Operational Oceanography in support of Marine Traffic

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tidetech

Applied Oceanography

Tidetech – Company Profile

- Science company specialising in providing accurate and detailed environment information for the marine industry

- Based in Hobart, Australia

- Founded 2008 by Penny Haire and Roger Proctor

- Core personnel of 6 with additional resource at hand

- Initial focus on recreational / elite sailing- Olympics, Americas Cup

- Engaged with commercial shipping since March 2012

Who uses the Oceans ?

- Global Shipping and Trade
- Fishing
- Domestic Shipping, Ferries, Dredging, Workboats
- Sailing – Racing and Cruising
- Windfarms
- Offshore Resources – Oil and Gas
- Cruise ships
- Humanity – Oceans regulate and drive weather on land

Products

- Catalogue of 300+ individual data products
- Global coverage
- Regional coverage for higher resolution weather, wave and tidal models

Tidetech Environmental Data Parameters

Weather

Wind 10m
Wind 40m
Mean Sea Level Pressure
Precipitation
Air Temperature
Humidity %
Cloud Cover %
Tropical Storms

Waves

Significant Wave Height
Primary Wave Direction
Primary Wave Period
Primary Wavelength
Wind Wave height
Wind Wave direction
Wind Wave period
Swell height
Swell direction
Swell period

Hydrodynamic

Tidal Currents
Non Tidal Currents
Sea Surface Height
Sea Temperature
Sea Ice thickness

Data Sources

- Tidetech Proprietary
- ECMWF
- NOAA / NCEP
- NASA Jet Propulsion Lab.
- Copernicus Marine Environment Service
- University College London
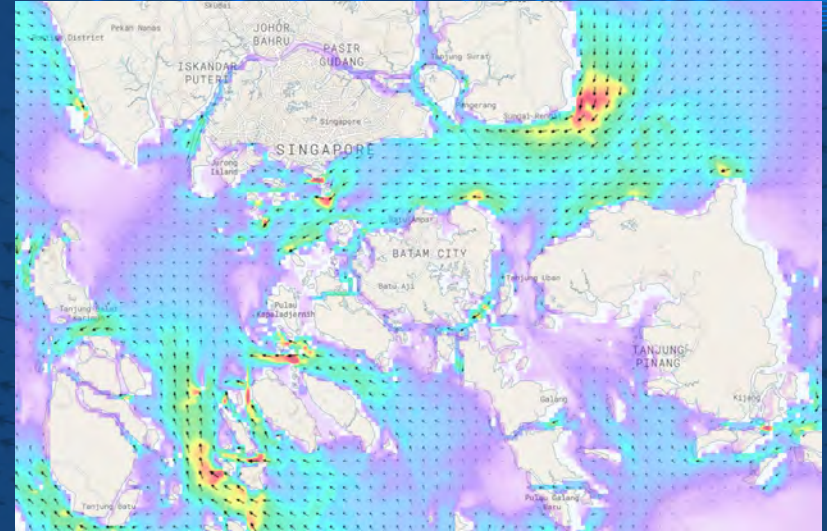
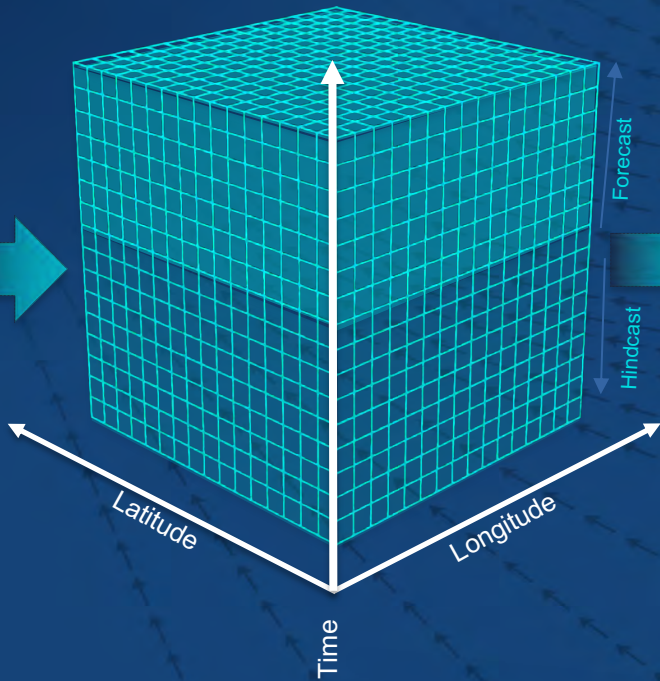Tidetech 0.9km Singapore Strait model

System Architecture

Some features of the system

- The Data Grinder – every dataset is standardised, validated and organised

- All data is stored as readily accessible files on AWS ElasticFileShare, an optimised Network File Share system connected to the API and WMTS

- Access to the files is governed by a PostgreSQL/PostGIS Relational Database System, guaranteeing data integrity, consistency and currency

Some features of the system (cont.)

- Everything is archived, so data can be compared and contrasted against historic forecasts and re-accessed if necessary

- A custom geospatial toolkit in Python is used by every application

- The toolkit farms out the heavy lifting to C++ to maximise efficiency and speed

- The entire system is platform independent; using Docker, Kubernetes and Python we can run the full architecture from the cupboard in the office, on AWS, Microsoft Azure or Google Compute Cloud with minimal friction

API Integration

Servers

Tidetech Interface

Application Programme Interface (API) automates process of selection and download of data
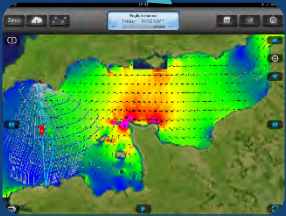
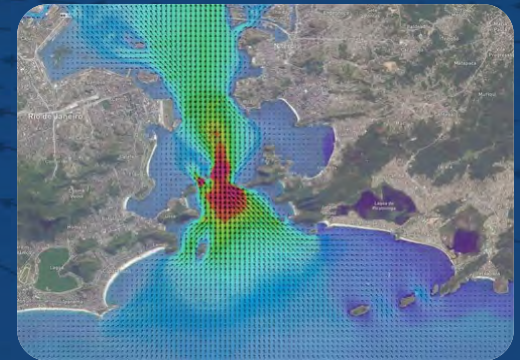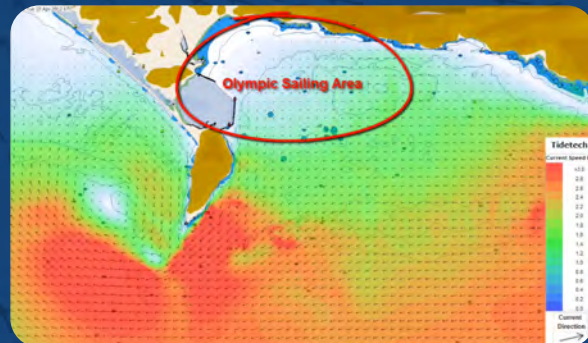**Apps**
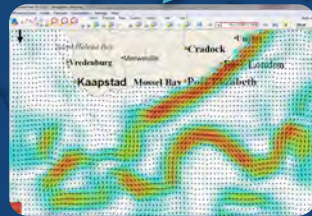
Software

Land Based

On Board

Sailing Support – Recreational and Elite

- Recreational – 5000 subscribers, 200-300 active at any one time

- Recreational – Sydney-Hobart, Hamilton Island, Cowes week, Fastnet, Newport-Bermuda

- Elite – America's Cup, Volvo Ocean Race, Olympics (2012 (UK), 2016 (Rio), 2020 (Japan))

# Example – America's Cup using Tidetech San Francisco Bay Hydrodynamic Model

Commercial Shipping

- Around 80 per cent of global trade by volume and over 70 per cent of global trade by value are carried by sea and are handled by ports worldwide (UNCTAD, 2018)

- But hauling goods around by sea requires roughly 300 million tons of very dirty fuel, producing nearly 3 percent of the world's carbon dioxide emissions, giving the international maritime shipping industry roughly the same carbon footprint as Germany.

- The International Maritime Organization predicts that as trade grows, carbon dioxide emissions from international shipping could increase by as much as 250 percent by 2050.
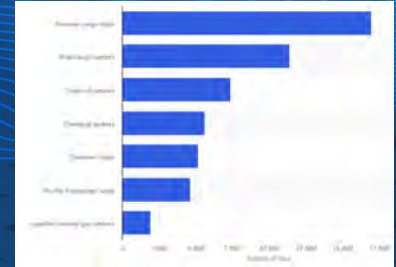
>53,000 vessels
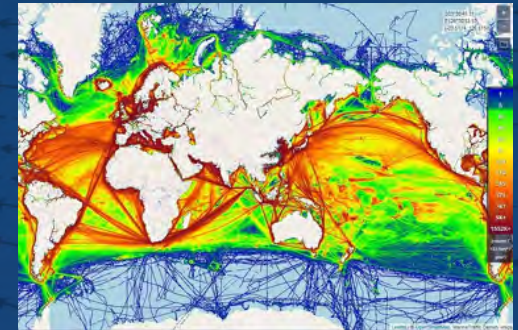
Traffic density

IMO Strategy on reduction of GHG emissions from ships

The Initial Strategy envisages for the first time a reduction in total GHG emissions from international shipping and identifies levels of ambition as follows:

- Carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships.

  - The EEDI provides a specific figure for an individual ship design, expressed in grams of carbon dioxide (CO_2) per ship's capacity-mile (the smaller the EEDI the more energy efficient ship design)

- Carbon intensity of international shipping to decline to reduce CO_2 emissions as an average across international shipping, by at least 40% by 2030, towards 70% by 2050, compared to 2008, whilst pursuing efforts towards phasing them out as consistent with the Paris Agreement temperature goals.

Shipping Company Strategies for emissions reduction

- Exhaust Scrubbing

- Green Steaming – Optimising speed for just in time arrival

- Slow Steaming – Reducing standard speed to use less fuel

- Alternative Fuels – LNG, Reduced Sulphur Fuel Oils, Hybrid, Electric, Wind-assist

- Route optimisation – Avoidance of wave height, adverse weather and currents

- Engine Optimisation – Selection of Engine Performance settings for reduced fuel burn/mile travelled

- Larger Ship Sizes, Ship Design, Autonomous Shipping, Shore based management (e.g. cold ironing)

The envisaged actions to meet the IMO Strategy increase the need for timely and accurate environmental data

Some examples of environmental data use by commercial shipping (Tidetech customers)

In Commercial Operation:

Fleet Management, SSAS Alert Advanced and Marine Asset Tracker 2.0 customers
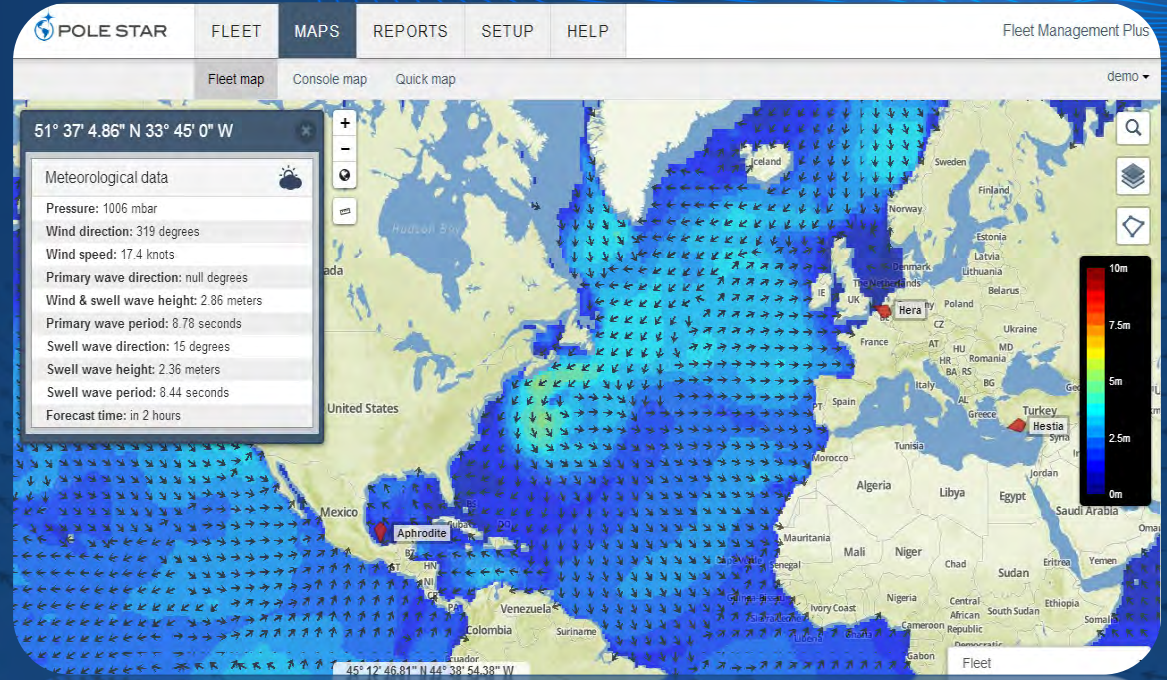
Web map service for met-ocean data layers
- 40,000 vessels, LRIT and fisheries tracking

In Commercial Operation:

ECDIS Integration

In Commercial Operation:

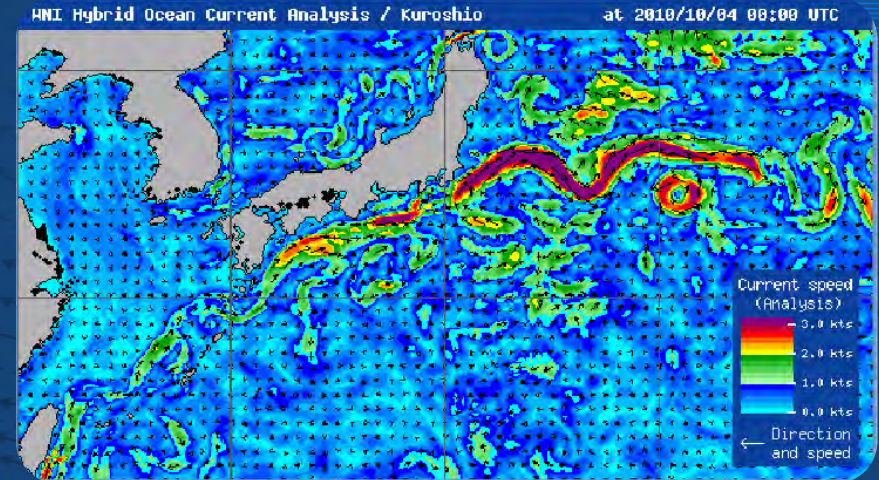<u>Maritime Energy Management Systems</u>

460 vessels using Tidetech Metocean Data
Eniram customers include:
Hapag Lloyd, Hamburg Sud, Carnival, Royal Caribbean and Norwegian Cruise Lines

In Commercial Operation:

Weathernews International
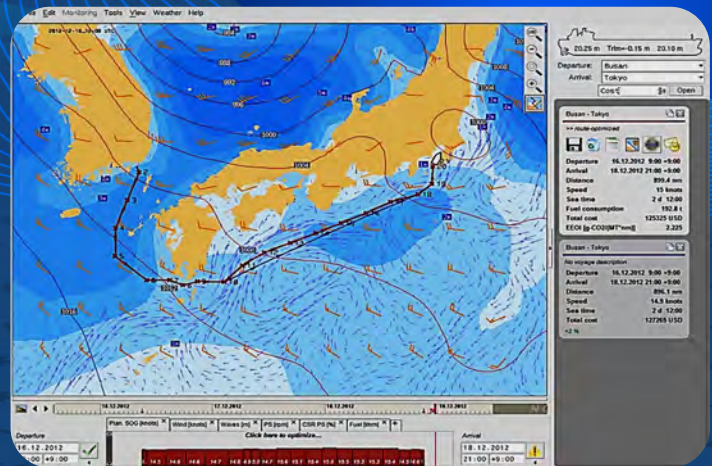Total Fleet Management Service

Supply of current data:
- Global Ocean Currents
- Tidal model – Singapore and Malacca Straits
- Tidal model - North Australia / Indonesia
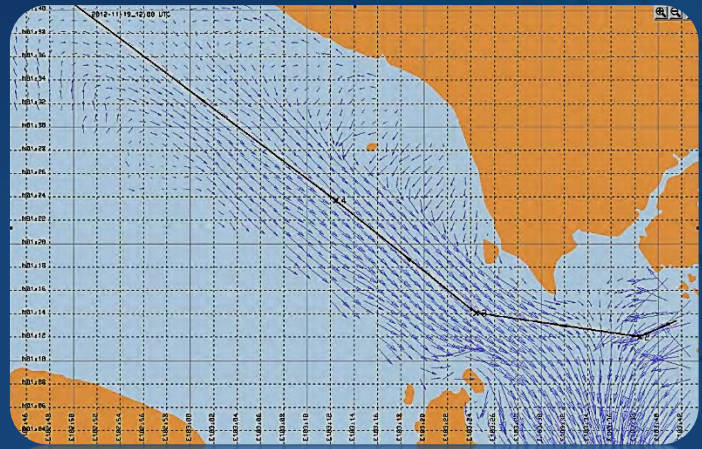- 5,000+ vessels

In Commercial Operation:

ClassNK Napa Green
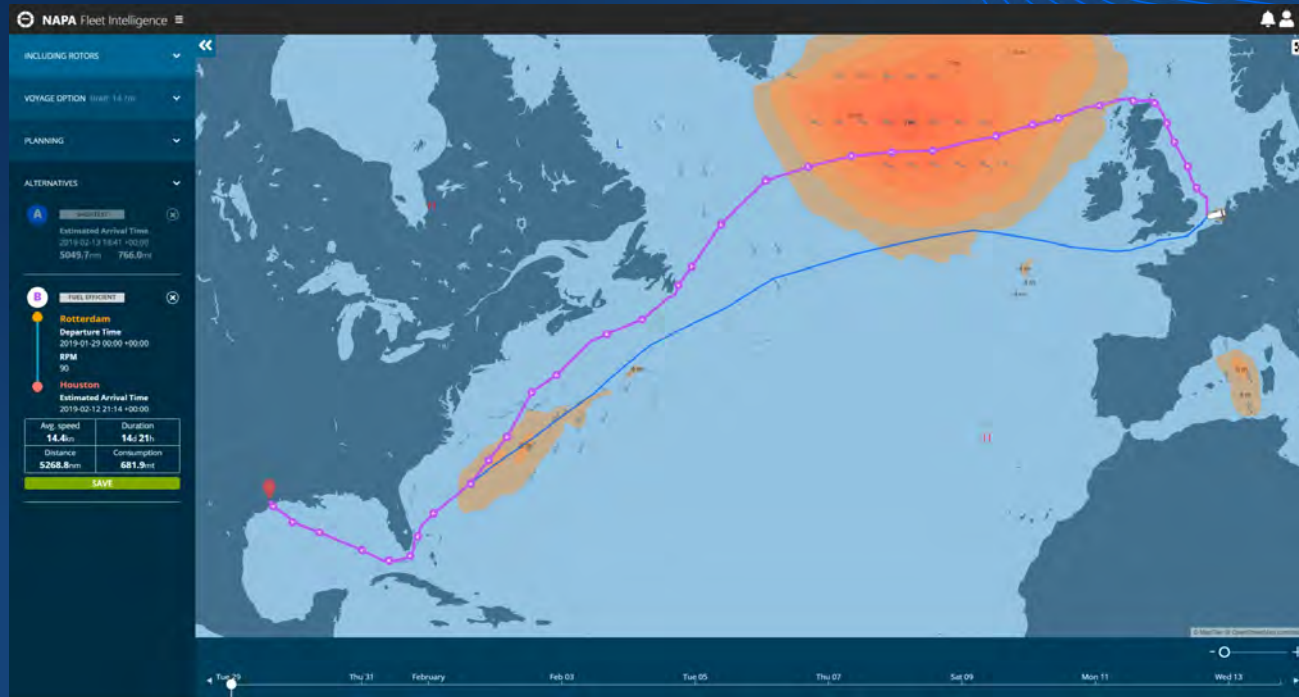Voyage Optimisation

Reported savings of
4-6% (BORE vessels)

450 vessels using data directly
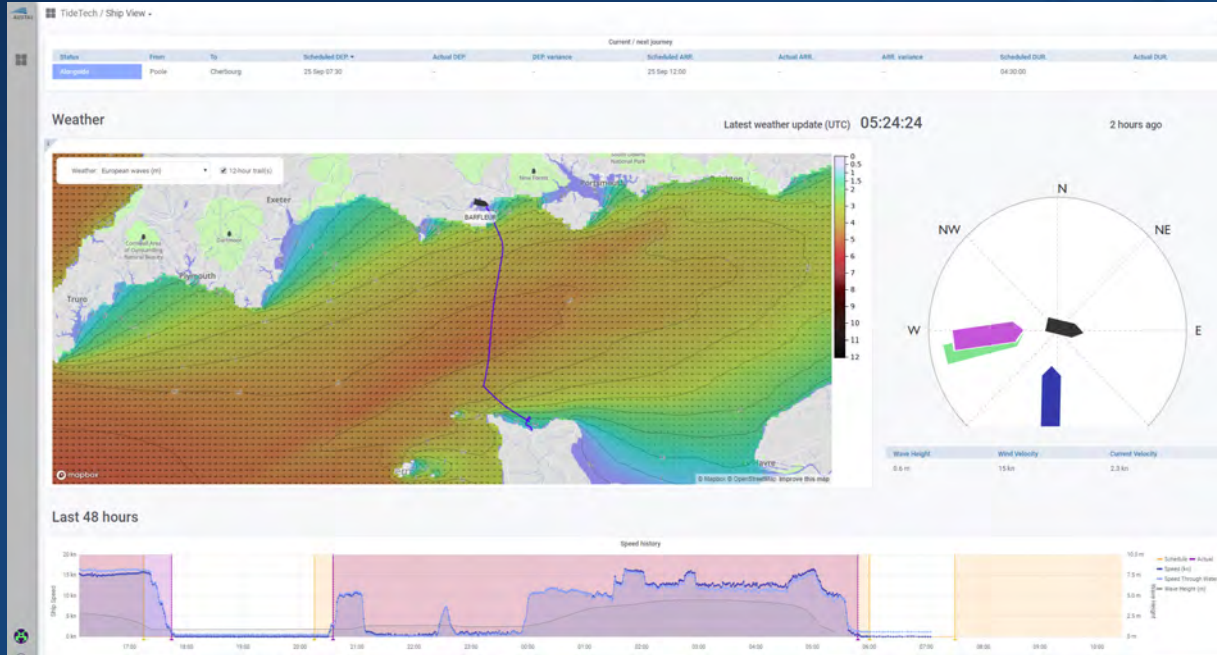
55,000 vessels for Fleet Monitoring
https://fleetintelligence.napa.fi/

Images courtesy of NAPA Voyage Optimisation, Star Cruises and BORE Finland

Napa route optimisation

Optimised route saves 84 tonnes of fuel = 46,200 $USD and 261 tonnes CO2

Austal MarineLink
## – showing Brittany Ferry and effect of big waves

Business partnership with CSIRO - KickStart

Aim:

- to explore opportunities to use the Environmental Model System to support operational oceanography, i.e. in delivering 24/7 oceanographic services to commercial shipping and sailing

- Test case: Enoshima, Sagami Bay, site of 2020 Olympic Sailing

Enoshima ocean surface currents and temperature
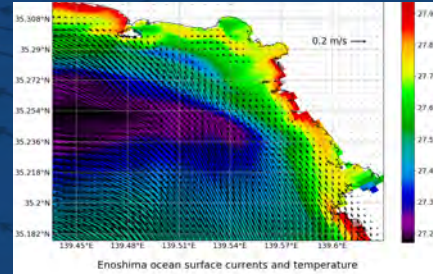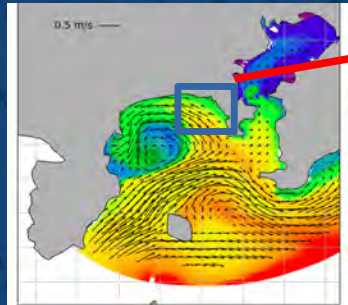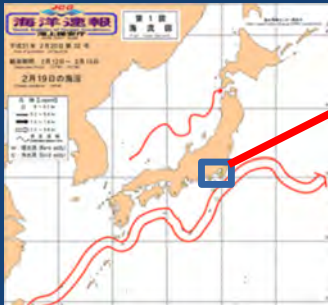
Thanks for listening

www.tidetech.org

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