

Socio-Economic Impacts in Policy Discussions *The U.S. Weather Enterprise & the Lower 50 GHz Band*

Global ITU/WMO Seminar on the Use of Radio Spectrum for Weather,
Climate, Water and Related Environmental Activities

29 September 2026

Supported by:



Renee A. Leduc
Founder & Principal
Narayan Strategy

Renee@narayanstrategy.com



Disclaimer:

The views and opinions expressed in this presentation are those of the presenter and do not necessarily reflect the official policy or position of the U.S. Government, the National Oceanic and Atmospheric Administration (NOAA) or the organizations noted in this presentation.

Passive Sensor Satellite Data: Critical to Numerical Weather Prediction

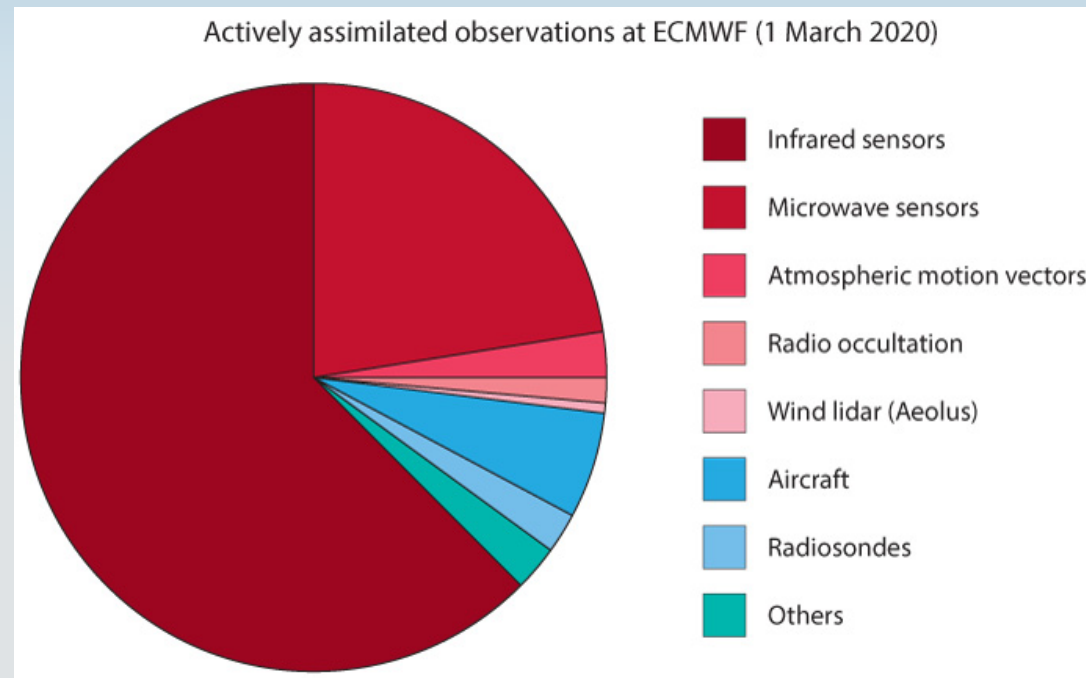


Source: NOAA

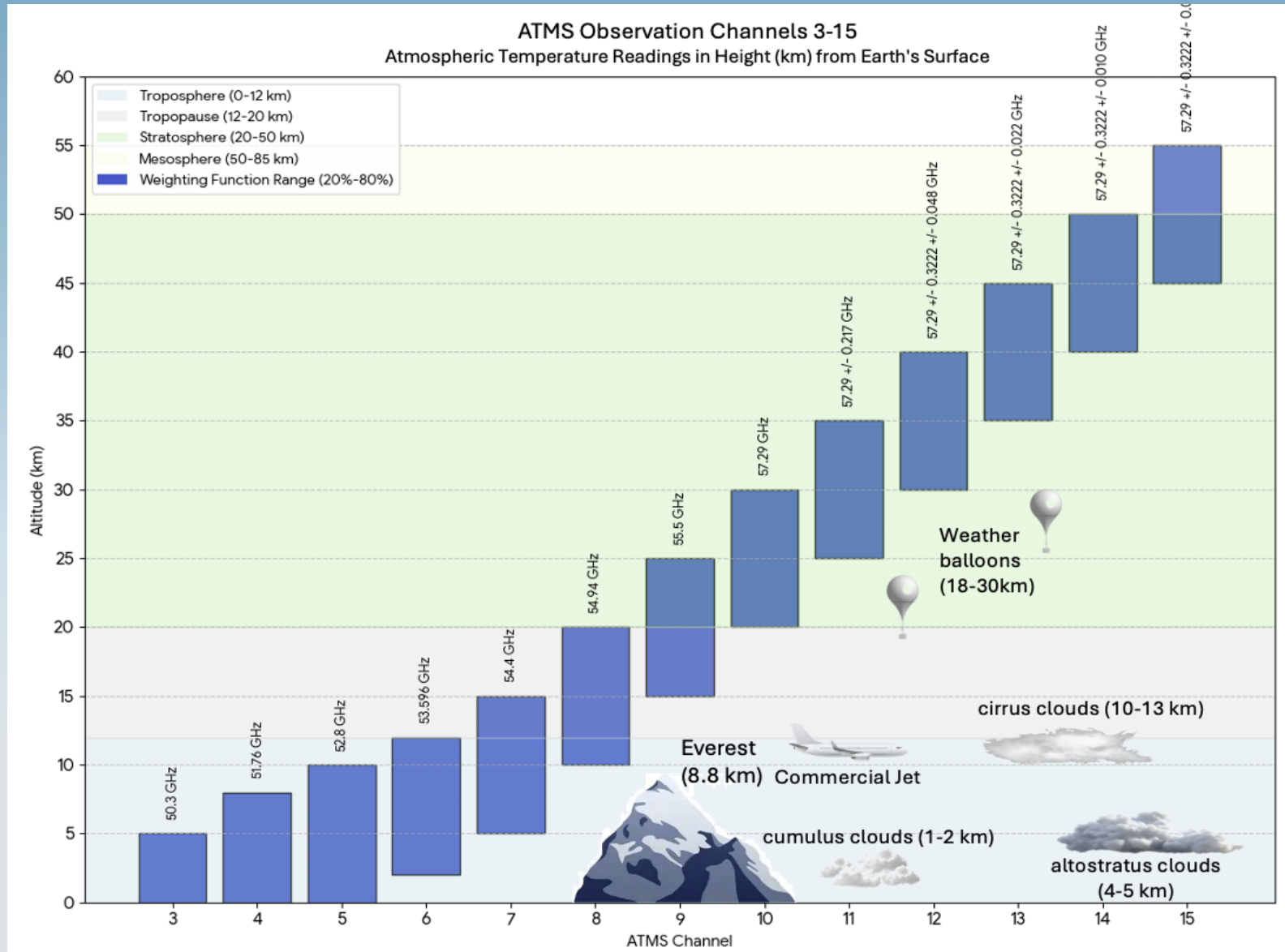
- 99% (approx.) of observations that modeling supercomputers receive originate from satellites
- After QA/QC, 90% (approx.) of observations assimilated are from satellites

- 15- 30% (approx.) of satellite observations assimilated into weather models are from passive microwave sensors

Sources: Jordan Gerth testimony to U.S. House Hearing, July 2021 (above)
Fact sheet: ECMWF's use of satellite observations (right)



The "Golden Bands" of Meteorology (50-58 GHz)

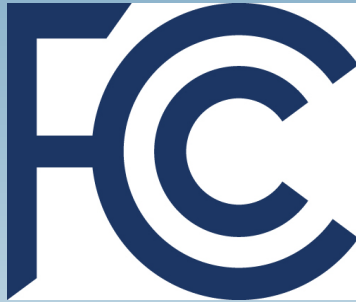


ATMS Channels 3-15, with atmospheric temperature heights for each unique center frequency/channel.

U.S. Weather Enterprise: Educating About Need for RF Spectrum for Weather Forecasts



“Unique” Structure of U.S. Spectrum Regulation



Federal Communications Commission (FCC)	National Telecommunications and Information Administration (NTIA)
Regulates <u>Public Use</u> of Spectrum	Manages <u>U.S. Government Use</u> of Spectrum
Independent Agency of Federal Government	Federal Agency
Managed by Five Commissioners (3 Majority Party, 2 Minority)	Managed under the U.S. Department of Commerce

Case Study:

2 Major FCC Proposed Rulemakings in 2025-6

1. Satellite Spectrum Awareness

Seeks to change rules about:

- ❑ 51.4-52.4 GHz,
- ❑ the so-called "W-band" at 92.0-94.0 GHz, 94.1-100 GHz, 102.0-109.5 GHz, & 111.8-114.25 GHz.

2. Facilitating More Intensive Use of Upper Microwave Flexible User Service(UMFUS)

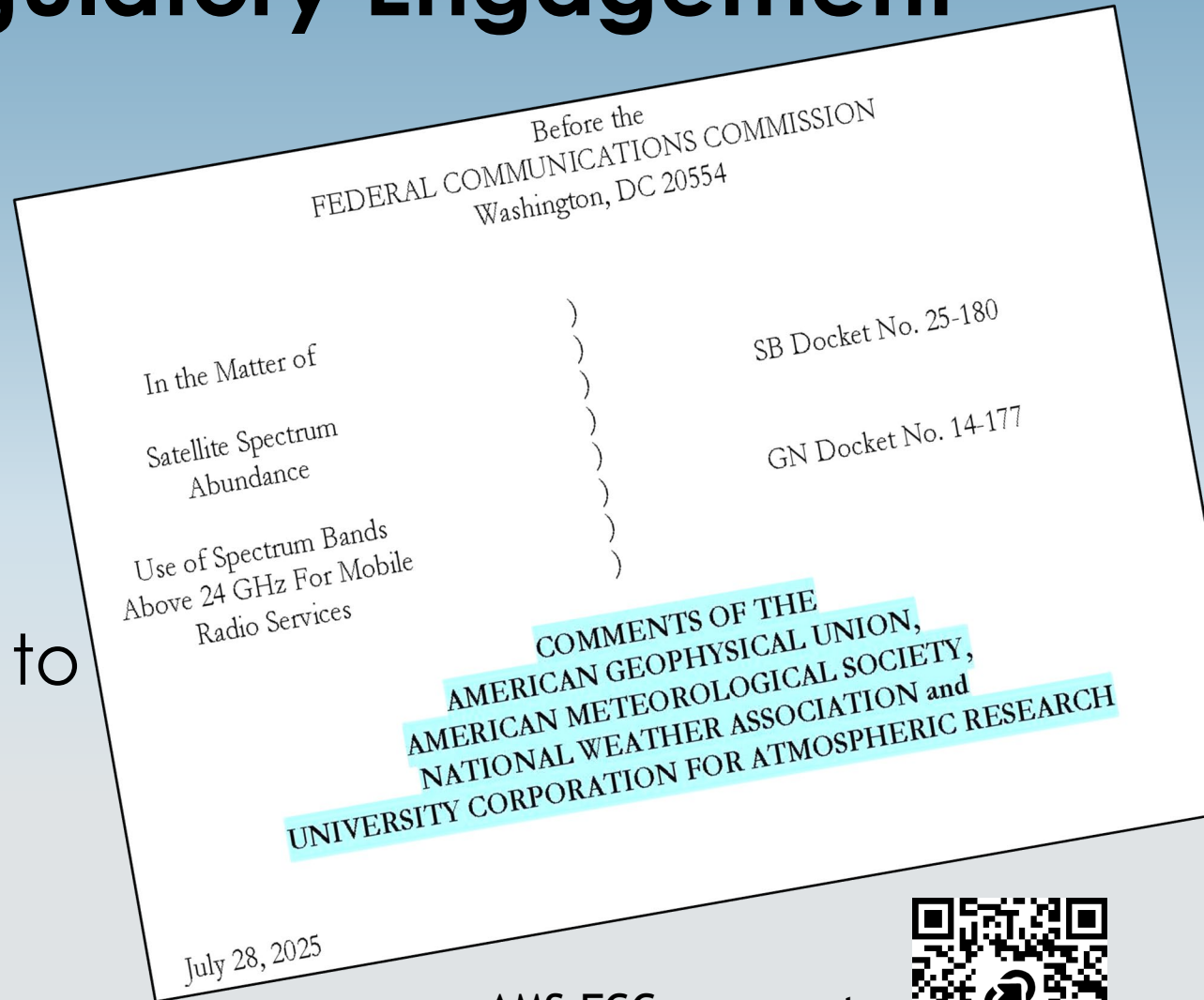
Seeks to change rules about:

- ❑ 37.7-38.6 GHz (upper 37 GHz band)
- ❑ 50.4-51.4 GHz (50 GHz band)



2025-6 Weather Enterprise U.S. Regulatory Engagement

- ☐ 4 Comments
- ☐ 2 Reply
Comments
- ☐ 4 In Person *Ex Parte* Briefings to
the FCC
- ☐ 1 Letter to U.S.
Congress



AMS FCC comments:



Who is the US Regulator Audience?

- **Mostly Attorneys or RF Engineers**
 - *Not atmospheric scientists*
- **Expertise in Communications Technologies**
 - *Limited remote sensing and passive sensing knowledge*
- **Satellite Broadband and Advanced Wireless Technologies are major national priorities in the US government**
 - *Limited knowledge of how/why weather forecasts require diverse spectrum resources*

Highlights of Weather Enterprise Comments to U.S. Regulators

- “Passive observations are not communications signals and are orders of magnitude weaker than typical communications links.”
 - Speak in terms that regulators resonate with
- “Information used from these bands provide value well beyond the U.S. government, including many weather-dependent industries, such as aviation, stadium event management and maritime shipping.”
 - Many do not realize that weather has a broad range of impacts across national and regional economies

Highlights: Big Picture Economic Perspective

Studies estimate **weather has a 3.4% annual effect on the U.S. economy.**

If that 3.4% is applied to the U.S. Bureau of Economic Analysis (BEA) 2024 GDP of 29.19 trillion, and nominal GDP estimates for 2025 will likely be about \$30 trillion, then **weather currently has an annual direct effect of approximately \$1 trillion on the nation's economy**, while indirect impacts on weather-impacted industries are far greater.

- Economic arguments drive spectrum decisions, remind of socio-economic value.

Highlights: Simplify Scientific Concepts

Measure the weak thermal emissions of the atmosphere?

- “The vibration of water molecules and oxygen due to temperature”
- “What most RF engineers call fluctuations in the “thermal noise floor.”

What are soundings or vertical profiles?

- Measurements of temperature or water vapor at many points in the atmosphere ranging from the ground to the edge of space

Why does it matter to measure these quiet emissions?

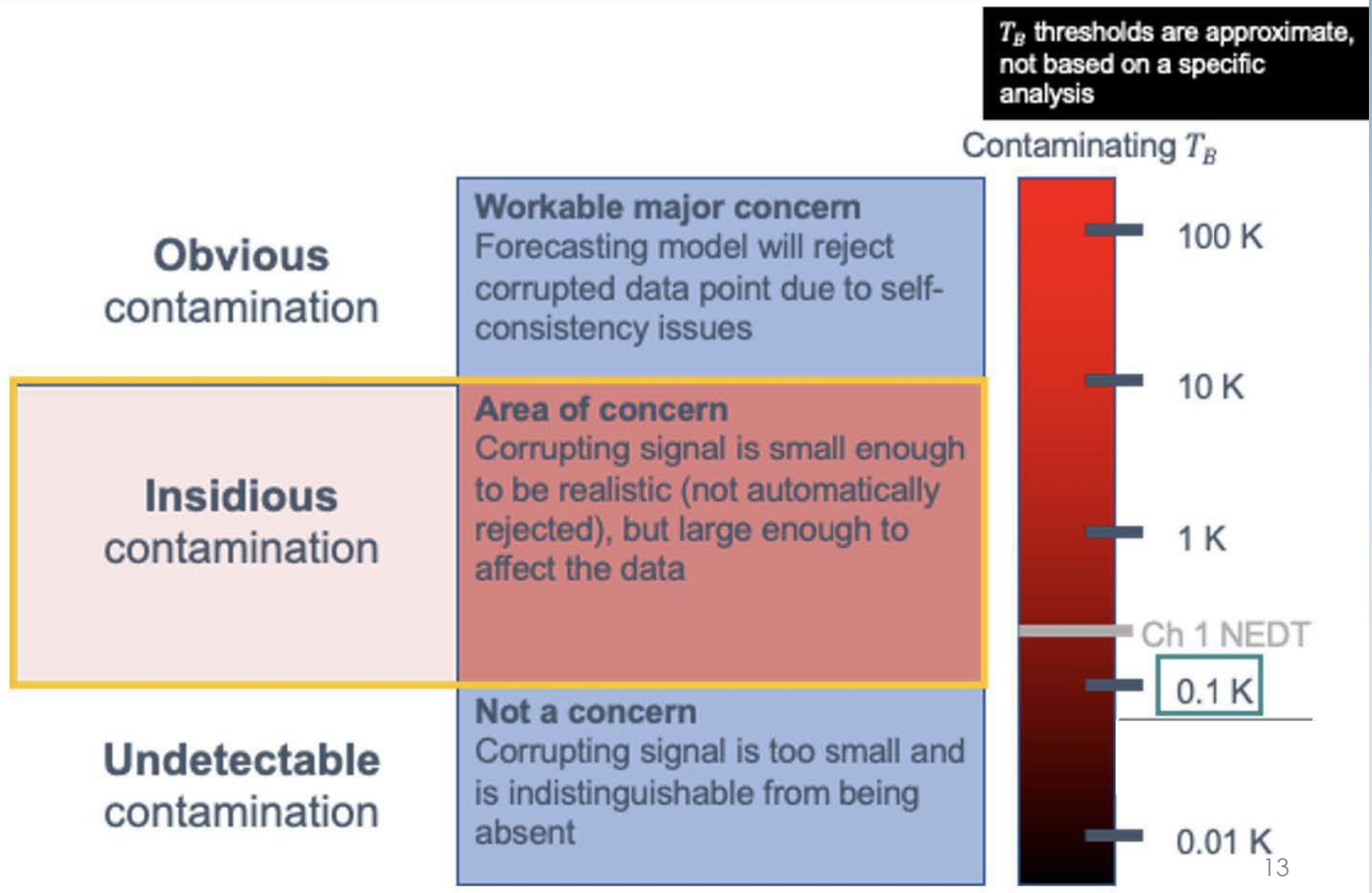
- “We can obtain a 3-D map of temperature and humidity worldwide.”

Why does this info really matter?

- “These crucial variables are the backbone of supercomputer models that allow forecasters to predict weather.”

Highlights:

Interference – Obvious, Insidious & Undetectable



Highlights: The Implications of Interference

"Interference into a single passive band undermines the value of the whole system since passive observations act as a system. Various passive bands provide complementary information on different atmospheric variables. Passive measurements in multiple bands must be considered in concert to obtain the most reliable atmospheric information. Thus, interference into a single band undermines the value of the complete observing system."

- U.S. regulators often claim meteorologists have "too many" spectrum allocations. But these observations cross-calibrate each other, so if one area is omitted, it impacts the quality of all of the data.

Highlights: Employ Past Weather Experiences

"Today, U.S. seven-to-ten-day weather forecasts are as accurate as three-to-five-day forecasts were 20 years ago.

Much of this increase in skill is directly attributable to enhanced satellite observations of the atmosphere from passive microwave sensors"

- Past severe weather experiences are strongly held. "Remember when...?" Weather forecast reliability is better than it was in the past.



Recommendations for Communicating with Spectrum Regulators

1. Know your audience. Adjust as you learn more. Consistency helps.
2. Economics drive national and international spectrum decisions – focus on the overall impacts of weather forecasting
3. Passive spectrum works as a system. It does not work to allow interference in “just a few” bands.
4. Regulator Meetings $\neq$ Science Conferences → Explain complex phenomena in terms non-scientists understand
5. Focus communications on the benefits from the satellite or instrument – rather than instruments themselves.

Socio-Economic Impacts in Policy Discussions

The U.S. Weather Enterprise & the Lower 50 GHz Band

Global ITU/WMO Seminar on the Use of Radio Spectrum for Weather, Climate, Water and Related Environmental Activities

29 September 2026

Thanks to AMS, AGU, GRSS FARS, NWA and UCAR for their persistence. Thank you to NOAA for the support. Appreciation to David Lubar, Jordan Gerth and Beau Backus.

Supported by:



Renee A. Leduc
Founder & Principal
Narayan Strategy

Renee@narayanstrategy.com

