen next? (nowcasting)

What is happening? (real-time model evaluation)

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

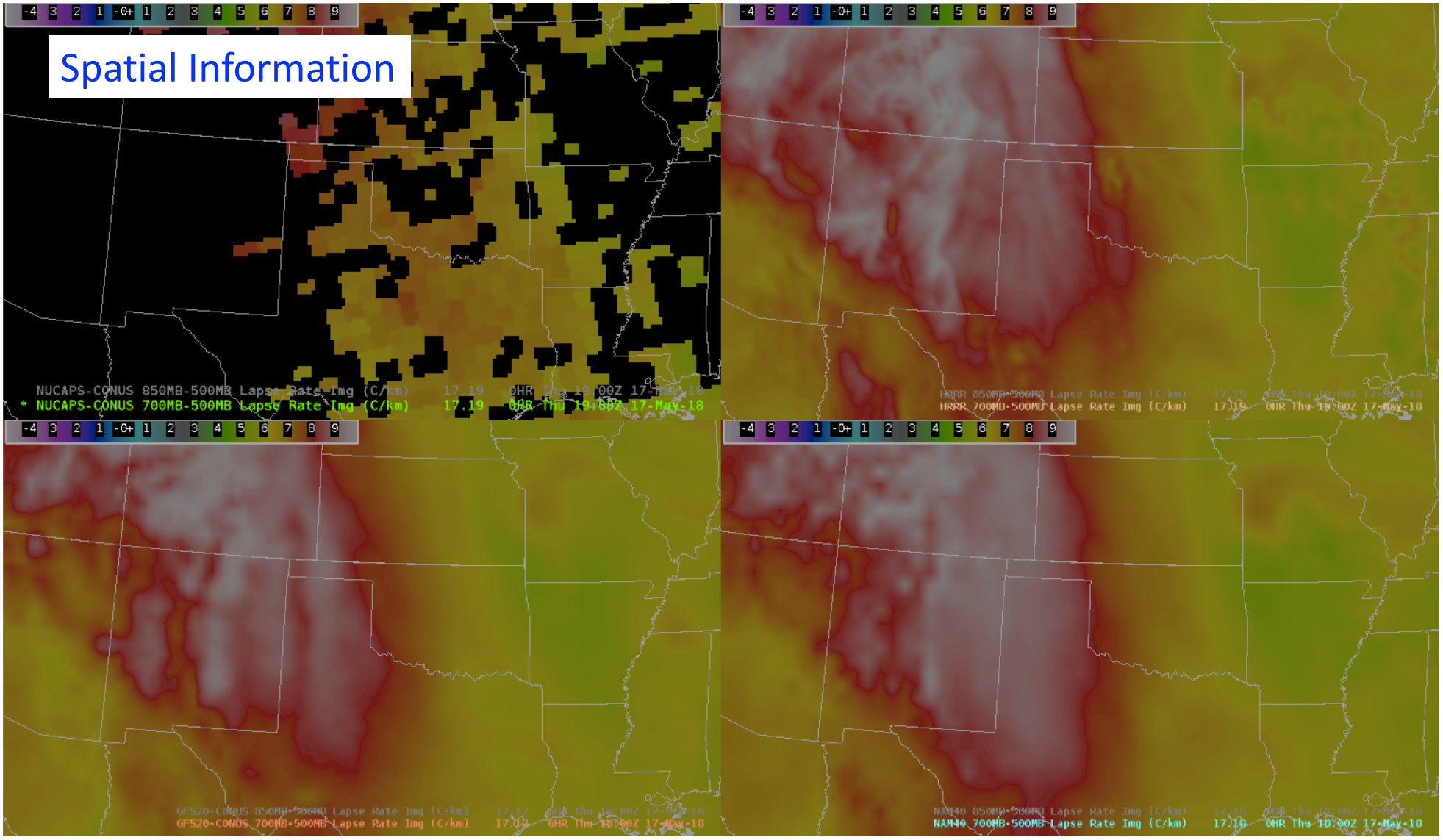
RAOB @ 2018-05-17 T18:00Z

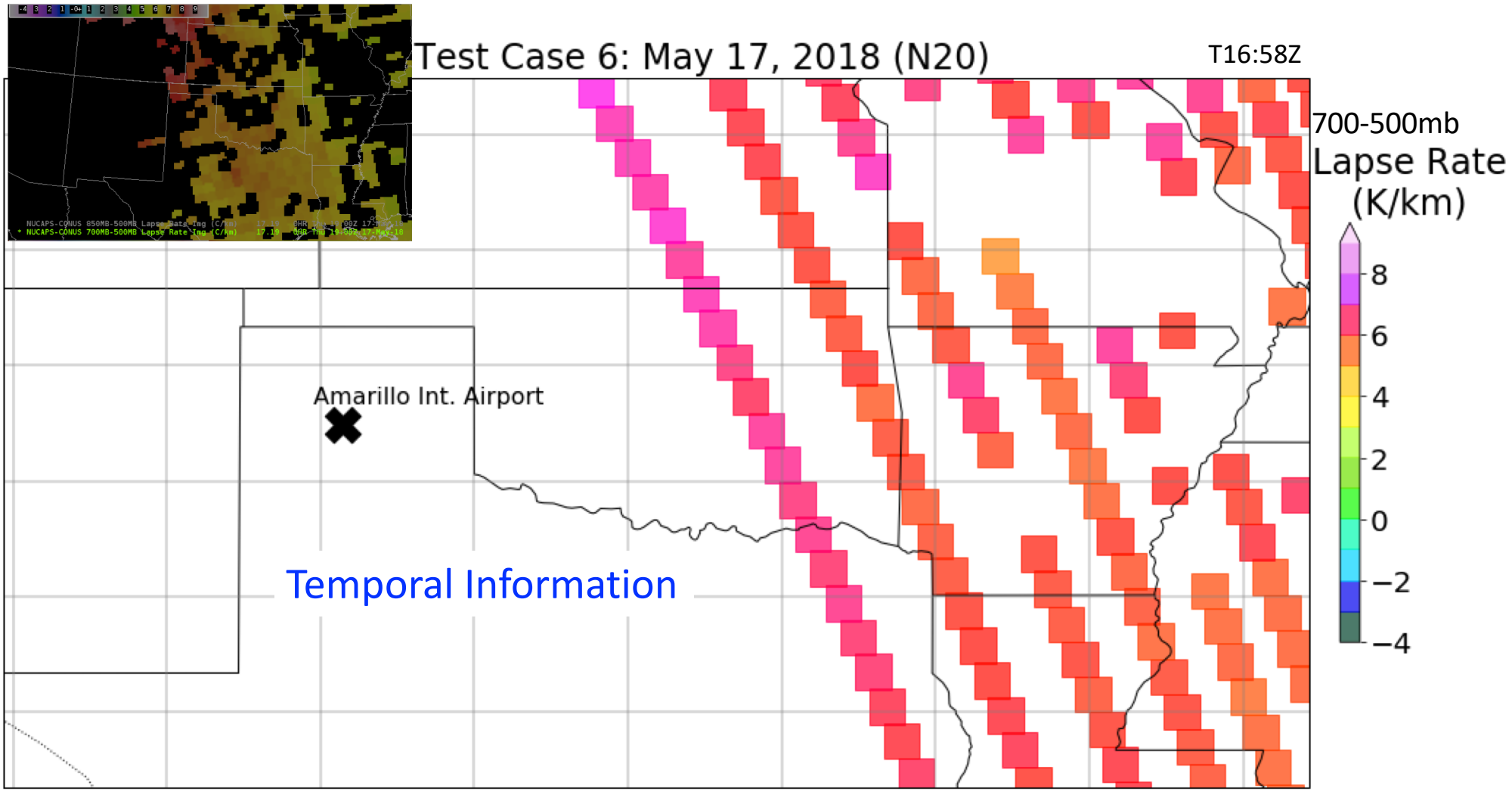


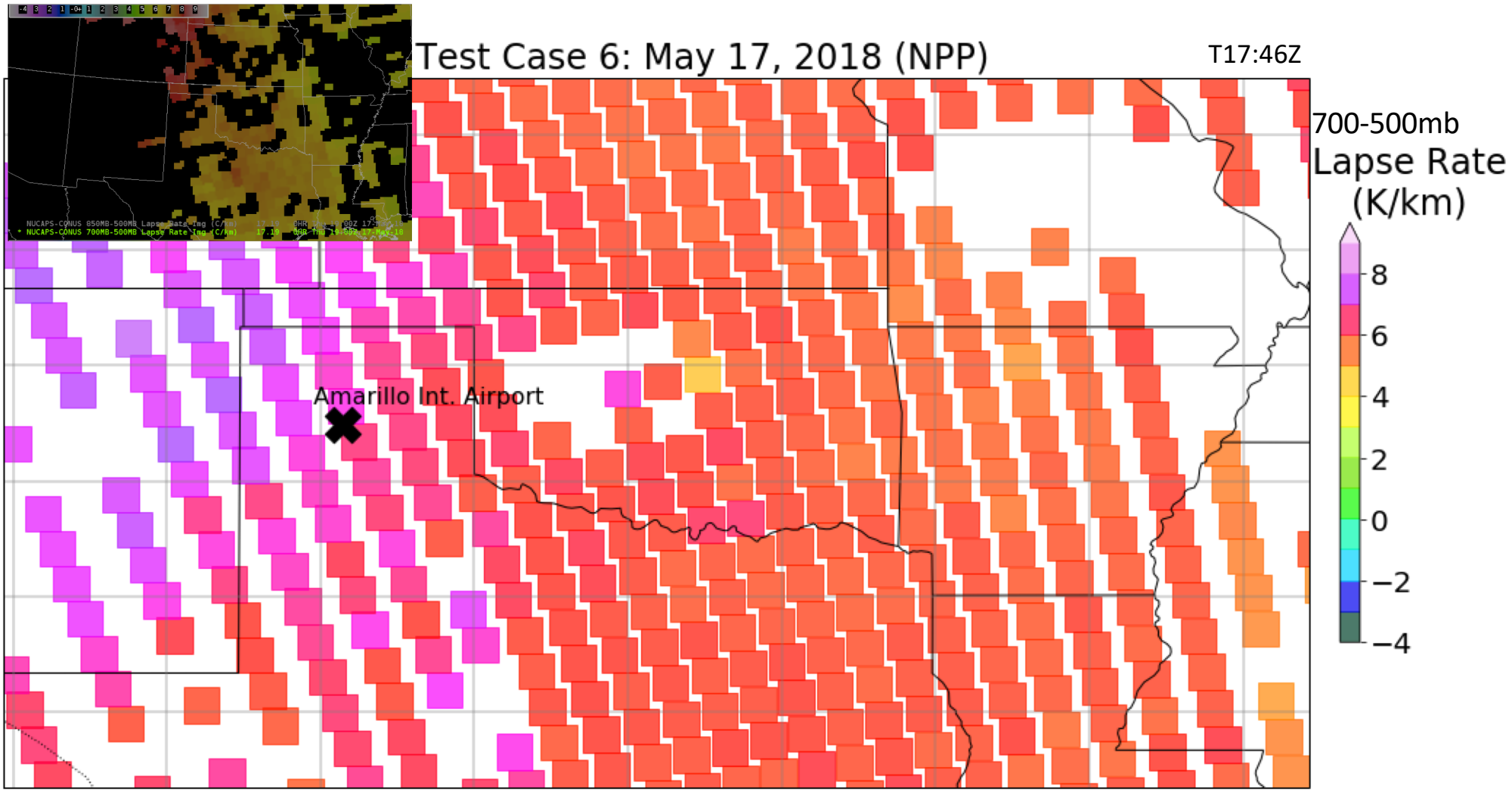


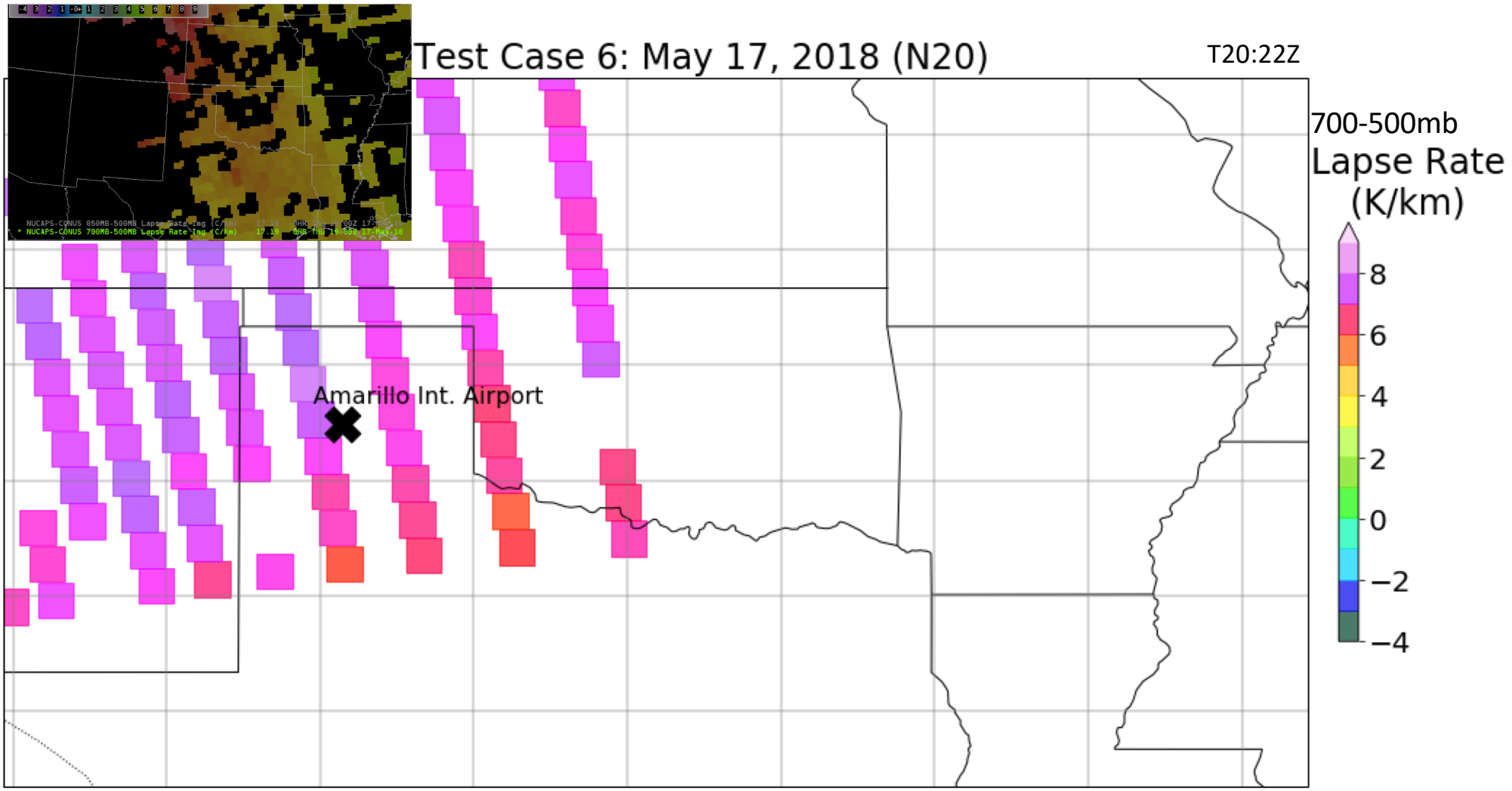
AMA // Location: 35N, 101W

Spatial Information

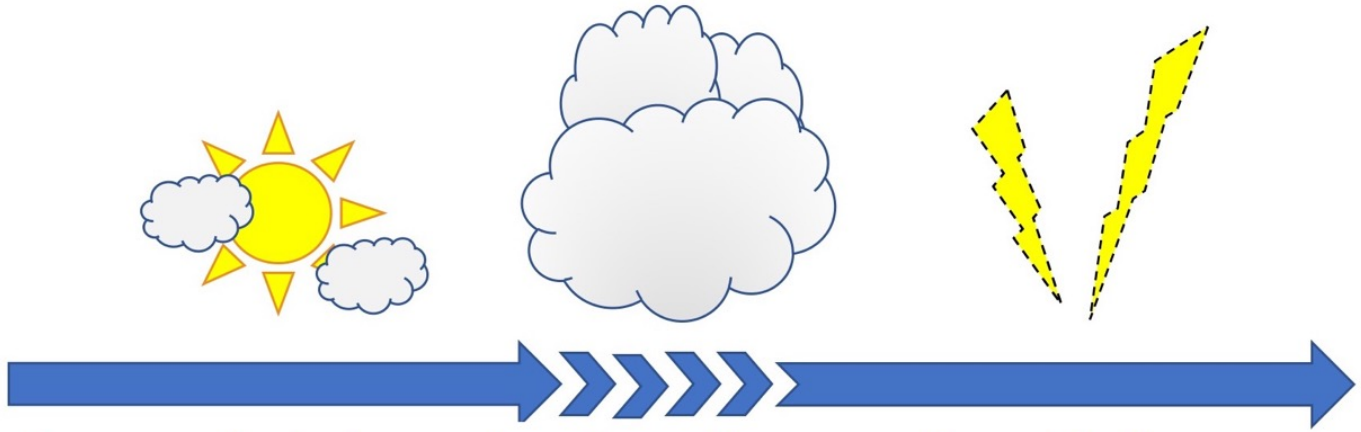



Test Case 6: May 17, 2018 (N20)
T16:58Z
700-500mb
Lapse Rate
(K/km)
8
6
4
2
0
−2
−4
Amarillo Int. Airport
Temporal Information


Test Case 6: May 17, 2018 (NPP)
T17:46Z
700-500mb
Lapse Rate
(K/km)
8
6
4
2
0
−2
−4
Amarillo Int. Airport


Test Case 6: May 17, 2018 (N20)
T20:22Z
Amarillo Int. Airport
700-500mb
Lapse Rate
(K/km)
8
6
4
2
0
−2
−4

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



Pre-convective Environment | **Convection** | **Severe Weather**

NUCAPS fills RAOB data gaps, verifies NWP models and SPC mesoanalysis … *"which we all know shouldn't be taken as 100% truth"*

GOES Imagery + Lightening Mapper

"We need the polar [NUCAPS] data ASAP to use in warning operations…otherwise we switch to GOES and model data"

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