Improving Hurricane Forecasting with Gliders
2022 Review and Look Ahead to 2023

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Hurricanes and Gliders

Essential Ocean Features (EOFs)
- Linked to rapid intensification and weakening
- May occur close to populated and vulnerable coastlines.

Key Point:
EOFs are challenging for models because:
- Highly dynamic nature
- Very limited sub-surface observations to initialize models

Glider Operations
- Sustained and targeted observing
- Real-time ocean observations to improve ocean representation in the models
- Demonstrated to reduce error in hurricane intensity forecasts

Essential Ocean features in the Atlantic Basin
### 2022 highlight:

Research and operations conducted through a multi-Institutional effort that includes sharing logistics and regional knowledge, resulting in cost-efficiency, enhanced productivity, and sharing of resources.
2022 Operations Overview

- **2022 Completed**
  - 3,432 Glider Days
  - 96,625 Ocean Profiles into GTS

- **U.S. Navy Gliders**
- **NOAA/Partner Gliders**
- **Hurricane Intensity Saildrone Project**

Map showing the distribution of glider operations in the Caribbean and Atlantic regions.
Regional Highlights

**Mid Atlantic**
- 1 Navy glider + heavily leveraged missions
- Gliders captured mixing and heat removal from Ian remnants - across 270 miles (Norfolk to Long Island Sound)

**South Atlantic**
- 2 Navy gliders + leveraged missions
- Co-located observations with saildrone
- Smooth operations with the Navy gliders & GOC
- Media event footage at Gray’s Reef NMS used in local, regional, and national coverage of gliders, saildrones, and Hurricane Ian

**Gulf of Mexico**
- 2 hurricane gliders + 8 Navy gliders
- Saildrone co-location for 1st time
- Expansion of hurricane glider missions in eastern Gulf (USF)
- Mexican partners glider data added to GANDALF visualization tool

**Tropical Atlantic and Caribbean Sea**
- 6 hurricane gliders + 3 Navy gliders
- Co-located observations with saildrones
- 100% success rate in operations
- Ocean conditions and location of observational assets monitored through NESDIS/CoastWatch-AOML OceanViewer
- AOML: Continuous assessment of RTOFS ocean model
- Data collected in/near 3 storms: Earl, Fiona, Nicole
Navy Collaboration

5th year of the NOAA-NAVY collaboration

Navy glider contributions are an important part of the coordinated hurricane glider effort

- 12 NAVY glider missions filled observing gaps
- Integrated, complementary observations captured by UxS during Hurricane Fiona (gliders, Saildrone, UAS, drifters)
- Glider co-location exercises with Saildrone
- Coordination of hurricane glider observations with NOAA research partners
- Included in a Global Ocean Observing System (GOOS) – Ocean Observing Co-design ‘Exemplar’ project
- Underwater Glider User Group workshop
IOOS Model/Data Comparisons

- Automated workflows to compare ensemble of operational ocean models with available data - both maps and profiles
- (Bi)-Weekly summaries developed with regional SMEs, transmitted to EMC, shared with Hurricane Glider Operators
2023 Plans