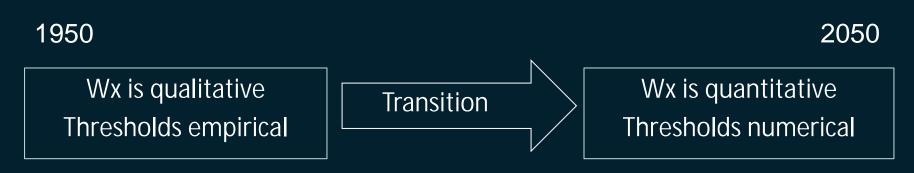
Marine Weather Decision Making



Peter McComb MetOcean Solutions / MetraWeather Meteorological Service of New Zealand



Marine Weather Decision Making



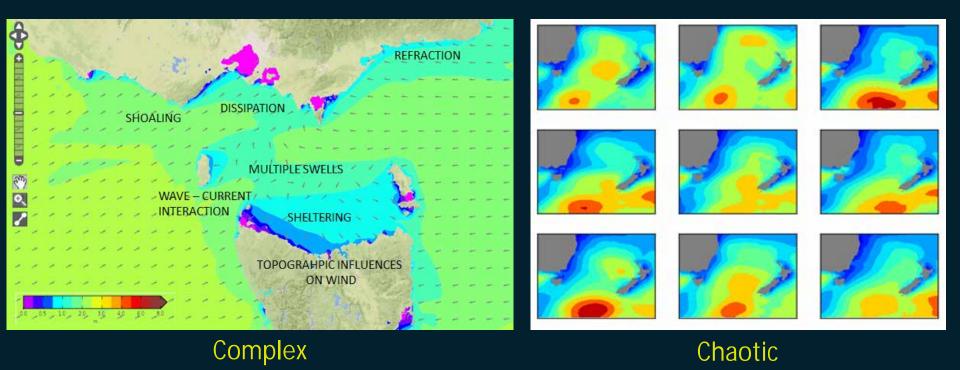
In 2015 we are somewhere along this spectrum.

A key parameter in the decision-making process is the perception of safety:

- **GREEN** we feel safe and comfortable everything is fine
- YELLOW it's ok but we are a bit worried about......
- **RED** this is dangerous we should not be out here doing this!
- INGNORANCE we are unaware of the risk profile



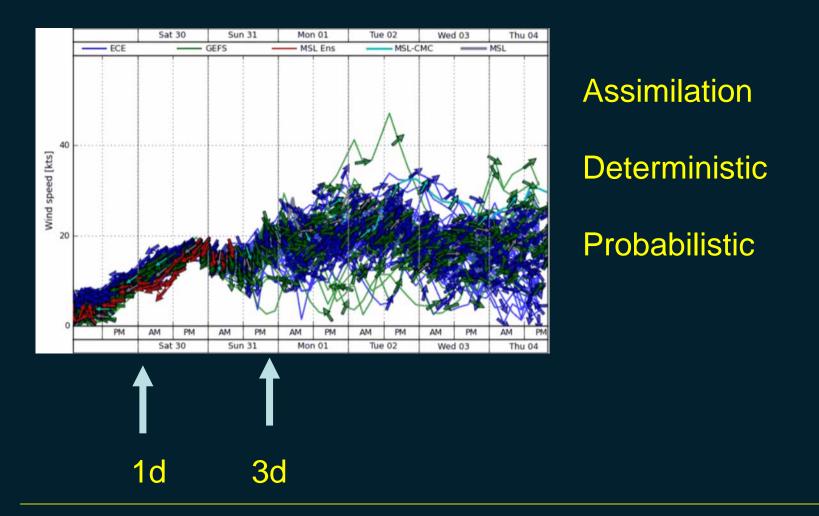
The technical challenge



The consequence of living on a wet, rotating planet is complex, chaotic weather.

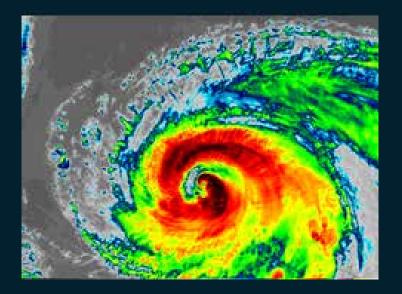


Finding the balance for practical marine guidance





Future data assimilation opportunities

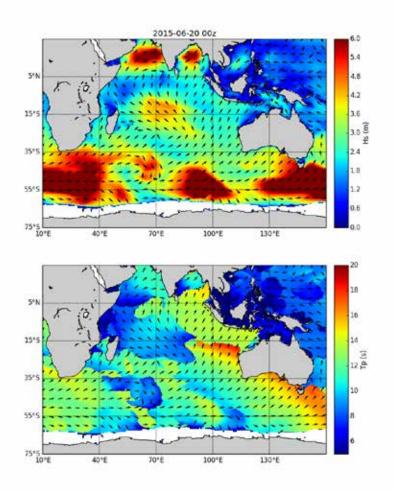


Hyper-spectral soundings Wx telematics Cheap sensors Private data networks

What will the weather business look like in 2020?



Local or regional scale data assimilation – waves



Improve model physics

Improve timing

Spectral shapes

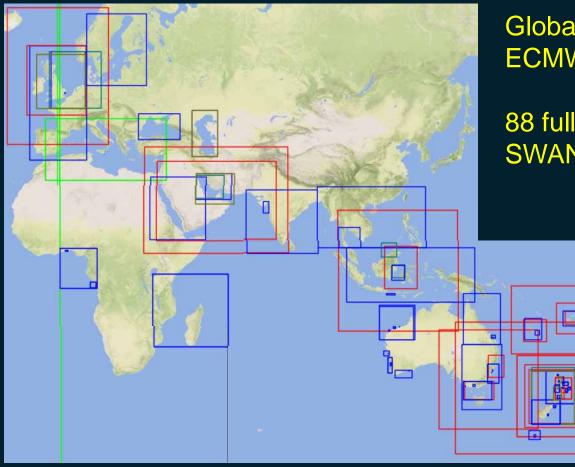
Sea state changes

Groupiness, Hs/Hx

Allow better human interpretation



Dynamical solutions – nested models



Global WW3 forced with ECMWF, NCEP, CMC, (PWS)

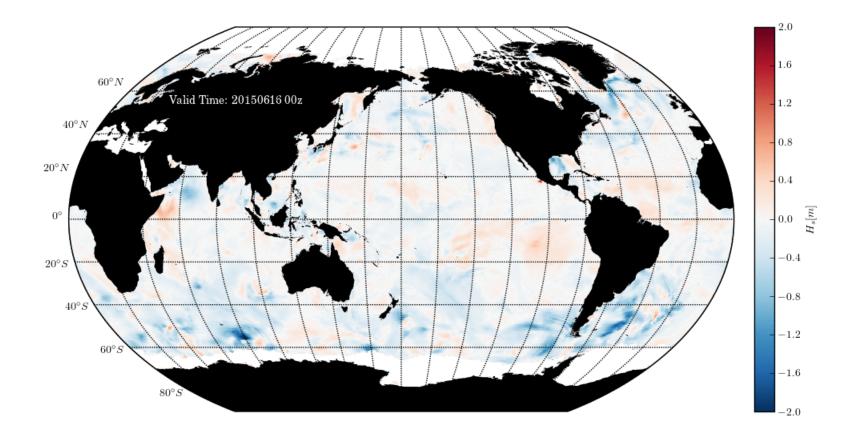
88 fully nested domains SWAN, ROMS, WRF





WW3 (ECMWF – GFS) Hs difference

Dynamical solutions - global scale wave

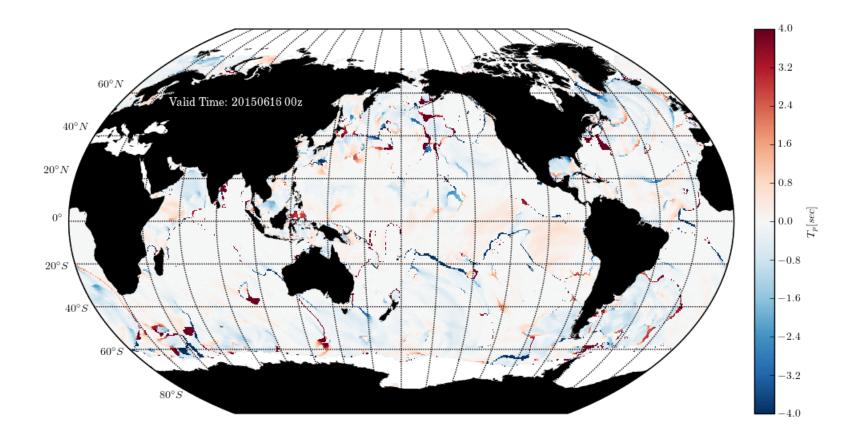




POWERFUL WEATHER INTELLIGENCE.

WW3 (ECMWF – GFS) Tp difference

Dynamical solutions - global scale wave

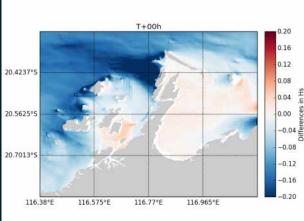


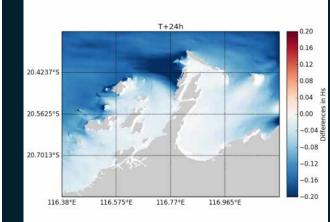


SWAN (TC96 -ST6)

Dynamical solutions – local scale wave

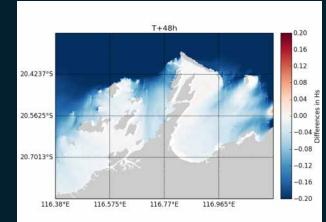
T+0h

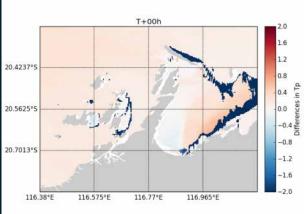


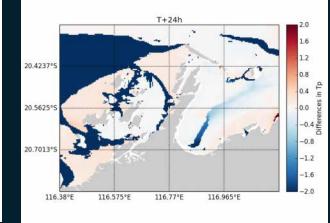


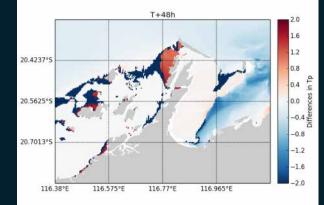
T+24h

T+48h



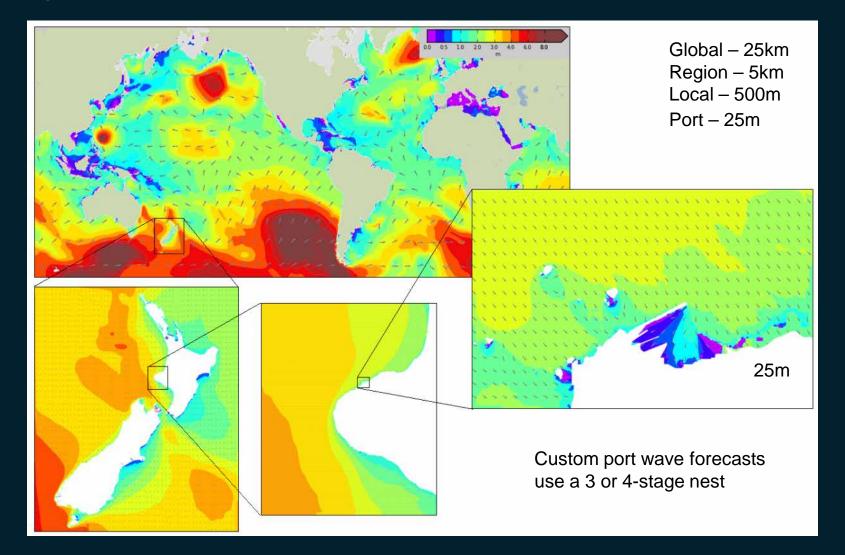








Dynamical solutions - wave





ECMWF and NCEP RTOFS and ORCA12

32.48

31.76 31.04

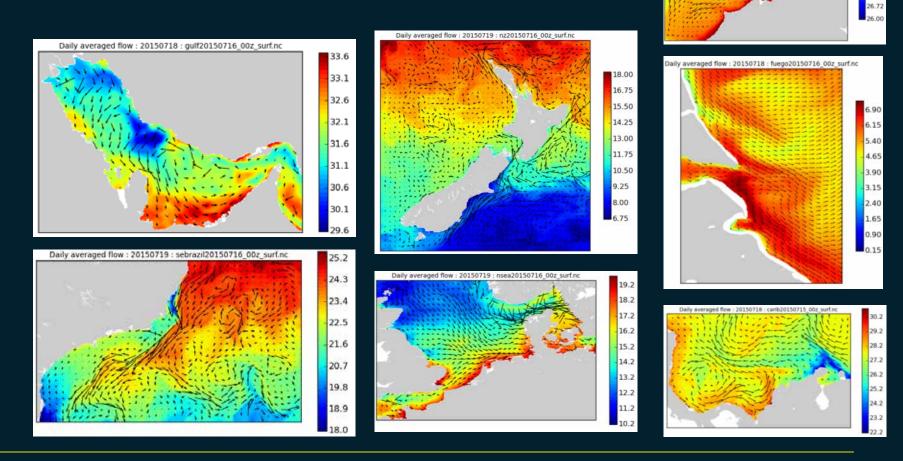
30.32 29.60 28.88

28.16 27.44

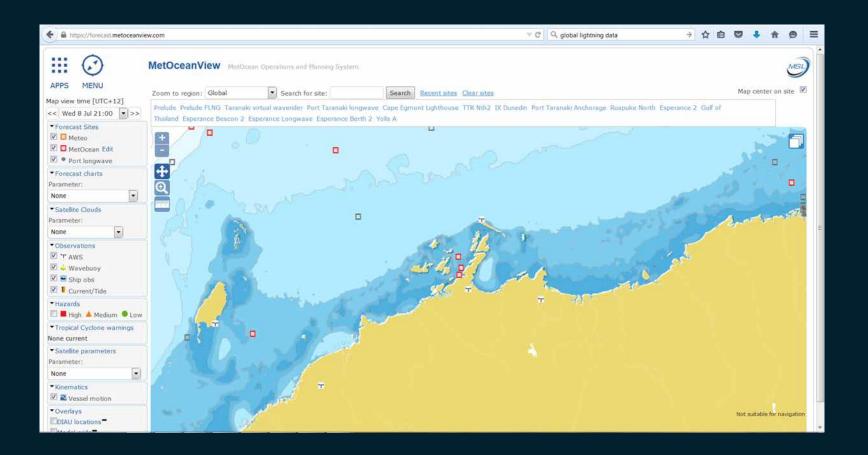
Dynamical solutions - ROMS

Bass Strait, Makassar Strait, Campos Basin, Patagonia, North Sea, Persian Gulf, Sabah Malaysia, New Zealand, Vietnam, Columbia, Dubai

Coming soon - South Australia, Gulf of Thailand, NW shelf Australia



Dynamical solutions - visualisation



Fully nested wave, wind and current models



Dynamical solutions

PM

AM

Fri 10

PM

AM

PM

Sat 11

AM

PM

Sun 12

AM

PM

Mon 13

MA

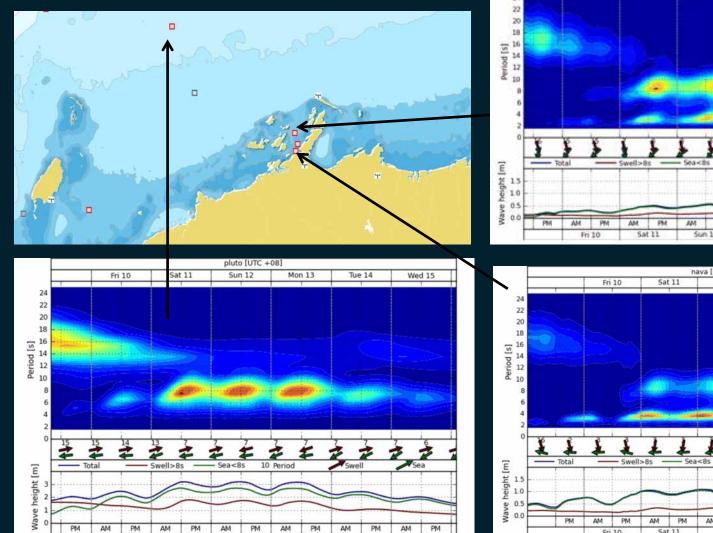
PM

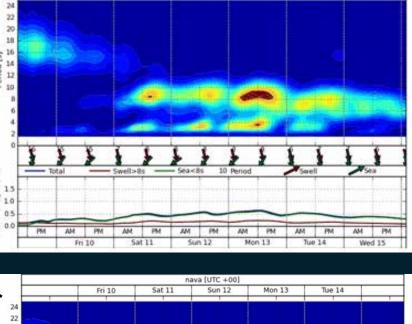
Tue 14

AM

PM

Wed 15





viva26 (UTC +08]

Mon 13

Tue 14

Wed 15

Sun 12

Fri 10

Sat 11

AM

Sun 12

Sat 11

Fri 10

10 Period

PM

MA PM

Mon 13

Swell

AM

PM

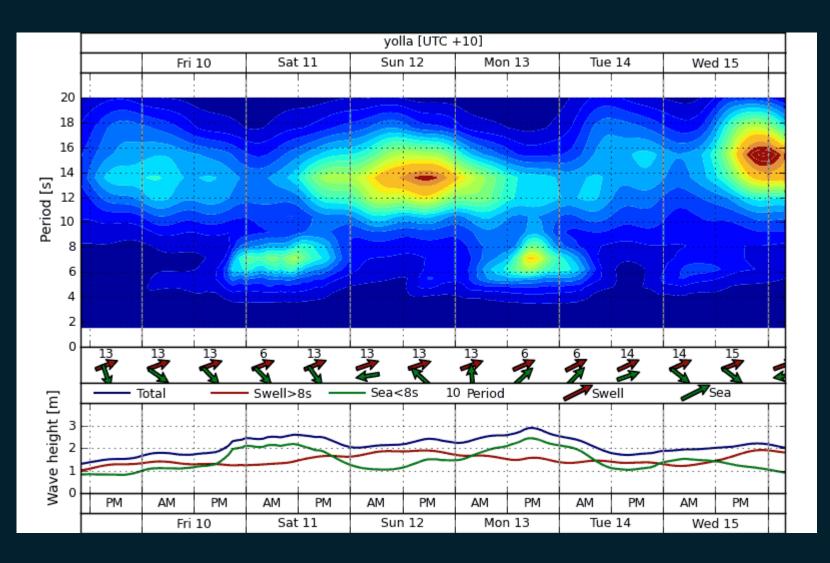
Tue 14



Sea

AM

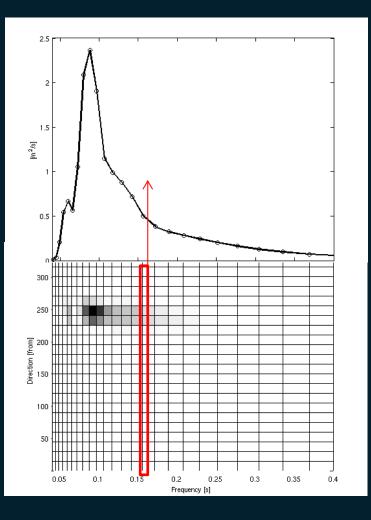
Dynamical solutions







Probabilistic solutions – Downscaled Super Ensemble

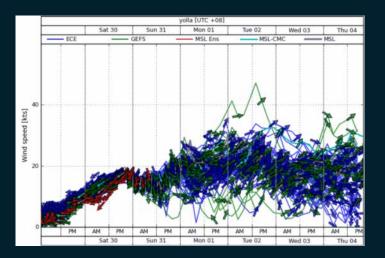


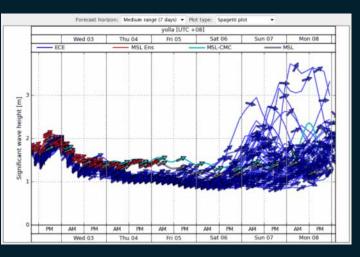
- 1. Select one or more points from global model
- 2. Aggregate co-temporal spectra
- 3. Reduce inshore spectra
- 4. Postulate linear relationship:

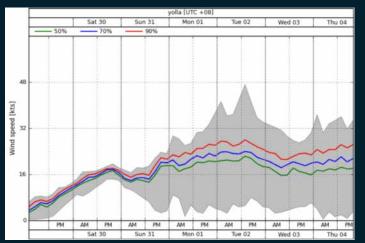
$$S(f) = A_{ij}D(f,\theta_j)_i + B_i$$

- 4. Fit model coefficients for each frequency
- 5. Apply statistical model to new offshore spectra
- 6. Calculate spectral parameters

Forecasting the uncertainty









Wind

Wave

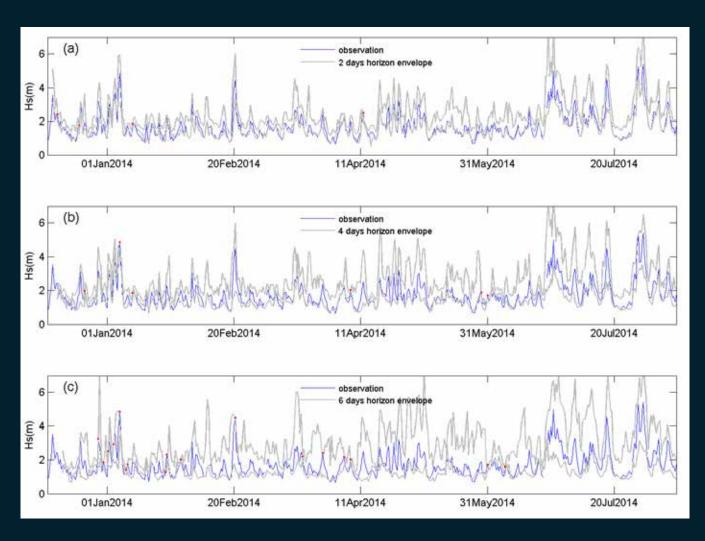


Forecasting the uncertainty - validation

2 day horizon

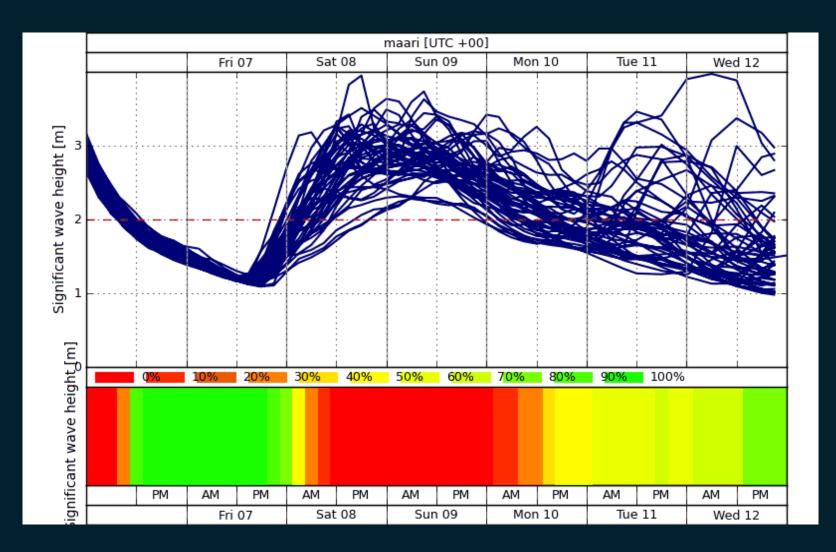
4 day horizon

6 day horizon



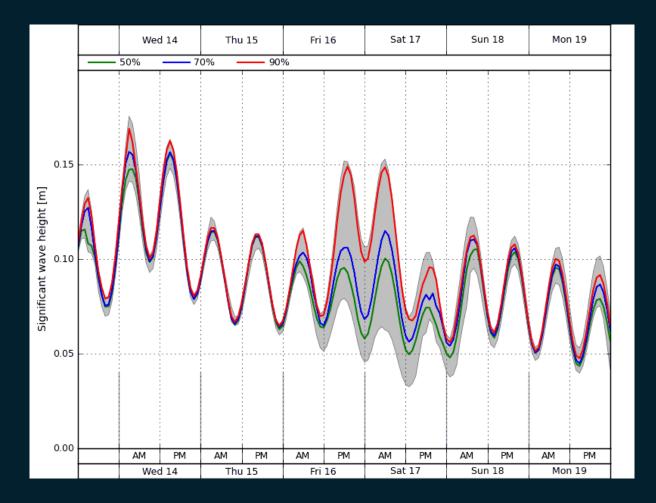


Forecasting the uncertainty - visualisation





Forecasting uncertainty in something very complex

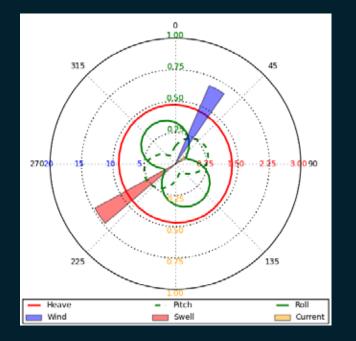


Forecast of the long period waves inducing surge at a berth inside a harbour

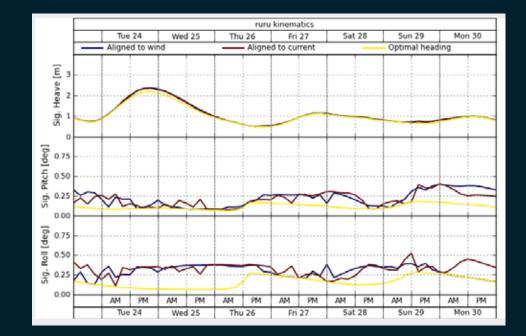


Forecasting complex things – vessel motion

Forecast 2D wave spectra convolved with RAO = motion forecast solutions



Heave/roll/pitch amplitude as a function of heading



Time series forecast of vessel motion





Forecasting something complex and making it simple

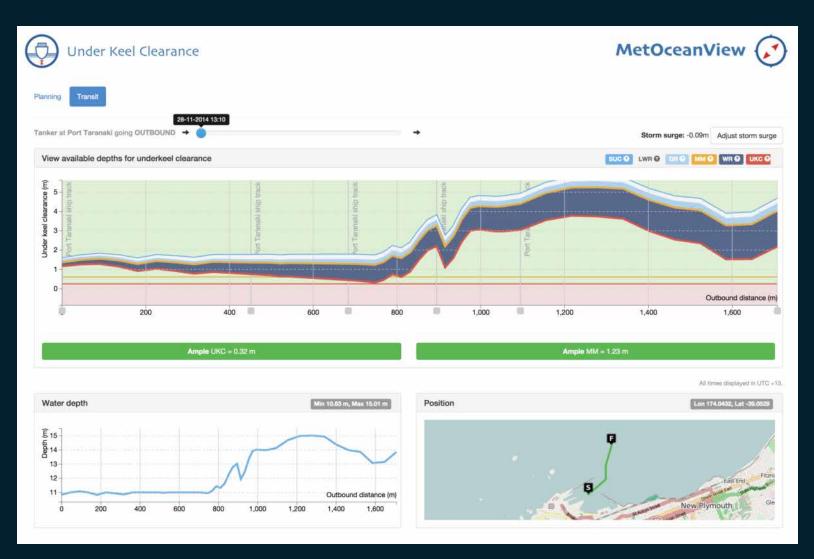
Safe under keel clearance windows for harbour transits

9 Under	Keel Clearance	MetOceanView
Transit		
nker at Port Tarana	aki going OUTBOUND 🔸	Adjust calculation settings
Opening windows	\$	Speed: average, LBP: 172, Beam: 32.2, Draft fore: 12.2, mid: 12.2, Tug: false, Risk: low, Safety margin: 0.25, MMT: 0.61
Open	Close	
28-11-2014 13:10	28-11-2014 16:30 View	
29-11-2014 02:40	29-11-2014 03:40 View	
29-11-2014 14:40	29-11-2014 17:10 View	
30-11-2014 02:40	30-11-2014 06:20 View	Statuce to darget threehold (n) Statuce to the stat
30-11-2014 14:50	30-11-2014 19:10 View	
02-12-2014 06:20	02-12-2014 07:30 View:	
02-12-2014 17:30	02-12-2014 20:50 View	Sat 29 Nov 30 December Tue 02 Wed 03 Thu 04 Fr
03-12-2014 05:50	03-12-2014 10:00 View	
03-12-2014 17:50	03-12-2014 22:40 View	
04-12-2014 06:10	04-12-2014 11:10 View	> § 2.0-
04-12-2014 18:30	04-12-2014 23:20 View	
		0.5

All times displayed in UTC +13.

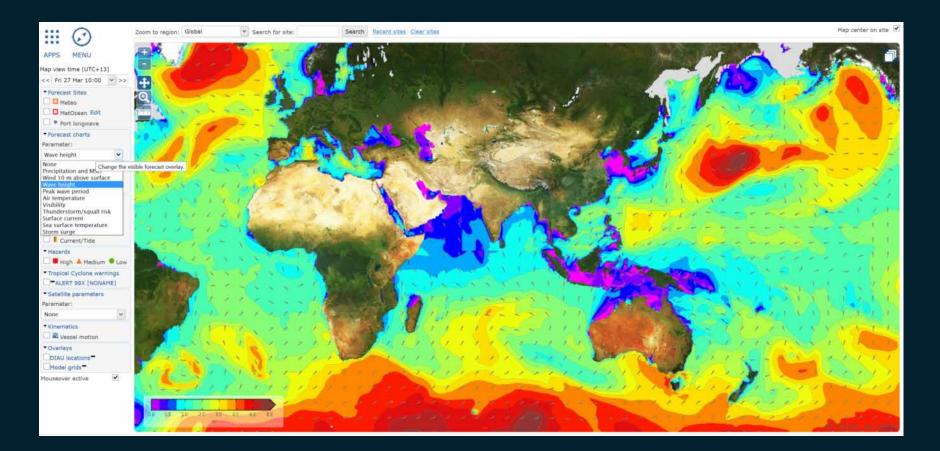


Forecasting something complex and making it simple





Thank you



Make easy-to-use tools for users and industry to improve their knowledge and make an intelligent transition. Don't limit the available data for decision makers.

