AOML/CARICOOS Sea Glider Collaboration

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BACKGROUND & PICS

Picture 1. Sea Glider

This collaboration and journey started in March 25th of 2014 at the **1st Underwater Gliders Working Group Meeting** (Picture 2) held in the Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami, Florida. The AOML team were starting a project that involved buying two underwater gliders and deploying them north and south of Puerto Rico; and thus they needed a partner as CARICOOS with the local facilities required to carry on the operational aspects of the project including maintenance and field deployments and recoveries north and south of Puerto Rico.

Picture 2. 1st Underwater Gliders Working Group Meeting

Goal: Improve operational hurricane forecast by furthering our understanding of air-sea interaction processes during hurricane force wind events. Approaches include assessing the impact of ocean profile data taken from gliders into hurricane intensity forecasts and documenting the impact of hurricane force winds on the upper ocean density structure.

Meet the crew!

Picture 3. R/V Sultana, boat used to deploy and recover sea gliders

Chief Scientist (AOML)**:** Gustavo Goni
Co-Chief Scientist (UPRM)**:** Julio Morell

Glider Pilots (AOML)**:** Grant Rawson, Thomas Sevilla, Ulises Rivero, Francis Bringas, Ricardo Dominguez.
Glider Technitians: Ulises Rivero, Grant Rawson, Luis Pomales (UPRM), Thomas Sevilla

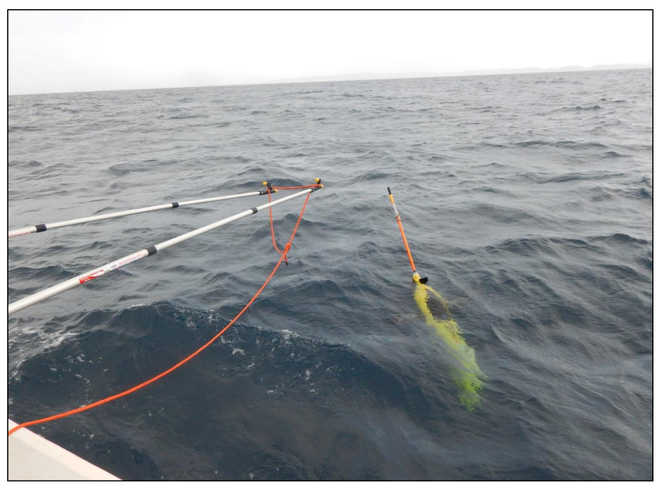
La Sultana Crew:
Captains: Ricky Laracuente and Cesar Carrero
Mechanics: Hugo Montalvo and Wilson Ramirez
Mariner: Ubaldo López and Nibo

Sea Glider HQ

Picture 4. Sea Glider laboratory for maintenance and storage.

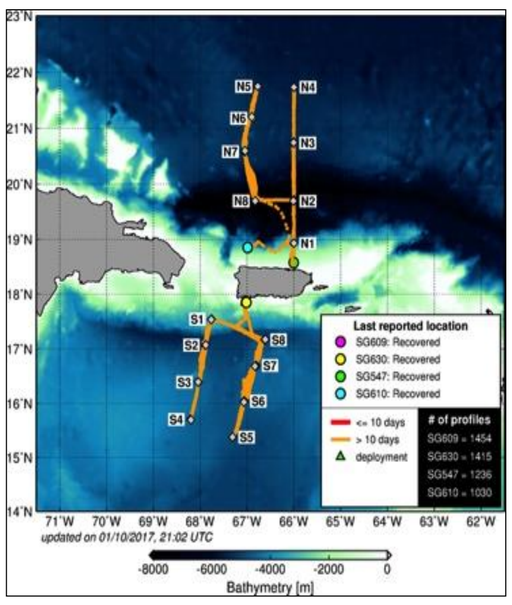
Field Operations

Picture 5. Glider deployment 14 nM off the north coast of San Juan.

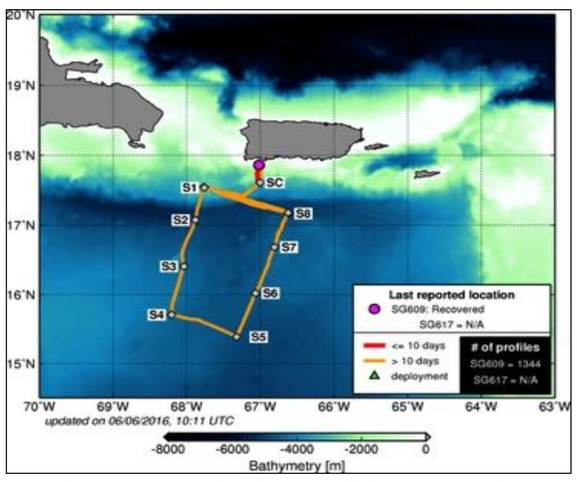


Picture 6. Glider recovery 8 nM off the south coast of La Parguera.

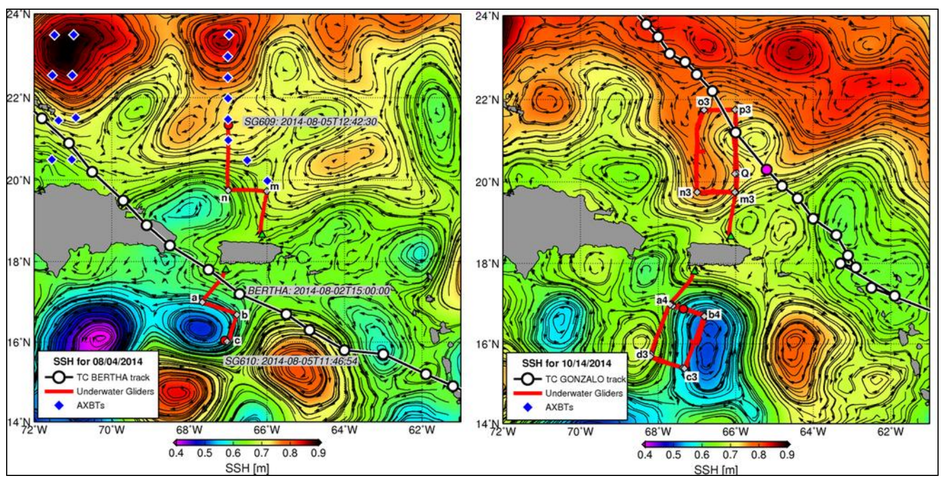
Sea Glider Trajectories



Picture 7. Typical Sea Glider surveying transects during the Hurricane Season.



Picture 8. Typical Sea Glider surveying transects during the Regular Season.



Picture 9. Sea Glider trajectories during important events in 2014. (Left) During Tropical Storm Bertha and (right) Hurricane Gonzalo. Figure made by Sang-Ki Lee.

Findings/Achievements:

- AOML-CARICOOS Underwater Gliders are officially part of the NOAA Hurricane Research Division tropical Atlantic Hurricane Field Program.
- Over 15,000 profiles have been collected during first 5 missions.
- Sea Glider data had a positive impact on Hurricane Gonzalo's strengthening forecast.
- Low salinity conditions were found to partially suppress ocean cooling right after the pass of Hurricane Gonzalo, this suppression may make warm waters available for another passing cyclone.

MISSION'S TIMELINE

- **07/20/2014 – Hurricane Season Glider Mission 1 Starts:** Two Sea Gliders (SG609 & 610) deployed in the Caribbean Sea and in the North Atlantic Ocean.
- **11/20/2014 – Mission 1 completed:** Sea Gliders were successfully recovered on the North Atlantic Ocean and Caribbean Sea. The recovery marks the completion of their first mission, with over 2,800 temperature and salinity profiles collected.
- **02/06/2015 – Regular Season Glider Mission 2 Starts:** Sea Gliders (SG609 & 610) deployed on the Caribbean Sea. Gliders are equipped with a new sensor to measure dissolved oxygen concentration was installed on both gliders.
- **04/27/2015 – Mission 2 Completed:** Sea Gliders recovered on the Caribbean Sea. During these mission over 2,000 temperature, salinity, and dissolved oxygen profiles were colllected.
- **07/15/2015 – Hurricane Season Glider Mission 3 Starts:** Two Sea Gliders (SG609 & 610) deployed on the Caribbean Sea and Tropical North Atlantic.
- **11/18/2015 – Mission 3 Completed:** Sea Gliders were recovered on the Caribbean Sea and Tropical North Atlantic. During this mission, over 2,600 temperature, salinity, and dissolved oxygen profiles were collected.
- **03/11/2016 – Regular Season Glider Mission 4 Starts:** Two Sea Gliders (SG609 & 617) deployed in the Caribbean Sea on March 10, 2016. Gliders are equipped Chla sensors.
- **03/21/2016 – Lost at sea:** Glider 617 was lost at sea due to recurrent floatability errors and a communication failure.
- **06/04/2016 – Mission 4 Completed:** Sea Gliders were successfully retrieved on June 2, 2016. Over 1,500 temperature, salinity, dissolved oxygen, and chlorophyll profile observations were collected in the Caribbean Sea during this mission.
- **07/22/2016 – Hurricane Season Glider Mission 5 Starts:** Four Sea Gliders (SG609, 610, 630 & 547) were deployed to mark the beginning of the 2016 Atlantic and Caribbean Hurricane Season.
- **11/10/2016 – Mission 5 completed:** All four Sea Gliders were successfully recovered in the Tropical Atlantic on November 2, 2016 and Caribbean Sea on November 10, 2016.

PUBLICATIONS

- Domingues et al. (2015), Upper ocean response to Hurricane Gonzalo (2014): Salinity effects revealed by targeted and sustained underwater glider observations, Geophys. Res. Lett., 42, doi:10.1002/2015GL065378.
- Goni, et al. (2015), State of the climate in 2014, Bull. Am. Meteorol. Soc., 96(7), S121–S122.
- Dong et al. (2017), Impact of underwater glider data on Hurricane Gonzalo (2014) forecast. Wea. Forecasting. Doi:10.1175/WAF-D-16-0182.1, in press.