International Challenger RU29 Mission Update

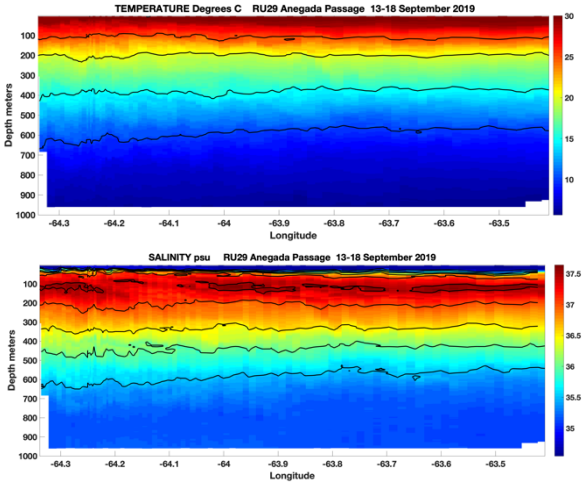
Update 6: 1 October 2019

The Anegada Passage

Since the last update, RU29 has successfully completed two full sections across the Anegada Passage from BVI to Anguilla. After completing the sections, RU29 spent some time repeating profiles in the deepest part of the Anegada Passage, looking to see what the effects of nearby tropical storm passages (Jerry, Karen) would be. The glider is wrapping up Leg I of its mission and returning back to St. Thomas to be cleaned up, have the full data set downloaded, batteries recharged, and head out again for Leg II. More about that in the next update.

For oceanographers, this region is interesting because of the complex mixing of waters from different geographic origins. Currents come together in the Anegada Passage from rivers near the equator, from the Sargasso Sea, from near Antarctica, and from the polar North Atlantic. Waters originating in each region retain distinctive Temperature and Salinity characteristics that reveal their sources. The amount of each present can tell us about the state of the Atlantic Ocean circulation, and can affect the ocean's ability to fuel hurricanes with warm near-surface waters – a priority measurement of RU29.

One way that oceanographers look at data collected by a glider is as a ***section***. When looking at a section, imagine you are looking from the side at a slice of the ocean (in this case from the south), with water properties represented in color by temperature or salinity value. These first Anegada Passage Temperature and Salinity sections were taken by RU29 13 to 18 September, 2019. As the glider goes up and down, it makes a measurement at a certain depth (Y-axis, in meters) and location across the section (X-axis, in Longitude). By associating measured Temperature or Salinity values with a color, we get Temperature and Salinity sections like these (click to see larger and more detailed section images of Temperature and Salinity).



The lowest salinity / highest temperature waters near the surface come from near the equator and outflow from fresh-water South American rivers, the Amazon and Orinoco. Northward currents can bring them seasonally along the Antilles island chain. Below the layer of fresher water lies high salinities, with a maximum around 120 m depth. These waters come from the north, from the surface of the subtropical North Atlantic, where evaporation and lack of rainfall create the highest salinities in the open Atlantic Ocean. The strong density gradient between the two water masses can inhibit ocean mixing during tropical storms and help keep them from strengthening, so it is important that ocean models correctly represent this. Deeper, the gradual decrease in salinity is from the influence of Antarctic Intermediate Water formed in the Southern Ocean. Near 1000 meters and below is North Atlantic Deep Water formed at the surface near the Arctic Circle, moving southward along the western boundary of the Atlantic Basin. This complex mix of waters from distant sources make the region interesting but difficult to model – and makes glider measurements like these important.

The International Challenger RU29 Mission is a collaboration among Rutgers University (New Brunswick, NJ) Center for Ocean Observing Leadership, Ocean and Coastal Observing - Virgin Islands (OCOVI, an affiliate of the US Integrated Ocean Observing System (IOOS) Caribbean Coastal and Ocean Observing System (CARICOOS)), and the University of the Virgin Islands. This mission will collect upper ocean data to improve hurricane forecasting models; study conditions in the Anegada Passage, an important region for NE Caribbean climate change; and build international cooperation for ocean observing and glider activities. The mission will work in the waters of the US Virgin Islands, British Virgin Islands, and Anguilla, under international Marine Science Research permit. Funding for the project comes from the U.S. National Oceanic and Atmosheric Adminstration through the IOOS, Rutgers University, and the G. Unger Vetlesen Foundation.