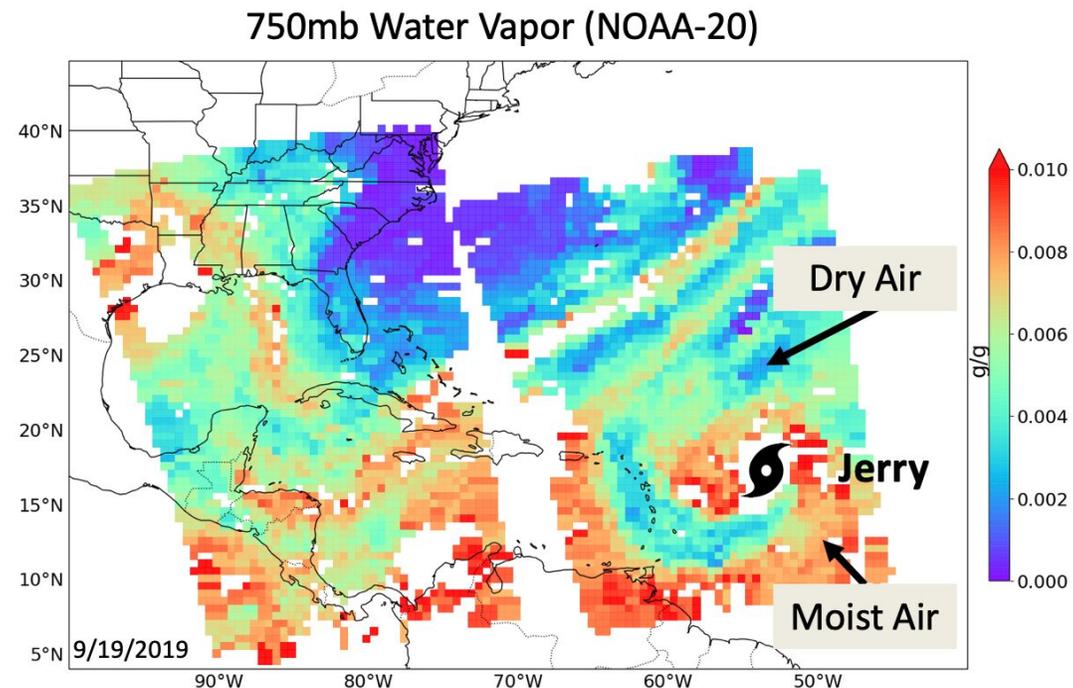
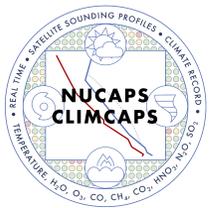


Adapting Satellite Soundings for Monitoring the Tropical Cyclones within the Intensity Forecasting EXperiment (IFEX) and JPSS Proving Ground

Rebekah Esmaili¹, Nadia Smith¹, Christopher Barnet¹, Jason Dunion², Jonathan Zawislak², Erika Duran^{3,5}, Emily Berndt^{4,5}, Jeff Szkodzinski¹, Michael Folmer⁶, Lihang Zhou⁷, Mitch Goldberg⁸

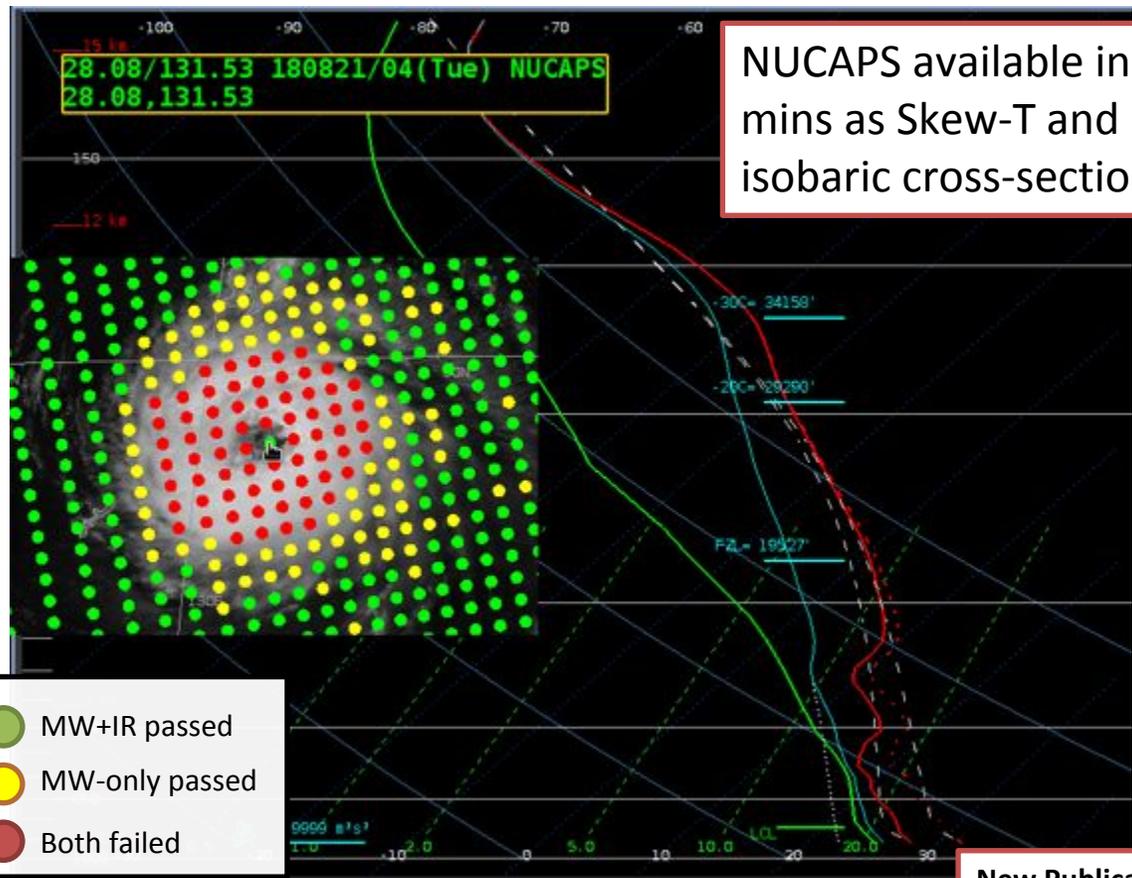
- ¹ Science and Technology Corporation (STC)
- ² University of Miami/CIMAS, NOAA/AOML/Hurricane Research Division
- ³ University of Alabama in Huntsville (UAH)
- ⁴ NASA Marshall Space Flight Center (MSFC)
- ⁵ NASA Short-term Prediction Research and Transition (SPoRT) Center
- ⁶ Cooperative Institute for Satellite Earth System Studies (CISESS) University of Maryland
- ⁷ Joint Polar Satellite System (JPSS)
- ⁸ NOAA NESDIS





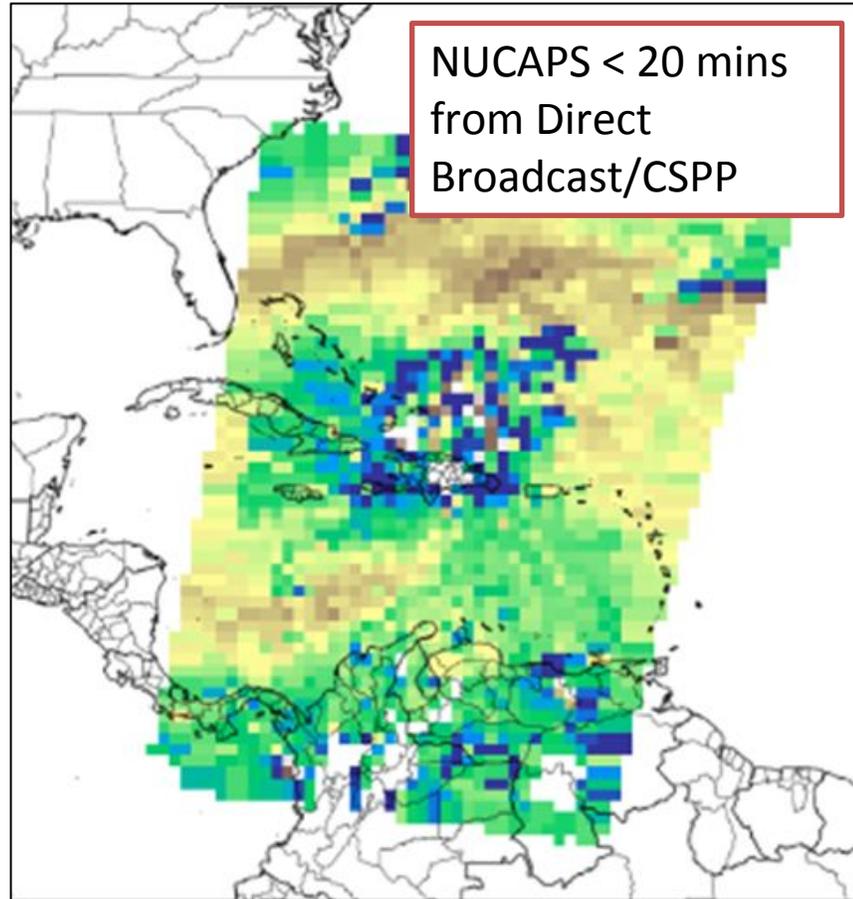
NUCAPS is in AWIPS and web-tools for severe weather, collaboration to adapting for TC forecasts

NUCAPS in AWIPS for NWS



NUCAPS available in < 90 mins as Skew-T and isobaric cross-sections

NUCAPS Web Tools for All Stakeholders



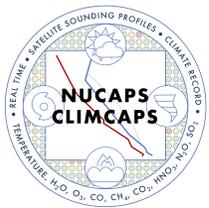
NUCAPS < 20 mins from Direct Broadcast/CSPP

Typhoon Soulik 4Z 21 August 2018 Courtesy of S. Lindstrom (SSEC)

Hurricane Isaias S-NPP 06 UTC 31 July 2020 Courtesy of Erika Duran

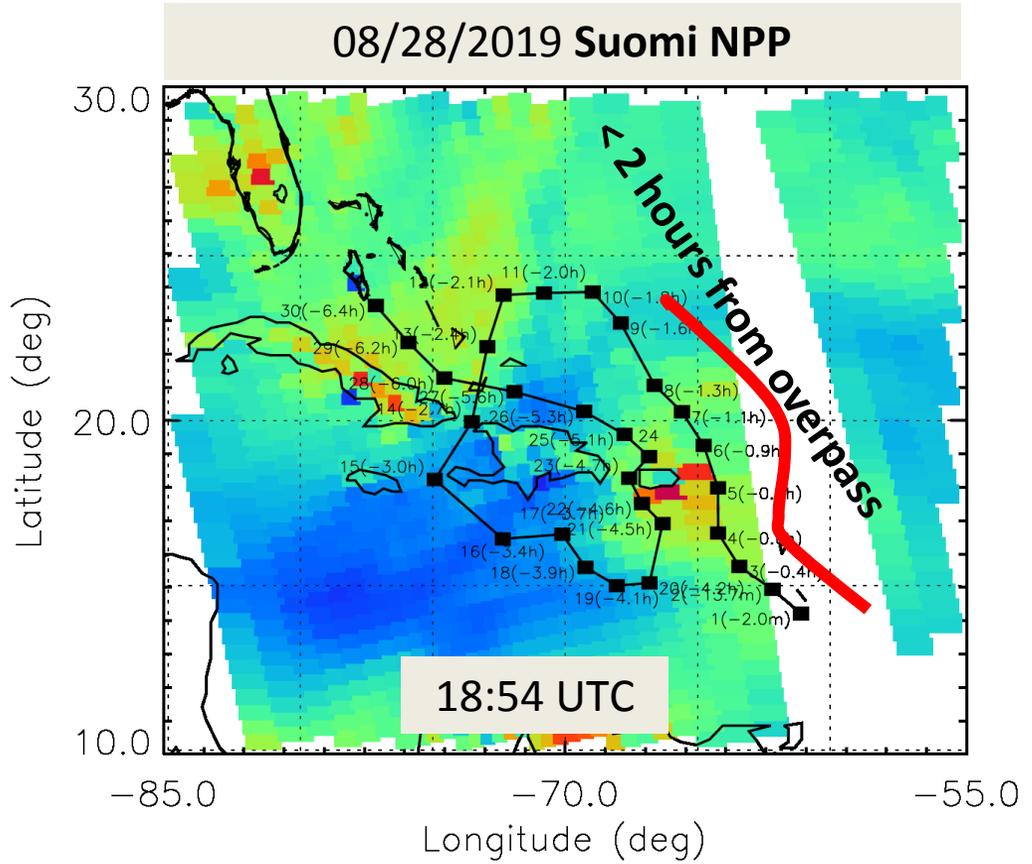
New Publications (2020)

- Esmaili et al.
- Berndt et al.

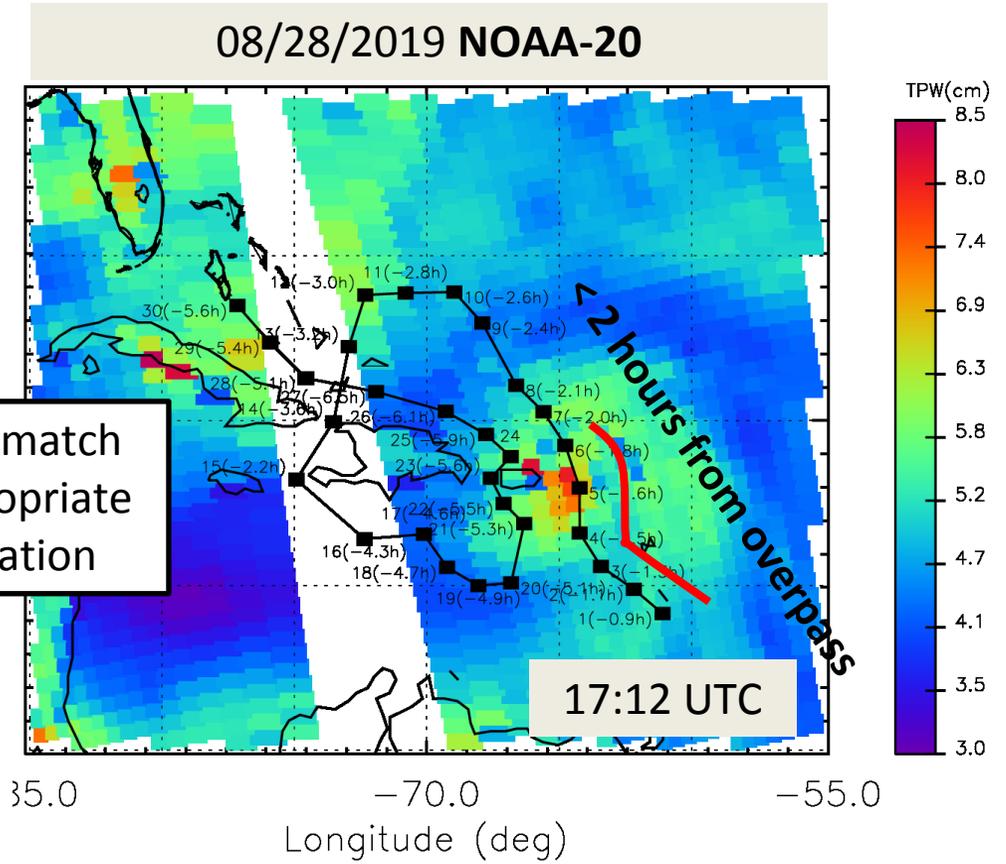


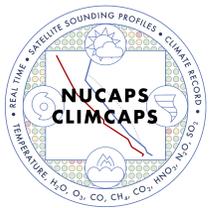
Why coordinate? Hurricane recon flights are timed with the NWP model runs, not satellite overpasses

Hurricane Dorian



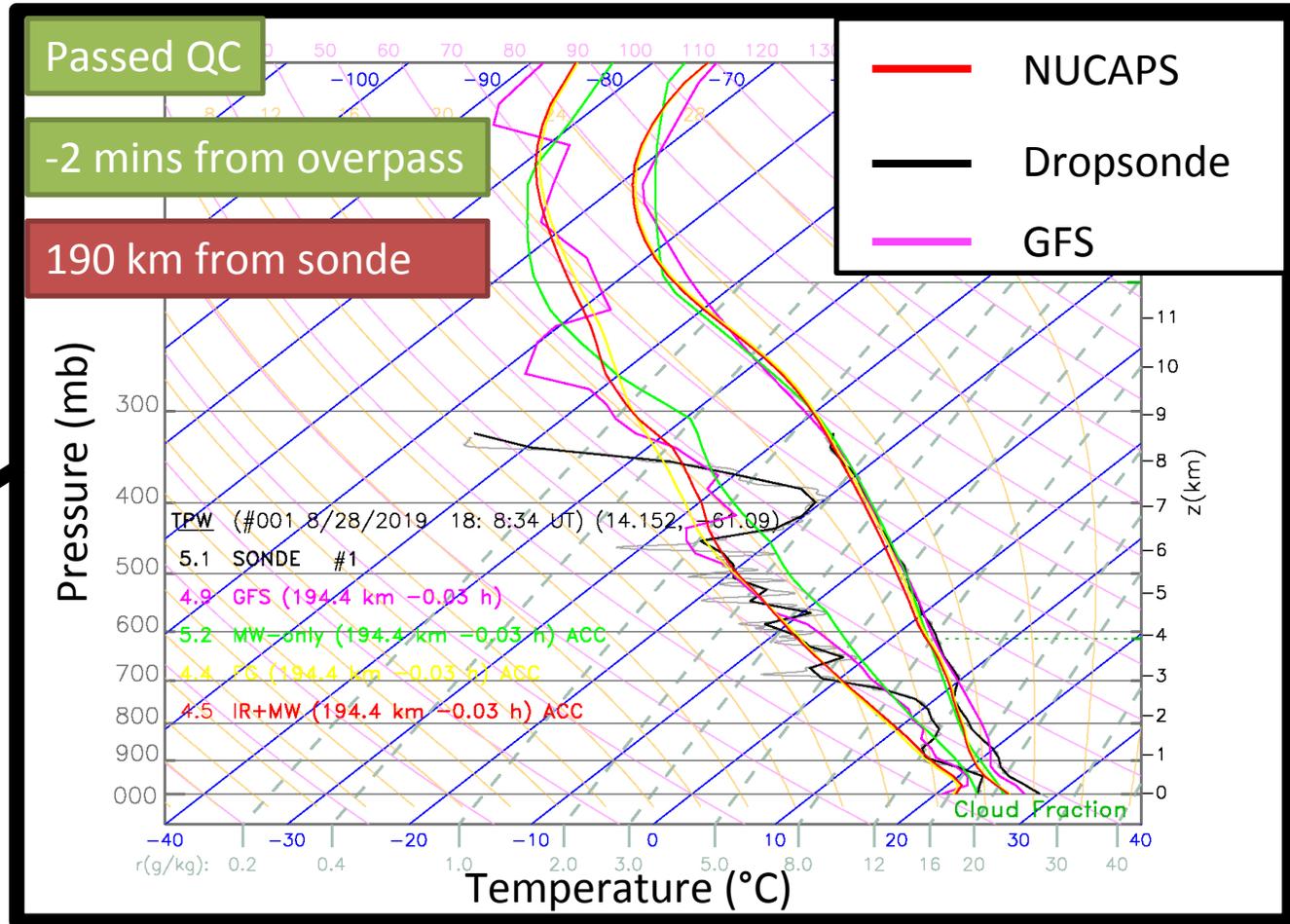
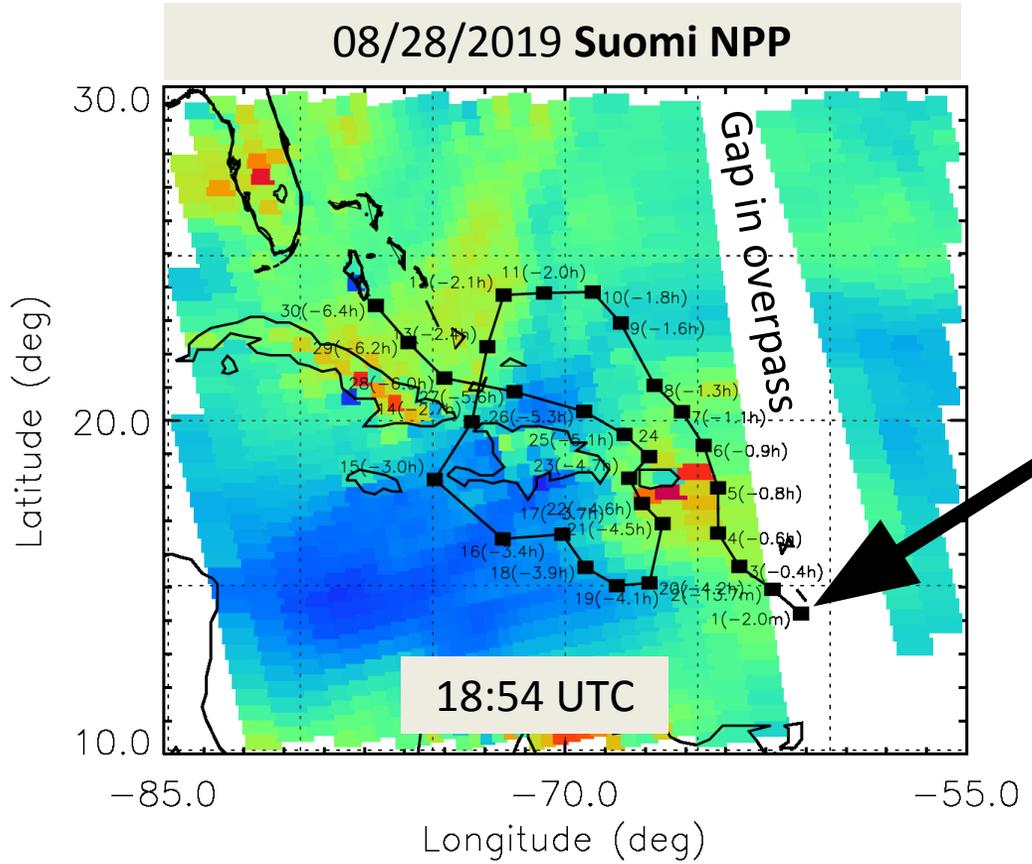
Time mismatch not appropriate for evaluation

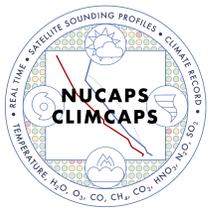




While 10/30 dropsondes match in time (<2 hours), not all match in space!

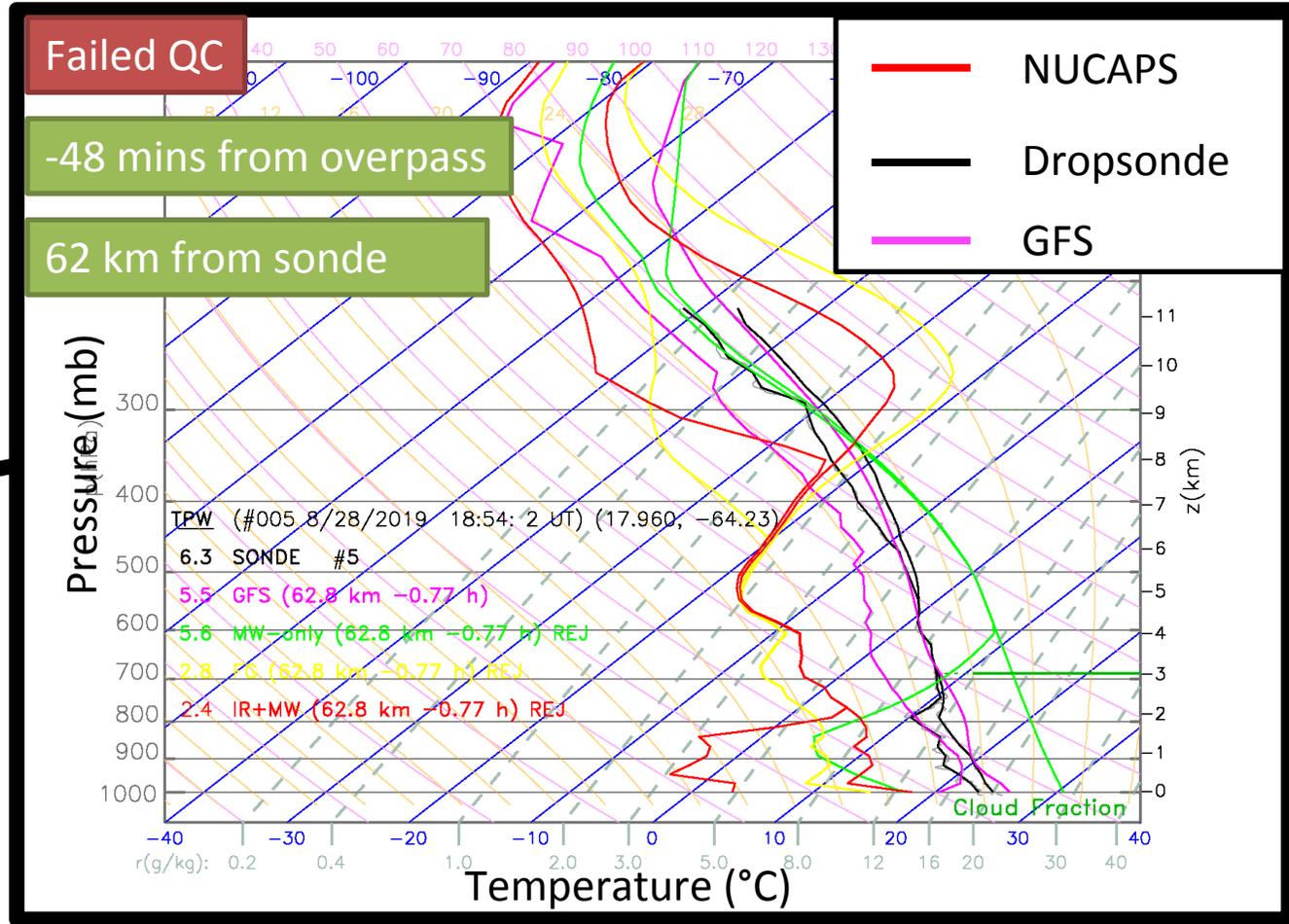
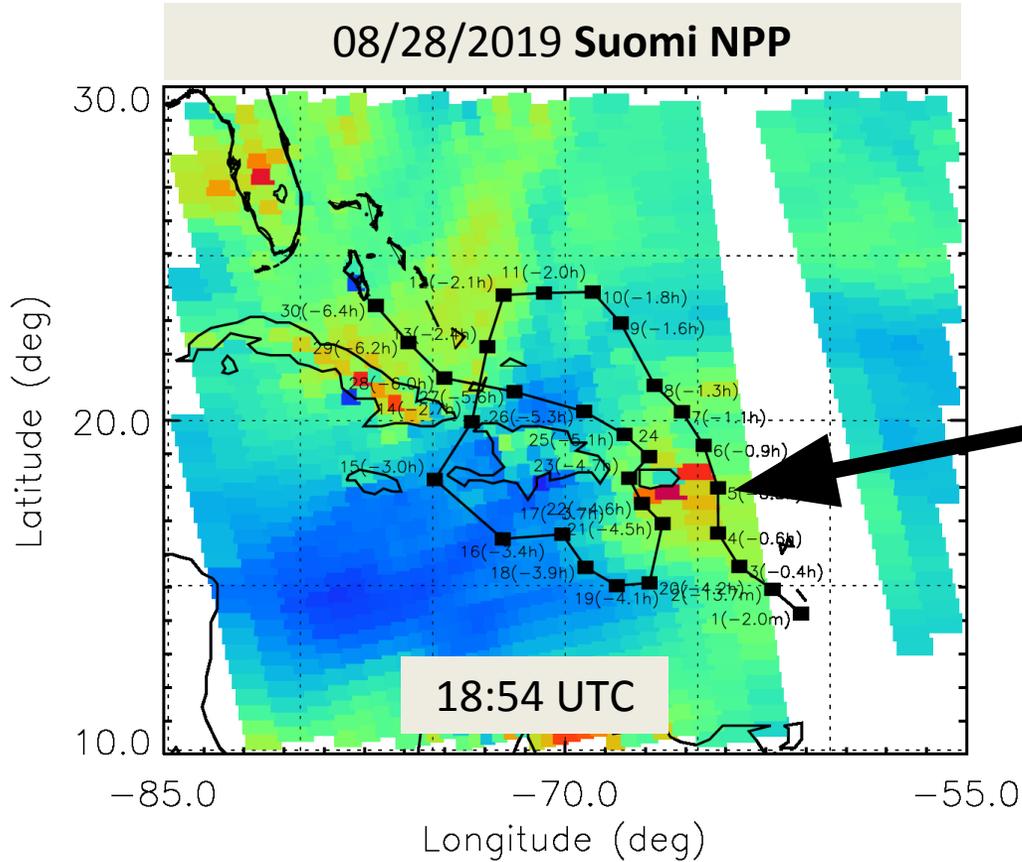
Hurricane Dorian

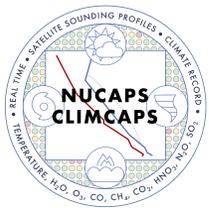




Even when dropsondes match in time and space (150 km), not all retrievals pass QC!

Hurricane Dorian



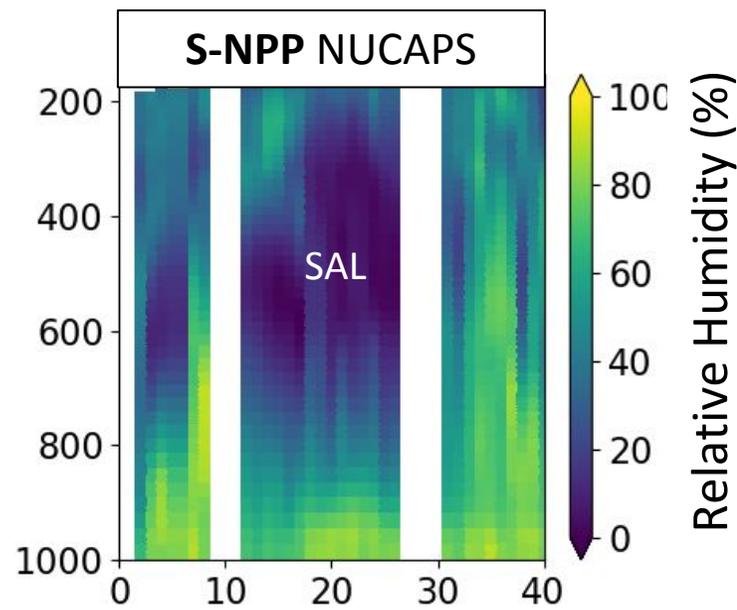
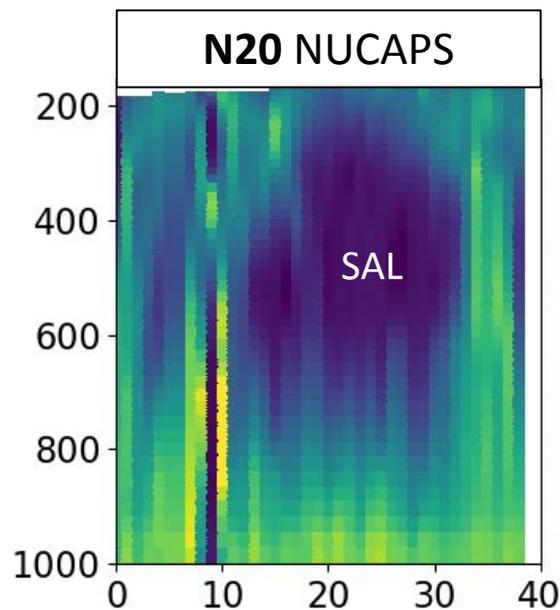
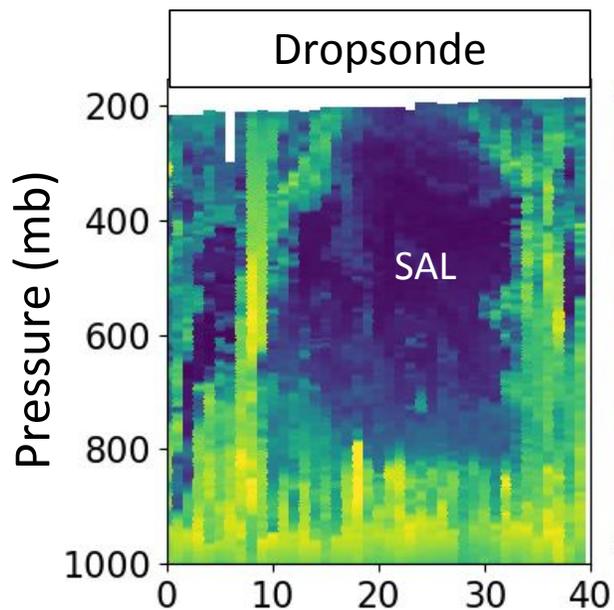
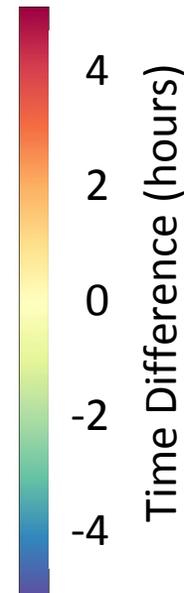
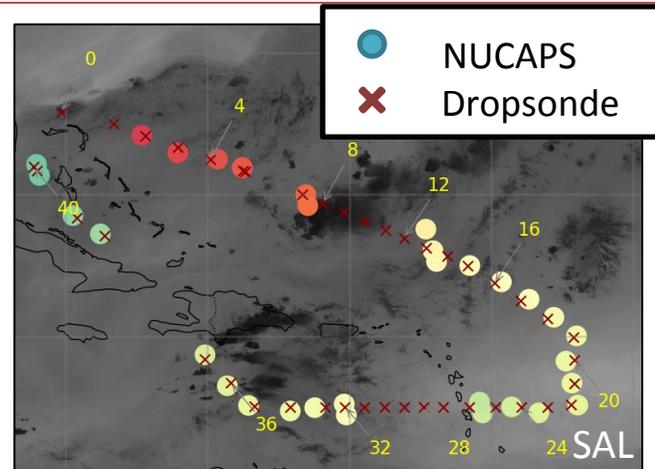
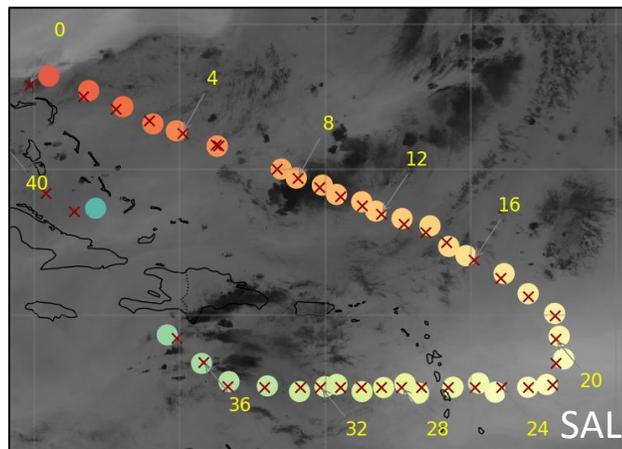


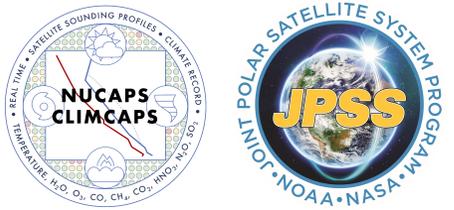
Coordinated 2018 flight over SAL shows NUCAPS captures the dry layer feature

Well-timed Flights

Cross Sections

GOES-16 CH 8 6.2 μm WVV



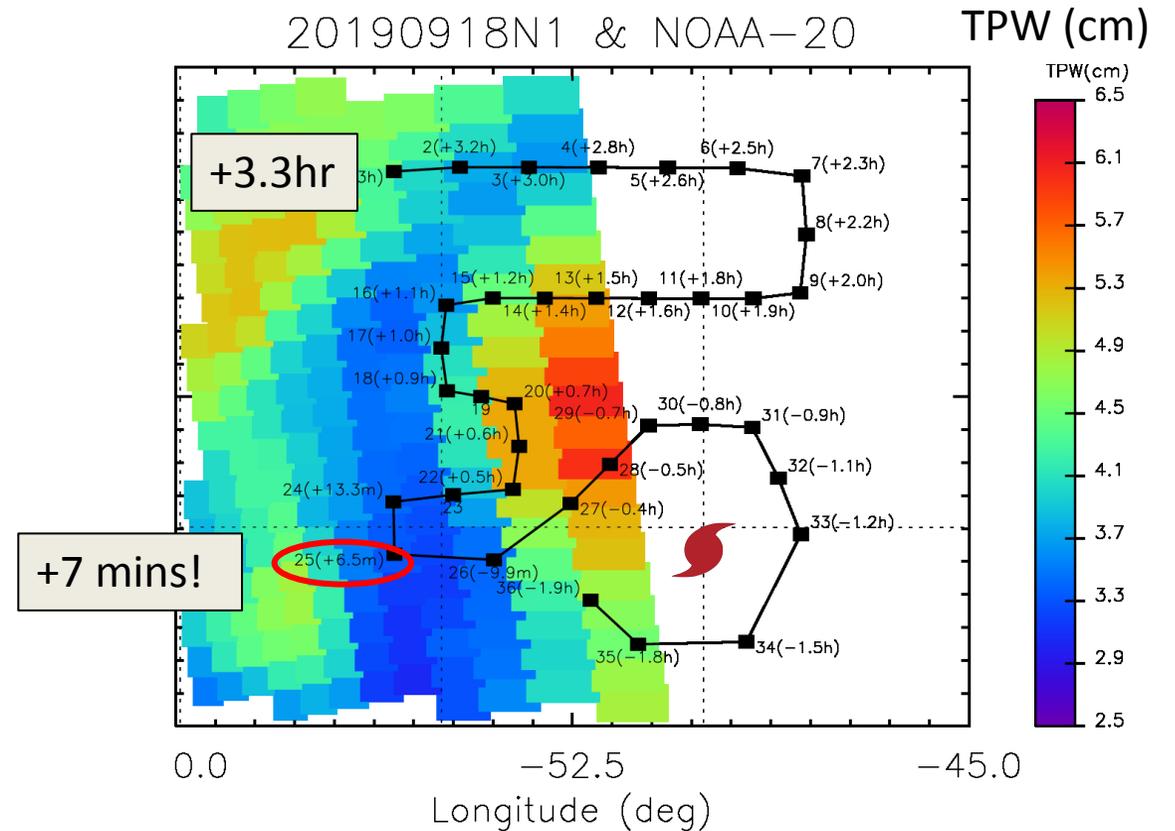
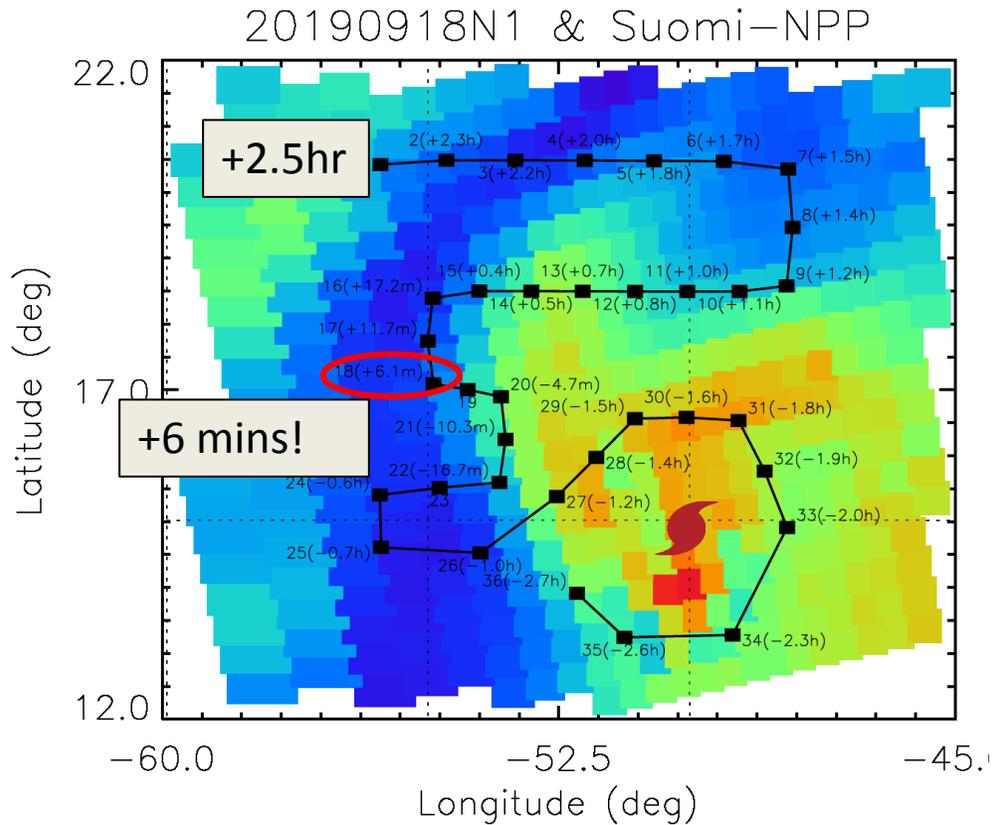


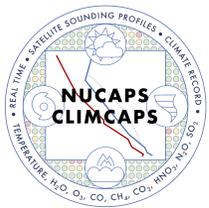
For 2019 collaboration flights, best time match for SNPP, N20 was within 6 mins of overpass

Hurricane Jerry

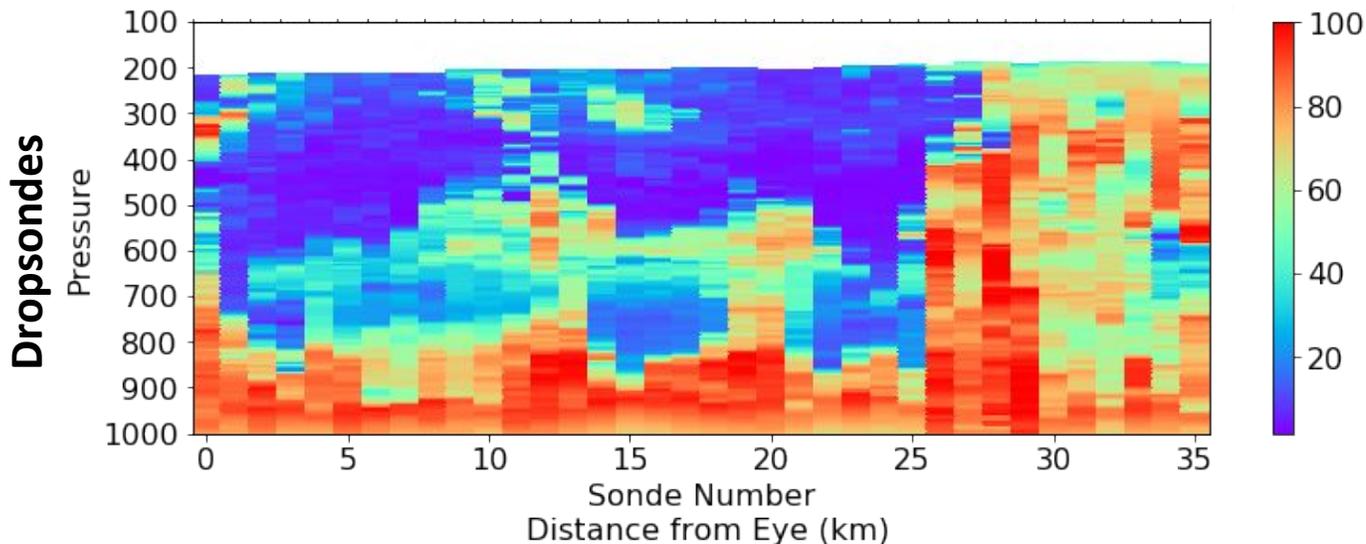
Suomi NPP

NOAA-20



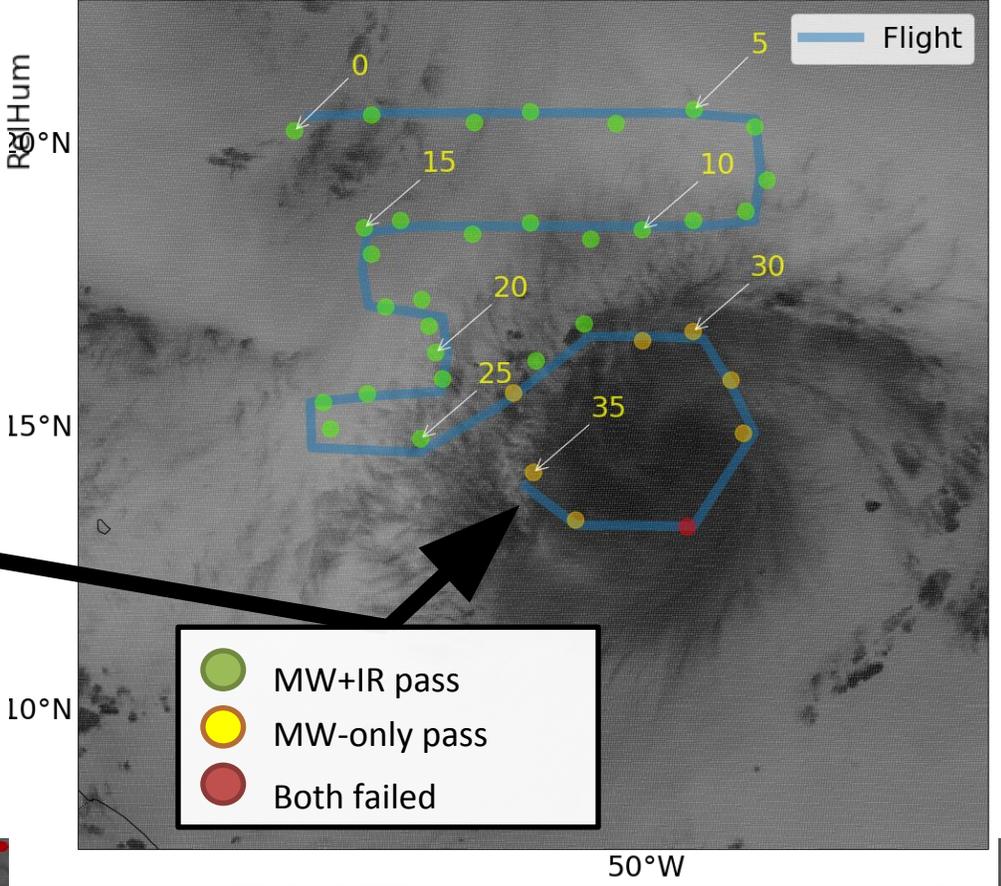


Coordinated 2019 flight data shows NUCAPS can sampling environment, improvement closer to hurricane center?

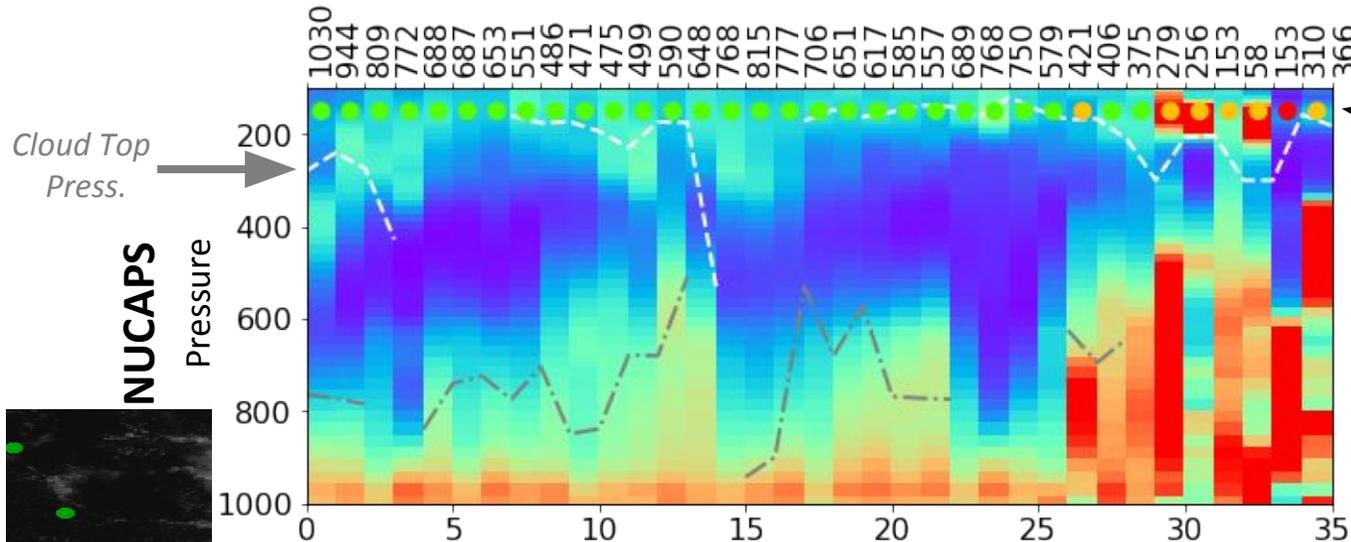


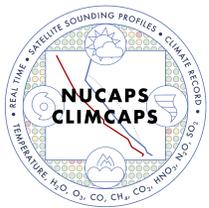
Sept 18, 2019 (Jerry Flight)

2019/09/18 16:31-16:33 UTC (Suomi NPP)

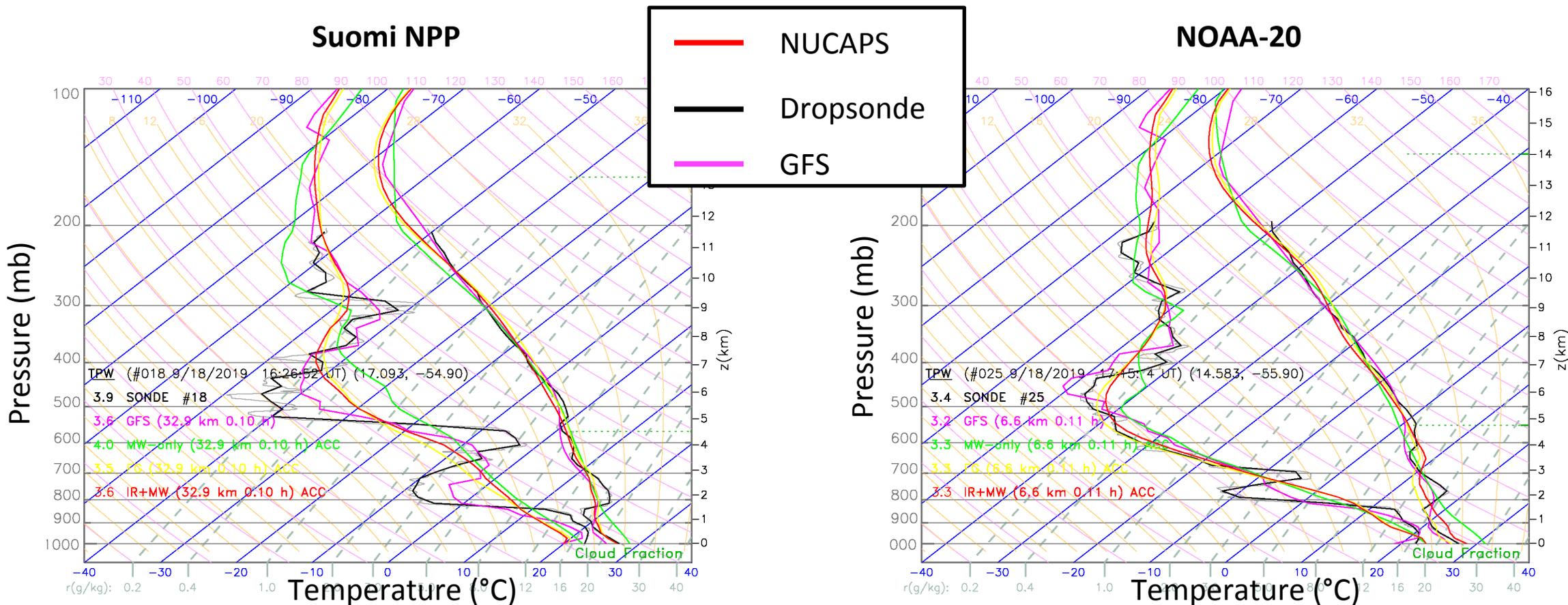


GOES-16 ABI 6.2 μm 16:30 UTC





Generated match-ups every 20 minutes using Direct Broadcast as the dropsonde data became available



-6.0 mins from overpass

33 km away from dropsonde

-6.6 mins from overpass

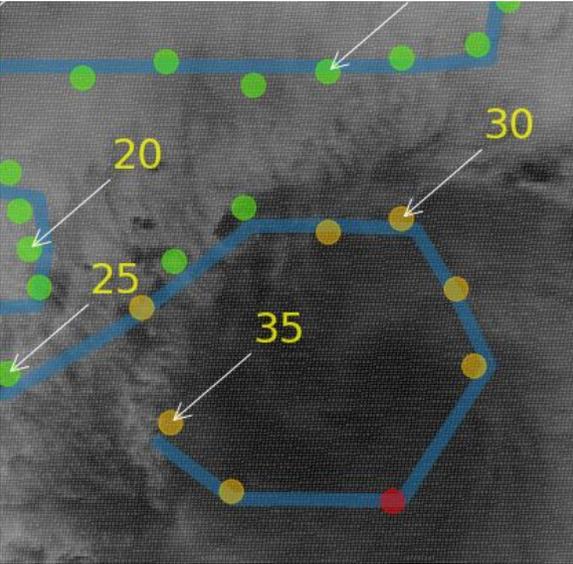
6.6 km away from dropsonde

#AGU20

<https://linktr.ee/nucaps>

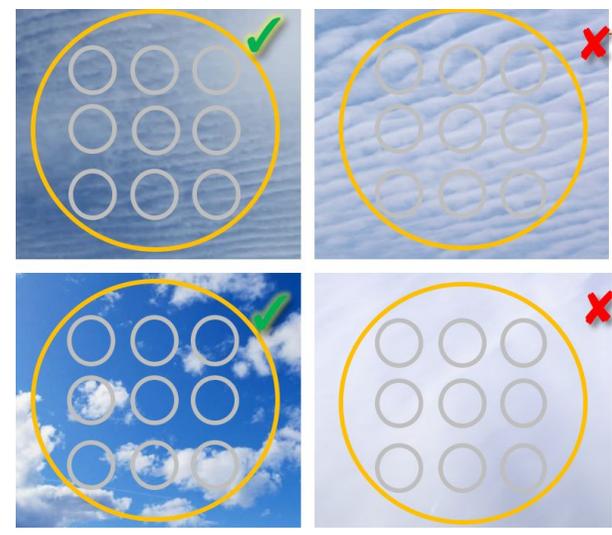
Engage with users to evaluate/refine NUCAPS algorithm for TC applications

Retrievals fail closer to hurricane center

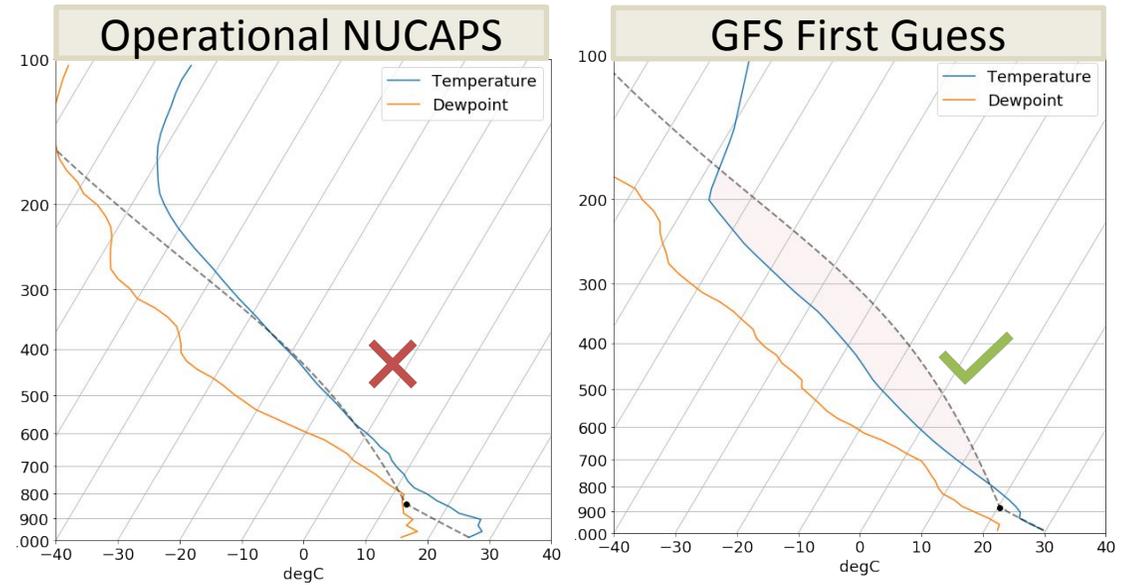


- IR+MW passed
- MW-only passed
- Both failed

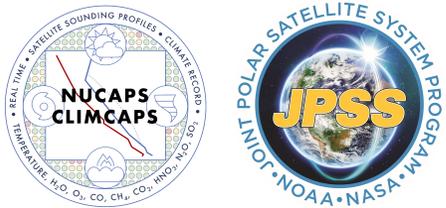
Use of MW-retrieval?



Model-based first guess?

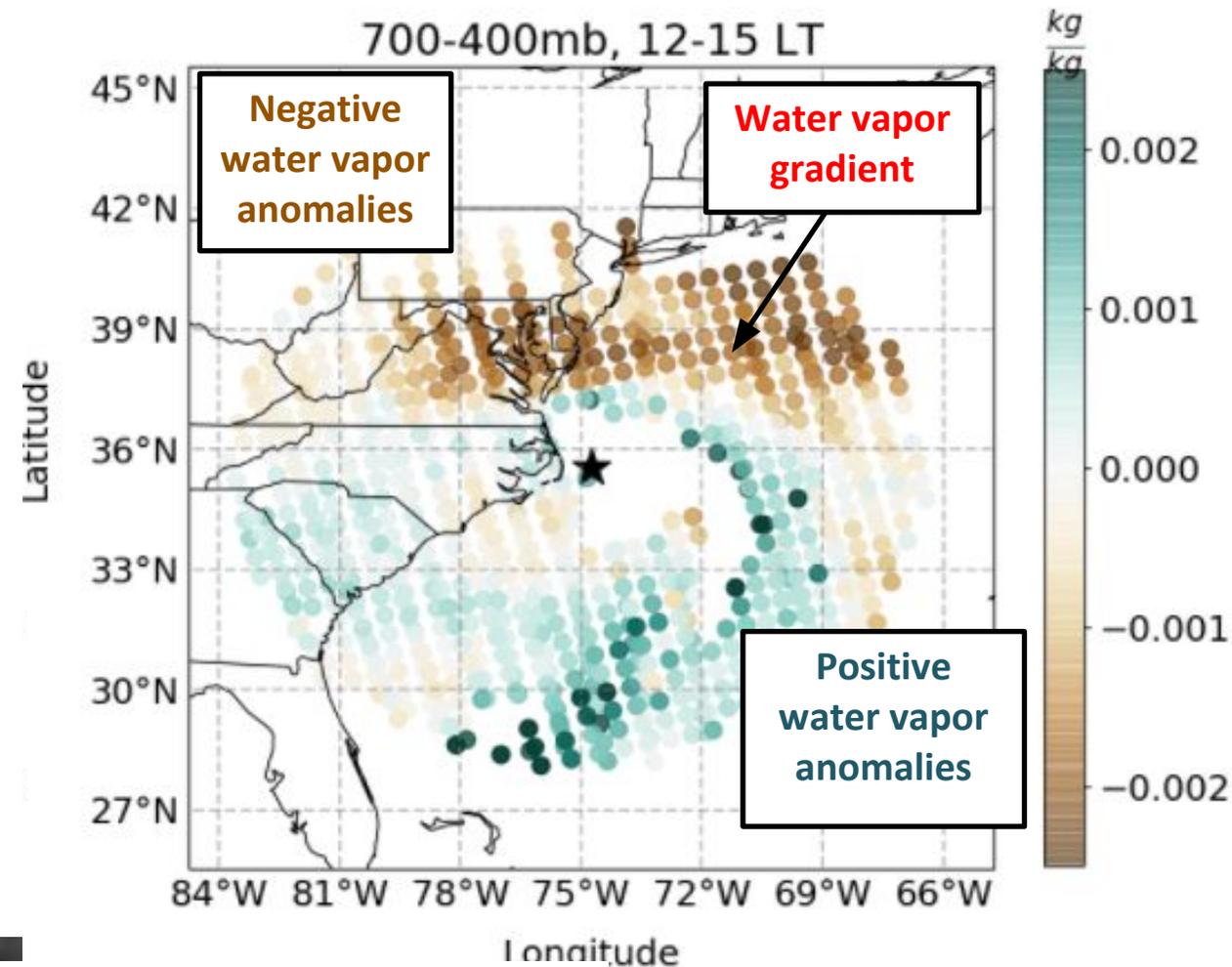
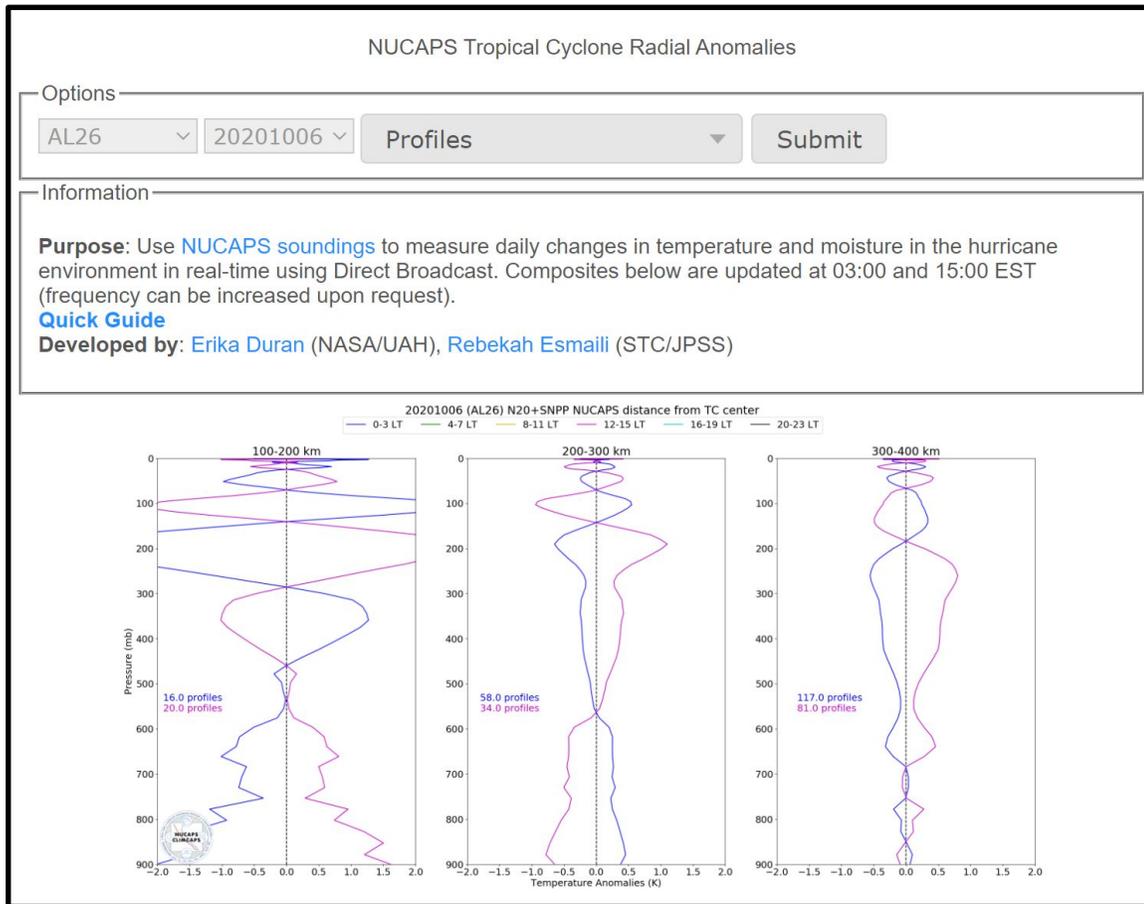


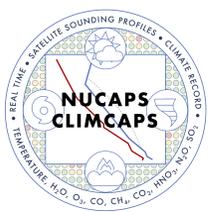
1835 to 1845 UTC (N20) 5 June 2019; Springfield, IL



Priority: create user friendly tools to foster innovative applications in real-time

WV anomalies TS Fay on 8 July, 2020





Outcomes of Flight

Collaboration Priorities



Introduce HRD users to NUCAPS

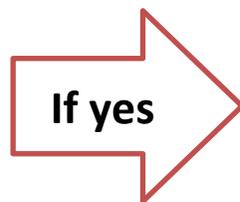


Validation: Acquire test cases for operational NUCAPS algorithm improvements

Evaluation



- Determine the value of designing a new product
- Gather baseline evaluation metrics



Accomplishments so Far:

- Real-time **plan view, skew-T, and diurnal cycle tools** for users
- ~250 useable sondes for evaluation and improvements of NUCAPS

- Use 2018 and 2019 dropsondes to design a new system
- Demonstrate in 2021 flights (if needed)
- Get feedback from users on tools

Interested? Join NUCAPS Users Working Group!