MarineLabs
DATA SYSTEMS

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In Situ Realtime & Forecast Metocean Data Reduces Costs and Improves Safety in Maritime Operations

May 22, 2025

Who are we?

- Canadian Owned and Operated - Victoria, BC
- 26 Employees
- Operational across North America

Customers include:

Pacific Pilotage Authority
hullo
Prince Rupert Port Authority
Port of Halifax
Port Saint John
DP World
BCFerries

What We Do

Turning Data into Decisions

You don't need to manage costly deployments, procure or maintain your own data buoys, or rely on government agencies to fill weather data gaps. Simply subscribe to MarineLabs.

Strength in numbers

Our expanding sensor network delivers hyper-local, real-time weather information and multi-day forecasts with built-in redundancy to ensure data feeds are continuous and reliable. Positioned along coastlines, our sensor nodes are engineered for long-term, dependable data collection.

Solutions for maritime operations

Coast Pilots
Real-time weather data and forecasts for safer navigation. Tailored alerts for weather-critical decisions in challenging conditions.

Port Operators
Comprehensive weather intelligence and berth-depth data. Improved safety and efficiency with data-driven decisions.

Coastal Engineers
Easy-to-access validation data essential for modeling coastal infrastructure and climate resilience projects.

How We Do It

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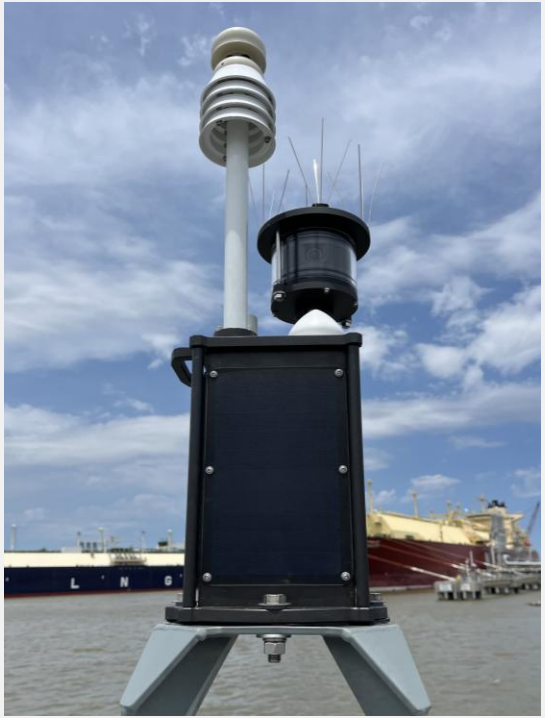
Rapid-deployable sensor nodes collect new real-time data:

- Wind
- Wave
- Temperature, Pressure, Humidity
- 360-Degree Cameras
- Vessel Wake Detection



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Can turn any navigation buoy into a Smart Buoy.

Also Works on Small Buoys

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- 0.9m diameter
- ~80kg
- Max 4kn current, 200m water depth
- Meets or exceeds all private buoy regulations
- MarineLabs handles the anchor/mooring/float and all maintenance.
- Often deployed for specific Port monitoring – weather intelligence, climate resilience, vessel wake detection

Also Works on Medium Buoys

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Forecast AI

- Accurate, hyper-local forecasts that account for each location’s unique characteristics and geography
- Consistently outperforms trusted third-party models
- More accurate predictions you can rely on

Greatly Reduces Forecast Error

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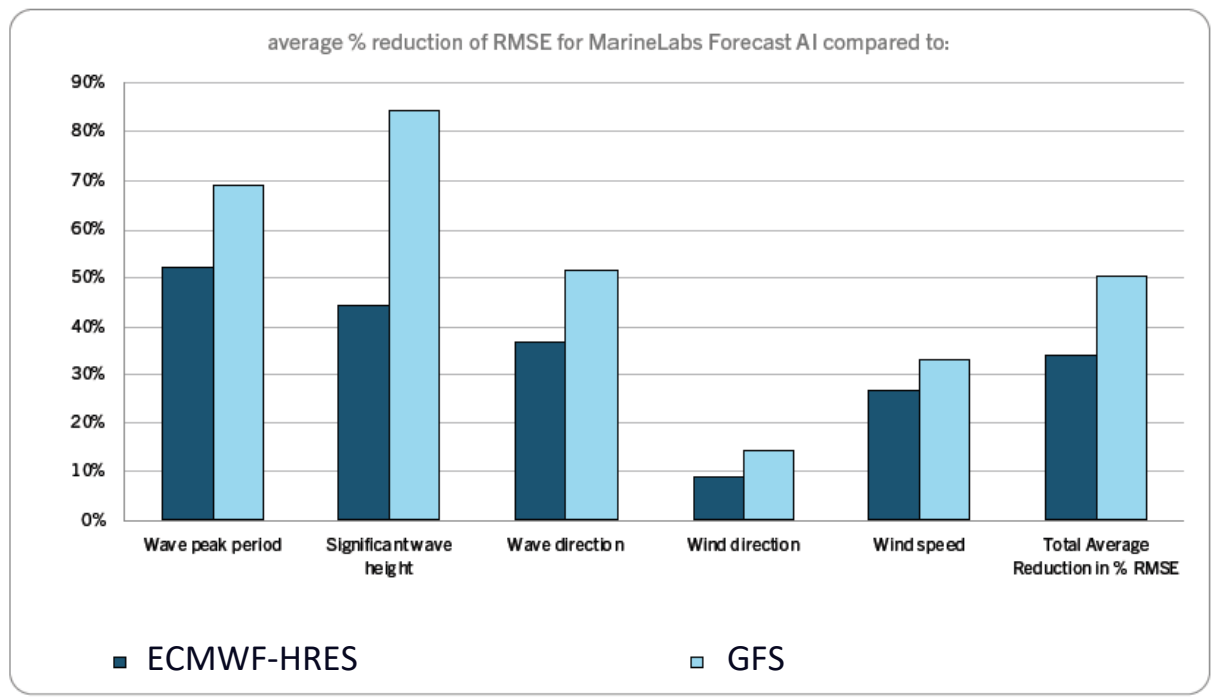
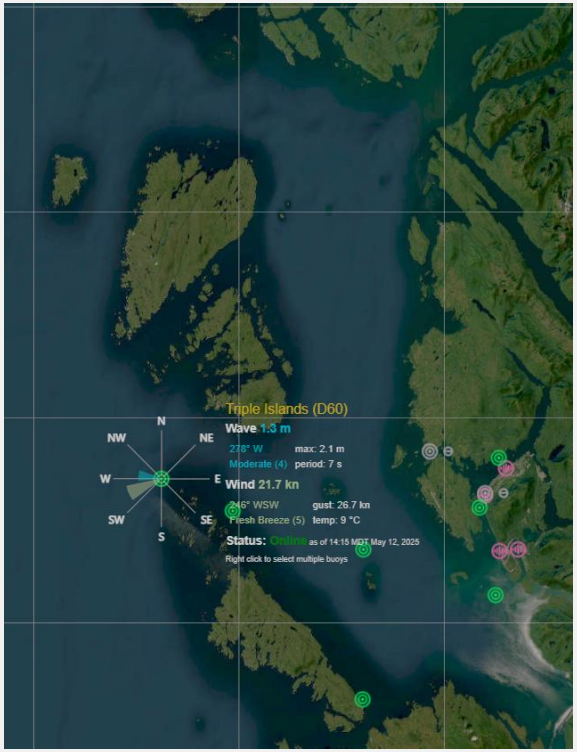
- In study of over 84 Buoy Years of Data across 32 locations
- Average 50% RMSE reduction across all parameters and forecast lead times
  - 1 hourly to 5 days, 3 hourly to 10 days

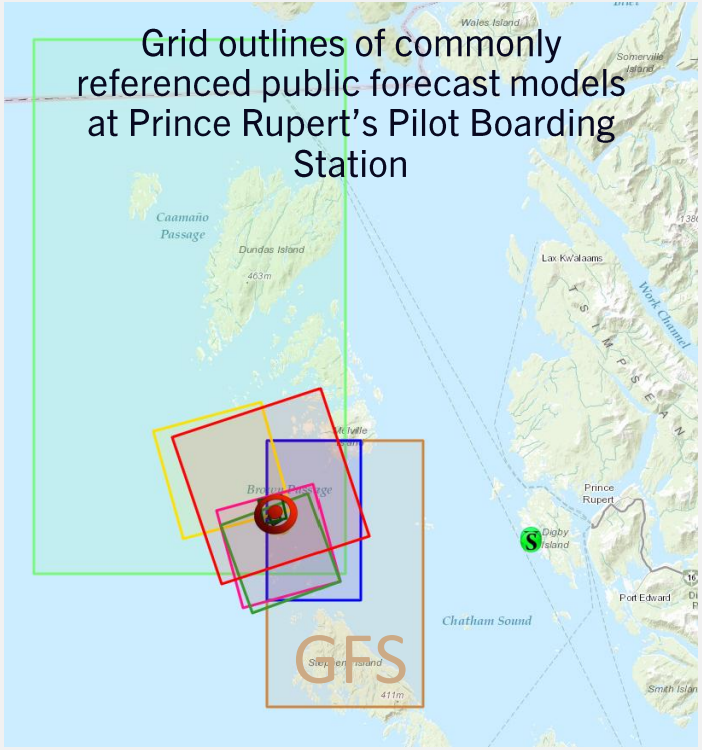


Advantage of Hyper-Local

- Large models, GFS for example forecasts on a 0.25° Grid resolution
- MarineLabs' forecasts are nodal and distinct for each sensor location
- Enables local surface and subsurface geography to be accounted for



MarineLabs Sensor Nodes around Prince Rupert, BC



How it works

- Time series models are trained upon historic observations at single locations, along with Numerical Weather Prediction (NWP) forecasts like ECMWF and GFS

- Produces a “bias-corrected” forecast for each sensor location with the NWP forecasts and site-specific observations as inputs

Quantifying Performance Operationally

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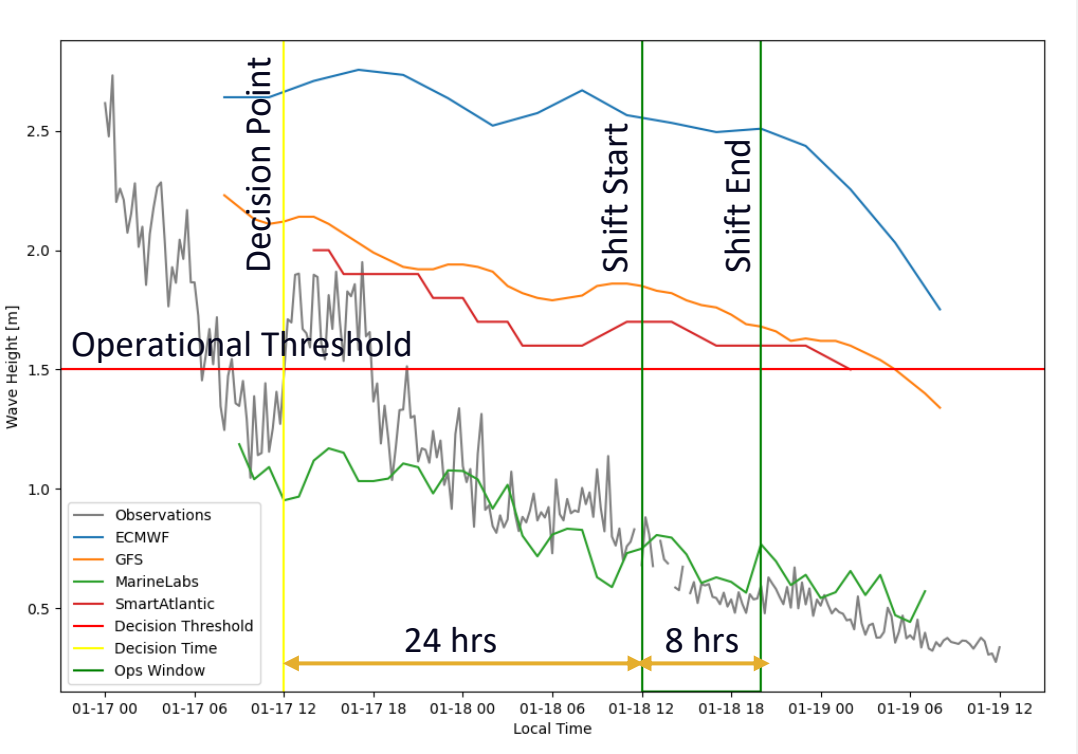
- Break time series into 8 hour operational shifts (3/day)
- Set a decision point 24 hours in advance of each shift start
- Set a decision threshold value
- 4 outcomes:
  - Correct Above or Below
  - Incorrect Above or Below



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Case Study — 13 Months in Saint John, NB

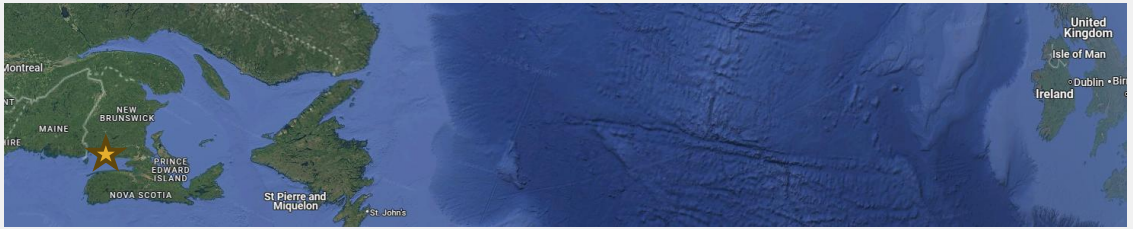
May 22, 2025

Case Study – 13 Months in Saint John, NB

- Jan. 1st, 2023 through Feb. 14th, 2024 -> 1110x 8-Hour shifts
- 2 Scenarios:

1. 24hr ahead calls for 8 hour work shifts, **25kn** operational **Wind Speed** limit
2. 24hr ahead calls for 8 hour work shifts, **1.5m** operational **Significant Wave Height** limit

	MarineLabs		SmartAtlantic		ECMWF-MARS		NOAA GFS	
	% Correct	% Incorrect	% Correct	% Incorrect	% Correct	% Incorrect	% Correct	% Incorrect
Significant Wave Height 1.5m	99%	1%	96%	4%	97%	3%	90%	10%
Wind Speed 25kn	89%	11%	82%	18%	82%	18%	81%	19%



Saint John, NB – Wind Limit

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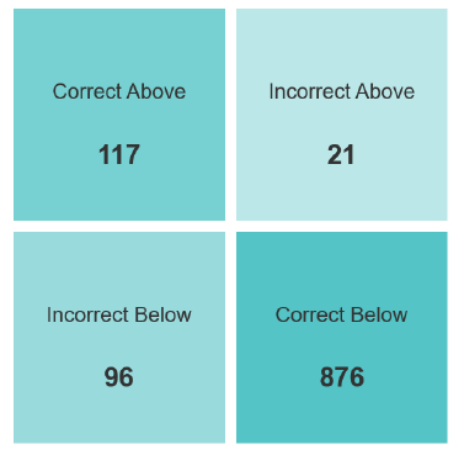
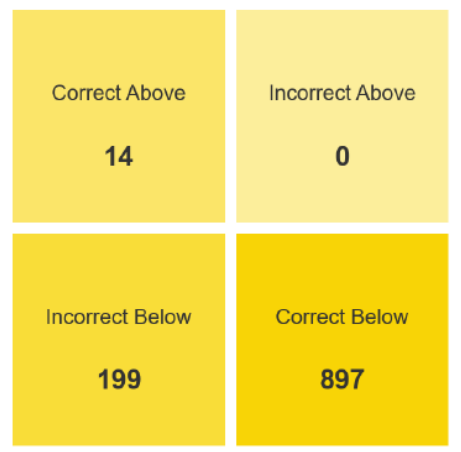
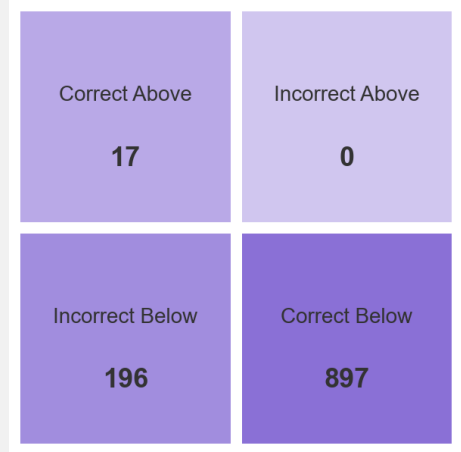
Decision Outcome Matrices, 25kn Operational Wind Speed Limit



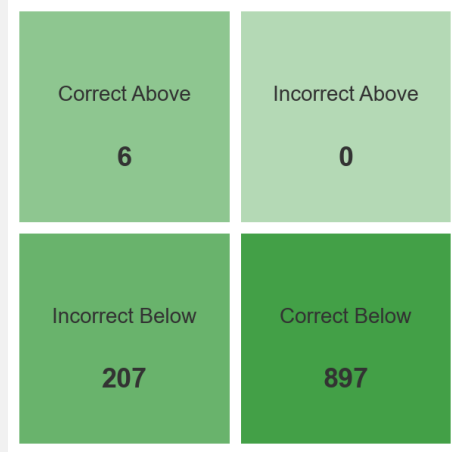
MarineLabs Forecast



SmartAtlantic



ECMWF-MARS



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Saint John, NB – Wave Limit

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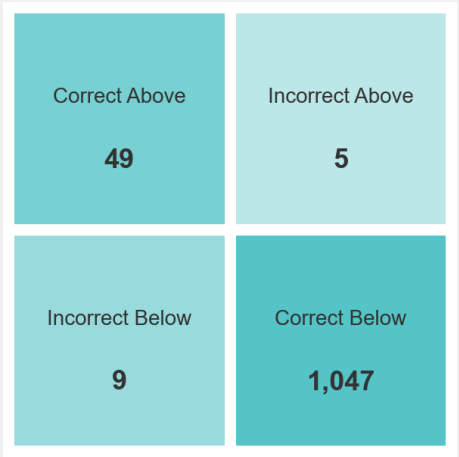
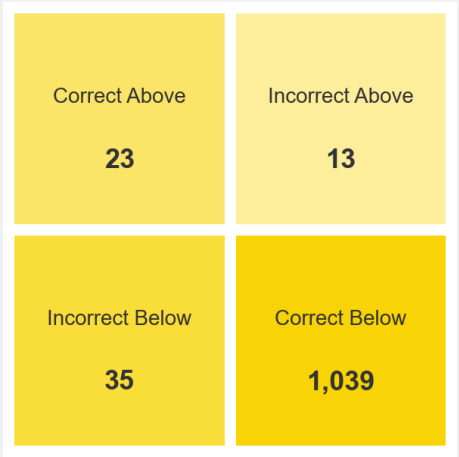
Decision Outcome Matrices, 1.5m Operational Sig. Wave Height Limit



MarineLabs Forecast



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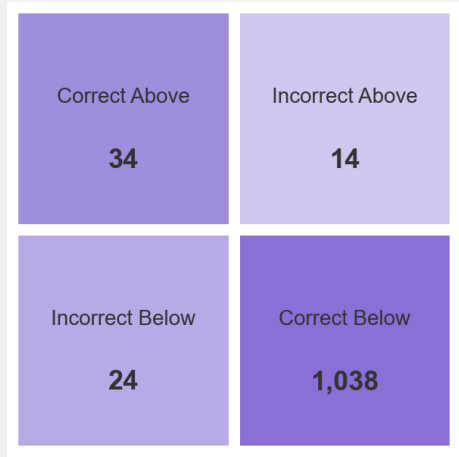

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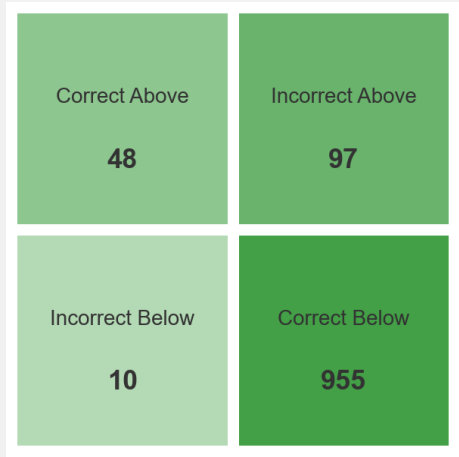

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Case Study — 8.5 Months in Halifax, NS

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- May 1st, 2023 Through Feb. 13th, 2024 -> 853x 8-Hour shifts
- 2 Scenarios:

1. 24hr ahead calls for 8 hour work shifts, **25kn** operational **Wind** limit
2. 24hr ahead calls for 8 hour work shifts, **1.5m** operational **Significant Wave Height** limit

	MarineLabs		SmartAtlantic		ECMWF-MARS		NOAA GFS	
	% Correct	% Incorrect	% Correct	% Incorrect	% Correct	% Incorrect	% Correct	% Incorrect
Signifcant Wave Height 1.5m	98%	2%	90%	10%	78%	22%	90%	10%
Wind Speed 25kn	92%	8%	89%	11%	87%	13%	90%	10%

Halifax, NS – Wind Limit

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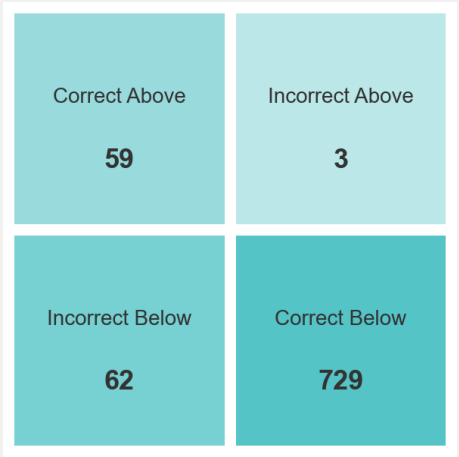
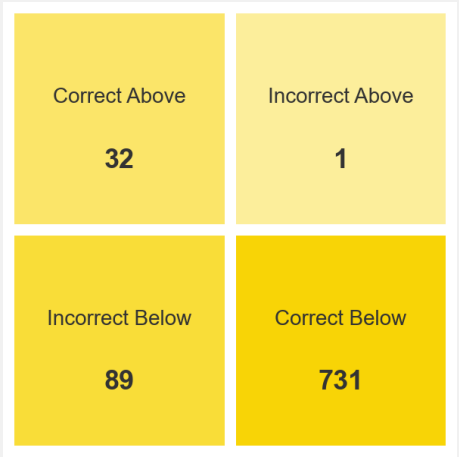
Decision Outcome Matrices, 25kn Operational Wind Speed Limit



MarineLabs Forecast



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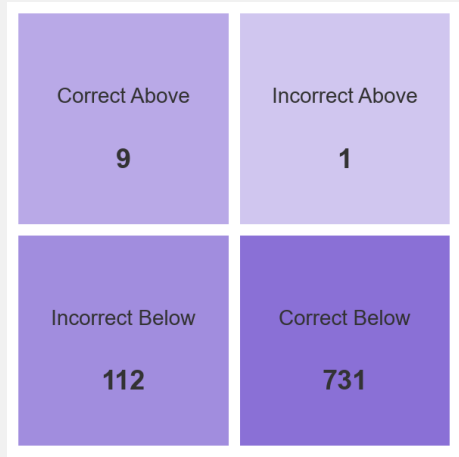
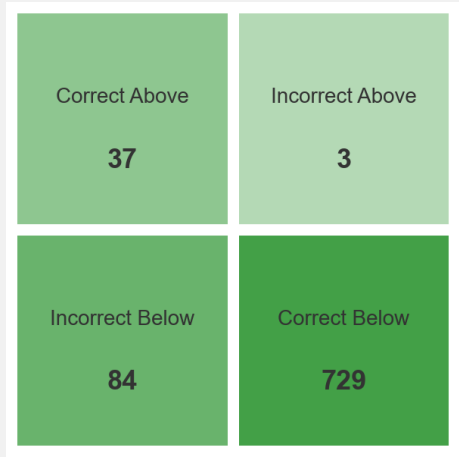


ECMWF-MARS



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Halifax, NS – Wave Limit

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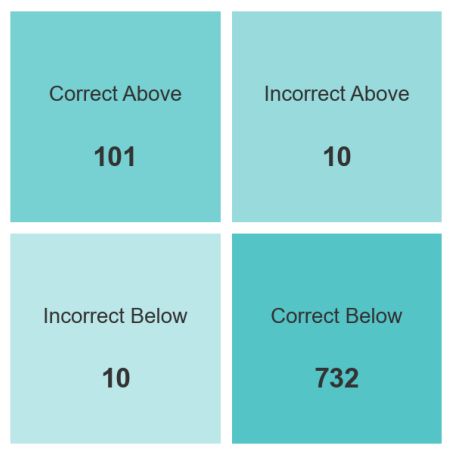
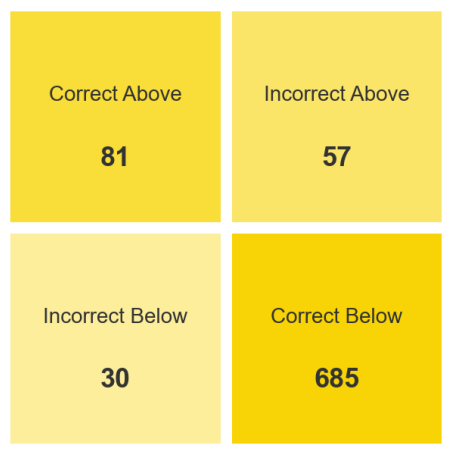
Decision Outcome Matrices, 1.5m Operational Sig. Wave Height Limit



MarineLabs Forecast



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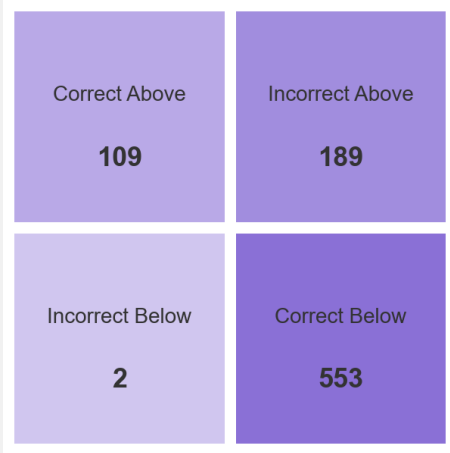

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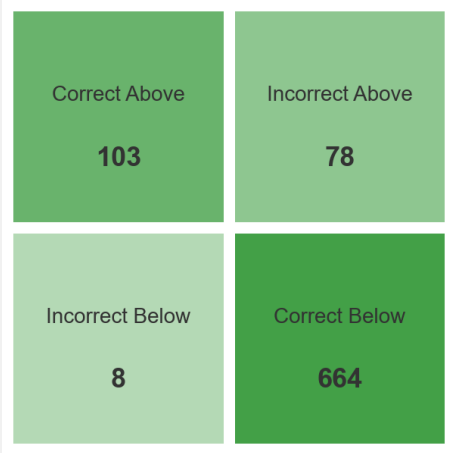

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What’s Next?

Coming Soon

- Realtime Detection of Fog
- Forecasting
  - Temperature
  - Pressure
  - Humidity
  - Likelihood of Fog

Fog Density:
Class: Low
Confidence: 0.9025

Occlusion:
Class: Partial
Confidence: 0.9647

(521 kB)

Fog Density:
Class: Low
Confidence: 0.9989

Occlusion:
Class: Normal
Confidence: 0.9999

(965 kB)