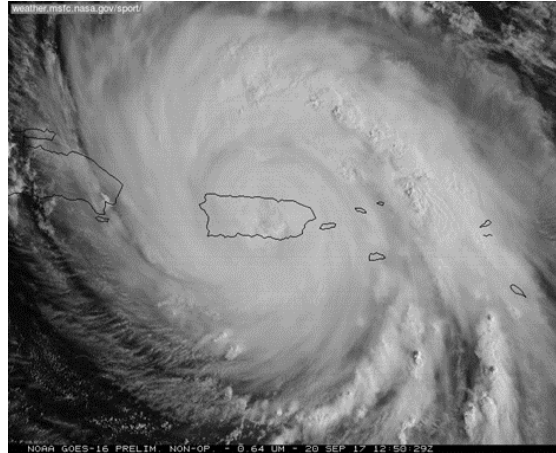


**NASA Science Mission Directorate
Earth Science Division
Applied Sciences Program**



18C.6: NASA TROPICS Applications and Early Adopter Program

Emily Berndt (NASA/MSFC) TROPICS Deputy Program Applications Lead

Jason Dunion (UM/NOAA/AOML), Bill Blackwell (MIT LL), Scott Braun (NASA/GSFC),

David Green (NASA/HQ) Disasters Program Manager and TROPICS Program Applications Lead

Presentation to the 34th Conference on Hurricanes and Tropical Meteorology

TROPICS Applications & Early Adopter Program



The goal of the TROPICS Applications and the Early Adopter program is to understand and demonstrate the utility of TROPICS data before launch and accelerate post launch integration of TROPICS observations in applied-research and operations.

Objectives

1

Identify applied research and applications areas relevant to TROPICS

2

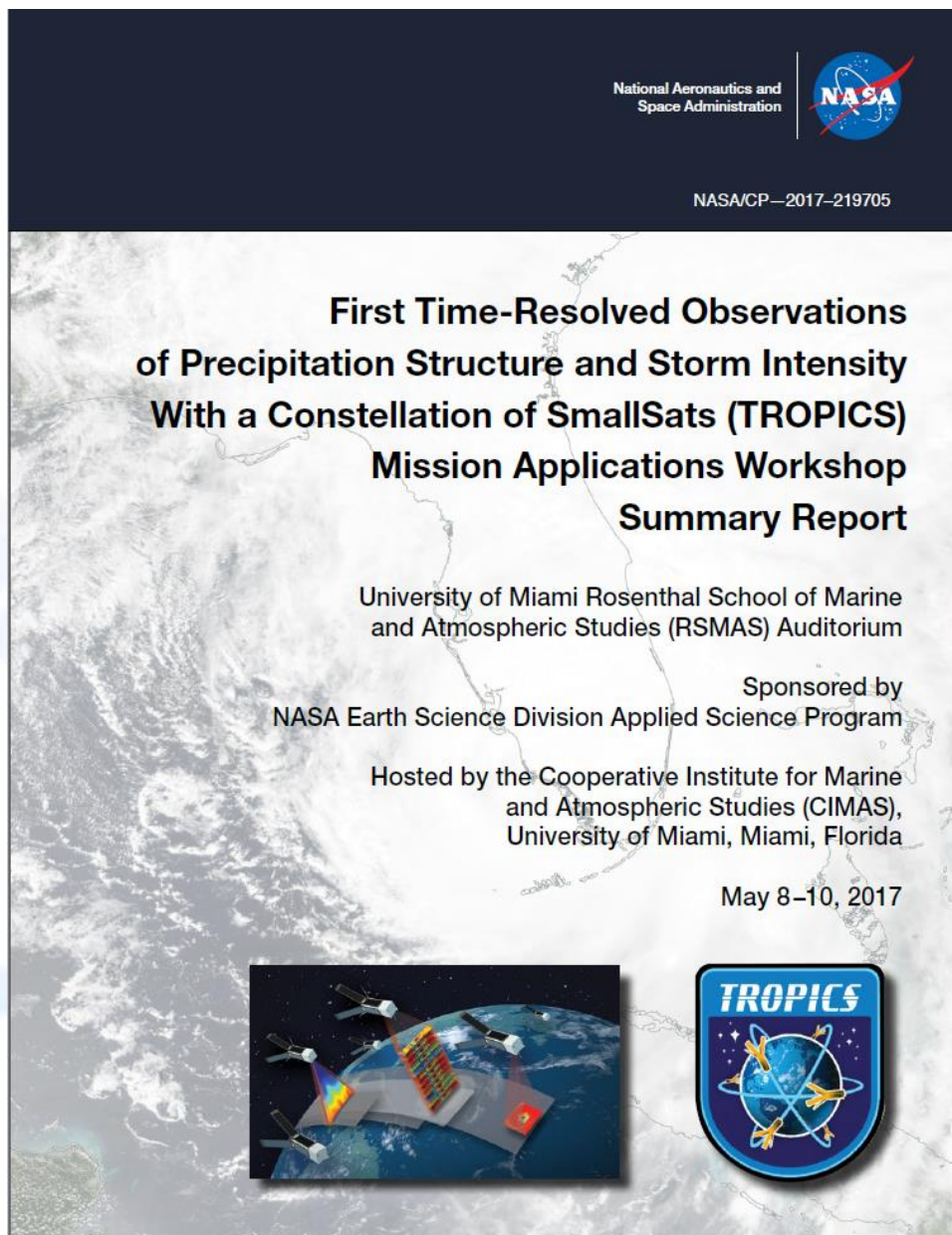
Use current sensors and proxy data to demonstrate TROPICS capabilities and value

3

Foster interaction between the Science Team and applied research / operational communities



First TROPICS Applications Workshop



- **Meeting Objectives**

- Introduce a broad community of potential end-users to the expected value of TROPICS by reviewing mission specifications and status
- Review TROPICS data applications through presentations and breakout discussions
- Provide a forum for applied researchers and operational decision makers to share insight into how observations from TROPICS can be used in their organizations and challenges to their application
- Begin establishment of a user community that can be used to highlight potential TROPICS applications and accelerate post-launch applications

[Full Workshop Report Available Online](#)



Meeting Take-Aways



- **Four application areas were identified and reported on:**
 - Terrestrial: high-temporal resolution precipitation data can supplement tropical regions that lack ground-based radar coverage
 - TC Analysis and Nowcasting: providing mission observations and imagery to operational hurricane forecasters who rely on satellite data to diagnose storm structure
 - TC Modeling and Data Assimilation: increased temporal frequency when used with 4DVAR techniques may aid in improving intensity forecasts
 - Tropical Dynamics: applied research to determine convective extremes and trends in precipitation and severe storms not resolved well enough with current temporal frequency of observations
- **End-users want temporal refresh of 30 – 60 minutes to address research and forecasting challenges related to tropical cyclones; more than 3 hours doesn't add to current datasets**
- **Most users want data latency of < 1 hour; > 3 hours makes data difficult to use for operations**
- **Mission data need to be provided in data formats compatible with user modeling and decision support systems**

Applications Focus Areas & Projects



Terrestrial / Disasters



Tropical Cyclone Analysis and
Nowcasting



Tropical Cyclone Modeling
and Data Assimilation



Tropical Cyclone and Tropical
Dynamics

Example Projects:

Ana Barros
Duke University

“Improve QPE forecasts,
flashflood and landslide
prediction”

Daniel Vila
National Institute for
Space

“Improved rainfall
retrieval to monitor
tropical convective
lifecycle”

Niels Bormann
European Centre for
Medium Range Weather
Forecasts

“Assimilation into global
NWP modeling systems
to improve analysis and
forecasts of humidity,
clouds, wind, and tropical
cyclone prediction

Hui Su
Jet Propulsion Laboratory

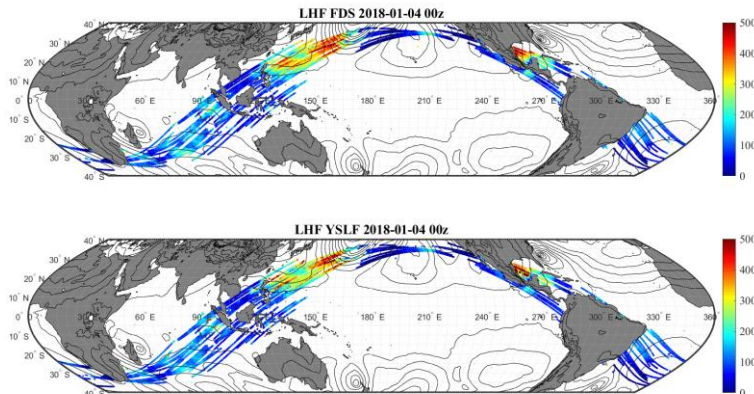
“Improve statistical
analysis (SHIPS) of
tropical cyclone structure
and rapid intensification”

All 20 Early Adopter Projects are listed on the TROPICS Applications webpage

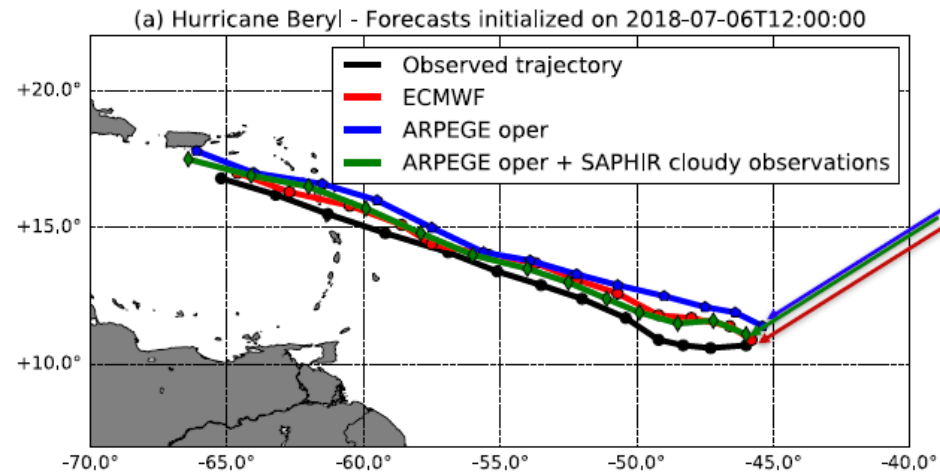
Quarterly TROPICS Applications Telecons



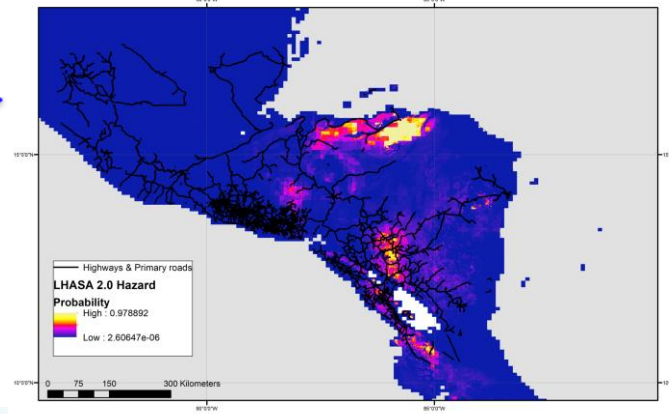
An Opportunity for the community of end users to hear mission updates, learn about products and planned calibration/validation, engage in presentations relevant to TROPICS applications, and discuss synergy with other NASA missions



CYGNSS can provide
surface heat flux
observations
Juan Crespo (JPL)



Discussing current and
future modeling and data
assimilation impact and
strategies
Philippe Chambon
(Meteo-France)



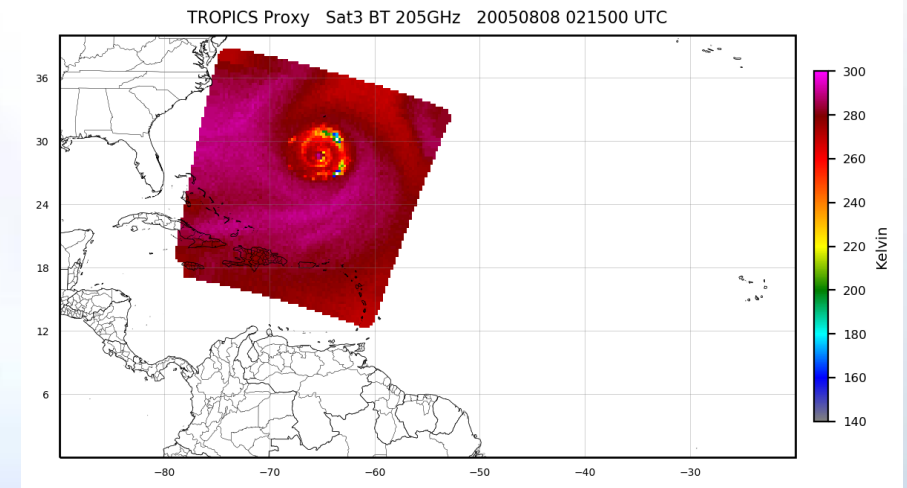
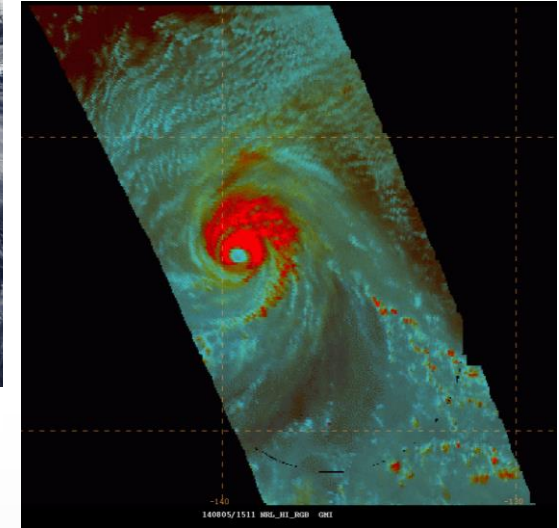
GPM Precipitation
informs Landslide
Hazard and Disaster
Response
Robert Emberson
(GSFC)

Second TROPICS Applications Workshop



- **Meeting Objectives**

- Introduce end-users to expected value of TROPICS by reviewing mission specifications and status
- Engage the end-user community to learn how TROPICS observations could be used by their organizations and barriers to data use
- Provide an opportunity for the early adopter community to share results with current and/or proxy data, communicate challenges, successes, and future needs to the science team
- Identify technical and visualization needs that can be addressed by the science and applications community (e.g., data assimilation, Level 3/Level 4 products, visualization tools) to accelerate broad utilization of TROPICS data post launch



[Full Workshop Report Available Online](#)



Meeting Recommendations



- **Improved data latency** (e.g., less than 3 hours; optimally <1 hour) beyond mission requirements is strongly desired
- **Launch of the 7th TROPICS qualification unit** as an early pathfinder mission will enable preliminary integration into algorithms, end user applications, and data assimilation systems as an opportunity to create the needed infrastructure for the full mission and accelerate post-launch activities
- **Development of a variety of formats and visualizations** will enable broad use of TROPICS observations. The greatest needs to consider pre-launch include BUFR format, AWIPS visualization, and NASA WorldView integration
- **Short, applications-based training on TROPICS basics and new capabilities** will enable users to understand strengths/limitations of the data and adopt TROPICS observations into operations
- Understanding the relationship of the remote sensing, detected features, and associated phenomena can be used to **understand new capabilities of TROPICS** and to create targeted training material for the community of end users

Benefit and Impact of Improved Latency



How Latency Drives Applications

Summary of 2020 Applications Workshop

Long-term Decisions

6-12 hour latency

- Research studies
- Improve Algorithms
- Model Verification
- Disaster Relief & Preparedness

Short-term Decisions

3-6 hour latency – Operational Analysis

- Operational Hurricane Forecasting
- Operational Weather Forecasting
- Operational Data Assimilation

Time-critical Decisions

1 hour latency – Time Critical Decisions

- Weather Nowcasting/Warnings
- Ingest in Rapid Update Models
- Disaster Warning, Evacuation, Response, Mobilization



Philippe Chambon: If latency < 4h, all data can go into the DA, > 10 hours no data can be used



Jack Beven : Data latency of more than 3 h rapidly decreases the real-time utility of the data as NHC is moving into the next advisory cycle. Please make every possible effort to get this data to the forecasters in real time!



Neils Bormann: For mesoscale operations, 120-180 minutes is latest cut-off for real-time integration. For global modeling, 3-6 hours may be more acceptable.



James Darlow: Data latency is important: Data must be in the hands of the forecaster < 6 hrs < 3hrs is highly desirable

Summary



- The goal TROPICS Applications and the Early Adopter program is to understand and demonstrate the utility of TROPICS data before launch to accelerate post-launch use of the data.
- A 2017 Applications Workshop resulted in 4 main TROPICS Applications focus areas the development of an Early Adopter Program.
- Workshops and Telecons offer opportunities for the community of end users to interact with the science team, get mission updates and access to proxy data, as well as learn about expected data formats and visualizations.
- Consistent stakeholder feedback has led to actionable recommendations for the science team to consider implementing to increase use and benefit of the TROPICS mission data.



For more information see the [TROPICS Applications webpage](#) or contact emily.b.berndt@nasa.gov