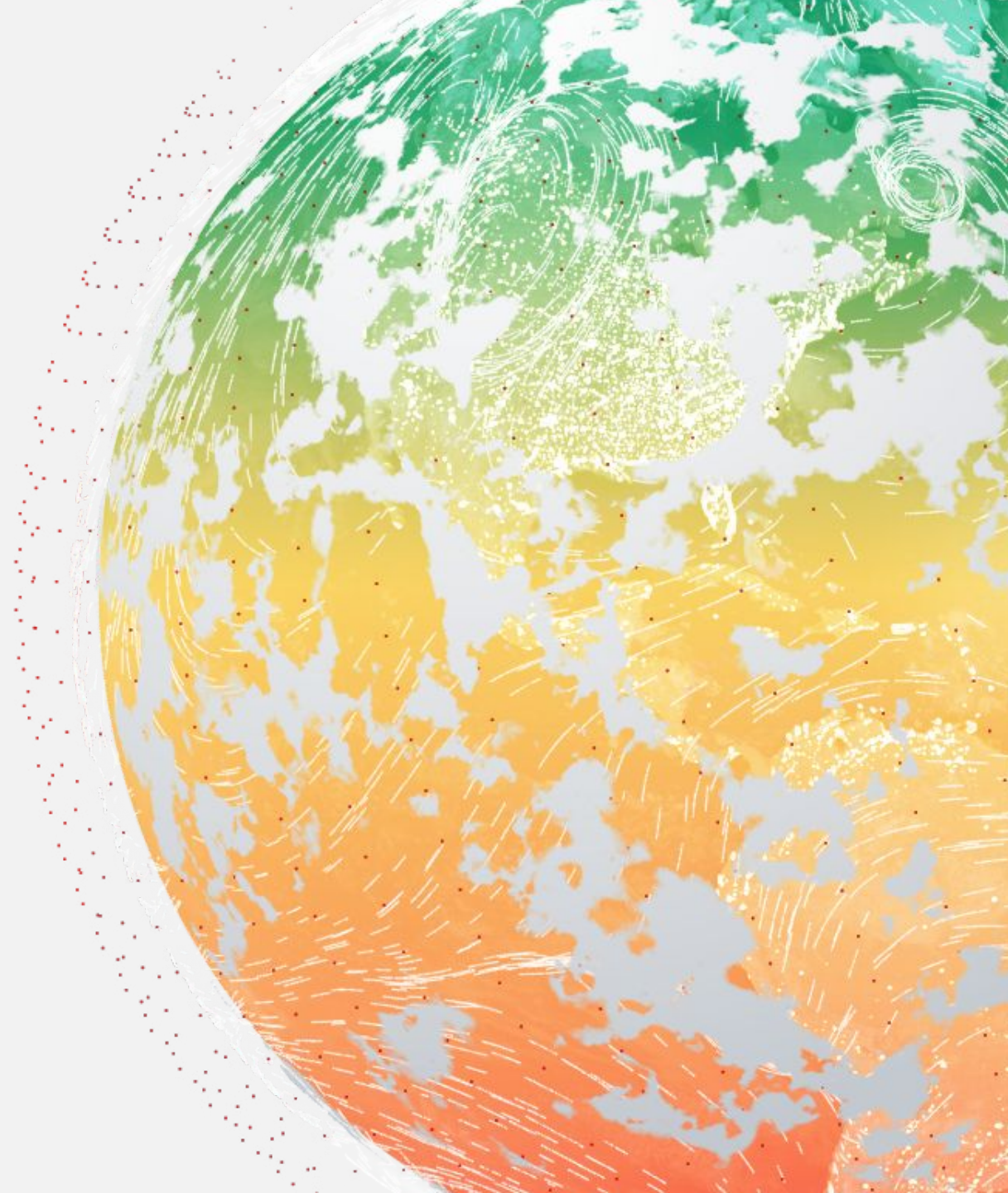
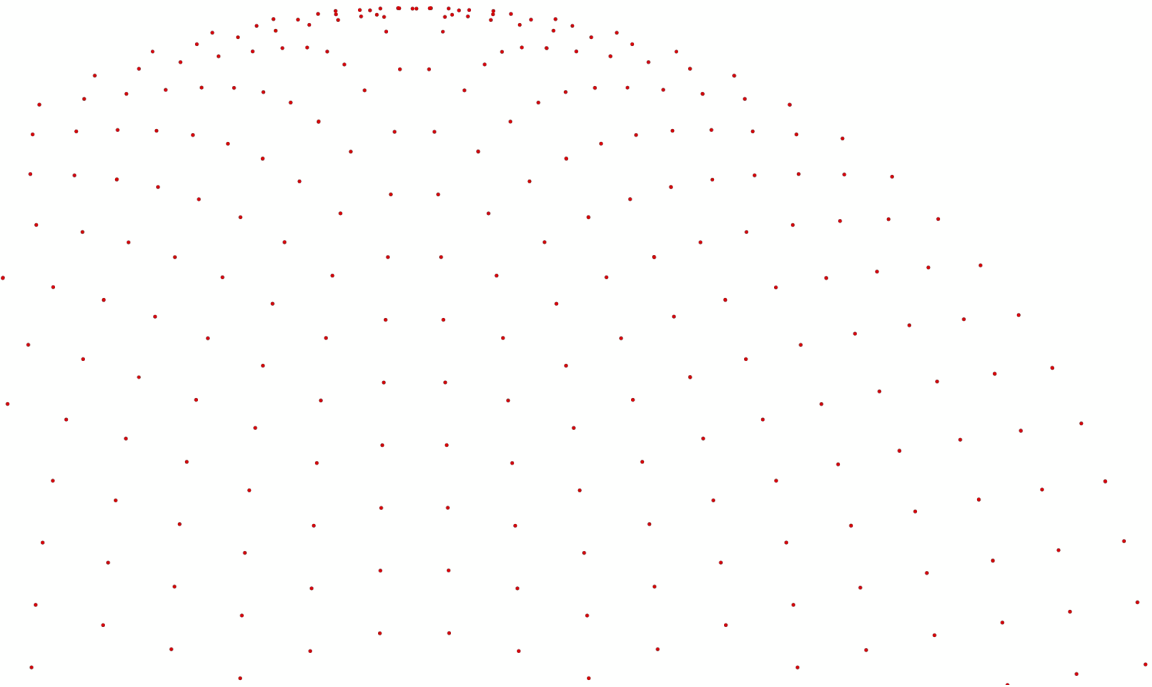


How to Optimize Voyages with AI and Space-Powered Maritime Weather Data



Overview



1. Embracing Technological Innovation: Maritime Industry's Response to Industry Dynamics
2. Maritime Weather Data: Collection, Challenges, and Business Impact
3. Multi-objective Voyage Optimization Engine
4. Ship Models (Blue Wasp Marine)
5. Conclusion

Embracing Technological Innovation: Maritime Industry's Response to Industry Dynamics

Several factors have contributed to the increased adoption of new technologies, datasets, algorithms and digital solutions by the global maritime value chain to improve efficiency, reduce costs, and enhance safety.

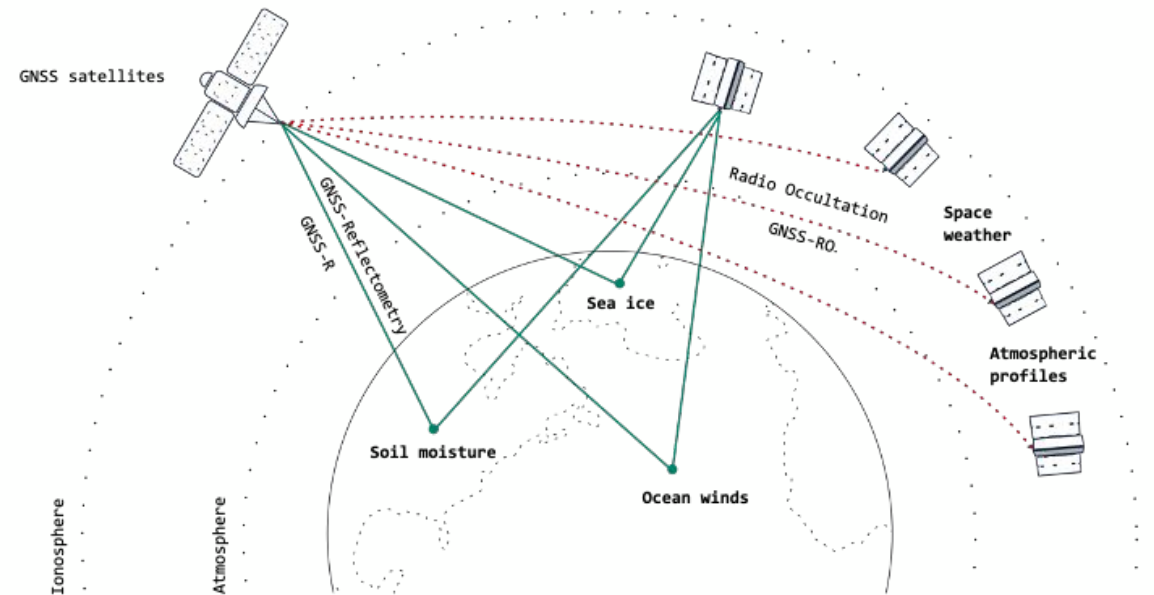
- **Growing global trade:** Leading to the increase in efficiency and technologically advanced solutions to handle larger volumes of cargo
- **Pressure to comply with Environmental and Sustainability goals:** Stricter environmental regulations imposed by international bodies to reduce maritime emissions.
- **Pressure to adopt cleaner technologies,** such as voyage optimization solutions, low-emission fuels and wind-assisted propulsion systems.
- **Increased competitiveness** and the race towards profitability
- **Demand for Real-Time Connectivity and Data lakes,** including weather, AIS, and IoT



Unlocking New Opportunities with Satellite-powered Maritime Weather Data

Satellite-powered maritime weather data is superior to other sources of weather data due to its comprehensive global coverage, providing real-time and accurate information over vast oceanic areas that are otherwise difficult to access, enabling proactive decision-making and improved safety for maritime operations.

- **Global coverage even in remote ocean areas**
- **Spire's weather forecasts consistently outperform leading public global forecast models, 2-5 Day accuracy advantage on average**
- **Volume of Metocean data including historical, current, and weather forecasts**
- **Data on current Sea Ice extent and the height of tides (historical & future through 2025)**
- **Flexibility and integration capabilities into existing tech stacks via API – available in various formats like JSON or GRIB2**



Unleashing the Power of Multi-Objective Voyage Performance Optimisation Engine

Spire Voyage Optimization powered by Theyr predicts a ship's performance in various sea states and meteorological conditions in order to produce the most optimal voyages. Multiple voyage options are calculated simultaneously during the optimization process.

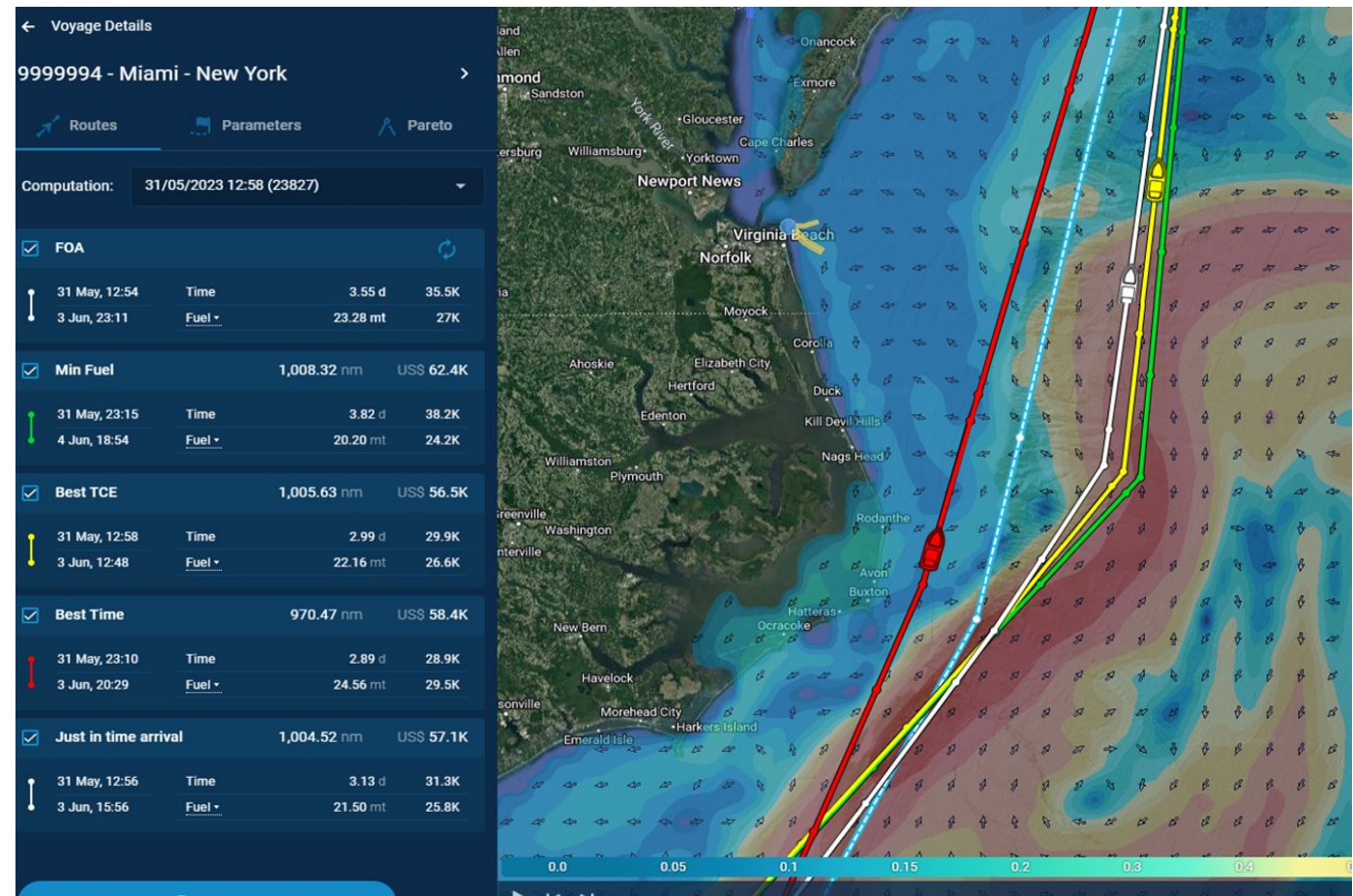


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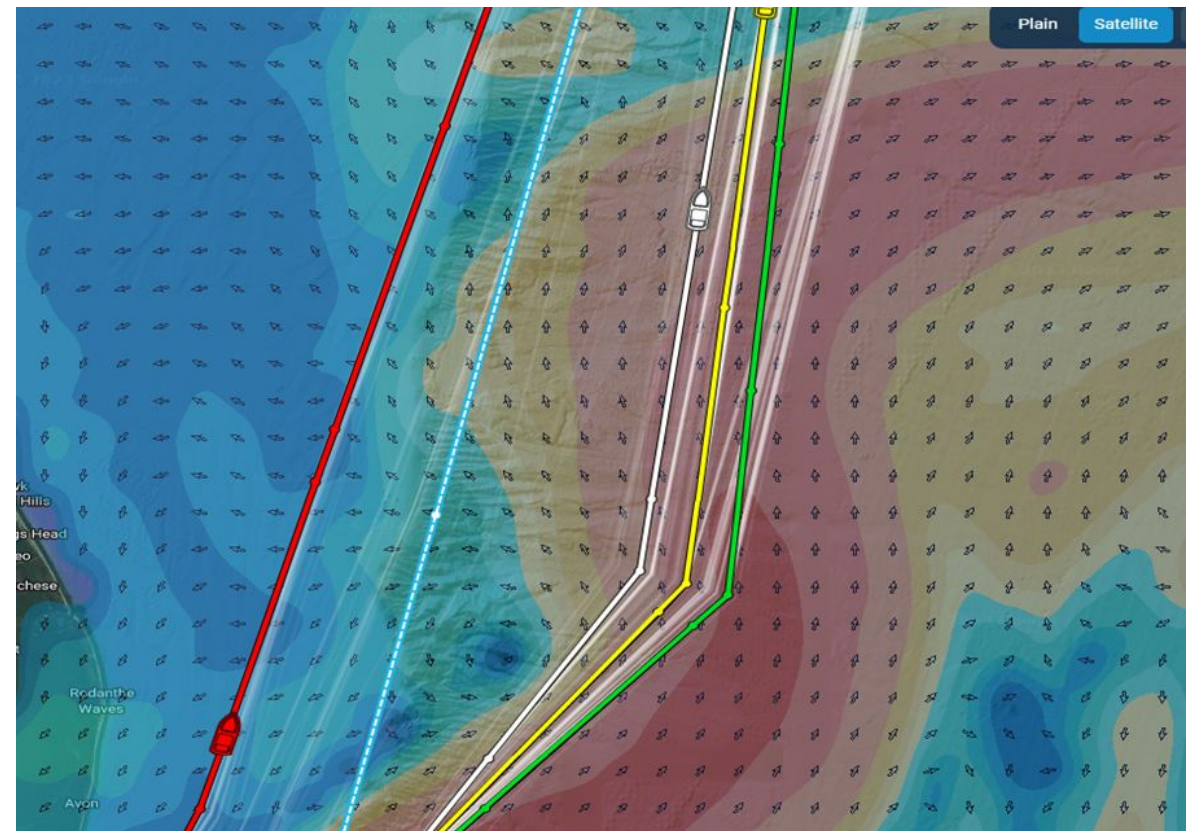
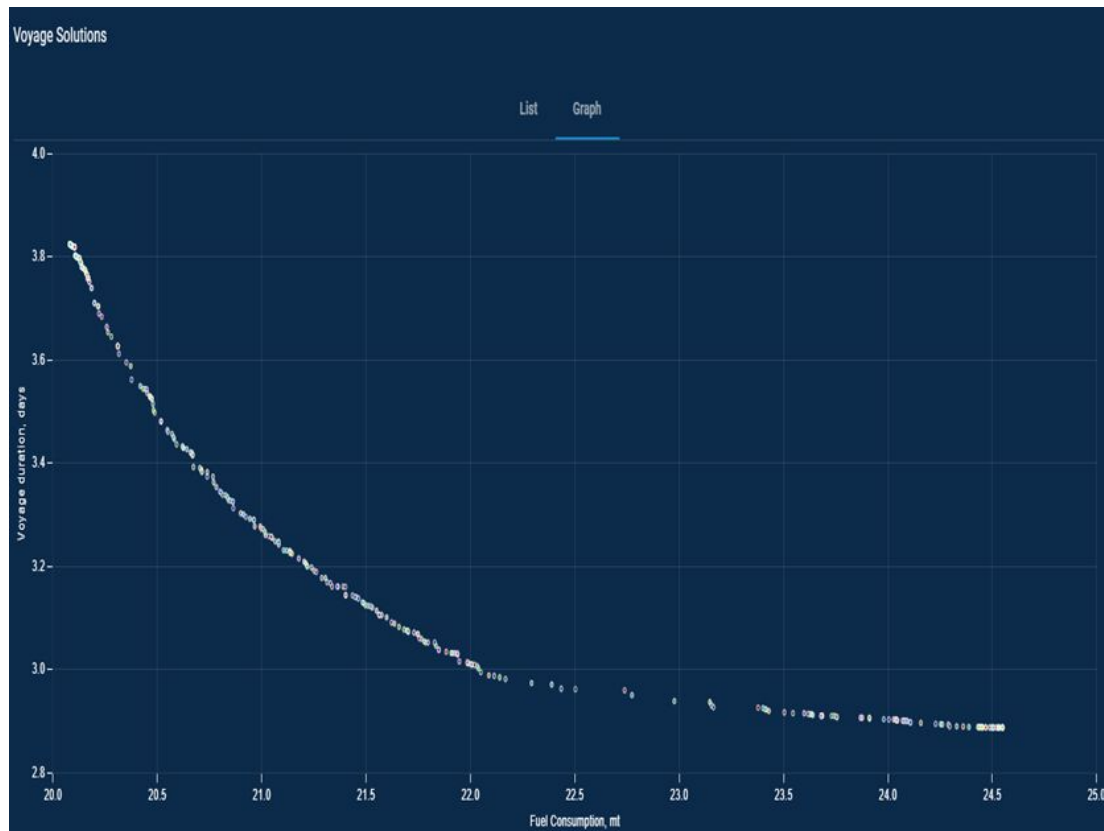
Multiple voyage options (300.000) are calculated simultaneously during the optimisation process,

- Flexible Departure and Arrival Time Windows
- Best Time - Optimal route in voyage duration.
- Min Fuel - Lowest fuel consumption
- Best TCE – Time Charter Equivalent
- JITA – Just In Time arrival (JITA)
- CO2 + Fixed & Variable Speed + RPM & Power
- Pareto Front Optimal Solutions
- Future Proof
- Open Architecture



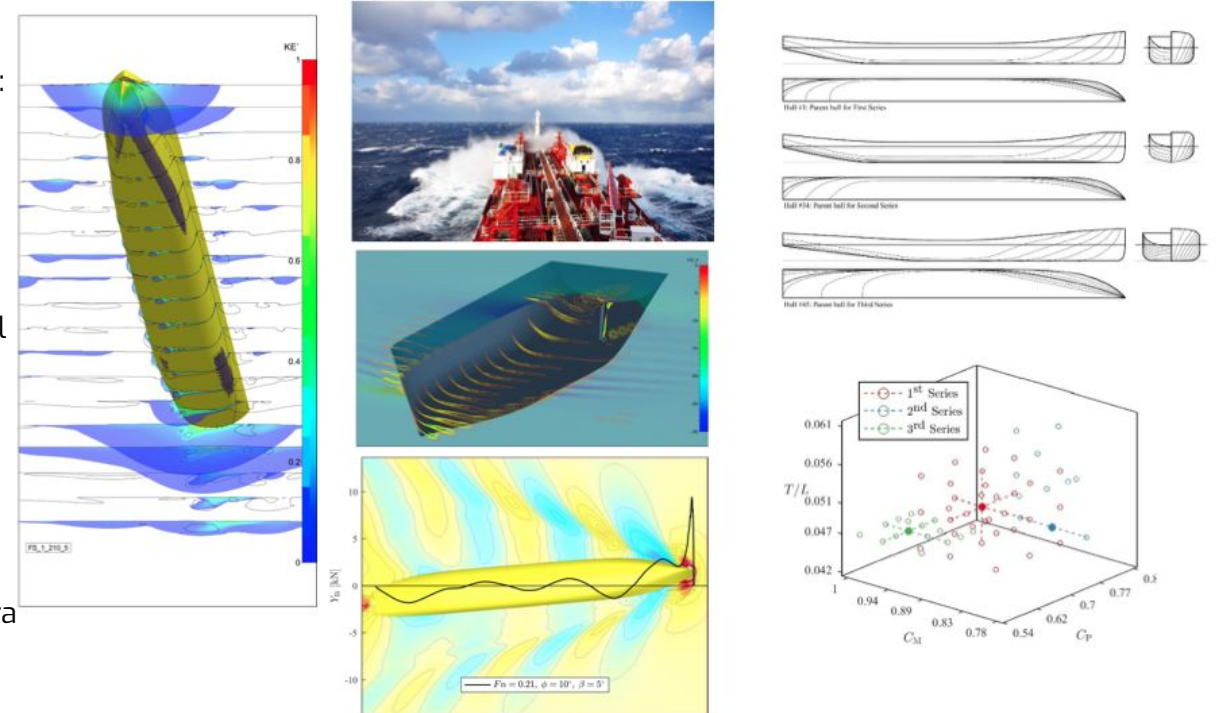
Unleashing the Power of Multi-Objective Voyage Performance Optimisation Engine

- Pareto Front Optimal Solutions (additional 1000 Voyage Options with customer's selectable objectives)



Blue Wasp's High Fidelity Ship Type Model account for Aero and Hydrodynamic Loads in Ship Resistance in 4 DOF: Surge (X), Sway (Y), Roll (K) and Yaw (N).

- **Hull Loads** combination of standard regression formulas and a Machine Learning model trained on the Delft Wind Assist series (2020): a set of more than 1500 validated RANS-CFD simulations.
- **Rudder Loads** using the rudder's main dimensions and using publicly available lift and drag coefficients of different rudder types.
- **Propellor and Engine Model** The main engine power and fuel oil consumption is calculated to deliver the required propeller thrust.
- **Added Resistance in Waves** calculated using the SPAWAVE method, which is an empirical method that relates the wave-added resistance to the sea state and wave direction.
- **Windage** windage in 4 DOF is calculated using the method of Fujiwara *et al.*
- **Service and Fouling Margins**



Conclusion: Leveraging cutting-edge maritime tech is a necessity for tomorrow's operations

Knowing that weather and voyage performance optimization can reduce fuel consumption and CO2 emissions by 5-10% and using high-fidelity ship models improves the output of the route recommendation(s) – **the maritime industry has a new imperative to embrace new technologies, and benefit from the value it brings.**

- **Enhancing Safety and Efficiency:** Enable advanced safety systems, real-time monitoring, and predictive analytics, minimizing risks and maximizing operational efficiency.
- **Meeting Environmental Regulations:** Innovative voyage optimization solutions powered by accurate weather data are crucial for sustainable and compliant operations.
- **Embracing Digitalization:** Benefit from streamlined processes, automated workflows, data-driven decision-making, and improved connectivity, paving the way for smarter, more agile and resilient maritime operations.

Spire's Deep Navigation Analytics™ Platform



Thank you!

From our team, to yours.

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