

Will McCarty – Past Life

- PhD in Atmospheric Science, Univ. of Alabama in Huntsville
- Grad School at MSFC (2003-09)
- Postdoc (2009-10) and Civil Servant (2010-21) at NASA GSFC
- Observation Lead, Global Modeling and Assimilation Office
 - **Past Observations: Observation Lead for MERRA-2 Reanalysis**
 - **(Then-) Current Observations: Oversaw the integration of new observations into GEOS Forward Processing system**
 - **Future Observations: Observing Simulation System Experiments (OSSEs) targeting next-generation observing systems**
 - **Experience in most atmospheric conventional and satellite data**
- First Project Scientist, Commercial Satellite Data Acquisition Program
 - **Oversaw pilot evaluation of Spire radio occultation data**
 - **Part of team that grew pilot to established program**

Will McCarty – Current Life

- Started at headquarters in 2022 as the successor to Gail Skofronick-Jackson
 - **Program Manager for Weather**
 - **Program Scientist for Weather Satellites**
- For first two years, served as first Program Scientist for CSDA Program before handing off to Melissa Martin
 - **Competed 3rd Vendor Onramp Evaluation, 2nd Data Analysis ROSES elements**
- Broad scope of experience has translated to having Program Science responsibilities for multiple missions
 - **FALCON (Lidar, Radar, Radiometer, Integration), INCUS, PoISIR, TROPICS, CYGNSS, Aqua, Terra, Suomi NPP, GPM, JAXA PMM, ISS-LIS**
- Key role in potential future missions through the Decadal Survey Incubation (DSI) line for the Planetary Boundary Layer
 - **From pre-2017 Decadal Center-based team at GSFC --> PBL Incubation Study Team --> HQ Program Scientist**

Justin Stachnik – Past Life

- PhD in Atmospheric Science, Texas A&M University
- Joint postdoc at NASA JPL and UCLA
 - **Technically in AIRS group but more aligned with Atmospheric Physics and Climate**
- Faculty at the University of Kansas (2016-2024)
 - **Director of Clouds, Climate, and Precipitation Group**
 - **Broad teaching portfolio for all things weather and remote sensing (8 preps as an Assistant Professor!)**
- Expertise in Tropical Meteorology and Weather/Climate Physics + Dynamics
 - **Publications on variability of tropical precipitating systems and dynamics ranging from cloud clusters, mesoscale convective systems (MCSs), and easterly waves**
 - **Large-scale focus on convective coupled equatorial waves, the Intertropical Convergence Zone, and Hadley circulation**
 - **Other work on aerosols and aircraft icing, convective microphysics and hailstorms, and geoscience pedagogy**

Justin Stachnik – Current Life

- Assoc. Program Scientist at NASA HQ (Jan. 2024)
 - Originally in Weather and Atmospheric Dynamics Focus Area (with Tsengdar Lee and Will McCarty)
 - Now dual-role in Atmosphere (Atmospheric Physics) and Hydrosphere (Precipitation Science)
- Backup/support for current and future missions including Aqua/AIRS, GPM, CYGNSS, TROPICS, INCUS, PoISIR, FALCON, and DSI-PBL
 - Suborbital efforts including NURTURE
- Other Select Responsibilities
 - Peer-review panels (thank you, reviewers!)
 - HQ Thematic Lead for Satellite Needs Working Group
 - ESSRP website development and maintenance
 - Managing new/existing awards and interacting with PIs and science/DART teams



Precipitation Science as a Research Program

Precipitation Science will always be tied to orbital missions

- **Orbiting, planned, and what's possible**
- **The timescales of precipitation require a constellation mentality**
- **How is the program of record changing?**
- **How can we influence the future program of record? Small buses, new buses, new/more spectral coverage, traditional vs. commercial data, etc.**

General Science Themes

- **Reduce uncertainty!**
- **What can only NASA do?**
- **How to we bridge observations, models, and emerging data science techniques**
- **Always leave room for new ideas!**

Annual ROSES elements – three themes on a “rotating” cycle

- **Data analysis**
- **New & innovative methods**
- **“Potpourri”**

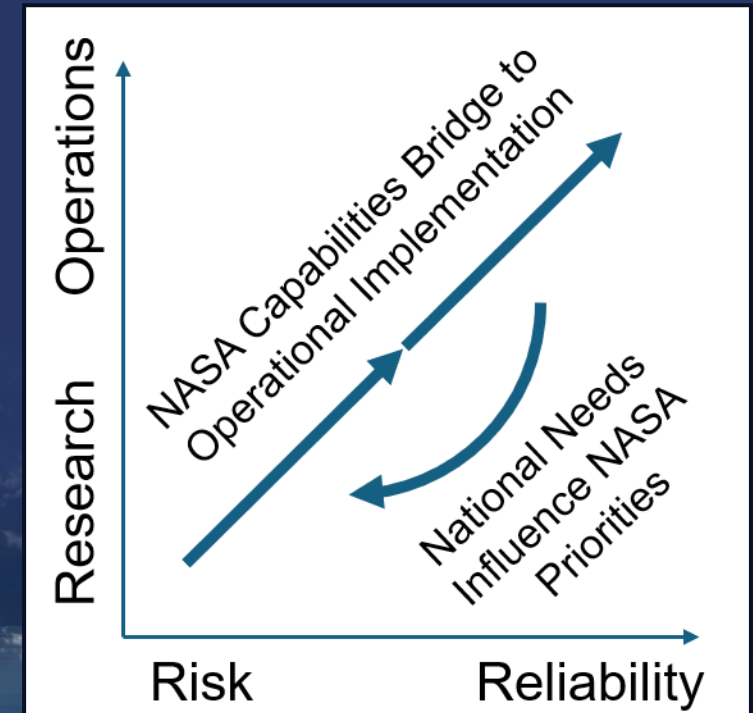
Precipitation Science in the Earth Science Division

How do we advance Earth Science (within ESD)

- **Work hand-in-hand with ESTO to align research priorities with emerging technologies, and to identify investments that align with the largest sources of uncertainty**
- **Understand the needs (and shortcomings) of our end-users with Earth Action programs**
- **Maximize scientific return on our flight programs by implementing a cross-mission strategy**
- **Make advancements aligned with the evolving data systems and emerging data science methods**

Engage the larger enterprise

- **Our observations are important beyond NASA**
- **Our organizational structure is unique, our advancements affect everyone**



Fleet for the Atmosphere Linking Commercial Observations with NASA FALCON

PMM (JAXA/GSFC)

Precipitation profiles

FALCON-Lidar (GSFC/LaRC)

Atmospheric structure and composition measurements

FALCON-Radar (JPL)

Cloud profiles to improve understanding of severe weather drivers.

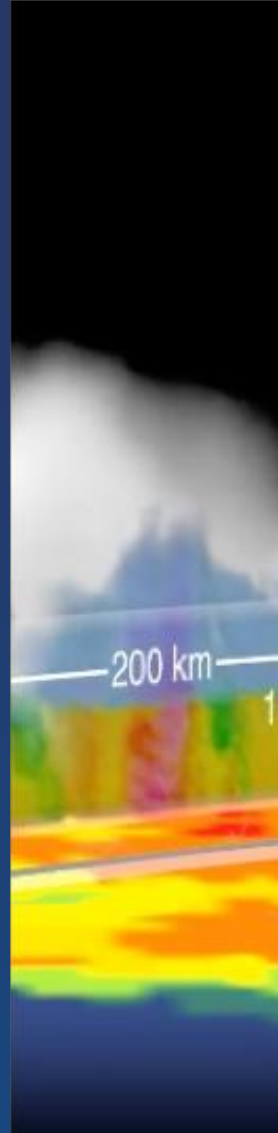
FALCON-Radiometry (Commercial)

Seeking commercial options to extend microwave radiometry to the constellation

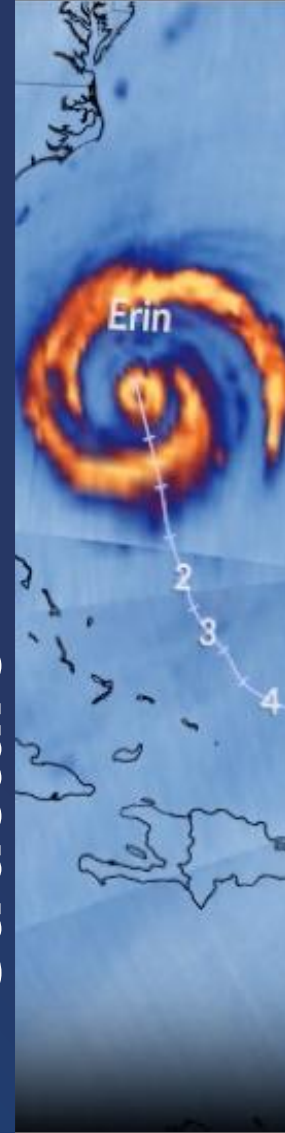
Joining the FALCON fleet

- INCUS (CSU/JPL)
- PoSIR (Vanderbilt/GSFC)
- STRIVE (UW/GSFC)

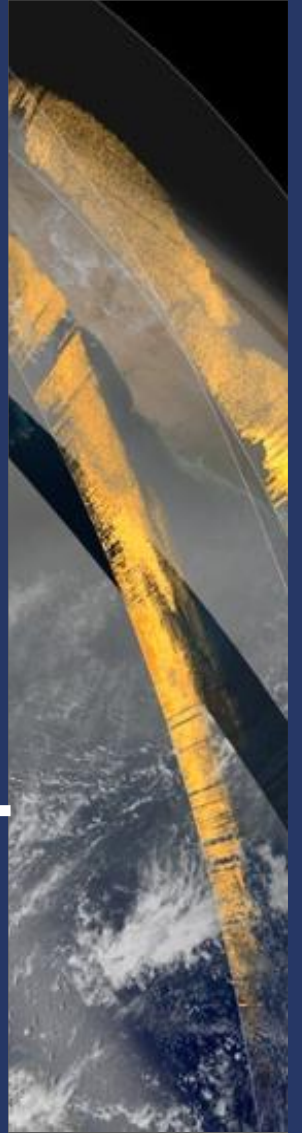
Profiles



Structure



Composition

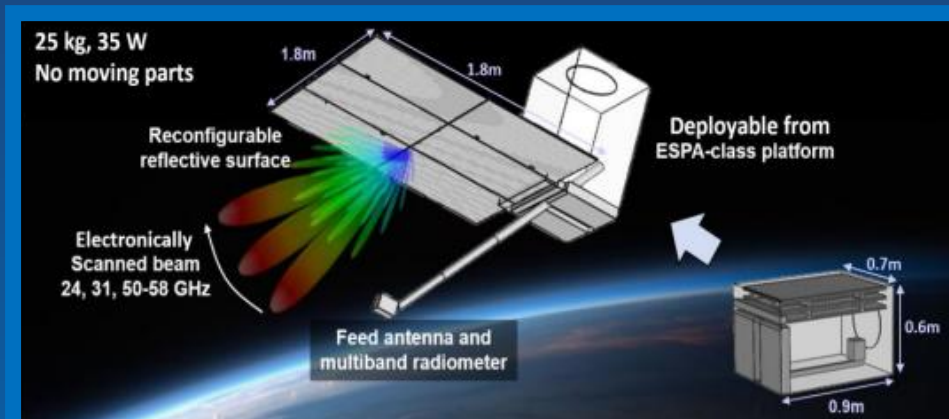
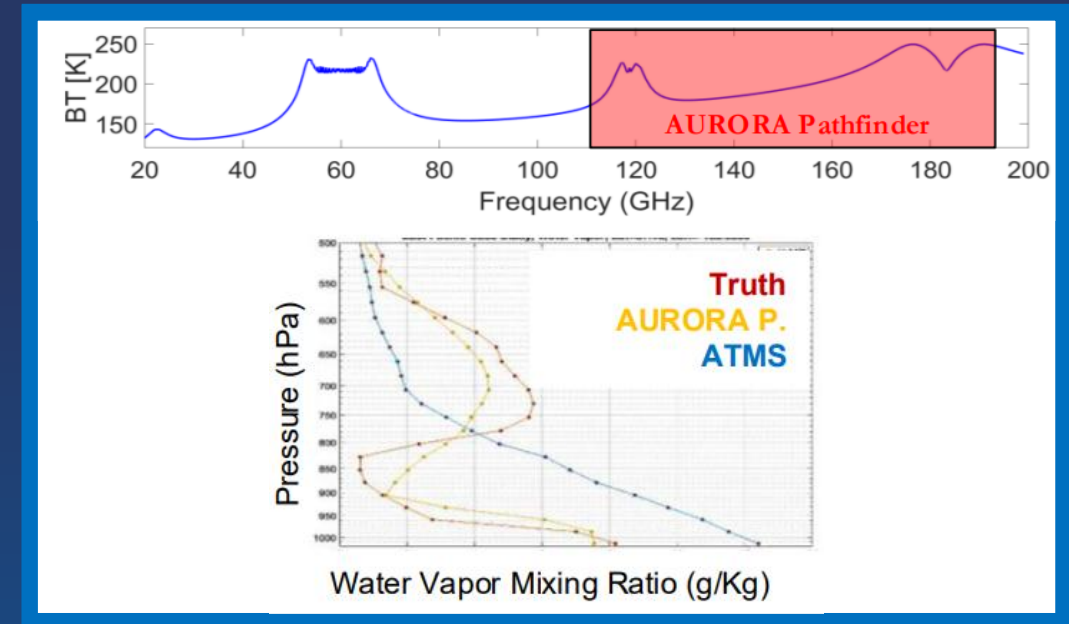


A Selection of Precip-Relevant Investments

ESTO Advancing Precipitation

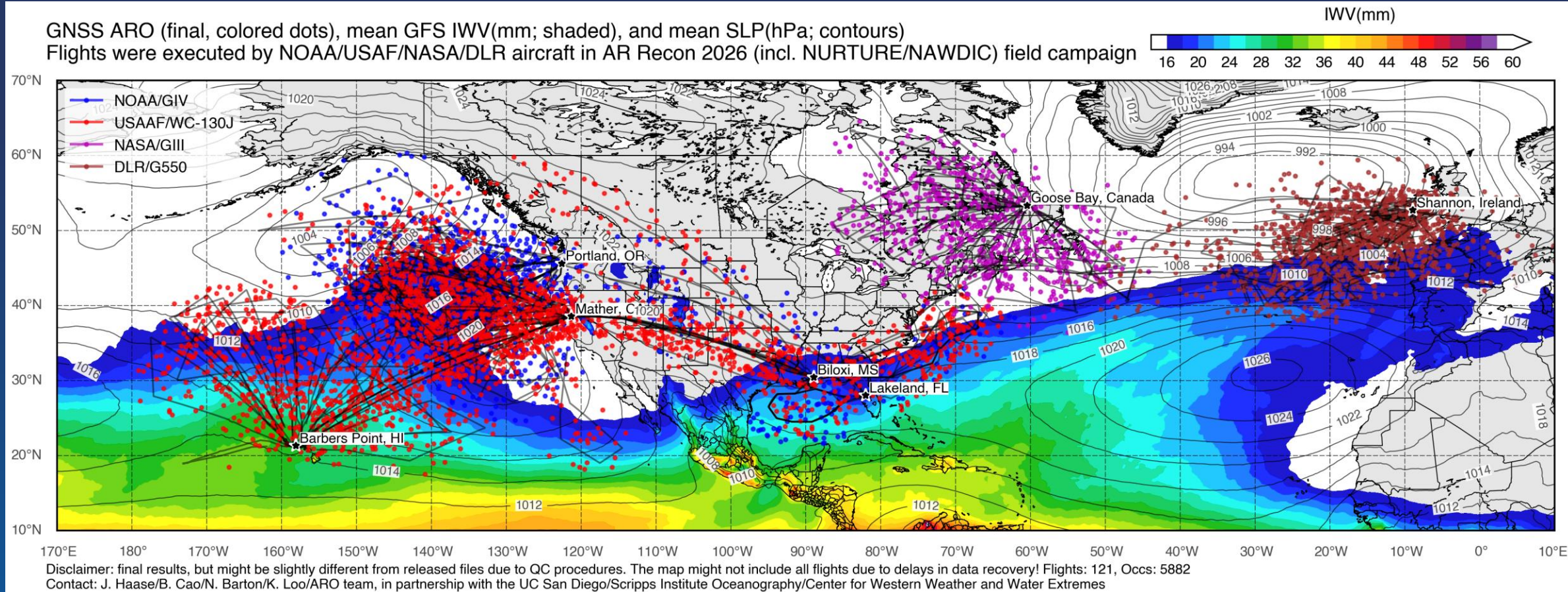
Advanced Ultra-high Resolution Optical and Radio frequency (AURORA) Pathfinder

(NASA GSFC) First-of-its-kind space-based hyperspectral microwave sensor to demonstrate the use of microwave components interfaced with photonic integrated components (PICs) and spectrometer Application Specific Integrated Circuits (ASICs) to sense Earth microwave radiation within the range of ~110-192 GHz



CREWSR: Configurable Reflectarray for Electronic Wideband Scanning Radiometry

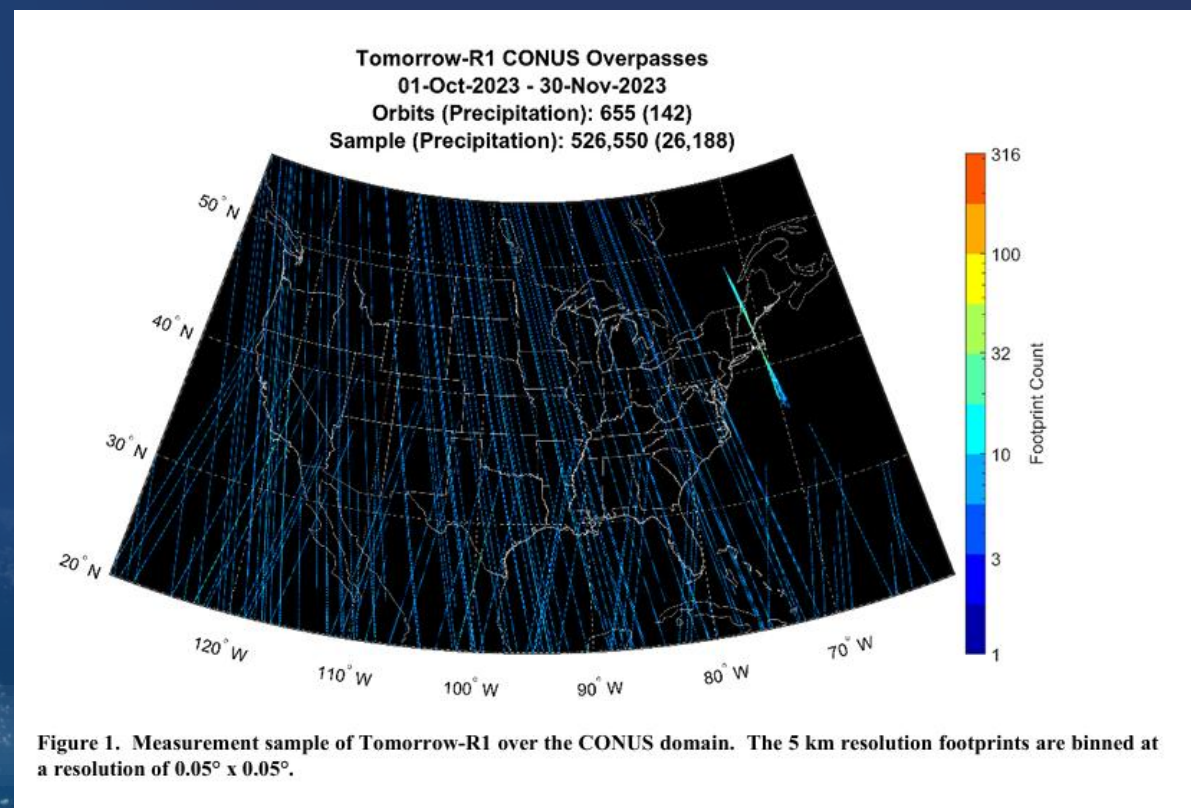
(MIT Lincoln Lab) CREWSR is a very large, scalable, lightweight, deployable apertures for multi-band microwave remote sensing. It enables a wide range of Earth science observations, including wind sensing, polarimetric imaging, soil moisture and sea-surface measurements, and atmospheric sounding.



NURTURE 26 was part of the Global Atmospheric River Reconnaissance Program (GARRP), which coordinated field efforts from NOAA (AR-Recon), Europe (NAWDIC), and NASA for hemispheric-wide observational coverage

Tomorrow.io Pathfinder Precipitation Radar Archive

- **Extensive Data Collection:** Over 7,250 data granules from Tomorrow.io's Pathfinder radars (R1 & R2), covering multiple annual cycles and diverse geographic regions. Initial deliveries included 1,046 files each for Level 1 GEOPROF, Level 2 PRECIP, and AUX products.
- **Seasonal and Spatial Sampling:** The archive now spans several seasons, enabling analysis of precipitation variability across different times of year. Spatial coverage is broad but limited by radar swath width, with most routine tasking focused near the Equator and midlatitudes.
- **Collocations with Other Sensors:** Coincident measurements with other NASA assets and Tomorrow.io sensors, enhancing data value through cross-platform comparisons.
- **Expanded Observation Modes:** Beyond precipitation sensing, the archive includes passive brightness temperature sensing, altimetry, high sensitivity measurements, and onboard processing for larger data downlinks.



Quick Takeaways

What can only NASA do?

- Administration prioritizing discovery
- What don't we know?
- We should take risks – what risks can we take?

While times have been uncertain, there vector is coming into focus

- FALCON provides a constellation to plan toward
- FALCON will enable further exploitation of the program of record beyond the core constellation

What do we need from you?

- How do we better contribute to intra-sphere and inter-sphere scientific research and discovery?
- How to we continue to support our downstream users?



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