



NOAA/JPSS

# What is a satellite measurement?

*Communicating abstract satellite concepts to the world*



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# Science communication

## Communication is a fundamental aspect of scientific inquiry

- Scientist => Scientist
  - Scientist => Decision maker
  - Scientist => Policy maker
  - Scientist => General Public
- 
- What's the goal of our research? problem statement
  - So what? relevance to society



**Knowledge grows through scientific inquiry and problem solving, both driven by communication**





# Lessons in Satellite Sounding Communication

- Lack of evidence that satellite sounding products were used operationally
- Satellite soundings do not make “pretty pictures”
- Compare “quick looks” of soundings to satellite images (sub-km horizontal resolution) and radiosondes (sub-km vertical resolution)... this hindered early adoption.
- The information in satellite soundings is difficult to understand and use
- The “**Valley of Death**”: where good products go to die (see “*Travels through the Jornada del Muerto..*” Chris Barnet AIRS STM, 03/23/16)

Forecasters are now putting satellite soundings up with radiosondes in analyzing weather events...How did this happen?





# Communication Innovation

## Switch from Salesman to Scientist

- ❑ “You should use our products because they are the best!”
- ❑ “Trust me, I know better than anyone else”
- ❑ “What do you need?”
- ❑ “How can this product be more useful to you?”

A radical change in communication lead to a paradigm shift in quality and value of our scientific work



## For decades we assumed we were communicating



Inadvertently, Roy dooms the entire Earth to annihilation when in an attempt to be friendly, he seizes their leader by the head and shakes vigorously



# Misunderstanding #1

## “What is a Satellite Sounding?”

$$\hat{\mathbf{x}} = \mathbf{x}_a + (\mathbf{K}^T \mathbf{S}_m^{-1} \mathbf{K} + \mathbf{S}_a^{-1})^{-1} \mathbf{K}^T \mathbf{S}_m^{-1} (\mathbf{y} - \mathbf{y}_a)$$

$$\hat{S}_i = \frac{1}{(\mathbf{K}^T \mathbf{S}_\varepsilon^{-1} \mathbf{K} + 1/s_a)}$$

$$\chi^2 = (\mathbf{y}_t - \mathbf{y}_a)^T \mathbf{S}_m^{-1} (\mathbf{y}_t - \mathbf{y}_a) + (\delta \mathbf{x}_f) \mathbf{S}_a^{-1} (\delta \mathbf{x}_f)$$

Satellite soundings do not make “pretty pictures”; Value not visually obvious

Using equations to explain what they are only obscure understanding

We learned to communicate within context

Soundings have value in applications so use language based on context

We now communicate within our community more effectively





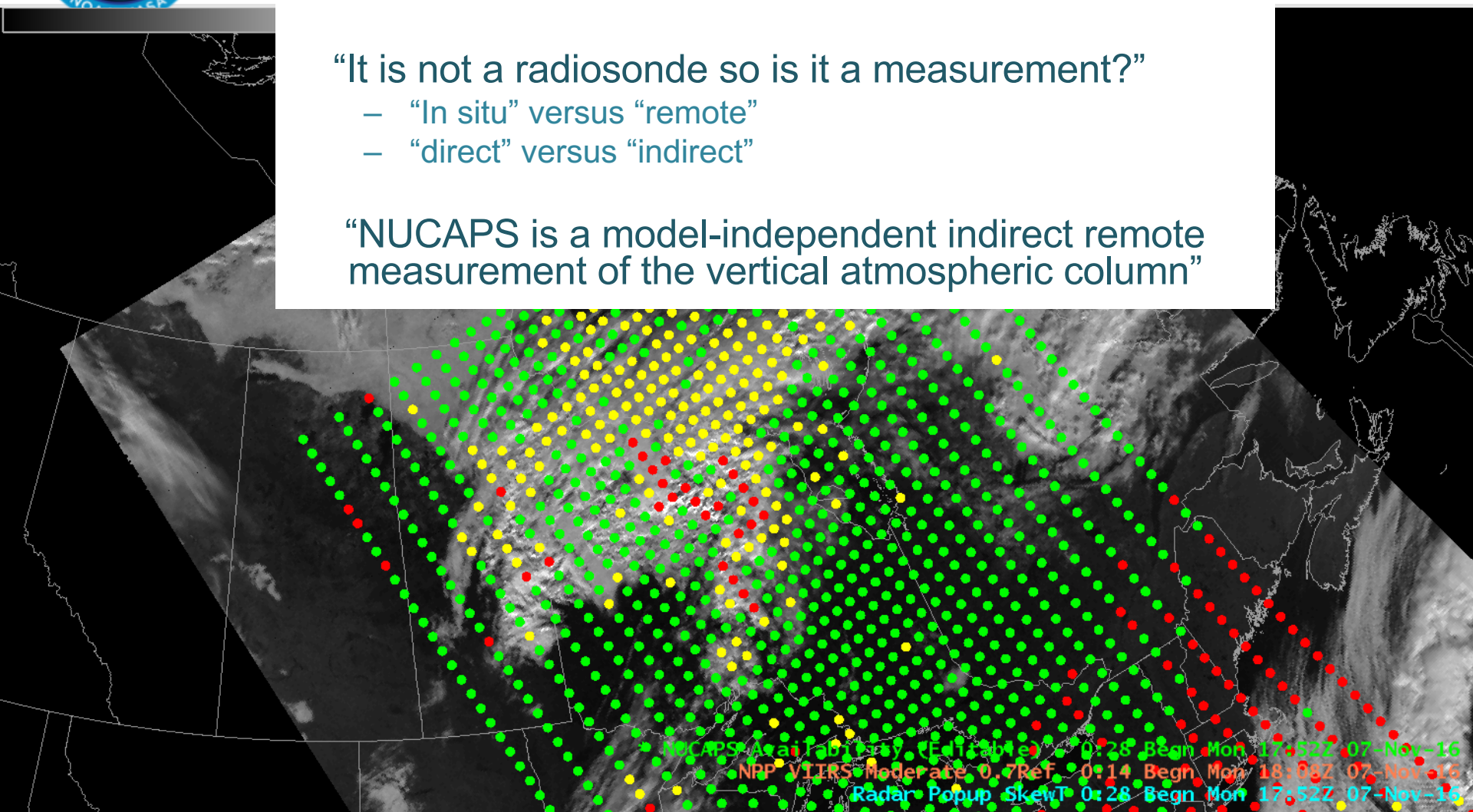


# What is Satellite Sounding?

“It is not a radiosonde so is it a measurement?”

- “In situ” versus “remote”
- “direct” versus “indirect”

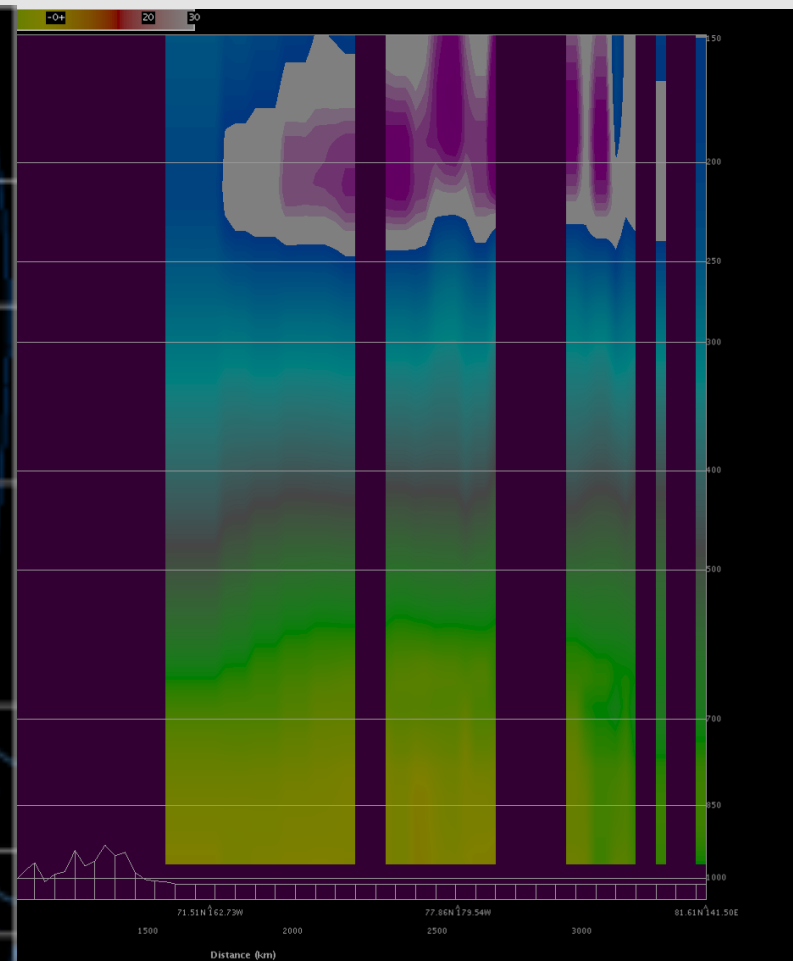
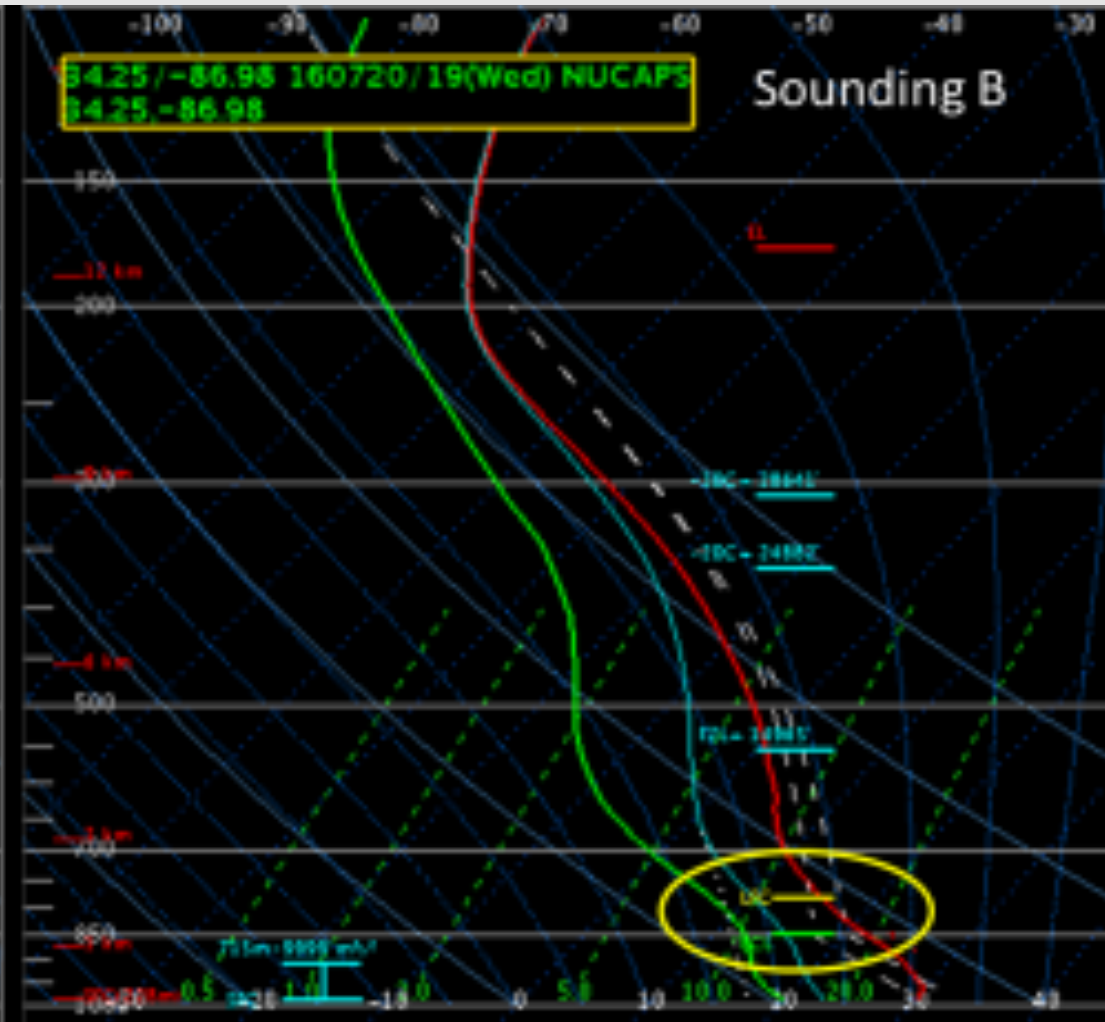
“NUCAPS is a model-independent indirect remote measurement of the vertical atmospheric column”







# What is Satellite Sounding?

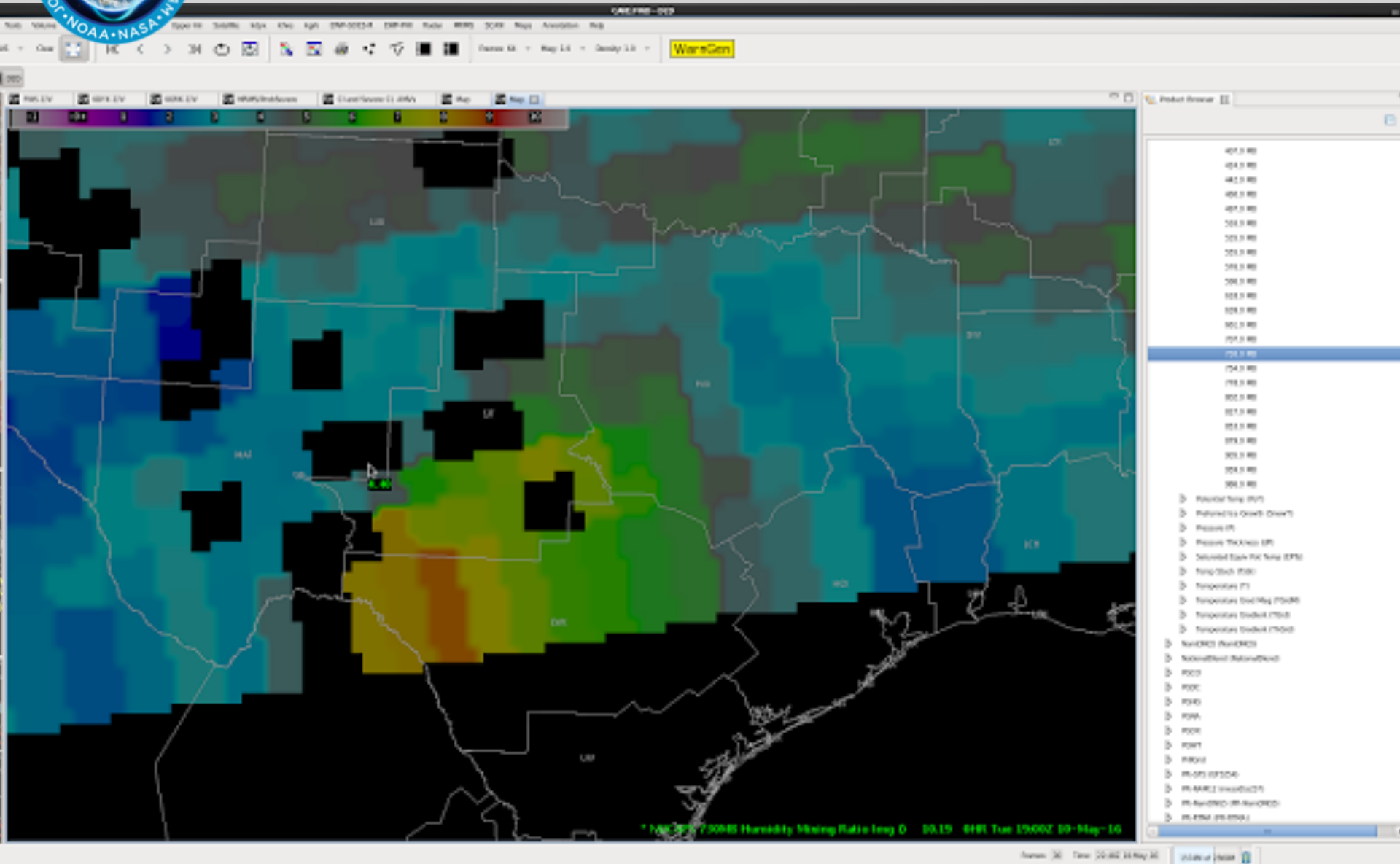


\* NUCAPS-ALASKA LineF Temperature (C) 08.17 0HR Thu 17:00Z 08-Dec-16





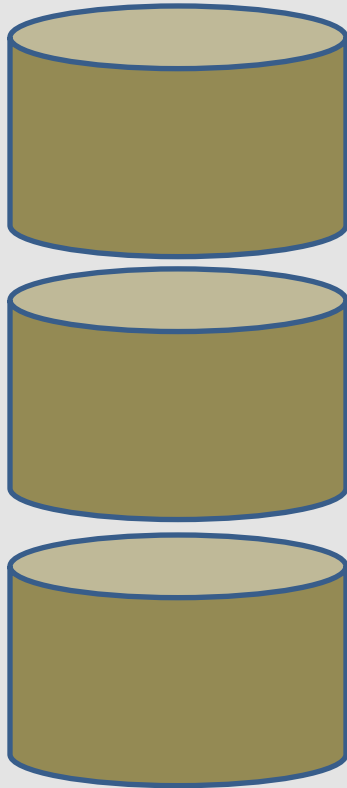
# What is a Satellite Sounding?





## Misunderstanding #2

### “NUCAPS profiles are volume measurements”



We mean to say that a NUCAPS profile is not point-source like radiosondes but instead a stack of thick layers as if a column

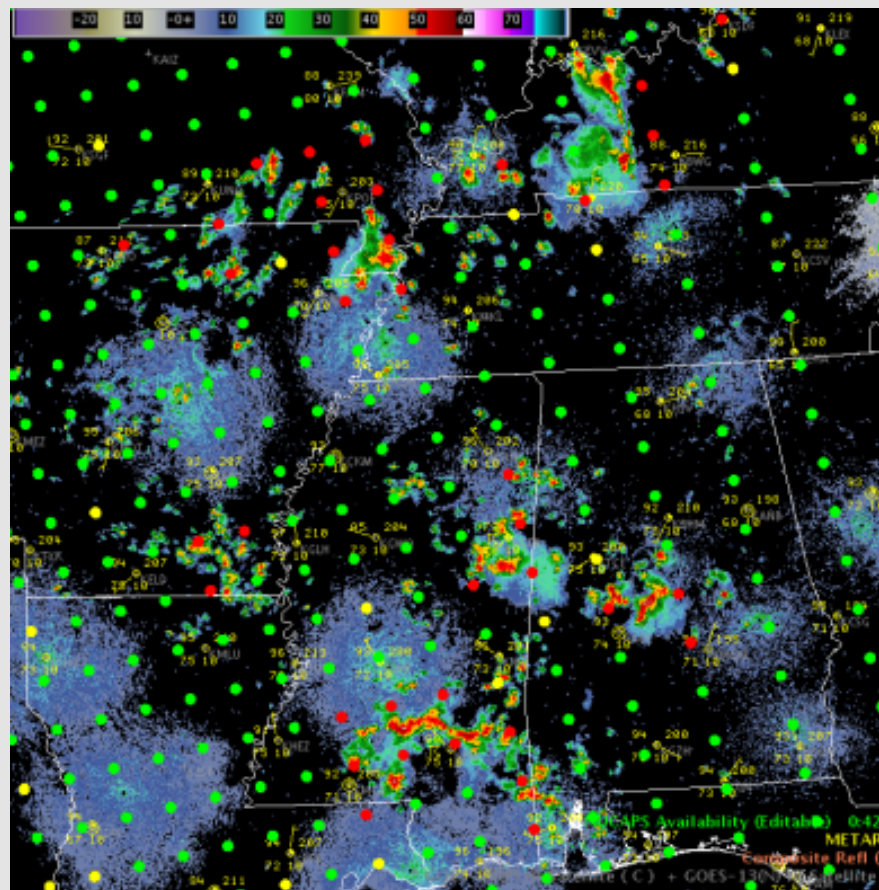
But to an atmospheric chemist this means something else altogether

Satellite sounding products serve a broad scientific community and we need to critically evaluate our own words to ensure we communicate effectively



# Misunderstanding #3

## “Cloud clearing”



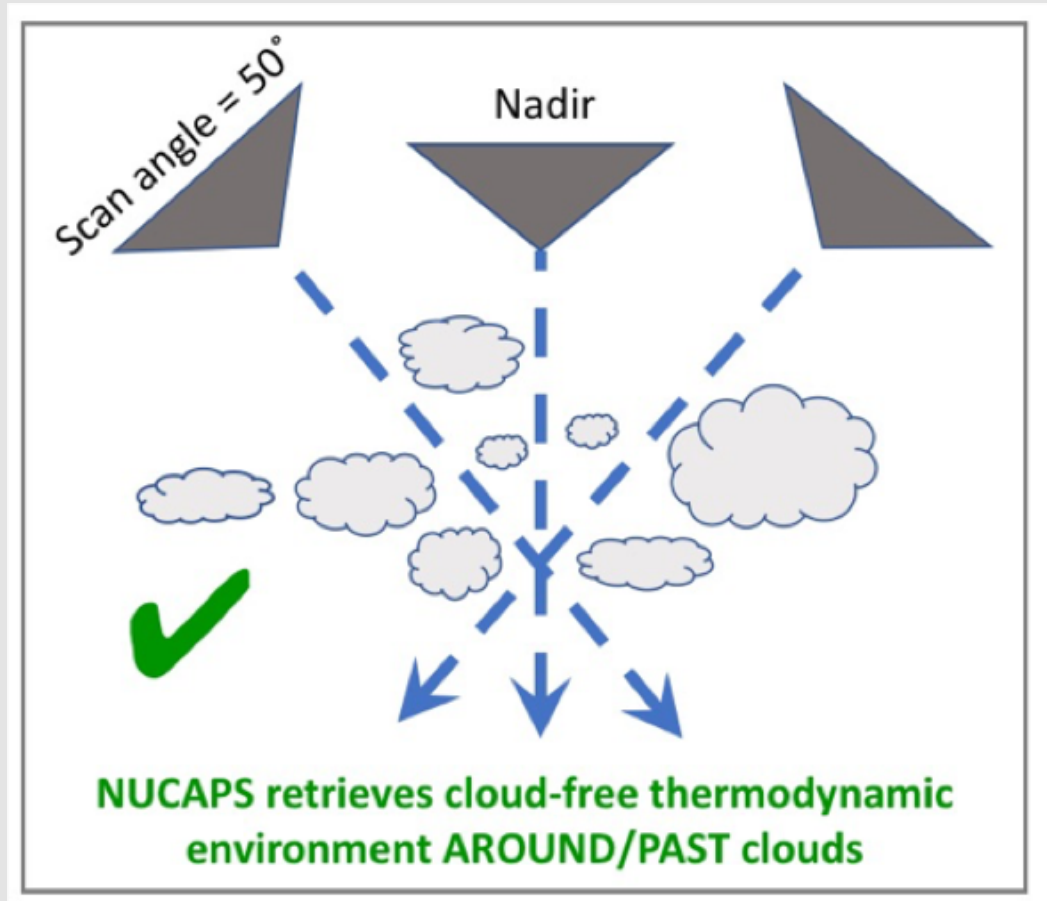




# Misunderstanding #3

## “Cloud clearing”

If you're retrieving soundings in cloudy fields, why don't I see a bump in the profile to indicate the environment inside the cloud?





# In the midst of a paradigm shift

- Working through **decades of miscommunication**, of talking past each other
- Willingness to ask fundamental questions:
  - “**Does this make sense to you?**”
  - Tell me what is wrong with this product, I will listen.
- **Learning to communicate anew**
  - To each other
  - To forecasters, disaster managers
  - Congressional staffers, Government agencies
  - General public

