

**MicroStep - MIS**

COMPLEX SOLUTIONS FOR THE REAL WORLD

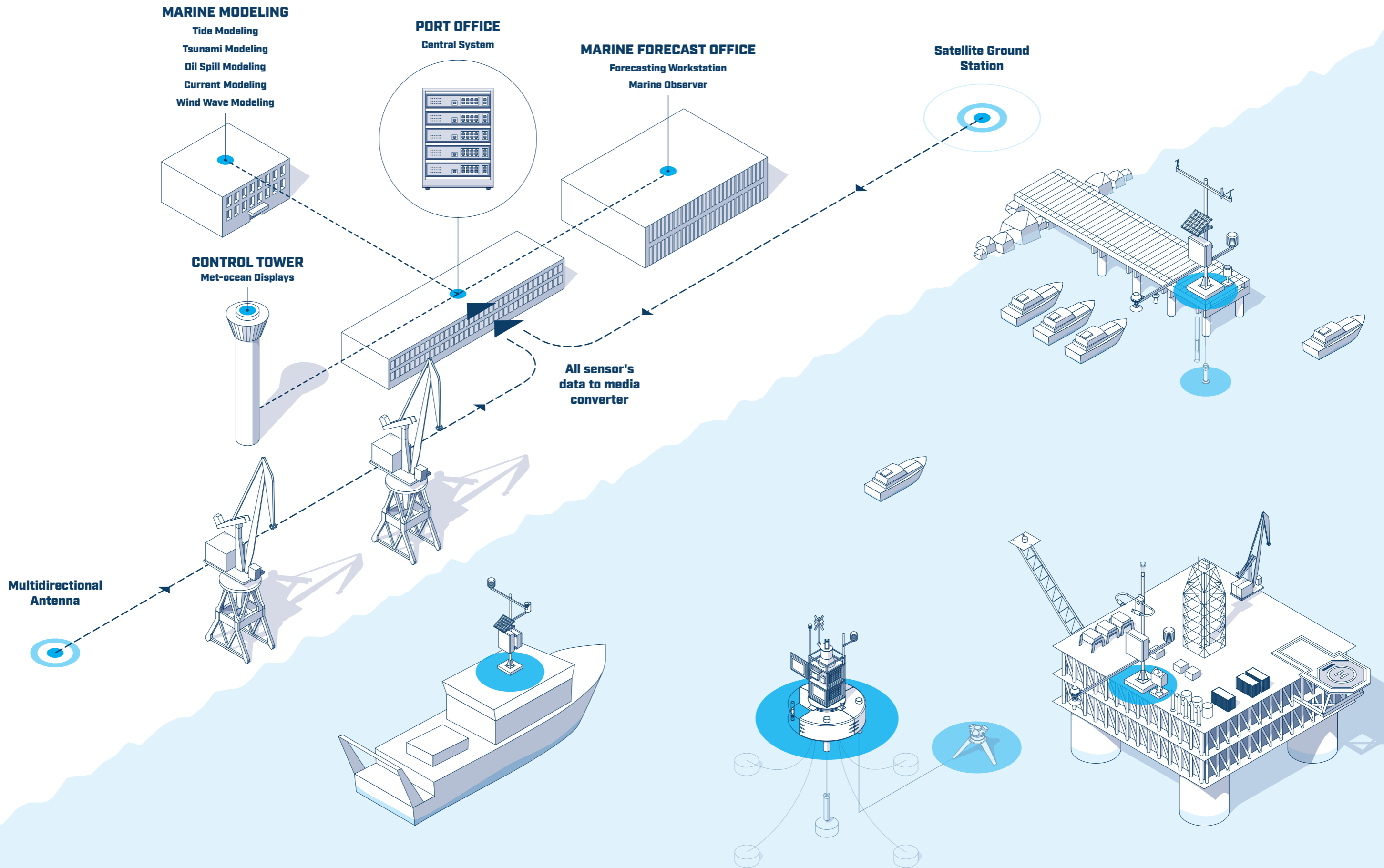
# MARINE SYSTEMS

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**30** YEARS  
OF EXPERIENCE

# INTEGRATED MET-OCEAN MONITORING AND FORECASTING SYSTEM



# EXPERTS IN MARINE MONITORING

Maritime industries, such as shipping, dredging, fishing, and offshore oil and gas, continue to grow in response to rising incomes and population growth. Additionally, newer sectors, including offshore deep-water oil and gas, renewable energy, mariculture, and seabed mining, have begun to play a major role in the economy. However, the growth of a sustainable global economy will be constrained unless we develop integrated systems for marine environment monitoring to support efficient management of marine resources.

Marine environment monitoring systems must withstand complex and harsh operating conditions. Gathering data from the marine environment is both a complex and expensive operation. Our portfolio includes the development of marine and harbor systems, marine surveys, software

and hardware development, database management, collection systems, modeling and forecasting, and early warning systems. As a certified research organization, we actively participate in various research projects, the results of which assist in our continuous product development efforts.

Our core customer groups encompass marine operators, coastal management authorities, environmental agencies, meteorological departments, and offices of civil protection. To better respond to the specific requirements and local conditions in each region, we have established several offices worldwide, including our Dubai office, MicroStep-MIS FZCO, which specializes in marine monitoring systems and solutions.



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# WEATHER SOLUTIONS FOR THE OCEANS

Elevate your maritime ventures with our comprehensive portfolio, encompassing marine and harbor systems, surveys, software and hardware development, database and collection systems, modeling, forecasting, and early warning systems, all driven by advanced marine environment monitoring solutions for sustainable growth.

**150+**

integrated marine  
stations

**10+**

supplied countries  
worldwide

comprehensive  
marine environment  
monitoring  
systems

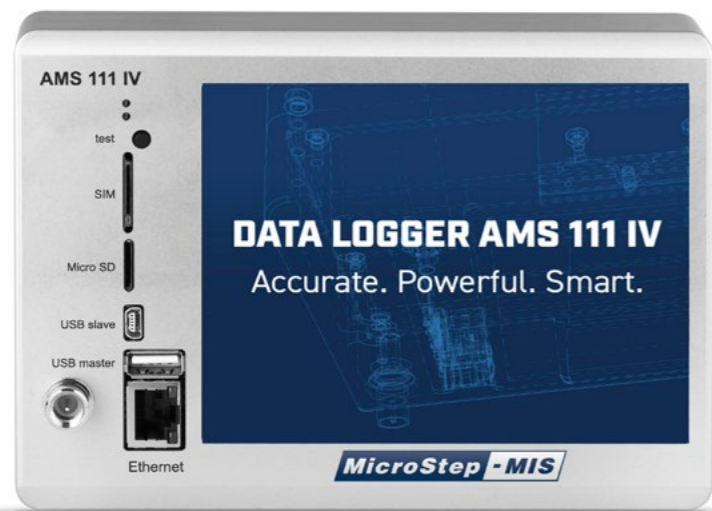
global presence  
and local  
expertise

expertise in  
data gathering  
and analysis

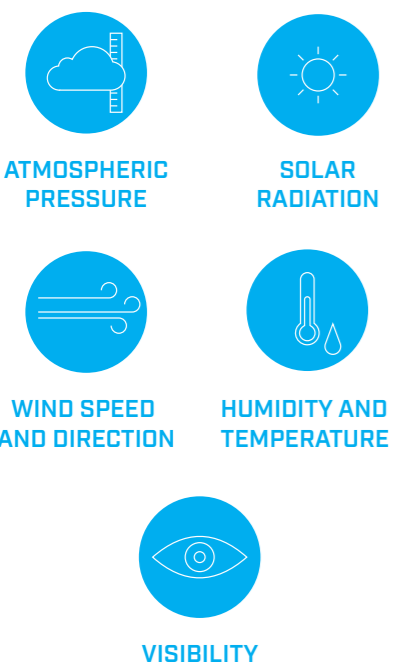
# MEASUREMENT AND MONITORING DEVICES

AMS 111 IV represents the fourth generation of MicroStep-MIS data loggers. It is now designed on a modular platform that supports different main systems. The basic version is based on a 32-bit CPU. The mainboard of AMS 111 IV includes an ultra-low-power 32-bit CPU, enabling connections to more peripherals to optimize power consumption, even with Linux-based systems.

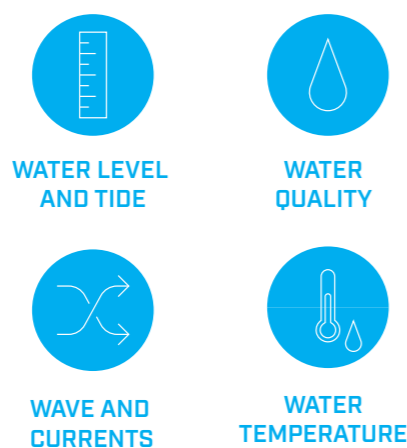
Users have the flexibility to configure the slave processor independently, enabling not only measurement and communication with intelligent sensors but also mathematical and statistical calculations independent of the state of the main processor or system. This capability facilitates the design of systems with either very low power consumption or very high CPU capacity within a single data logger.



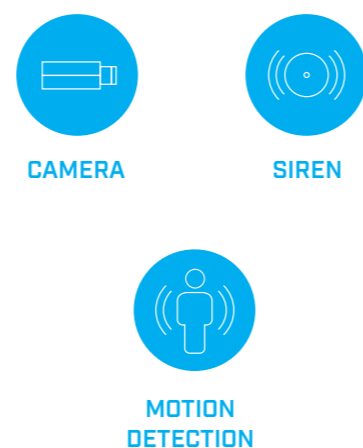
## METEOROLOGICAL DATA



## MARINE DATA



## ANTIVANDALISM SYSTEM

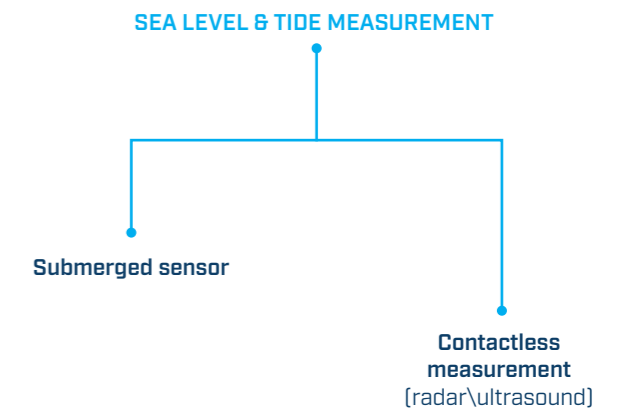


## Integration of a variety of concepts into unified system

Marine sensors can be divided into three main categories in terms of measurement: sea level and tide, wave and current, and last but not least, the water quality. The sensors use a variety of approaches from non-contact to immersed, acoustic wave and current profilers suitable for stable as well as the most adverse weather conditions.

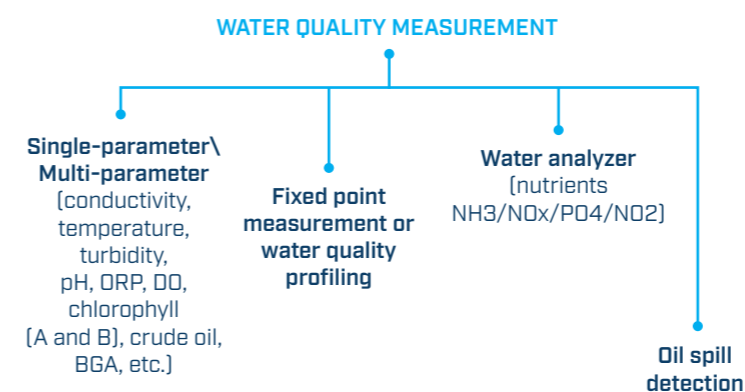
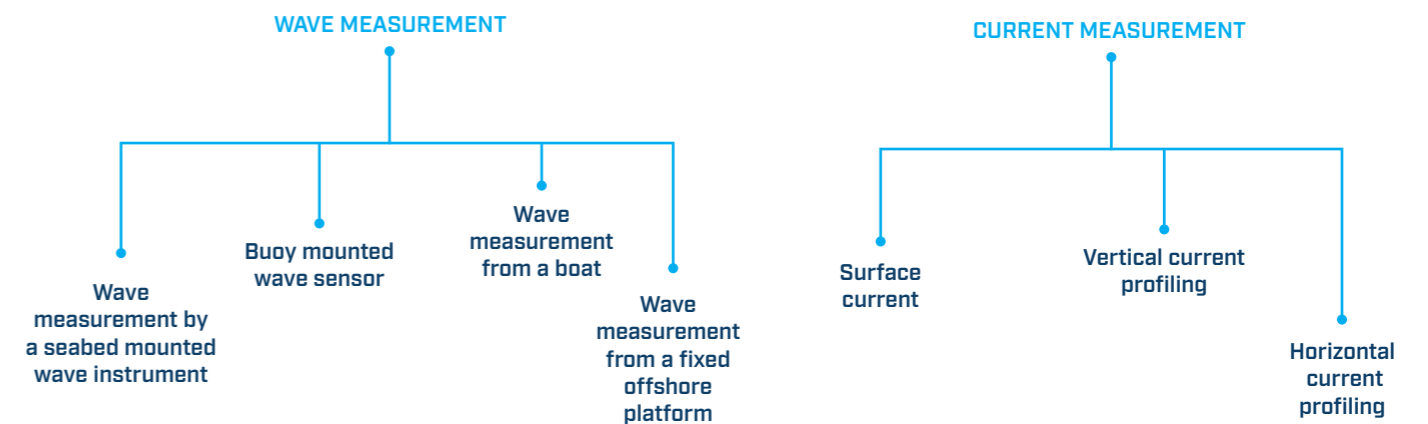
### WATER LEVEL AND TIDE MEASUREMENT

We integrate several types of water level and tide sensors. A submersible pressure transmitter is intended for very accurate measurement of water level and tide. Non-invasive radar level sensor represents a highly stable system for waves and sea level measurement. The downward-looking non-contact sensor uses a microwave radar to measure distance to the sea surface and represents a perfect medium for the extreme demands of the harsh offshore environment. The acoustic water level sensor calculates the true average level and can be configured via its communication ports for virtually any site-unique conditions.



### WAVE AND CURRENTS MEASUREMENT

MicroStep-MIS also integrates several types of acoustic current Doppler profilers (bottom mounting or buoy-based ADCP), single point current meters, and inertial sensors to measure water currents and waves in estuaries shallow and deep seawater. The measurements from various wave and current sensors have a minimal error due to buoy movement, therefore the integration of a motion reference unit for correcting the measurements is possible.



### WATER QUALITY MONITORING

The challenge to have accurate water quality data is the biofouling, therefore, we integrate probes with different biofouling control technology, such as mechanical wipers, copper mesh, and ultraviolet light to prevent marine growth.

The multi-parameter instrument allows for the changing of the instrument's sensor load, in-the-field and on-demand. It can accommodate many sensor heads on the end-cap allowing to configure the focus of the research on an application-by-application basis.

## EDDY COVARIANCE FLUX SYSTEM

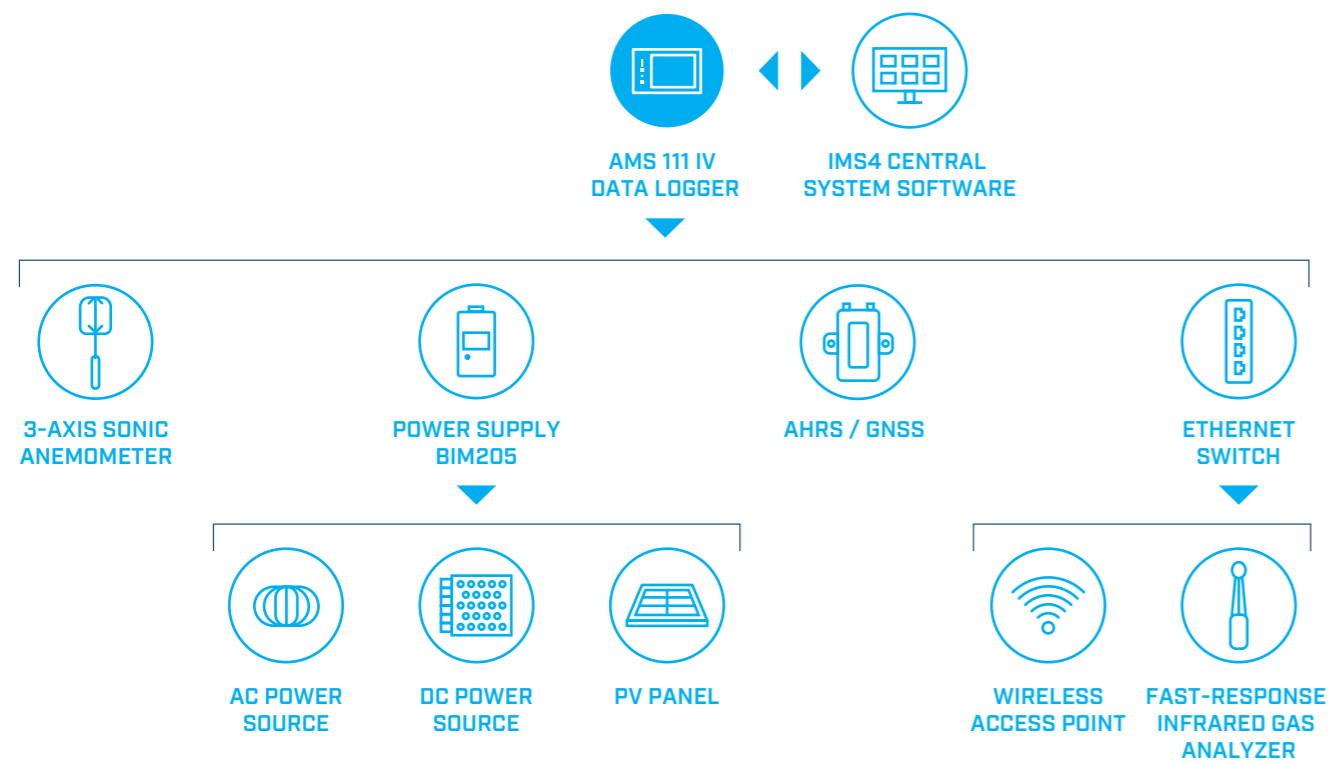
Additionally, the design and development of an Eddy Covariance Flux System (ECFS) is a pivotal aspect within the framework of smart MicroStep-MIS's integrated solutions, facilitating the investigation of water vapor and carbon dioxide exchange between ocean surfaces and the atmosphere.

Vessel-mounted ECFS systems have demonstrated their efficacy in measuring turbulent momentum, heat fluxes, and trace gas flux, while also enabling the sampling of diverse oceanic environments. This facilitates comprehensive

studies on the exchange of water vapor and carbon dioxide between ocean surfaces and the atmosphere.

The shipboard ECFS solution comprises an integrated system featuring various components, including:

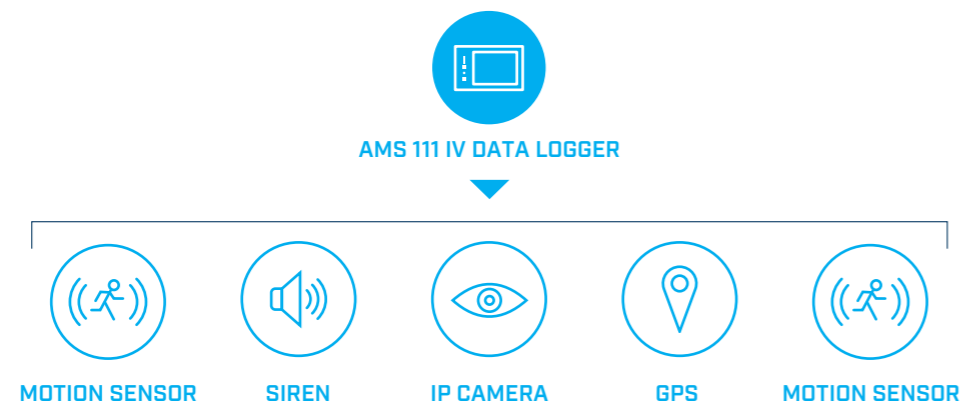
- > Fast-response infrared gas analyzer
- > 3-axis sonic anemometer
- > Attitude and Heading Reference System (AHRS) with GNSS
- > High-speed data collection (AMS 111 IV Data Logger)
- > IMS4 Central System with data validation and mapping capabilities.



## VANDALISM AND TRACKING SYSTEM

The AMS 111 IV system can be seamlessly integrated with a camera, siren, and PIR sensor to detect and potentially deter unauthorized interventions. Furthermore, for enhanced

tracking and monitoring of marine platforms, the integrated GPS system issues alerts in the event of buoy drifting beyond specified areas.



# AUTOMATIC MARINE STATION



MODULAR AND SCALABLE PLATFORM FOR ADDITIONAL SENSORS AND FUTURE UPGRADES



MEASUREMENT AND REMOTE MONITORING OF VARIOUS DATA FROM THE ENVIRONMENT



STATISTICS, GRAPHS, ALERTS AND NOTIFICATIONS BASED ON USER-DEFINED PARAMETERS

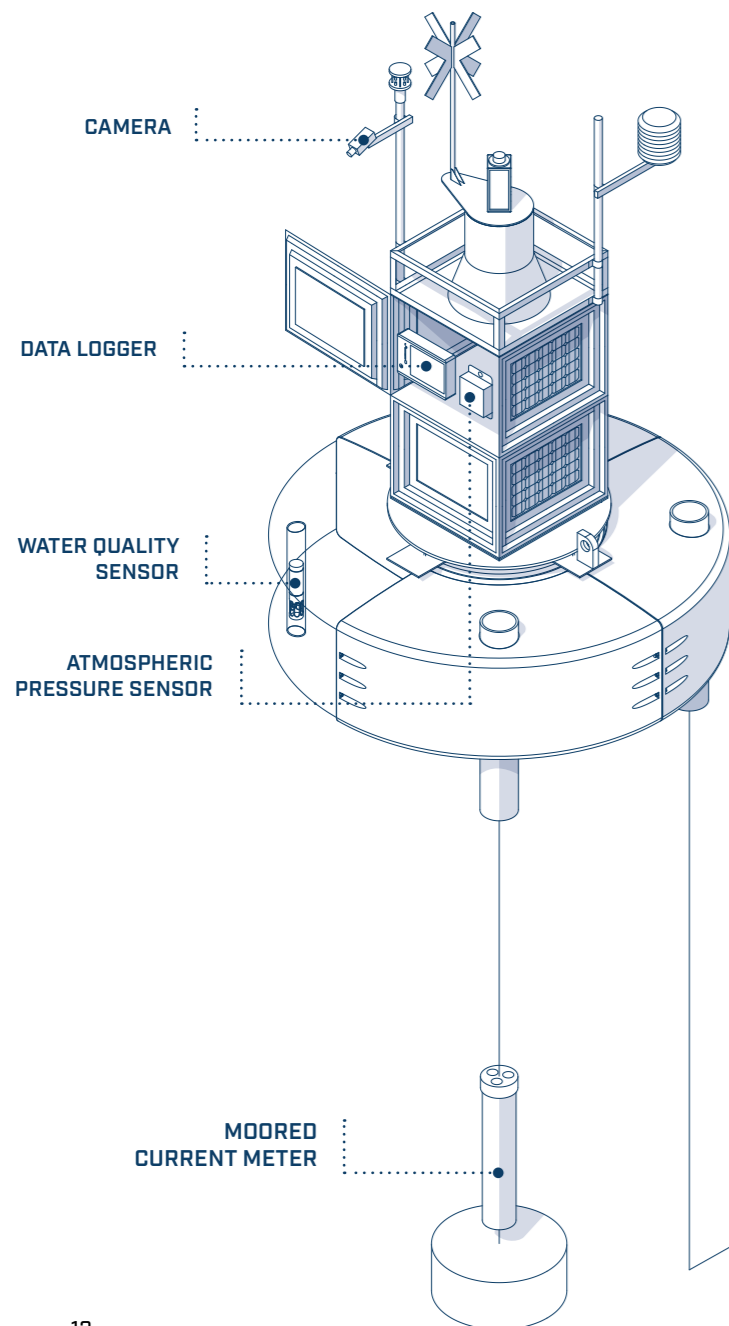


CUSTOMIZABLE WEB INTERFACE



MULTIMODE DATA COMMUNICATION

## AUTOMATIC BUOY STATION



Our automatic buoy platforms enable seamless measurement in both near-shore and off-shore environments, providing a wide range of met-ocean parameters. These parameters encompass meteorological factors such as wind speed and direction, air temperature, humidity, air pressure, visibility, and gamma dose rate, as well as oceanic variables including currents, waves, water quality, and water level.

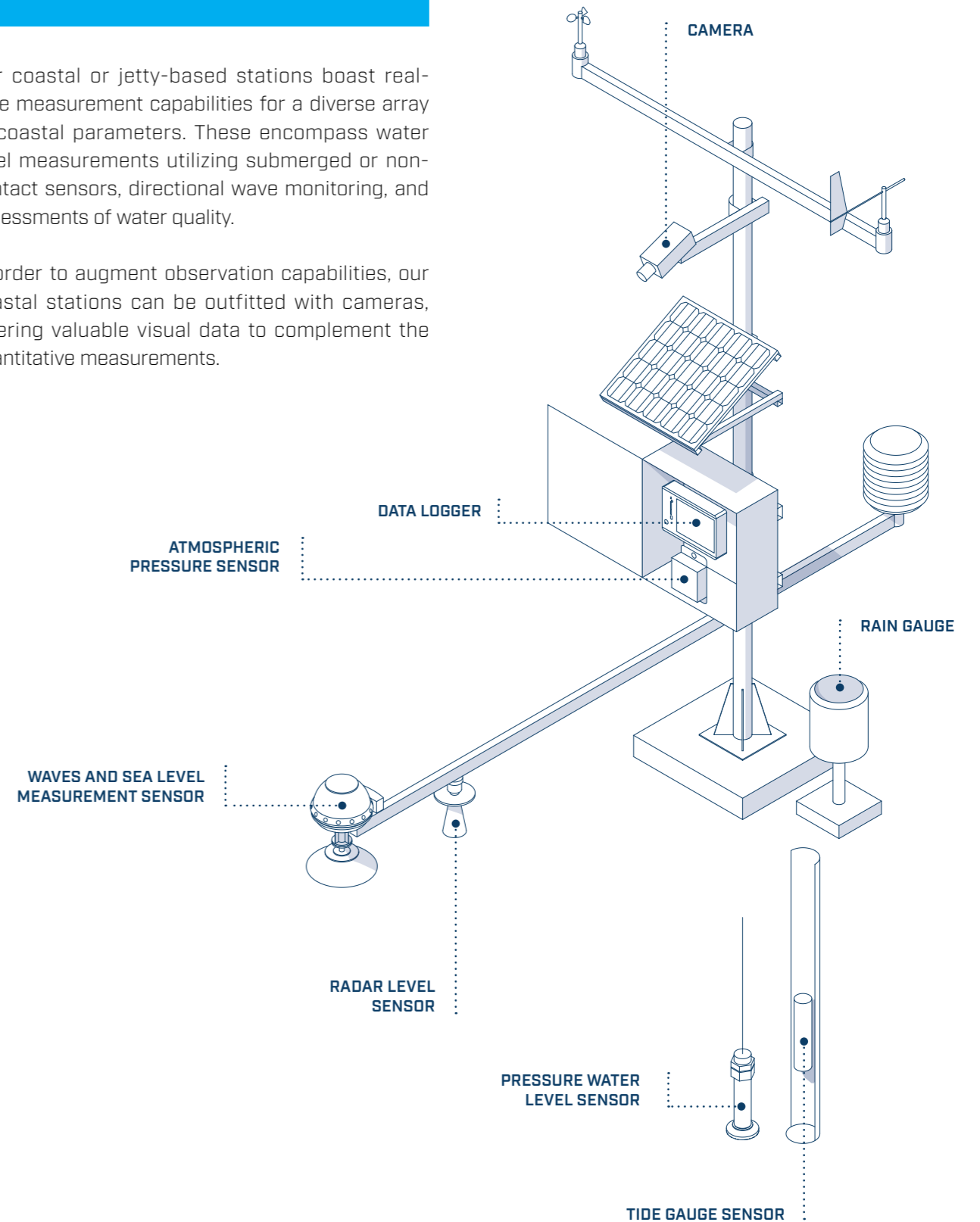
Our automatic buoy stations can be equipped with additional features to enhance functionality and security. These may include cameras, anti-vandalism mechanisms with alarming systems, and GPS tracking for precise location monitoring.

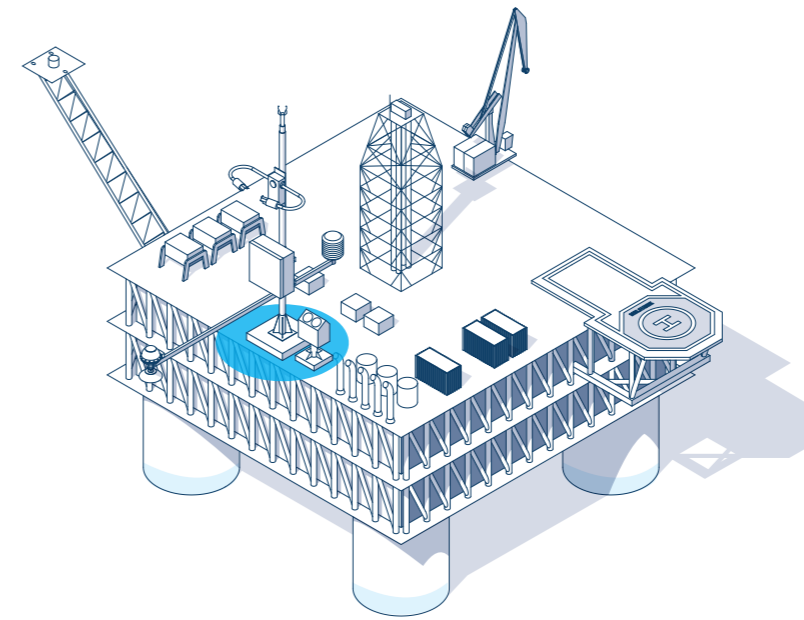
Furthermore, our automatic buoy stations can be outfitted with profiling winches, allowing for water quality profiling at different depths. This capability enhances the station's versatility and effectiveness in capturing comprehensive data across various environmental conditions.

## AUTOMATIC COASTAL STATION

Our coastal or jetty-based stations boast real-time measurement capabilities for a diverse array of coastal parameters. These encompass water level measurements utilizing submerged or non-contact sensors, directional wave monitoring, and assessments of water quality.

In order to augment observation capabilities, our coastal stations can be outfitted with cameras, offering valuable visual data to complement the quantitative measurements.





## AUTOMATIC HELIDECK STATION

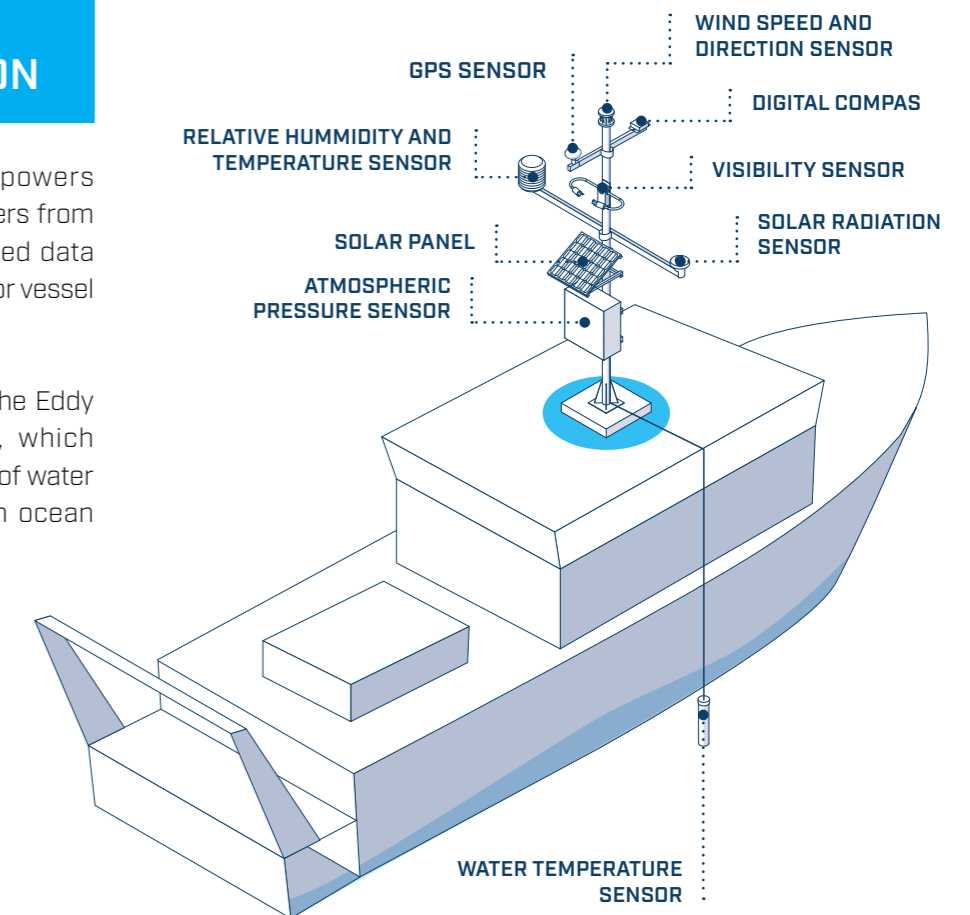
Our coastal or jetty-based stations excel in providing real-time measurement capabilities for a diverse array of coastal parameters. These encompass water level measurements utilizing submerged or non-contact sensors, directional wave monitoring, and assessments of water quality.

To further enhance observation capabilities, our coastal stations can be equipped with cameras, providing valuable visual data to complement the quantitative measurements.

## AUTOMATIC SHIPBOARD STATION

Our vessel-mounted station empowers users to record met-ocean parameters from research vessels, providing advanced data analysis capabilities to compensate for vessel movement.

One typical research application is the Eddy Covariance Flux System (ECFS), which facilitates the study of the exchange of water vapor and carbon dioxide between ocean surfaces and the atmosphere.

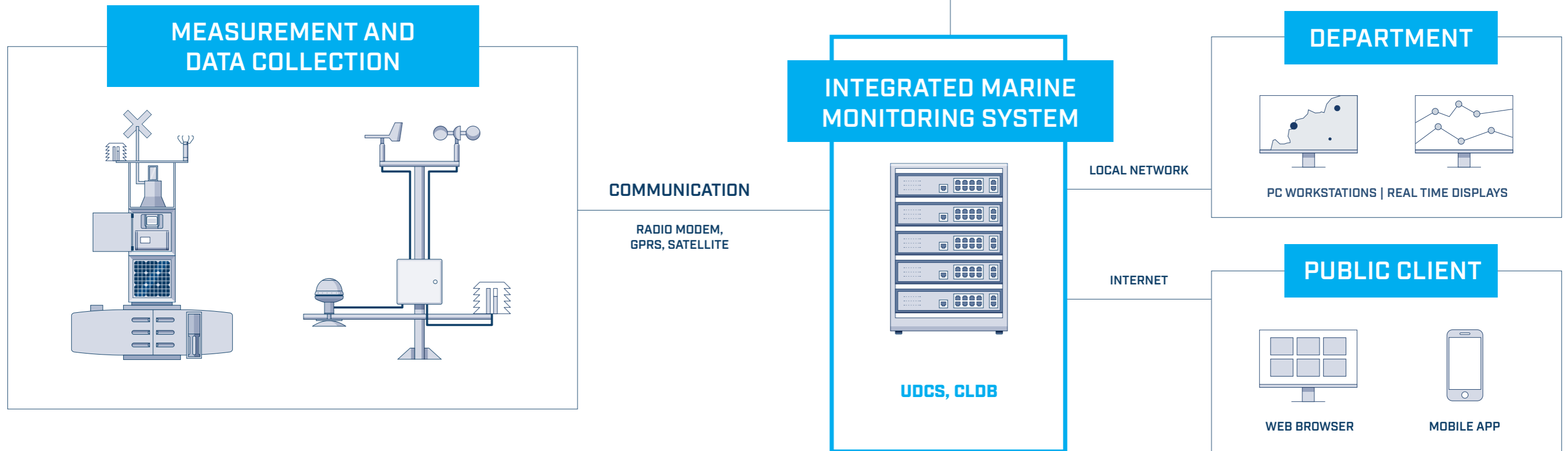




# INTEGRATED MARINE MONITORING SYSTEM

IMS4 Marine stands as an innovative open architecture platform, offering seamless access, monitoring, and high-resolution management of met-marine data. In continuous development since 1993, it is meticulously crafted for uninterrupted 24/7 operation, with a remarkable track record of over 150 installations

across the Middle East and Asia. This robust system adheres rigorously to regulations and recommendations, while also exhibiting adaptability to align with national practices, thereby ensuring both compliance and flexibility for its users.



## IMS4 Unified Data Collection System

MicroStep-MIS offers a comprehensive solution tailored for the measurement, processing, storage, presentation, and communication of marine weather data to various users, including marine observers, port control offices, pilots, and others. This information is delivered in real-time through screens, graphs, WMO codes, alarms, and reports.

IMS4 Marine ensures real-time data collection and archiving, featuring displays customized to meet client specifications. Measured data is presented in various formats such as text, tables, and graphs, including time series, statistics, and wave spectra. Moreover, the system facilitates the automatic or manual creation of standard WMO codes (Buoy, Synop, etc.) and national proprietary code forms with data verification.

The data acquisition module establishes connections with stations and retrieves data. This acquisition can be configured for real-time (or near real-time) operation or on an hourly, daily, or weekly basis, depending on station capabilities.

Communication is streamlined through telemetry links, with the Unified Data Collection System (UDCS) capable

of connecting to a station to retrieve missed data in case of failure, once communication is restored.

The UDCS is extensible and supports various communication channels, protocols, and data formats. Additionally, the system can be expanded to a dual hot failover system to enhance reliability.

## IMS4 Integrated Environmental Database

**The primary function of IMS4 EnviDB is to centralize the storage of all collected met-marine data into a unified structure, thereby minimizing inconsistencies and discrepancies while facilitating standard and accessible data retrieval for users and other software systems.**

Ensuring the quality of data storage is facilitated by the industry-proven Oracle® Database Server, renowned for its leadership in database technologies. For smaller and medium systems, an excellent alternative is provided by the PostgreSQL solution. These databases offer long-term archiving and reporting capabilities, with the data serving as crucial input parameters for current and tidal modeling software.

Real-time and historical data, along with early warnings, are readily available whenever and wherever needed, empowering decision-makers to effectively control and plan marine transport, industrial operations, and environmental protection activities.

A significant advantage of CLDB is its modular architecture, offering end users extensive customization capabilities. Users can specify additional non-standard input and output modules, which can be easily implemented and integrated into existing or future installations. Particularly notable is the option to upgrade to an environmental database, integrating a wide range of data sources such as AWS, radar, satellite, profiler, historical observations, marine data, radiation, and air pollution monitoring. To ensure high availability of the database, we utilize Oracle Real Application Cluster, a robust database solution providing fault tolerance and high performance for mission-critical applications.



*Automatic Marine Stations System for a client in Oman, specifically focusing on Wave and Current Stations, with the onshore installation including the jetty portion at the shore of the Arabian Sea.*





Customized Met-ocean Monitoring System for Kuwait waters - Graphical Weather Displays with map, graphical, and chart views

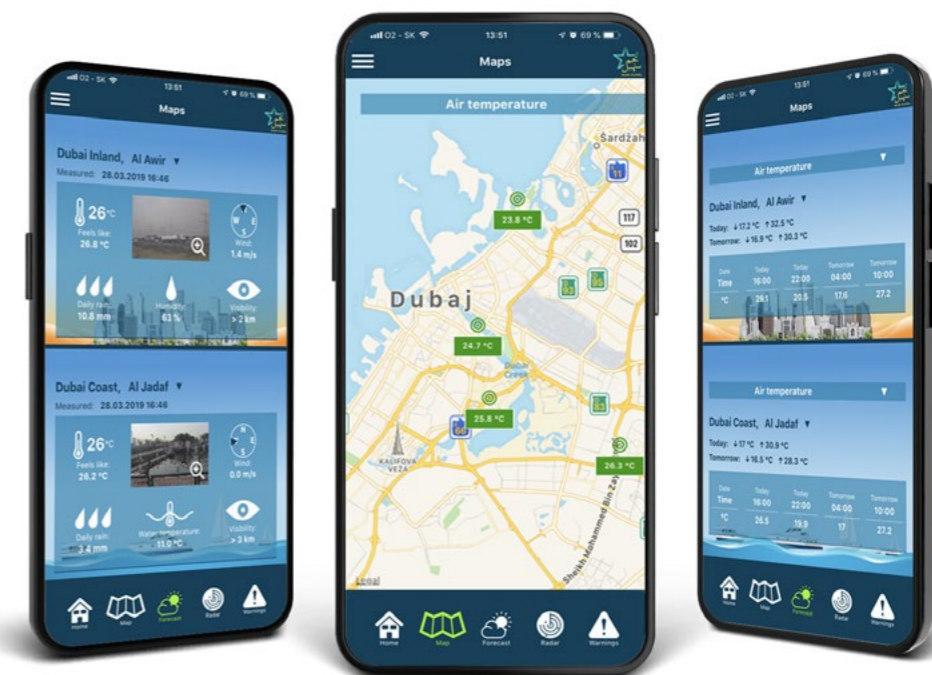
## Graphical user interface - from web to smartphone apps

The real-time displays are strategically positioned in the central office, primarily dedicated to presenting live data sourced from the Automatic Marine Stations deployed in the field. These displays play a pivotal role in visualizing critical information that aids marine operators in their decision-making processes and provides timely alerts during emergency situations. Conveniently, all screens are accessible through any standard web browser.

Customization options abound with the graphical display, offering flexibility to showcase data for all parameters measured at a single station or to provide a consolidated view of a specific parameter across multiple stations, tailored precisely to meet the customer's preferences. Weather trends across various stations and the dynamic evolution of a specific parameter while keeping other values in view are intuitively presented on the right side of the display, with quick links facilitating seamless navigation to other functions.

The system is ingeniously designed to seamlessly integrate satellite data with a map interface showcasing updated real-time information from the stations, each station marked by a distinctive icon. Notably, the color of the station and the displayed values dynamically adjust to reflect the current station status.

Expanding the horizons of data visualization, near real-time camera images can also be incorporated if communication bandwidth permits. Online camera views, alongside multiple camera snapshots from all stations, can be conveniently visualized on a comprehensive screen. Moreover, the inclusion of modeling and forecasting data, such as identifying areas at risk of fog or presenting a general weather forecast map, empowers users to explore diverse forecasts, parameters, and weather animations, among other enriching features.



Snapshots of Najm Sahajl mobile app, providing early warnings and visualizing forecasts in Dubai with up to two days' advance



## Marine Models and Forecasting Systems

**IMS4 Marine integrates with both 2D and 3D marine models for water motion study and modeling. Model outputs can be easily accessed and stored in a unified data platform for further analysis and QA/QC.**

Front-end tools allow interaction with marine models, including data retrieval and time series extraction. Transactions can be drawn to visualize profile graphs for surface currents. The software facilitates animation of marine parameters over time in user-friendly displays, with forecast assessment as a key component.

### MARINE FORECASTING SOLUTIONS

We have successfully implemented numerous marine monitoring and forecasting solutions at both local and national levels. These solutions encompass the development of customized systems for marine data collection, management, forecasting, and early warning applications for hazardous phenomena like storm surges and waves.

IMS4 utilizes numerical models to forecast marine parameters. The complexity of these models depends on the specific task and may include:

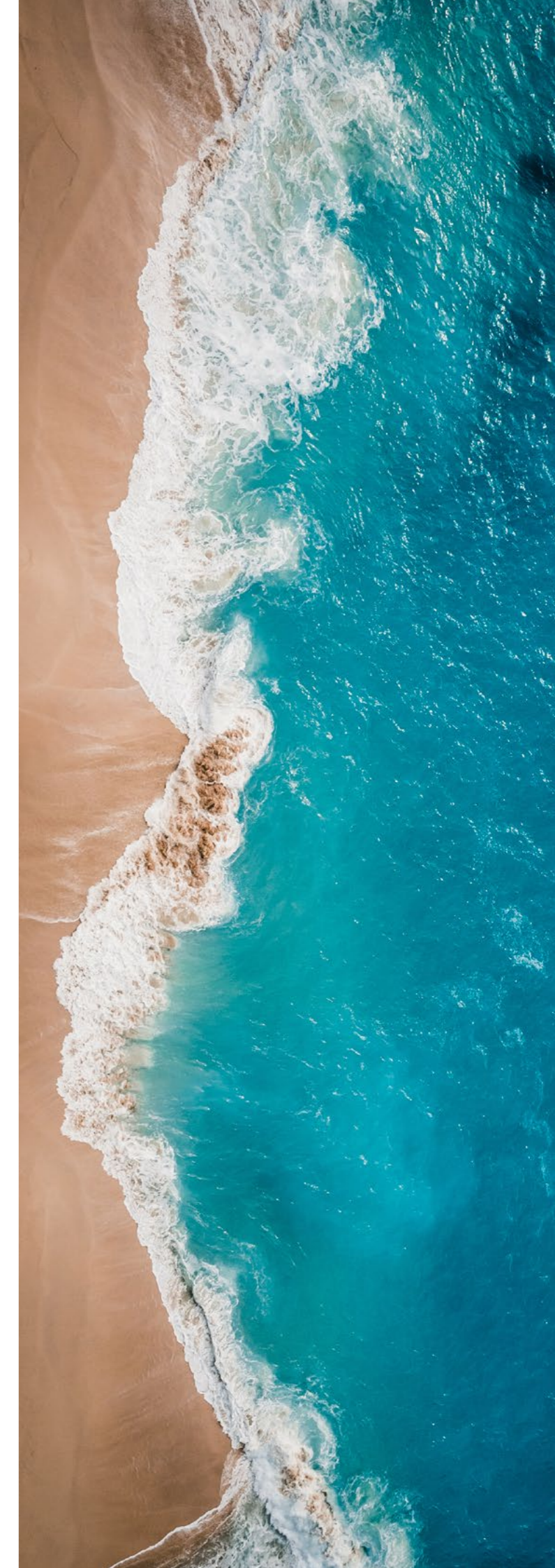
- > building unstructured triangle meshes to improve near-shore forecasting,
- > implementing 3D terrain-following vertical grids to address the lack of high-quality data in the deep ocean,
- > developing coupled models for high-quality forecasts of complex “atmosphere-ocean-wave” systems.

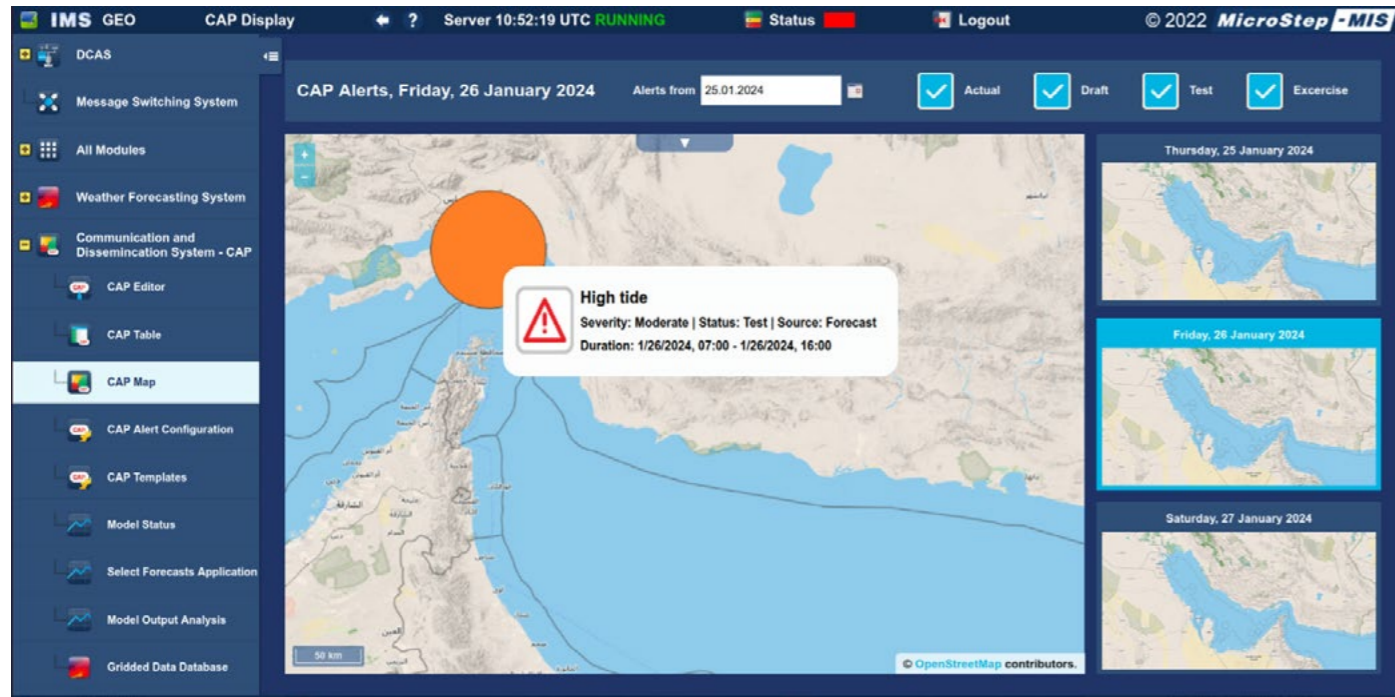
IMS4 generates alerts and warning notifications based on predicted values and preset threshold values for marine parameters. We also have experience in the development of SMS and Email services for issuing warnings and notifications.

### CUSTOMIZED TIDAL ANALYSIS AND PREDICTION

IMS4 ATTide is tailored software for tidal analysis and prediction, accessible online for easy use. It ensures rigorous QA/QC of tide gauge data, including spike removal, interpolation for gaps, and correction for date and time shifts, with a complete change log.

The software automatically selects harmonics from a set of 112 based on UKHO/IHO standards, with user option to add more. It identifies input time series as water level or current and adjusts accordingly, providing graphical output at user-defined intervals and saving data as CSV files for import into graphic software. High and low tide predictions are automated.



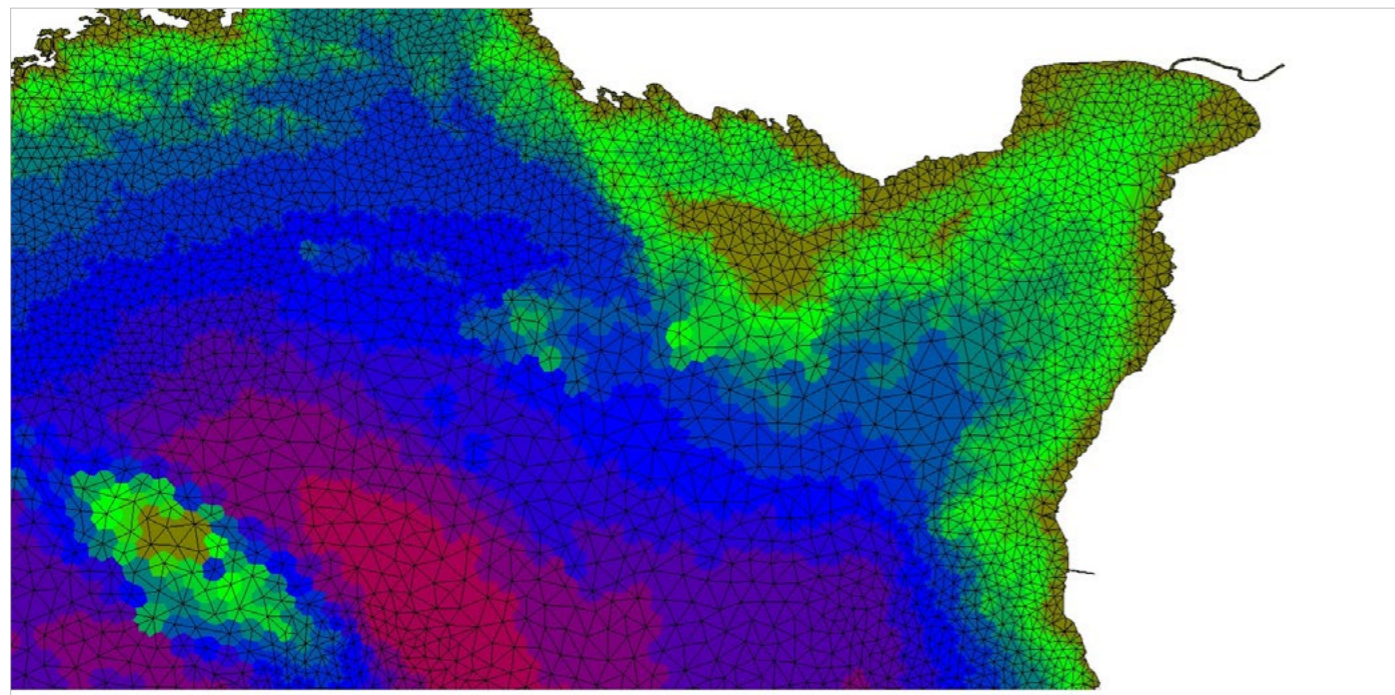


High tide warning area

## WIND-WAVE MODELS

Wave forecasts are of utmost importance for the shipping industry on the high seas. Therefore, IMS4 Marine can be seamlessly integrated with wind-wave models to simulate wave heights, periods, and propagation directions for

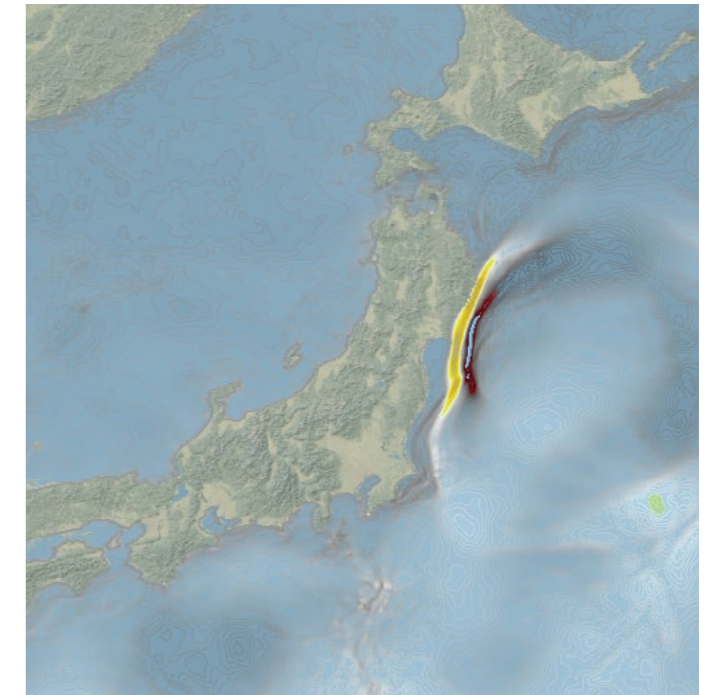
regional seas or global oceans. Wind-wave models employ numerical techniques to characterize the sea state and predict the evolution of wind wave energy.



Marine model on unstructured grid



Significant wave height forecast



Tsunami wave propagation scenario

## OIL LEAKAGE MODELING

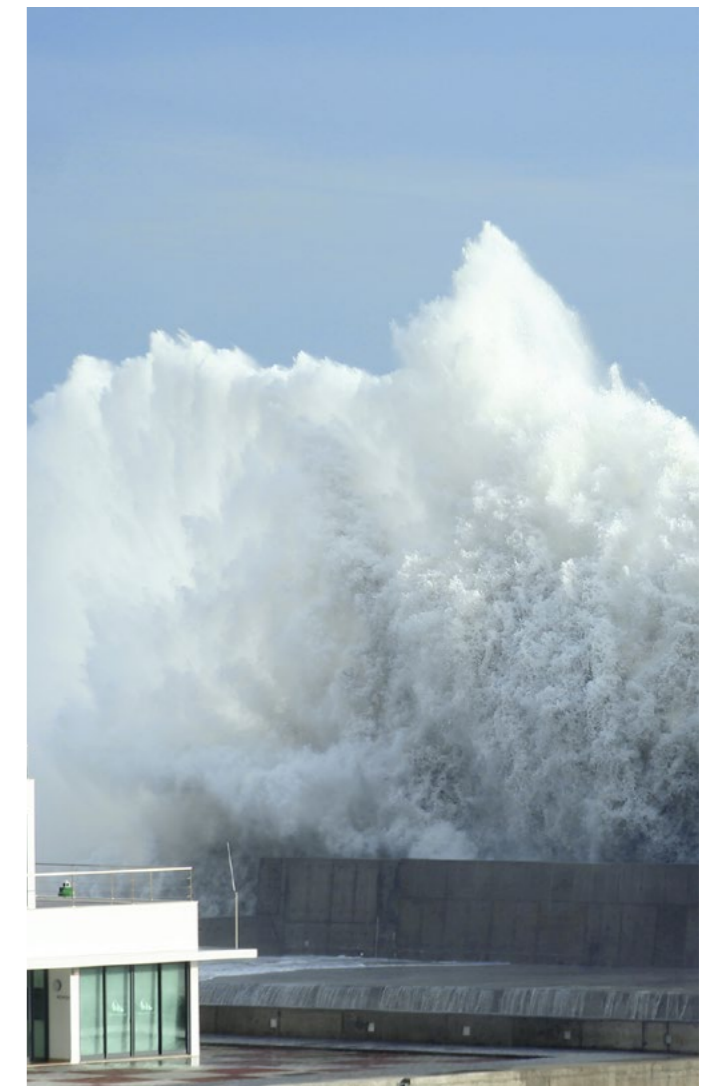
In cases of emergencies involving oil spills in water areas, quick management decisions are vital. IMS4 Marine, as an integrated forecasting system, allows for real-time calculation of oil spill prognostic scenarios. It presents oil propagation results in a user-friendly manner.

The user-friendly interface supports rapid calculation of multiple spill propagation scenarios, convenient comparison of forecasts with observational data, and the import/export of data in various formats. The IMS4 Marine web application provides:

- > real-time oil spill information overlaid on satellite images,
- > menus to select spill scenarios and customize leak parameters,
- > options to choose different sources of forecast information.

## TSUNAMI EARLY WARNING

A tsunami monitoring and early warning system usually consists of two components: one for real-time monitoring of seismic events and another for tracking tidal waves. Integrating a tsunami model improves comprehension of water level and current reactions in coastal regions to earthquake-triggered tsunamis, considering various quake magnitudes and locations, with focus on parameters like water level, current, and arrival times at different sites.



# SERVICES FOR MARINE APPLICATIONS

**MicroStep-MIS is dedicated to providing comprehensive turnkey solutions for establishing complete monitoring systems, ensuring a seamless process for our clients from initial consultation to final system handover. Our experienced team actively engages in or supports every stage of the project, guaranteeing a successful outcome.**

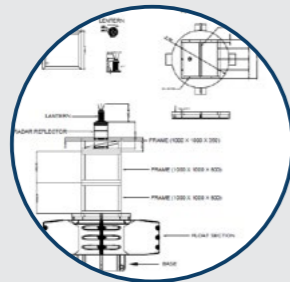
Our on-site support services for marine station installations encompass a wide range of essential tasks, including site clearance surveys, reconnaissance surveys, offshore engineering, mooring design, site preparation, anchor and mooring positioning, diving support, cable laying, and subsea installation works. We meticulously tailor our services to meet the unique requirements of each client, leveraging the expertise of our specialist team to ensure efficient installation, commissioning, and trials of marine systems.

With years of experience and accumulated knowledge in marine systems, our personnel are well-equipped to overcome any challenges and ensure that marine monitoring systems are online and operational according to client needs. Moreover, our maintenance services provide comprehensive support to clients, ensuring continuous and trouble-free operation of marine monitoring systems. This includes diagnostics, analysis, and reporting of marine data, along with preemptive maintenance measures through a planned maintenance program.

Furthermore, we offer on-call attendance for any maintenance issues reported by clients, providing prompt resolution and comprehensive service reports for every routine and on-call maintenance visit. Our commitment to excellence ensures that our clients receive reliable and effective support throughout the lifecycle of their monitoring systems.



*From an initial design, to real-time monitoring*



DESIGN



ASSEMBLY, FACTORY  
ACCEPTANCE & DELIVERY



TRAINING



DEPLOYMENT



REAL-TIME MONITORING  
OF OFFSHORE ASSETS



24/7 REMOTE  
SUPPORT



MAINTENANCE



A synergy of over

**180**

passionate and skilled  
professionals

**ISO Quality Certified Company**



**150+**

*integrated marine  
stations*

**CONTACT US**

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