

Rapid Response Service Goes Operational in Northern Norway



Following the successful demonstration in September 2010 of the rapid response SeaSonde for oil spill response, The Norwegian Clean Seas Association for Operating Companies (NOFO) and the oil company ENI NORGE AS have initiated a pilot service for monitoring surface currents in the Barents Sea around the Goliat oil field, 60 km off the pristine coast of the county of Finnmark.

Under the management of CodarNor A/S (led by Anton Kjelaas), three Low Power SeaSonde Remote Units, each consuming less than 210 W average, have been integrated into durable, lightweight shelters with autonomous, off-grid power supplies consisting of a combination of fuel cell and solar panels.

In September of 2012, all three shelters were delivered to remote locations on offshore islands via helicopter. With a crew of four and a helicopter pilot, all three units were installed and operating in a little under 10 hours, including transit time, with no more than 2.5 hours on the ground at any of the sites. Built by Power Controls A/S, each shelter's power system can be remotely monitored and controlled in real-time via CDMA wireless data modem. SeaSonde data products are also being provided in real-time via wireless communications to NOFO and the Norwegian Meteorologic Institute for incorporation into coastal ocean circulation and oil drift models. These SeaSondes and shelters will be used in a six-month campaign for the Goliat field with other deployments planned afterward. At any time they can be rapidly relocated in case of a spill in a different area.

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SeaSondes: The Ideal "Near-Field" Tsunami Observation Tool

A special workshop at 2011 IEEE Oceans/MTS in Hawaii introduced and focused on a new term: "*near-field*" sensors at coastal areas that will be impacted by a tsunami. This is distinct from "far-field", which includes bottom DART-type pressure sensors and satellite altimetry, which observe hours before arrival at the coast. Data from the latter are used to refine the model forecasts, but are not enough. Near-shore bottom sensors or buoys in the coastal zone would not survive ravages of a passing tsunami. SeaSonde HF radars -- with no presence in the water -- are ideal and can observe before arrival. Tide gages are the other near-field sensor. But because they warn after initial impact, they provide only "upstream" information; this is not as useful as data at the impacted coastal point because of significant alongshore variation due to bathymetry. ***All information: seismic, far-field, model, and near-field (the latter including HF radar data) will prove invaluable in the evolving tsunami warning centers of the future.***

The discovery and publication by Barrick in 1979 that HF radars could detect a tsunami wave from its orbital velocity¹ lay dormant for 25 years until the devastating 2004 Banda Aceh event provided a "wake-up call." Although no HF radars were in place to observe that event, work began on hypothesizing the idealized tsunami current patterns one might expect to see from a single radar. It was recognized that the nearshore bathymetry would be a dominant factor that defined its surface signature. The problem lay in finding this tsunami pattern among the complex background flow constituents that these radars normally observe, and doing this rapidly with an automatic algorithm. This hypothetical pattern work gave way to reality after the March 2011 cataclysmic tsunami that wreaked havoc on Japan and whose strong waves were observed in the U.S. and South America. This time, over 20 SeaSondes were in place and able to record a trove of data that proved invaluable in creating the first HF radar algorithm ever that could detect the approaching tsunami signal offshore -- pulling it out of the background flows -- and provide an alert.

The algorithm that proved successful was based on the temporal characteristics of the tsunami wave rather than its spatial pattern; the latter will be added later. Damaging tsunamis have periods between 20 - 40 minutes. This separates them from wind-wave and swell motions, but is shorter than the 6-hour half-period of tides. However, normal spectral analysis methods require several periods to identify the desired peak, and this is too long to wait when lives are at stake. Therefore, to find the onset of this unique signature quickly among the other background flows, the algorithm we developed and demonstrated is based on the following:



Locator map for April 2012 tsunami event in the Indian Ocean.

- Running averages and standard deviations of radial velocity flows from the radar back in time are being continually computed in bands parallel to the bathymetry (depth) contours. Then we:
- Calculate a "velocity-deviation function" from this background as a product over several adjacent bands.
- Calculate a "velocity-increment function" as the magnitude change over three successive time steps of 2 - 4 minutes each.
- Calculate a "velocity-correlation function" over the three or four depth-oriented bands. This must then increase or decrease in at least three consecutive time steps.
- Finally, the above three "functions" are multiplied together to create our "q-factor", which -- when it jumps from quiescent by a significant amount -- becomes the "tsunami alert" that is transmitted to a national coordination center.

The above algorithm was tested offline but in a automatic manner on data from 14 SeaSondes for the intense March 2011 Japanese tsunami: in both Japan and the U.S.; and at different frequency bands². In all cases, it detected the tsunami before it was seen at the coast by tide gages. And in all of these locations, the shallow shelf did not extend far offshore -- a particularly challenging scenario.

How does it work for weaker tsunamis? We had a chance to test this with an April 2012 magnitude 8.6 event in the Indian Ocean, followed by a weak 8.2 aftershock. [See locator map].

Recall that it is not the magnitude of the earthquake that dictates tsunami intensity; it is related to the nature of the plate motions. In these events, coastal tide gages recorded maxima less than a meter, and at the radar sites, only tens of centimeters. This was seen by the 13 MHz SeaSonde at Padang, Indonesia and two 5 MHz SeaSondes in the Andaman Islands belonging to India. A paper submitted August 2012 to Remote Sensing journal offers details of these detections³.

Is this the end of our tsunami algorithm development? No. As with other tsunami sensors, analysis algorithms, and their mutual data fusion, they are in a state of flux and optimization. Our algorithm will see improvements in the following areas:

- The tradeoff between probability of detection and false alarms. You want the former to be as big as possible and the latter to be small. There is a "cost function" that describes this tradeoff. Never a false alarm carries a high cost of missing "the big event" and is unnecessary because other information (e.g., seismic) in a national tsunami fusion center will cull relevant alerts.
- The large velocity associated with the incoming tsunami is sensed by the radar. This will be converted to height through the spatio-temporal relations we developed, because height is the real killer.
- Although our recent experience shows the tsunami is detected before it arrives at the coast, we must refine this alert time more precisely. Again, the spatio-temporal tools to do this exist; we will develop and test them based on our past data observations.

¹ Barrick, D.E. "A Coastal Radar System for Tsunami Warning." *Remote Sensing of Environment*, Vol. 8, 353-358 (1979).

² Lipa, B., D. Barrick, S. I. Saitoh, Y. Ishikawa, T. Awaji, J. Largier, and N. Garfield. "Japan Tsunami Current Flows Observed by HF Radars on Two Continents." *Remote Sensing*, Vol. 3, 1-17 (2011).

³ Lipa, B. J., D.E. Barrick, S. Diposaptono, J. Isaacson, B.K. Jena, B.B. Nyden, K. Rajesh, T. Srinivasa Kumar. "High Frequency Radar Detection of the Weak 2012 Indonesia Tsunamis."

Submitted to Remote Sensing in August 2012.

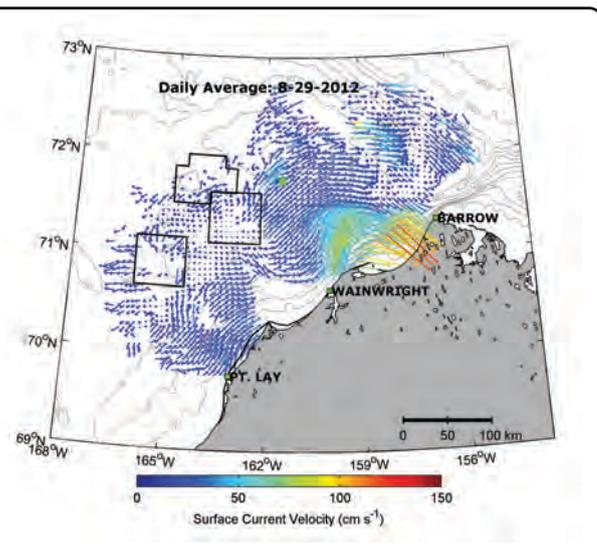
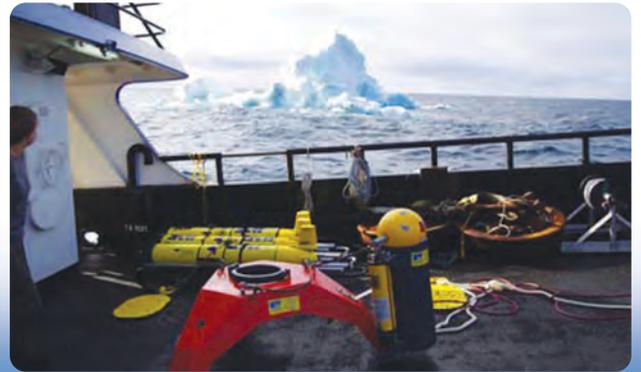
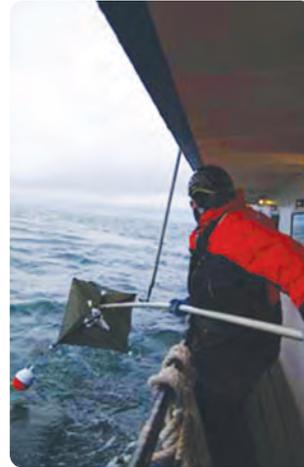


Background image: SeaSonde Remote Unit operating in Indonesia on coastal bluff.

University of Alaska Fairbanks Summer 2012 Roundup: "We threw everything at the ocean this year, including the kitchen sink!"

Contributed by Hank Statscewich & Peter Winsor, University of Alaska Fairbanks

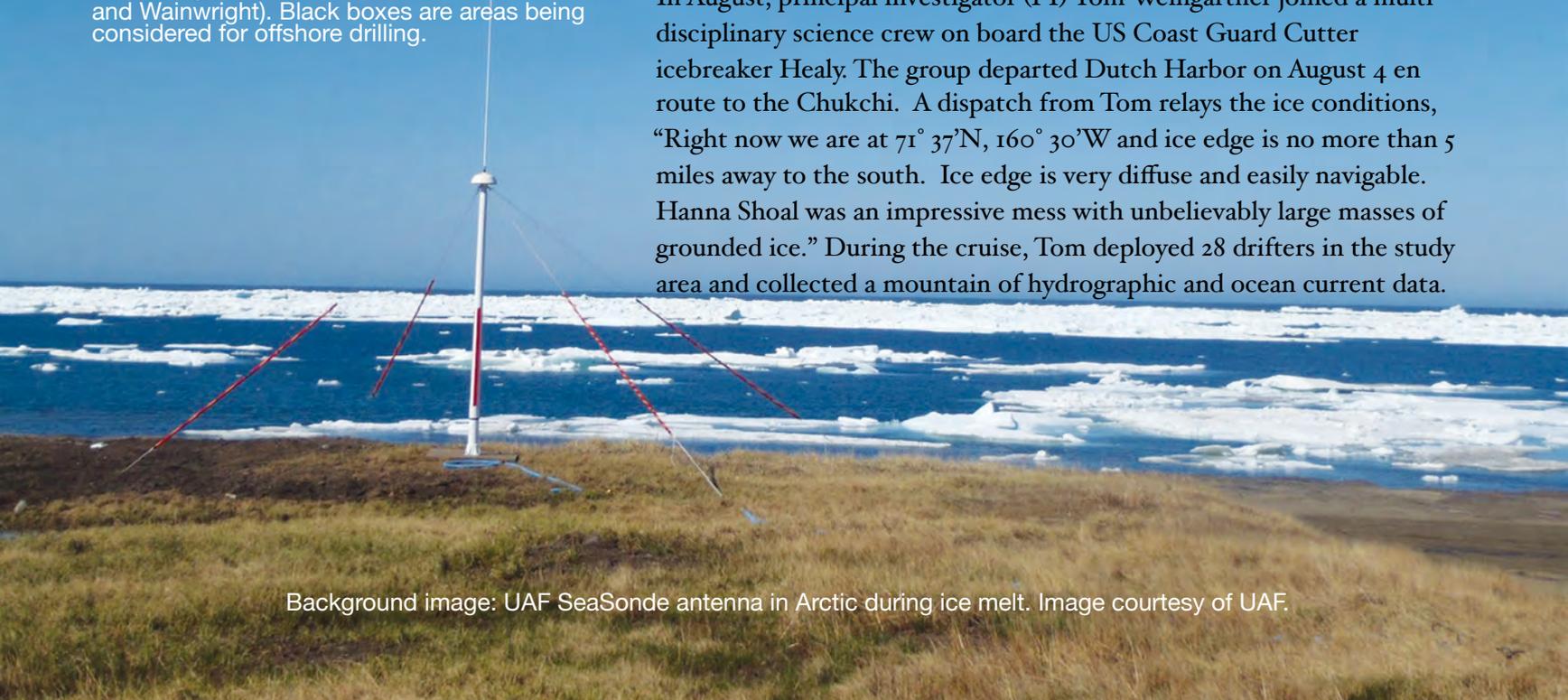
Summer 2012: Researchers at the University of Alaska Fairbanks (UAF) have kicked off an exciting field season with a massive sampling exercise to measure ocean currents and stratification in the Chukchi Sea, a marginal sea of the Arctic Ocean. The season started off with the installation of CODAR Extended Long-Range SeaSondes in the villages of Barrow, Wainwright and Point Lay. These specially-configured units feature a second transmitter and transmit antenna to a traditional 5 MHz installation to maximize the amount of energy transmitted from the antennas towards ocean. Heavy ice cover lingered throughout the study area through most of June and into mid-July, but by mid-August the ice started to break apart and improvements in range from each of the three systems due to the hardware augmentation started to become evident. Some preliminary analysis show ~25% improvement in range, from 180 km to 240 km!



Current map with a strongly sheared current field and huge front in the vertical sections (transition between greens and blue colors between Barrow and Wainwright). Black boxes are areas being considered for offshore drilling.

In addition to the Long-Range SeaSondes, two higher resolution 25 MHz systems are running in the village of Barrow to investigate the near shore current fields around Point Barrow, the northernmost point in the United States. The energetic currents of the region represent the oceanographic link between the Pacific and Arctic Oceans via Barrow Canyon, a deep submarine canyon that is located just 20 km from shore.

In August, principal investigator (PI) Tom Weingartner joined a multi-disciplinary science crew on board the US Coast Guard Cutter icebreaker Healy. The group departed Dutch Harbor on August 4 en route to the Chukchi. A dispatch from Tom relays the ice conditions, "Right now we are at 71° 37'N, 160° 30'W and ice edge is no more than 5 miles away to the south. Ice edge is very diffuse and easily navigable. Hanna Shoal was an impressive mess with unbelievably large masses of grounded ice." During the cruise, Tom deployed 28 drifters in the study area and collected a mountain of hydrographic and ocean current data.

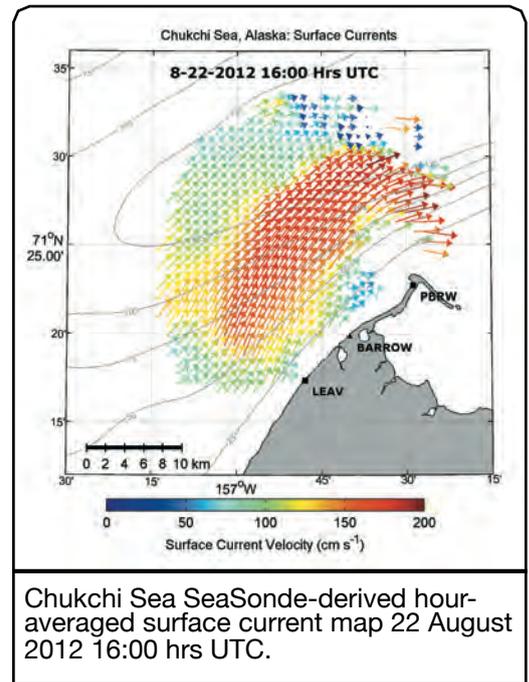


Background image: UAF SeaSonde antenna in Arctic during ice melt. Image courtesy of UAF.

Follow That Front! Adaptive Sampling Using SeaSonde Data

The day that Tom stepped off the Healy and onto dry land, PI Peter Winsor and crew stepped onto the Norseman II for a two week survey of the frontal structures on the Chukchi Shelf. Winsor and crew towed an undulating CTD-optics instrument through the water almost continuously for 12 days, collecting >4,000 casts through a 1,300 swath of ocean. The science party made extensive use of the surface current maps produced by the SeaSondes to adaptively sample fronts, convergence zones and coastal jets in the region. Winsor also deployed 20 drifters, two gliders and a short-term current meter mooring. The drifters were initially separated by 10 km but were placed on either side of a front, identified by the CODAR and towed instrument, with a temperature difference of >6 °C. Two Webb Slocum gliders were deployed alongside the drifter clusters to gain a Lagrangian perspective of the frontal physics. For these glider deployments, the UAF team relied on the glider piloting expertise of the Rutgers University Coastal Ocean Observation Lab. While the UAF researchers were at sea in the Chukchi, the glider pilots were comfortably situated in New Jersey.

A total of ~100 drifters were deployed in the Chukchi Sea this summer. Apart from giving the science team insights into the circulation patterns of the area, the drifters will also be used for detailed comparisons with the CODAR-derived surface currents. Project data, including real-time surface current vectors can be viewed on the project website: <http://dm.sfos.uaf.edu/chukchi-beaufort/index.php>.

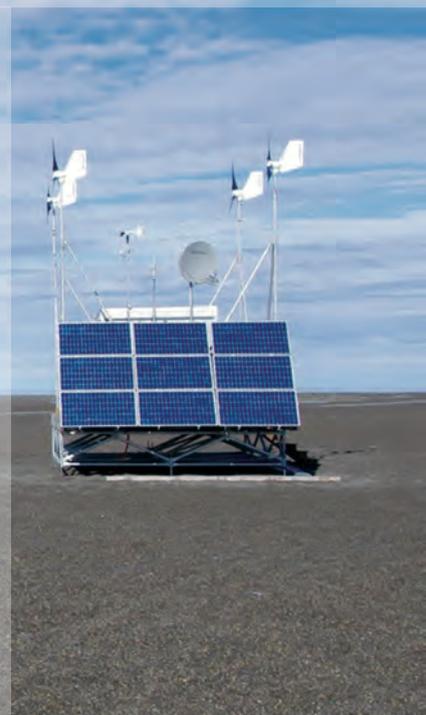


BOEM Funding for this research is provided by the United States Department of the Interior, Bureau of Ocean Energy Management. *All images provided courtesy of University of Alaska Fairbanks.*

Ship Detection in Arctic

Since 1906, when Norwegian Roald Amundsen first transited the Northwest Passage in his sloop, Gjøa, Atlantic mariners have dreamed about a northern route to the Pacific. With retreating sea ice and longer periods of thin ice and open waters in the Arctic Summer, this dream may soon be a reality. With increased shipping activity and other economic opportunities, including potential offshore oil and gas development and tourist cruises in the Chukchi Sea, the U.S. Coast Guard is increasing their presence and capabilities in all US Arctic waters. Part of this increased focus requires the ability to monitor vessels working and transiting through the area.

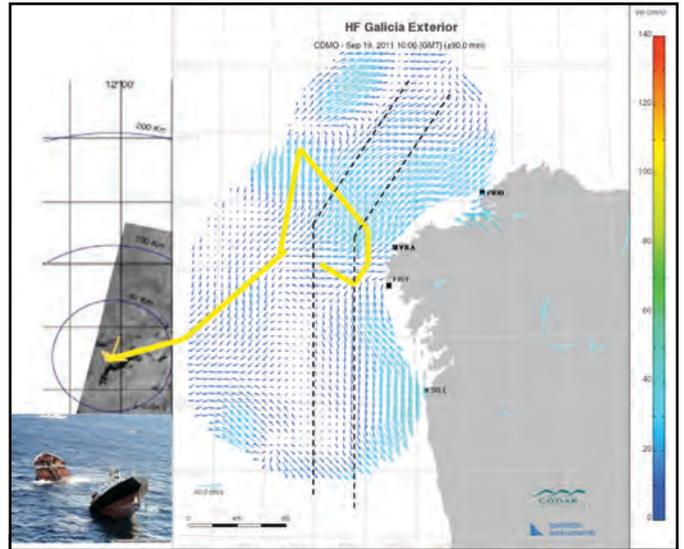
Together with Rutgers University, the University of Alaska Fairbanks has implemented CODAR Ocean Sensors' real-time ship detection software simultaneously on Long-Range and Hi-Res SeaSondes during Summer of 2012 in Barrow, Alaska, the focal point for vessels transiting between the Beaufort and Chukchi Seas. This software is a true dual-use application in that it runs as a complementary, parallel process and does not interfere with nor detract from SeaSonde current and wave processing. The main purpose of the vessel detection work in Alaska was to demonstrate that the real-time capability Rutgers already has in operation for monitoring the New York Harbor approaches could also be applied to an Arctic environment where unique sea ice and auroral effects exist. In addition, it has proven to operate well in remote arctic settings where shore-based grid power is unavailable requiring autonomous power and communication systems. The HF-generated vessel detections and AIS data feeds from the ships operating in the area are passed to Rutgers in real-time for further association and QC analysis. Funding for this work is provided by the U.S. Department of Homeland Security.



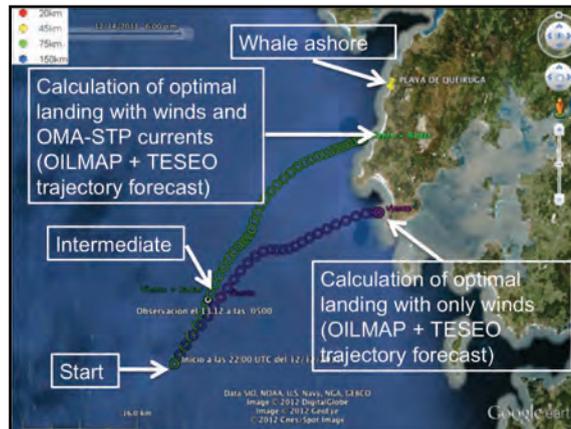
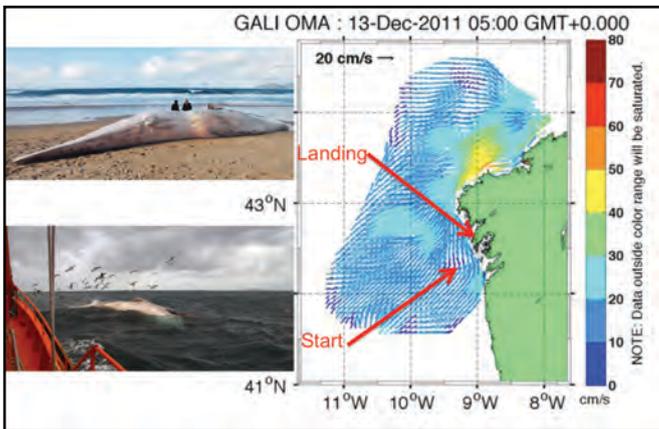
Drift Trajectory Analysis of a ... Whale Carcass?!

In 2002, the Prestige oil spill disaster off the northwestern coast of Spain acted as a wake up call highlighting the importance of preparing for such a crisis. It led to Spanish institutions prioritizing the improvement of activities such as maritime protection, operational oceanography and oil spill preparedness and response. As part of this, ten years after the Prestige, a Galician SeaSonde HF radar network provides real time surface currents, wave data and currents forecast information covering 280 km or 75% of Galicia coast and with a range of up to 200 km offshore. Its operation and exploitation is the responsibility of Puertos del Estado www.puertos.es, INTECMAR www.intecmar.org and MeteoGalicia www.meteogalicia.es.

The present use of the data is wide; an exemplary case on how the data are being used is a drifting object trajectory forecast analysis done in December 2011 for the Directorate of the Spanish Merchant Marine. A drifting whale was identified the 12th of December by the Spanish Coast Guard at 22 00 h UTC in position 42°22'N 09°23'W. Intermediate positions of the whale were monitored at that time; landing happened the 14th of December at 21 39 h UTC, as notified by the Vigo Rescue Coordination Center of the Spanish Coast Guard.



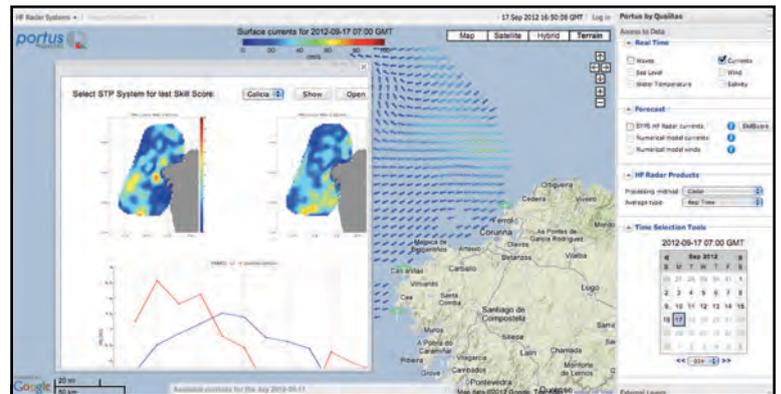
Trajectory followed by the Prestige ship in November 2002, most of it inside the present SeaSonde coverage area (Images courtesy of Puertos del Estado and INTECMAR).



Trajectory of a whale along Galician waters (Data courtesy of the Spanish Merchant Marine Administration) and trajectory forecast model done by IH using the "Lagrangian Model TESEO".

Data input into the trajectory forecast model	Intermediate sighting		Landing at the coast	
	Distance in km	Search area in km ²	Distance in km	Search area in km ²
Only winds	1.6	2.56	17.66	311.88
Winds and OMA-STP currents	0.7	0.49	7.63	58.22
Improvement in %	56.2	80.8	56.8	81.3

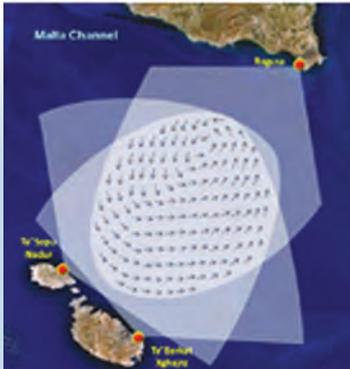
An analysis to assess the qualitative improvement by using SeaSonde currents and OMA-STP forecast system together with a trajectory model was performed against results provided by a standard trajectory forecast based only on wind data. The analysis of the whale trajectory as presented was done by IH Cantabria www.ihcantabria.com in collaboration with QUALITAS www.qualitasremos.com based on the OMA-STP currents which are delivered in an operational mode as part of the PORTUS by QUALITAS® Marine Information System along the Galician coast and the trajectory forecast models that are currently being used by the Spanish Coast Guard (ASA OILMAP™ and TESEO Lagrangian Model). The results contained in the adjacent table make clear that the use of OMA-STP currents can greatly improve trajectory forecast models (around 80% for this experiment) in areas which are close to the coast and where HF Radar systems are able to provide high quality surface currents information.



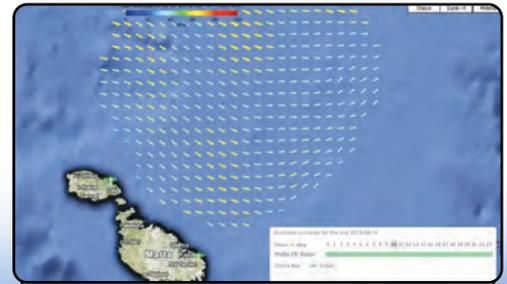
Value analysis of the Galician operative OMA STP currents prediction system in a trajectory forecast with regards to a situation with only wind data.



CALYPSO Project SeaSonde Network: Improving Oil Spill Response Using HF Radar in the Malta-Sicily Channel



Three SeaSondes will soon be providing real-time surface current maps in the strip of sea dividing Malta and Sicily, for the CALYPSO Project, coordinated by Prof. Aldo Drago from the University of Malta. Two units have already been installed and commissioned on northern Malta (Ta'Barkat and Ta'Sopu), with the final unit scheduled for installation in late October 2012 in southern Sicily (Port of Pozzallo). The CALYPSO radar network also includes latest technology to extend the coverage performance with use of Multi-Static Data Processing Software at one of the sites in Malta. This is intended to extend the area of coverage closer to the Maltese coastline as well as to add redundancy in the conventional backscatter region, thereby increasing current measurement robustness. The network is managed using a state-of-the-art data management platform, which consists of the CODAR Central Management / Data Combining Station and the PORTUS by QUALITAS Marine Information System, providing data retrieval and combining from the radar stations, access to all SeaSonde data outputs (offline or through a web based viewer), powerful data sharing tools like OPEnDAP, ftp or WMS as well as advanced tools for system administration, monitoring and reporting.



Above: SeaSonde surface current maps for the Malta System shown in PORTUS. Courtesy of CALYPSO partners.

Below: Some of the CALYPSO Partners during SeaSonde training in Malta.



CALYPSO primary aim is to support efficient response against marine oil spills in the Malta-Sicily Channel, that is one of the busiest areas of maritime transportation in the Mediterranean, accounting for roughly twenty percent of the world's oil tanker traffic. An oil spill accident may cause a devastating damage to a small island state like Malta where economic assets and areas of touristic attraction are concentrated in space. Malta's water desalinization plants are among the most vulnerable to oil spill objects since they provide the country's major source of fresh water.

The routine acquisition of such spatially widespread, long-term data sets is expected to trigger an unprecedented leap in the economic value of ocean data and information, and will additionally target multiple applications and information users. This project puts Malta and Sicily at the forefront of such initiatives in the Mediterranean and will serve as a stepping stone to expand the system in the future for coverage of the full marine space around the Maltese Islands and the Sicilian perimeter.

CALYPSO brings together three other partners from Malta - Transport Malta, Civil Protection Department and Armed Forces of Malta - and four partners from Sicily - ARPA Sicilia, IAMC-CNR Capo Granitola, Università degli Studi di Palermo (UNIPA) and Università di Catania (CUTGANNA). Spanish engineering company Qualitas Remos has been awarded the contract for radar supply, installation, commission and calibration.

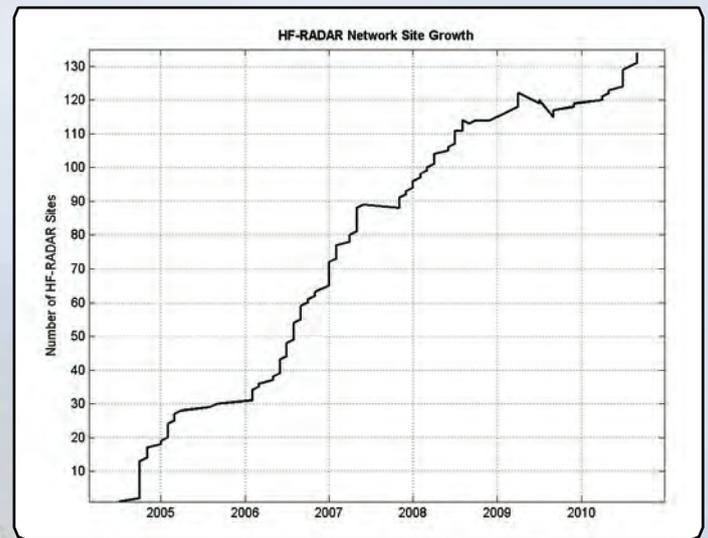
More information about this project at -
<http://oceania.research.um.edu.mt/cms/calypsoweb>

Status of U.S. HF Radar National Network (HFRNet)

Contributed by L. Hazard, M. Otero, T. Cook, T. de Paolo, & E. Terrill, Scripps Institution of Oceanography

The success and continued expansion of a high frequency (HF) radar national network for the distribution of coastal surface currents has become possible through the dedication and partnerships of multiple institutions, federal and non-federal agencies, local and state governments, and private companies. The U.S. Integrated Ocean Observing System (U.S. IOOS®) is dedicated to maintaining the U.S. network and beginning to reach out to global partners as these data are used in universal applications for the health and safety of human and marine populations.

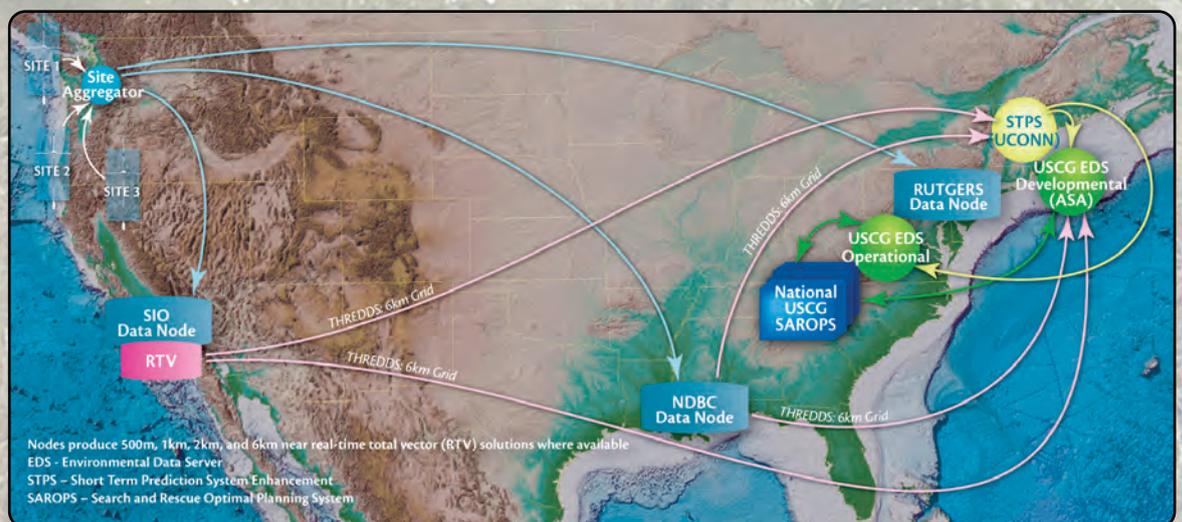
The Coastal Observing Research and Development Center (CORDC) at Scripps Institution of Oceanography (SIO) leads the development and administration of the HF Radar National Network (HFRNet) for distribution of HF radar derived surface currents. The HF-Radar Network started as a prototype with a single portal and node and 4 sites in December 2003 and has since grown to an operational status with over 4 million radial files produced by 133 sites from 29 participating institutions as of September 2012 as shown in adjacent figure. Central repository nodes have been deployed at the National Data Buoy Center (NDBC), on the west coast at Scripps Institution of Oceanography (SIO), and east coast at Rutgers University, to demonstrate an end to end distributed data. Site aggregators are currently deployed at eleven partnering institutions including Oregon State University; San Francisco State University; Monterey Bay Aquarium Research Institute; California Polytechnic State University; University of California, Santa Barbara; University of Southern California; Scripps Institution of Oceanography; University of Maine; Rutgers University; University of Southern Mississippi; and University of Miami. The U.S. IOOS program has supported the standards-based ingest and delivery of HF radar data. Standardized data formats and access methods enable surface-current data to be ingested by national tactical decision aids, such as those used by the U.S. Coast Guard for search-and-rescue, and NOAA for oil spill tracking and abatement. Coastal applications utilizing HF radar derived surface currents transcend all coasts. The first Group on Earth Observation (GEO) Global High Frequency Radar meeting was held in London, England in March, 2012. A pilot project to extend the distributed data management system to global partners will begin next year initially with the Republic of Korea. U.S. and Korean partners will collaborate in all aspects of HF radar operations including system deployment, maintenance, data distribution, and products.



HF Radar site growth in U.S. from 2003 - present.

HFRNet Data Integration into Search and Rescue Optimal Planning (SAROPS)

Full HFRNet integration into the U.S. Coast Guard Search and Rescue Optimal Planning System (SAROPS) has occurred in a phased approach in partnership with the United States Coast Guard (USCG), CORDC, Applied Science Associates (ASA), NDBC, the University of Connecticut (UConn), and Rutgers University with funding from the U.S. IOOS. The CONUS total vectors are made available in near real-time via both graphical display tools, and machine services Thematic Real-time Environmental Distributed Data Services (THREDDSS) to USCG Environmental Data Server (EDS). A graphical representation of the network is showing in adjacent figure.

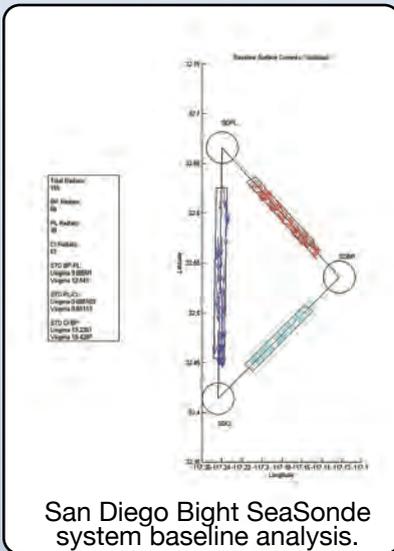


Graphical representation of data path from site to SAROPS tool.

Direction of Arrival (DOA) Metrics

Detailed analysis into Quality Assurance (QA) metrics is an ongoing research area at CORDC and SIO. Analysis of the compact antenna patterns and the internal signal processing within the MUSIC algorithm leads to a goodness-of-fit quality metric for the output radial current velocities and bearings produced by the HF radar system. Quality of measured antenna patterns is paramount to the accuracy of the MUSIC algorithm bearing output. Ongoing research and development between CORDC and CODAR Ocean Sensors aims to provide HF radar users with a practical quality metric for the radial current velocities and their associated bearings produced by the HF radar system.

Our current effort focuses on the three CODAR SeaSonde sites in the San Diego Bight: Point Loma (SDPL), Border Park (SDBP), and Coronado Island (SDCI). Using the Radial Metric files that CODAR Ocean Sensors developed, we can collect the statistical distributions of various QA metrics for each site. In this analysis, we are using the maximum of the Direction of Arrival (DOA) function, the half power width of the DOA function, and the Doppler cell Signal to Noise Ratio (SNR). All of these metrics are used in determining the bearing angle of each radial velocity vector. See references [5] and [6] for complete details.



The data set currently being analyzed is shown in adjacent Figure, which lays out the baseline areas between SIO SeaSonde sites. If one looks closely, especially on the baseline between SDBP and SDCI, there are inconsistencies in the radial vectors. Radial velocity vectors are pointing in both directions, to the northeast, and to the southwest. Physically, this is unlikely to be a realistic situation. By eliminating the vectors with low quality metrics, according to the distributions above, it is expected that the baseline data will become more consistent. As a measure of consistency, the standard deviation of the two components of the radial velocity vectors (U, V) should decrease after QA analysis. Many days of baseline data are being analyzed at this time, and formal results will follow.

HF Radar Oil Platform Deployments in Gulf of Mexico

CORDC staff continue HF radar operations at the Atlantis Platform in the Gulf of Mexico and an additional radar has just recently been installed on Thunderhorse Platform in August 2012. Processing efforts continue to focus on Loop Current detection using radial currents from a single radar, and altimeter-derived currents to constrain the single site solutions. Analysis efforts are prioritized to a time frame when Loop Current passes within close proximity of the Atlantis radar system. In support of these efforts an array of

14 CORDC miniature wave buoys were deployed along a transect in the Gulf of Mexico on October 21-22, 2011. The transect extended from the shelf break (~800m depth) to a deep water location (~2800m depth) that was predicted to be the location of the Loop Current as estimated from satellite imagery and the EddyWatch product. Within the first 2 weeks of the deployment, 8 of the buoys were entrained in a warm core eddy that was forming along the Loop Current, while the remaining buoys drifted along the shelf, and exhibited flow patterns consistent with wind generated and inertial motions (figure at right). The buoys were unique in that they captured the warm core eddy during its formation, and continued to be entrained in the eddy, some making 3 or 4 transits around the eddy. The buoys that made it on to the shelf provided wave and current observations in the vicinity of many of BP's offshore leases. Analysis efforts are continuing on platform based HF Radar deployments.



Track of all buoys over entire deployment (Oct 2011 - Jan 2012).

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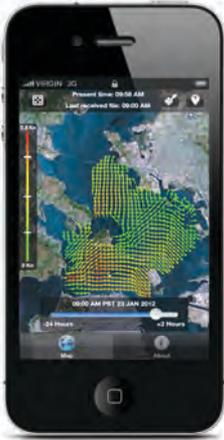
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All images provided courtesy of Scripps Institution of Oceanography.

Cleanup Teams Guided by CODAR Data

HF radar technology used successfully to find trash hot-spots

Contributed by Chris Pincetich, Marine Biologist, SeaTurtles.org



Sausalito, California - A team of non-profit scientists has begun using high-frequency radar to locate and cleanup trash hot-spots on the waters of the San Francisco Bay.

Using a small boat launched from Sausalito, the team was able to locate two hot-spots of trash, or marine debris as it is called at sea, in just under an hour. Dip nets collected foam pieces, discarded rope, plastic bags, plastic cups, and dozens of other items. “Over 90% of the recovered trash items were

plastic, and 87% of those were disposable items people use once and litter or landfill,” said Chris Pincetich, Ph.D. marine biologist and leader of Marine Debris Action Teams, a project of SeaTurtles.org. “The plastic is polluting the critical habitat feeding area of leatherback sea turtles offshore of San Francisco Bay and may be harming them and other marine life.”

The teams' ultimate goal is to prove that this technology could target the massive accumulation of plastic pollution in Pacific Ocean gyres. Plastic marine debris is known to harm wildlife in the ocean, like Pacific leatherback sea turtles, that accidentally ingest it or become entangled in it.

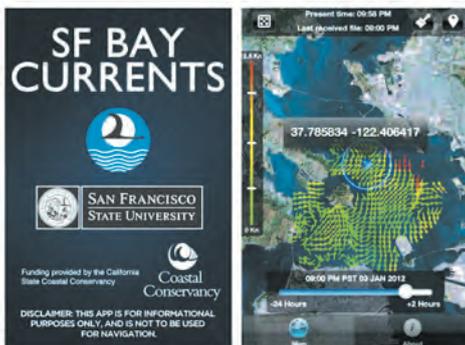


Chris Pincetich of SeaTurtles.org speaking with local ABC news affiliate as San Francisco Bay exercise gets underway.



Above: Nick Drobac explaining to NBC Bay Area news how the team utilizes the SF Bay Currents App to look for front lines and other convergence zones.

Below: The San Francisco Bay SeaSonde network data is fed into the app which displays a surface currents nowcast and short-term forecast.



The Pacific leatherback swims 6,000 miles across the ocean to feed on jellyfish along the California coast. More than 16,000 square miles of California's coastal waters were designated as critical habitat for the leatherbacks earlier this year. “We were able to go directly to high-density piles of plastic pollution using this high-resolution radar technology, just as we anticipated,” said Nick Drobac, Executive Director of The Clean Oceans Project. “I'm confident that this work in the San Francisco Bay will demonstrate that we can have equal success on the high seas tackling the massive amounts of plastic waste in the Pacific Ocean.”

“Floating debris tends to be concentrated in convergence areas that can be monitored in real-time using high-frequency radar” said Dr. Toby Garfield at San Francisco State University, who oversees parts of the network of radar along California's coast. “We are very pleased that this data is being used to remove marine debris much more effectively.”

The Clean Oceans Project has been assembling technologies to launch offshore missions to address the growing epidemic of plastic pollution in the world's oceans through a plan to efficiently locate it, collect it, and process it into diesel fuel using machines they possess. The SeaTurtles.org works in California and around the world to protect endangered sea turtles and formed Marine Debris Action Teams in 2011 to stem the tide of plastic pollution in sea turtle feeding areas through cleanups, scientific research, outreach, and education. These two groups have developed a collaboration in San Francisco Bay where local volunteers can assist with cleanups before litter reaches the open ocean.

The radar used to locate litter hot-spots is part of the Coastal Ocean Currents Monitoring Program (COCMP) established in 2005 to measure coastal surface circulation along the whole California Coast. Nearly sixty CODAR SeaSonde radar stations along the coast provide live data on offshore currents to oceanographers, ocean rescue teams, and oil spill response teams. Most stations provide 1 or 3 km resolution but the system inside the San Francisco Bay offers 0.4 km spatial

resolution of current movements in the central Bay. This high-resolution portion of network provided important current information during the response effort to the Cosco Busan oil spill of 2007.

“Studies determined that 37% of leatherback sea turtles have plastic inside of them, likely because they mistake floating plastic for jellyfish, their main prey,” said Dr. Pincetich. “Since most dead sea turtles are eaten by sharks or sink, there could be far more dying offshore from plastic pollution than we know about.”



Team members show off trash retrieved at a convergence zone.



Thailand - U.S. Increasing Ties in HF Radar Technology

Information sharing to prove beneficial as Thailand expands its SeaSonde network



This August a high-ranking delegation from Thailand's Ministry of Science and Geo-Informatics Space Technology Development Agency (GISTDA) kicked off a special U.S. trip by visiting SeaSonde sites along the New Jersey coast and the Rutgers University Coastal Ocean Observation Laboratory (COOLroom), where they joined Rutgers scientists as well as U.S. Integrated

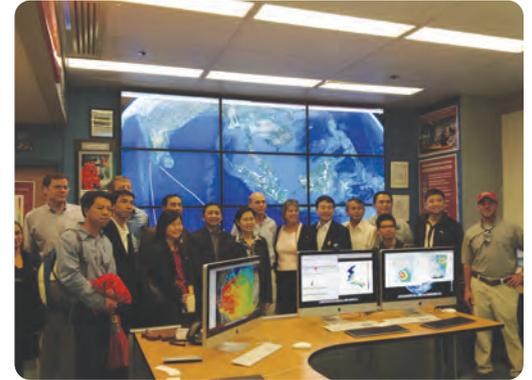
Ocean Observing System (U.S. IOOS) Program Director Ms. Zdenka Willis in discussion on U.S. experiences with HF radar and data utilization for both research and operational pursuits.

GISTDA, already with expertise in satellite remote sensing, is adding HF radar technology into its suite of

observing technologies and establishing a 13-radar unit SeaSonde network in the Gulf of Thailand this year. Delegates concluded their U.S. trip in San Francisco touring local radar sites inside the bay and conducting factory inspections of their new SeaSonde materials. Preparations for the installation, led by CODAR's local Thai partner Metlink Info. Co., are already underway and once completed will bring the total number of SeaSondes operating in that country to 20.



Rutgers' Hugh Roarty points out details of the SeaSonde hardware in Belmar, New Jersey.



Members of the Thai delegation, Rutgers University and U.S. IOOS pose for a group photo in front of COOLroom glider ops screen.

The 1st Ocean Radar Conference for Asia (ORCA): Certainly Not the Last

Ocean-monitoring using HF radar technology is truly a niche field due in part to the large area coverage that can be achieved with very few units. Inside any country one can find at most an elite handful of persons with direct experience working with such systems and data outputs. But as the number of HF radar installations has increased over the past decade, some countries have achieved wide area coverage with national networks, and this brings potential for providing useful data to a large number of organizations who can exploit for improved decision making in a variety of operational pursuits, including search and rescue, pollution spill response, fisheries management, efficient vessel navigation, tsunami observing and more.



1st ORCA participants

Operations and maintenance, management, processing, quality control and interpretation of HF radar data -- tasks to be resolved prior to packaging data appropriately for supporting decision making activities -- are issues that brought together 62 persons from 10 countries in Seoul, South Korea this past May at the 1st Ocean Radar Conference for Asia. This three day event hosted by the Korea Ocean Radar Forum (KORF) was a tremendous success in both technical content and as well as making progress in the ORCA event purpose: "building relationships across national boundaries to help foster the development and growth of HF radar observation networks along the Asian seas".



1st ORCA sponsors

ORCA events are expected to occur every two years, with venue moving to different asian locations, the 2nd ORCA tentatively scheduled for Spring 2014.



CODAR's Recommended List of Presentations

Many excellent presentations are expected at the upcoming Oceans '12 MTS/IEEE Hampton Roads. Here is a select list of those having some connection to HF radar (especially SeaSonde) that are considered "must-attend" by CODAR staff. We hope to see you in the audience!

Session 4.4 Coastal Radars / Tues. 16 October / 1:30 - 2:50 PM / Room MR 2C

- Hugh Roarty: Automated quality control of high frequency radar data (120514-003).
- Chad Whelan: Automatic calibrations for improved quality assurance of coastal HF radar currents (120601-066).
- Mike Muglia: Identifying the shoreward Gulf stream front at Cape Hatteras with coastal ocean radar surface currents (120601-017).
- Theresa Updyke: A study of surface currents in the coastal ocean outside Chesapeake Bay using high frequency radars operating at multiple frequencies (120518-149).

Session HR5 - Integrated Ocean Observing - Regional IOOS 1 / Tues. 16 October / 1:30 - 2:50 PM / Room MR 1C

- Gerhard Kuska: Raising the bar in the mid-Atlantic: moving MARACOOS observations to next generation forecasting and product development (120518-108).
- Clifford Merz: Evolution of the USF/CMS CODAR and WERA HF radar network (120518-115).

Session 4.4 Coastal Radars / Tues. 16 October / 3:20 - 5:00 PM / Room MR 2C

- Colin Evans: Examination of the SeaSonde wave processing parameters and the effects of shallow water on wave measurements (120518-225).
- Calvin Teague: Findings on the estimation of wind turbine RCS and its effect on 13.5 MHz radars (120517-039).

Session HR3 Wind Marine Renewable Energy- Wind / Tues. 16 October / 3:20 - 5:00 PM / Room MR 2B

- Hugh Roarty: Analysis of the wind resource off New Jersey for offshore wind energy development (120515-001).

Session 4.4 Coastal Radars / Wed. 17 October / 8:20 -9:40 AM / Room MR 2C

- Emanuele Rognoli: Surface flow dynamics within an exposed wind-driven bay: combined HFR observations and model simulations (120518-033).

Session 3.41 Systems and Observatories / Wed. 17 October / 8:20 - 9:40 AM / Room MR 4B

- Scott Glenn: Impact of Ocean Observatories on hurricane forecasts in the mid-Atlantic (120518-083).

Session HR3 Marine Renewable Energy- Waves 3 / Wed. 17 October / 3:20 - 5:00 PM / Room MR 2B

- Hugh Roarty: Expanding the coverage of HF radar through use of wave powered buoys (120514-004).

Session 5.6 Data Assimilation / Thursday 18 October / 8:20 - 9:40 AM / Room MR 3E

- Emanuele Ragnoli: An optimal interpolation scheme of HFR current data into a numerical ocean model (120518-032).
- Alan Blumberg: Impact of assimilating high frequency radar surface currents on the fidelity of a middle Atlantic bight circulation model (120531-023).

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