NOAA's APHEX Hurricane Field Program: 2025 Highlights & Plans for 2026

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OAR

2026 TCORF/IHC
February 25, 2026

APHEX Goals & Partnerships

Goal 1: Collect observations that span the TC life cycle

Goal 2: Develop measurement strategies and technologies

Goal 3: Improve understanding of physical processes

Partnerships: HRD, NHC, EMC, AOC, NESDIS

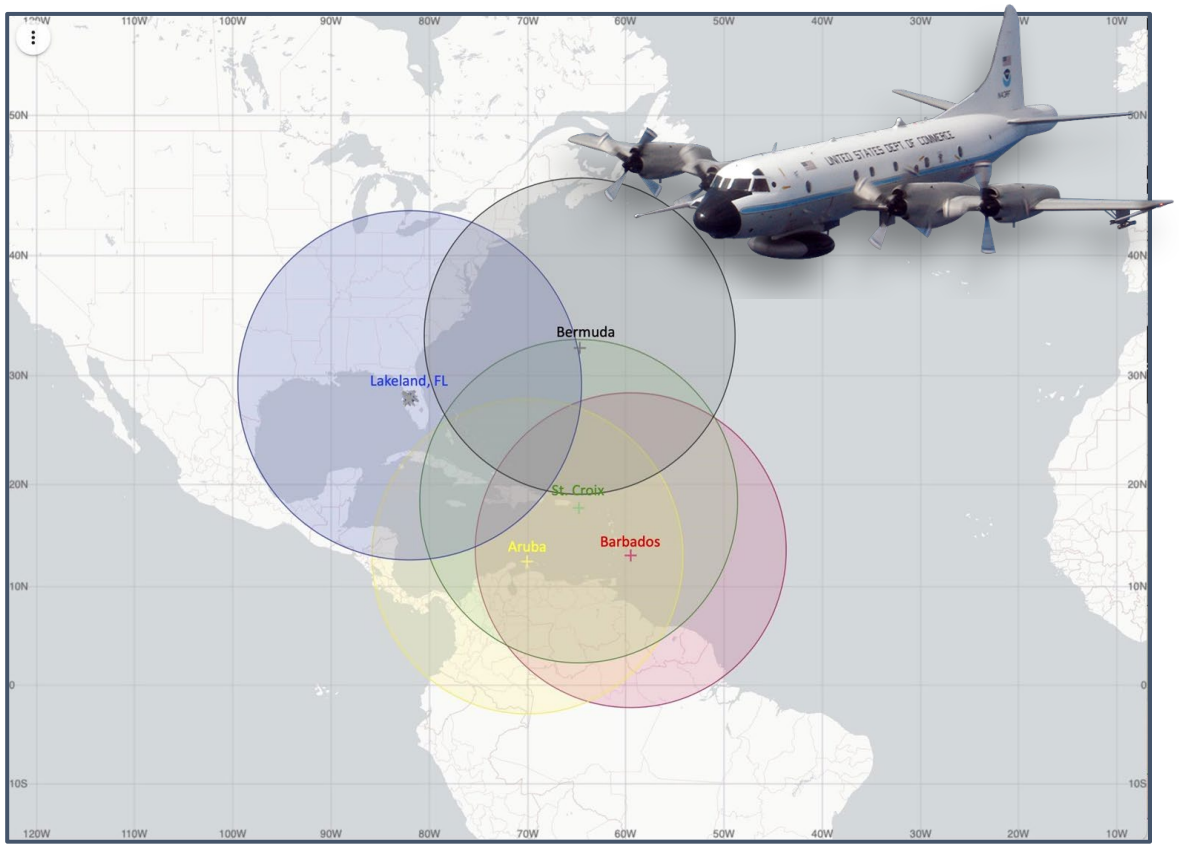
Collaborations: AOML/PhOD, ONR SASCWATCH, ONR NRL, NASA, NOAA GOMO, Scripps, Stonybrook, Skyfora, Black Swift, UM, CIMAS, NGI

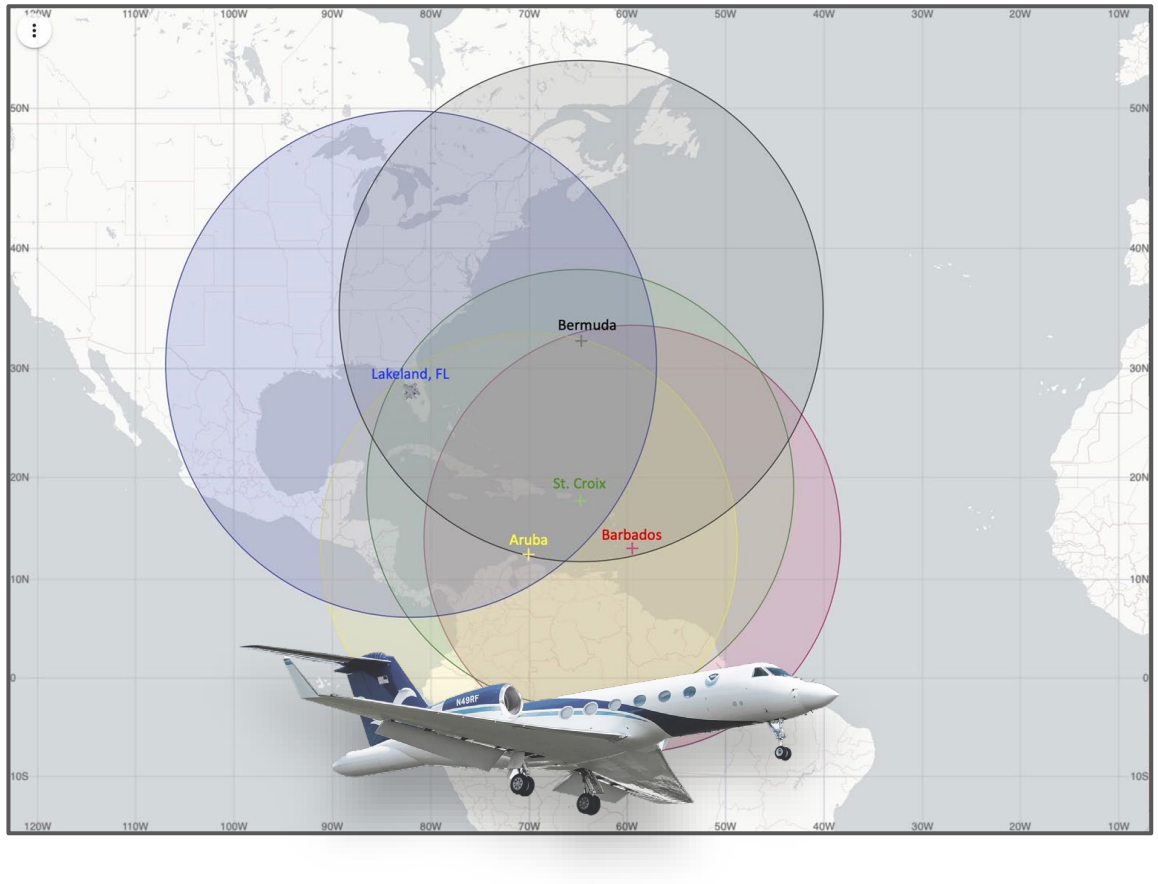
Collaboration Highlight: ONR SASCWATCH

- **Main Goal**: Improve understanding and parameterization of air-sea interaction in TCs
- **Deployment Strategy:** WC-130 deploys drifters and floats ahead of the storm prior to a NOAA P-3 flight. The P-3 subsequently flies over the assets.
- **Synergy with NOAA HFP**: Numerous modules involving ocean and TC PBL

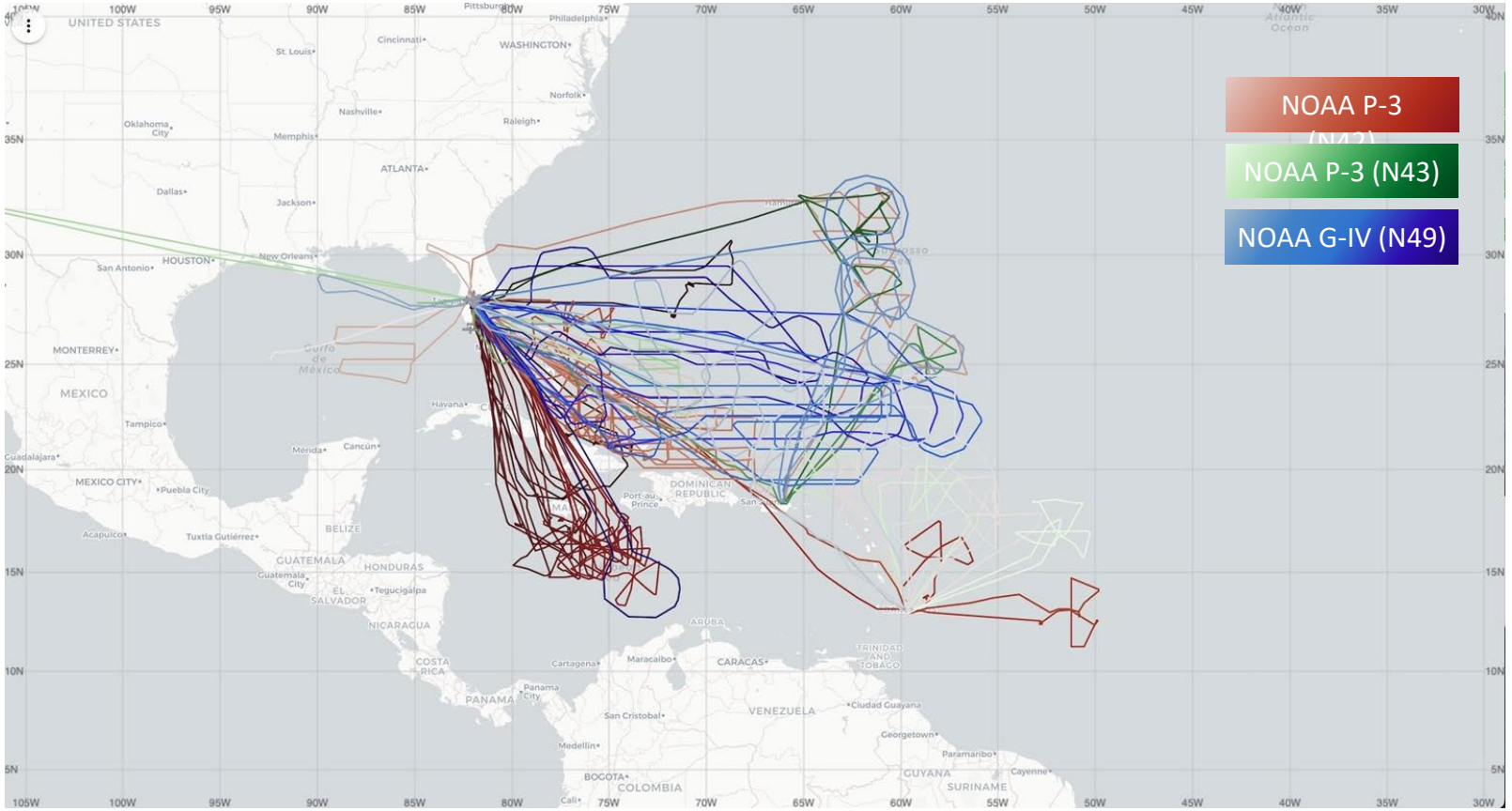
Operations & Logistics

Primary Atlantic Operating Bases and Ranges (2-h on-station time)





Operations & Logistics



Summary of 2025 Missions (1 June - 30 November)

55 P-3 & G-IV Missions: Erin (13) – Gulf Survey (1) – Gabrielle (9) – Imelda-Humberto (16) – Jerry (2) – Melissa (14)

2025 Hurricane Field Program

by the numbers (1 June – 30 Nov)

Atlantic Oceanographic and Meteorological Laboratory
National Oceanic and Atmospheric Administration

NOAA APHEX Hurricane Field Program Research & Collaborations

6
Tropical Cyclones Flown
Erin, Gabrielle, Humberto, Imelda, Jerry, & Melissa

1
Gulf of America Ocean Survey Research Mission

11
APHEX P-3 & G-IV Research Experiments & Modules Conducted

Collaborations
AOML/HRD & PhOD, NESDIS, NOAA GOMO, Office of Naval Research, Scripps

NOAA Hurricane Hunters

39
P-3 missions
28 Operational (NHC & EMC)
11 Research (AOML/HRD,NESDIS)

16
G-IV missions
13 Operational (NHC & EMC)
3 Research (AOML/HRD)

387
P-3 & G-IV flight hrs flown
Equivalent to flying 5x around the world

Aircraft Instruments

1215 **GPS dropsondes (GTS)**

31 **Airborne eXpendable BathyThermographs (AXBTS)**

158 **Tail Doppler Radar Analyses transmitted to EMC & NHC**

18 **Black Swift S0 sUASs**

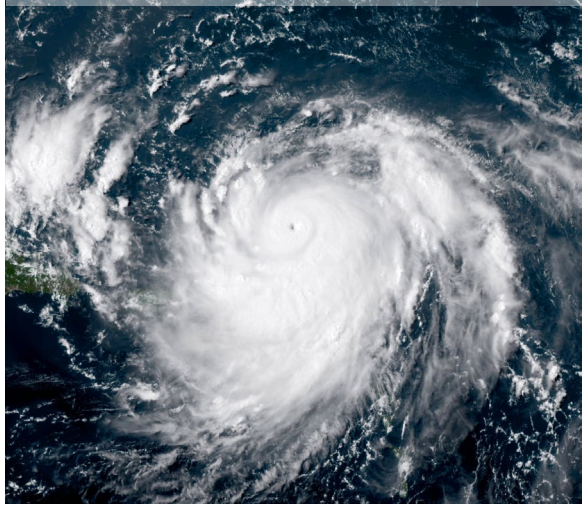
50 **Skyfora Streamsondes**

44 **Aircraft Deployed Ocean Probes**
Waves, currents, temperature, & salinity

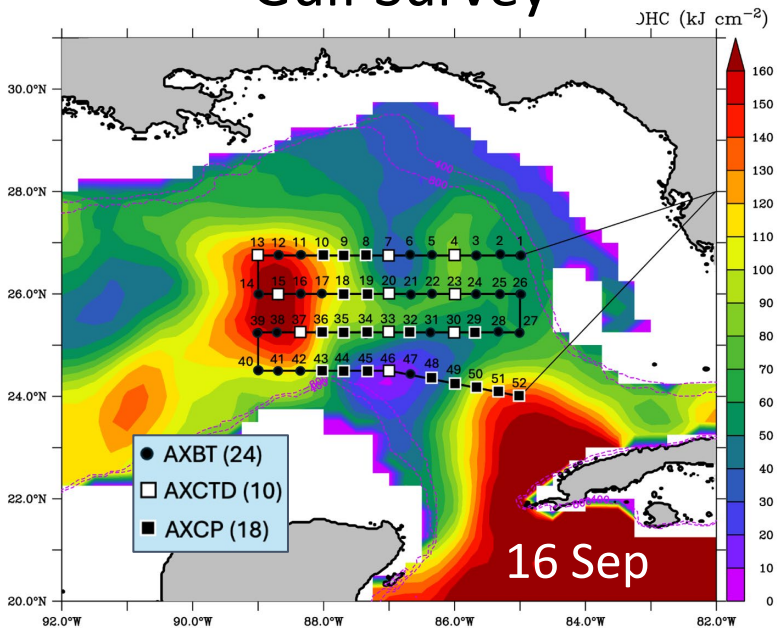
Jason Dunion, University of Miami/CIMAS - NOAA/AOML/HRD, Jason Sippel, NOAA/AOML/HRD, Heather Holbach, FSU/NGI

Atlantic Missions Overview

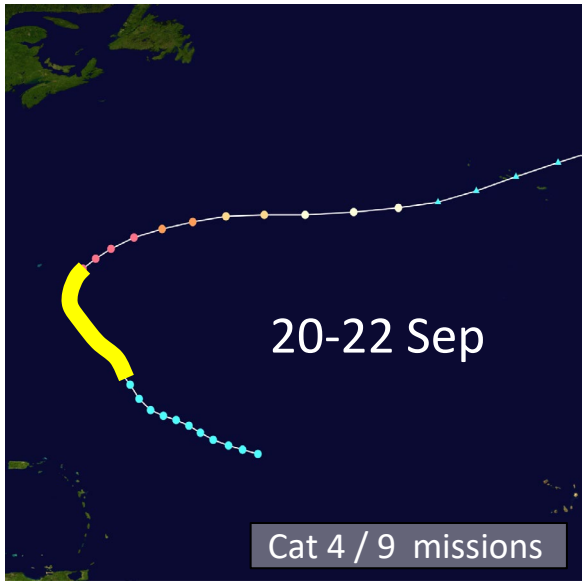
Hurricane Erin



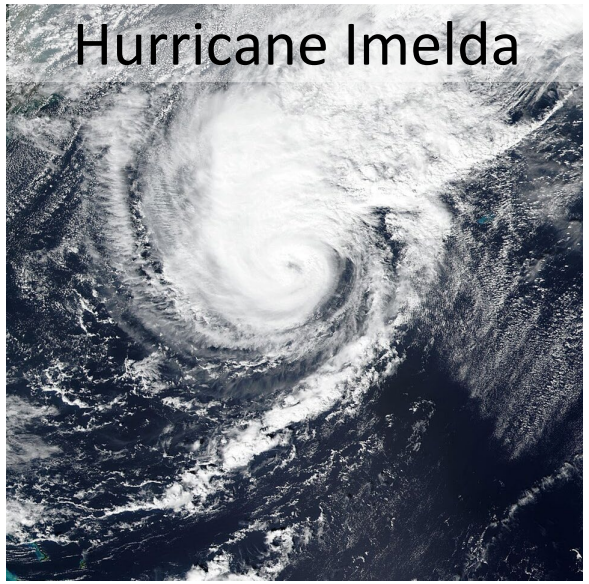
Gulf Survey

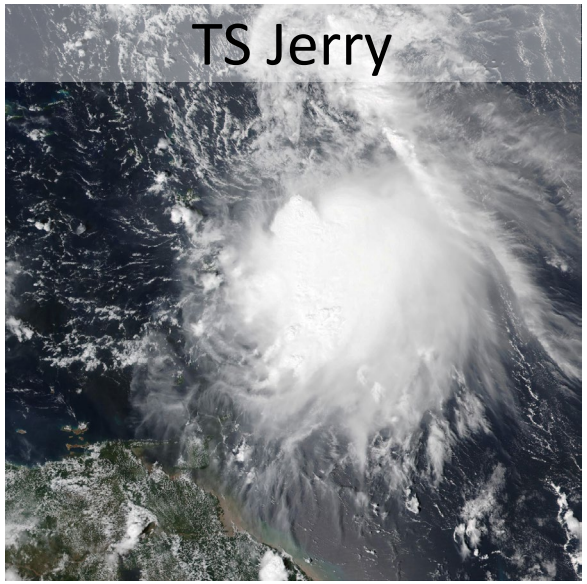


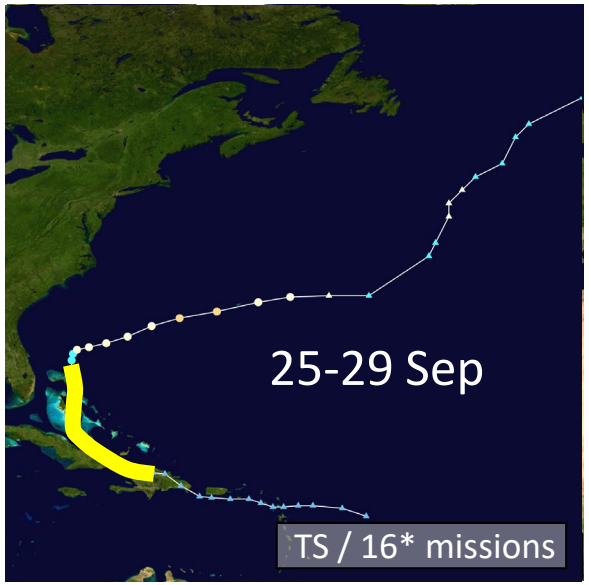
Hurricane Gabrielle

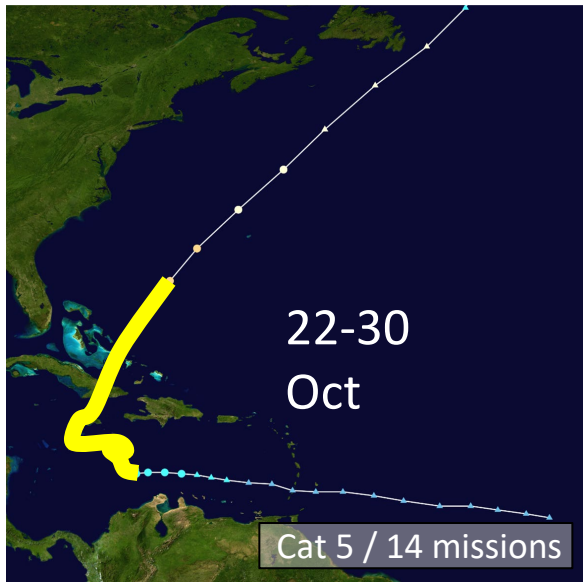


Atlantic Missions Overview





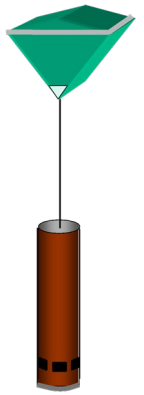




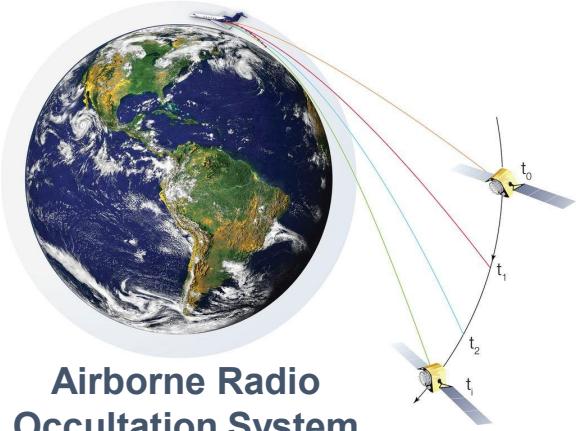
2025 Instrumentation

Aircraft Observations

- Pressure, temperature, moisture, & wind
- Doppler reflectivity & winds
- Aerosol & precipitation size distributions
- Ocean wave heights

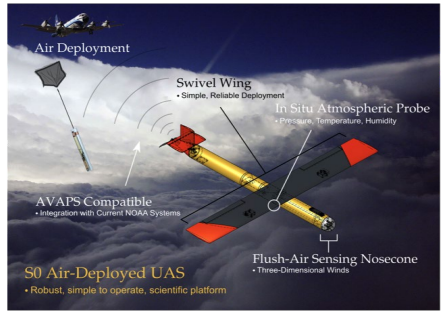


GPS Dropsondes & Skyfora Streamsondes



Airborne Radio Occultation System
Scripps

P-3 Flight-Level Data

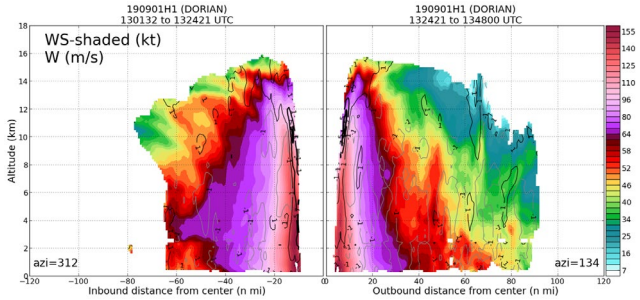


Black Swift S0 small UAS

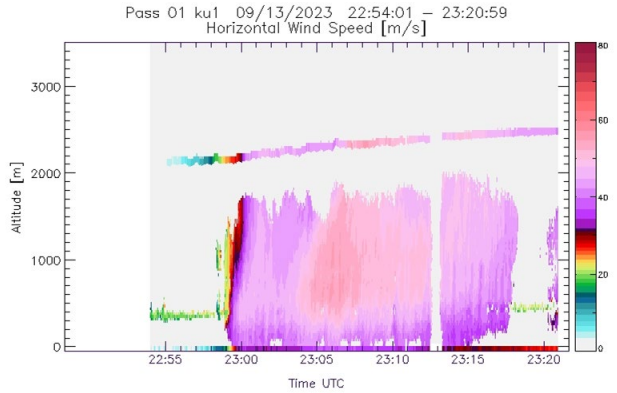
2025 Instrumentation

Aircraft Observations

- Pressure, temperature, moisture, & wind
- Doppler reflectivity & winds
- Aerosol & precipitation size distributions
- Ocean wave heights



Tail Doppler radar (TDR)



Imaging Wind and Rain Airborne Profiler (IWRAP) & Rain, Ocean and Atmosphere Radar System (ROARS)

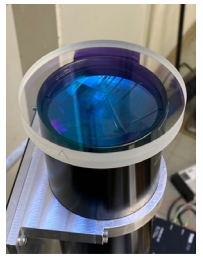
NESDIS

2025 Instrumentation

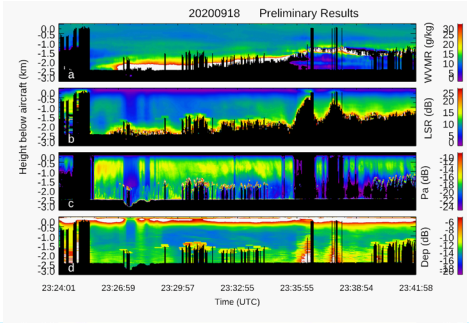
Aircraft Observations

- Pressure, temperature, moisture, & wind
- Doppler reflectivity & winds
- Aerosol & precipitation size distributions
- Ocean wave heights

Cloud Microphysics



Compact rotational Raman Lidar (CRL)
Stonybrook

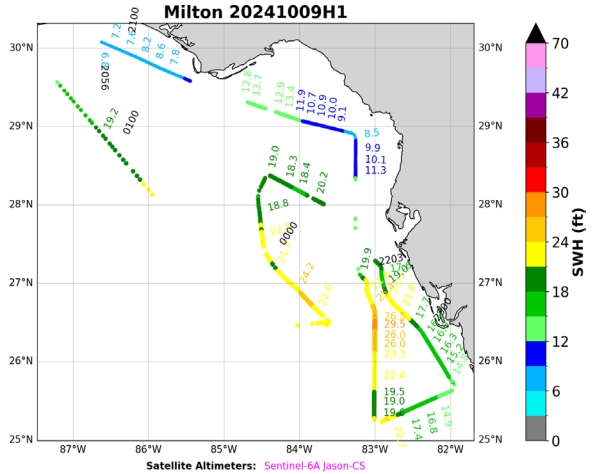


Airborne Doppler Lidar (ADL)
Stonybrook

2025 Instrumentation

Aircraft Observations

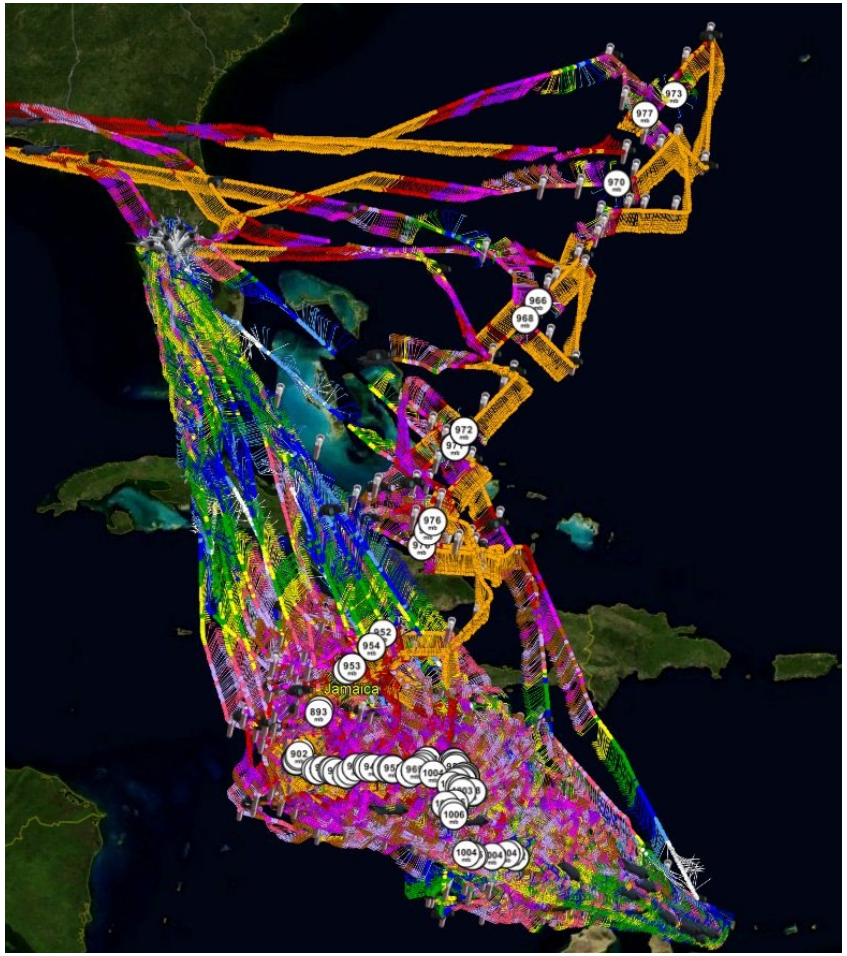
- Pressure, temperature, moisture, & wind
- Doppler reflectivity & winds
- Aerosol & precipitation size distributions
- Ocean wave heights



Ka-band Interferometric Altimeter (KaIA)
&
Rain, Ocean and Atmosphere Radar System (ROARS)
NESDIS

2025 Successes

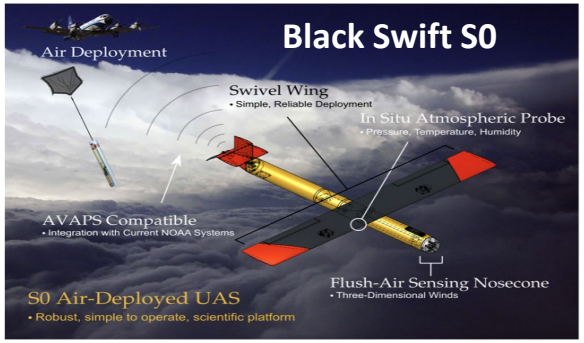
- **Shutdown Operations**
  - Successful missions with limited staffing
- **TDR Transition Progress**
  - Culminated with experimental handoff of TDR processing to AOC on last Melissa fix mission
- **Research**
  - 6 TCs and 1 ocean survey flown
  - 11 research P-3 taskings, 3 research G-IV taskings
  - 11 APHEX experiments & modules conducted
- **Partnerships/Collaborations**
  - HRD, UM/CIMAS, FSU/NGI, PhOD, NESDIS, ONR SASCWATCH, NASA, GOMO, Scripps, Stonybrook, Skyfora, BlackSwift



2025 Successes

- **HRD-NESDIS-AOC-NHC collaboration: identify issues with the P-3 SFMR**
  - Goal: ensure that high quality SFMR data is being transmitted off the P-3s (solution is still TBD)
- **Emerging Technology**
  - 19 Black Swift sUASs deployed from the P-3s
  - 50 Skyfora Streamsondes deployed from the P-3s
- **Ocean Expendables**
  - 31 AXBTs
  - 6 P-3 deployed A-Sized Wave Drifters
  - 38 P-3 deployed AXCP or AXCTD

microSWIFT Wave Buoy



2025 Challenges

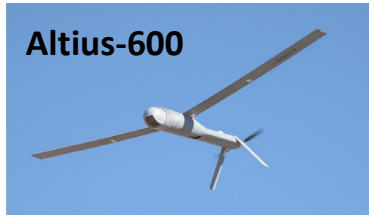
- **Dropsonde processing**
  - Issues with onboard and ground-based processing
  - Status-quo on ground-based processing carries a risk of failure (mitigation being discussed)
  - Differing opinions on how to handle fast-fall sondes

- **New Federal operating environment**
  - Federal travel approvals
  - Evolving operating procedures for travel
  - Shutdown-related impacts on resource availability (e.g. NASA MTS)

Plans for 2026

- **APHEX HFP Plan (Experiments & Modules)**
  - Genesis Stage - Early Stage - Mature Stage – End Stage – Ocean Observing – Satellite Validation
- **ONR SASCWATCH**
  - Study on Air-Sea Coupling with WAves, Turbulence, and Clouds at High winds
  - Collect data from the TC center to gain crucial insights into air/sea energy transfer
  - Verify the physical processes dominant in such extreme conditions
- **Continue transitioning operational P-3 TDR and G-IV missions**

- **Emerging Technologies**
  - *sUAS (Altius & S0)*
  - *Dragoon Coriolis*
  - *Skyfora Streamsondes*




Questions?