



Specialists in Oceanography

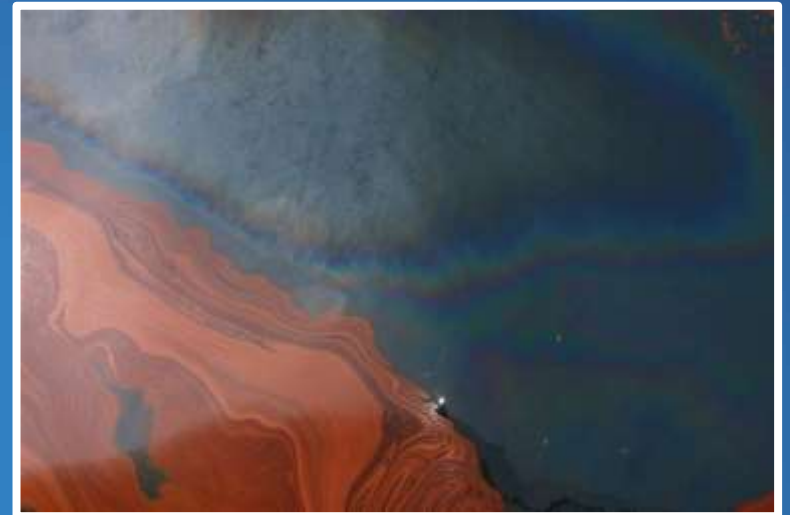


Modelling to tackle marine debris

Dr Brett Beamsley

Presentation overview

1. Introduction to MetOcean Solutions
2. Tracking marine debris with MetOcean Track (MOT)
3. MetOcean Solution API tiles
4. Putting it into a greater perspective
How our work complements the SDGs and UN IGIF





Marine weather expertise

Specialists in numerical modelling and analytical services in meteorology and oceanography.



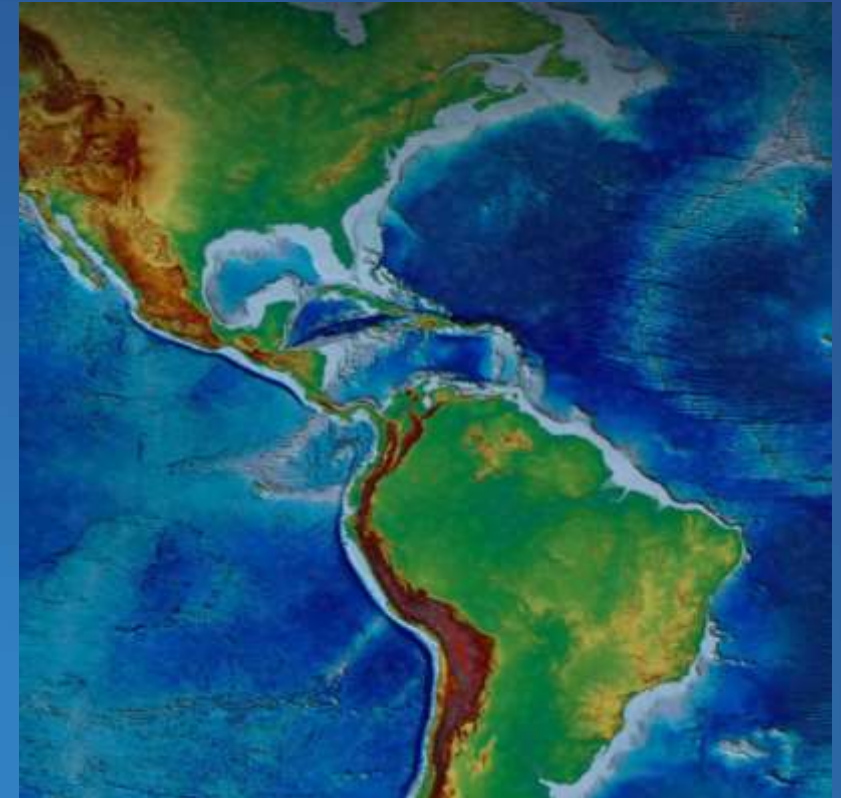
Strong science and technical skills

PhD level scientists, experienced mariners and technical experts - all under one roof.



Extensive track record and solid experience

As a team, we understand the ocean and know what it is like to work at sea.





MetOcean Solutions | metocean.co.nz

Operational Oceanography



One of the largest team of physical oceanographers in the Southern Hemisphere



Strong focus on scientific research and innovation



Operational wave and ocean current models all over the world. Ours science team deploys the latest numerical solutions inside an agile technology stack.



MetOcean Solutions is a division of Meteorological Service of New Zealand (MetService).



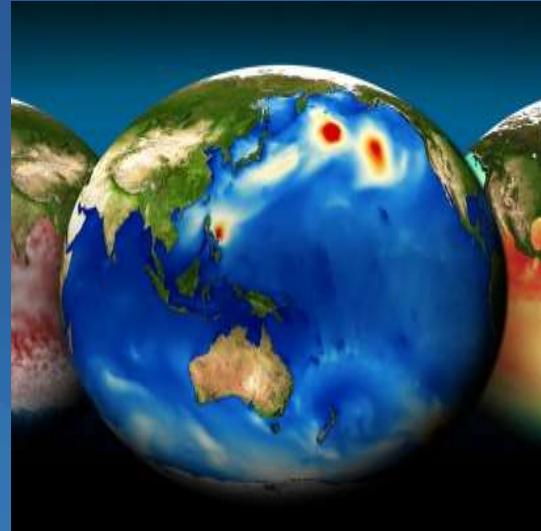
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Operational Oceanography



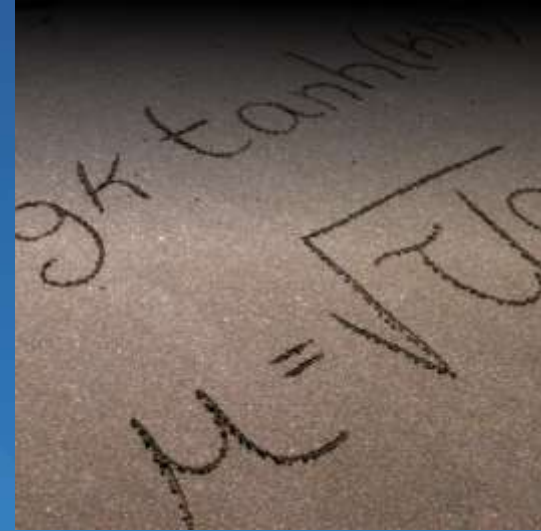
Weather Forecast

Accurate, reliable and customised



Historical Weather

Multi-year simulations for any location



Scientific Consultancy

Modelling expertise, analysis and advice



Research & Development

Significant benefit to marine industries



Tracking particles using MetOceanTrack

Particle Parameters



Particle Track Model

$$\frac{du_p}{dt} = \tilde{u}(x, y, z, t) + u_t$$
$$\frac{dv_p}{dt} = \tilde{v}(x, y, z, t) + v_t$$
$$\frac{dw_p}{dt} = -w_s + w_g + w_t$$

Physical Parameters

Hydrodynamics

Waves

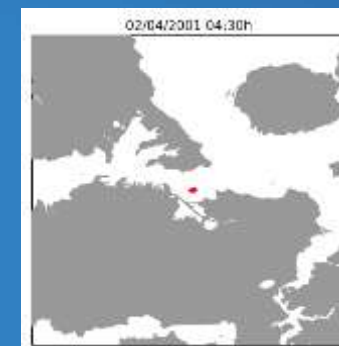
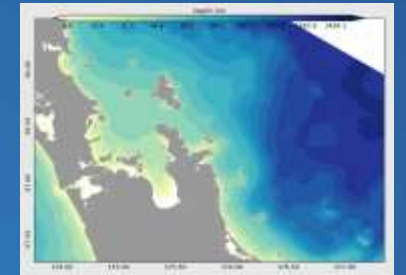
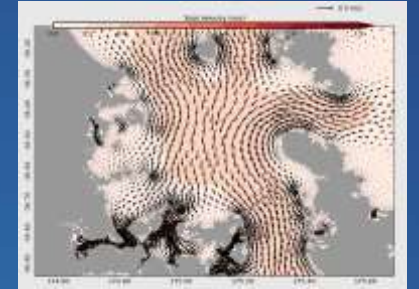
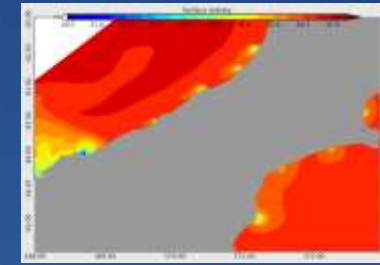
Wind

Salinity

Temperature

Bathymetry

Coast line



MetOceanTrack

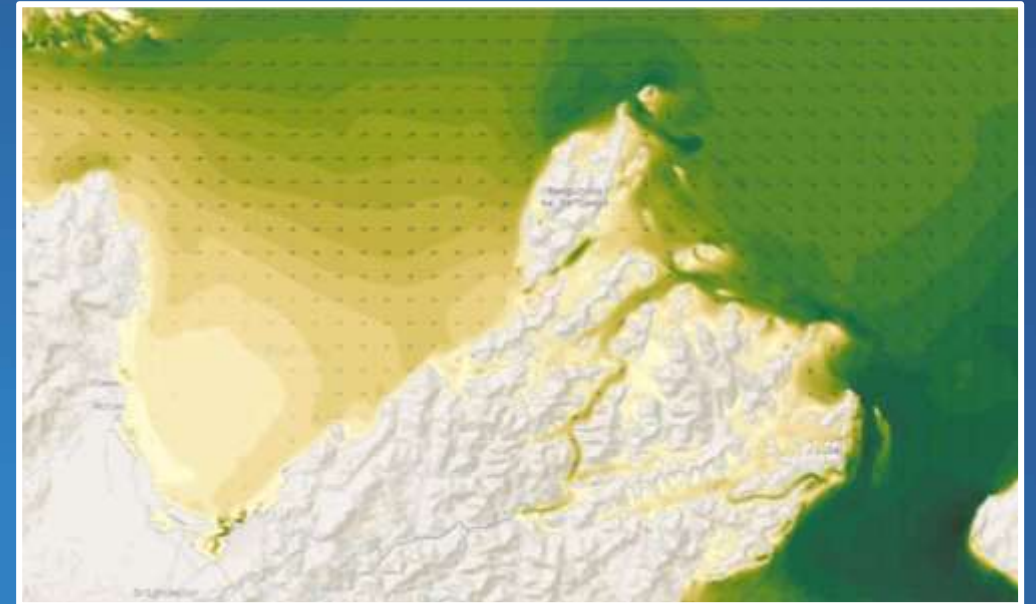
Key features

- Uses **Opendrift** (Open-source software/numerical model)
- **Global datasets** (e.g., Mercator Ocean) and MetOcean Solutions' high resolution hydrodynamic datasets (ROMS and SCHISM)
- **Multiple datasets** in the **same simulation** → Regional to Global Scale
- Considers **waves** and **winds** which influence the flow of particles
- Defines **particle behaviour** which may interact with the environment and affect particles flow
- Infrastructure is backed by Cloud computing → Many **concurrent simulations**
- Visualisations are backed by the latest technology in Web maps, such as Mapbox and MetOcean's APIs (WxTiles in the future)



MetOceanTrack

SCHISM surface current high-resolution model





Examples of a particle release

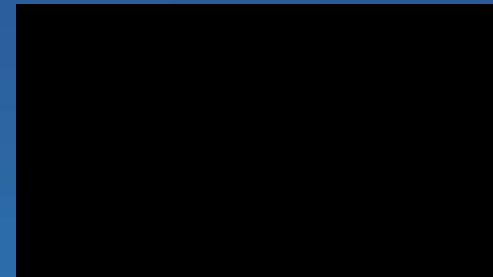
Drakes Passage, Southern Ocean

Particle movement

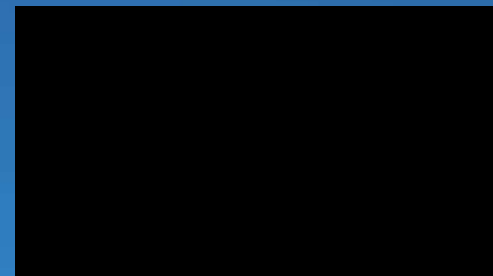


The Marlborough Sounds, New Zealand

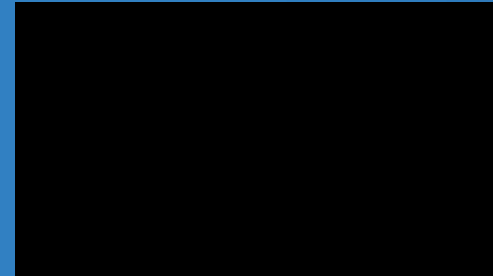
Particle movement



Heatmap



Trajectory



MetOceanTrack

Applications

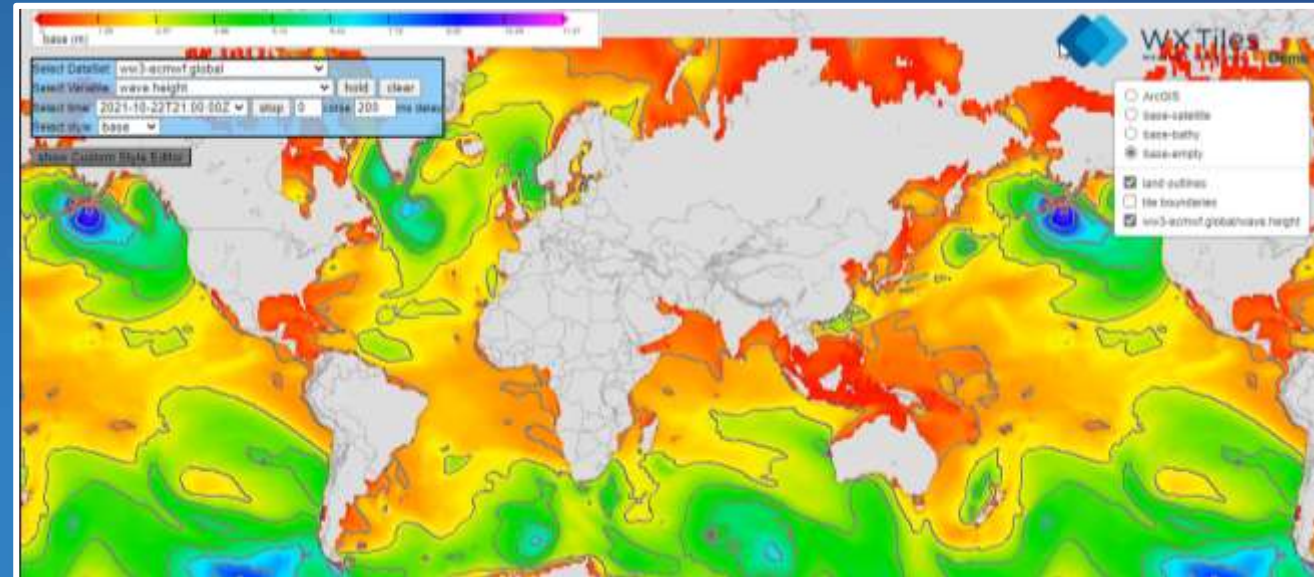
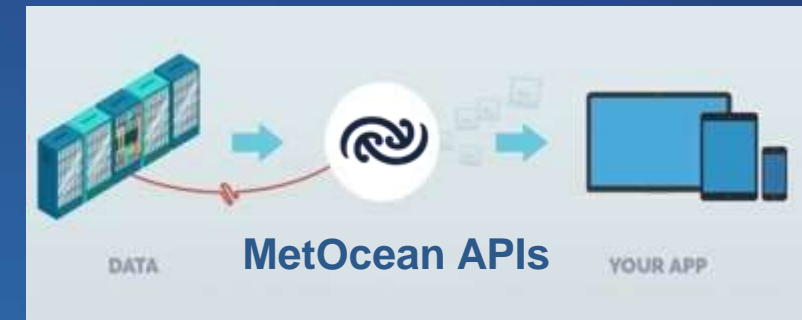
- Marine debris
- Oil spills
- Marine biosecurity
- Aquaculture
- Biological hazards
- Biological oceanography
- Marine biology



APIs Developed in the MetOcean Division

A new approach to weather intelligence

- **Forecast API:** Forecast data for any point in the world from model data.
- **Tiles API:** Tiles mapping service for gridded datasets. Not limited to model data, also for spatial observations such as satellite and radar.
- **Observations API:** historical and real-time in-situ measurements data.
- **Lightning API:** Real-time global lightning data.
- **Cyclones API:** Tropical Cyclones API from multiple sources.
- **Hindcast API:** Statistical parameters and time-series for hindcast data.
- **Tide API:** tidal timeseries, high and low water and tidal constituents from stations and models.
- **Spectra API:** directional wave spectra data from spectral wave models or wave buoy observations.



<https://tiles.metoceanapi.com/>



MetOcean APIs applications

A new approach to marine weather intelligence

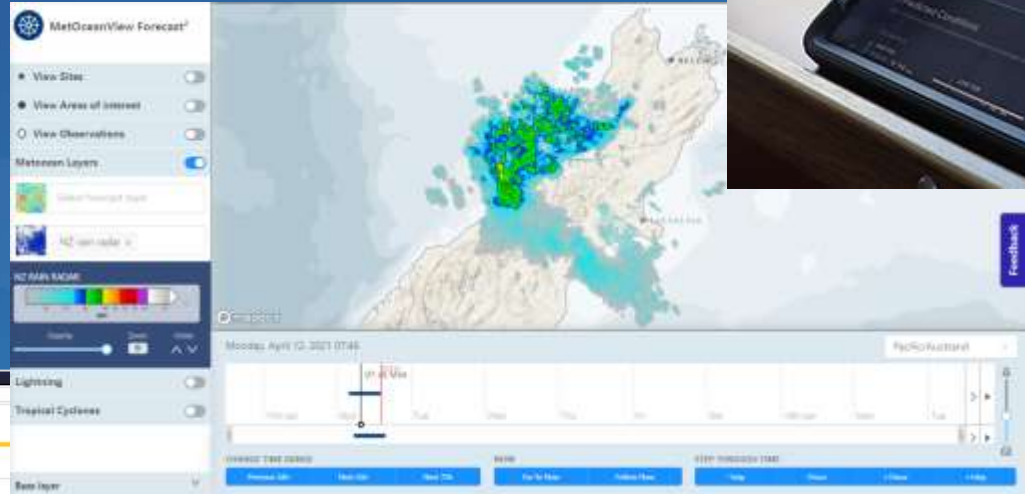
Forecast API and Tide API
Incorporated by eMPX

Forecast API at NZ Coastguard App



Image source: eMPX website

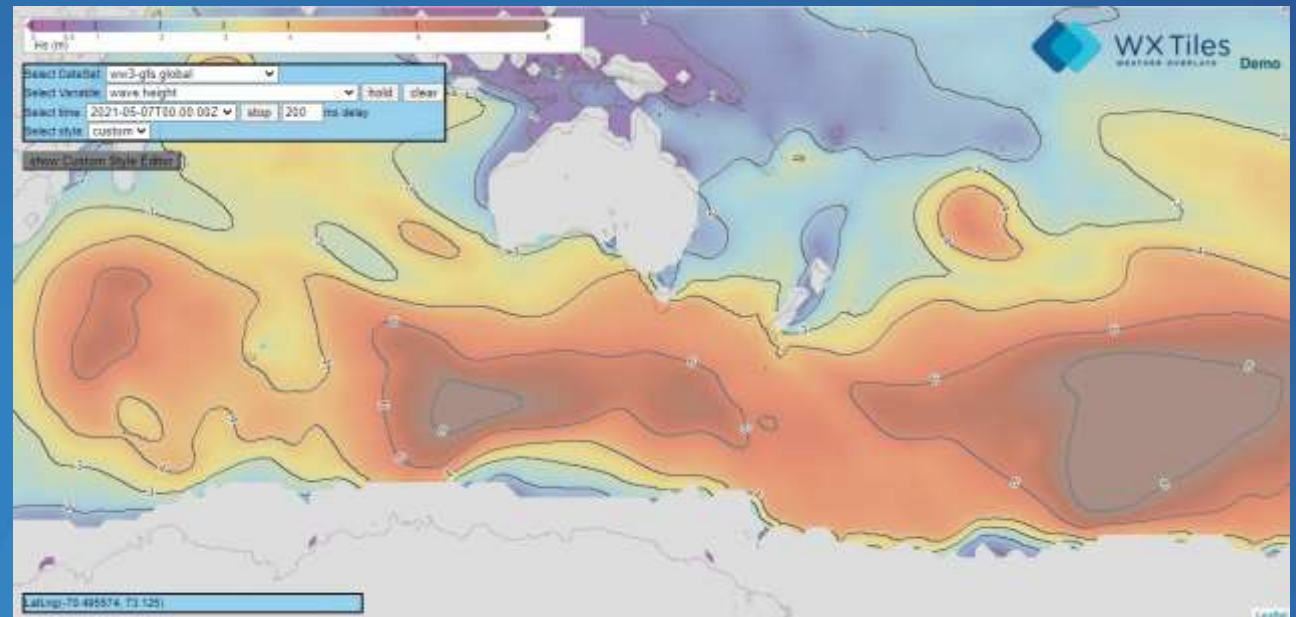
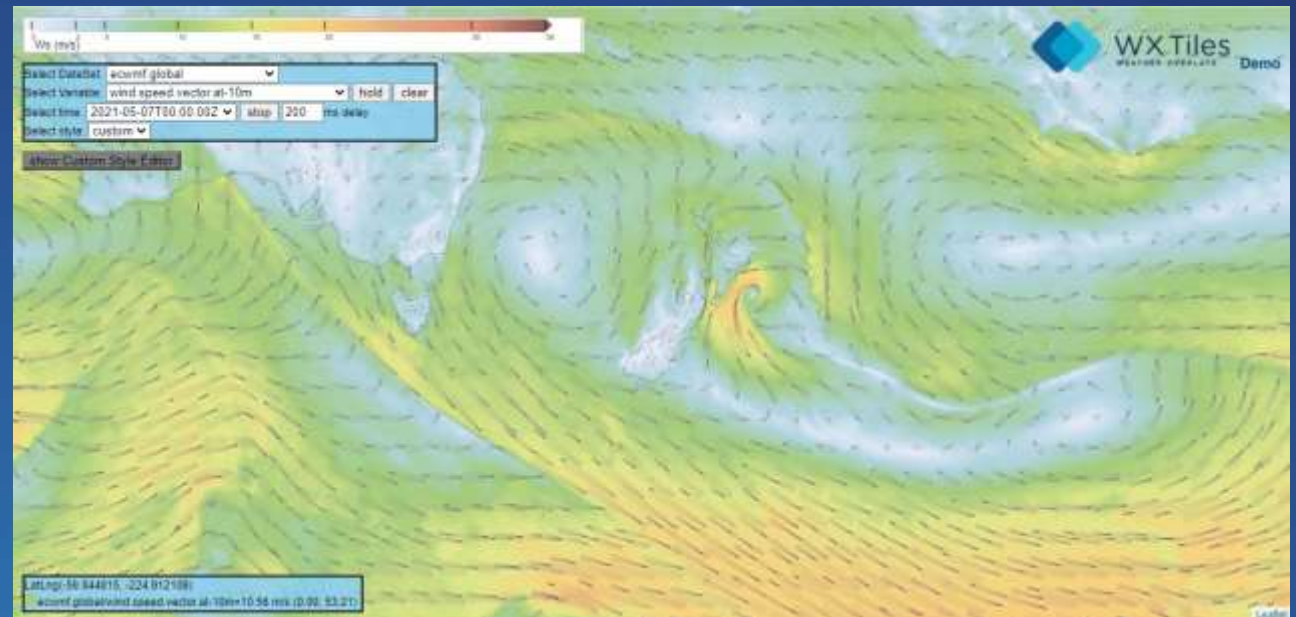
Tiles API: map overlayer



Tiles API

Key features

- Add **dynamic** and **interactive weather visualisation** and functionality with the Tiles API
- Premium data layers that deliver up to the minute **high resolution** information about current and future weather for your location
- The Tiles mapping has capability to include **model data and spatial observations** such as satellite and radar



<https://tiles.metoceanapi.com/>



How our work fits into the larger perspective

United Nation's Sustainable Development Goal 14 Life below water

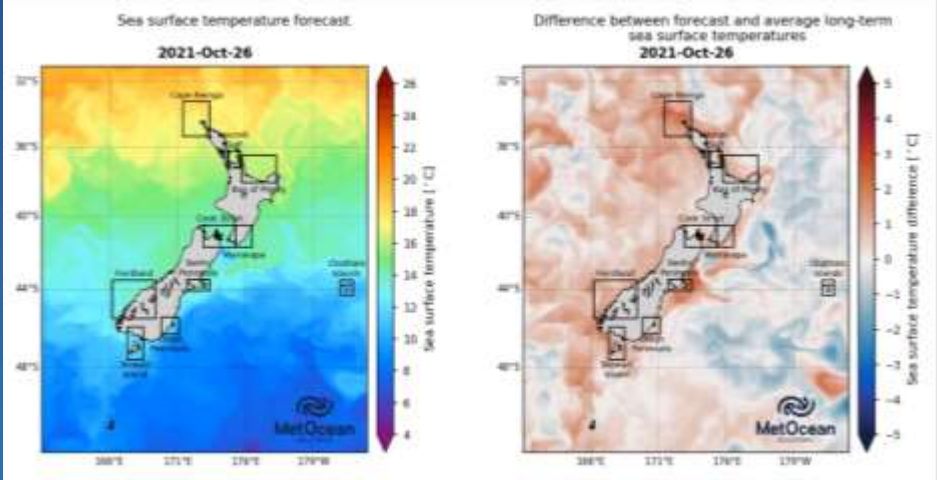
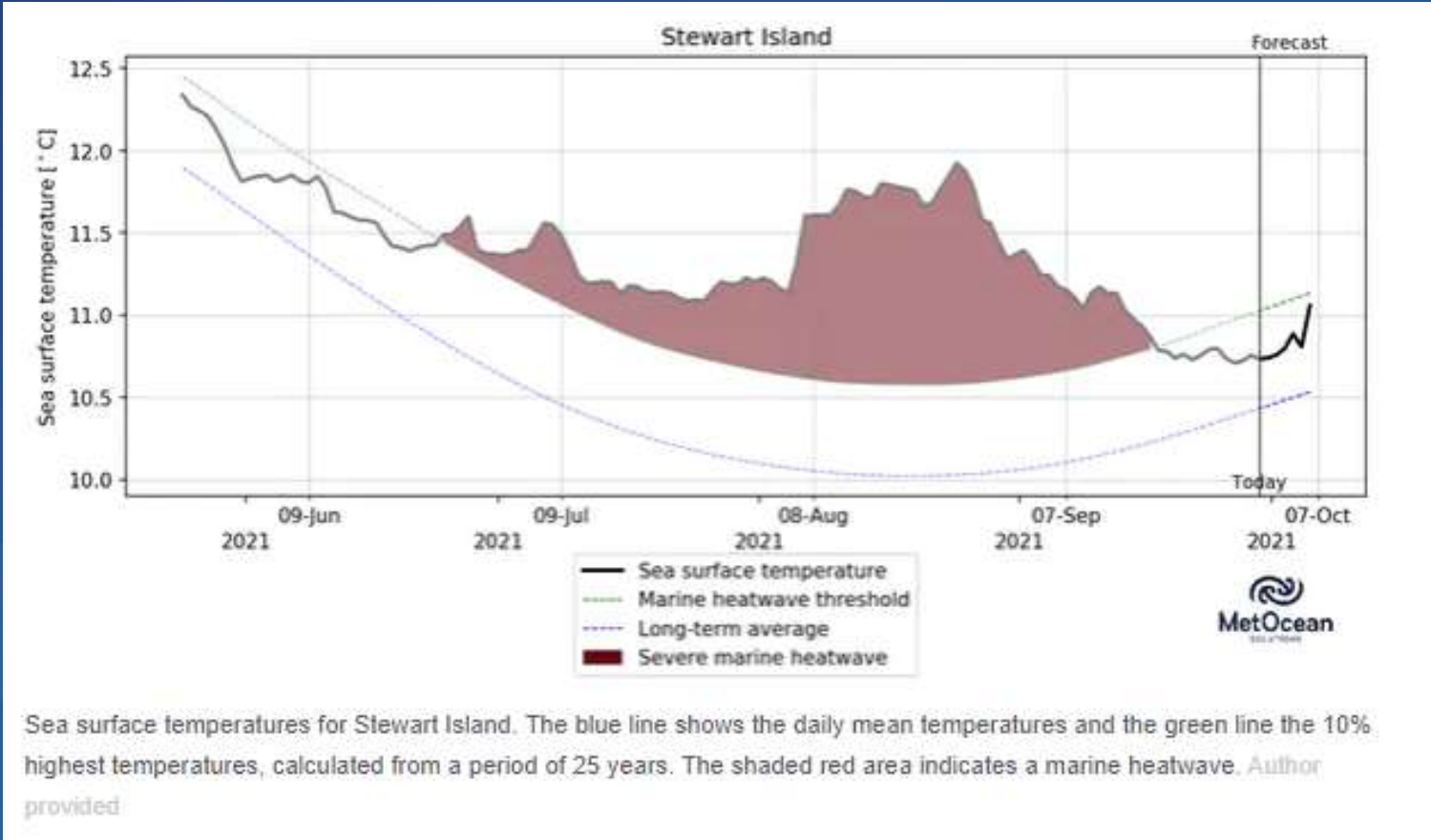
MetOceanTrack is applicable to stakeholders working to “prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution”

The Integrated Geospatial Information Framework (IGIF)

MetOcean Solutions' API services makes high quality data readily available to “assist in the development, integration, strengthening and maximisation of geospatial information management”



Example: MetOcean Solutions' models monitor the occurrence of winter marine heatwaves



Stewart Island, New Zealand





Specialists in Oceanography



Thanks for listening

