Bi-Weekly Z-GRAM - 12 December 2009
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IOOS® - Our Eyes On Our Oceans, Coasts, and Great Lakes

The format of this Z-Gram take a different format as I share with you the emotional landing events of Scarlet Knight in Baiona, Spain, 8-9 December and reflect on the importance of this new technology. Scarlet Knight, or as our Spanish colleagues referred to her, El Caballero Escarlata, traveled 7409.60 km and for 221 days.

The events of Baiona

The town could not have been more welcoming and more pleased to be part of this historic event. In 1493 the Pinta came back to Baiona with word of the new world and now they were proud to make history again by receiving the first trans-Atlantic Glider.

The first evening, Mayor Jesús Vázquez Almuiña hosted a reception where he recognized NOAA, the White House Office of Science Technology and Policy (OSTP), and Rutgers University by presenting each institution with a replica of the Pinta to mark the occasion. On 9 December, we first gathered in the La Capitanía Marítima, which is the harbor master's building, right in the center of town. Remarks were provided by the Mayor of Baiona, Dr. Rick Spinrad, NOAA Assistant Administrator for Oceanic Atmospheric Research, Dr. Jerry Miller, White House - Office of Science Technology and Policy, the President of Puertos del Estado, and Dr. Bob Goodman, Dean, Rutgers University. Each of the remarks stressed the importance of this new technology for ocean observing, the crucial need for international collaboration, and an understanding of the importance of the ocean in all of our lives. This was followed by a joint presentation by Rutgers and Teledyne Webb Research of a replica of the Glider to the town of Baiona for their new maritime museum that will open in May 2010. Secretary Locke, United States Secretary of Commerce, provide congratulatory comments via video (this will be posted on www.ioos.gov next week). This was followed by a very emotional video of the actual first sighting and pick-up at sea of Scarlet Knight. A thunderous and well deserved applause followed the video, both from the oceanographers who appreciated the true feat of this mission to Dena Seidel who, through her English class at Rutgers, has been filming Scarlet Knight since the beginning and will produce a documentary in Fall 2010.

Below is a poster we saw several places in town depicting the event.

Following the first event, we walked to the harbor where a plaque was unveiled by the town along side the plaque that honored the sailors of the Pinta. An overwhelming event that put Scarlet Knight in a historic light made us reflect on the impact of this mission.

From there we continued on to the Monte-Real Club De Yates De Baiona for the landing of Scarlet Knight. We anxiously awaited her arrival from the Investiagador - the ship used to pick her up. She made a triumphant trip around the Pinta and then finally arrived on land to a sea of cameras and welcoming children. First the Glider was opened to retrieve the NOAA coin, the letters from NOAA and Rutgers (which were stamped by the Mayor with and official seal), letters from students and an RU COOL Leatherman that made the trip with Scarlet. This was followed by speeches by Mayor Almuiña, Fernando González Laxe, President of Puertos Del Estado; Rick Spinrad- NOAA, Jerry Miller - OSTP, and The Honorable José Blanco López, Minister of Public Works and Transport. The highlight of the event was threefold, the reading by a Spanish student of one of the American child's letter, the handing back over of the glider to the United States from Minister López to Jerry Miller and the tremendous fascination by the children of the Glider. Below are pictures of Scarlet Knight making her trip around the bay, the child reading the letter, the children around the glider, and Rick and myself holding up the mementos from the glider

So why is this mission so important?

Technology - Research to Operations:

- Scarlet Knight is a Slocum Electric glider. This glider started as a dream by Doug Webb, founder of Webb Research, now Teledyne-Webb Research, of Falmouth, Mass. Doug came up with the idea of the glider in the 1980s, in conversations with the late oceanographer Henry Stommel. "The whole notion has been to make the interior of the ocean much easier to observe," Webb told us earlier this week in Baiona. Webb thought it was possible to build a fleet of vehicles that could roam the

ocean for extended periods, and the events in Baiona this week were at least a partial vindication of that thought. This picture says it all.

- Many missions preceded this particular mission. The Office of Naval Research, National Science Foundation and NOAA have, throughout the years, provided research support to take the glider technology to where we are today. Funding continues today on research to improve the Glider and advance sensor technologies.
- Teledyne Webb Research was relentless in pursuit of this dream and continues to push the technology. The Drake Glider is a thermal glider currently underway.
- In 2009, the United States Navy awarded to Teledyne Webb Research a purchase of 150 Gliders through the Navy's Littoral Battle Space - Glider Program. Teledyne Webb Research has delivered gliders to over 14 countries.
- IOOS Regional Associations are now making routine observations with gliders.
- Data from Scarlet Knight was immediately available and was used to evaluate Satellite SST and Altimeter data, and used to validate and improve the HYCOM circulation model.
- Based on the lessons learned from the 2008, new technologies were integrated for this mission that included being able to measure battery life, new anti bio-fouling coatings, and improved communications software to name a few.

Education

- The Atlantic Crossing class brought together Oceanographers, Computer Scientists, and Engineers, all getting practical experience on what they have learned in the classroom. They have learned about the importance of the ocean and its impact on climate change.
- There has been a tie to K-12 through blogs and classes following the glider both in the United States and Spain.
- The Rutgers students, now a part of history, as part of the class go back to their High Schools to talk about this mission.
- Through the English Department and Dena Seidel, English majors are involved through the making of a documentary. These students are not only learning about how to make a documentary but are also learning about the importance of the ocean.

Partnerships - International to Local; Federal to Federal; Federal to Non-Federal and with Industry

- We could not have been successful without the help of Antonio Gonzalez Ramos and Enrique Alvarez Fanjul. Antonio is a biology professor at the University of Las Palmas on Grand Canary, in the Canary Islands, and Enrique is a physical oceanographer with Puertos del Estado, the Spanish government agency that runs the country's ports and also concerns itself with oceanography. Their contributions were crucial and included access to important satellite data used by the glider pilots in Rutgers to plot their course, and in Antonio's case, an algorithm to help them make the best use of that information. Enrique used his diplomatic skills and cross-cultural sensitivity to help everyone focus on the task at hand; it was his agency that chartered the Investigador, for instance.
- International Student Exchange enables shared science, shared goals, shared cultures, and leads to solving problems together.
- The mission culminates many years of efforts through the National Oceanographic Partnership Program that brings together the Federal Agencies in support of research and operational oceanography of our oceans, coasts, and Great Lakes.
- US IOOS has a global component and a coastal component. Within the coastal component there is the National or Federal participation and at the Regional level are the IOOS Regional Associations. Rutgers is a member of the Mid-Atlantic Coastal Ocean Observing Regional Association and connects the Federal Partners with our non-Regional Partners.
- Teledyne Webb Research has been the ultimate partner - with their resources, their can do attitude and Clayton Jones' calming demeanor it was a final ingredient to success.

Other Efforts - I would certainly be remiss if I did not finish on highlights of other missions (with apologies to those I have missed)

- The Rutgers team has made 164 deployments worldwide (Oct. 2003 – Jul. 2009); that include the Mid-Atlantic Shelf, Florida, the Mediterranean Sea; Liverpool Coastal Observatory, Australia, Norway and Antarctica
- Long-endurance Seagliders developed at the Applied Physics Laboratory, University of Washington completed successful under-ice surveys across Davis Strait in December 2006 and through winter 2008/2009, with the most recent mission spanning 6 months, including 51 days and 450 miles of fully autonomous under-ice operations.
- US IOOS PacIOOS is operating the REMUS (Remote Environmental Monitoring UnitS) equipped with sensors that measure salinity, temperature, currents, bathymetry, and water quality parameters. Using REMUS to collect these parameters provides a spatial context for the nearshore/offshore sensor network and water sampling programs. Monthly Remus AUV surveys are carried out focusing on the south shore of Oahu as part of the Hawaii Ocean Observing System (HIOOS). AUV surveys also target specific water quality 'events' such as effluent spills and high run-off periods.
- Slocum Glider in the Great Lakes: On September 17, 2009, researchers at the University of Minnesota Duluth launched an underwater glider into Lake Superior to collect data in a way that was never before possible. This project, co-funded by the Great Lakes Ocean

Observing System (GLOS), has succeeded in building a glider that can descend 700 feet, covering more of the 1,300 feet of Lake Superior than ever before.

- With CenCOOS the SPRAY Glider operated along CalCOFI Line 67 in 2007 and 2008. The SPRAY Glider was developed with the support of the Office of Naval Research by Scripps scientists and engineers.
- SCCOOS HAB monitoring team, the NOAA-funded MERHAB RADPALERT project at USC, the Center for Embedded Networked Sensing project at USC, the Orange County and Los Angeles County Sanitation Districts, the Pacific Marine Mammal Center, the Fort MacArthur Marine Mammal Care Center, the Wetlands and Wildlife Care Center and the International Bird Rescue Research Center, used USC Webb Gliders to support the detection of a widespread domoic acid poisoning event that is taking place as a result of a *Pseudo-nitzschia* bloom in the waters off southern California in May 2009.
- During the AOOS - Sound Predictions 2009 used Autonomous underwater vehicles (AUVs) and gliders to contribute to a regional scale view of water column structure to 200m depth, and help evaluate and improve the performance of ROMS, the Regional Ocean Modeling System and oil spill response models.

NOW for some FUN

- Click on the YouTube video - 'We're Going to Fly the Glider': http://www.youtube.com/watch?v=iiRXbq5Wr3g. This is set to Billy Joel's "We Didn't Start the Fire."
- Fun Facts about the Atlantic Crossing (Thanks to the Rutgers Atlantic Crossing Website: http://rucool.marine.rutgers.edu/atlantic/)
    - RU27 **called home** over 1000 times during the mission to report her location and send/receive data.
    - RU27 **moved her buoyancy pump** approximately 22,000 times, which allowed her to…
    - Complete approximately 22,000 **inflections**, 11,000 **dives** and 11,000 **climbs**.
    - The raw data shows that Scarlet **traveled vertically** approximately 2200 kilometers (almost 1400 miles). Explanation: Glider goes more forward than up and down when it's flying.
    - Almost 16 MB of **data was transferred** via satellite during the mission. This is likely low for a 220-day deployment but that is due to an energy/efficiency/surface risk habit.

So what started as a challenge by Dr. Spinrad in 2005 to cross the Atlantic resulted in MISSION ACCOMPLISHED! To all involved in the Scarlet Knight mission, including all those who worked on the previous missions for many years, without whom we could not be successful, I say Bravo Zulu and Job Exceptionally Well Done! But there is no rest, as Dr. Spinrad has already levied the next challenge: Repeat the HMS Challenger mission with Gliders.

Cheers,
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