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)
Vertical Information
Spatial Information
IMPROVED 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