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CTO Miros

MIROS

How accurate weather data can help improve vessel performance

PTM Bergen 22. October 2026

Real-time Ocean Insights

Waves. Currents. Oil Spill Detection.





MIROS



Oil & Gas



Offshore Wind



Offshore Operations



Shipping



Ports & Coastal

Miros has over 40 years of experience in measuring ocean waves, currents and oil spills

Miros delivers radar-based instruments in a modern IoT ecosystem, with apps for monitoring, analysis and decision support that connect offshore and onshore teams

#MaritimeSafety #OceanEnvironment #VesselPerformance #KnowYourWaves #PredictifAI #MirosCloud

Vessel performance – an exercise in uncertainty?



- What is the actual performance of a vessel right now?
- When should you do your next hull and propeller cleaning?
- How much fuel will your vessel consume on a certain route?
- What is the impact of your energy saving device?
- What performance should you be stated in your next contract?

Performance estimates can have errors of 20-50%
This can have substantial financial impacts



Some key factors influencing performance

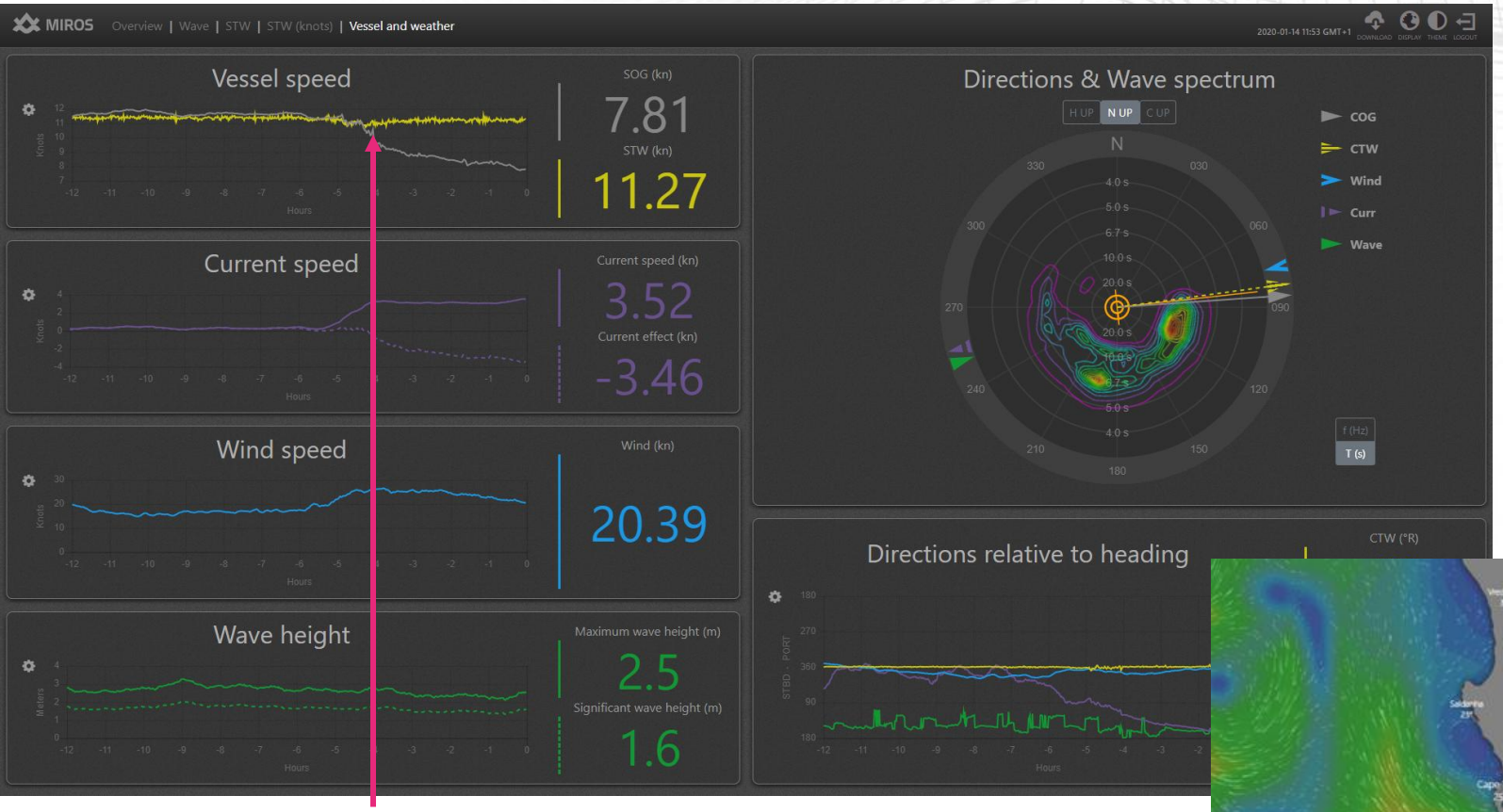
Even light slime can increase fuel consumption by up to 20%, while heavy calcareous fouling can boost it by up to 85% (DNV)

Biofouling is costing the shipping industry 30 billion USD per year (Clean Shipping Coalition)

Bad weather can more than double the fuel consumption of a vessel (Miros)

What about bad data?

Measured data vs model data – which one do you trust?

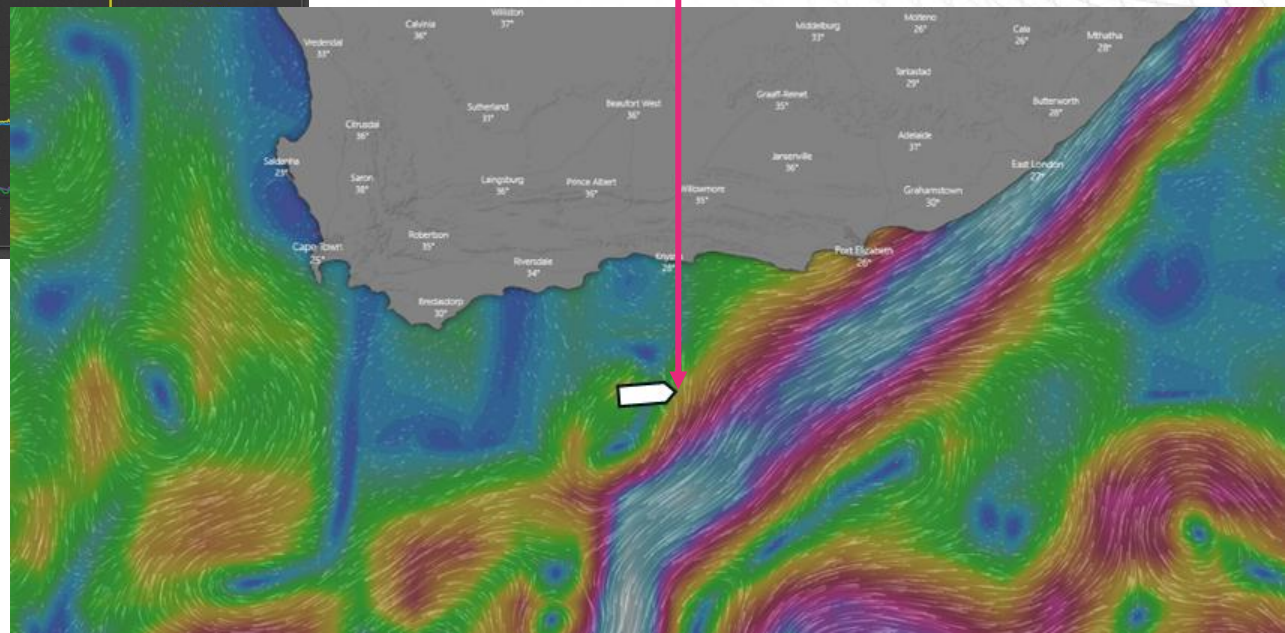


Measured data: (Miros Wavex)

4 hours ago: Vessel going east, entering an area of very strong westbound currents

Model data: (Source: windy.com)

Now: Vessel is about to enter an area of strong currents



Vessel speed

SOG (GPS) — STW (Wavex - long.) — STW (SpeedLog - long.)



SOG (GPS) **10.8** kn

STW (Wavex - long.) **11.1** kn

STW (SpeedLog - long.) **11.1** kn

Current speed

Current speed - - - Current effect



Current speed **0.41** kn

Current effect **-0.35** kn

Wind speed

- - - True wind at sensor — True wind 10m height



True wind at sensor **13.7** kn

True wind 10m height **10.8** kn

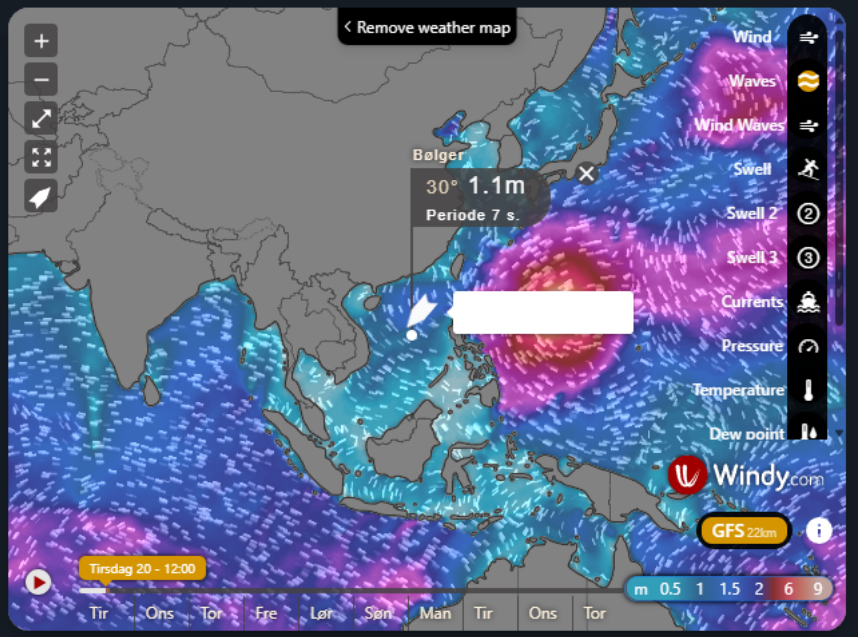
Wave height

- - - Maximum wave height — Significant wave height

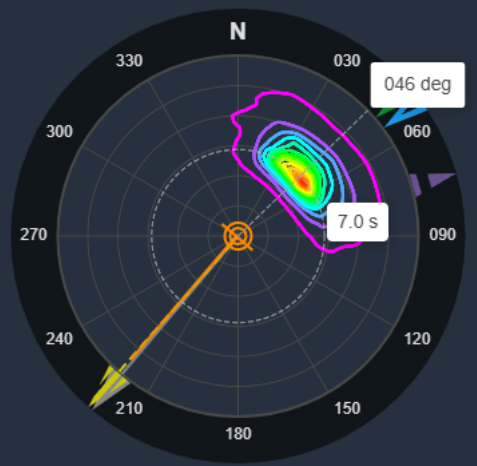


Maximum wave height **3.7** m

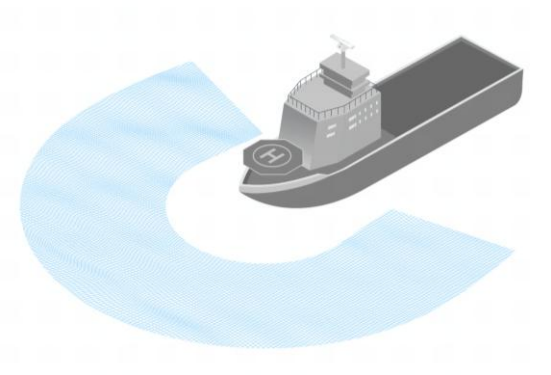
Significant wave height **2.2** m



Vessel and weather



Measurement principle





Essential for:

- Accurate vessel performance analysis
- Accurate fuel optimization
- Structural integrity verification
- Reducing damage to vessel & cargo
- Increasing passenger comfort
- Reducing uncertainty in weather claims

MIROS

Miros Wavex®

- Measures waves, surface currents and speed through water from digitized sea clutter images provided by a marine X-band radar when operated in short pulse mode.
- Wave height accuracy ± 0.2 m
- Current & STW accuracy ± 0.05 m/s



VTI
Vessel Technical Index

08 Mar 2026 19:00 UTC	
Shaft power	6811.64 kW
VTI	1.31
pWind	1115.24 kW
p0	3825.97 kW
pWave	638.32 kW
pTemp	- 13.89 kW

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The VTI is a metric for the technical performance of a vessel

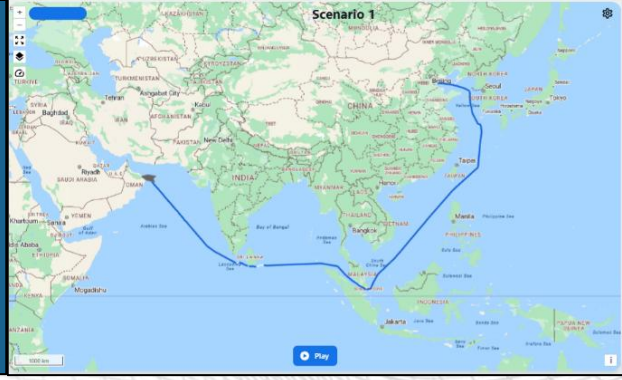
$$\text{VTI} = \frac{\text{normalized shaft power}}{\text{reference shaft power}}$$

The effects of the weather, loading condition and other operational factors are removed

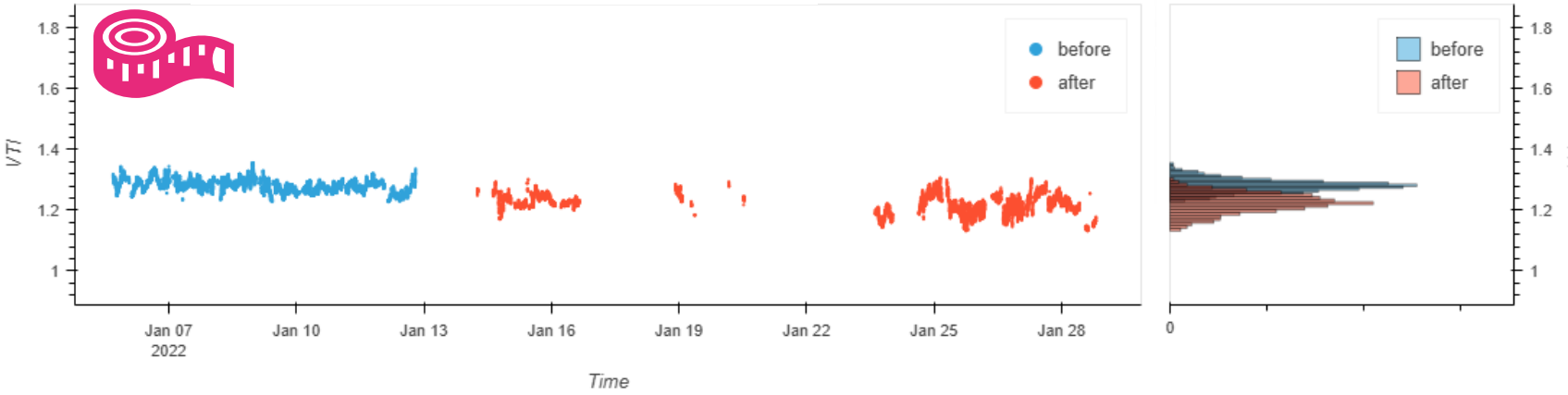
Scenario 1: Measured weather vs hindcast

Scenario 1
LNG carrier

- 8-day voyage leg
- Propeller cleaning
- 15-day voyage leg

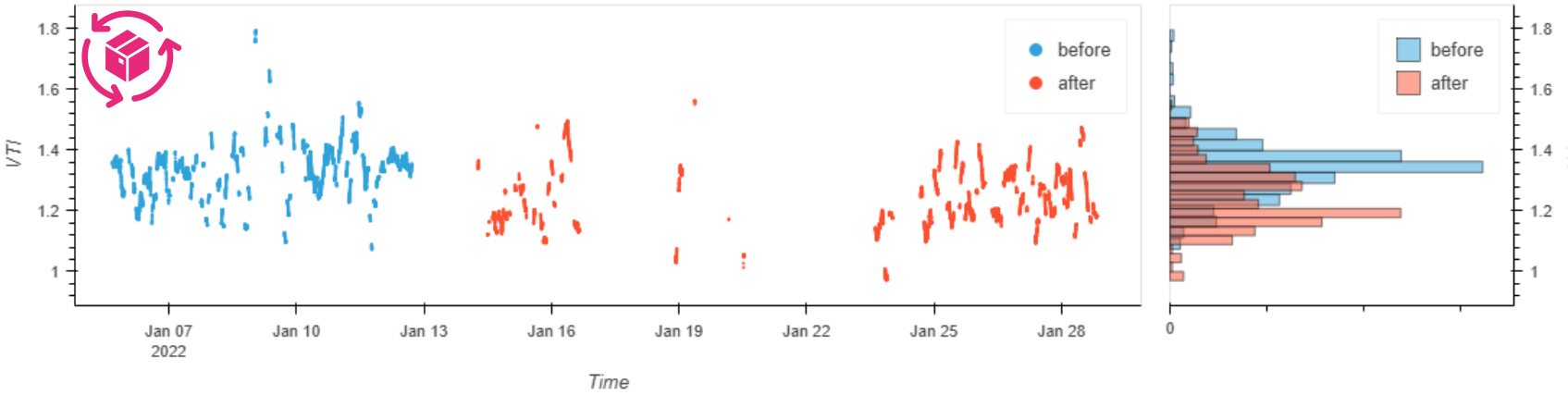


Scenario 1 **Measured: current/STW, waves, wind**



VTI statistics Scenario 1				
Input data	Before (8 days)		After (15 days)	
	Avg	Std	Avg	Std
Measured	1.28	±0.02	1.22	±0.03

Scenario 1 | Hindcast: current, waves, wind

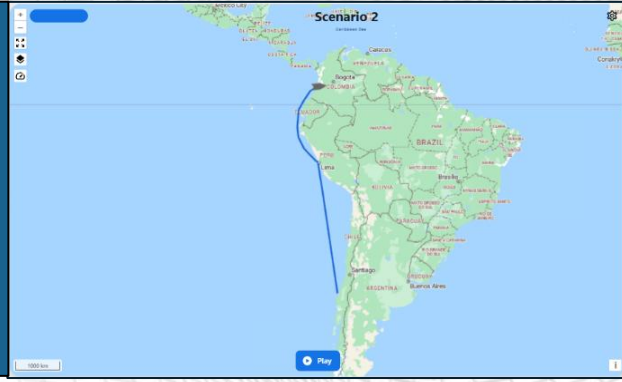


VTI statistics Scenario 1				
Input data	Before (8 days)		After (15 days)	
	Avg	Std	Avg	Std
Model	1.33	±0.09	1.24	±0.10

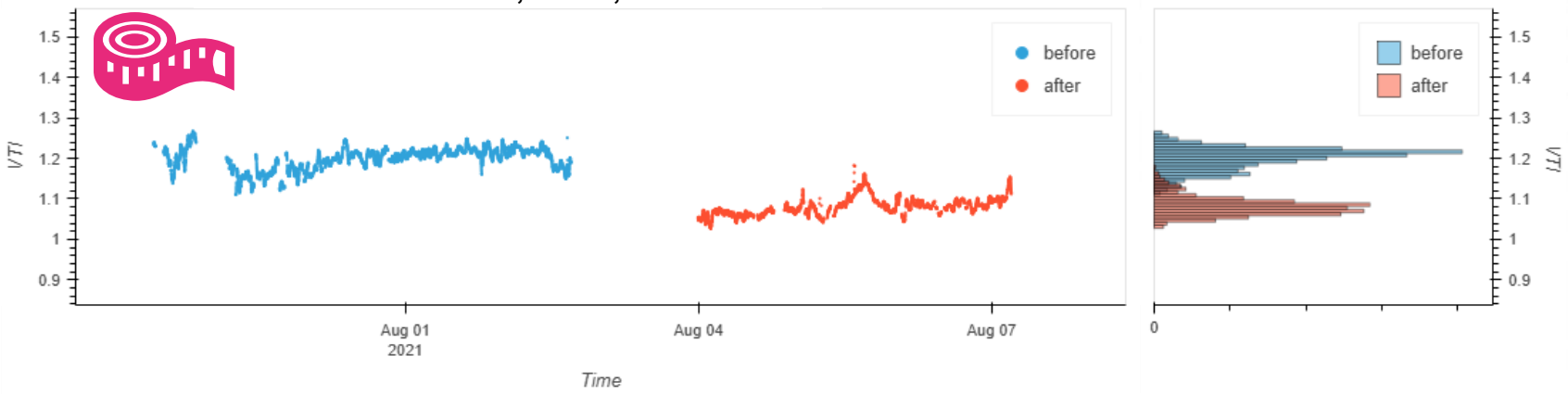
Scenario 2: Measured weather vs hindcast

- **Scenario 2**
- Bulk carrier

- 5-day voyage leg
- Propeller cleaning
- 4-day voyage leg

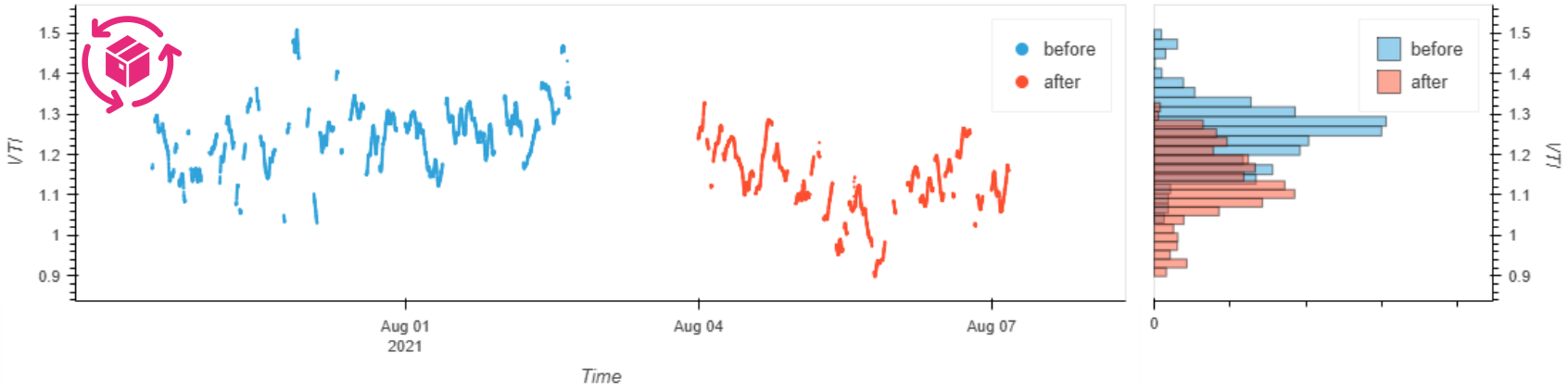


Scenario 2 Measured: current/STW, waves, wind



VTI statistics Scenario 2				
Input data	Before (5 days)		After (4 days)	
	Avg	Std	Avg	Std
Measured	1.20	±0.03	1.08	±0.02

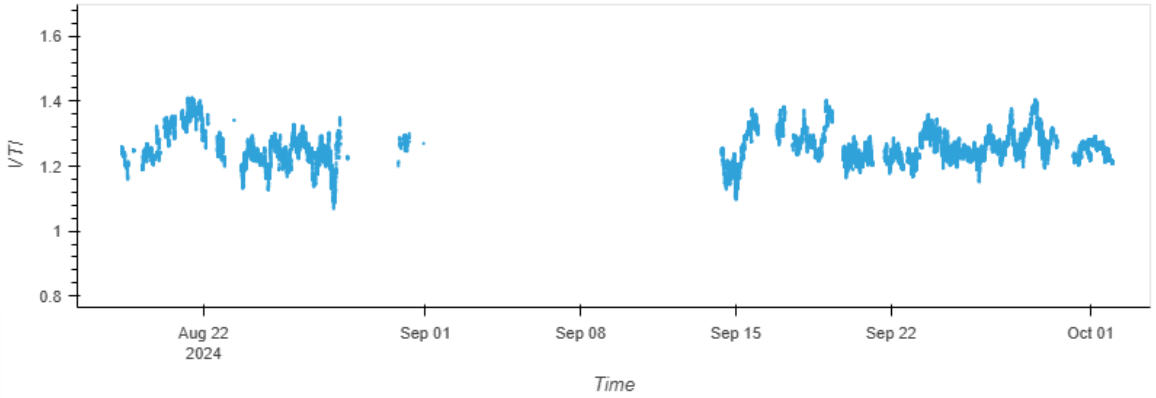
Scenario 2 | Hindcast: current, waves, wind



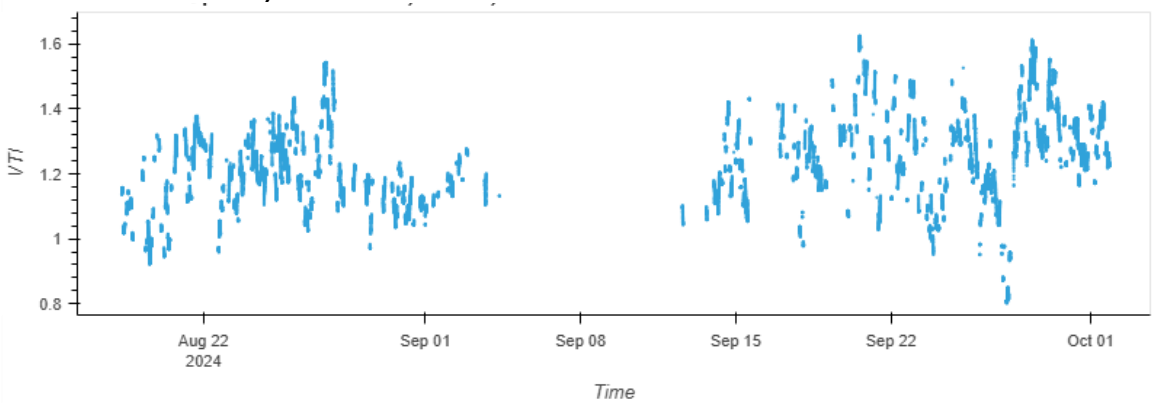
VTI statistics Scenario 2				
Input data	Before (5 days)		After (4 days)	
	Avg	Std	Avg	Std
Model	1.25	±0.08	1.13	±0.09

Scenario 3: Different inputs give very different results

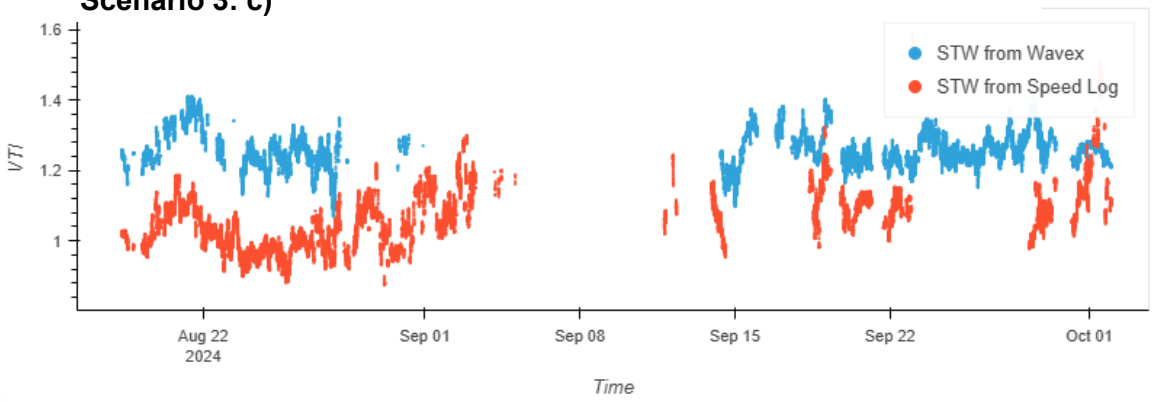
Scenario 3: a)



Scenario 3: b)

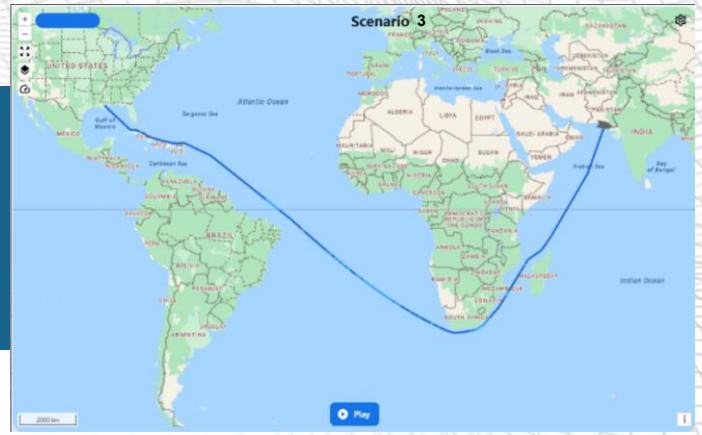


Scenario 3: c)



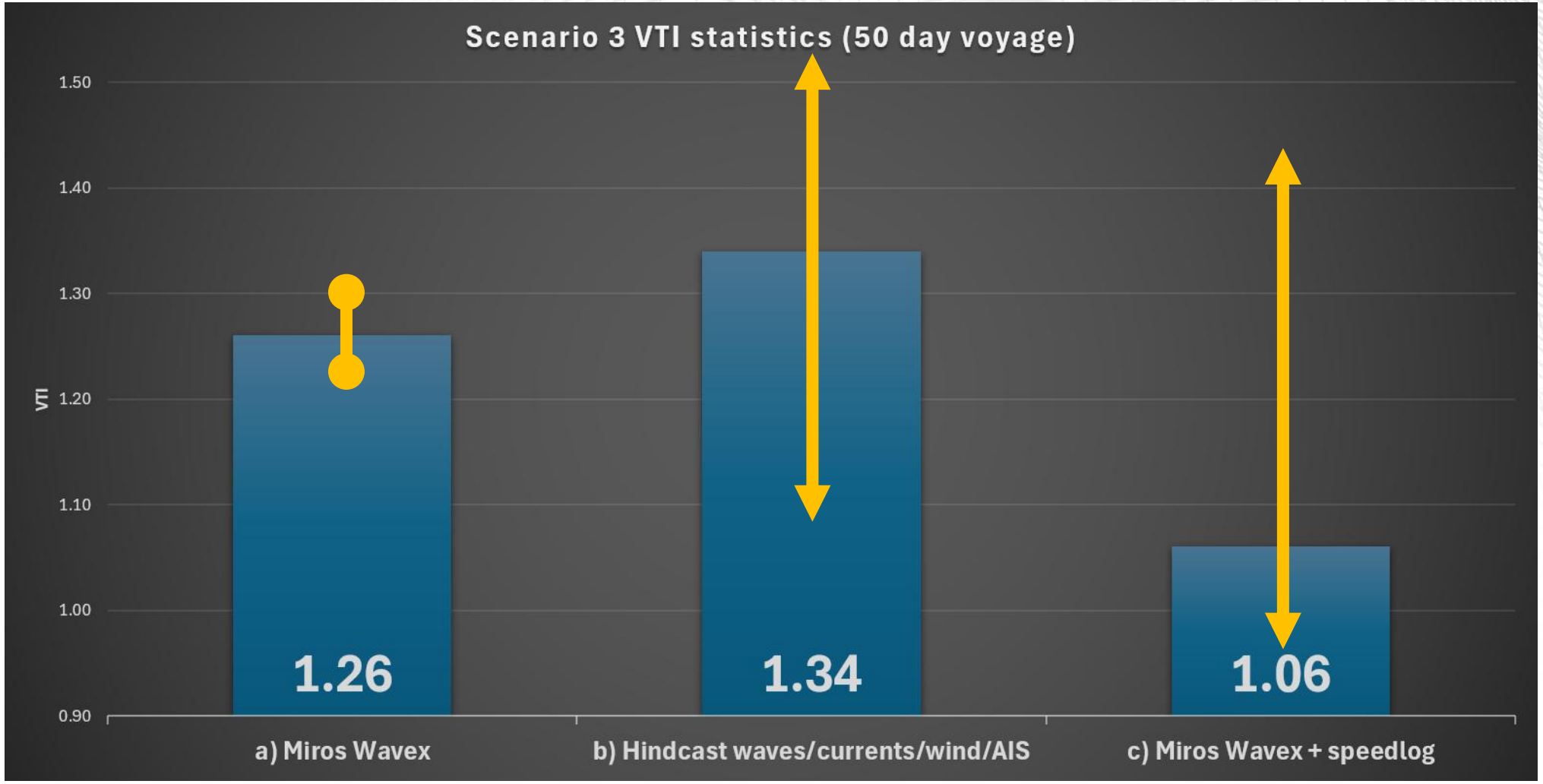
Scenario 3
Bulk carrier

50-day voyage



VTI statistics Scenario 3		
Input data	Full voyage (50 days)	
	Avg	Std
a) Miros Wavex	1.26	±0.05
b) Hindcast waves/currents/wind/AIS	1.34	±0.14
c) Miros Wavex + speedlog	1.06	±0.09

Data quality matters



Error: ± 4%
Offset: 0%

Error: ± 14%
Offset: ± 0-25%

Error: ± 8%
Offset: ± 0-25%

Fuel table (loading condition, speed, weather, VTI)

MIROS

MIROS | Dynamic Fuel Table | Dynamic Fuel Table | Performance Analyzer | Voyage Analyzer

Vessel

Technical indexes

VTI	1.26
METI	1.05

Fuel

Fuel oil type	HSHFO (LCV 40.2 MJ/kg)
AE consumption incl.	0.0 mt/d

Weather

Wind speed	16.0 kn
Significant wave height	2.0 m
Significant swell height	0.5 m
Wind angle	0 deg
Wave angle	0 deg
Swell angle	0 deg
Wave period	5.0 s
Swell period	16.0 s

Miros fuel table

Fuel oil: HSHFO (LCV 40.2 MJ/kg)
VTI: 1.26 METI: 1.05
Auxillary engines consumption included: 0.0 mt/d
No boiler consumption included

Vessel:

Wind: 16.0 kn 5 BFT Angle: 0 deg
Wave: 2.0 m Angle: 0 deg Period: 5.0 s
Swell: 0.5 m Angle: 0 deg Period: 16.0 s
Wind, wave, swell angle of 0 deg denotes head wind, wave, swell

Total Fuel Oil Consumption (mt/d)

Loading condition (draft aft/fore) (m) Add condition

Speed (kn)	7.26/4.76	11.20/11.20	13.31/13.31
11.00	14.3	16.2	18.0
11.25	15.1	17.2	19.0
11.50	16.0	18.1	20.1
11.75	16.9	19.1	21.2
12.00	17.8	20.2	22.4
12.25	18.8	21.2	23.5
12.50	19.9	22.4	24.8
12.75	21.1	23.5	26.1
13.00	22.3	24.8	27.6

From VTI to fuel to cost: Scenario 1 propeller cleaning

VTI reduction

0.06

From 1.28 to 1.22

CO_2 Reduction (Voyage)

245 mt

31 days laden voyage

Fuel savings (voyage)

78 mt

31 days laden voyage
16 kn speed

Cost savings (voyage)

$46 500

$600 per mt fuel

From VTI to fuel to cost: Heavily fouled tanker

VTI reduction

0.47

From 1.52 to 1.05

CO_2 Reduction (Voyage)

734 mt

31 days laden voyage

Fuel savings (voyage)

233 mt

31 days laden voyage
13 kn speed

Cost savings (voyage)

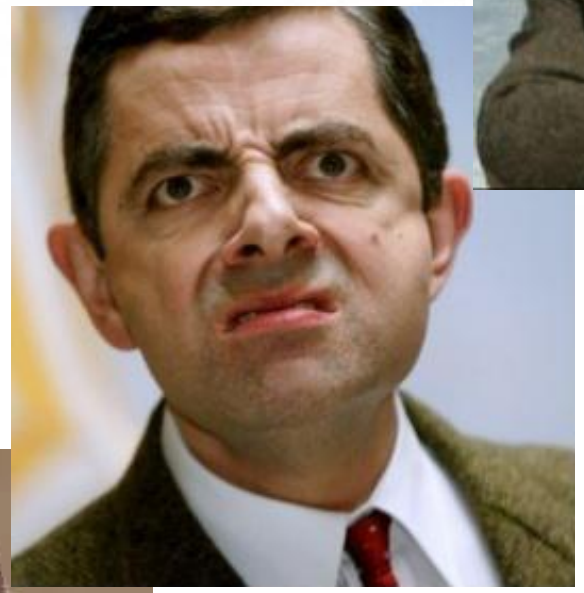
$140 000

$600 per mt fuel

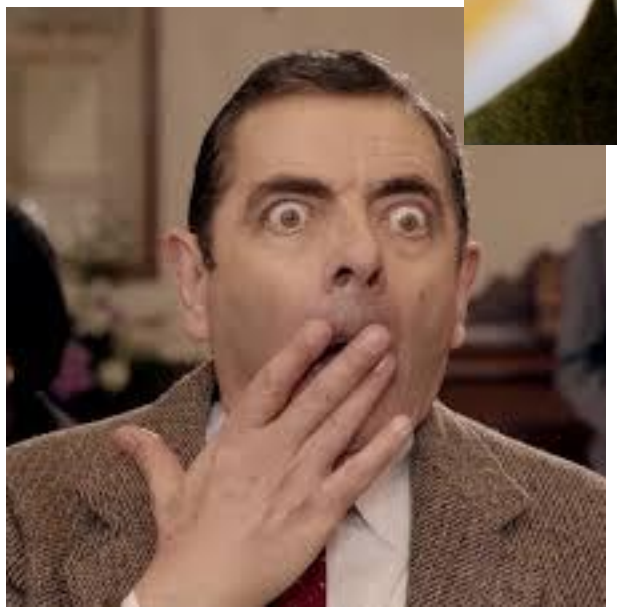
Summary



Using accurate, measured, high-frequency data



Using hindcast data



Using noon report data

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