



Weather forecasting all good in hindsight

The weather plays an important role in the operation and maintenance of wind farms, helping to determine output, scheduling maintenance and predicting potential downtime. Accurate forecasting is therefore essential for forward planning. But what about hindsight forecasting? Can looking back over the history of weather patterns help us make wise assumptions for the future too?

Understanding local weather conditions relies on a more global picture to get a clear sense of climate and marine risk evolutions. Launched a year ago, the enovOcean e-platform provides professional weather forecasting and is about to take this one step further, by actually working backwards with access to 30 years of data on wind and waves.

enovOcean goes beyond the usual important parameters like wind, wave and current predictions, providing unique indicators that can help build a reliable model of future weather patterns, including rogue waves, steep sea, model comparisons, tidal currents, marine

energies, and now hindcast data too.

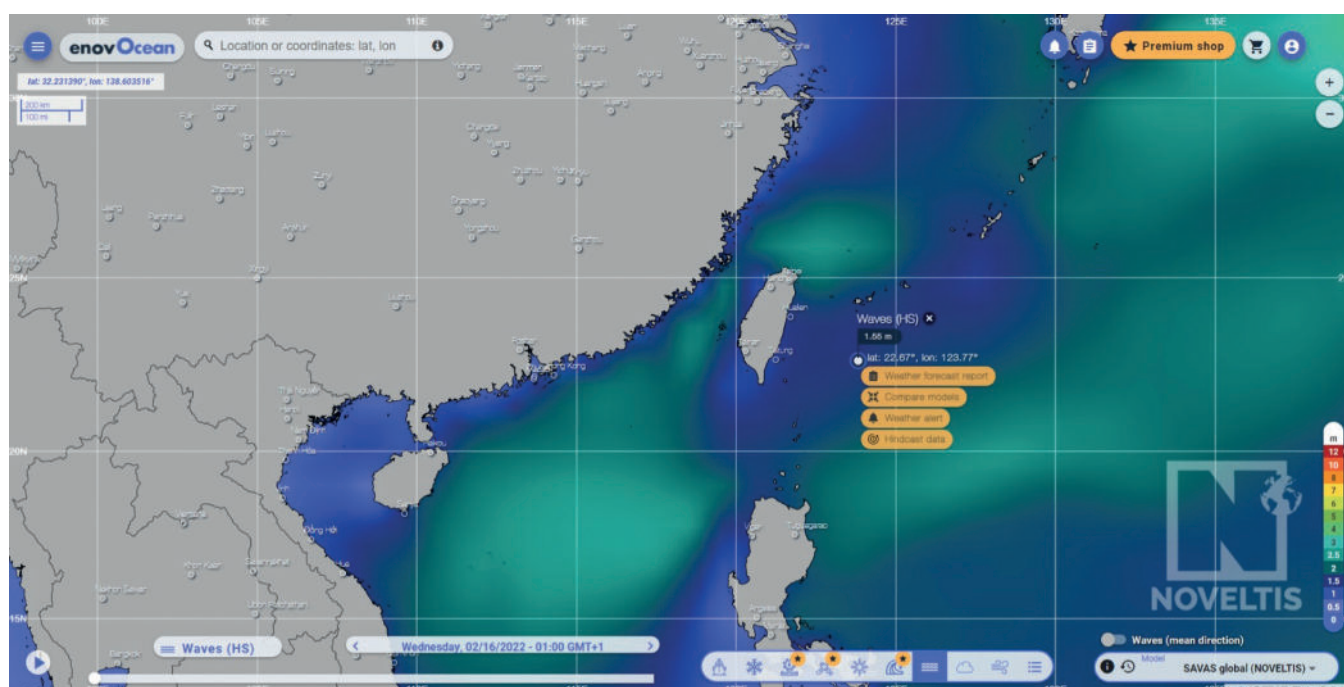
This metocean data can be accessed online, retrieved and shared among teams, helping to save time and costs.

Hindsight data offers the quickest way to identify the maximum waves and winds that could threaten an offshore operation. Global warming issues have, of course, altered conditions during the last 30 years, so statistical trend analyses helps overcome potential reliability pitfalls here, while also enabling users to check whether climate change is already noticeable in their area of interest.

Wave risks

A large set of risk animated maps provide unique information on the dangerousness of sea state conditions, with 7-day forecasts updated every six hours. Advanced indicators such as crossed sea, rogue waves and steep sea are provided globally or at fine scale resolution.

The sea state conditions provided at fine-scale are produced by the SAVaS operational system of NOVELTIS, including the most advanced forecasting technologies, using a system developed with the validation of the General Direction for Armament in France and the French Navy.



With reliable, accurate, fast and easy to use details, the sea state conditions are based on state-of-the-art wave modeling and wind forcing parametrization. A downscaling option enables users to focus on an area of interest for particular marine activities, including towing or carrying fragile objects, securing and protecting people, vessels and infrastructures from the unusual sea state conditions, providing a decision-making support for operations planning and ensuring a continuous monitoring of the sea state and its risks.

Fine-scale meteocean forecasts

Access is also available to very fine-scale meteocean forecasts down to 3,5 km of spatial resolution.

Examples of regions provided at fine-scale include:

- North-West Africa (resolution: 15km)
- South-West Africa (resolution: 15km)
- South America (resolution 15km)
- Cape of Good-Hope (resolution 3,5km)

Downscaling can be brought down under 1km resolution, if requested.

Observations and models inter-comparisons

Users can also receive access to a large set of satellite and in-situ observations, over all maritime areas, as well as to unique inter-comparisons between the different models that are available.

By inter-comparing the models and the actual observations the accuracy of each forecasting model can be assessed, helping users to decide which forecasting model is



enovOcean

Hs/Month : % Occurrences (Annual)

HS/month (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
0-0.5	0.067	0.064	0.127	0.276	0.536	0.756	0.741	0.761	0.650	0.229	0.080	0.077	4.357
0.5-1	0.912	1.272	2.035	2.776	4.139	4.246	4.869	5.107	3.847	2.554	1.606	1.314	34.670
1-1.5	2.076	2.062	2.673	2.724	2.475	2.307	2.079	1.844	2.231	2.602	2.235	2.270	27.573
1.5-2	1.955	1.452	1.777	1.402	0.822	0.536	0.571	0.524	0.859	1.644	1.884	1.694	15.115
2-2.5	1.258	1.115	0.966	0.568	0.357	0.246	0.162	0.171	0.390	0.803	1.087	1.125	8.244
2.5-3	0.825	0.741	0.493	0.224	0.106	0.101	0.044	0.056	0.145	0.338	0.726	0.854	4.648
3-3.5	0.564	0.453	0.246	0.128	0.028	0.022	0.016	0.021	0.051	0.167	0.350	0.563	2.603
3.5-4	0.394	0.276	0.107	0.077	0.021	0.004	0.007	0.006	0.022	0.095	0.152	0.329	1.485
4-4.5	0.241	0.160	0.040	0.021	0.007		0.004	0.001	0.008	0.044	0.060	0.140	0.721
4.5-5	0.112	0.080	0.014	0.015	0.003				0.005	0.010	0.031	0.078	0.345
5-5.5	0.063	0.030	0.009	0.006					0.004	0.004	0.004	0.031	0.147
5.5-6	0.019	0.022	0.007	0.002					0.003	0.002	0.002	0.013	0.068
6-6.5	0.007	0.009	0.001						0.004		0.003	0.004	0.025
6.5-7		0.001							0.002			0.003	0.005
7-7.5		0.001										0.001	0.002
7.5-8		0.001											0.001

the most appropriate for planning their operations at sea, thus reducing technical, human, material and environmental risks.

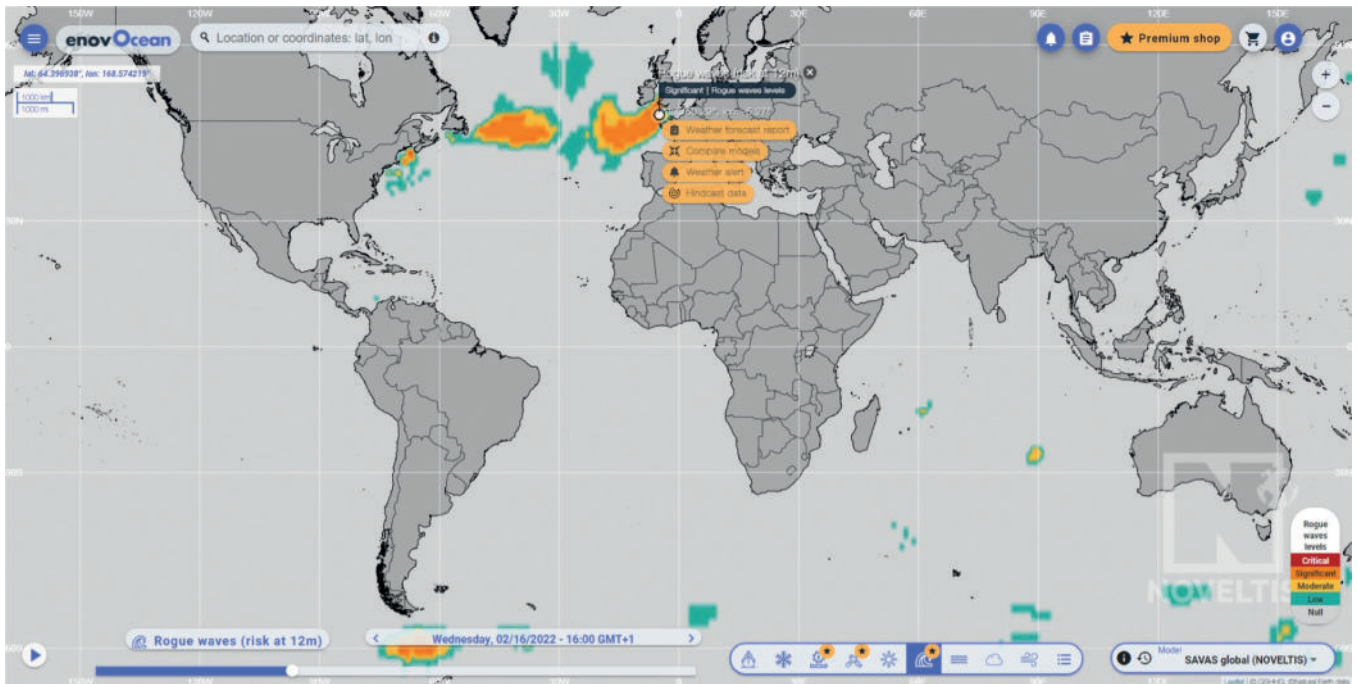
This online solution brings together all the information on the meteocean conditions and provides a wealth of comprehensive information for decision-making. Providing operational support to all stakeholders in the maritime industry for the planning and optimization of their activities at sea, it is particularly useful for offshore activities.

Latest updates to the technology make it possible to check which wave model is the most accurate on average in a particular area of interest. With all the forecasts (24h, 48h, 72h) compared to actual measurements by satellites, users can conclude which model shows the highest correlation and the lowest bias with the satellite measurements.

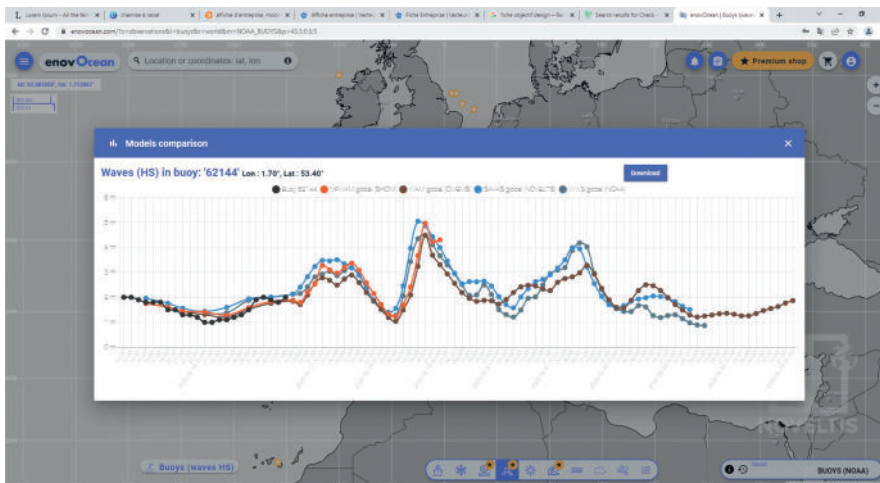
Weather reports

Many outdoor activities require a clear vision of the weather situation for the following days. Especially at sea, a close monitoring of the evolution of wind and waves can be absolutely crucial for business and sometimes even for the lives of those working offshore.

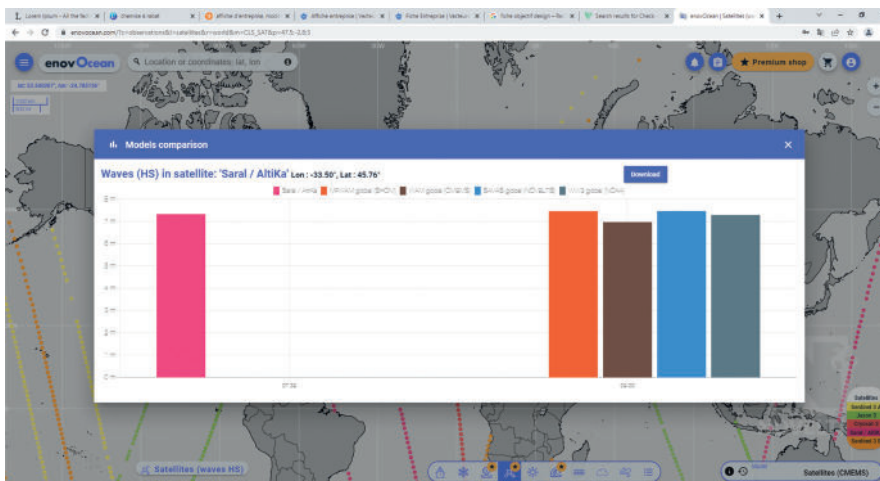
Every activity has its own requirements, which is why a fully customized weather report is so important. The enovOcean weather report provides this, with the user simply selecting the point for which they want a weather report, either by clicking on the map or by entering some co-ordinates. The parameters followed can be selected according to the needs of the activity. It is possible to select a large variety of indicators in the most important categories,



enovOcean rogue waves map



Excellent correlation between the SAVAS wave model in light blue with the in-situ observations from the buoys



Very good correlation between the SAVAS wave model in light blue and the satellite Sentinel 3A measurement

including wind, wave, weather, currents, sea-icing, making it very useful for offshore activities and for marine renewable energies such as wind turbines, tidal turbines and wave converters.

A rolling four-day horizon provides a good level of reliability, while user-friendly color coding enables users to assess the evolution of the weather situation at a glance.

Weather alerts

If certain weather conditions present a threat, automatic alert can be set, eradicating the need for watching the forecast several times a day. Similarly, if favorable minimum weather wind conditions are required an automatic alert can be set for these too.

The enovOcean.com platform can provide custom weather alerts for wind, waves, pressure, risk waves, sea ice thickness and current speed. Warnings are sent by email two days in advance, with only one warning sent for each event.

With its parent company NOVELTIS bringing more than 20 years' experience of observing and modeling wind, sea-states, currents and associated risks, the enovOcean platform is ideal for a number of maritime activities including offshore wind farm commissioning and operations and maintenance.

www.enovOcean.com



Free

Worldwide coverage and a 5-day ahead forecast, including:

- Winds
 - Wind at 10m, 80m and 100m, wind gusts
- Sea-states
 - Waves, primary and secondary swells, wind waves, period
- Ocean parameters
 - Sea temperature, salinity and sea surface elevation
- Observations
 - Bathymetry
- Weather
 - Clouds, humidity, precipitation, air temperature, pressure
- Currents
 - Speed and direction
- Sea ice
 - Sea ice thickness and sea ice area fraction

Premium

Best data available, fine-scale indicators and a 7-day ahead forecast, including:

- Hindcast data: 30 years of wind and waves
 - Raw data and statistical analysis: return period, occurrences, wind and waves
- Waves risk products
 - Crossed sea, probability of return of extreme waves, rogue waves and steep sea
- Fine scale metocean products
 - Waves HS, primary swell, mean and peak periods, direction
- Observations and models inter-comparisons
 - Inter-comparison tools between all models, satellites and buoys
- Marine renewable energy
 - Current maximum, occurrence of velocity and power density
- Weather reports
 - Select the parameters you want to follow, get a 4-day ahead weather report every day
- Weather alerts
 - Select the parameter on which you want an alert and get an email two days in advance if the threshold is trespassed.

Hindcast data

With this new service, 30 years of historical wave and wind data are available all over the world.

2 sets of data:

- Waves and wind at 10m
- Waves and wind at 100m, ideal for offshore wind farms

2 possible outputs:

- A statistical report in pdf and csv format, analyzing 30 years of data
- And/or the raw time series data for the 30 years, in csv format.

Customized metocean studies

Specific and tailored studies by NOVELTIS

- Metocean studies
 - To characterize any offshore site
- Preliminary metocean data studies
 - To determine the correct sizing of the components of offshore structures, looking at wind, waves, currents, risks
- Weather downtime studies
 - To assess the average probable number of workable days at sea, month by month
- Weather reports
 - During the commissioning, with alerts customized to your own thresholds
- Select the best weather window or route
 - To set sails or to sail safely or save fuel
- Renewable energies
 - Site assessments and operational forecasts
- Upon request: specific studies