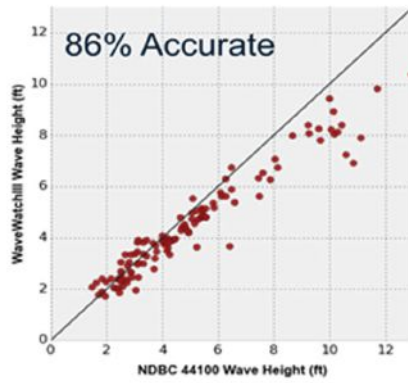


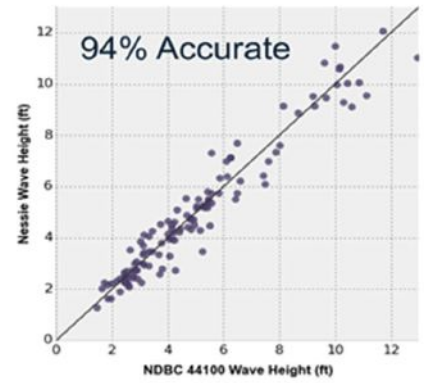
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NOAA WAVEWATCH III



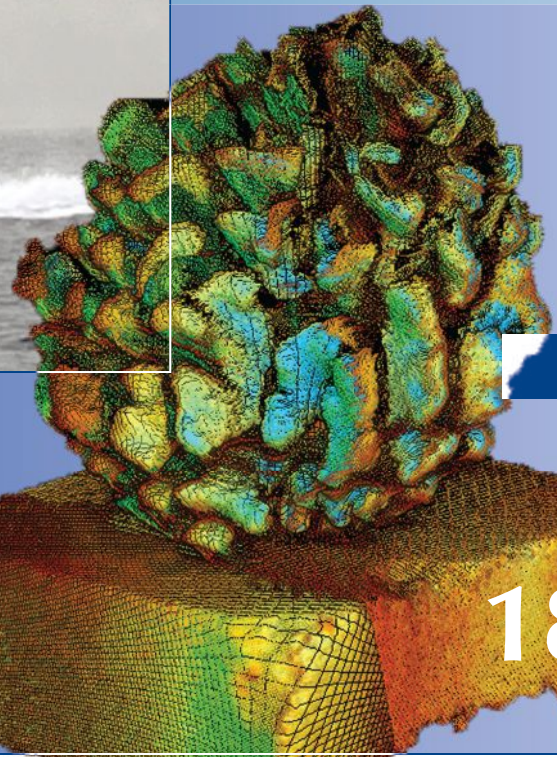
Accuracy (%)	86
RMS	0.99
Bias (ft)	-0.54
R2	0.94

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Accuracy (%)	94
RMS	0.65
Bias (ft)	-0.06
R2	0.94

15



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Cable Landing Station Beach Manhole Subsea Cable Beach Manhole Cable Landing Station

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Miros Oil Spill Detection (OSD) system in action during spill recovery operations. IR and optical cameras aid operators in the verification and characterization of oil spills, including in low visibility or darkness. Port and coastal agencies, oil companies, shipowners, and oil spill response organizations worldwide use Miros OSD. (Credit: Miros)

NEXT MONTH

USV for mine countermeasures ... NATO's approach to climate change ... Autonomous naval tech ... Position, navigation and timing solutions for defense ... Extending the life of submarine cables.

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)) Market Growth, Challenges for Electric Vessels. Over 1 GWh of batteries are now sailing on waters globally, reflecting 72 percent industry growth in 2022, according to the IDTechEx report “Electric Boats & Ships 2024-2044.” Despite this trend, there have been several challenges that shipbuilders and maritime battery suppliers have had to navigate in recent years. First, electric ship markets have historically been underpinned by electric ferry orders, which made up 37 percent of the maritime battery capacity (GWh) deliveries between 2019 and 2022. Norway is a key driver, with around 100 electric ferries in operation: the most in the world. However, IDTechEx expects market saturation here soon as government targets are set to be surpassed next year. Electric and hybrid vessels are also typically newbuilds, specifically designed to be efficient with electric propulsion. However, the recent climate of uncertainty and inflation arising from the COVID-19 pandemic and the Russia-Ukraine war has had a negative impact on newbuild contracts, including on ship types targeted for electrification. The future of the electric ship industry lies with hybrid cargo vessels. IDTechEx expects that zero-emission anchorage requirements, upcoming International Maritime Organization and EU regulations, and the possibility for larger battery systems per vessel will drive battery installations. The potential is huge: Less than a percent of the global merchant fleet currently runs on alternative fuels (including batteries), and battery systems improve the efficiency of both engines and future technologies, such as hydrogen fuel cells. System sizes per vessel have also been increasing and can span into the tens of megawatt-hour per vessel, another driver for growth. As the market develops, China-based battery suppliers are finding success in offering low prices for type-approved marine battery systems. This is achieved with high levels of vertical integration and battery chemistries such as LFP (lithium iron phosphate), which is predominantly manufactured in China. In the short term, marine battery suppliers outside China may command a premium due to very high levels of experience in this safety-critical sector. However, China’s entry will help consolidate and streamline the value chain, as well as drive the next phase of growth for the industry as it sails into multigigawatt-hour territory.

)) Winner of Don Walsh Ocean Exploration Award. Dr. Peter Girguis, professor of organismic and evolutionary biology at Harvard University and adjunct oceanographer at Woods Hole Oceanographic Institution, described by his peers as “the epitome of a deep-sea explorer” and “a man for all ocean seasons,” is the winner of the 2023 Captain Don Walsh Award for Ocean Exploration, sponsored by the Marine Technology Society (MTS) and the Society for Underwater Technology (SUT). Girguis’s prolific career is dedicated to increasing understanding of the animals and microbes that thrive in the deep sea and to advancing deep-sea exploration. Colleagues have paid tribute to his leadership, attributing it to his capacity for expansive thinking in ocean science: considering what the field requires to flourish and identifying emerging scientific questions. His primary focus is to understand how marine organisms have adapted to their habitats and how they respond to a changing world. Within his research, his team made groundbreaking discoveries of previously unknown microbe communities that “eat” methane at unprecedented rates, keeping the greenhouse gas out of our atmosphere. His pioneering efforts continued with the development of innovative methods to grow the deep-sea microbes that are responsible for keeping methane out of the atmosphere.

)) Culled Fruit Trees Show Potential as Reefs. Researchers have shown that sinking culled fruit trees into the sea is a low-cost and effective way to recreate reefs and boost the local diversity and abundance of marine life. The study, published in *Frontiers in Marine Science*, was done in the Wadden Sea, a UNESCO World Heritage Site and the largest tidal flats system in the world. “Before humans domesticated the landscape with agriculture, logging and river controls, trees fell into rivers in large numbers and were washed out to sea,” said Jon Dickson, the study’s lead author. “We know that such sunken wood has been present in marine ecosystems since the Jurassic, providing a home, shelter and food for marine animals.” In April 2022, the researchers constructed 32 pyramid-like structures from 192 felled pear trees past their economic life span and transported these by ship to open waters between the Dutch barrier islands Texel and Vlieland. There, the “tree-reefs” were rooted in concrete feet and sunk to the soft sea bottom at four different locations, 3 to 4 m deep. Within six months, the tree-reefs were covered with sessile animals and algae and home to more fish than surrounding control areas.

)) US High-Tide Flooding on the Rise. Coastal communities in eight locations along the U.S. East and West Coasts experienced record high-tide flooding last year—a trend that is expected to continue in 2024, according to NOAA. For many communities, the expected strengthening of El Niño will bring even more high-tide flood days. The 2023 Annual High Tide Flooding Outlook documents high-tide flooding events from May 2022 to April 2023 at 98 NOAA tide gauges along the U.S. coast. It also provides a flooding outlook for these 98 locations through April 2024 and decadal projections out to 2050. High-tide flooding is becoming increasingly common due to continued sea level rise, driven in part by climate change. By 2050, the nation is expected to experience an average of 45 to 85 high-tide flooding days per year. Long-term projections are based on the ranges of expected relative sea level rise of about a foot on average across the U.S. by 2050. Data specific to each NOAA tide gauge can be found at: <https://tidesandcurrents.noaa.gov/high-tide-flooding/annual-outlook.html>. **ST**

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Autonomous Systems Supercharge Science, Commerce

What is the role of our oceans in influencing climate and long-term carbon balance? How can governments guarantee security and create sustainable energy sources without harming delicate ecosystems? How do companies operate in ocean environments ethically and profitably? These are all urgent questions that confront humanity today.

Uncrewed vehicles offer the potential to deliver massive amounts of ocean data, unlocking answers to many important questions about our planet—and our role in shaping its future. One example is Saildrone, which is known for cutting-edge scientific research, delivering data from inside hurricanes, sailing into sea ice in the extreme northern latitudes, and circumnavigating Antarctica to study ocean carbon uptake. Autonomous technologies have now been embraced by governments, the scientific community and private enterprise. These platforms are poised to revolutionize maritime operations.

Advancements in artificial intelligence and sensor technology combined with proven, persistent autonomous platforms are enabling businesses to perform a wide range of operations at unprecedented scale and cost efficiency. From underwater exploration and research to offshore energy applications, this technology offers endless possibilities to optimize marine operations.

At the publication of this issue, the third year of Saildrone's partnership with NOAA to study the physical processes that drive hurricane rapid intensification is concluding in the Tropical Atlantic and Gulf of Mexico. During these missions, NOAA has coordinated sampling by aerial, surface and sub-surface assets to create a complete picture of a storm, from 30,000 ft. above the surface to several thousand feet below. This method of teaming uncrewed assets can be applied to homeland security and asset protection as well.

Saildrone's hurricane mission is just one of many that demonstrate the role of autonomous uncrewed platforms in dramatically increasing our ability to observe our oceans. In the Pacific, NOAA uses the Saildrone platform as part of the Tropical Pacific Observing System (TPOS), developed to improve early predictions of major weather events, such as El Niño and La Niña. In the Arctic, Saildrone has sailed into sea ice to provide in-situ observations to NASA for improving satellite algorithms for ice and sea surface temperature prediction. In the Antarctic, Saildrone observations of CO₂ flux helped improve scientists' understanding of carbon absorption rates in the Southern Ocean.

Uncrewed platforms are more environmentally friendly and have a lower carbon footprint than traditional ships. There is no risk to crews nor the need to return to port frequently. This enables sustained data collection for months at a time. These advances empower private industry to create more innovative and cost-effective business models that reduce the risk of investment and promote quicker adoption of autonomous platforms.

Saildrone has already spent over 25,000 days at sea, autonomously covering nearly 1 million nautical mi. We continue this journey every day as our platforms collect data that are invaluable to metocean sciences, sustainable fisheries management, ocean mapping and maritime security initiatives. To ensure the best support for our customers' diverse requirements, Saildrone has developed three sizes of USVs. Each class is designed to carry a variety of sensor payload options to meet every challenge with the optimal platform.

Whether monitoring coastal waters or charting offshore wind farms, government, academia, and private industry will realize unprecedented economic, scientific, and security benefits by accelerating the use of uncrewed systems. This is the first meaningful step to unlocking and leveraging the potential of our oceans for a more secure and sustainable future. **ST**

SEA TECHNOLOGY® 2024

JANUARY

Annual Review & Forecast

****EUROMARITIME 2024**, January 30-February 1, Marseille, France

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

****Oceanology International 2024**, March 12-14, ExCel, London, U.K.

MARCH

Electronic Charting/Vessel Management/ Ports & Harbors/Dredging/Homeland Security

****UDT 2024**, April 9-11, ExCel, London, U.K.

****OCEANS 2024 Singapore**, April 14-18, Singapore

****XPONENTIAL 2024**, April 22-25, San Diego, CA

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

****Offshore Technology Conference**, May 6-9, Houston, TX

MAY

Communications, Telemetry, Data Processing

JUNE

Seafloor Mapping/Sonar Systems/Vessels

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BONUS INFORMATION

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4 EDITORIAL CALENDAR

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JULY

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****IMAGE 2024**, August 25-30, Houston, TX

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Ocean Resources Development & Coastal Zone Management

****OCEANS 2024 Halifax**, September 23-26, Halifax, Canada

SEPTEMBER

Geophysical Exploration/Seafloor Engineering

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

****EURONAVAL 2024**, November 4-7, Paris, France

****CLEAN GULF**, November 18-20, San Antonio, TX

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Metocean Parametric Insurance

Weather Window Risk Reduction for Offshore Wind Bidding, Ops

By Daniel Mendelsohn • Dr. Jeffrey L. Hanson • Gethin Jones

The offshore wind industry has an ongoing need for risk reduction in offshore operations, from site surveying to construction to operations and maintenance. The Weather Window (WW) service/product with embedded parametric insurance has been developed to provide a robust solution to risks currently unprotected with standard insurance products. This is made available through an exciting new partnership between industry insurance consultant Skyline Partners, experienced metocean consultant Innovative Environmental Science

(IES), and the ocean modeling and analysis expertise of WaveForce Technologies LLC.

Parametric is a new kind of insurance, fit for our changing world. Parametric insurance is typically used to complement, rather than replace, conventional insurance, but sometimes parametric policies are used to cover things that traditional insurance cannot, such as intangible losses.

Conventional insurance refunds adjusted losses caused by an insured peril, up to the policy limit. Para-

How it Works

A pre-agreement to make a defined payment upon the occurrence of a triggering event rather than indemnifying the pure loss.



Agree on index to cover your location and which wind and wave critical thresholds to define an operational window



We monitor the parametric index using the wave and wind published data

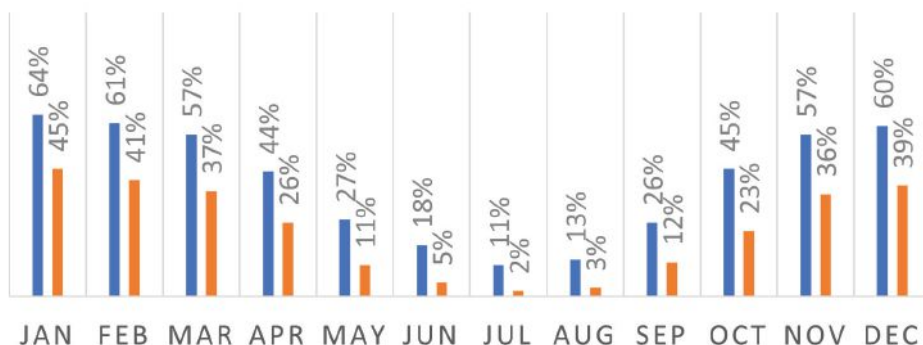


When the index is triggered, you receive a **Pay-out in Days**

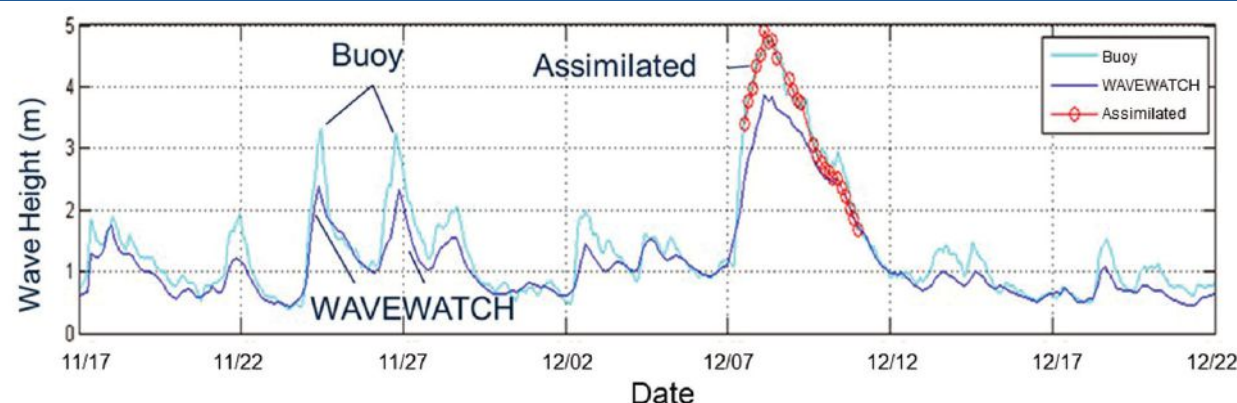
Schematic of how Weather Window metocean parametric insurance for offshore operations works.

50TH PERCENTILE OF MISSED TIME BY MONTH

■ 15 kts Threshold ■ 20 kts Threshold



(Left) Example of monthly missed-days analysis results comparing two wind speed thresholds. (Below) WAVEWATCH III routinely underpredicts peak wave heights associated with passing storms off the U.S. Atlantic seaboard. Modeled and observed significant wave heights at NDBC station 44099 (Virginia Beach) during November to December 2018 are depicted.



metric insurance—policies with a “parametric trigger”—pay out a specified sum when a very specific event occurs, the “parameter.”

Our new Weather Window parametric insurance (which is backed by the insurance industry) works through a pre-agreement to make a defined payment upon the occurrence of a metocean triggering event (e.g., wave height or wind speed exceedance), rather than indemnifying a physical damage loss, as with traditional insurance products.

The parametric insurance will cover nonphysical damage-related losses incurred due to adverse weather delays, such as increased operational costs, loss of revenue, fines relating to delays, and impacts of reputational damages. Given that the payment amount and the triggering event are pre-agreed, claim payments are fast, providing quick access to cash when it is needed at the time of the event.

The accurate determination of weather-related trigger events will be used for this innovative new weather-indexed parametric insurance to cover time lost during offshore development activities. The insurance industry recognizes that superior model predictions will give offshore operators the confidence necessary to make critical decisions affecting project success. This combined

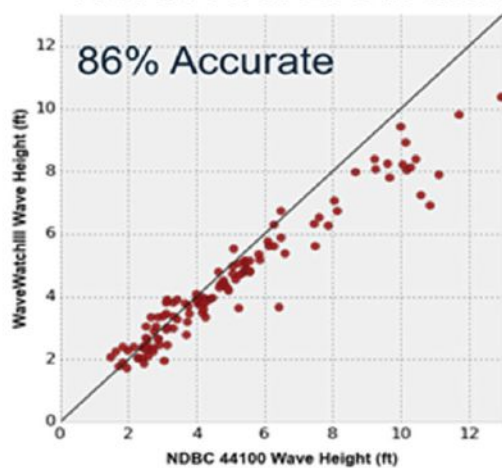
product both reduces the risk of financial losses related to increasing weather delays through improved modeling accuracy and provides a risk transfer solution based on the same data used for operational decision making. While this form of weather-related parametric insurance is common in the marketplace for other industries, the downtime parametric insurance market for offshore wind does not currently exist. (We are not aware of any providers of downtime analysis systems with the proposed parametric insurance risk transfer products for the offshore wind industry.)

Weather Window Metocean Analysis

Offshore operations decision making and planning, including “go/no go,” are often supported with comprehensive metocean assessments and site-specific weather conditions. Weather Window provides a historical analysis of local weather and sea state conditions for statistical assessment of the number of workable/missed days for a given time period to make bidding and operational decisions.

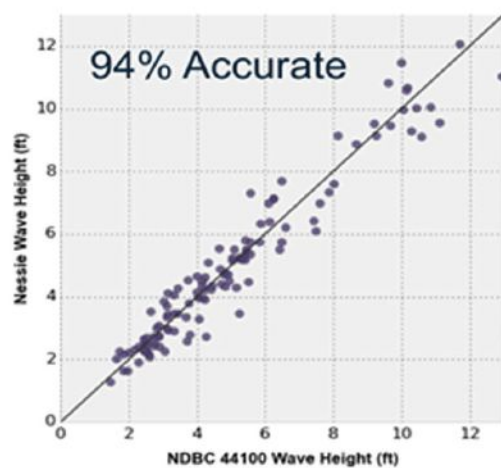
WW is a globally relocatable tool integrating publicly available long-term model reanalyses with long-term buoy data (where available) to develop a verified, site-specific data set. WW has two basic technical func-

NOAA WAVEWATCH III



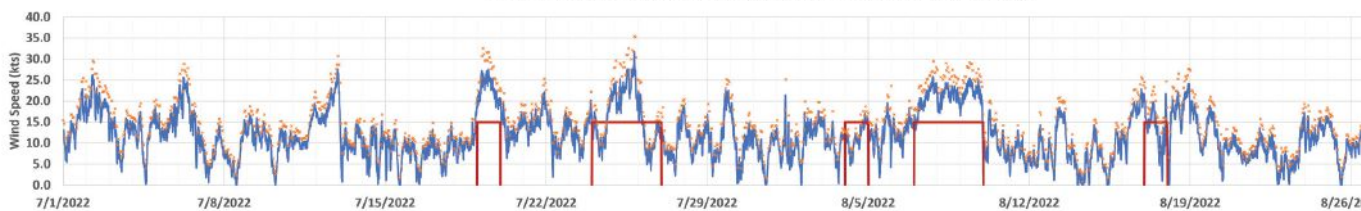
Accuracy (%)	86
RMS	0.99
Bias (ft)	-0.54
R2	0.94

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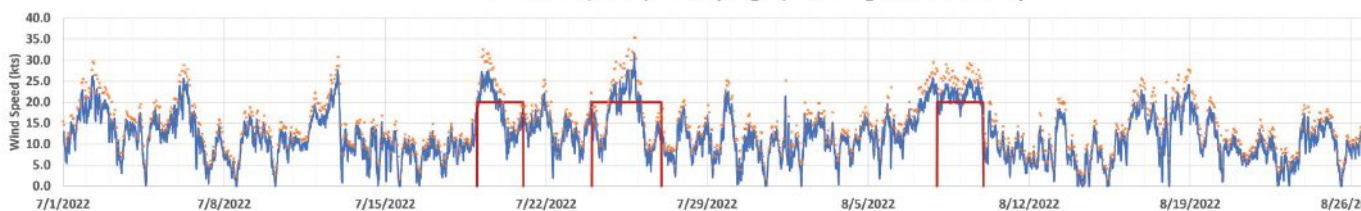


Accuracy (%)	94
RMS	0.65
Bias (ft)	-0.06
R2	0.94

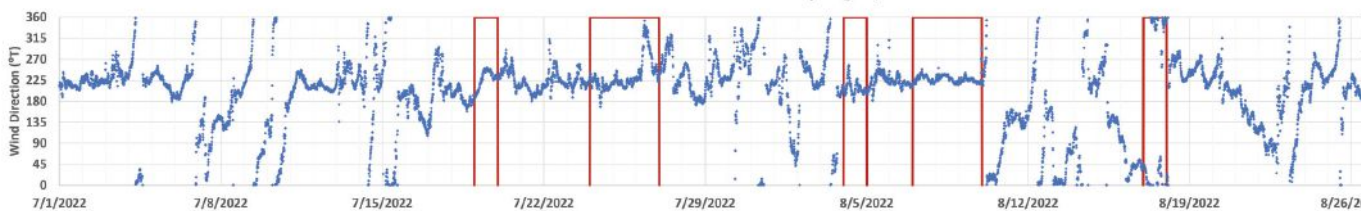
BUZM3 Wind/Gust Speed : July-August, 2022 : Small Boat Weather Days



BUZM3 Wind/Gust Speed : July-August, 2022 : Large Boat Weather Days



BUZM3 Wind Direction : July-August, 2022



tions: a statistical analysis for determination of workable/missed days, and a unique hindcast and forecast system for improved sea state predictions based on buoy data assimilation.

The percent workable/missed time for a given time period is based on selected wind and wave height threshold criteria, e.g., for a specific boat and/or operation under consideration. Publicly available data used in the system include the 30-year NOAA WAVEWATCH III Production Hindcast, which consists of a homogeneous data set of high-resolution wind/wave model output. As an alterna-

(Top) Demonstration of 12-hr. forecast improvement with partial wave system data assimilation at NDBC buoy station 44100 in Duck, North Carolina (September 23 to October 22, 2019). (Bottom) Example of application results showing the actual missed (weather) days for two types of boats during July to August 2022 offshore site assessment operations in the northeast U.S., overlain on the local observed wind speeds and direction.

tive, the Weather Window can use the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5, fifth-generation atmospheric reanalysis of the global climate. The NOAA National Data Buoy Center (NDBC) aggregates many observation stations along the U.S. coast, for which long-term meteorological and oceanographic data sets are available.

In application, a domain around the proposed work area is selected. Data from the long-term model grid points within the domain are preprocessed to develop a 1-hr.-interval data set for analysis. If buoy data are available within the domain, the model point closest to the buoy is selected for calibration of the wave model output through the WW data assimilation and prediction tool for improved model predictions within the domain.

The user-specified wind and wave thresholds along with duration determine missed-day trigger events. The workable/missed statistics are presented as percentile distribution of results on an annual, monthly, weekly or daily basis; tabular, plotted and spatial variability on the map.

The rapid turnaround of the WW system, from domain selection and planned operations to workable/missed days, makes this a very efficient approach for analysis during the bidding process to characterize operations risk and loss potential. This statistical coverage in conjunction with the embedded parametric insurance option literally insures the WW predictions, reducing the risks associated with the bidding process.

Parametric insurance coverage of a specific project and wind/wave threshold criteria would be selected based on the vessel and planned operations. Based on the proposed project and the statistical predictions, the vessel operations group would decide on the number of workable days needed (or allowable missed days). If the number of workable days falls short during operations based on the preselected criteria and a third-party data source (e.g., NDBC buoy data), the insured party would get paid. No accident or actual missed days need occur if the trigger threshold is exceeded.

For example, if the 50th percentile (P50) for the number of missed days within a specified period is five days, and the operations team cannot afford to miss more, they may choose to insure for missed days exceeding five. If the number of missed days is actually seven, based on the wind/

wave thresholds as measured by a mutually agreed upon third-party assessment, the insured would receive payout for the two exceeding days, without having to submit a claim or prove damages. Collection of payment is therefore fast and efficient.

Wave Forecasting Innovations

As weather prediction accuracy is paramount to reducing risk and ultimately ensuring overall project success, WaveForce has developed a new data assimilation technology for improving available wave model predic-

tions. Within the U.S., publicly available operational wave hindcasts and forecasts are primarily issued by the NOAA National Centers for Environmental Prediction (NCEP) Environmental Modeling Center (EMC) using the WAVEWATCH III and SWAN numerical models. Prediction errors arise from a variety of factors, including imperfect surface wind boundary conditions, inaccurate wave forcing at open boundaries, improper physics and numerical errors. These errors are then propagated through the modeling space-time domain by the evolving wave fields that are composed of individual wave systems generated by specific wind events on the ocean surface.

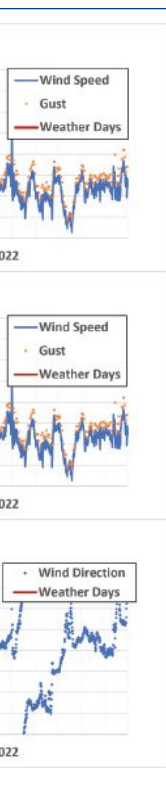
The accurate identification and delineation of evolving wave systems is an important engineering problem since wave systems transport energy away from wind wave generation locations and produce navigation hazards, offshore structure fatigue, and coastal erosion and flooding. Wave partitioning divides wave data into subsets attributed to specific wind events. Wave height, frequency and direction statistics from each subset allow the evolution of multiple distinct wind-sea and swell wave systems to be characterized across space and time with a greatly reduced set of spectral parameters. One of the authors of this article, Dr. Jeffrey Hanson of WaveForce Technologies, has spent decades developing this technology for offshore energy clients and has integrated these tools into the commercialized XWaves Ocean Wavefield Analysis toolbox. XWaves is extensively used for a full range of structure design, development, operation and maintenance activities.

Our unique data assimilation approach uses the data from observational buoys to correct the errors within these individual sea and swell wave systems, and propagates these corrections along with the wave systems through space and time in the modeling domain. As an example, in the critical region of offshore renewable energy development on the U.S. Atlantic seaboard, using buoy significant wave heights at NDBC station 44099, WAVEWATCH III model nowcasts are shown to exhibit a strong tendency for underpredicting storm wind-sea peaks and then “catching up” with more accurate swell predictions once the storms have passed. In contrast, the assimilation of the buoy data into the model hindcast results in a more accurate forecast over the entire storm duration. The propagation of these corrections forward in time are used to significantly improve the forecast. When considering a full month of 12-hr. forecast results from this study, the negative wave height bias at elevated wave conditions in the WAVEWATCH III record is almost completely removed by the assimilation method.

Through our unique partnership, the data assimilation methodology described above is now a part of the Weather Window system.

Weather Window Application

An approximately two-month offshore hydrographic survey in the northeast U.S. during July and August 2022 using one large and two small boats was studied as a use case for WW. The boats used 20- and 15-kt. wind speed, respectively, along with a 1.5-m wave height threshold



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*“WW is a globally relocatable tool
integrating publicly available
long-term model reanalyses with
long-term buoy data”*

and a 3-hr. duration for go/no-go criteria. The WW results were evaluated at the 50th percentile occurrence. The model predicted eight and 11 missed days for the large and small boats, respectively, and the actual missed days were seven and nine for the two boat lengths, respectively. The July and August 2022 predictions appear to be consistent with statistical norm, and the number of missed days did not exceed statistical norm at 50th percentile.

Conclusion

Weather Window and its embedded parametric insurance will be of interest to stakeholders in offshore and coastal operations that could be restricted by meteorological and oceanographic conditions. This includes planners and contract bidders who need to understand the percent of potential working days for a given period, the offshore decision-making personnel who make go/no go decisions, and management/developers responsible for reducing the risk of offshore operations.

References

For a list of references, contact: daniel.mendelsohn@iescoastal.com. **ST**

Daniel Mendelsohn has over 35 years' experience in coastal and ocean environmental engineering, focusing on numerical model development and application for metocean and environmental impact assessment. His expertise is in the design, implementation and management of engineering analyses in the environment. He is owner/CEO of Innovative Environmental Science Inc.



Dr. Jeffrey L. Hanson has 35 years' experience in air-sea interaction and ocean waves. He has a Ph.D. in physical oceanography from Johns Hopkins University and has held research scientist positions at U.S. Army Corps of Engineers - Field Research Facility in Duck, North Carolina. He is co-owner/CEO of WaveForce Technologies LLC.



Gethin Jones has over 15 years' senior management experience in the insurance industry, leading international teams, managing multimillion dollar budgets and bringing innovation to the industry. He is founder and director of Skyline Partners, a parametric insurance solutions provider of technology-powered weather insurance offerings that target the global protection gap.



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Protecting Offshore Energy Sources

MARTAC USVs Can Safeguard Vulnerable Assets at Sea

By George Galdorisi

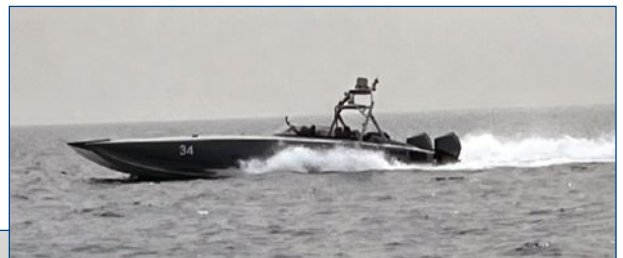
For those who follow energy matters in the media, the often impassioned dialogue regarding energy sources typically breaks people into two camps. There are those who promote fossil fuel production and those who favor green energy. Those who support green energy are sometimes zealous in their arguments that the United States should eliminate fossil fuel dependence and rely only on green energy. This is a noble goal, but one that will take time to instantiate.

As this debate rages, what is often lost in the arguments on both sides is that the offshore platforms related to fossil fuels and renewable energy, especially oil rigs, oil and gas pipelines, and wind farms, are incredibly vulnerable to attack in wartime, or at the hands of those looking to make a political statement. One need look no further than the suspected sabotage of Nord Stream gas pipelines that run from Russia to Europe under the Baltic Sea to understand the vulnerability of sea-based energy sources. Thus, the fossil fuel industry and the green energy industry do have one area in common: the need to protect their offshore platforms.

The strategic implications of the United States' transition from energy dependence to energy independence

are being felt worldwide and accelerated by the war in Ukraine. While the exigencies of climate change have led to major strides in the development and fielding of renewable energy sources such as solar, wind and others, for the foreseeable future, the world's energy needs will continue to be met primarily by oil and natural gas. While much of the reporting regarding America's increased energy production has focused on fracking, it is the offshore oil and gas industry that still provides a huge amount of United States' energy. According to *Forbes*, offshore energy production has been increasing over the past decade and now stands at over 2.5 million barrels of oil and almost 3 trillion cubic ft. of gas a day.

This massive production effort is sustained by the hundreds of U.S. offshore drilling rigs, primarily in the Gulf of



T38 Devil Ray. (Credit: Jack Rowley)

Mexico. However, environmental concerns—impelled by major events such as the 2010 Deepwater Horizon disaster in the Gulf of Mexico—have served as a brake on U.S. offshore drilling. And it is worth noting that the second largest marine oil spill in history, the Ixtoc 1 spill, also occurred in the Gulf of Mexico. These—and other industry disasters—have resulted in ongoing environmental activism that has given second thoughts about the viability of continuing to drill for oil and gas offshore.

Addressing these environmental worries has been a challenge for the oil and gas industry. While offshore oil and gas companies have been proactive in ensuring the safety of their platforms, more remains to be done. Platform operators that depend on divers and ROVs to perform inspections are hampered by the substantial risk and increasingly high cost of putting divers in the water and the limited field of view of ROVs.

On the “green” side of the equation, offshore wind farms have seen explosive growth, with predictions of more wind farms in littoral waters. Several offshore wind farms are in operation now, and many more are planned. Sadly, there has been little dialogue as to how to protect these expensive assets, and, like their “old” energy counterparts—oil rigs—they are, and will remain, highly vulnerable.

MARTAC USVs

Maritime Tactical Systems Inc. (MARTAC), a Florida-based manufacturer of USVs, has fielded a family of low-cost rugged and adaptable MANTAS and Devil Ray USVs built with a catamaran hull. Part of the attraction

of using such USVs to inspect offshore oil and gas platforms, pipelines and offshore wind farms is that these vehicles have been proven through extensive use in military exercises, experiments and demonstrations in both nearshore and open ocean, as well as hundreds of hours of use in civilian missions, ranging from commercial canal and dam hydrography to power plant inspections to port and harbor security.

The MANTAS T12 (12-ft.) USV has already been equipped and tested with a wide variety of surface and below-surface sensors, such as the SeaFLIR 230 gyro-stabilized high-definition EO/IR zoom camera with laser tracking, FLIR M232 thermal camera, Teledyne RESON SeaBat-T20 high-resolution multibeam sonar, Teledyne BlueView M900 single-beam echosounder and NORBIT iWBMS STX multibeam sonar, among others. Additionally, MARTAC has fielded T24 (24-ft.) and T38 (38-ft.) Devil Ray boats, capable of carrying these sensors, with even more capabilities than the MANTAS.

For offshore oil rig and wind farm inspections, the Devil Ray is the best alternative. The MANTAS T12 is battery powered and would need periodic recovery and recharge, while the Devil Ray, with its diesel engines, can remain underway for days and weeks, depending on speed and mission preferences.

This off-the-shelf technology can be used today for faster and more complete inspections of offshore oil/gas platforms and their surrounding bottom-mounted pipelines, valves and sensors, as well as offshore wind farms, while dramatically decreasing the need for human divers. Under this concept, a Devil Ray USV would be controlled by one operator in the rig command center or offshore wind farm command center. This inspection of components of oil rigs, pipelines or offshore wind farms can be part of scheduled, routine checks, or it can be done on demand to investigate something out of the ordinary discovered by watchstanders.

For underwater imaging, the Devil Ray could be equipped with NORBIT iWBMS STX multibeam sonar, a forward-looking or side scan sonar, or any other commercial off-the-shelf underwater sensors.



(Top) T38 Devil Ray in the evening. (Credit: Jack Rowley) (Bottom) T38 Devil Ray flattop. (Credit: Jack Rowley)

For surface investigation, such as area security, external rig or offshore wind farm structure investigation and surface contact monitoring, the Devil Ray, which is already equipped with a FURUNO DRS4D-NXT Doppler radar and AIS, can be equipped with a SeaFLIR 280-HDEP multispectral surveillance system at the high end, or the simpler FLIR M400, M500 or M364C LR EO/thermal cameras.

Since one of the early indicators of material failure of oil rig components involves oil and other material from the rig seeping into the surrounding water, the Devil Ray USV can be equipped with monitoring sensors, including ADCPs, CTD sensors, fluorimeters and others, to detect embedded petroleum products in the immediate vicinity of the rig.

The T24 and T38 have the inherent capability and sensor-swap modularity to perform various inspections of these valuable—and vulnerable—offshore resources. This sensor swap capability has been demonstrated in numerous U.S. Navy and Marine Corps exercises, experiments and demonstrations, as recently as Digital Horizon 2022 conducted in the Arabian Gulf.

Depending on the mission, operators can control any of the Devil Ray USVs remotely and direct its mission manually, or use the USV in an autonomous or semi-autonomous mode to search along a predetermined course. Most significantly, the video and sonar imaging from the MANTAS or Devil Ray can be sent directly to operators in real time, thereby providing immediate notification of what the USV discovers above or below the water surface, thus enabling operators to make time-sensitive decisions.

Anticipating near-term demand from the offshore oil and gas and offshore wind industries, MARTAC is developing concepts of operations (CONOPS) for how Devil Ray would be used to help ensure security of these energy resources. For example, an operator could have a Devil Ray on patrol on a predictable pattern inspecting an asset above and below the water surface. If the USV discovers an anomaly and relays the video back in real time, the operator would be alerted and could switch to remote manual control and command the Devil Ray to linger in a particular area for more granular analysis using its integrated radar, camera, and sonar sensor suite. If this investigation uncovers an area of concern, a diver can be deployed to make a repair. This CONOPS will secure the integrity of the energy platform while substantially reducing the false alarms generated by other methods. Conversely, if the investigation does not reveal an issue, the Devil Ray can return to its autonomous mission profile.

Conclusion

The same USV technology that is poised to assist the oil and gas and offshore wind farm industries is already being used to inspect critical infrastructure such harbors, ports, inland waterways, dams, levees, canals, bridges and other infrastructure that cannot be safely or effectively inspected by humans. For example, a MANTAS T12 USV was used to conduct inspections of the Keokuk dam

and energy center, the Bagnell energy center, the Elkhart hydro dam, the Central Arizona Project canal and other infrastructure.

Oil and gas rigs, as well as offshore wind farm towers, are close enough in some areas for numerous assets to share a single Devil Ray. The USV can make its rounds with a cruise speed of 25 to 40 kt., a burst speed of up to 80 kt. and a cruise radius of 60-plus nautical mi.

The enormous investment America's energy companies have made—and will continue to make—in our offshore oil and gas rigs and offshore wind farms must be protected against failure, sabotage and other hazards. Protecting these expensive and vulnerable energy assets is a first-order priority for the industry and one that is increasingly expensive. Current means of inspecting these rigs are slow, costly and hazardous. Employing commercial-off-the-shelf USVs, such as the Devil Ray that can be rapidly reconfigured with a diverse range of sensors, can enhance the ability to deliver energy to America and the world. This is not just a win-win for the energy industry but a national security priority. **ST**

Captain George Galdorisi (U.S. Navy, retired) is a career naval aviator whose 30 years of active-duty service included four command tours and five years as a carrier strike group chief of staff. He is the author of 16 books, including four New York Times best-sellers. The views presented here are those of the author and do not reflect the views of the U.S. Navy or the Department of Defense.

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Safeguarding Glass Sponge Reefs

Robotic Solution to Monitor Canadian MPAs

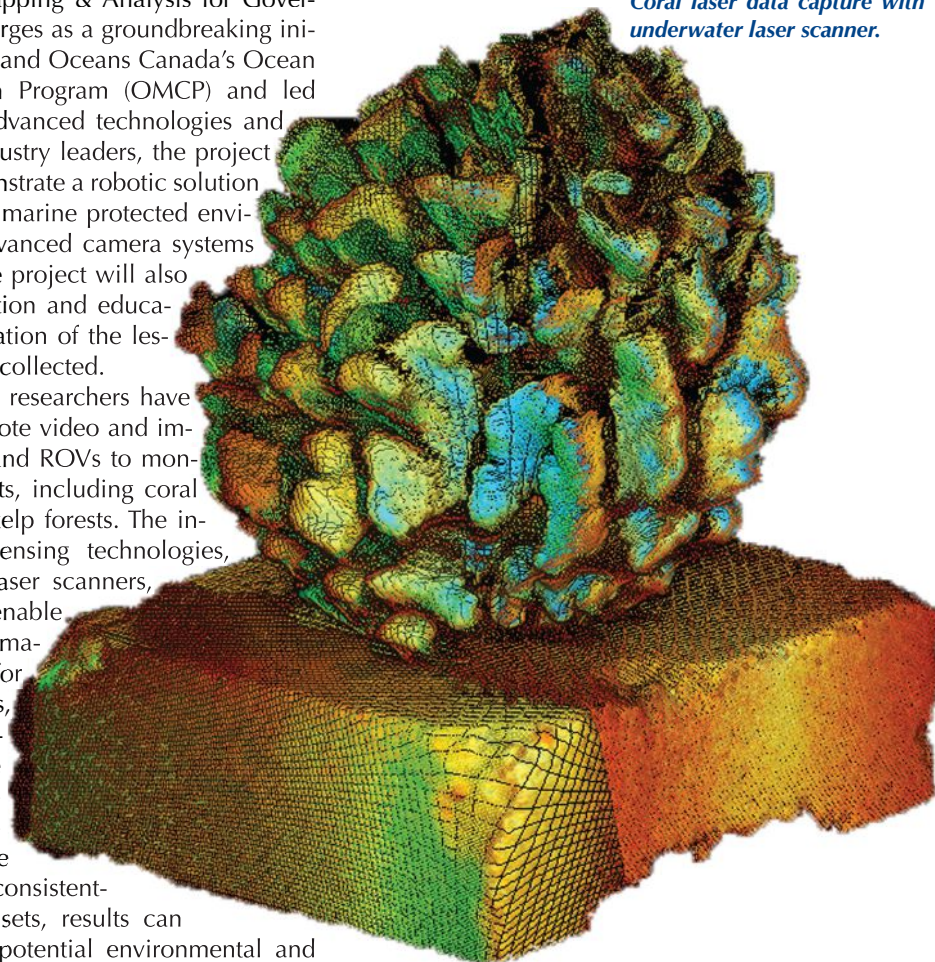
By Patricia Sestari

The marine ecosystem is a critical component of our planet's health, providing essential services such as carbon sequestration and the support of diverse marine life. However, increasing human activities and climate change pose significant threats to the delicate balance in marine environments. To address these challenges, the IMAGE Project (Image Mapping & Analysis for Governance and Education) emerges as a groundbreaking initiative funded by Fisheries and Oceans Canada's Ocean Management Contribution Program (OMCP) and led by Voyis. By leveraging advanced technologies and collaboration between industry leaders, the project aims to develop and demonstrate a robotic solution for monitoring designated marine protected environments using Voyis's advanced camera systems and machine learning. The project will also enhance marine conservation and education through the dissemination of the lessons learned and data sets collected.

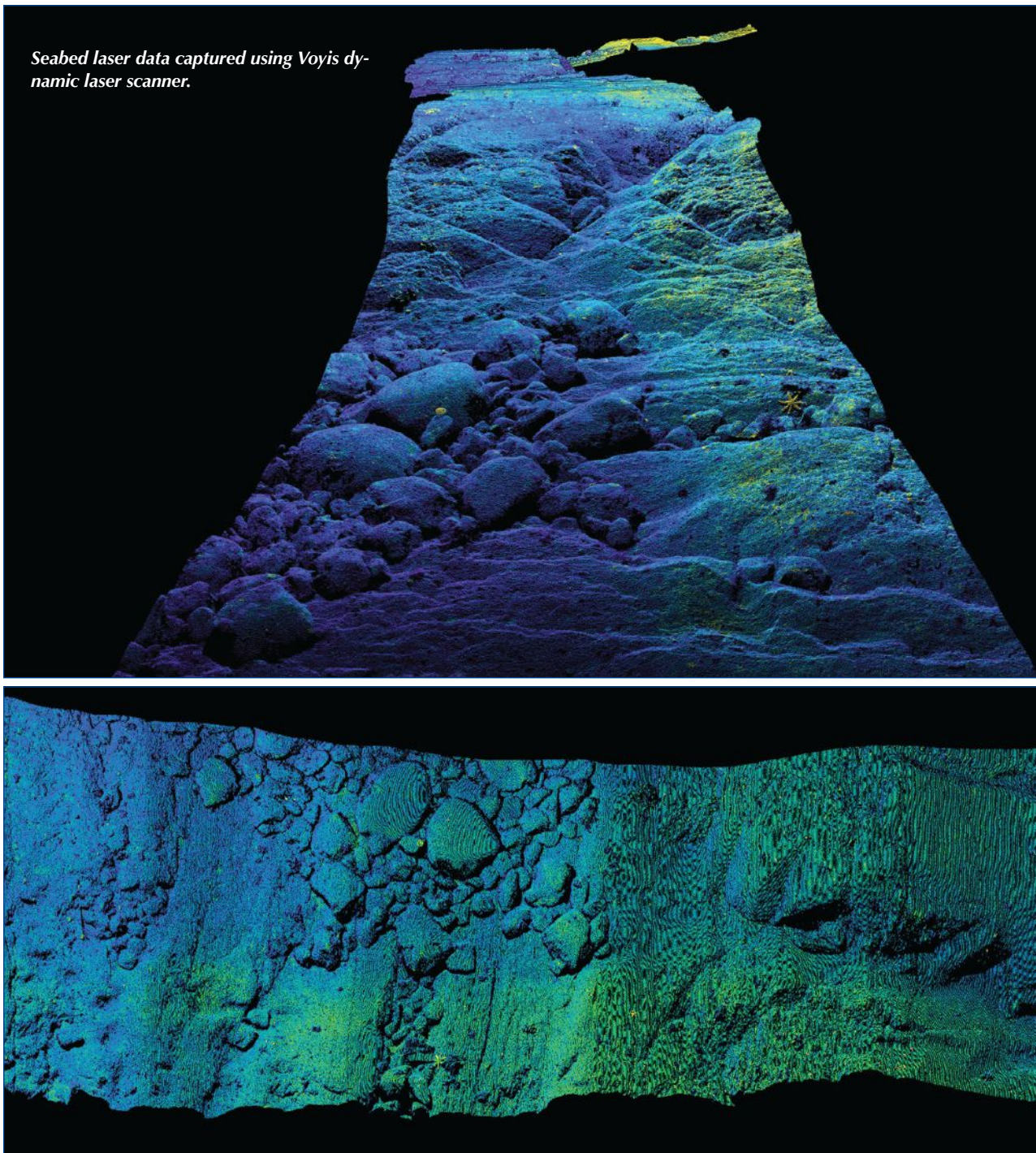
In recent times, marine researchers have increasingly turned to remote video and imagery captured by AUVs and ROVs to monitor various marine habitats, including coral reefs, boulder fields and kelp forests. The integration of innovative sensing technologies, such as underwater 3D laser scanners, true color cameras that enable photogrammetry, and machine learning algorithms for evaluating large data sets, presents an exciting opportunity to automate marine protected area (MPA) surveys and efficiently classify and quantify diverse species' abundance. By consistently collecting yearly data sets, results can be compared to identify potential environmental and

population changes, which could be attributed to factors such as climate change, illegal fishing, pollution or other external influences. As an ambitious endeavor, this project aims to demonstrate the practical application of this formerly academic monitoring approach on a larger

Coral laser data capture with Voyis underwater laser scanner.



Seabed laser data captured using Voyis dynamic laser scanner.



scale, specifically within Canadian ocean management. By developing a robust commercial solution using Voyis's proven underwater optical sensors and collaborating with local indigenous stakeholders, the project will help inform the development of an effective and comprehensive MPA monitoring strategy.

Project Goals

At the heart of the IMAGE Project lies the development of a comprehensive monitoring solution for MPAs comprising four primary goals.

The first goal is to design and integrate Voyis's cutting-edge optical sensors into both an AUV and ROV

platform, laying the foundation for an efficient and remote MPA monitoring solution. The first objective is optical sensor integration into selected underwater vehicles. The second objective is to commercialize machine learning-based image interpretation software for automated image clustering, species counting and target localization.

The second goal is indigenous training and mission planning. Recognizing the importance of incorporating traditional ecological knowledge, the IMAGE Project seeks to empower indigenous communities with the technical capacity to actively participate in marine environmental monitoring and ocean conservation plan-

Still image captured with Voyis camera and corrected in real time.



ning. The first objective is to develop working groups with indigenous communities to identify marine areas of interest for survey and select personnel for training. The second objective is training on subsea vehicle and sensor operation. The third objective is mission planning, including marine protected environment location selection, marine identification goals, data products, survey trajectory and other essential elements.

The third goal is execution of survey operations and meticulous data analysis, aligned with the developed mission plans, which is pivotal for gaining valuable insights into marine habitats. The first objective is survey operations and operator training. The second objective is data processing using automated image interpretation tools to generate valuable data products serving as indicators of MPA and OECMs (other effective conservation measures) effectiveness.

The fourth goal focuses on disseminating the collected data to enhance education and inform the development of novel methodologies and site establishment. The first objective is to develop new MPA monitoring and identification frameworks based on the survey and data analysis solution. The team will deliver a feasibility report outlining a future business model for MPA/RCA (regional conservation areas) management by First Nation communities, utilizing the IMAGE approach. The second

objective is to foster excitement about ocean science and improve education, which includes publishing colored seafloor area maps and models on various online platforms. Additionally, a web-based Google Earth-style viewing of geolocated image data will be developed. This facilitates ongoing research, collaboration and informed decision making in ocean management initiatives.

MPA Location

The location chosen for the project's implementation is Átl'ka7sem/Howe Sound in British Columbia, Canada. This region is home to a substantial population of live glass sponge reefs, a unique habitat found exclusively along the Pacific coast of Canada and the United States. The ecological significance of these reefs cannot be overstated, as they play a critical role in filtering and processing carbon and nitrogen. Additionally, they provide shelter and support for a diverse community of marine species, including economically important ones, such as spot prawns, lingcod and crab.

Despite their ecological importance, glass sponge reefs face threats from human activities, especially bottom-contact fishing and sedimentation. To safeguard these fragile ecosystems, Fisheries and Oceans Canada (DFO) established marine refuges through fishing closures. However, the slow growth rate of glass sponges

Subsea Control Systems

The Role of Electrohydraulics in the Energy Transition

By Alistair Mykura

Global energy security and affordability is an international concern. In the face of challenging times post-pandemic, along with the Russia-Ukraine war and global economic headwinds, a pragmatic transition to sustainable energy has become the focus.

However, oil and gas will continue to play a critical role in the global energy system as we transition to alternative forms of energy, and the subsea segment is experiencing a particular resurgence to meet the growing demand for fossil fuels, particularly gas. The subsea systems market is estimated to reach \$15.3 billion by 2030 alone, pushing technological advancement throughout the subsea industry, particularly in subsea control systems (<https://shorturl.at/ltx1N>).

But growth and innovation can be a double-edged sword, with commercial pressure on owners and operators to maximize the opportunities. Every missed hour of production could mean millions of dollars of lost revenue, so ensuring and safely maintaining asset reliability is a priority from both an operational and commercial perspective. The risks and challenges increase as the industry ventures into more complex, deeper and longer offset fields.

All aspects of the system, from topside to the subsea distribution equipment, need to be field proven to ensure



Transaqua SP is a fluid that tolerates seawater contamination by up to 30 percent while maintaining its corrosion protection capability.

the fastest time and path of least resistance to first gas/oil. Consideration must also be given to budget concerns and ensuring system performance availability once commissioned.

The growing trend of innovation in the subsea sector is apparent in the new all-electric subsea control systems

slowly coming to the market, offering great potential to drive down CAPEX and decarbonize. However, existing systems still have value; for example, we expect that the majority of christmas trees (XT) forecasted for the next few years will not be all-electric solutions.

Operators are looking for solutions they can trust, and existing multiplex electrohydraulic control systems will continue to be a compelling offer for the foreseeable future. With hydraulics, operators get a higher level of reliability with field-proven solutions at the highest technology readiness level (TRL), underpinned by decades of steady performance and an established supply chain.

Electrohydraulic systems have also benefited from the optimization of their design over the last 30+ years, with well-defined operation and performance envelopes. These systems have developed a long life cycle, designed to remain in challenging conditions for up to 30 years, and possibly more.

Control Fluids

Control fluids are the lifeblood of hydraulic systems. These control systems are evolving to meet the ever-challenging demands of wells and fields, such as depth, temperature and hydrate management. Having proven and effective control fluids that suit these conditions is crucial.

An arguably even more fundamental element of hydraulic fluid development lies in the sustainability and environmental performance of the fluids. They need to deliver minimal or no impact to our precious marine ecosystems. Environmental standards continue to evolve, and legislative bodies such as the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the Offshore Chemical Notification Scheme (OCNS) necessitate continued investment in delivering compliant product offerings. No single party can deliver this. Lubricant suppliers, such as Castrol, must work with the oil and gas majors, OEMs, operators and regulators to develop commercially viable and high-performing products underpinned by a clear understanding of subsea operations from the well to the shore.

Focusing on the balance between safety, technical performance, and environmental and sustainability requirements is at the heart of Castrol's fluid development operations. Castrol's Transaqua SP product has undergone 130,000 hr. of testing to ensure it meets the most demanding requirements across all facets of intended use and industry and OEM standards, with successful environmental testing worldwide (<https://shorturl.at/hrHZ4>).

This enables us to bring high-performing products that offer a range of system benefits, including corrosion protection and hydrate control. Castrol's product range boosts the longevity of hydraulic systems with enhanced corrosion protection.

For example, Transaqua SP is a fluid that tolerates seawater contamination by up to 30 percent while maintaining its corrosion protection capability. Once again, this is balanced with minimal environmental impact and compliance with international regulations, including OSPAR, OCNS and Norway's rating system.

The Bridge to the Future

The industry should not seek to compare hydraulic and electric but rather see how they can coexist as we continue to navigate the energy transition. The acceleration of decarbonization in the offshore world, from the operations of platforms to the growth of wind and wave power, along with changing regulations, mean that all-electric systems have a lot to offer the industry's next phase of evolution. Subsea power grids are promising electric networks on the seafloor, powering XTs and boosting pump and autonomous vehicles for subsea intervention. In fact, we're approaching the second generation in all-electric systems now, bringing cost reductions and simplifications as joint industry programs develop solutions and operational frameworks that will ensure improved performance and reliability.

Castrol was a pioneer lubricant and fluid supplier when the subsea industry adopted hydraulics, and when electrohydraulics came into play, these systems eventually became the established industry solution with proven results, positioning Castrol in the bridge between traditional hydraulic and all-electric systems.

All-electric technology has a strong track record in key application areas, such as manifolds and some tree functionality, but for an industry looking to rationalize operations and reduce costs, a rapid move to all-electric could be counterintuitive and certainly will not happen overnight. Hydraulic subsea control fluids still have a crucial role in underpinning reliability throughout field life, especially on legacy installed assets that will use hydraulic technology throughout the life cycle.

In the next five years, we predict that the subsea sector will likely continue to use hydraulically controlled subsea wells because they are proven and reliable. We also anticipate that the industry will continue to use hydraulic systems to underpin subsea production activities in increasingly harsh and remote locations for years to come.

We should certainly continue to invest in technology that has the potential to unlock desired operational efficiencies and meet new challenges. To do this effectively, we need to call upon all the expertise we have within the sector. Castrol has always been at the forefront of new technology, from developing complementary solutions and adapting our existing products to new ways of working, to supporting upgrades and protecting them with the latest control fluid chemistry. The company continues to play a role during the energy transition as the industry looks to optimize performance and sustainability. **ST**

Alistair Mykura is the subsea and energy OEM liaison manager at Castrol.



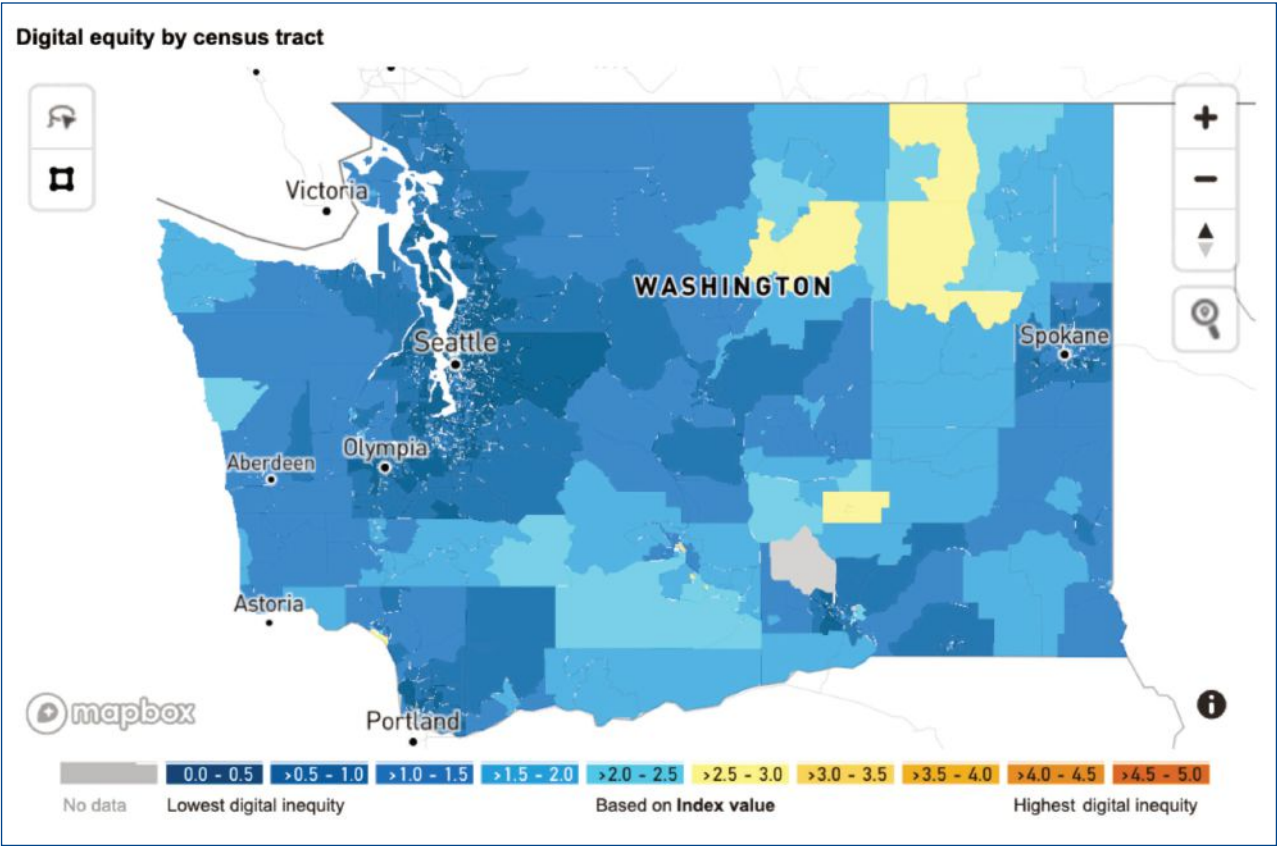
Closing the Digital Divide

How to Increase Internet Access in Unserved and Underserved Areas

By Tyson Johnston

We live in a world where cars are starting to drive themselves and AI is transforming the way people work. But for some communities, simply getting a reliable internet connection has remained a frustrating impossibility. That's the case for roughly 42 million Americans who have no internet access, according to data from BroadbandNow. And it's not much better for the

157.3 million people who don't have access to broadband-level speeds. Technology continues to advance, but, as it does, the digital divide continues to widen. This problem is predominantly an issue in rural and tribal areas, where lower population density makes the investment in broadband infrastructure difficult for for-profit companies to justify. For years, this issue has



The digital divide in Tiptana's home state of Washington. (Credit: Microsoft Airband Initiative, 2023)

“As a sovereign Indian nation with coastal access and adjudicated ocean rights on Washington state’s coast, the Quinault Indian Nation, which owns Toptana Technologies, is able to make the critical infrastructure for the first and middle miles a reality.”

affected my people, the citizens of the Quinault Indian Nation (QIN), and our neighboring communities. So, we have decided to make the bold move to launch a venture that will not only bring connectivity to unserved and underserved markets across Washington State and Oregon but will also serve as a new revenue-generating business in our nation’s portfolio, reinforcing our self-sustaining economy. Toptana Technologies, rooted in the Quinault words for “beach” and “shore,” was formally launched in 2022 with the aim of bringing connectivity to all.

Toptana Technologies is defined by compelling firsts. It owns the first subsea cable landing station in Washington in over two decades. It is the first such project fully owned by an indigenous nation. It is the first Quinault business venture branching outside of our borders. And it will enable local providers to provide high-speed broadband internet access to unserved and underserved communities in our region.

Critical Infrastructure

Companies and governments have attempted to bridge the digital divide before but have only advanced short-term, limited solutions. The bigger picture need for the underlying infrastructure to close the gap once and for all is a more complex problem that has, unfortunately, remained mostly unmet on tribal and rural lands.

The goal of closing the gap has potential longer term

economic impact: According to a study commissioned by Amazon Web Services and the U.S. Chamber of Commerce, increased access to digital tools could add \$116.7 million to annual wages and create nearly 2,500 jobs per year in Washington State alone.

In order to make it happen, the infrastructure of the internet needs to be in place: the first, middle and last miles required for all connectivity around the globe. The first mile comprises bookends of cable landing stations and beach manholes connected by subsea cable. The middle mile runs from the second cable landing station through a backhaul cable to a regional point of presence. The last mile delivers internet access from the regional point of presence to the end-users.

The timing for Toptana to create this infrastructure could not be better because the need for additional cable landing stations—the places where subsea fiber cables connect to the mainland—is greater than ever, especially for transpacific connections. And Washington State hasn’t had new submarine fiber-optic cables land in more than 20 years, while Oregon and California have laid 14 in that period.

As a sovereign Indian nation with coastal access and adjudicated ocean rights on Washington state’s coast, the Quinault Indian Nation, which owns Toptana Technologies, is able to make the critical infrastructure for the first and middle miles a reality.



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“Building the infrastructure needed to bridge the digital divide will mean better healthcare, education, business opportunities, job prospects and safety programs.”

Toptana’s team hired numerous third-party engineers and environmental consultants with local knowledge to conduct the necessary studies to make sure the project is feasible and environmentally safe. Toptana will own the cable landing station and the backhaul network, and our partner internet service providers (ISPs) will build the last mile infrastructure. When the time comes to lay the cable (timing of construction is yet to be determined by the ISPs), a cable-laying ship will trench, lay and bury cables nearshore, a process that typically takes several days. After this, sediment on the ocean floor will resettle, and the cables will be dormant beneath the surface, much like utilities on land. Fisheries are given exact specifications on the placement of the cables in order to prevent damage from activity such as bottom trawling. We’re grateful to our friends at the Oregon Fishermen’s Cable Committee for providing guidance with the insights and wisdom they’ve gathered in over two decades of fishing over Oregon’s many subsea cables.

We’re excited for what’s to come and the impact this connectivity will have, both for our tribe and for other rural communities in the Pacific Northwest. Building the infrastructure needed to bridge the digital divide will mean better healthcare, education, business opportunities, job prospects and safety programs. Together, these improvements to quality of life will create upward mobility. All this will be possible as a result of the new opportunity to connect to knowledge, people and places around the globe. **ST**

Tyson Johnston is the chairman of the board and head of development for Toptana Technologies, where he leads the enterprise development of Toptana and its subsea and terrestrial network solutions. He is also the executive director of self-governance and former vice president of the Quinault Indian Nation (QIN), having served in elected office for the past decade. As the largest employer in Gray’s Harbor County, Washington, QIN owns and operates a variety of enterprises in forestry, fishing, hospitality and retail. Johnston has worked closely with local, state and federal governments to effectively co-manage resources in the Pacific Northwest. He is an alumnus of the University of Washington and a life-long resident of Taholah, Washington, the coastal headquarters of the QIN’s government.



international

UAE Decarbonization Centre

The United Arab Emirates (UAE) Ministry of Energy and Infrastructure and Foundation Det Norske Veritas have signed a memorandum of understanding to establish a new UAE Decarbonization Centre, with launch in early 2024. Work will be done through joint industry research programs; collaboration with government, industry and academic stakeholders; and attracting and developing new talent for the industry. The center will also focus on programs that incubate and accelerate the development of new technologies and provide a centralized hub for information on decarbonization solutions.

Air Cavity System for Vessel Retrofit

Damen Shipyards Group has made the first sale of its innovative Damen Air Cavity System (DACS) to Amisco. Damen will retrofit the DACS to Amisco's cargo vessel *Danita* in Tallinn, Estonia.

DACS is an air lubrication system resulting from a collaboration with the Delft University of Technology (TU Delft). It maintains a thin layer of air over the flat bottom of a vessel's hull, reducing resistance in the water, thereby lowering drag and friction. This improves vessel efficiency, with fuel consumption reduced by up to 15 percent.

AiP for Liquefied Hydrogen Carrier Systems

ClassNK has issued an approval in principle (AiP) for a Cargo Containment System (CCS) and Cargo Handling System (CHS) for a liquefied hydrogen carrier developed by GTT.

Hydrogen is expected to be used as a source of clean energy for decarbonization since it does not emit CO₂ when combusted. The technological development for maritime hydrogen transportation is progressing actively, with the aim of establishing a hydrogen supply chain.

Battery Development for Defense

Kraken Technology Group has partnered with Cosworth to develop advanced battery solutions for its littoral defense and security range. The initial focus is around the Kraken MANTA platform, a range of autonomous uncrewed surface and subsurface vessels designed to address a growing range of ISR (intelligence, surveillance and reconnaissance) mission and deployment capability requirements.

ANB Chooses Resellers

ANB Sensors has made a reseller agreement with DC Technology in Spain. ANB creates solid-state sensors for pH, conductivity and temperature that require no calibration and are ideal for use in any sensing platform in freshwater, saltwater, and aquaculture applications. DC Technology's expertise in research and the environment will facilitate ANB's business in Spain.

ANB has also signed a reseller agreement with Clockwise Subsea Pte Ltd., an independent subsea services

provider of rental solutions and consultancy. This partnership will increase ANB's reach in Singapore, Malaysia, Indonesia, Thailand, Taiwan and India.

AI Solar Energy Management for Vessels

Carisbrooke Shipping Ltd., which operates a fleet of multipurpose vessels from offices in Cowes on the Isle of Wight, has signed a letter of intent with Anglesey- and Manchester-based Grafmarine to utilize the cutting-edge NanoDeck AI Solar tile management solution.

The companies have worked in partnership over the last 12 months. Grafmarine was given a marine vessel to test its NanoDeck technology, which can be attached to any flat surface, in this case, a cargo ship, to capture, store and remotely manage clean energy generation via AI solar technology. The testing included a return voyage from Scotland to West Africa, when the NanoDeck sent live data that gave both organizations a better understanding of how the equipment will withstand the rigors of a marine environment.

The first vessel to install this solution was the *UAL Osprey*, with plans to roll it out to multiple vessels when additional tests are successfully concluded.

Moby ROV Magnet Testing

Blumags' latest innovation, the Moby ROV magnet, has been tested with development partner DeepOcean in the Balder field in the Norwegian sector of the North Sea. Moby assisted with ROV hull cleaning and other tasks on the Balder floating production unit.

The magnet was tested as an ROV guide for the 250Te crane main block on OLYMPIC ARES during a tree cap replacement and as an ROV grabber bar on a template during a clamp installation down to approximately 115-m depth. The possibility of angling the magnetic modules ensured Moby could be installed on a curved surface, and DeepOcean reported that the magnet held and the release mechanism was easy to operate both by hand and with the ROV.

Hydrocarbon Detection in Desalination Plants

OSIL has manufactured a large number of oil spill buoy systems that are now installed in multiple locations to protect the water intake systems of desalination plants.

If hydrocarbons enter a desalination plant's intakes, the filters are rendered ineffective, possibly leading to the closure of the plant while the complete filter stack is washed. The lengthy and costly cleaning process causes additional complications related to wastewater disposal.

The OSIL buoys provide an early warning system for the presence of hydrocarbons to internet-enabled devices. The optical oil spill monitoring systems can be networked to cover multiple locations and can detect a variety of hydrocarbon-based substances, even under harsh weather conditions.

Sub, Surface Vessel Valve Manufacturer Turns 50

CIRCOR International Inc.'s brand Portland Valve (PV) is celebrating its 50th anniversary. Originally incorporated in 1973 with five employees, PV has grown to be-

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come a standard name in valves for both submarines and surface vessels.

Portland Valve manufactures a full line of ship service ball valves and other specialty valves for submarine applications, as well as specialty valves for aircraft carriers and destroyers. PV also provides repair services.

In the last 10 years, PV has increased its market share for new submarine construction and is the last remaining legacy valve manufacturer for these programs. A major investment in new equipment has positioned PV to meet increased demand as submarine construction increases.

New Channel Partner for GeoAcoustics in GOM

GeoAcoustics Ltd. has appointed Houston-based sub-sea technology specialists C.A. Richards and Associates Inc. as its new channel partner in the U.S., with focus on sales and support of the GeoSwath bathymetric sonar, GeoPulse sub-bottom profiler and Pulsar side scan sonar product lines for customers working in Texas, Louisiana and Mississippi.

With offshore wind growing in the Gulf of Mexico (GOM), the time-saving capabilities of the new AI system for GeoSwath 4 should be of interest to Gulf customers, as it can make up for the shortage of marine surveyors in the region by enabling them to do more specialist tasks while quality controlled data are delivered automatically in real time.

Weems & Plath's 95th Anniversary

Weems & Plath has reached 95 years in business. The globally renowned nautical and weather instrument manufacturer was founded in 1928 by Captain Philip Van Horn Weems, a graduate and instructor of the U.S. Naval Academy, in partnership with his wife, Margaret Thackray Weems.

In its early years, the company began as a navigation school based in Annapolis, Maryland, where students could choose to receive correspondence or in-person courses to learn how to navigate in the air and at sea. The company quickly evolved into manufacturing navigational instruments that could be used in tandem with the courses. Courses continued to be offered through the mid-1970s, at which time the company decided to focus more on enhancing navigation by serving as a consultant for the U.S. Navy and U.S. Coast Guard.

Updated versions of some of the instruments developed by the school 95 years ago are still among the most popular products sold by Weems & Plath today, including the Weems Parallel Plotter, 12-in. Parallel Rule and Hand-Bearing Compass. Weems & Plath now offers over 400 products, with customers worldwide.

TDI-Brooks Adds to Fleet

The market for subsea services remains strong, and TDI-Brooks has added a 75-m DP2 vessel, RV *Nautilus* (formerly *Nautical Geo*), to its fleet.

After retrofit, the research vessel will offer assistance for construction, exploration, production, ROV operations, diving, scientific research, survey mapping and military purposes. **ST**

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Design Contract for South Korea Floating Offshore Wind

DORIS has secured a second front-end engineering design (FEED) contract for the Gray Whale 3 floating offshore wind farm in South Korea. The scope includes the project's full electrical and communications system to the grid connection, array and export cabling, and all aspects of the fixed offshore substation foundation and topside structures.

Gray Whale 3 is being developed by BadaEnergy, a joint venture between Corio Generation, TotalEnergies and SK ecoplant. With a capacity of 504 MW, it will be one of the largest floating offshore wind developments globally. Situated 60 to 70 km from the port of Ulsan, the project is part of a three-phase development expected to reach a total capacity of 1.5 GW.

Completion of Wind-Assisted Propulsion Project in EU

The EU-Interreg North Sea Region project "WASP: Wind Assisted Ship Propulsion" has officially concluded with: five commercial vessels retrofitted with wind-assist systems; three different wind propulsion technologies tested; third-party validations conducted to verify actual fuel savings achieved; and other key deliverables concerning performance indicators, standard sea trials and decision-making tools.

WASP brought universities, wind-assist technology providers and shipowners together to research, trial, and validate the operational performance of a selection of wind propulsion solutions. After 3.5 years, the project has generated crucial information and transparency around wind propulsion technology selection, installation and operation, contributing greatly to the general development of the wind-assist sector in the North Sea region and beyond.

Modular Power Units

In support of Germany's energy transition agenda, P&O Maritime

Logistics will use its multi-carrying vessels to transport modular units for offshore wind power stations, which will be used to build a new wind farm in the German part of the North Sea. P&O Maritime Logistics will transport the components for the Spanish company that oversees the construction of the offshore substations for the wind farm.

Expected to commence power production in 2025, the 900-MW wind farm will be a key contributor to achieving Germany's energy transition goals of fulfilling 80 percent of its electricity needs from renewable sources by 2030.

Wave Power Education

Eco Wave Power Global AB has been given a GREENinMED grant from the European Union, under the ENI CBC Mediterranean Sea Basin Programme. Eco Wave Power's project was selected to be a grant recipient by the Kinneret Academic College, with the goal of adding educational and knowledge-sharing features to Eco Wave Power's newest wave energy power station, located at the Port of Jaffa in Israel, for the benefit of the local population and tourists.

Site Investigation in Baltic

Benthic, a geo-services brand in Acteon's Data and Robotics division, has completed a site investigation comprising cone penetration tests (CPTs) using its portable remotely operated drill (PROD) that has enabled the design of foundations for about 100 wind turbines and two offshore substations for the Baltyk II and III wind farms offshore Poland in the Baltic Sea. The work for the developments, which are a 50–50 joint venture between Norwegian energy company Equinor and Polish power utility company Polenergia, was performed at 16 locations in 40- to 55-m water depths.

The PROD unit, supported by the survey services of Acteon geo-services brand UTEC, was deployed from the *Ocean Zephyr* offshore supply vessel. The geotech-

nical work was completed in three months. Wind farm construction is expected to start in early 2024, and the first power export is anticipated in 2026.

Joint Venture to Support Taiwan Offshore Wind

Ørsted Taiwan has selected Mammoet-Giant Taiwan, a joint venture, to provide lifting support for the 920-MW Greater Changhua 2b and 4 offshore wind farms, which will contribute to Taiwan's goal of 5.7 GW of offshore wind power capacity by 2025.

The joint venture has been entrusted with the marshaling and lifting activities for 66 suction bucket jackets. Mammoet will use its 5,000-t-capacity SK 350 ring crane to lift the 2,500-t suction bucket jackets directly from deck carriers to the quayside and, after temporary storage on site, onto deck carriers ferrying the jackets to the installation vessel in the field. This methodology will eliminate the need for vessel repositioning during offloading and loading operations.

Metocean Survey in Scotland

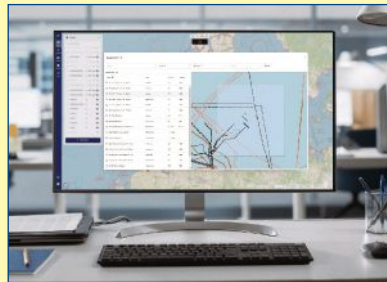
Salamander, a joint venture between Ørsted, Simply Blue Group and Subsea 7, has appointed Fugro to conduct a metocean survey for the Salamander offshore wind farm project. Located 35 km off the coast of Peterhead, Scotland, the 100-MW project will use innovative floating offshore wind technologies to power up to 100,000 Scottish homes and provide insights and best practices for future commercial-scale developments in Scottish waters.

The survey was scheduled to start in September and run for approximately 12 months to gather meteorological, oceanographic and environmental data. Insights from the data will inform the project's design, operations and maintenance strategy, and support the planning application process. Two floating SEAWATCH wind LiDAR buoys and a Wavescan buoy will facilitate the survey. The necessary consent applications will be submitted by early 2024. **ST**

productdevelopment

For more information on any of these products, visit our website at www.sea-technology.com/products

Geospatial Search Update



TrueOcean Marine Data Platform (MDP) has a new geospatial search function that enables data on the platform to be located and accessed in seconds using a map-based interface. This simplifies searching for all hydroacoustic and geotechnical data, as the operator needs only circle the corresponding area on the digital map to see a list of the available files. The platform automatically georeferences data and extracts metadata during file upload. TrueOcean GmbH.

CII Compliance Management

Bearing CII Optimizer can optimize commercial and operational decision making of maritime companies by leveraging massive quantities of real-world data and incorporating dozens of seaway variables to provide proactive recommendations for meeting and maintaining compliance. The emissions prediction and tracking solution can apply to other carbon compliance regulations, and it has ClassNK's innovation endorsement. Bearing AI.

Measuring Fuel Quantity, Quality

LNG-Quality Release System (L-QRS) is software that collects all relevant information that is necessary in order to determine the amount of energy transferred during LNG vessel loading and unloading operations. The fully automated information flows eliminate human errors in the data processing that can arise when copying measurement data among different systems. KROHNE Marine.

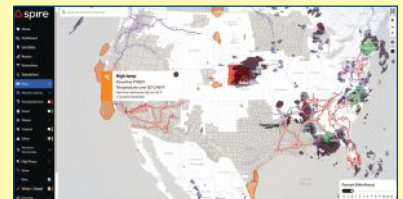
Multi-Client Data Ecosystem

New tiered offerings for Versal allow for free access to the world's most comprehensive multi-client data coverage in one centralized location. Versal users now have unlimited access to essential data from CGG, PGS and TGS, streamlining workflows for exploration and production, data management and procurement. CGG SA.

Firmware Update for Fish Tags

Code maps have been made easier with a new firmware update that ensures receivers can detect all MAP-114, MAP-115 and future Innovasea tags. Previously released for VR2Tx and VR2AR receivers, the firmware is now available for VR2W and VR4-UWM receivers. With the update, researchers using 69-kHz systems will no longer need to worry about which receiver code map to use. Innovasea Systems Inc.

Weather Monitoring



With Spire's unmatched global weather coverage, including under-observed areas and remote regions, DeepVision can monitor and alert on thousands of moving or static supply chain assets, existing infrastructure, planned routes and more in real time. With the visualization platform, customers can proactively monitor weather conditions, anticipate potential disruptions and take immediate action to mitigate risk and optimize operations across every layer of complex trade and supply networks. Spire Global Inc.

Ensuring Proper Cable Connection

Twist-Lock 50A Cable Sets enhance dockside safety by incorporating



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bright LED indicators that provide clear and immediate assurance of proper connection. Engineered to withstand the harsh marine environment, each features a fully molded ergonomic housing incorporating a nickel-plated brass shell for superior waterproofing and corrosion resistance. Hubbell Marine Electrical Products.

Lithium Battery



InSight 12V is a 120-Ah powerhouse that outputs 160 A continuously and offers higher peak discharge for marine deep-cycle and solar applications. The battery is scalable and provides reliable power for multiple applications. RELiON Battery.

Navigation Lights

The AHD-LED product line has been brought to the U.S. market for the first time. These LED navigation lights, constructed with seawater-proof aluminum and stainless steel and weather-resistant lenses, are built to withstand challenging conditions and outlast standard navigation lights. Available in 12 to 24 V, they are suitable for both small pleasure boats and large commercial vessels that require type approvals. Böning USA.

Modular Blade Server

The Mercury Processing Platform is a mission compute solution designed for networking, big data and signals intelligence workloads. It is an open standards-based, modular server that drives critical applications at sea, on land or in air. The Common Module System (CMS) X08 blade server answers demands for more processing, bandwidth

and capabilities, and expands supplier choice to future-proof your architecture utilizing Open Compute Project (OCP) openEDGE. Mercury Systems Inc.

Extensive Internet Connectivity

For commercial and recreational vessels with extensive internet connectivity needs, the Glomex webBoat Link IT1304PRO/US is optimized to operate in North American waters. The pioneering dual-SIM device receives local Wi-Fi, 3G and 4G cellular connections up to 10 mi. from shore, as well as satellite signals. It then seamlessly switches between them as needed and repurposes them through the integrated secure hotspot and/or ethernet. GA Communications LLC.

SonarWiz Update

SonarWiz 7.11.2 displays SSS, SBP and backscatter imagery using dB or linear scale; adds far field tracking support to seabed classification; features export bathymetry nadir

depth as XYZ file; offers GeoPulse 2 and GeoChirp 2 support with new pinger min/max frequencies; and fixes more than 25 bugs. Chesapeake Technology Inc.

In-Line Mooring Buoyancy

Designed to secure floating wind turbines and other structures to a seabed anchor while providing uplift to the mooring line, the system can also act as a connection point between the bottom and top sections of the line while allowing trajectory and tension to be controlled in the water column. Balmoral Comtec Ltd.

Engine Filtration System

engineBoll 6.49 for two-stroke engines guarantees continuous cleaning of the servo oil and ensures zero-loss operations in the oil circulation system. The automatic filter has a redundant arrangement comprising two chambers with two backflushing mechanisms. Boll & Kirch Filterbau GmbH. **ST**

A Twitter advertisement featuring a blue cartoon bird holding a copy of 'SEA TECHNOLOGY' magazine. The magazine cover shows a satellite and the text 'SEA TECHNOLOGY SERVICE THE WORLD'. The background is a blue gradient with the Twitter logo and the URL 'twitter.com/SeaTechnology' repeated. The main text 'FOLLOW SEA TECHNOLOGY ON...' is in large yellow letters at the top, and 'twitter.com/SeaTechnology' is in large yellow letters at the bottom.

marineelectronics

Michigan's 'Fresh Coast Corridor' Initial Cohort

The cohort of maritime grant recipients to support Michigan's "Fresh Coast Corridor" has been chosen. Arc Boat Co., Aqua super-Power, Hercules Electric Mobility, Lilypad, Michigan Technological University and Voltaic Marine Inc. will receive \$506,000 in total grant funding to establish what will become an evolving network of shore-side charging facilities for clean-fueled marine vessels and electric passenger vehicles operating on the Great Lakes.

The Fresh Coast Maritime Challenge was launched in April 2023 to offer commercial enterprises of all sizes a sustainable, cost-effective and efficient means of transitioning watercraft from diesel to electric power and electrifying marinas. This goal correlates to the sustainability directives outlined in the MI

Healthy Climate Plan and MI Future Mobility Plan. The first cohort of grant recipients will help enable continued innovation in Michigan's mobility industry while contributing to a blueprint that can be replicated by marinas across North America.

AI to Monitor Water Quality

OSIL is investigating improvements for cost-effective, real-time marine water quality monitoring solutions, using AI modeling to help visualize and predict events.

With the specific aim of improving predictions for high coliform events, OSIL has manufactured and deployed a self-contained 1.2-m Tern data buoy platform equipped with multiparameter water quality instrumentation, met sensors and GSM data telemetry system. The buoy is monitoring local conditions for a range of parameters, providing feedback on sedimentation, low

oxygen levels, excess nutrients and effluent pollution. The data are validated externally by the collection of local water samples.

The data from both the smart monitoring buoy and the sample analysis are then entered into an AI modeling system to look at developing specific indicators for coliform predictions and are presented in a graphical user interface (GUI). The goal is to narrow the set of parameters that are needed to model predictions for high coliform events, thereby reducing the cost of monitoring and evaluating these events, and enabling more systems to be deployed in more locations longer term.

The project is being funded by Innovate UK, part of UK Research and Innovation, in conjunction with the Department for Environment, Food and Rural Affairs (Defra) as part of a series of innovation projects to improve the observation capabilities for the U.K.'s waters in order to advance assessment and evaluation of

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Underwater Intervention is excited to announce it is joining forces with WorkBoat to present UI 2023 at this year's International WorkBoat Show

Back and better than ever, Underwater Intervention will take place at the Morial Convention Center in New Orleans, LA from November 29 - December 1, 2023. Consisting of a dedicated exhibitor pavilion and a multi-track technical conference program, this new co-location capitalizes on the tremendous amount of synergy between the Workboat audience and Underwater Intervention attendees. The exhibitors will be showcasing the latest developments in commercial diving and underwater products, and the Technical Program will highlight current state of the art technologies as well future developments to support underwater operations.

Use code **"seatech"** for free entry to Underwater Intervention and the International WorkBoat Show and 25% off the conference.



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More Companies Join Aquarius Innovation Forum

Eco Marine Power has announced that two more Japanese companies, Nitto Seiko and Sunflame, have joined the Aquarius Innovation Forum and bring with them innovative technologies related to improving energy efficiency on board ships, systems automation and digital solutions for ship data performance management.

Nitto Seiko, with its head office in Kyoto, offers a wide range of fuel flow meters for maritime applications. Sunflame, also with its head office in Kyoto, manufactures combustion technology for marine use with its rotary cup burner and control technology. Both companies will join online meetings, seminars and technology presentations for shipowners and ship managers, as well as taking part in study projects.

Nautilus Multibeam Sonar Backscatter Calibration

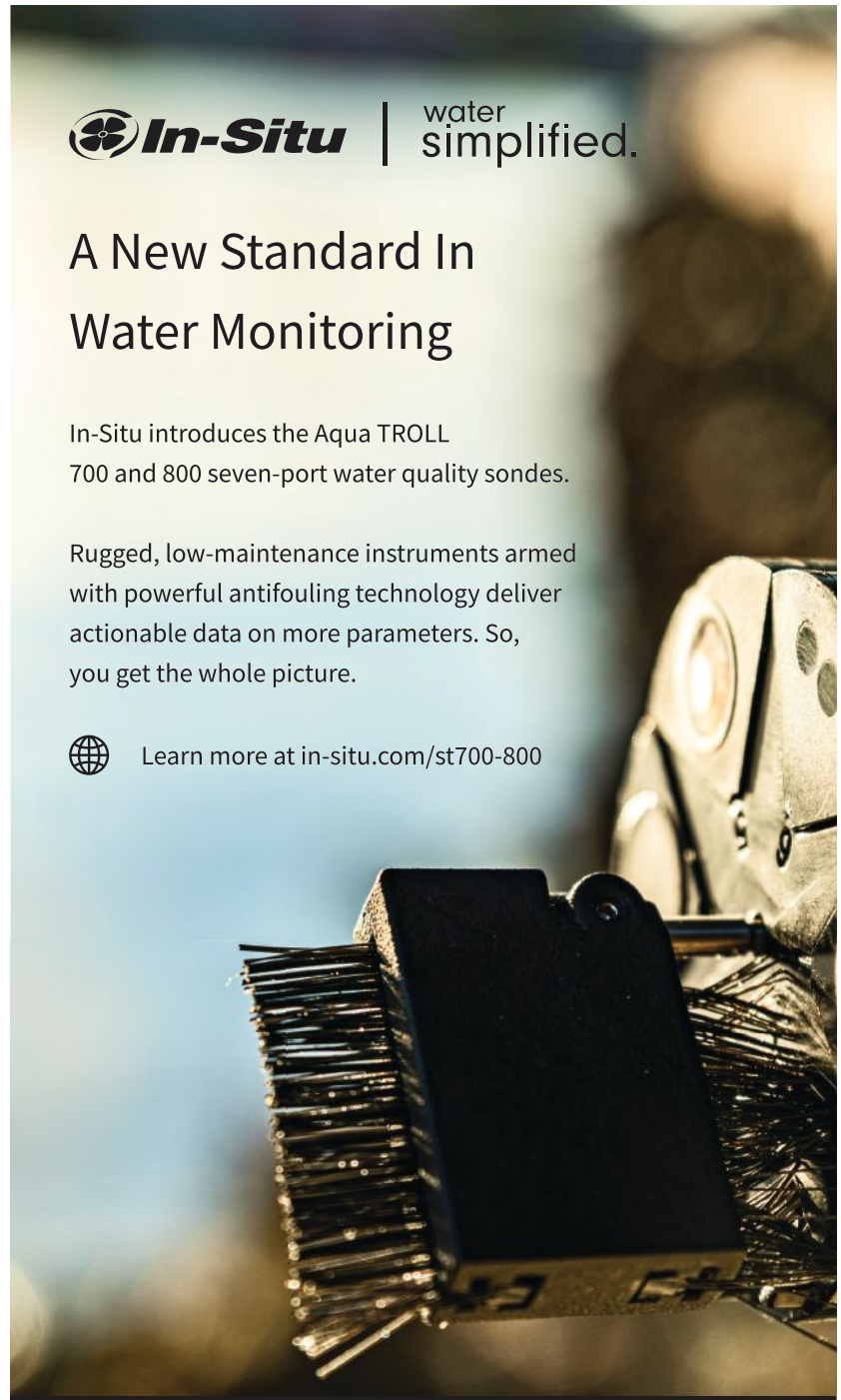
During the NA152 expedition, the Ocean Exploration Trust (OET) and partners successfully completed a backscatter calibration of EV *Nautilus's* multibeam sonar at reference sites offshore of the island of Oahu and outside Hawaii state waters. Backscatter calibration enables obtaining high-quality imagery of the relative hardness of the seafloor as a ship traverses variable terrain and water depths. This information is critical for understanding marine habitats, interpreting marine geology and informing siting of offshore infrastructure placement (such as communications cables). OET is coordinating with NOAA to use the same calibration site as other NOAA ships to improve methods to collect more consistent data from different vessels.

Sonar backscatter measures how much sound is reflected from the seafloor and provides valuable insights into the distribution of hard or soft habitats (i.e., rock versus mud). The backscatter calibration process involves gathering multibeam sonar data over sets of reciprocal tracks at

different sonar operating modes and adjusting computer processing routines to deliver comparable imagery. Calibration lines used during the exercise were located at depths of 650 and 3,000 m. NOAA Ship *Rainier* previously established the calibration lines used by EV *Nautilus*, and the same lines will also be surveyed by NOAA Ship *Okeanos Explorer* to enhance the comparability of backscatter data among different ships.

Thanks to support and funding from NOAA Ocean Exploration via the Ocean Exploration Cooperative Institute (OECI), OET and other institutions can continue collective endeavors to map the substantial amount of remaining seafloor that has yet to be surveyed at high resolution.

Nautilus's multibeam sonar data also contribute to Seabed 2030, an initiative to map the global seafloor. **ST**



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Ammonia, LCO₂ Carrier AiP

ClassNK has issued an approval in principle (AiP) for an ammonia and liquefied CO₂ (LCO₂) carrier jointly developed by Mitsubishi Shipbuilding Co. Ltd. and Nippon Yusen Kabushiki Kaisha (NYK Line).

Ammonia is projected to be widely used as a source of clean energy for decarbonization since it does not emit CO₂ when combusted, and it is expected to be increasingly transported by sea. Meanwhile, efforts toward carbon dioxide capture, utilization and storage (CCUS), a process that captures emitted CO₂ and either uses it as a resource or stores it in a stable underground geological formation, are also progressing. LCO₂ carriers could provide efficient transport of captured CO₂ to facilities for utilization and storage sites.

The ammonia and LCO₂ carrier developed by Mitsubishi Shipbuild-

ing and NYK Line is designed to carry both ammonia and LCO₂ safely and economically using the same carrier. The carrier enables operations such as transporting ammonia to thermal power plants on the outbound route and transporting CO₂ emitted from thermal power plants to storage sites on the return route.

Donation for Artificial Reef Offshore Virginia

Hill's Newport News Shipbuilding division has partnered with the Virginia Marine Resource Commission (VMRC) to donate and sink a former drydock caisson gate offshore, giving it new life as part of an artificial reef.

Caisson gates are used at the harbor end of a drydock, with pipes inside allowing for water from the James River to enter when the drydock must be flooded. This particular gate, originally put into service

in 1967, was part of a drydock no longer in use at the shipyard.

The gate was towed offshore and sunk earlier this year and is now taking on new life as part of the VMRC Tower Reef, which is already home to multiple barges, other vessels and subway cars. The donation directly supports Virginia's Artificial Reef Program, which aims to replicate natural fish habitats as closely as possible and increase fishing opportunities for anglers.

Development of Vessel Emissions Reporting Standard

ZeroNorth and Energy LEAP, an alliance between energy majors, together with other industry partners, have published a draft proposal for consultation for a Vessel Emissions Reporting Standard (VERS 0.9). This is the initial outcome of broader work to define and release a noon report standard. The new open standard is the culmination of eight months of consultation and collaboration with shipowners, charterers,

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energy majors, association bodies and software vendors, and sets out to enable emissions reporting required by law, supporting decarbonization and regulatory compliance. A standard way of managing and reporting emissions data is fundamental to tracking progress and ensuring compliance with the International Maritime Organization's (IMO) decarbonization goals. VERS 0.9 aims to create a standard outlining the data points that should be collected on a daily basis. This will improve the quality of the data operators collect, as well as further assist owners in reporting on emissions at the end of each year.

Current vessel data are based on past industry data needs. As the industry evolves and new requirements for environmental reporting arise, noon reports or vessel reports also need to adapt. A new standard is needed to enable owners to meet the challenges of both required and voluntary emissions reporting.

Nuclear Tech to Power Ships

newcleo, a nuclear technology company developing innovative Generation IV reactors using nuclear waste as fuel, has signed an agreement with Fincantieri, one of the largest shipbuilding companies in the world, and RINA, the inspection, certification, ship classification and consulting engineering multinational. The three companies will conduct a feasibility study for nuclear applications to the shipping industry, including newcleo's lead-cooled small modular reactors (SMRs) technology.

The deployment of newcleo's innovative LFR (Lead-cooled Fast Reactor) for naval propulsion would involve placing a closed mini-reactor on vessels as a small nuclear battery producing a 30-MW electric output. This would require infrequent refueling (only once every 10 to 15 years), very limited maintenance and easy replacement at end of life.

Using clean nuclear energy to power marine vessels would help rapidly decarbonize a sector grappling with huge fossil fuel consumption and its consequent carbon

emissions. The shipping industry, via the IMO, has approved the new target of net-zero greenhouse gas emissions by or close to 2050.

Also, using nuclear power on ships would safeguard the marine ecosystem in the event of an accident. With newcleo's design, the liquid lead inside the reactor would solidify as it cools down in contact with the cold water, enclosing the reactor core in a solid casing and

containing all radiation, thanks to the shielding properties of lead.

Oman Adds Fisheries Vessel

Fisheries Development Oman has launched the *Acila* as part of the fleet of its subsidiary, Oman Pelagic. The vessel is 84 m long, with a hold capacity of 1,800 m³. It is ideal for operations in the Indian Ocean, where it will target various tuna species in international waters. **ST**

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Domoic Acid Causes Illness

Researchers from Florida Atlantic University (FAU) Harbor Branch Oceanographic Institute have conducted the first widespread molecular study of the neurotoxin domoic acid, which is produced by a type of algae found in the Indian River Lagoon called *Pseudo-nitzschia*. At high enough concentrations, domoic acid can cause sickness in marine mammals and birds. Results of the study showed *Pseudo-nitzschia* was present in 87 percent of the surface water samples taken from the central and southern Indian River Lagoon. Domoic acid was found in 47 percent of surface water samples.

As one of multiple toxic bloom-forming organisms within the Indian River Lagoon, understanding the distribution and population dynamics of *Pseudo-nitzschia* is critical to protecting biodiversity, as well as human, animal and ecosystem health.

USV to Study Northern GOM

The Roger F. Wicker Center for Ocean Enterprise at the University of Southern Mississippi (USM) has partnered with MAHI (*Sea Technology*, August 2022) to integrate the MAHI Sense on a USM platform to create a fully autonomous surface vessel to study oceanographic processes in the northern Gulf of Mexico (GOM).

The vessel is a small draft RIB intended for shallow-water surveys and monitoring activities. It can be easily deployed from shore or a mother vessel and serves as an excellent platform for blue tech demonstrations, research and workforce training for helping create an applicant-ready pool of candidates for Gulfport's emerging uncrewed systems industry.

The MAHI obstacle avoidance and perception software has already produced exceptional results for researchers at the Wicker Center.

With the contract, MAHI expands its commercial activities in the United States. MAHI has delivered its MAHI Sense product, cov-

ering the hardware deployed on the vessel (edge hardware), software running on the vessel (edge computing), and software for remote operation. MAHI Sense processes the data from cameras, digital radar and AIS to detect obstacles. The vessel features several control modes, ranging from remote control using a handheld controller to fully autonomous operation.

National Geographic Grant For Shark Study

University of Haifa researchers have been awarded a \$100,000 National Geographic Wayfinder Grant to track the movement of sharks along the eastern Mediterranean Sea (EMS) to try to understand why the species thrives along the basin despite the impact of climate change on the region.

The study, which is led by National Geographic Explorer Dr. Aviad Scheinin of University of Haifa's Morris Kahn Marine Research Station, who is the head of its Marine Apex Predator Laboratory, and Dr. Leigh Livne, a postdoc at his lab, builds on established collaborations across the EMS to combine research with education for long-term conservation outcomes. The Wayfinder grant is crucial to pinpointing the movement and reproduction of sharks and why they return to specific hotspots year after year.

Using a range of minimally invasive satellite tags (including a "birth alert tag" to find parturition grounds of sharks), a network of fixed acoustic receivers, a suite of biological analyses, and the collection of environmental metadata, researchers hope to find where sharks are migrating and residing year-round in the EMS.

Scheinin has tagged 103 sharks so far, and he is leading the Mediterranean's first "shark tagging school" to deploy tags to monitor shark distribution along the Israeli coastal shelf. Since 2016, Scheinin has collected biological, morphometric and passive acoustic data to estimate the health and distribution of

sandbar and dusky sharks. Sandbar sharks are endangered, and there is data deficiency for dusky sharks in the Mediterranean Sea, according to the International Union for Conservation of Nature.

Livne's research will focus on conservation physiology of sharks in the eastern Mediterranean, using a range of hormone and blood biochemical markers, as well as ultrasonography, to determine the fecundity and maternal condition of the sharks.

Multiple Corer for East Antarctic Biodiversity Research

OSIL's Multiple Corer has recently been employed on the Antarctic Expedition NBP 23-03 for biodiversity studies in the East Antarctic, a significantly understudied region where there have been no visits from U.S. vessels in 22 years and very limited contact from other countries. The RVIB *Nathaniel B. Palmer* was the base of the cruise, which focused on Antarctic marine nematodes to evaluate their biodiversity, evolution and ecology using molecular data retrieved from Multiple Corer samples for a baseline data set for historical taxonomic studies.

The Multiple Corer, procured by the U.S. Antarctic Program, provides a pristine sediment sample that can be easily sectioned to study the microbial component of the sample. The penetration speed is controlled by a hydrostatically damped piston and central weight system that enables up to 12 core tubes to be slowly driven into the seabed at a consistent rate. The core tubes are automatically sealed at the top and bottom immediately at the start of the recovery process (using a hydrostatic seal at the top and a mechanical seal at the bottom), capturing a immaculate sediment sample together with the overlying supernatant water, and allowing the corer and samples to be rapidly recovered to the vessel without compromising sample integrity. The transparent cast acrylic core tubes are removed individually and can be subsampled immediately or treated/preserved for later study. **ST**

contracts

Wärtsilä, Helsinki, Finland, will supply methanol-fueled auxiliary engines for a French shipping company. The engines have been ordered for six 15,000-TEU container vessels being built at the Dalian Shipbuilding yard in China. CMA CGM.

Tritech International Ltd., Aberdeen, U.K., has finalized an exclusive reseller agreement to enhance its global presence and provide localized support to users and customers in China. Nortek China.

BlueFloat Energy, Madrid, Spain, has selected OPSIM software to simulate offshore wind projects for evaluation of risk and comparison of different operational strategies during the development and execution phases. Global Maritime.

CIRCOR International Inc.'s, Burlington, Massachusetts, Allweiler brand has secured a contract to supply pumps for the new frigates of the German Navy. The winner of the German Navy tender has ordered the complete pump packages from Allweiler. Damen Shipyards.

Hill's, McLean, Virginia, subsidiary under its Mission Technologies division was awarded the \$1.4 billion Joint Network Engineering and Emerging Operations task order. The company will provide the National Security Innovation Network and its mission partners with emerging technologies in intelligence, surveillance and reconnaissance systems and associated cybersecurity, communications, and information assurance. General Services Administration.

Global OTEC Resources, London, U.K., will co-develop key subsystems of Dominique, the 1.5-MW floating ocean thermal energy conversion (OTEC) platform to be installed for São Tomé and Príncipe in 2025. ENOGIA.

DORIS, Paris, France, has been ap-

pointed as principal designer on the Broadshore and Bellrock floating offshore wind farm projects in Scotland. BlueFloat Energy | Renantis Partnership.

Blue Venture Forum, Newport, Rhode Island, has signed a memorandum of understanding to collaborate on opportunities that will support startups in the global blue economy ecosystem. Invest Nova Scotia. **ST**

meetings

NOVEMBER

November 7-9, CLEAN GULF—San Antonio, Texas. www.clean.gulf.org.

November 13-16—BlueTech Week, San Diego, California. info@tmabluetech.org or <https://tmablue.tech.org/bluetech-week>.

November 28-29—Offshore Energy Exhibition & Conference, Amsterdam, Netherlands. www.offshore-energy.biz/oeec2023.

November 29-December 1—Underwater Intervention | International WorkBoat Show, New Orleans, Louisiana. www.workboatshow.com/underwater-intervention.

DECEMBER

December 4-6—AAPA LATAM Convention of Ports, Barranquilla, Colombia. <https://aapa.getregistered.net/latam-convention-of-ports>.

December 4-6—Marine Renewables Canada Conference, Ottawa, Canada. <https://marinerenewables.ca/event/marine-renewables-canada-2023-conference-december-4-6-in-ottawa>.

December 4-7—Egypt Defence Expo, Cairo, Egypt. www.egyptdefenceexpo.com.

2024

JANUARY

January 24-25—Coastal Futures, London, U.K. cms@coastms.co.uk and www.coastal-futures.net.

January 30-February 1—EUROMARITIME, Marseille, France. www.euromaritime.fr.

FEBRUARY

February 5-7—Floating Wind Solutions, Houston, Texas. <https://floatin windsolutions.com>.

February 26-29—Blue Innovation Symposium, Middletown, Rhode Island. <https://blueinnovationsymposium.com>.

MARCH

March 12-14—Oceanology International, London, U.K. <https://www.oceanologyinternational.com>.

APRIL

April 9-11—Undersea Defence Technology, London, U.K. www.udt-global.com.

April 14-18—OCEANS 2024 Singapore, Singapore. <https://singapore24.oceansconference.org>.

MAY

May 6-9—Offshore Technology Conference, Houston, Texas. 2024. otcnet.org.

May 20-23—MTS Buoy Workshop, Sequim, Washington. www.mtsociety.org/buoy-workshop.

JUNE

June 11-13—Seawork, Southampton, U.K. www.seawork.com.

NOVEMBER

November 4-7—EURONAVAL, Paris-Nord Villepinte, France. www.euronaval.fr.

November 7-10—Europort, Rotterdam, Netherlands. www.europort.nl.

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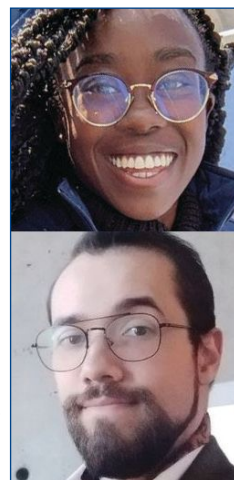


people



The UK Hydrographic Office (UKHO) has appointed **RAdm. Angus Essenhigh** OBE as the United Kingdom's new national hydrographer. He will take on the role of director for defense and data acquisition at the UKHO. The UKHO has also appointed **Vanessa Blake** as chief customer officer. She specializes in growth strategy, change and digital transformation, including applying artificial intelligence and machine learning to enhance customer environments.

Doctoral students **Moronke Harris** and **Fabio Frazao** are the first recipients of the new \$20,000 Roy Hyndman Ocean Observing Award. The award is named in honor of the late **Dr. Roy Hyndman**, one of the leading innovators of the NEPTUNE observatory and recent chair of the Ocean Observatory Council. Hyndman mentored and inspired hundreds of young scientists and students throughout his long career, and this award will support students of ocean science for years to come.



Marco Antonio (Tony) Garcia has retired from Aqueos, where he served as the senior executive sales representative for the past 12 years. He had nearly 48 years of oilfield sales and operational experience from companies including Sub Sea International, Offshore Pipelines Inc., Aquatica and Cal Dive International, in addition to Aqueos.

Marco Osorio has become a Latin America business development specialist for Furuno USA. He comes to Furuno with more than two decades of hands-on experience with the sale, installation and service of marine electronics.

The National Marine Representatives Association (NMRA) has awarded two scholarships of \$2,500 each to students pursuing education in the marine trades beginning this fall. **Kyle Bisceglia** of Rye, New York, will attend the Webb Institute. **Cassandra Serafin** of Cream Ridge, New Jersey, will attend the Ocean County (NJ) Vocational School.

Innovasea has hired veteran fish farmer **Erik Vis** as its new aquaculture services lead. He has more than 20 years of global experience as a fish farm operator and manager, most recently as director of the fish business unit at Naqua, where he oversaw a 10,000-ton Barramundi operation with multiple sites in Saudi Arabia. **ST**

The Case for 'Faster, Better, Cheaper' Emissions Monitoring—Dr. Tim Smyth

Dr. Tim Smyth is the head of science for marine biogeochemistry and observations at Plymouth Marine Laboratory (PML). He leads a diverse team, ranging from Ph.D. students to experienced senior scientists in various disciplines, including air-sea exchange, nutrient cycling and molecular science. His role includes oversight of the Atlantic Meridional Transect and the Western Channel Observatory.



New regulations have been implemented by the International Maritime Organization (IMO) over the last decade, following global concerns over air quality. Emissions of sulphur dioxide (SO₂) and nitrogen oxide (NO_x) from ships have been limited in emission control areas, which feature high shipping activity in close proximity to densely populated coastal regions, such as northwest Europe and the eastern U.S.

Any legislation must have a robust and rigorous monitoring program to ensure ongoing compliance and prove attribution to individual vessels in cases of noncompliance. Current conformity is measured by inspection of logbooks and fuel samples taken in port, which is time- and resource-consuming and open to abuse. Some innovative techniques, such as “sniffer” drones, are being trialled but are unlikely to meet the scale of coverage needed, and in-port inspections are still necessary to meet legislative compliance standards.

As the global population and ship-based trade increase, without enforceable regulations, the impact of SO₂ and NO_x pollution is expected to intensify. A 2016 Finnish study on the human health impacts of SO_x emissions from ships estimated that by not reducing the SO_x limit for ships from 2020, the air pollution created would contribute

to more than 570,000 additional premature deaths worldwide from 2020 to 2025.

SO₂ is linked with several adverse health effects and poses a particularly high risk to children, the elderly and those with respiratory issues. Likewise, NO_x can cause breathing issues, headaches, and skin and eye irritation. Once released in the atmosphere, SO_x can lead to acid rain, impacting agriculture, forests and aquatic species.

In order to meet the challenge of compliance and identification, the ship emission monitoring network needs to expand significantly to cover all locations where there is shipping activity, around the clock. However, the high bars for cost and technical capability are obstacles.

Research led by Plymouth Marine Laboratory (PML), with partners at exactEarth Europe Ltd. and TNO and funded through the European Union’s Horizon 2020 research project SCIPPER (www.scipper-project.eu), highlights possible solutions to improve ship emission compliance and identification.

The team’s recommendation builds on two widely accessible technologies of low-cost portable gas analyzers (designed to measure automobile engine exhausts) and satellite identification systems. By combining these technologies with devices that already transmit ship data, such as onboard telemeters, the approach has the potential to cover 100 percent of the global ocean while attributing emissions to individual ships in near real time.

A major benefit of this approach is that emissions are measured directly from the ship’s stack rather than being diluted in the atmosphere, as is the case for flying drones close to ship exhausts or monitoring from a shore-based sampling system.

Another aspect that was considered was data security. The data were encoded prior to transmission,

so the content of the data is not accessible by third parties. Once the data are retrieved and decoded by the authorized end-user, the GPS-located ship emission data can be used as a point measurement in spreadsheets or plotted on interactive maps.

In order for a commercially viable product to be developed, sensor integration with a satellite identification system and web visualization should be viewed as a whole package. If a port authority or regulator has access to such a system, individual ship emissions could be interrogated before deciding to inspect. Additionally, data aggregation to explore overall environmental performance and comparison with emissions regulations would be beneficial to ensure compliance.

By utilizing the additional data-carrying capacity of onboard satellite AIS (S-AIS), PML demonstrated faster, better and cheaper emissions monitoring: faster with the real-time reporting of data, with message rates of 4 to 10 per hour, even in radio-frequency-congested regions, such as the Baltic and English Channel; better in that the emissions are measured at the source within the stack of a vessel, and those emissions can be uniquely identifiable by a ship’s maritime mobile service identity; and cheaper in that the emissions sensors, with the S-AIS telemetry system, maintenance and other costs, are in the order of €100 to €1,000.

The IMO released a new strategy on the “Reduction of Greenhouse Gas Emissions from Ships” (<https://shorturl.at/ptD58>) this year, with enhanced targets to tackle harmful emissions. Again, effective compliance monitoring is central to this strategy, and to reach net-zero greenhouse gas emissions from international shipping by 2050. Our approach can solve the atmospheric shipping emission compliance and attribution conundrum. **ST**

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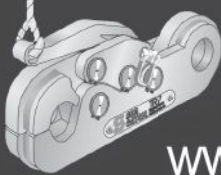
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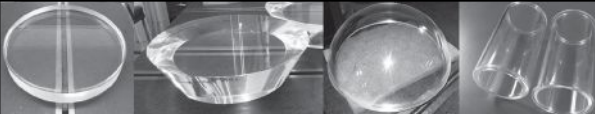
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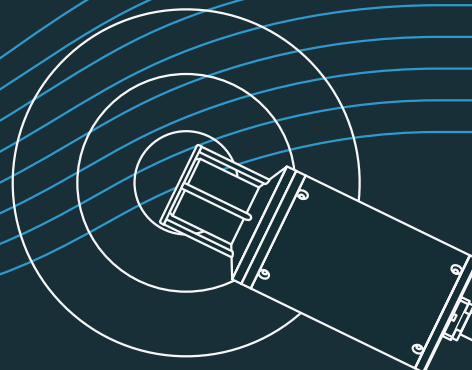
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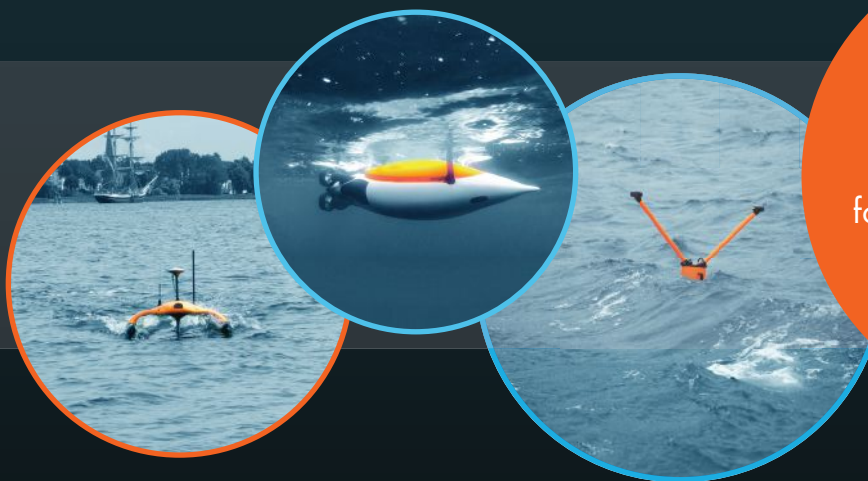
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