

Weather for Sailors

Session 3



Weather for Sailors

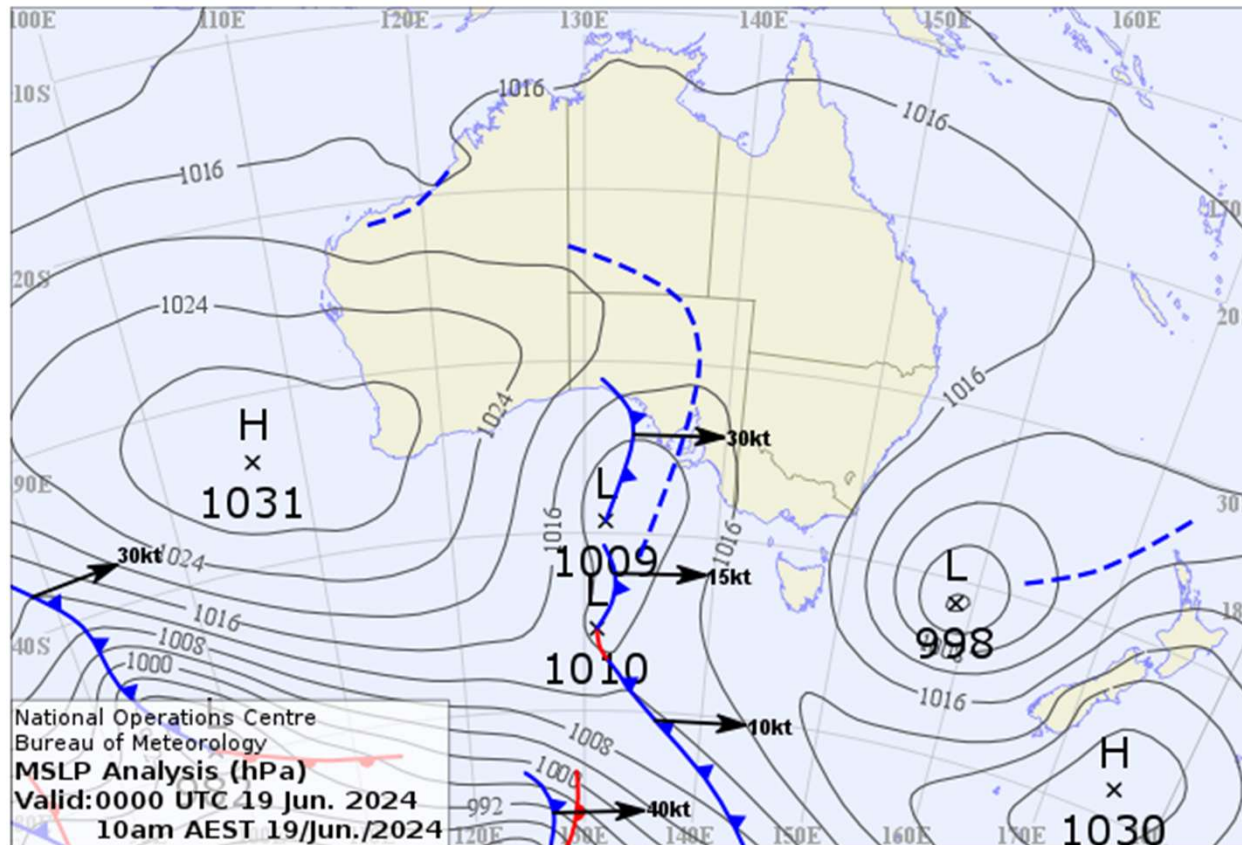
The Fundamentals-Enclosed Waters





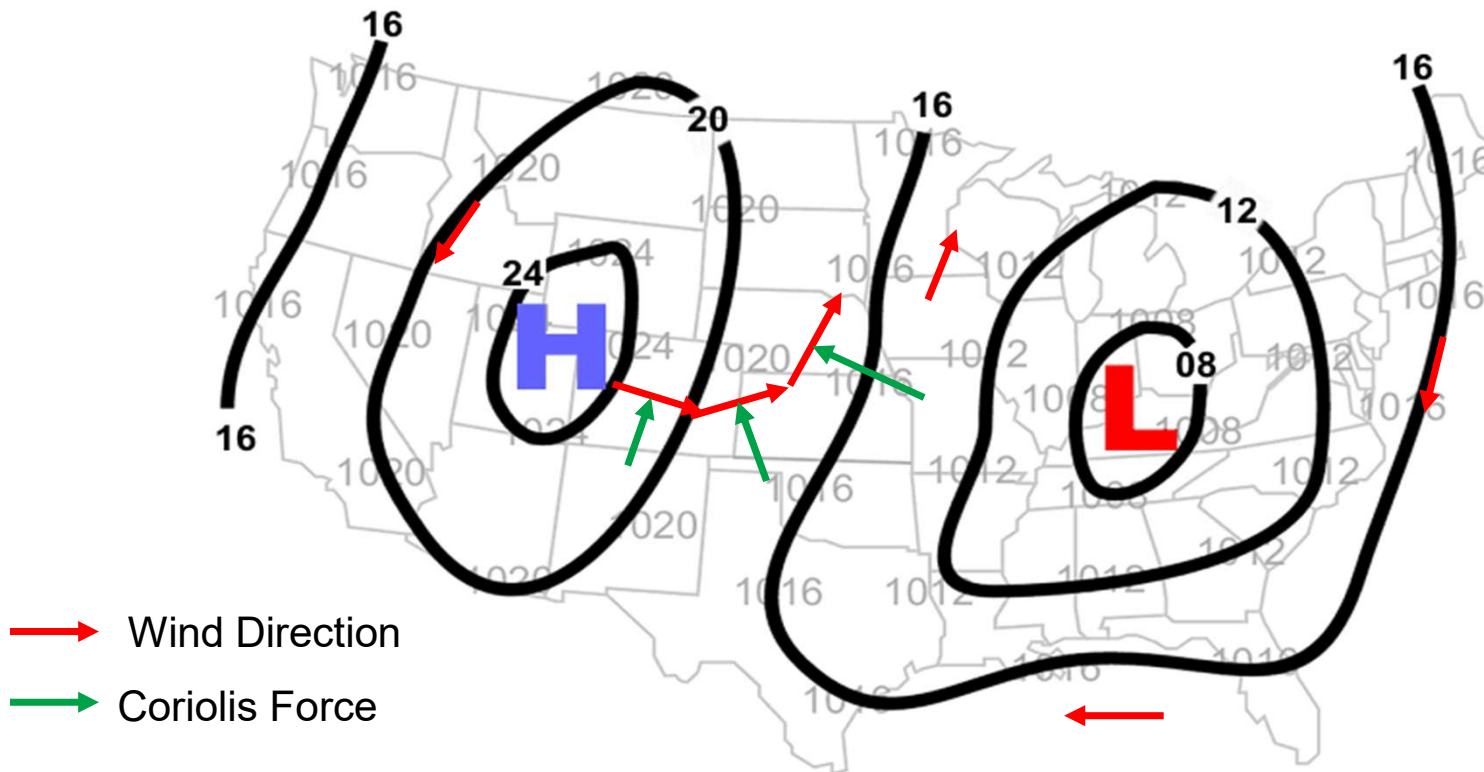
Isobar Spacing, Latitude and Wind Speed

Analysis for 00:00 UTC on Wednesday 19 June 2024



- Isobar spacing is a measure of wind speed
- Only at the same latitude!

Isobar Spacing, Latitude and Wind Speed



- Closer isobars mean higher pressure force which means higher wind speed
- The Coriolis Force always acts at right angles to the direction of motion
- The magnitude of the Coriolis force is proportional to the wind speed
- The Coriolis force is also proportional to the angle of Latitude (actually the sine of the angle!)
- The atmosphere is in balance when the pressure force equals the Coriolis force



The balance condition is called the Geostrophic balance

Isobar Spacing, Latitude and Wind Speed

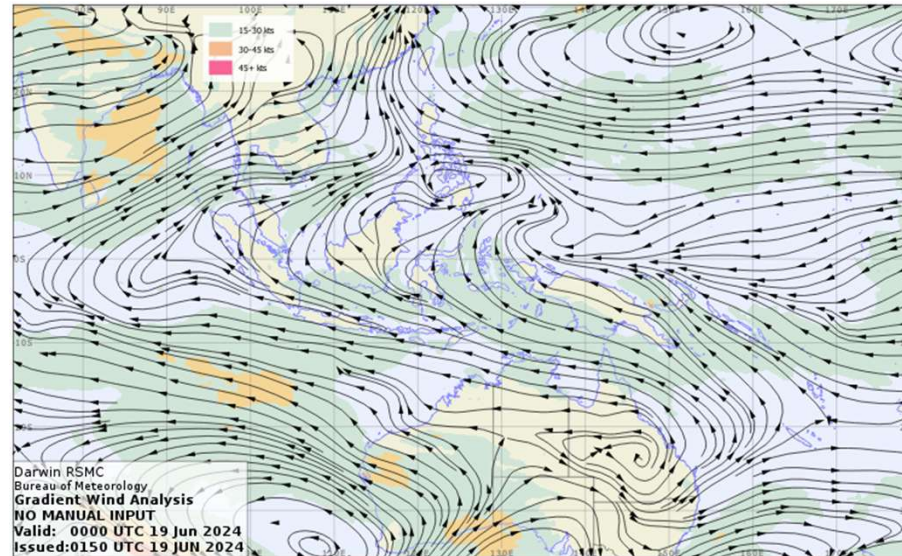
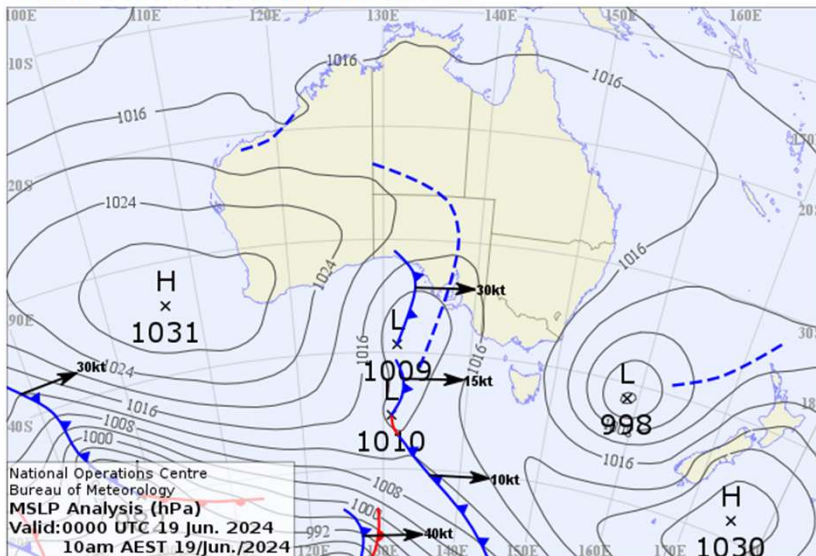


City	Latitude	Coriolis Factor
Melbourne	37.8	1.00
Townsville	19.3	0.54
Darwin	12.4	0.35

- The Coriolis Force at Darwin is a third of that at Melbourne
- This means that for the same isobar spacing, that is same pressure force, the wind at Darwin has to be three times as high to achieve the balance of pressure force and Coriolis Force
- This means that using isobar spacing as a measure of wind speed becomes problematic at lower latitudes and the gradient wind becomes more useful.

Isobar Spacing, Latitude and Wind Speed

Analysis for 00:00 UTC on Wednesday 19 June 2024



- Gradient wind maps show streamlines showing the wind direction at 1000m altitude
- At that height, friction, and local effects (sea breezes, land, wave effects) are minimal
- Gradient wind maps much more useful at lower latitudes to predict winds

Isobar Spacing, Latitude and Wind Speed



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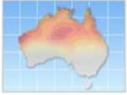
[Bureau Home](#) > [Australia](#) > Weather Maps

Weather Maps

From Wednesday 13 March 2024 we are changing the system we use to produce the Gradient Level Wind Analysis and Asia Mean Sea Level Pressure charts.

You may notice minor differences in the appearance of the charts. You can send questions or feedback to weatherquestions@bom.gov.au

Numerical Weather and Ocean Prediction Maps



- [Interactive Weather and Wave Forecast Maps](#)

Australian Region



- [Mean Sea Level Pressure \(MSLP\) map](#)
- [Latest Colour Mean Sea-Level Pressure Analysis and Infrared Greyscale Satellite](#)
- [Short-term forecast](#)
- [Forecast map for next 4 days](#)
- [UV Forecast](#)

Tropical Region



Mean Sea Level Pressure (MSLP)

- [Asia MSLP Analysis 00 UTC](#)

Gradient Level Wind (GLW)

- [Gradient Level Wind Analysis: 00 UTC or 12 UTC](#)
- [Pacific Ocean GLW \(A\): 00 UTC or 12 UTC](#)
- [Indian Ocean GLW \(B\): 00 UTC or 12 UTC](#)

Southern Hemisphere



- [Southern Hemisphere MSLP Analysis](#)
- [Pacific Ocean MSLP Analyses](#)
- [Indian Ocean MSLP Analyses](#)

Related Information

- [Analysis & Prediction Operations Bulletins](#)
- [Interpreting the MSLP Analysis](#)
- [Interpreting the Gradient Level Wind Analysis \(Asia Region\)](#)



BOM Weather

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NWP Data Files

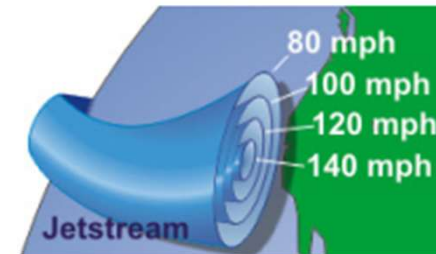
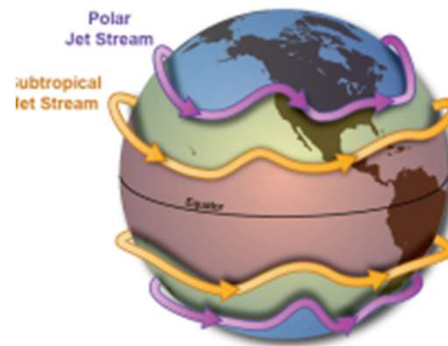
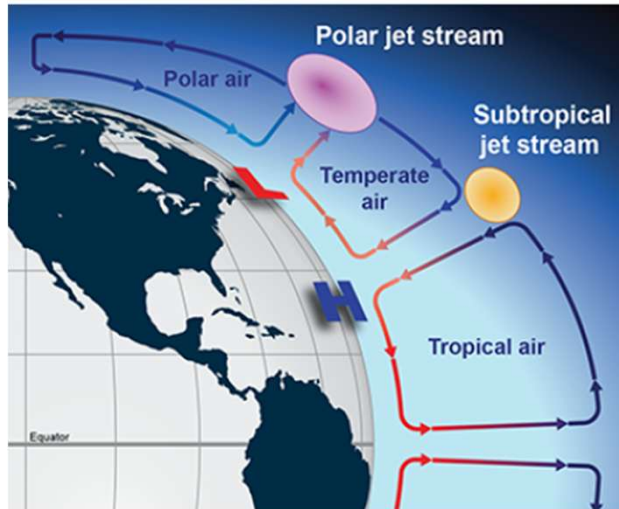
- [ACCESS Data Files Documentation](#)
- [AUSWAVE Data Files Documentation](#)

Map Archives

- [Analysis Chart Archive](#)
- [Climate Map Archive](#)

<https://www.bom.gov.au/australia/charts/?ref=ftr>

Jetstream



- High level (8000-10000km) narrow bands of high-speed air (up to 200 knots) circulating the globe
- Caused by the global temperature differences and the Earth's rotation
- More dominant in winter when the temperature differences are greater
- The faster moving air can draw air out of the rising in a low-pressure system intensifying the low producing more unsettled conditions, stronger winds
- A slower, more meandering Jetstream can strengthen high-pressure system giving more stable conditions

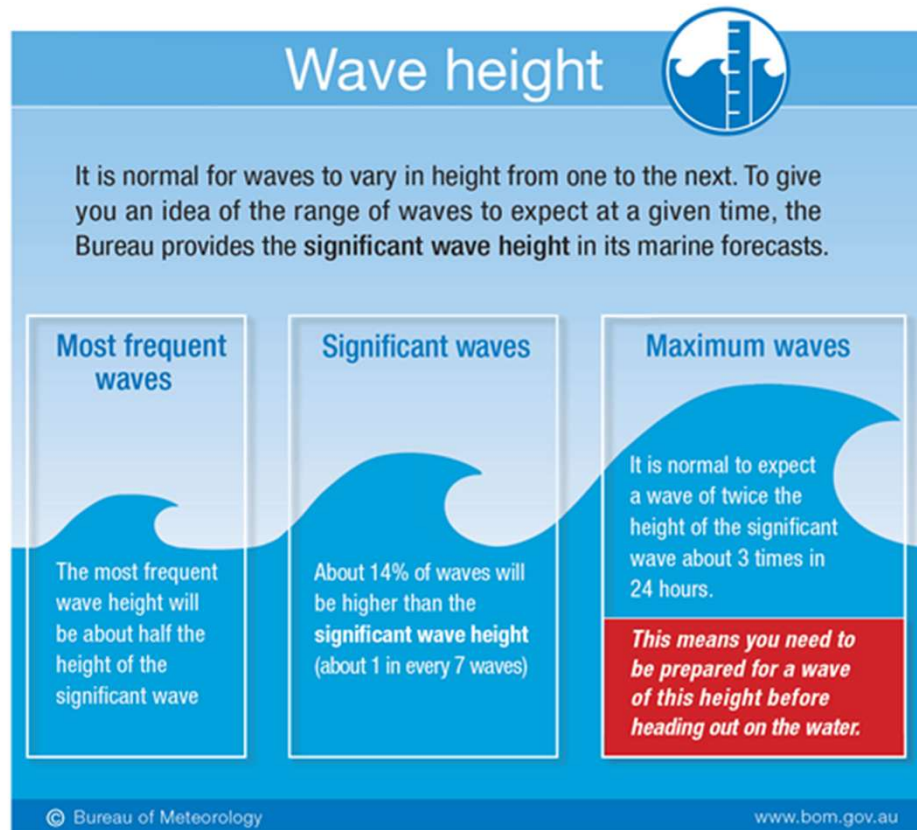
Jetstream



www.youtube.com/geographylessons

Waves

Sea Waves



- Generated by the prevailing wind
- Height depends on wind strength, fetch and time the wind has been blowing
- Reported wave height is the average of the highest third of the waves, so-called significant wave height
- A few times a day, waves will be twice that height
- Will break when the water depth approaches the wave height
- Wave heights and shapes also depend on wind direction and tide direction

Waves

Swell



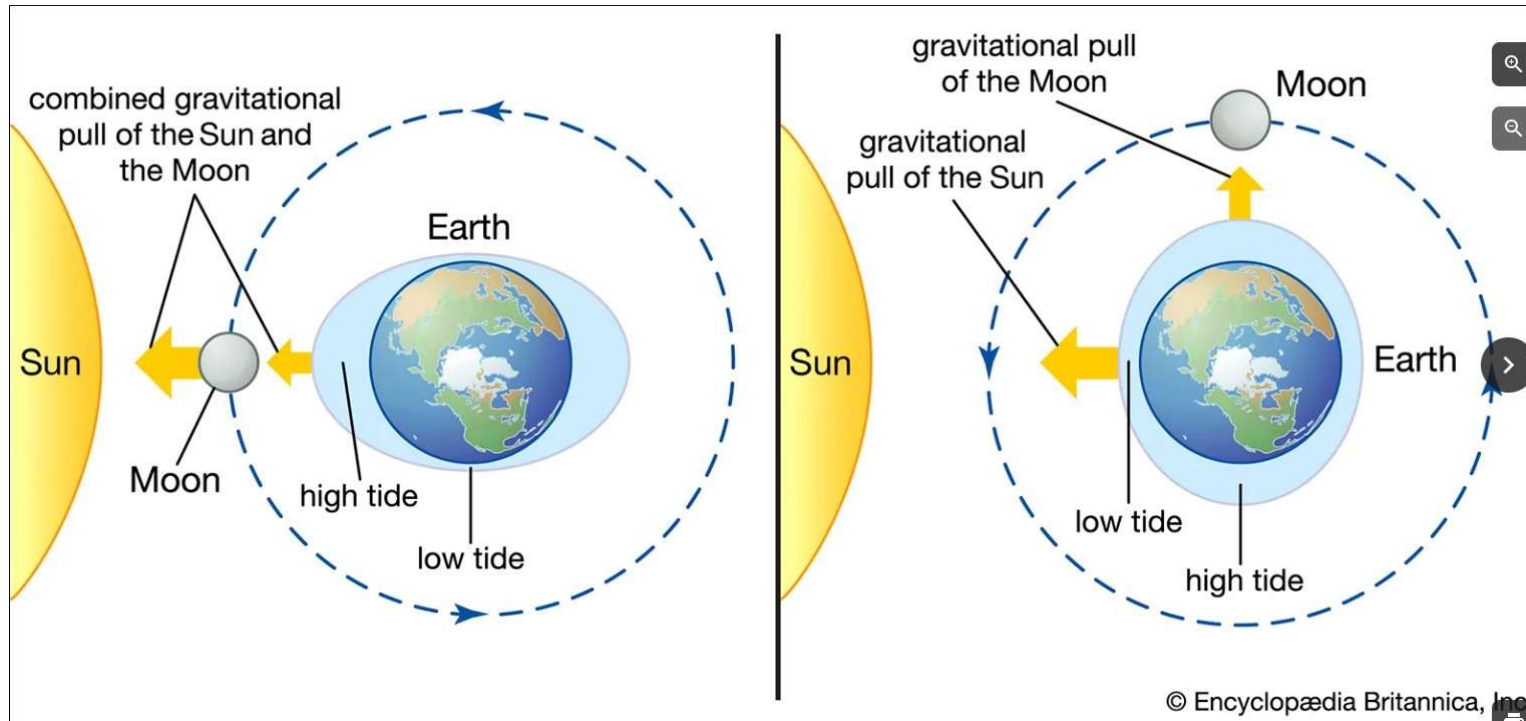
- Regular, longer period waves generated by distant weather systems
- Can travel thousands of kilometres
- Can be present even in calm wind conditions
- Can have swell from different directions giving more confused sea
- Sea state is the total of wind wave plus swell height (both height and direction)

Coastal Fog



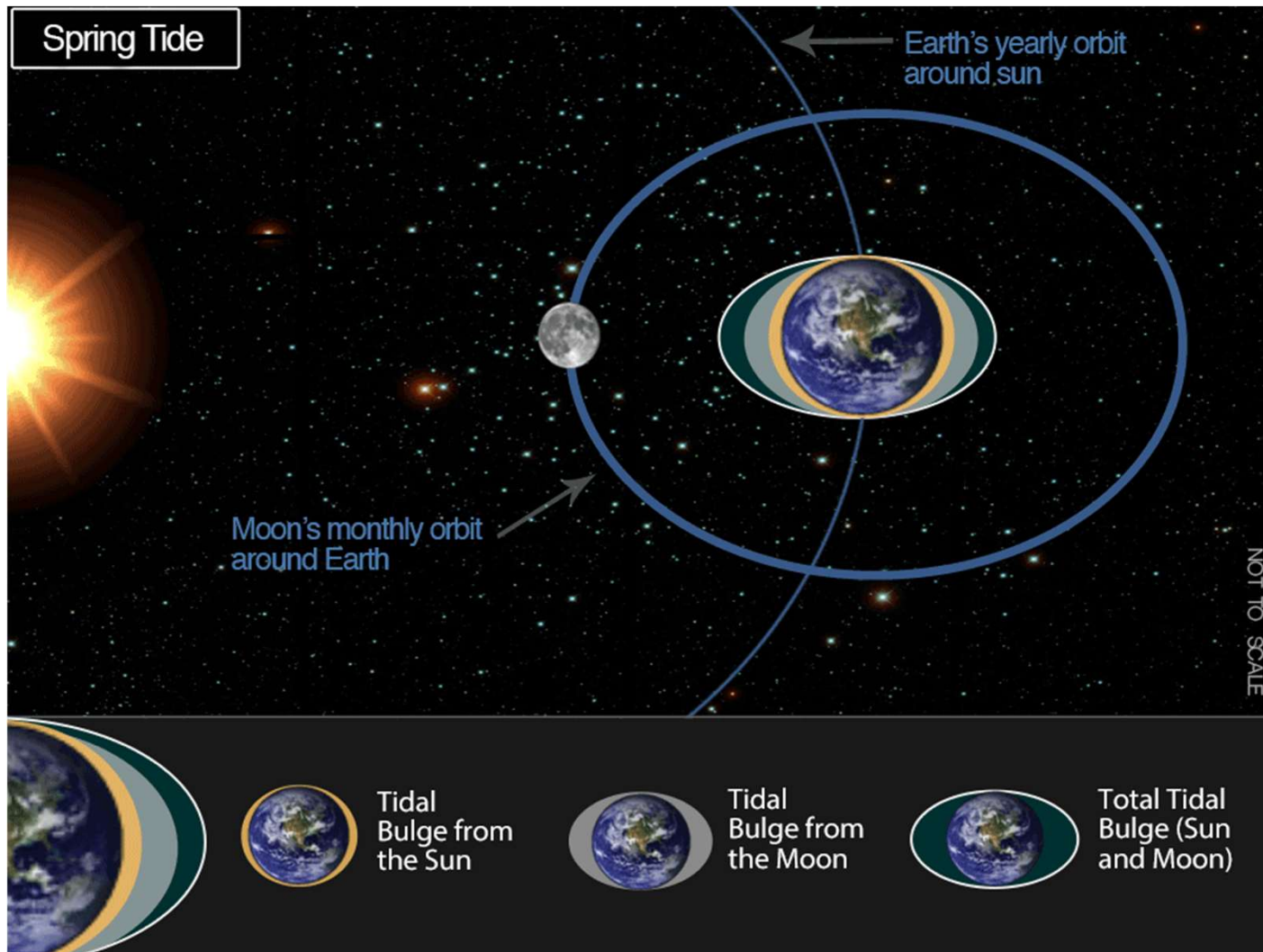
- Forms when warmer, moist air passes over a cooler surface, (land or cold current)
- Water vapour in the low, cooling air condenses to form small water droplets (advection) fog which is trapped by the warmer air above
- Sea breezes or pressure gradient differences can then draw this cooled, moist air towards the shore and onto the coastal land
- In San Francisco, the warmer air rising inland “sucks” the fog through the only coastal opening at the Golden Gate, enveloping the city in fog

What causes tides?



- The gravitational attraction of both the moon and the sun on the waters of the oceans
- Gravitational force depends on how massive the object is and how far away it is
- The moon has about twice the impact as the sun (more massive but a long way away)
- Why does the water bulge on the side further away from the moon?

How big are the tides?



- The gravitational attraction of both the moon and the sun on the waters of the oceans
- The moon has about twice the impact as the sun
- The moon revolves around the earth in about 27 days
- Tides are maximum when the moon and the sun are aligned (Spring tides)
- Tides are weakest when the moon and sun are at right angles (Neap tides)

How big can tides be?



- Not a big issue in Port Phillip
 - typically, about 1 m range though flow rates in the Heads can be significant, typically 5-6 knots but up to 9 knots in extreme cases
- More of an issue in Westernport
 - up to 3m,
- More important in sailing the Whitsundays – up to 4m
- Dramatic in some parts of the world like Brittany France, 10-14m tidal range
- Tide levels can be impacted by wind and air pressure

Tide Levels and Stream Flows

📍 South Channel, VIC – June 2026					
WED 17 JUN		THU 18 JUN		FRI 19 JUN	
HIGH	12:45 am 0.97 m	HIGH	2:00 am 0.98 m	HIGH	3:10 am 0.99 m
LOW	7:40 am 0.23 m	LOW	8:33 am 0.24 m	LOW	9:25 am 0.28 m
HIGH	3:08 pm 1.02 m	HIGH	3:59 pm 1.05 m	HIGH	4:46 pm 1.07 m
LOW	8:38 pm 0.69 m	LOW	9:30 pm 0.66 m	LOW	10:22 pm 0.63 m

📍 The Rip, VIC – June 2026					
WED 17 JUN		THU 18 JUN		FRI 19 JUN	
SLACK	MAXIMUM	SLACK	MAXIMUM	SLACK	MAXIMUM
TIME	TIME RATE	TIME	TIME RATE	TIME	TIME RATE
	12:24 am +2.54		1:26 am +2.93		2:26 am +3.24
2:29 am	5:32 am -5.99	3:35 am	6:34 am -6.11	4:40 am	7:36 am -6.04
10:04 am	12:47 pm +4.69	10:59 am	1:40 pm +4.68	11:51 am	2:31 pm +4.58
5:10 pm	7:21 pm -3.99	5:55 pm	8:08 pm -4.31	6:36 pm	8:54 pm -4.62
10:50 pm		11:44 pm			

- In the open ocean, slack water does nominally coincide with high and low tides
- Local geography and underwater sea landscape can change that, at times, significantly
- In Port Phillip, the large amount of water that needs to exit the narrow and very variable depth of the Heads takes time and leads to slack water and high/low tides times being out of synch.

Why are tides about an hour later every day?



0 hrs



- The moon revolves around the earth in the same direction as the earth is rotating
- By the time the earth has rotated a full day (24 hours) the moon has moved on!
- The earth then has to rotate a little more (taking about an hour) to experience the full effect of the moon again (high tide)

Break/Questions

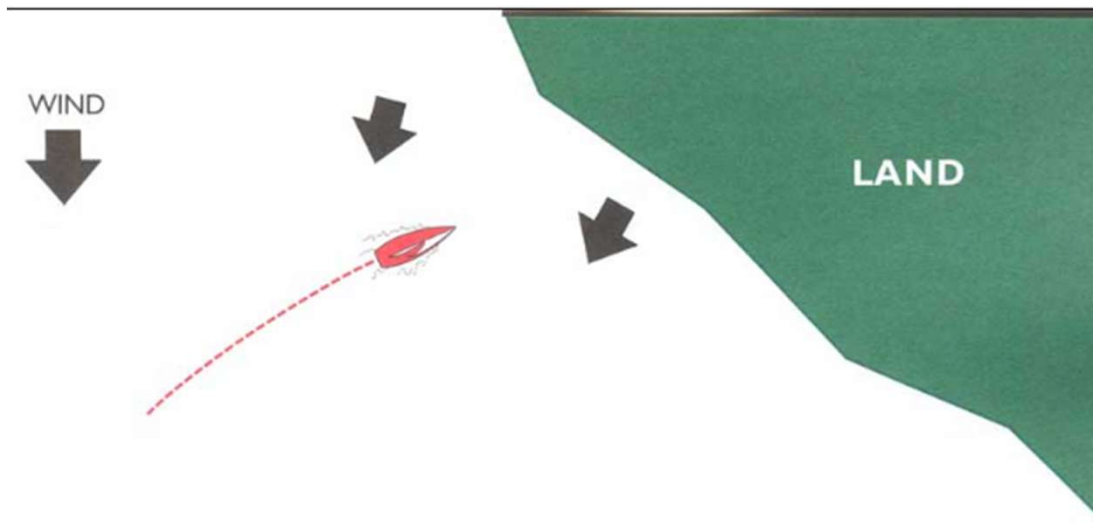


Weather for Sailors

The Fundamentals-Enclosed Waters



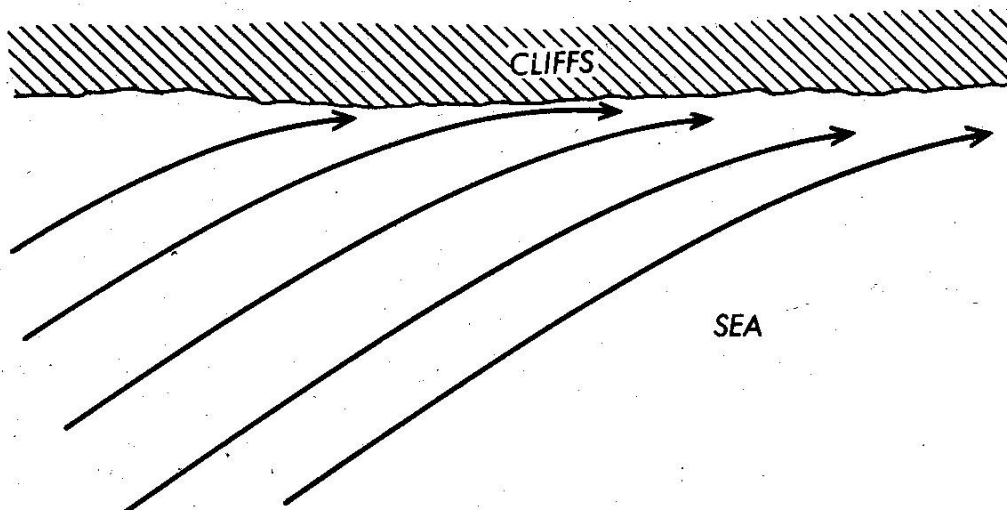
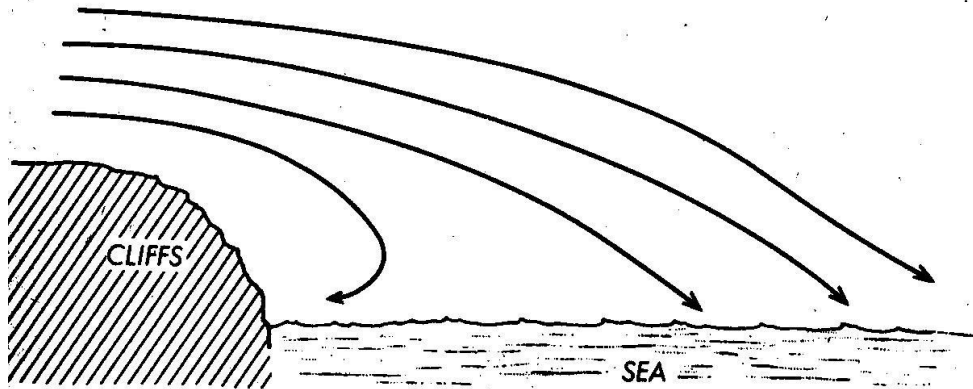
Land Effects



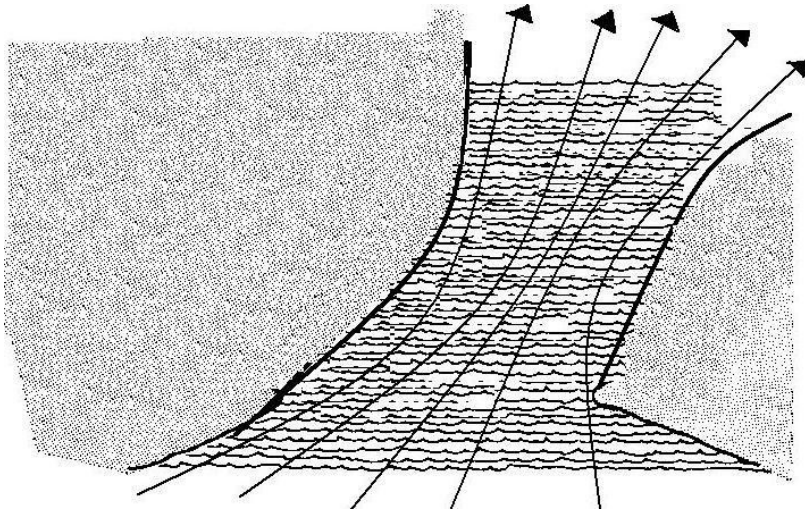
- Wind slows down over the land
- Coriolis causes the wind direction to shift to be more perpendicular to the coast
- Boat steadily headed as it approaches the land

Land Effects

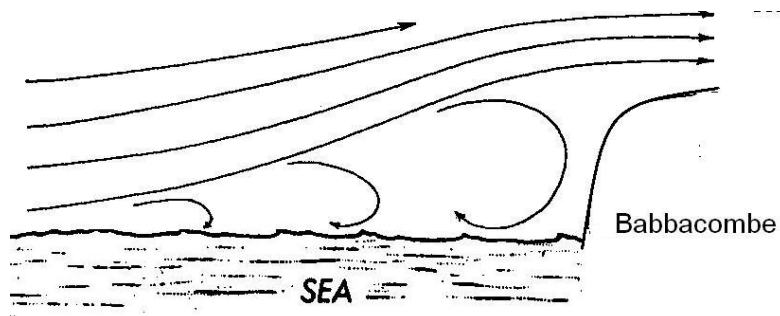
- Mechanical obstructions can modify the prevailing wind speed and direction
- Off-shore breeze and hilly coastline
- Eddies near the shore
- On-shore breeze and hilly coastline
- Change in both speed and direction



Land Effects

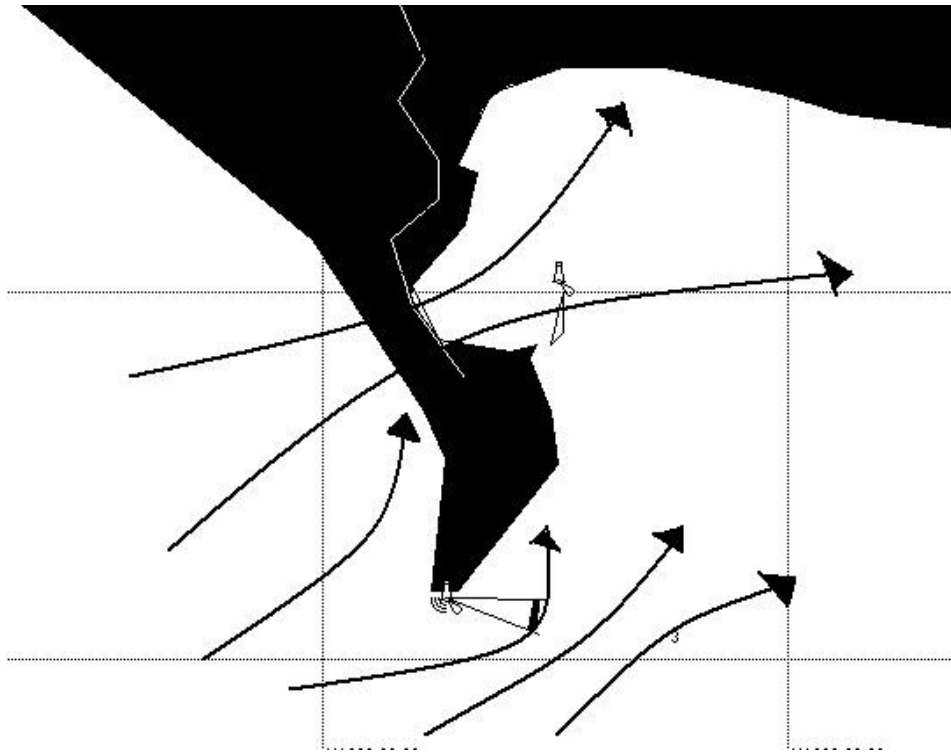


- Wind funnelling through a narrow opening
- Wind accelerates through an opening

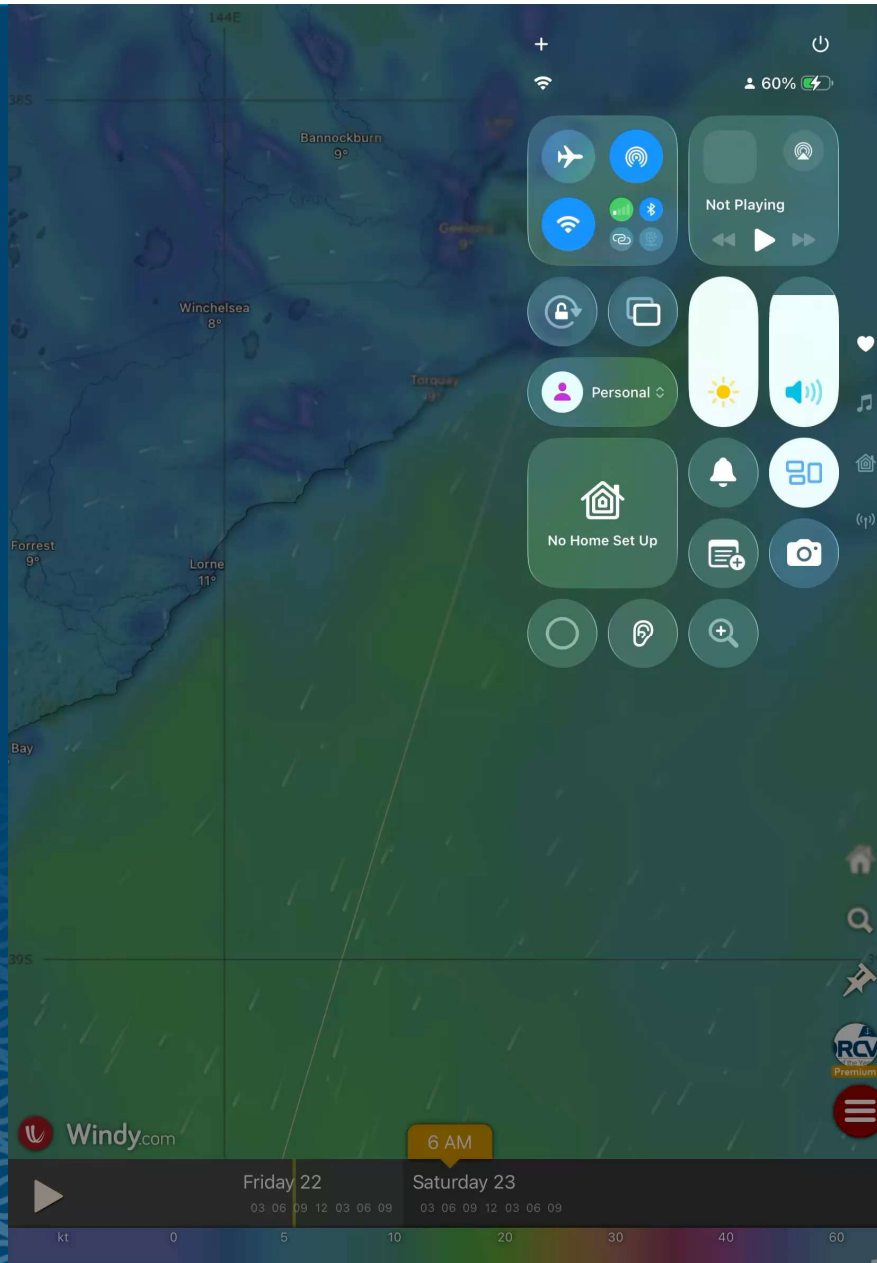


- Winds eddies close to the coast

Land Effects



- Wind effects around a headland or promontory



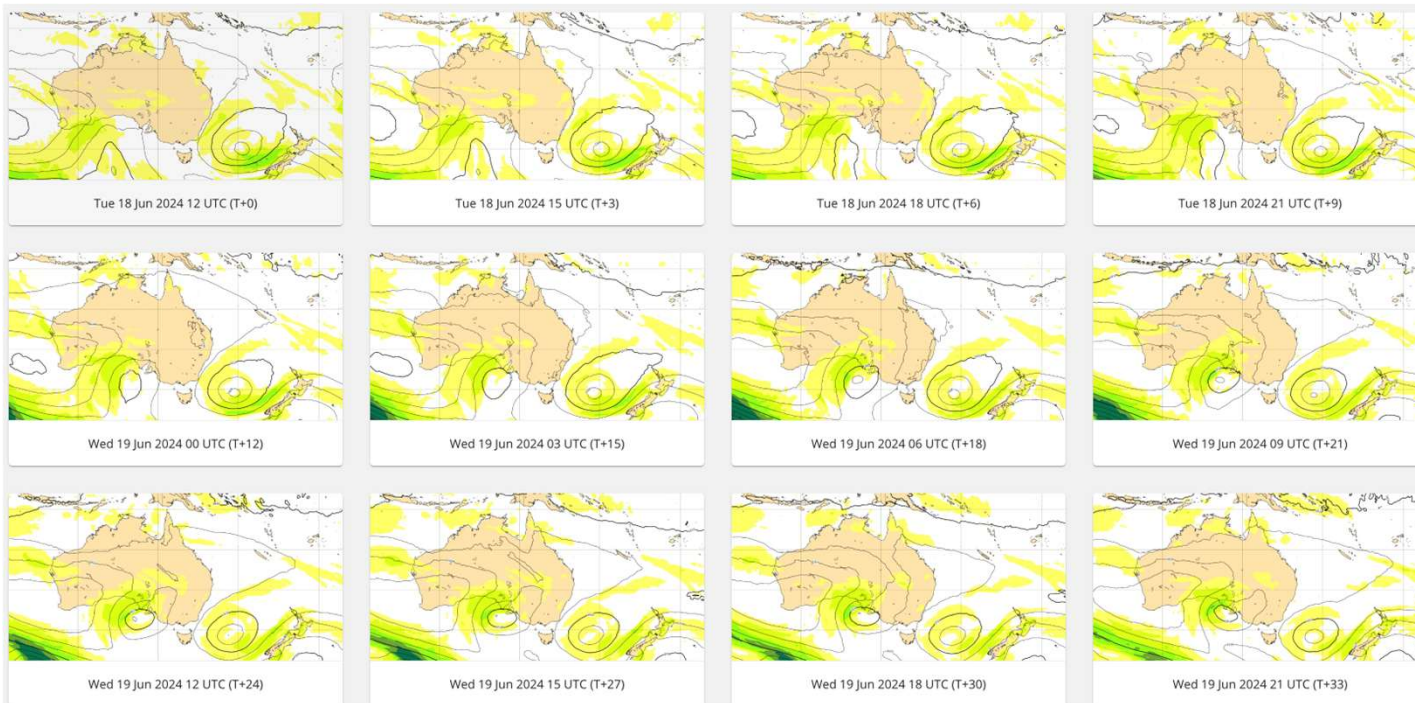
Long Range Weather forecasting 12 days

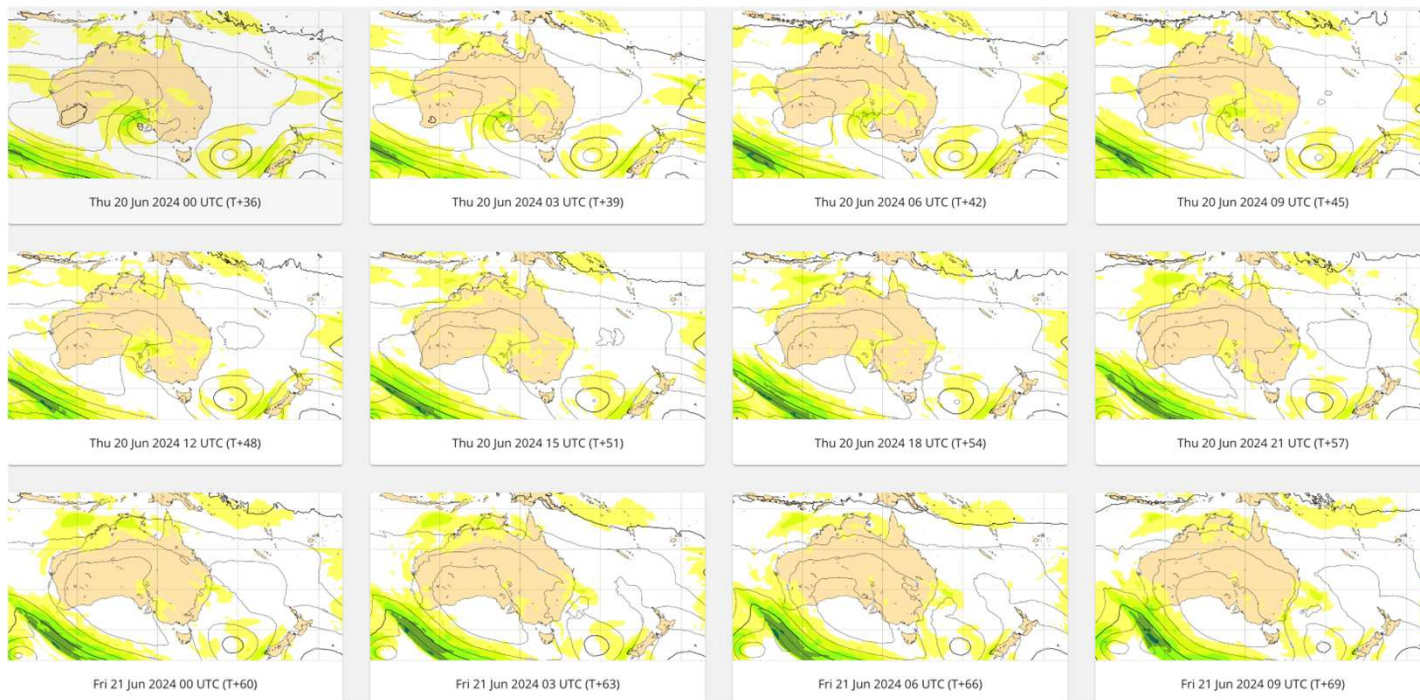
ECMWF (European Centre for Medium-Range Weather Forecasts) Long Range forecast

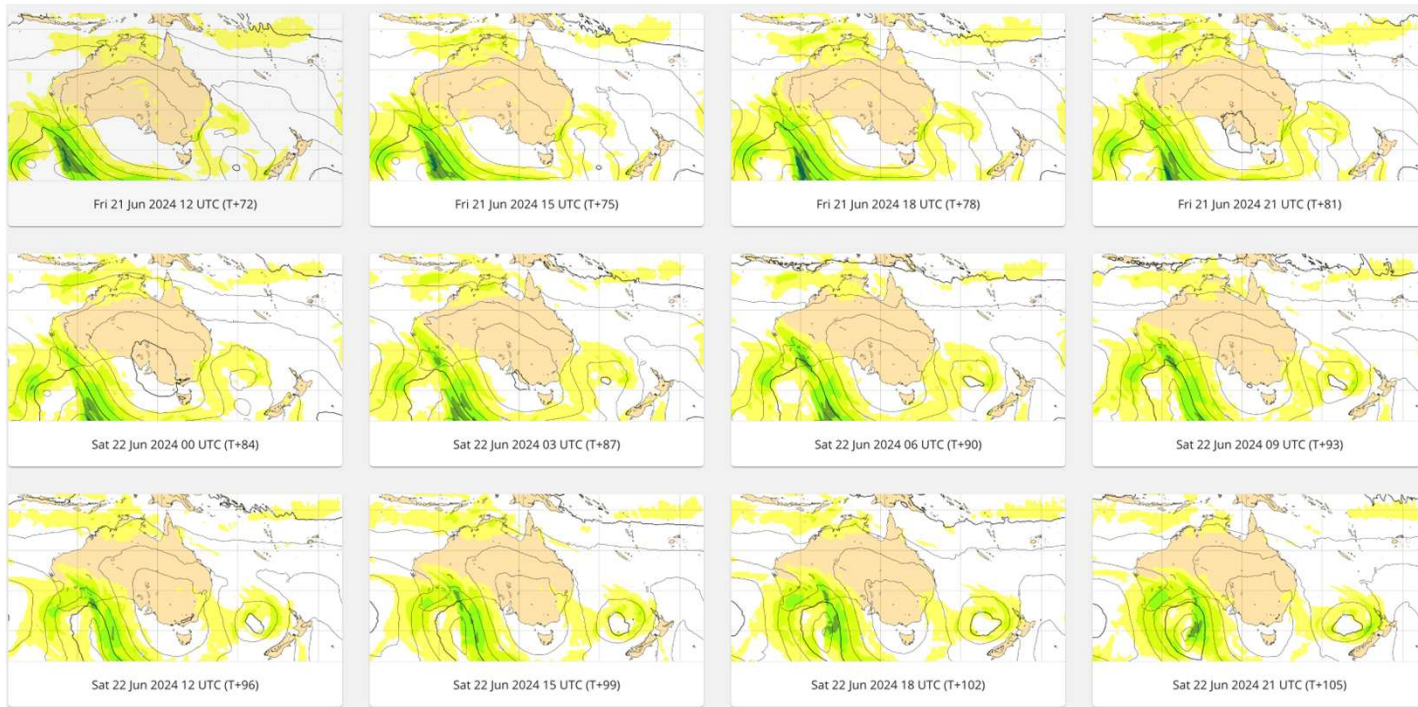
15 days ECMWF's operational forecasts aim to show how the weather is most likely to evolve. To do this, the Centre produces an ensemble of predictions.

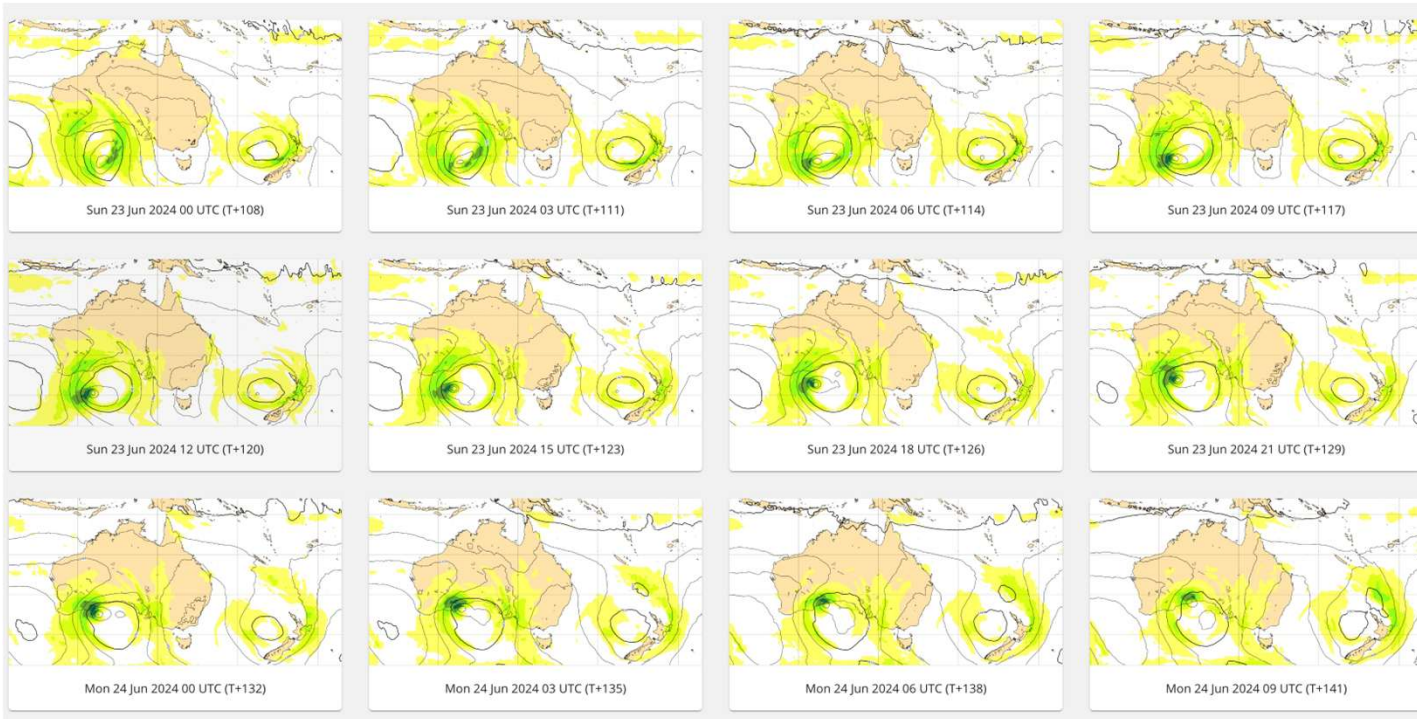
Predictwind

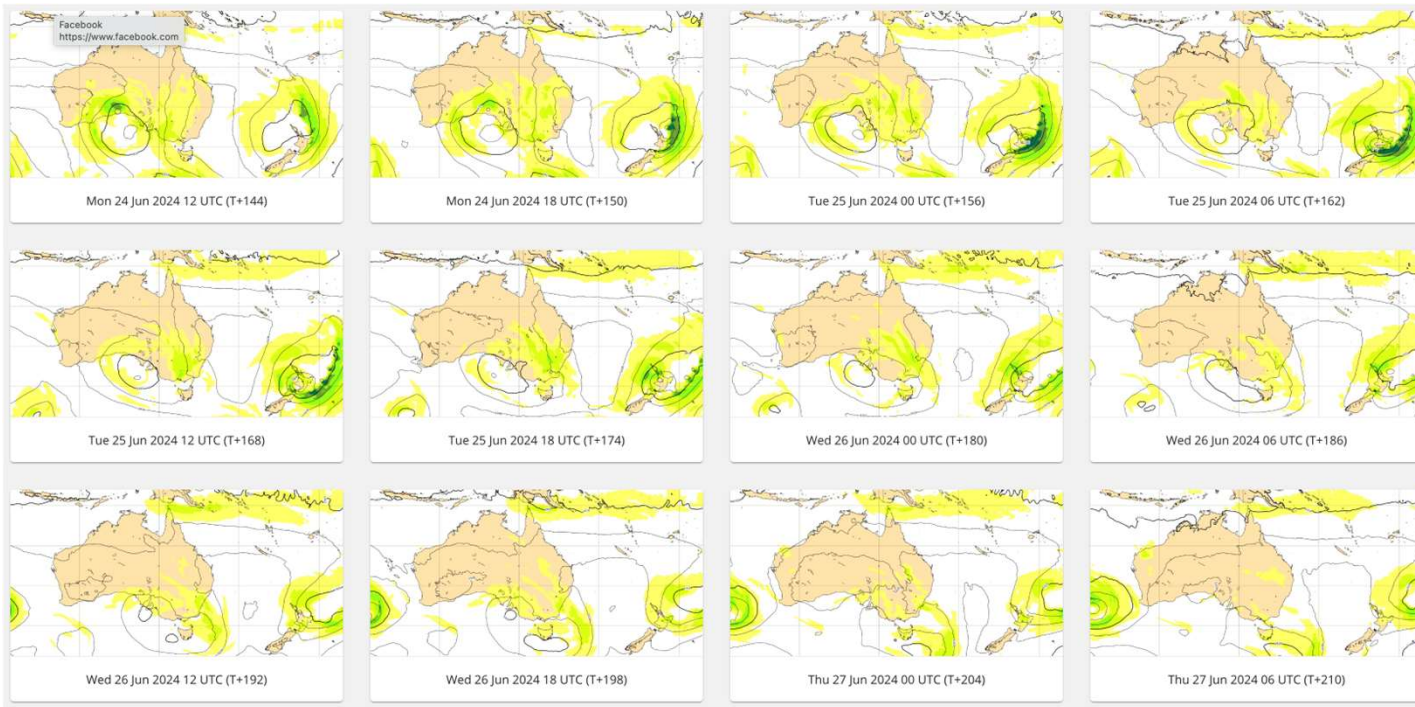
Windy

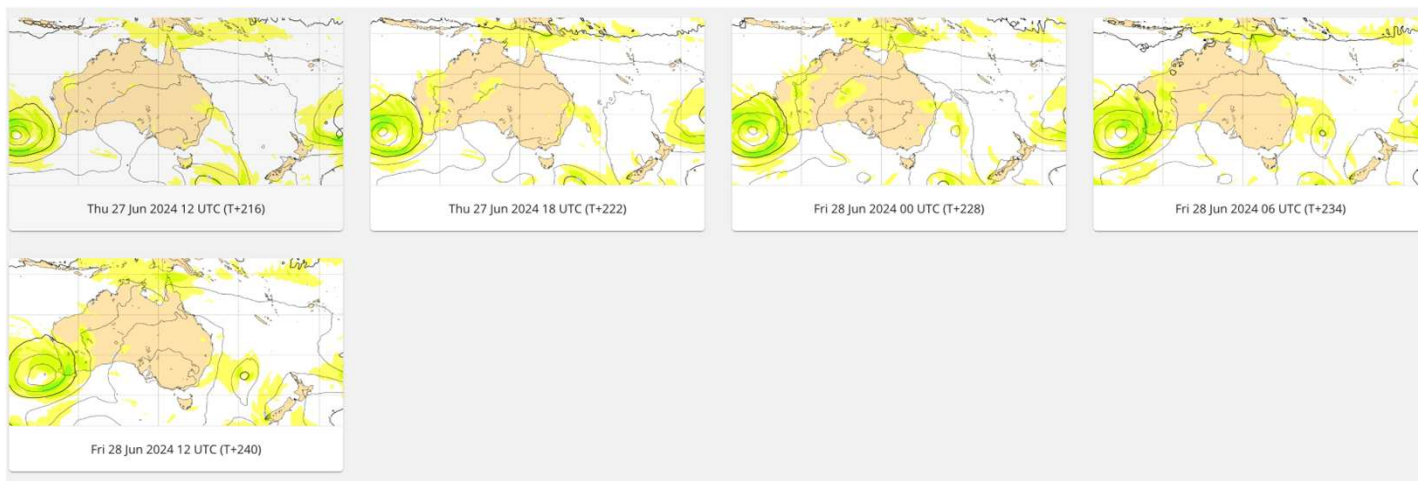




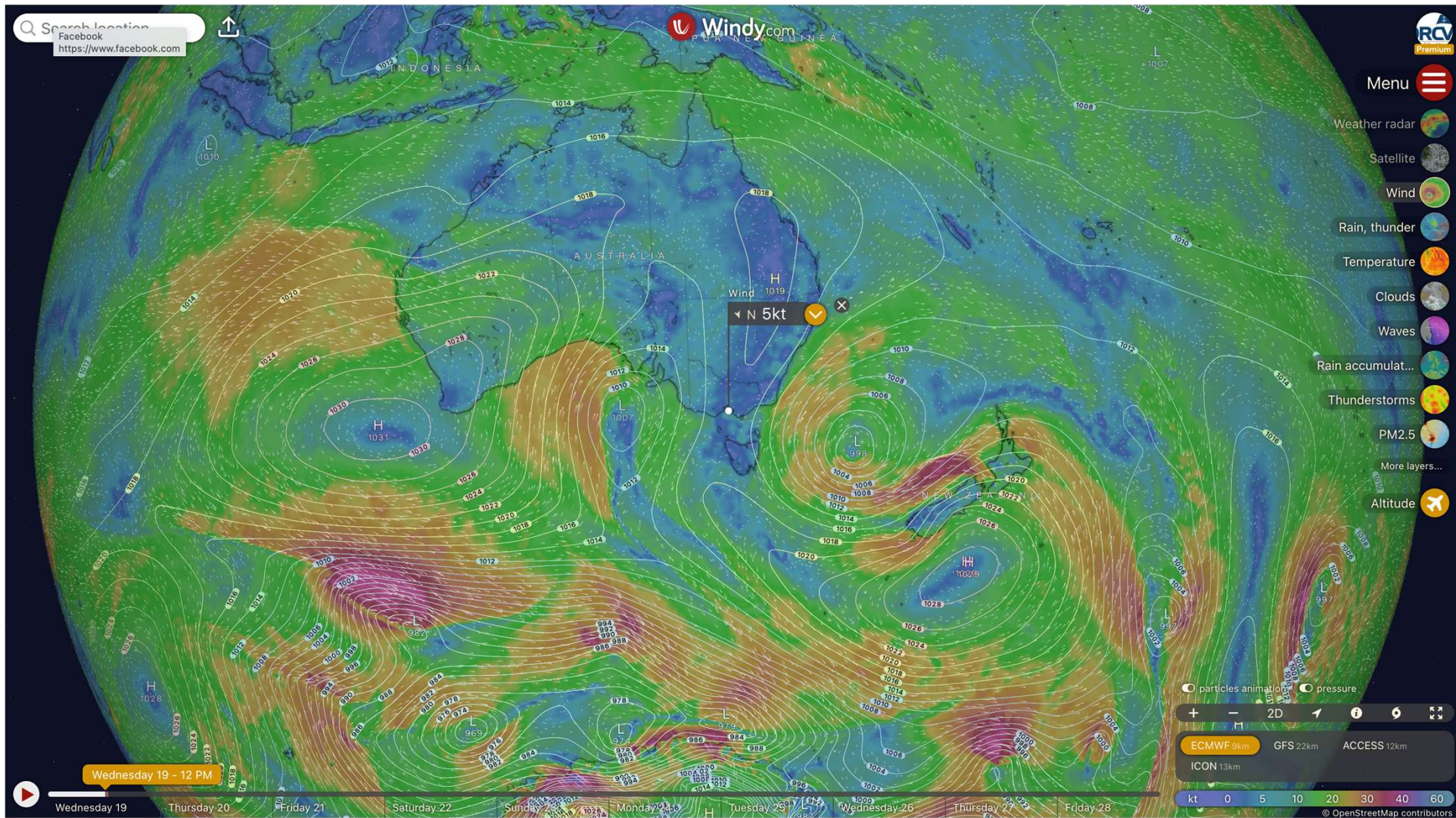




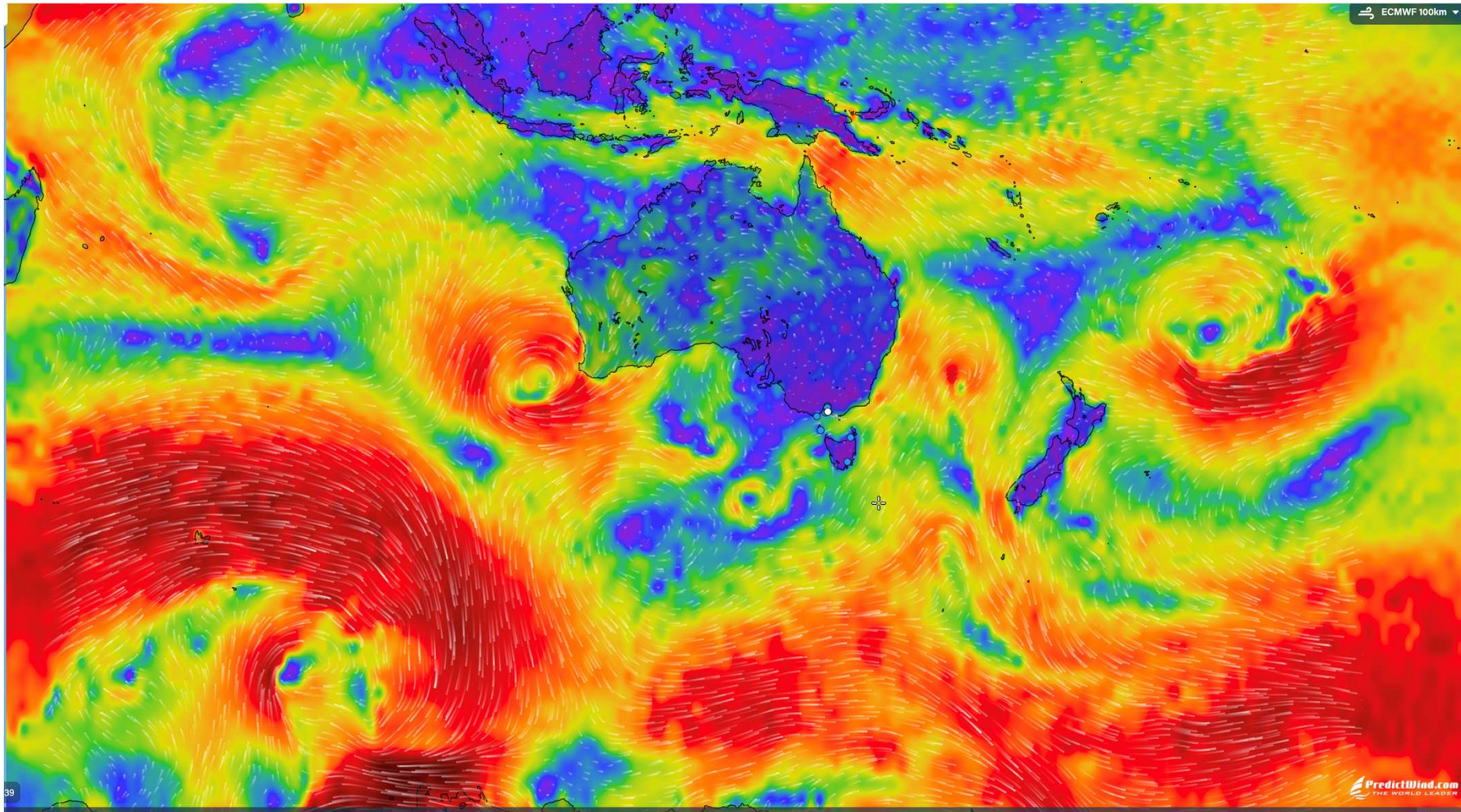




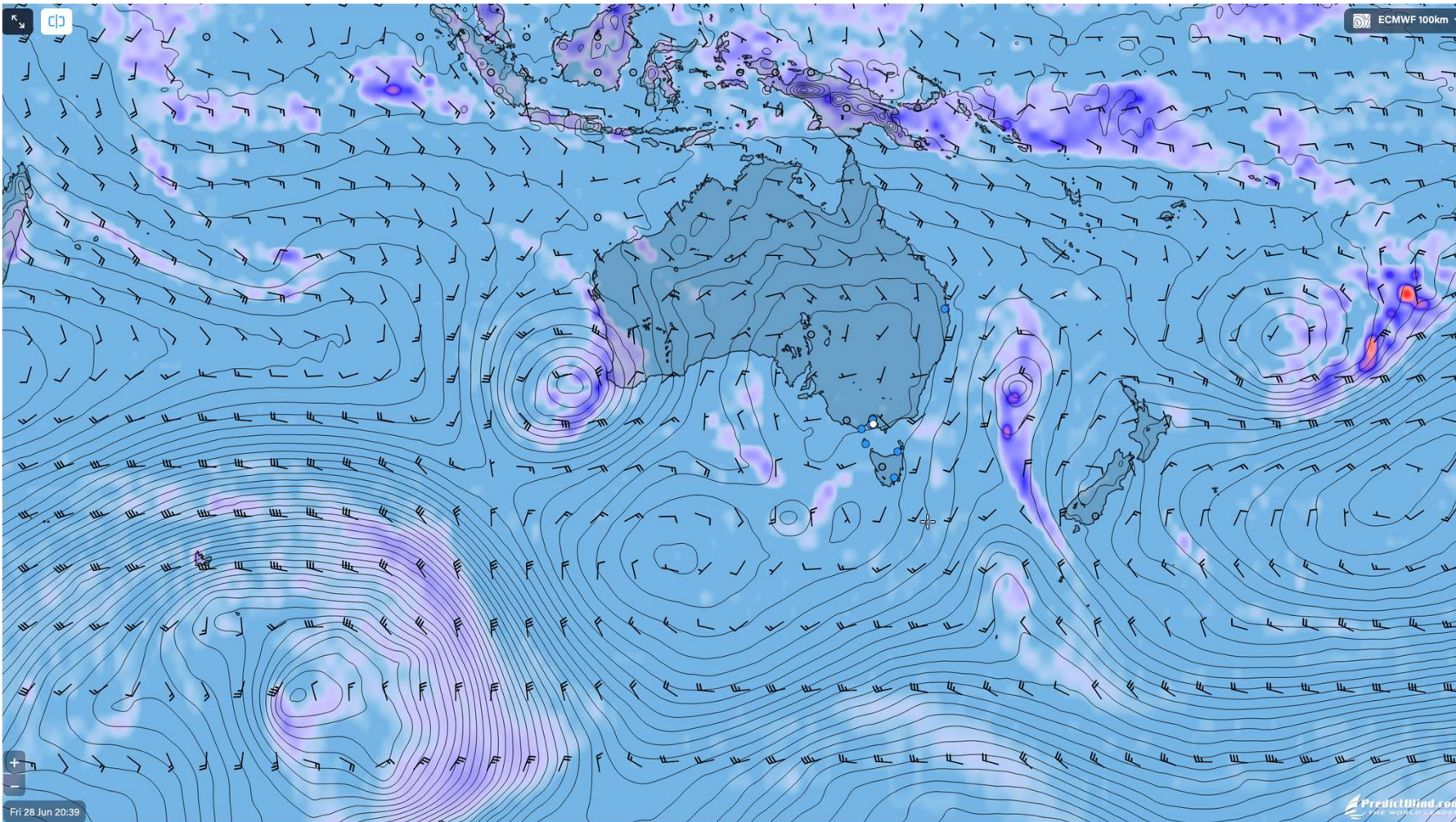
Windy 9 Day

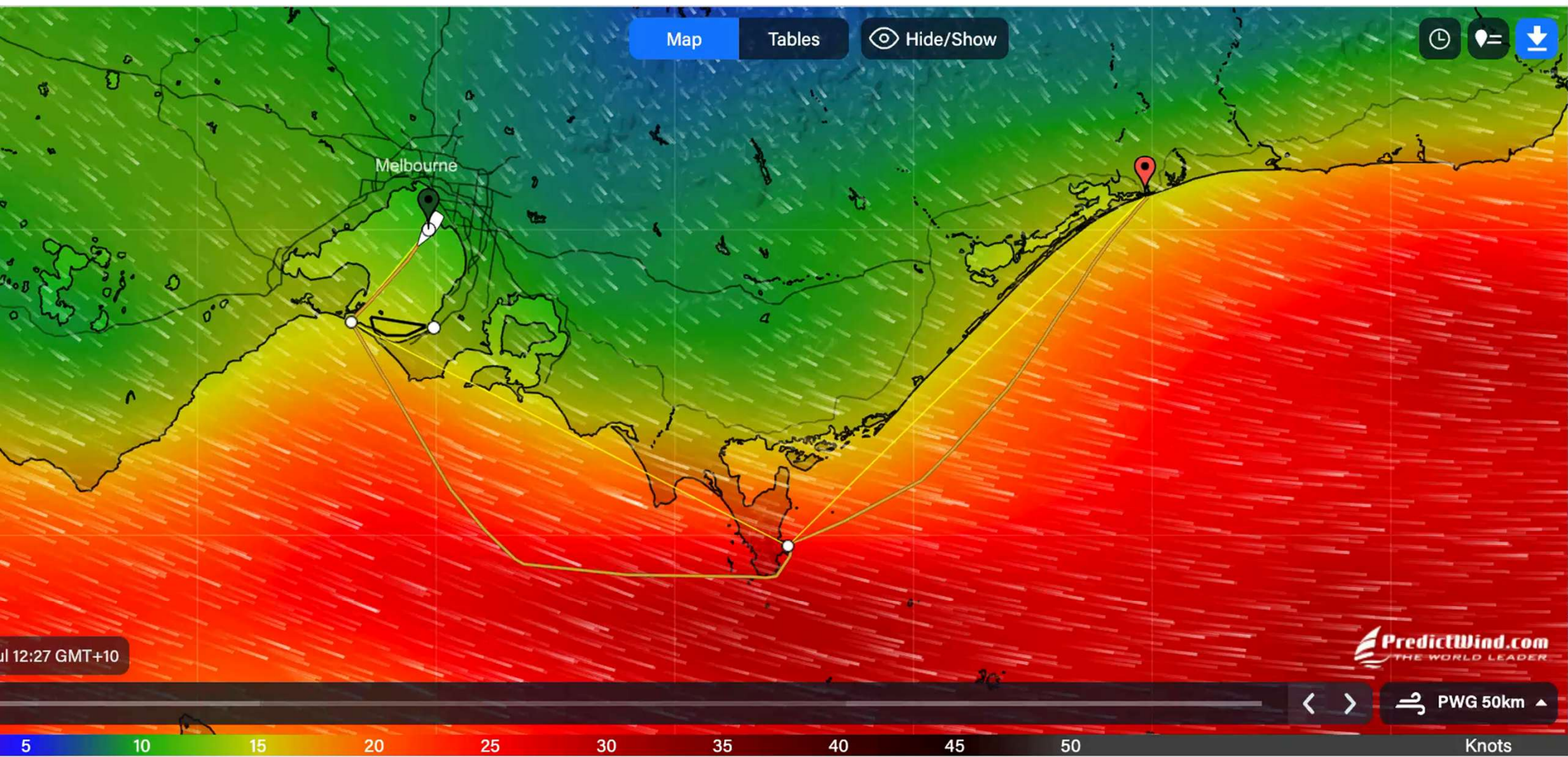


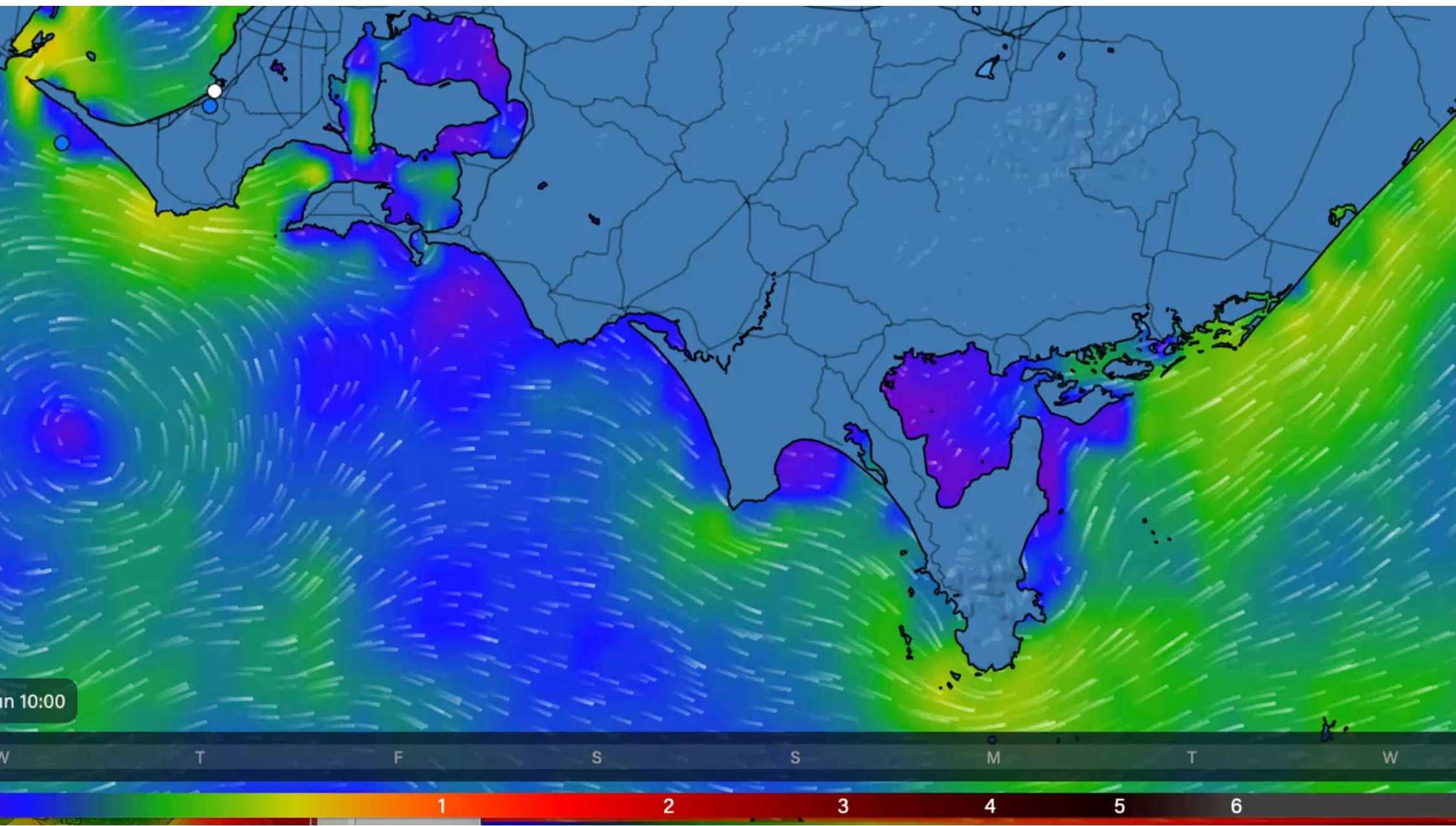
PredictWind ECMWF 9 days



PredictWind Isobar Map 100km resolution







7 Day forecasting

Bom

Access Model 3 to 6km

Windy

Access 12km, GFS 22km, ECmWF 9km, ICON 18km

Predictwind

1, 8, 50 and 100km resolution models

PWG, PWE, ECMWF, GFS, SPIRE, UKMO

Weather Gribbs for the computer specialists

Saildocs:

- Saildocs provides GRIB files via email requests. You send an email request with specific parameters, and they send back the GRIB file.

NOAA (National Oceanic and Atmospheric Administration):

- NOAA provides free access to GFS model GRIB files among other data. You can download these directly from their servers or use tools to fetch the data.

ZYGRIB:

- ZYGRIB offers a user-friendly way to download GRIB files through their software. It's popular among sailors and provides access to multiple weather models.

Coasts and oceans

Find Australian tides and marine weather information for coastal and local waters, lakes, seas and oceans

Forecasts

Observations

Map

National and international

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[Sea temperatures and currents](#)



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[Ocean temperature – long-range forecasts](#)



[Interactive weather and wave forecast maps](#)



[Marine heatwave – long-range forecasts](#)



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Interactive Weather and Wave Forecast

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Map Selection

These forecast maps are produced from computer models and are used by forecasters to develop the official forecast maps on [MetEye](#).

Show
Timezone

- Surface Pressure & Rainfall
- Surface Winds
- MSLP & Thickness
- Wind Speed and Direction
- Geopotential Height
- Temperature
- Relative Humidity
- Dew Point
- ✓ Total Wave Height
- Primary Swell
- Secondary Swell
- Wind Waves
- Wave Period

Area:

Period:

[Refresh View](#)

Animate



Select a day or time to see its map

THURSDAY

FRIDAY

SATURDAY

SUNDAY

MONDAY

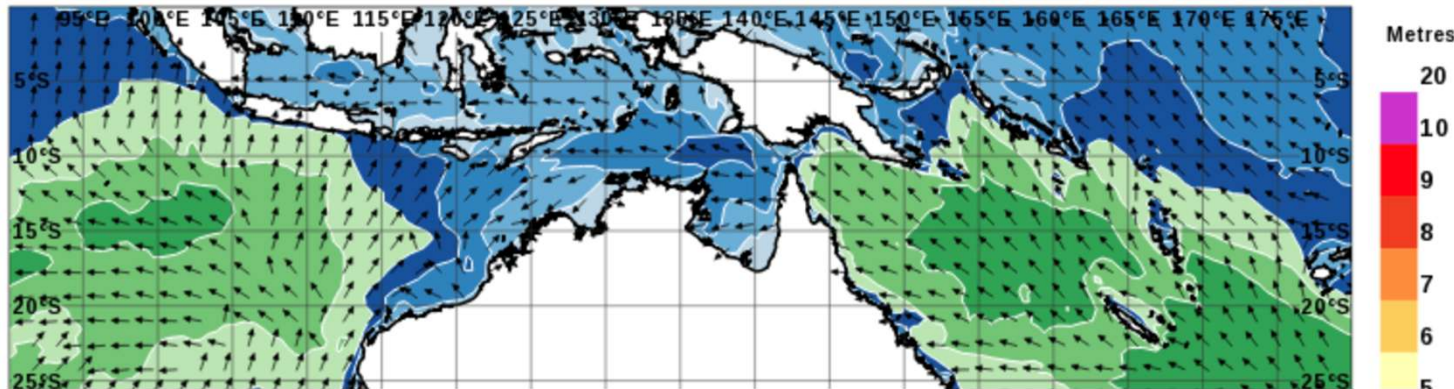
TUESDAY

WEDNESDAY

04 07 10 13 16 19 22 01 04 07 10 13 16 19 22 01 04 07 10 13 16 19 22 01 04 10 16 22 04 10 16 22 04 10 16 22 04 10 16 22

Total Wave Height & Direction
Valid 18UTC Wed 17 Jun 2026

AUSWAVE Regional
t+000



Victoria

[Port Phillip local waters forecast](#)



[Vic local and coastal waters forecast map](#)



[Western Port local waters forecast](#)



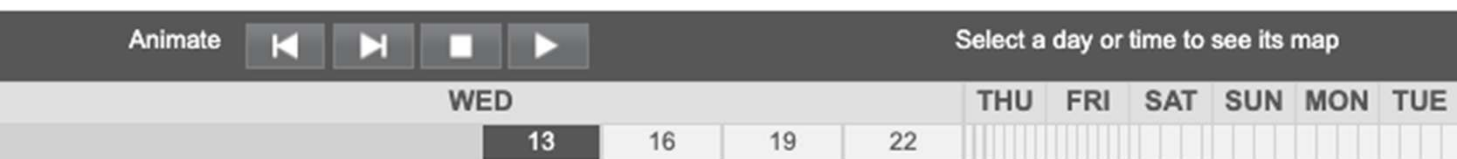
[Vic MetEye wind and waves forecast map](#)



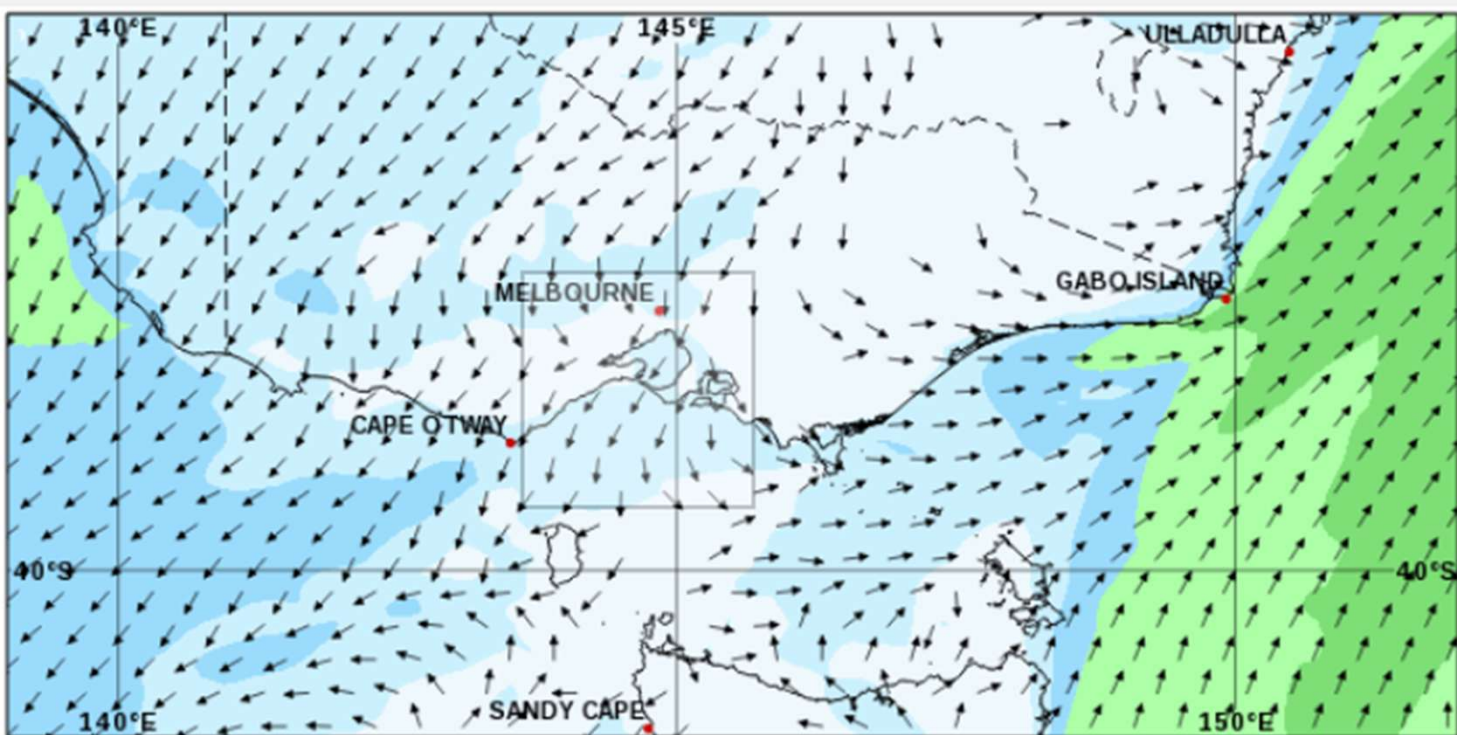
[Gippsland Lakes local waters forecast](#)



Queensland



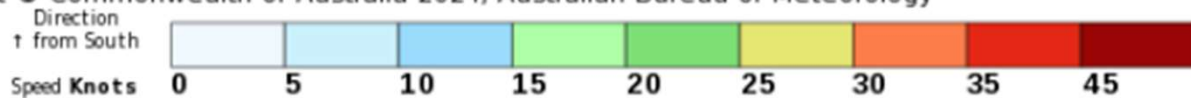
Forecast for 13:00 AEST on Wednesday 19 June 2024



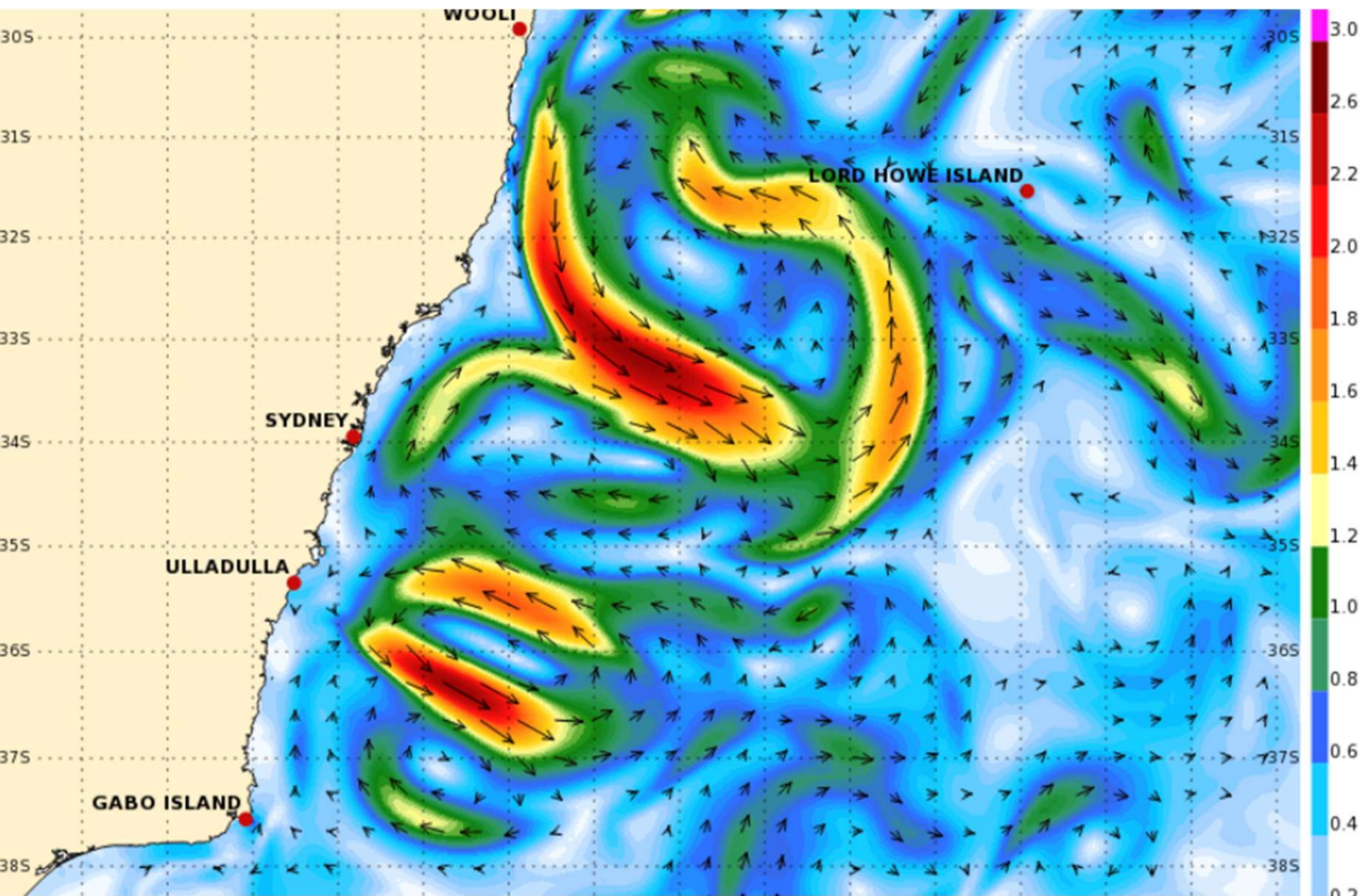
Wind Forecast for: 01:00 pm AEST 19/06/2024

Data from 18/06/2024

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Marine Wind Maps



Sea Temperature & Currents

Marine Weather Services (lite)

Please [refresh page](#) for latest warnings

WARNINGS

OCEAN WIND WARNINGS

- [Ocean Wind Warning 3 - Metarea 10](#)
- [Ocean Wind Warning 4 - Metarea 10](#)
- [Ocean Wind Warning 5 - Metarea 10](#)
- [Ocean Wind Warning 6 - Metarea 10](#)
- [Ocean Wind Warning 7 - Metarea 10](#)

QLD WARNINGS

No Warnings Current

NSW WARNINGS

- [Marine Wind Warning Summary for New South Wales](#)

VIC WARNINGS

No Warnings Current

TAS WARNINGS

No Warnings Current

SA WARNINGS

- [Marine Wind Warning Summary for South Australia](#)

FORECASTS

High Seas forecast

[North Eastern](#)

[South Eastern](#)

[Western](#)

[Northern](#)

[Southern](#)

CHARTS

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[Pacific Ocean MSLP Analysis](#)

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Bass Strait forecast

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Cape Otway to Sandy Cape and St Helens to Gabo Island

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WA/SA border to SA/VIC border

[Adelaide Metropolitan Waters](#)

Sellicks Beach to St Kilda

QLD forecast

[Gulf Waters Coastal Waters Zones](#)

QLD/NT border to Crab Island

[North Queensland Coastal Waters Zones](#)

Torres Strait to St Lawrence

[South Queensland Coastal Waters Zones](#)

St Lawrence to Point Danger

WA forecast

[Northern Coastal Waters Zones](#)

NT/WA border to North West Cape

[Western Coastal Waters Zones](#)

North West Cape to Cape Naturaliste

[Southern Coastal Waters Zones](#)

Marine Lite

<https://www.bom.gov.au/marine/lite/>



Central Coast: Cape Otway to Wilsons Promontory

Forecast for Thursday 20 June until midnight

Winds: Variable about 10 knots tending southeasterly later in the day. Seas: Below 1 metre. Swell: West to southwesterly around 1 metre, increasing to 1 to 1.5 metres in the west around midday. Weather: Becoming cloudy.

Forecast for Friday 21 June

Winds: Southerly about 10 knots increasing to 10 to 15 knots in the early afternoon. Seas: Around 1 metre. Swell: West to southwesterly 1 to 1.5 metres, increasing to 1.5 to 2 metres in the far west. Weather: Partly cloudy.

Forecast for Saturday 22 June

Winds: Southerly 10 to 15 knots becoming variable below 10 knots during the evening. Seas: Below 1 metre. Swell: Southwesterly 1 to 1.5 metres, increasing to 1.5 to 2 metres in the far west. Weather: Partly cloudy.

Central Gippsland Coast: Wilsons Promontory to Lakes Entrance

Forecast for Thursday 20 June until midnight

Winds: West to southwesterly below 10 knots becoming south to southeasterly in the late afternoon. Seas: Below 0.5 metres. Swell: East to southeasterly 1 to 1.5 metres. Weather: Mostly cloudy.

Forecast for Friday 21 June

Winds: Southerly 10 to 15 knots. Winds reaching up to 20 knots in the east during the morning. Seas: Below 1 metre, increasing to 1 to 1.5 metres in the east during the morning. Swell: East to southeasterly 1 to 1.5 metres. Weather: Partly cloudy. 70% chance of showers.

Forecast for Saturday 22 June

Winds: Southerly 10 to 15 knots turning west to southwesterly below 10 knots during the day. Seas: Around 1 metre. Swell: East to southeasterly around 1 metre, increasing to 1 to 1.5 metres in the east. Weather: Mostly sunny.

Bass Strait Forecast





Australian Government
Bureau of Meteorology

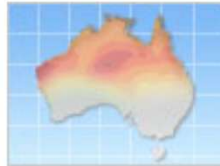
> Rain radars

> Satellite images

> Weather maps

> MetEye

Numerical Weather and Ocean Prediction Maps



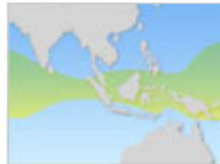
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Australian Region



- [Mean Sea Level Pressure \(MSLP\) map](#)
- [Latest Colour Mean Sea-Level Pressure Analysis and Infrared Greyscale Satellite](#)
- [Short-term forecast](#)
- [Forecast map for next 4 days](#)
- [UV Forecast](#)

Tropical Region



Mean Sea Level Pressure (MSLP)

- [Asia MSLP Analysis 00 UTC](#)

Gradient Level Wind (GLW)

- Gradient Level Wind Analysis: [00 UTC](#) or [12 UTC](#)
- Pacific Ocean GLW (A): [00 UTC](#) or [12 UTC](#)
- Indian Ocean GLW (B): [00 UTC](#) or [12 UTC](#)

Corrupt Data

Predictwind

Melbourne

All forecasts expected to update in 3 hours

Forecasts

Observations

Local Knowledge

Weather Routing



Sail Routing



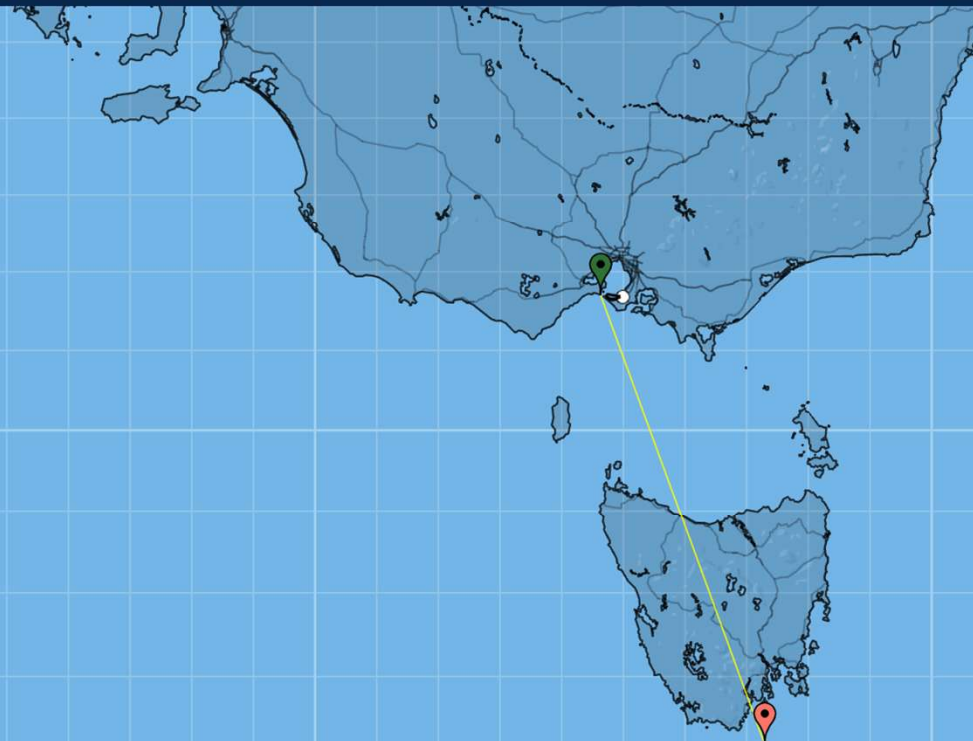
Power Routing

Departure Planning

Tools

Solutions

Help



Routing Options

Waypoints

Boundaries

Routes



38 18.054s 144 37.884e



43 48.066s 147 17.622e



Reverse Waypoints

Save Course

Export

Import

Saved Courses

M2KI



Deal Lady Baron



WestCoaster



Cock of the Bay



Lakes Entrance SSSC Exercise



M2



Melbourne

All forecasts expected to update in 3 hours

Forecasts

Observations

Local Knowledge

Weather Routing

Sail Routing

Power Routing

Departure Planning

Tools

Solutions

Help

Latitude 34 30.629s
Longitude 131 03.456e
Save Measure

+

-

Start Time

Start Timezone

Australia/Melbourne

Start Time

23/06/2024

12:27 PM

PredictWind

THE WORLD L



Melbourne

All forecasts expected to update in 3 hours

Forecasts

Observations

Local Knowledge

Weather Routing

Sail Routing

Power Routing

Departure Planning

Tools

Solutions

Help

☒ Map follows boat when animating routes

☐ Show extreme weather warnings

Optimise Route For:

FASTEST TIME

COMFORT

Boat Polar

Boat Type

☒ Predefined

☐ Sail

☐ Advanced

☐ AI Polar

Select Predefined Boat Polar:

Beneteau First 40

COPY TO ADVANCED POLAR

☐ Will motor at 8.0 knots when boat speed is less than 4.0 knots.

Polar Speed Adjustment

Upwind:

100%

Downwind:

100%

At Night:

100%

(20% - 200%)

Tack/Gybe Penalties

Tack:

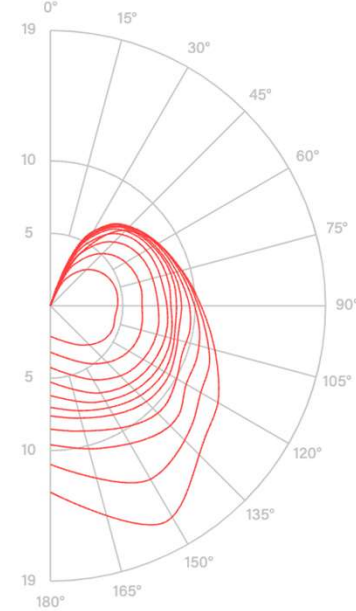
15

Gybe:

15

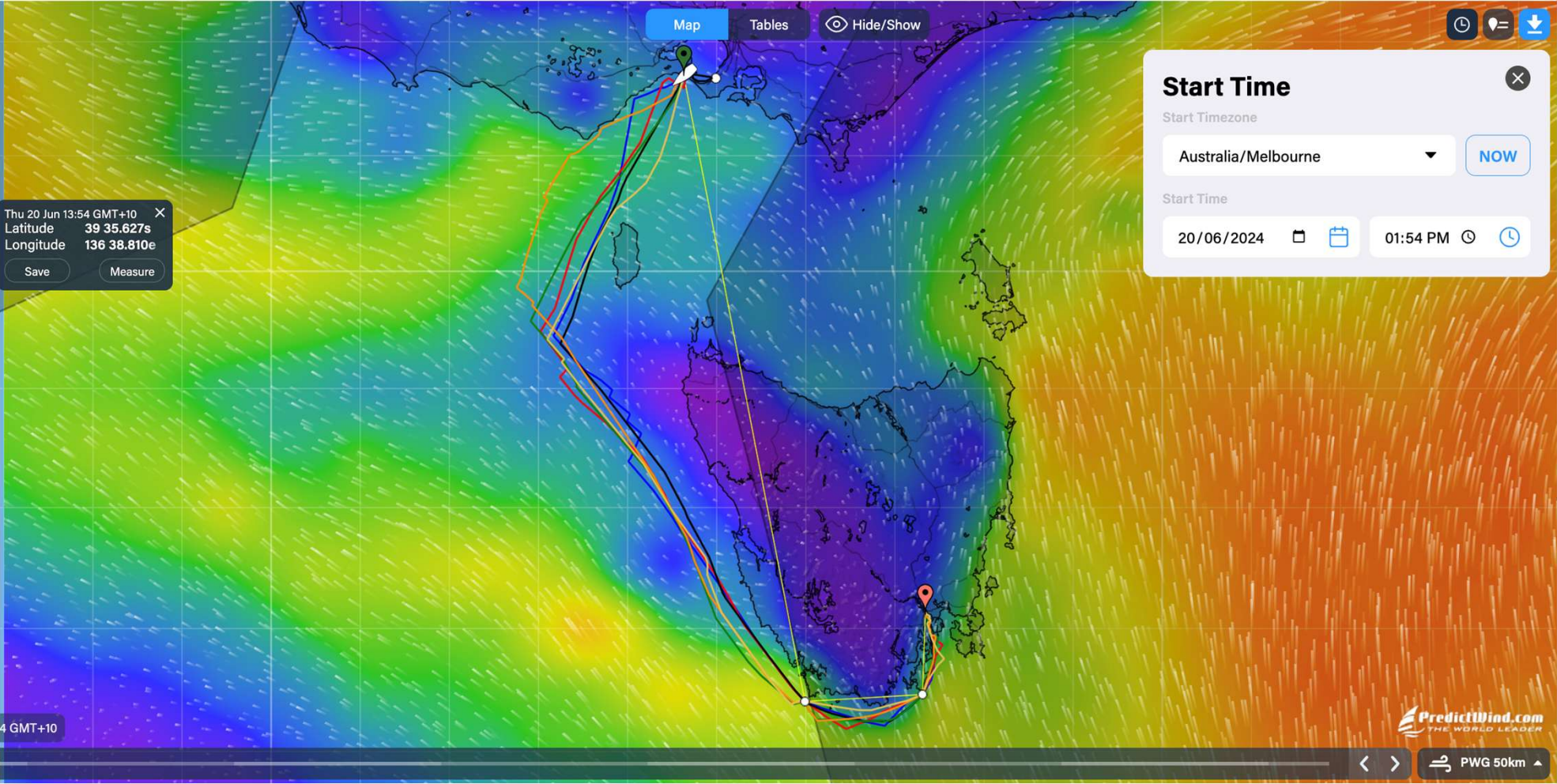
(seconds)

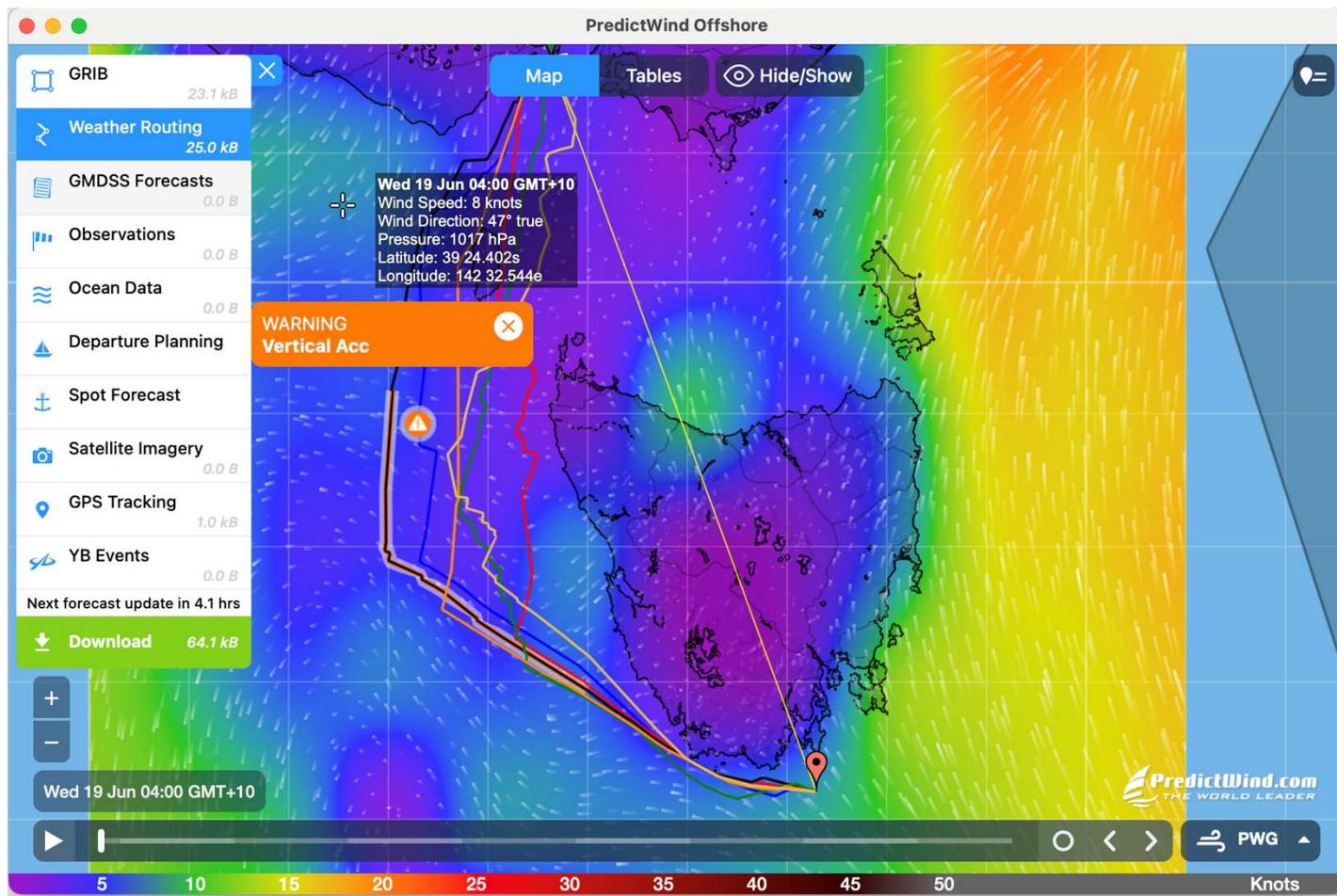
Boat Polar



FULL SCREEN

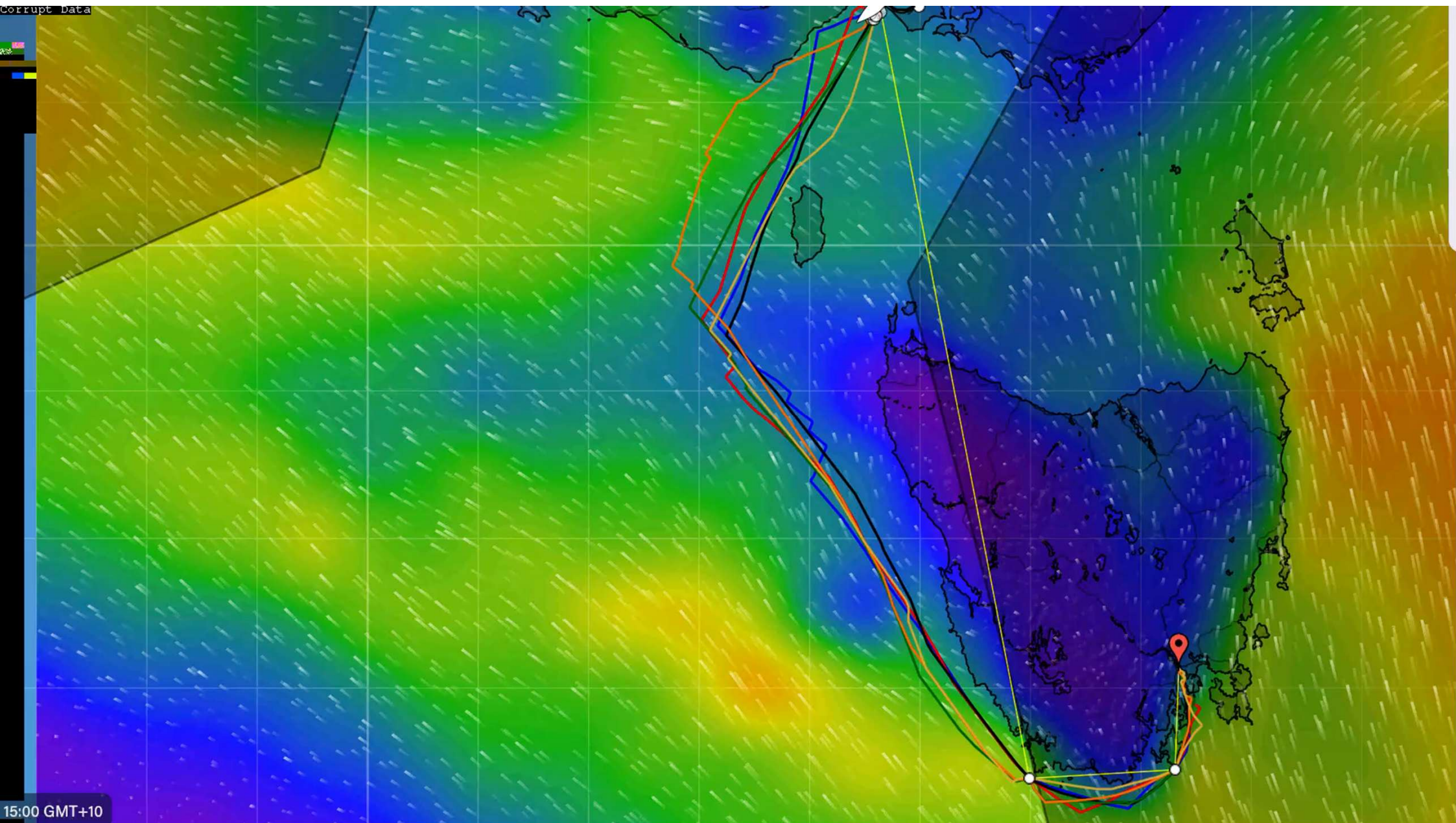
Four Models





Corrupt Data

15:00 GMT+10



Units		Polar Settings			
Speed	Knots	Pressure	hPa	Polar	Beneteau First 40
Direction	True	Temperature	Celsius	Polar Speed Adjustment	Upwind 100% — Downwind 100%
Wave Height	Meters	Rainfall	mm/hr	Motoring	False
Period	Seconds	CAPE	J/kg	Ocean Current	Mercator
				TWD Adjustment	0°
				TWS Scale Factor	100%

	PWG	PWE	ECMWF	GFS	SPIRE	UKMO
Warnings						
Timezone	GMT+10:00	GMT+10:00	GMT+10:00	GMT+10:00	GMT+10:00	GMT+10:00
Start Time	20 Jun 13:54	20 Jun 13:54	20 Jun 13:54	20 Jun 13:54	20 Jun 13:54	20 Jun 13:54
Finish Time	23 Jun 07:37	23 Jun 17:54	23 Jun 04:53	23 Jun 16:44	23 Jun 20:19	23 Jun 21:31
Time Taken	2 days 17h 42m 38s	3 days 3h 59m 59s	2 days 14h 58m 26s	3 days 2h 50m 19s	3 days 6h 24m 30s	3 days 7h 36m 30s
Motoring Time						
Distance Traveled	502.1 NM	515.5 NM	477.0 NM	507.0 NM	523.1 NM	495.4 NM
Average Speed (kts)	7.6	6.8	7.6	6.8	6.7	6.2
Passage Time (days)	2.74	3.17	2.62	3.12	3.27	3.32
Motoring Time (days)	0.00	0.00	0.00	0.00	0.00	0.00
Max Wind Speed (Knots)	14.6	11.2	16.3	14.9	13.6	13.8
Min Wind Speed (Knots)	2.6	1.4	4.6	2.2	2.0	2.4
Avg Wind Speed (Knots)	11.0	8.0	10.5	9.2	8.6	7.4
Max Gust (Knots)	17.3	17.3	21.0	16.2	18.4	18.4

PredictWind Offshore App

PredictWind Offshore

GRIB 23.1 kB

Weather Routing 25.0 kB

GMDSS Forecasts 0.0 B

Observations 0.0 B

Ocean Data 0.0 B

Departure Planning

Spot Forecast

Satellite Imagery 0.0 B

GPS Tracking 1.0 kB

YB Events 0.0 B

Next forecast update in 4.1 hrs

Download 64.1 kB

Wed 19 Jun 04:00 GMT+

5 10 15 20 25 30 35 40 45 50 Knots

Download Method: Web Use Offshore Optimised Settings

GRIB

24 Hourly

For 5 Days

100 km resolution

☒ PWG ☒ PWE ☒ Wind ☐ Gust

☒ ECMWF ☒ GFS ☒ Pressure ☐ CAPE

☒ SPIRE ☒ UKMO ☒ Rain ☐ Temp

☒ AROME ☒ NAM ☐ Wave ☐ Cloud

☒ HRRR

Weather Routing & Departure Planning (Standard/Professional)

Start Time: ☒ Now ☐ 12/ 6/2024, 11:38 AM

Route Type: ☒ Weather Routing ☐ Departure Planning ☐ Destination Forecast Only

GMDSS Forecast (Free)

GMDSS Graphical Forecast

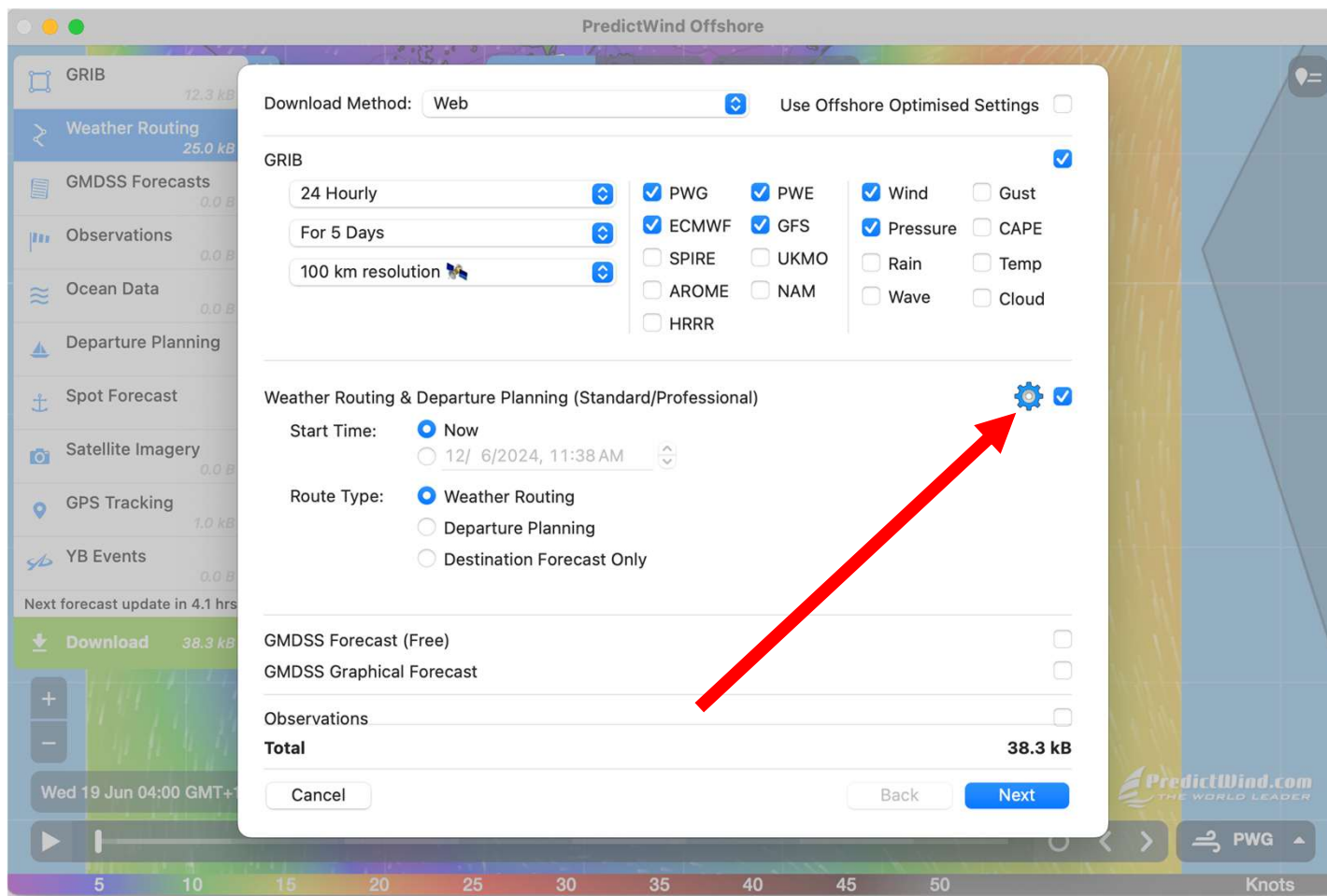
Observations

Total 64.1 kB

Cancel Back Next

PredictWind.com THE WORLD LEADER

PWG



Preferences

General PredictWind Iridium GO! Iridium GO! Exec Optimizer Globalstar DataHub **Routing** Map

☒ Map follows boat when animating routes.

☐ Comfort Settings (Weather Routing)

Departure Planning

Space departures by: 24 hours

Polar Speed Adjustment Upwind: 100 Downwind: 100 Night: 100 (20 - 200%)

Tack Penalty: 15 Gybe Penalty: 15 seconds.

Boat Type: ☒ Predefined ☐ Power ☐ Sail ☐ Advanced ☐ DataHub

Predefined Boat Polar: Beneteau First 40

☐ Will motor at 8 knots when boat speed is less than 4 knots.

☐ Wave Polar

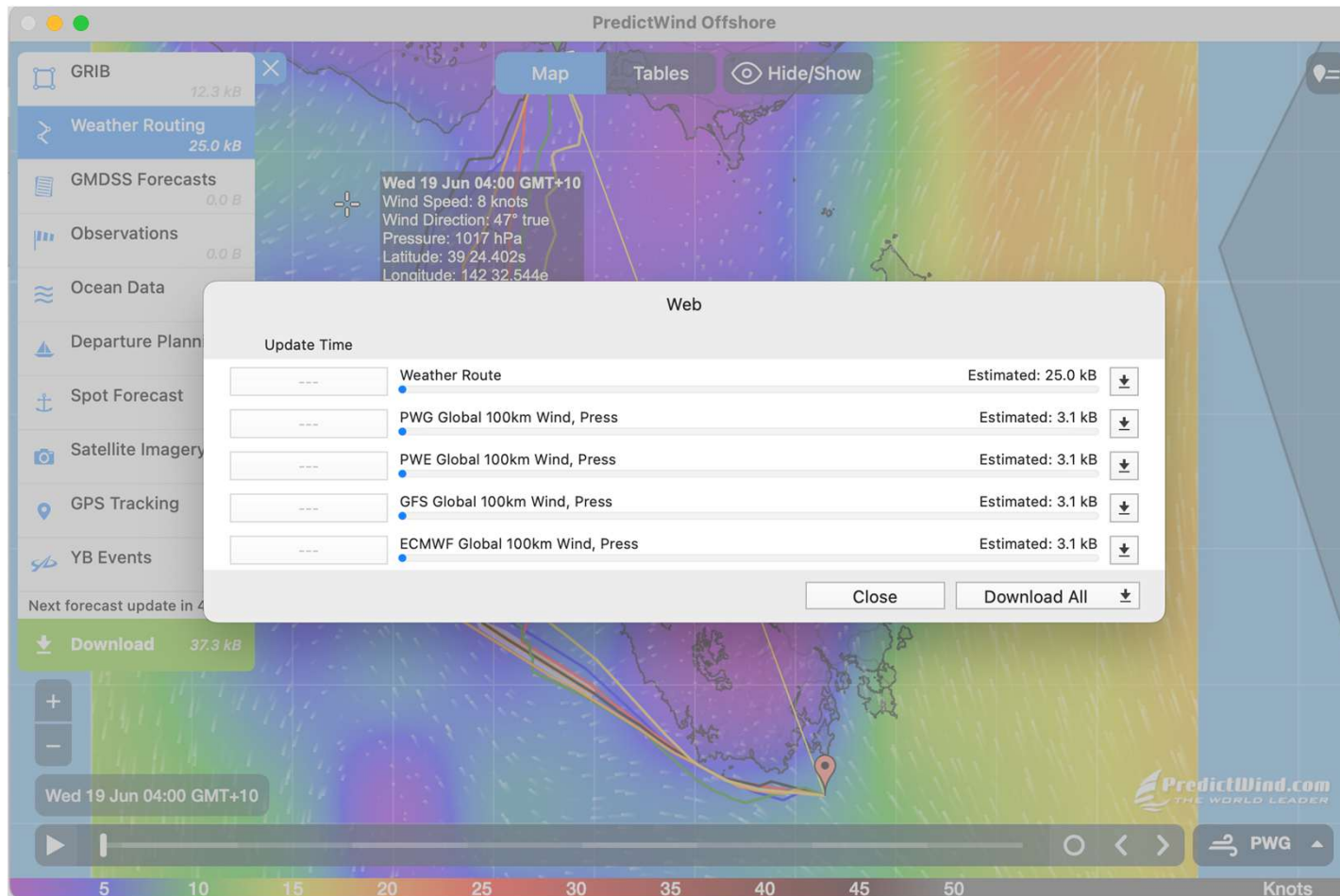
Depth Avoidance: ☐ Land ☒ 2m ☐ 5m ☐ 10m ☐ 20m ☐ 30m

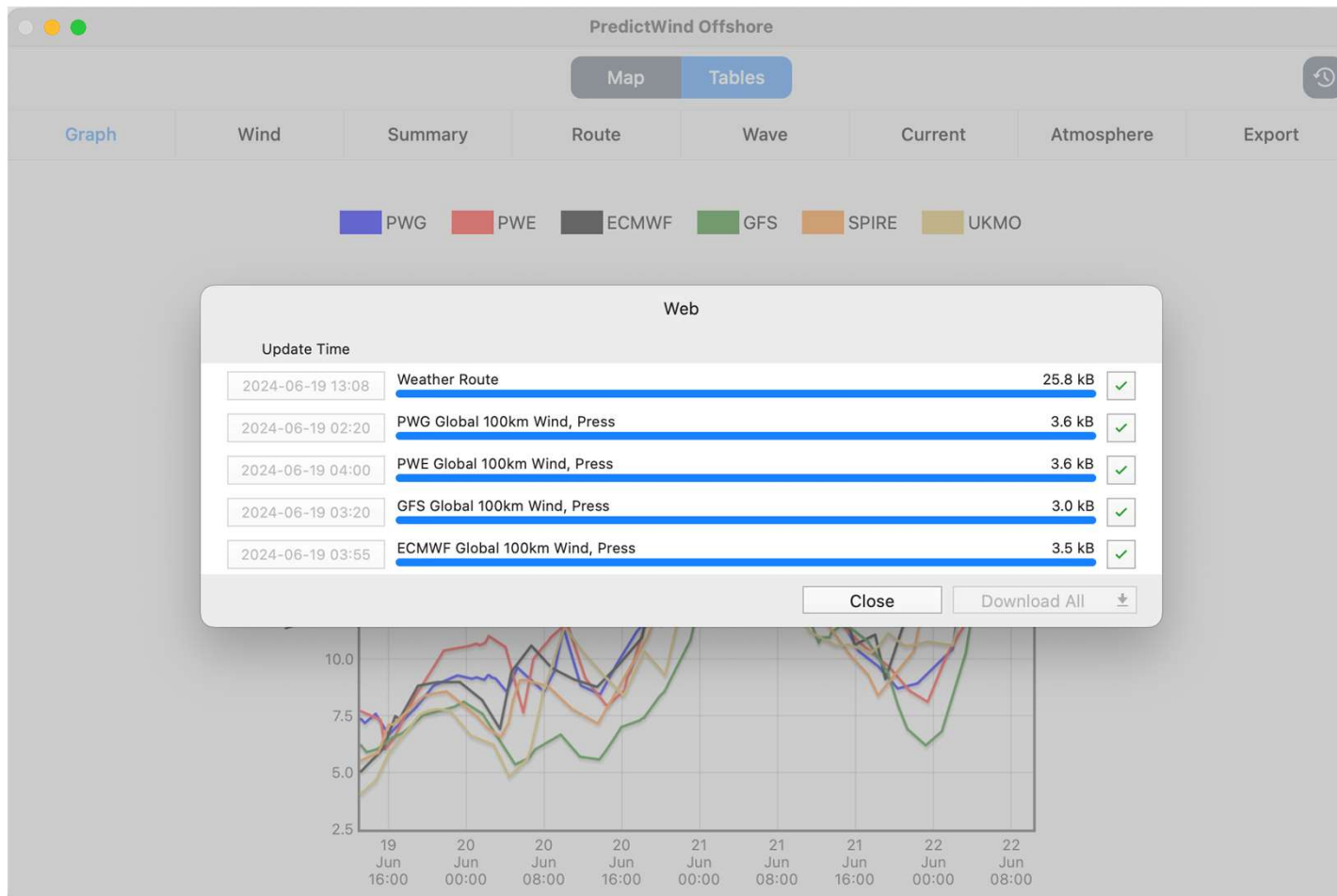
☒ Tidal & Ocean Currents Mercator

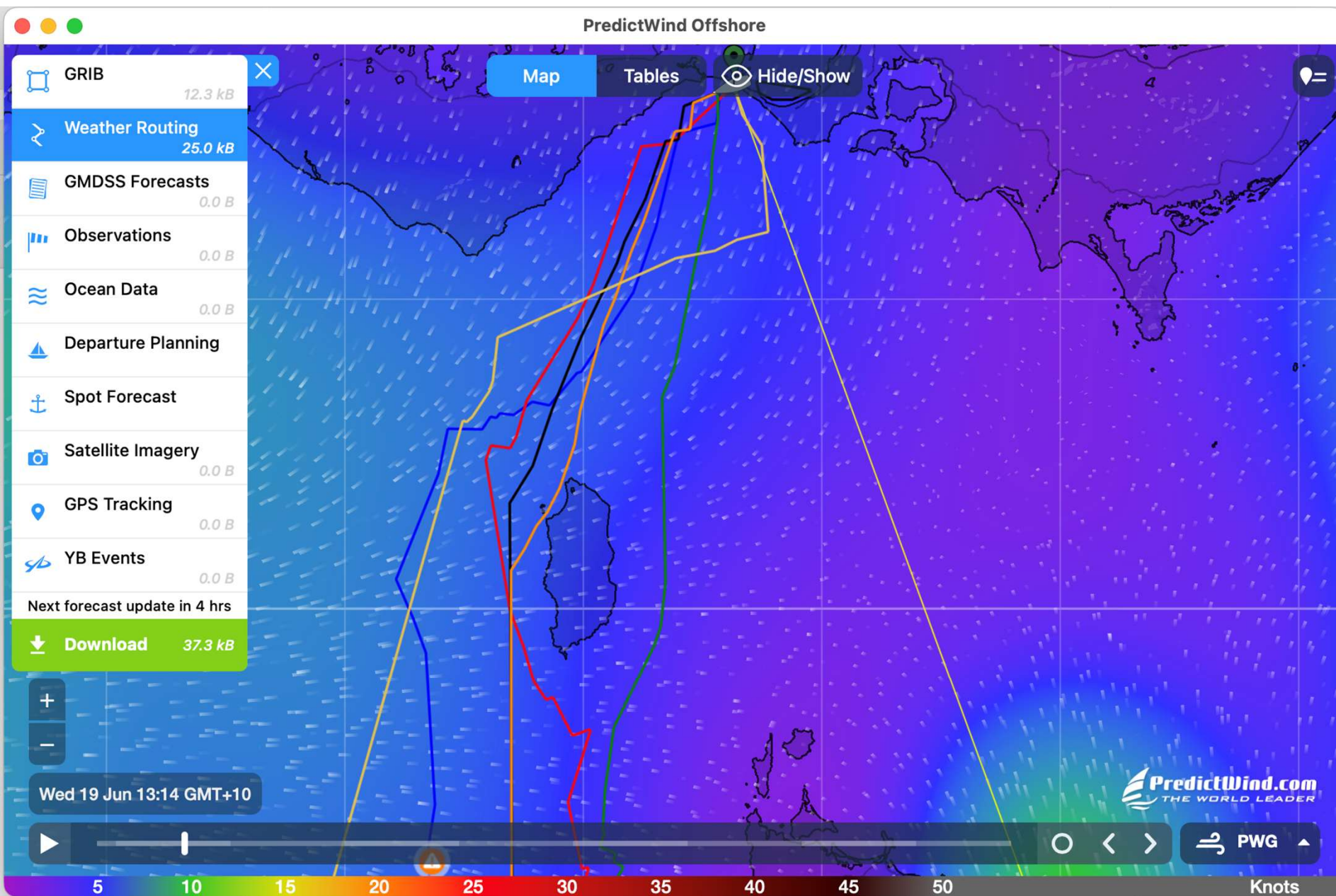
☐ Advanced Routing Adjustments

TWS scale factor: 100 (70% - 130%)

TWD adjustment: 0 (-45 to 45 degrees)







Weather Planning things to Remember

- Advance weather planning will make a safer trip
- Your Weather journey has just started
- Pick the tools that are right for you level of interest
- Get to know the tools that you choose
- When delivering or cruising always choose a window rather than a date
- Make sure that you have the ability to constantly update your weather while you are on the move
- In closing we have given you a lot
- Please maximize the benefit of this course by making your own weather bible



NAUTICAL PUBLICATIONS

Select a Publication to View:

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kt 0 5 10 20 30 40 60



Thursday 19

Friday 20

Thu 19 - 5 PM



Questions



Weather for Sailors

The Fundamentals-Enclosed Waters



Thank you

Our next training course is Fundamental Navigation with the first of three sessions on Tuesday 14th 16th and 21st July, 7.00pm. Note there is also an eLearning component of this course.

