



OCEAN RACING CLUB OF VICTORIA

WEATHER FOR SAILORS

MODULE 2 - COASTAL SAILING (PRESENTATION)

Welcome!

Please say "Hello" &
type "I'm ready" to the chat screen

Both can be found here

1



The slide features a blue background with a subtle grid pattern. On the left, there is a small image of the Earth. On the right, the ORCV logo is displayed above the text "OCEAN TRAINING". The main title "Weather Course" is prominently shown in white. Below it, the text "Module 2: Session 1" and "Coastal Waters-Voyages mostly 3-4 days duration" are listed.

Weather Course
Module 2: Session 1
Coastal Waters-Voyages mostly 3-4 days duration

2




The slide shows three small video thumbnails of the instructors. Below each thumbnail is the instructor's name. The ORCV logo is in the bottom right corner.


Robin Hewitt **Neville Rose** **Simon Dryden**

3


Tonight's Moderators




Jill Blunsom



Delma Dunoon

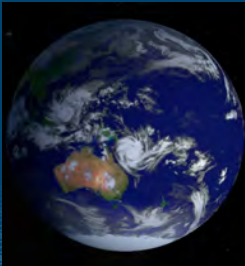


4



Some Reminders Questions

- Main Channel is "Chat"
- Please use the Everyone OR Organisers, The presenters channel is NOT monitored
- ? Question Breaks
- Limit video / mic (we will mute you)




5

Coastal

Races/cruises not usually longer than 3 days

Get as much weather info before-hand as possible

- Forecast for 3 days very reliable-Update when possible
- Will you have reliable internet access at sea for entire voyage? eg. Sydney-Hobart
- Internet capability ashore vs. offshore
- Semi-fatigue can arise: pre-plan as much as possible
- Weather Preview – for example:
 - Prognosis Maps
 - Wind forecasts
 - Tides
 - Currents (eg. East Australian Current)



6

Recap – The Weather Map

- Map Features
- Features and Wind
- Troughs



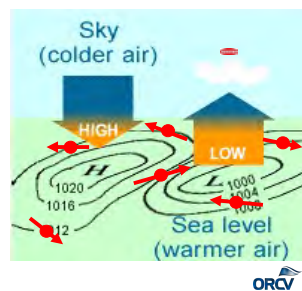
7

Highs and Lows

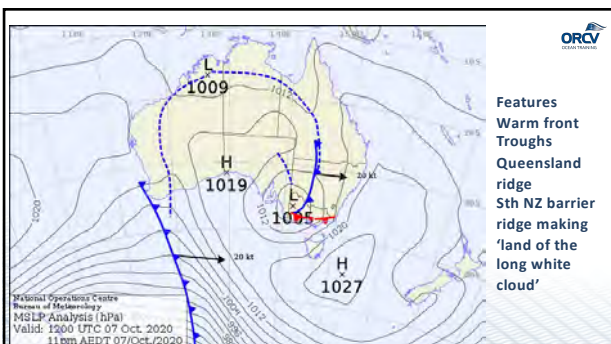
Wind Direction - Southern Hemisphere

- High: Wind Anti-Clockwise and outward 15 degrees from isobars.
- Low – Low Pressure System. Wind: Clockwise and inward 15 degrees from isobars.

Write these down for later on....

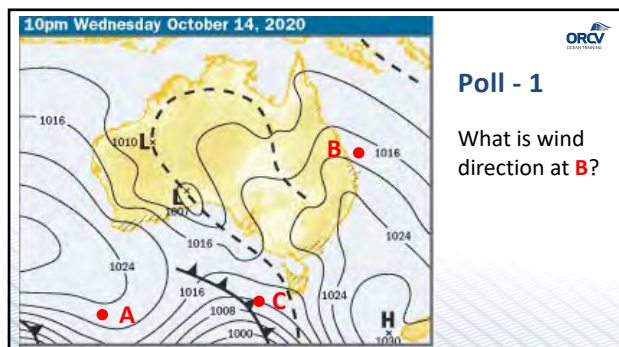


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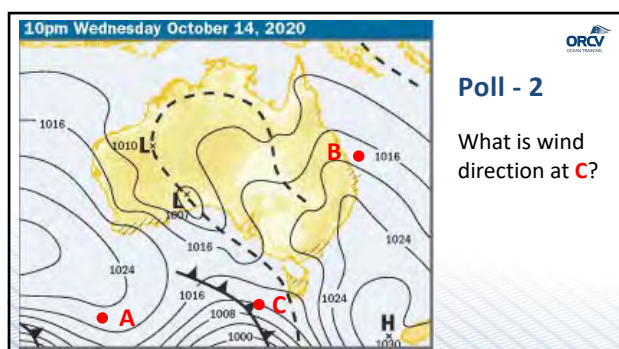


Features
Warm front
Troughs
Queensland
ridge
Sth NZ barrier
ridge making
'land of the
long white
cloud'

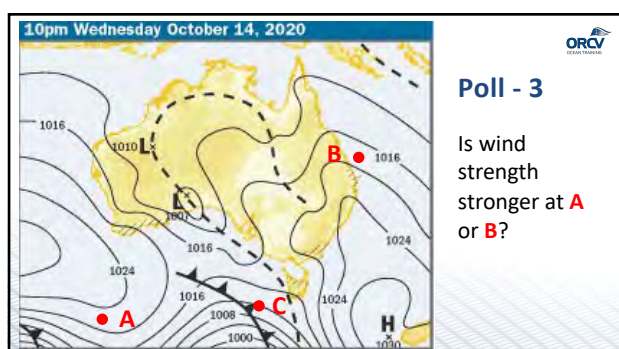
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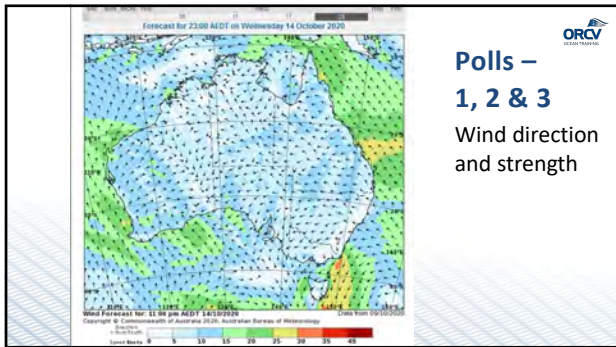
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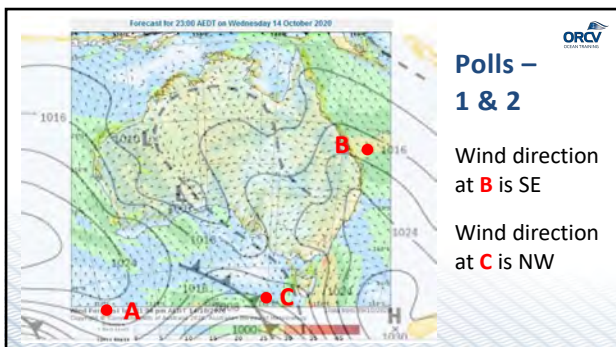
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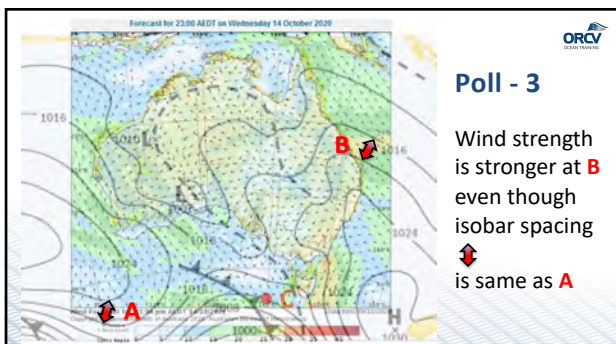
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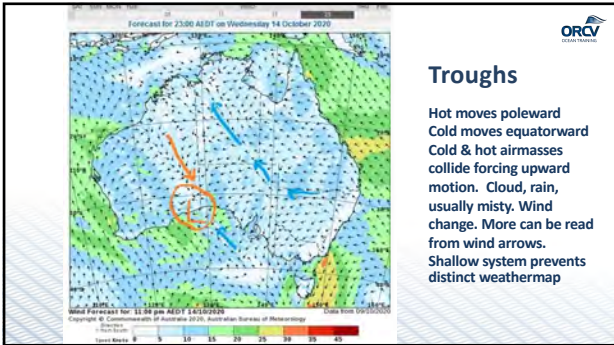
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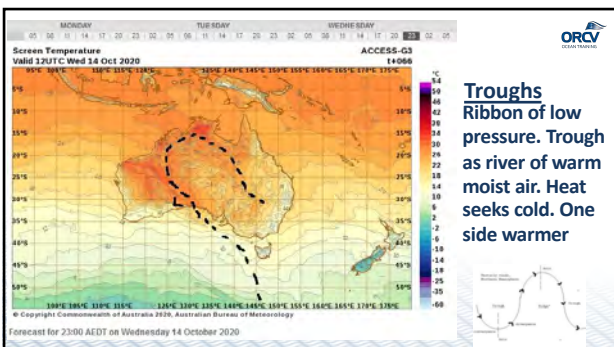
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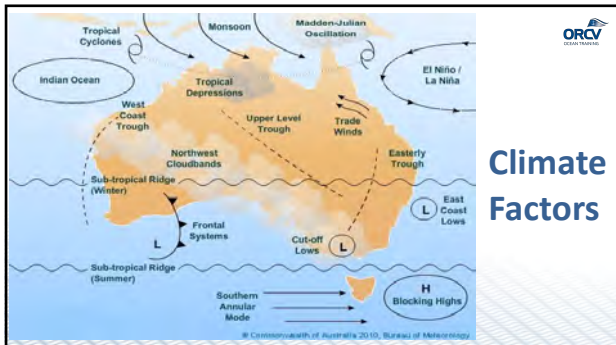


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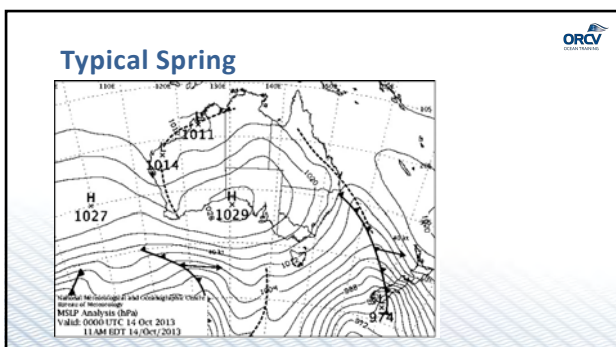


Planning
Alternatives (Contingencies)
Climate Factors
Seasons
Racing or Cruising-consider return
First time? Start small
Crew experience

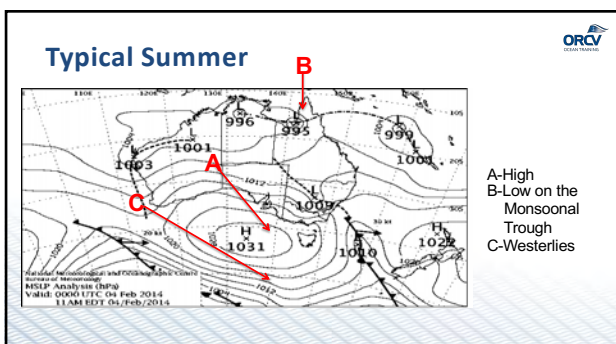
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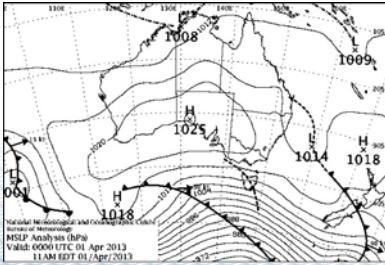


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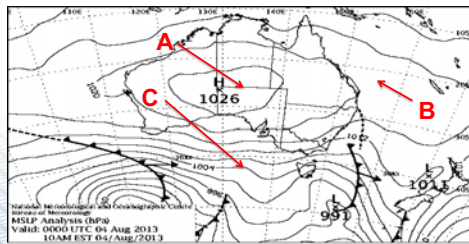
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Typical Autumn



22

Typical Winter

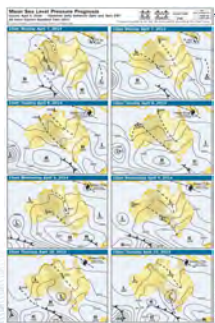


A-High
B-SE Trades
C-Westerlies

23

Prognosis Maps

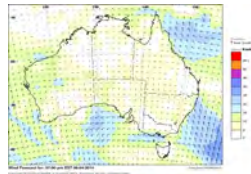
- 4 day BoM MSLP Prognosis
- Find via BoM website:
<http://www.bom.gov.au/>
- Also a useful tool for evaluating weather Stability
- Covered Module 1



24

Wind Forecasts

- BoM MetEye & Wind vector and Interactive Weather and Wave forecasts
- How does it correlate to the MSLP prognosis?
- Find via BoM website:
- Direct links: Construct your own directory to avoid un-necessary pages.



<http://www.bom.gov.au/australia/meteve/>

<http://www.bom.gov.au/>

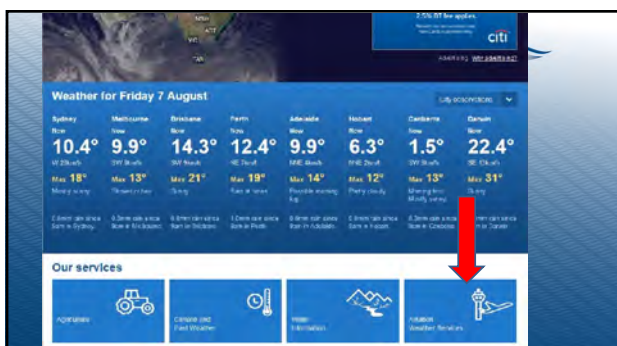
<http://www.bom.gov.au/marine/wind.shtml>

<http://www.bom.gov.au/australia/charts/viewer/index.shtml>

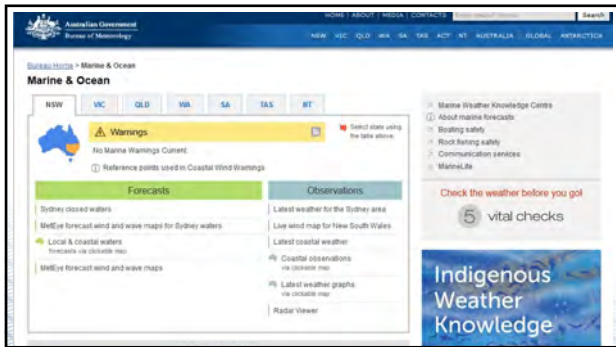
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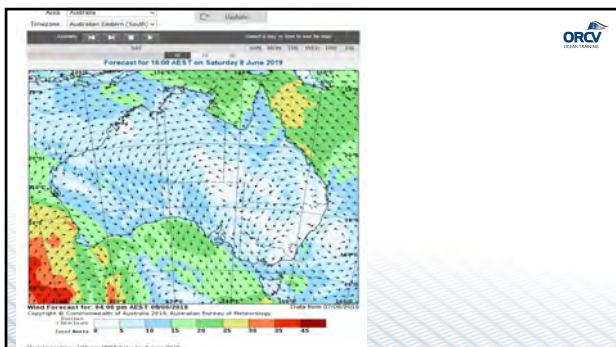
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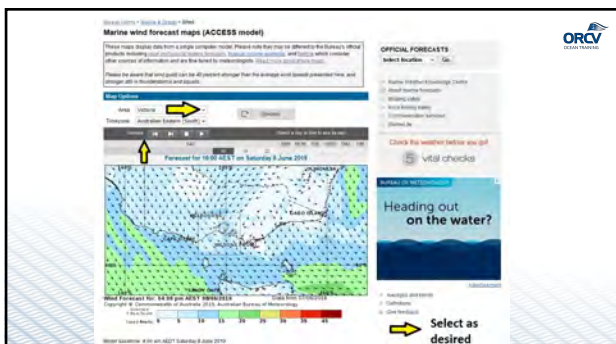
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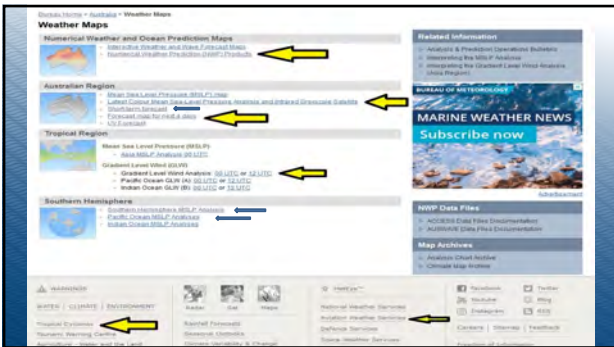
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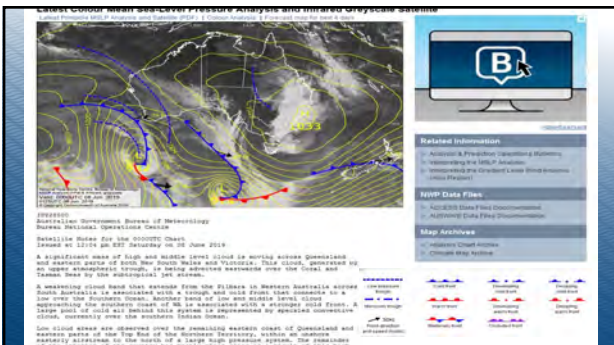
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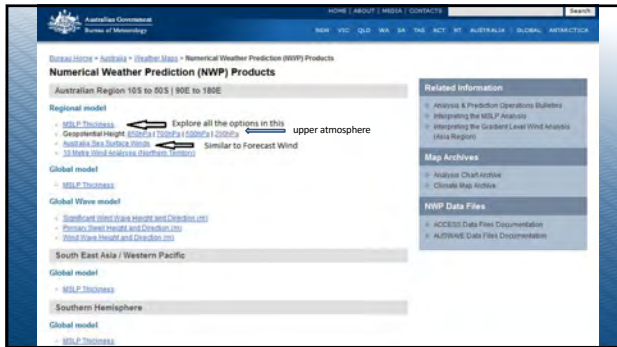
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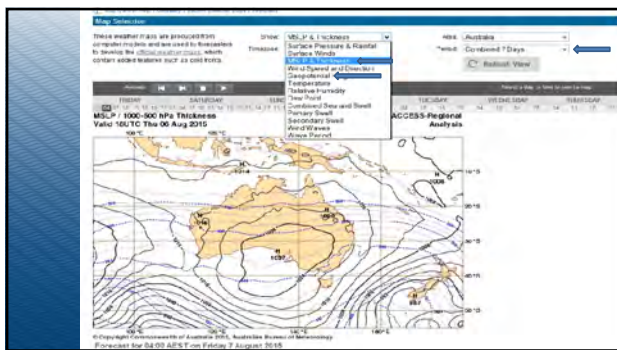
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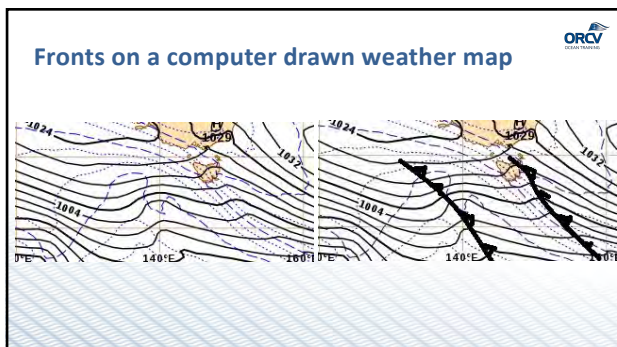
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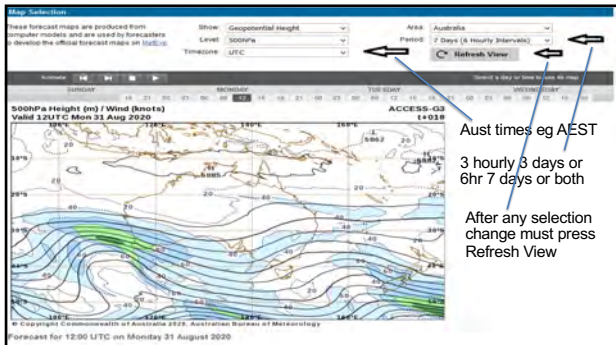
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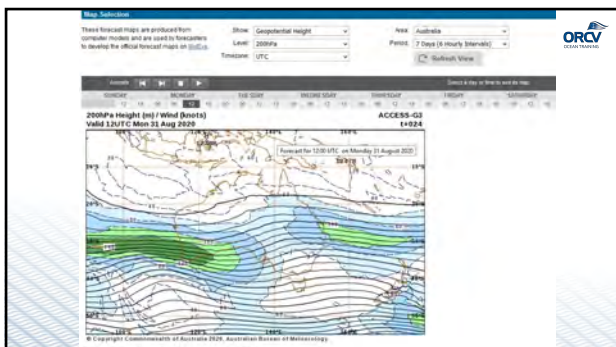


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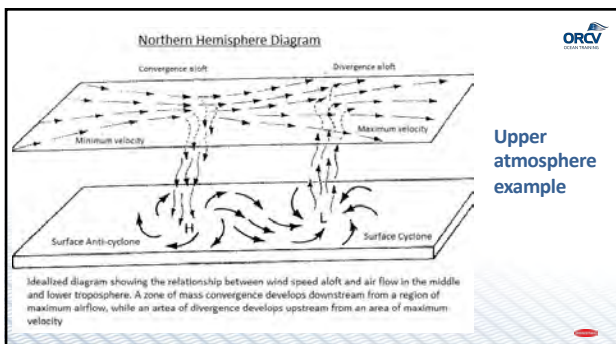


Aust times eg AEST
3 hourly 3 days or
6hr 7 days or both
After any selection
change must press
Refresh View

37



38



39

Change of Date - Module 3

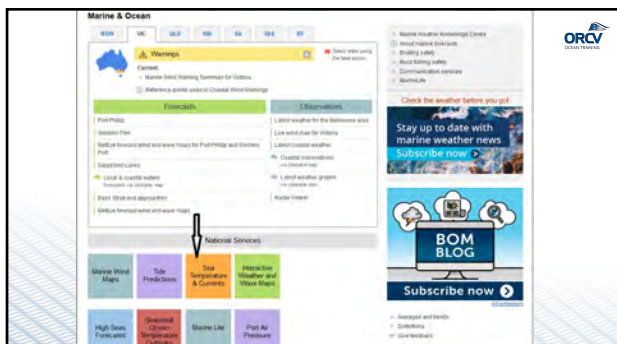
For those who have booked into Module 3, from feedback, we have moved the course dates
 FROM Tuesday 27 Oct and 10 Nov
 TO Tuesday 10 Nov and 17 Nov
 Any issues, please email training@orcv.org.au

40

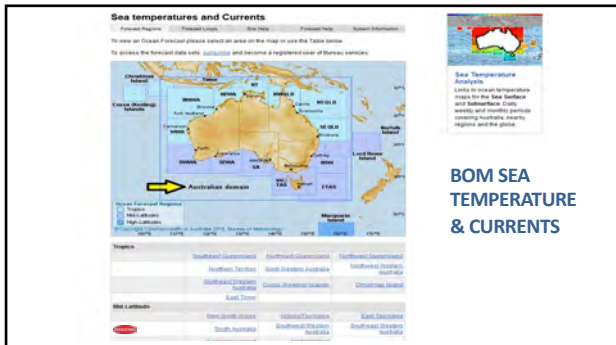
Short Break



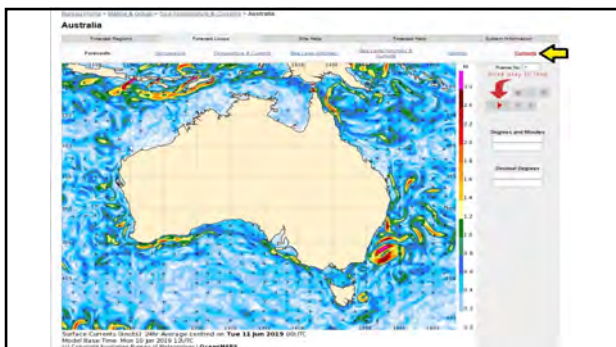
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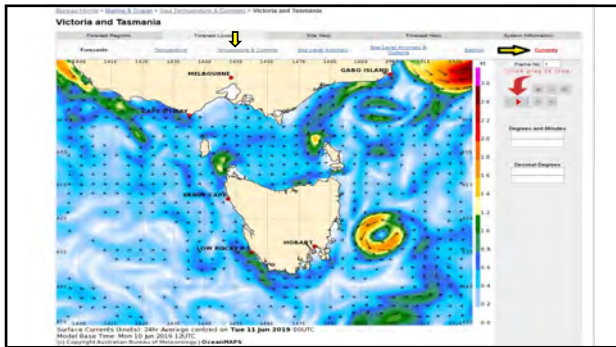
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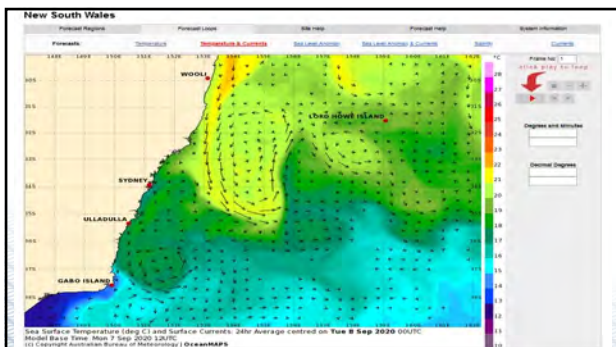
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47

Questions ?



48

Friction on Coastal Gradient Winds and Local Coastal Winds

Coastal Divergence/Convergence from Friction

Local Coastal Circulations:

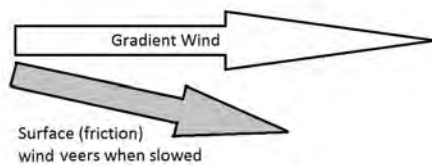
- Ocean/Coastal Seabreeze
- Land Breeze
- Katabatic Winds



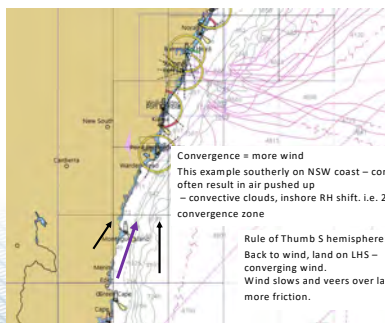
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Wind Convergence / Divergence

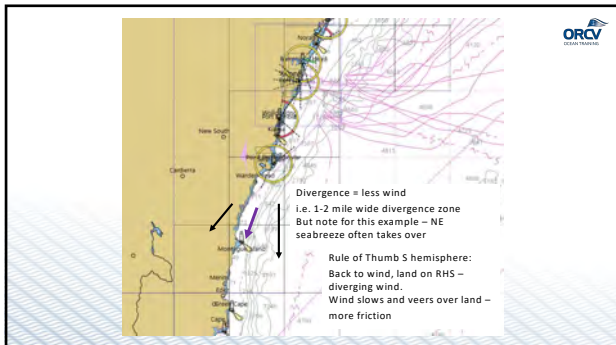
When wind is slowed, it veers (goes clockwise) in southern hemisphere



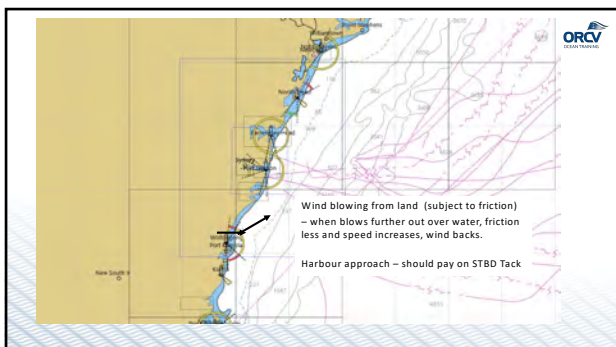
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51



52




53

Ocean Seabreeze

A shallow (~1000m thick) circulation set up by temp. differences between land and sea

Important in light gradient winds. Can be up to ~20-25 knots

- Recognise the possible areas
- Look for signs of formation
- Breeze starts close to coast and moves seaward



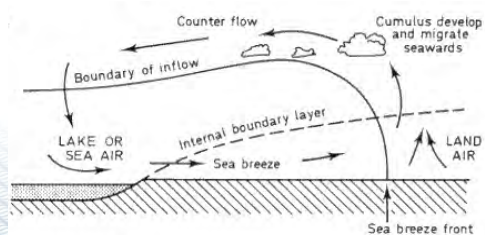
54

Sea Breeze Front

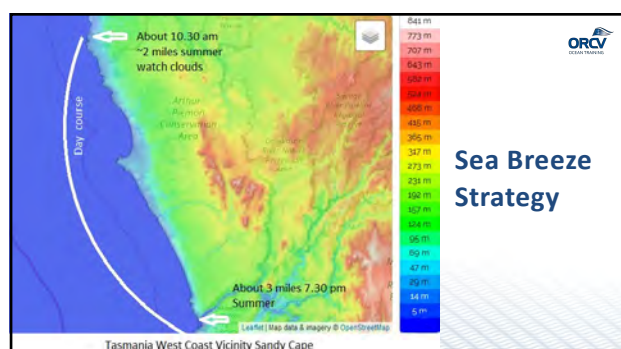


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Ocean Seabreeze



56



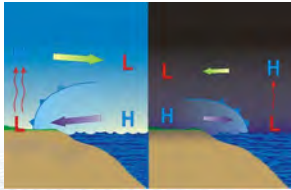
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58

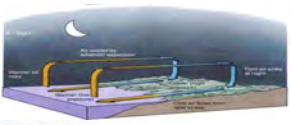
Seabreeze - Landbreeze

- Tactical importance of forecast and weather map
- Cloud identification
- Topography and gradient wind
- *Assists in identifying the most likely areas. i.e. sand areas, grasslands, sparse hills gain or lose temperature more than green forested areas*



59

- Cold air circulation (~100 meters thick), very light regime
- Starts close to shore (~1 nautical mile) late evening/early morning.
- Gradually moves outwards (some places to ~12 nautical miles).
- Fades by ~9am



Landbreeze

60

- Similar to a land breeze
- Wind from cold dense air that runs downhill
- Dissipates by ~2 nautical miles offshore
- Smooth and long down slope enhances strength
- Most famous are the Mistral, Bora and Antarctic mountain winds



Katabatic (downslope) winds

61

Katabatics

Example of katabatic process, albeit small
Gordon River
West Coast
Tasmania



62

Katabatics

Could be a katabatic?



63

Katabatics

Could be a katabatic?



64

Katabatics

River Derwent - Valley



65

Katabatics

- River – Valley – Primary indicator of katabatic potential - i.e. Derwent (Tas), Yarra (Vic), Tweed (Qld)
- Other consideration with rivers is the outflow
 - Temperature differences/Inversion/high pressure
 - Turbulent mixing
 - Differences with currents, waves, light winds
- Check rainfall



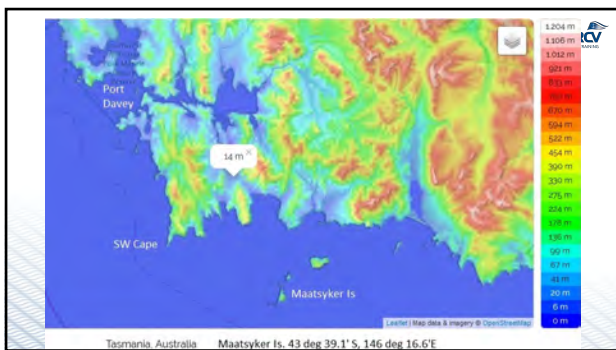
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Katabatics

To take advantage of a katabatic or landbreeze:

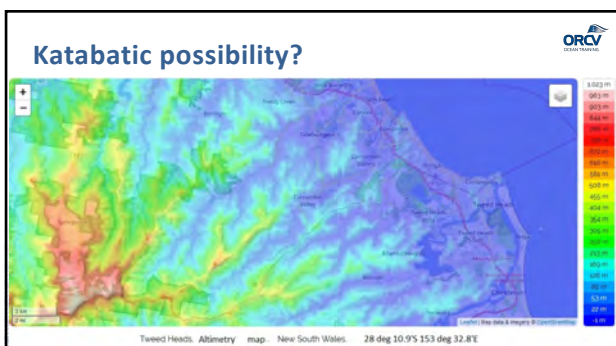
- Know the topography – valleys, smooth slopes from hilly terrain
- Be in the right place 1am to 9am, & less than 2 nautical miles from shore
- The sky must have been and be clear
- Gradient wind is preferably light

67



68

Katabatic possibility?



69

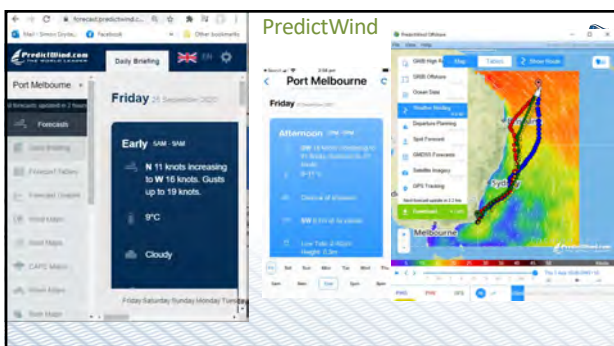
Questions ?

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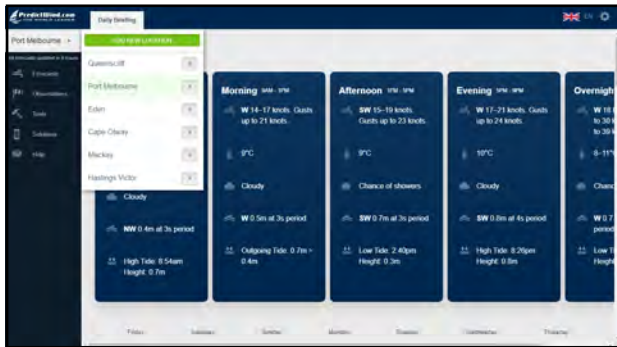
Routing Software

- Use of GRIB (Gridded Binary) files overlaid on electronic charts, i.e.
 - Maxsea
 - Expedition
 - PredictWind-Weather & maps, Predict Wind Offshore, Predict Wind Routing
- Quick demo - GRIB file overlay on navigation software/plotter
- Download pre-race ashore and update during race as internet connection(s) allow

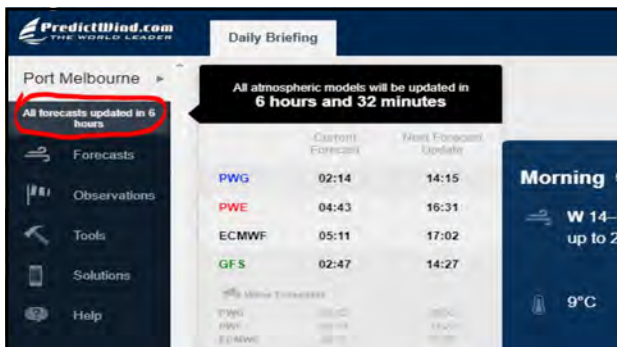
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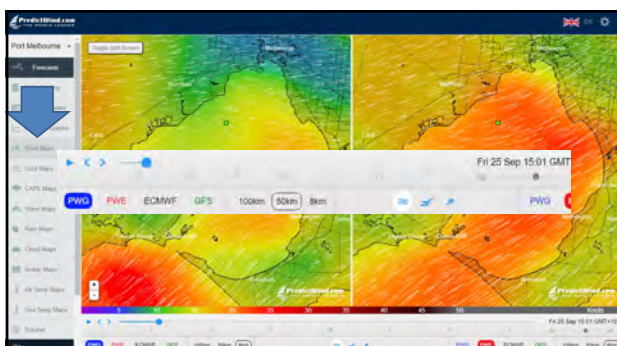
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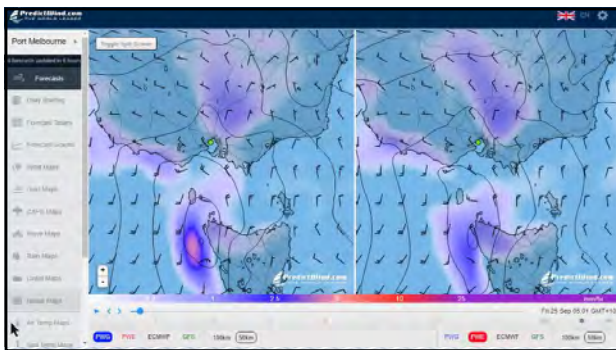
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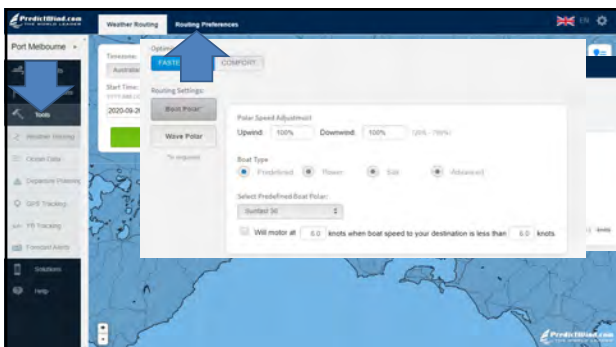
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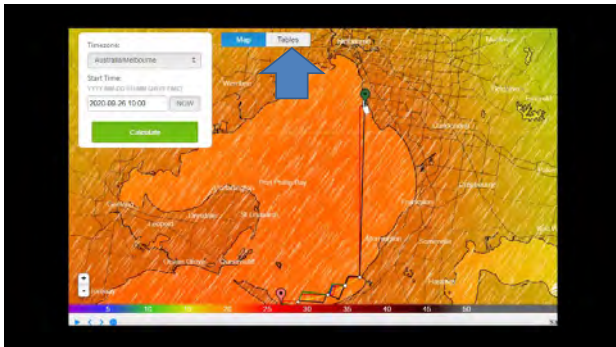
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77



78



79

% time upwind	100%	100%	100%	94%
% time reaching	0%	0%	0%	5%
% time downwind				
% time < 8 knots				
% time 8 - 20 knots	38%	22%	78%	3%
% time 20 - 30 knots	62%	78%	22%	91%
% time 30 - 40 knots				
% time > 40 knots				
% time < 1m wave	62%	63%	60%	60%
% time 1 - 2m wave				
% time 2 - 3m wave	38%	37%	40%	40%
% time 3 - 4m wave				
% time 4 - 5m wave				
% time 5 - 6m wave				
% time > 6m wave				
Max wind speed (knots)	27.0	28.1	21.4	22.9
Min wind speed (knots)	18.0	18.0	18.7	18.5
Ave wind speed (knots)	24.1	25.1	19.0	21.0

80




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2. Enter your details and the Promo code [orcv](#)
3. Download the Free PredictWind App or Offshore App by following the link [here](#). The promotional subscription allows you to use all the PredictWind Apps and tools along with the data you need for the training.

Please reach out to <https://www.predictwind.com/contact-us/> if you need any assistance claiming your subscription. If you have an existing sub we can upgrade it for you.

81

Zygrib Free grib file viewer

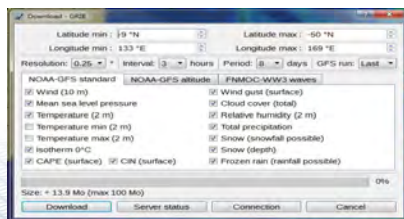
World wide grib file from NOAA and
Meteoblue

Waves from FNMOC

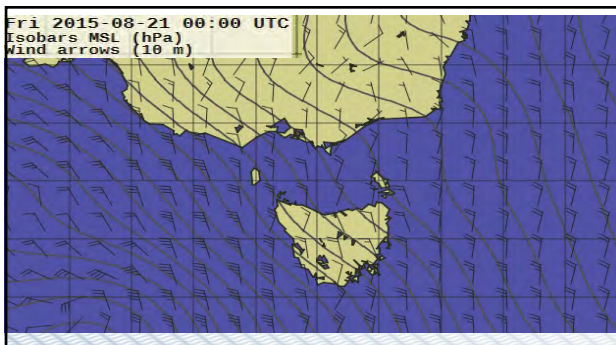
<http://www.zygrib.org/>

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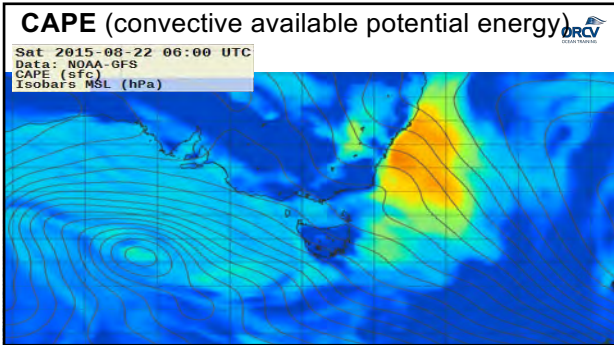
You can choose the size of the
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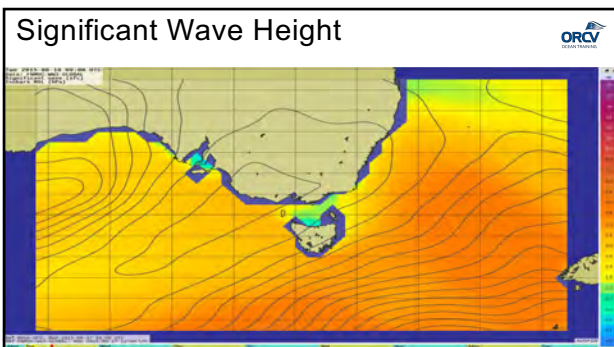
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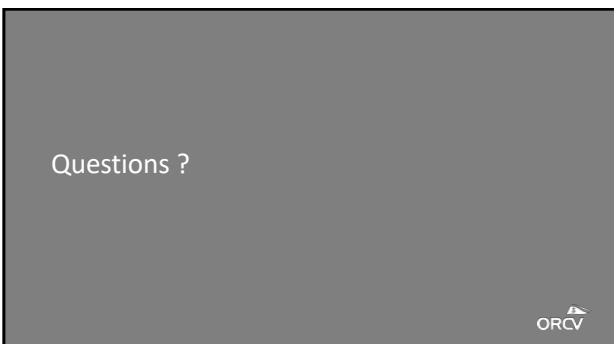
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85



86



87

Reminders

See you again next Monday

6th September 2021 7pm

See you all next week.



88



OCEAN RACING CLUB OF VICTORIA

WEATHER FOR SAILORS

MODULE 2 - COASTAL SAILING SESSION 2





Weather Course

Module 2: Session 2


Coastal Waters-Voyages mostly 3-4 days duration

1



Some Reminders Questions


- o Main Channel is "Chat"
- o Please use the Everyone OR Organisers, The presenters channel is NOT monitored
- o ? Question Breaks
- o Limit video / mic (we will mute you)



2

Tides

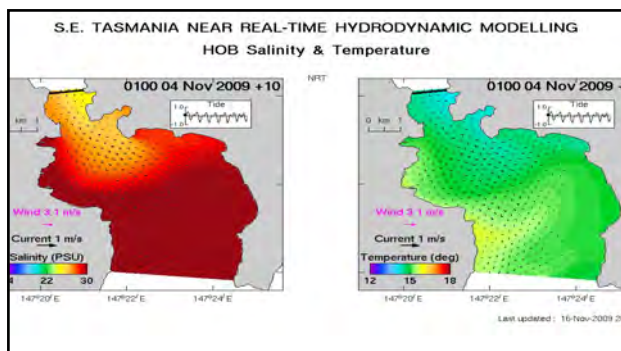
- Tidal predictions
- Find via BoM website:
<http://www.bom.gov.au/>
- Bass Strait tidal model (ORCV Yearbook)
- Port Phillip Heads – Streams also
<http://www.bom.gov.au/australia/tides/>



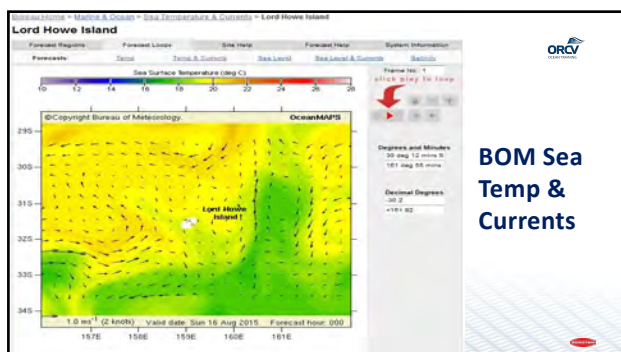
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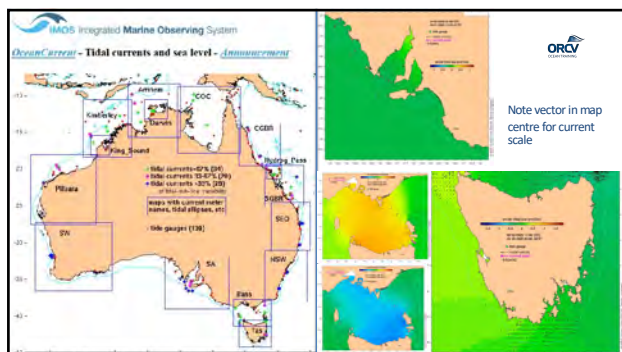
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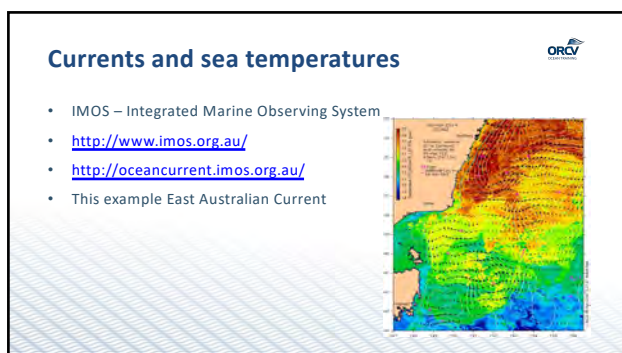
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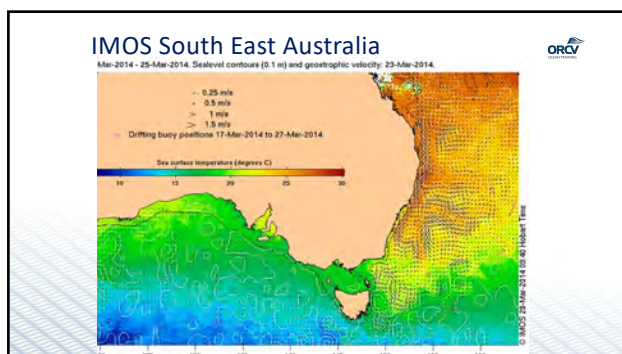
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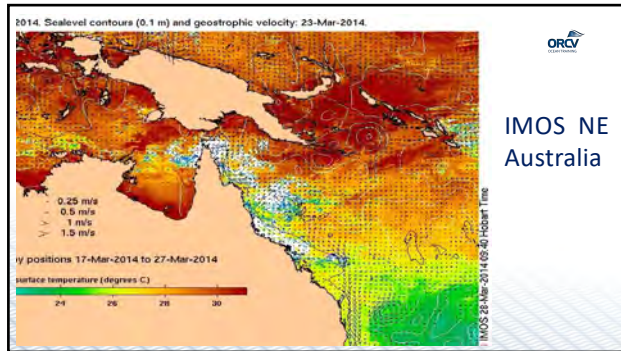
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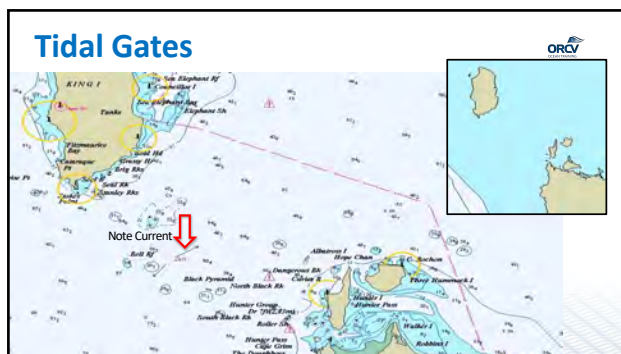
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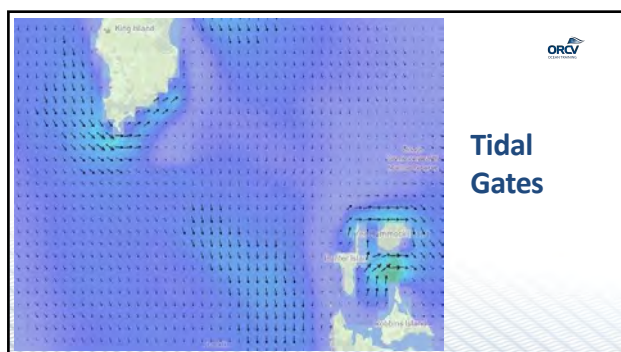
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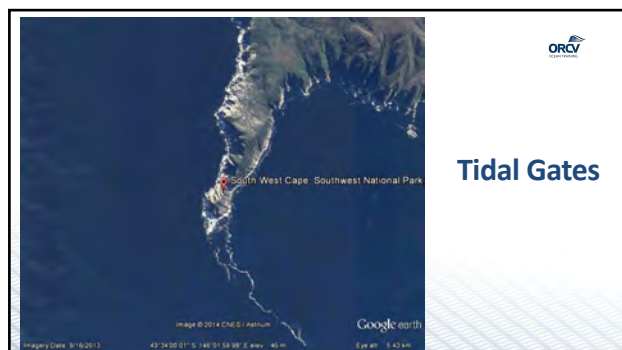
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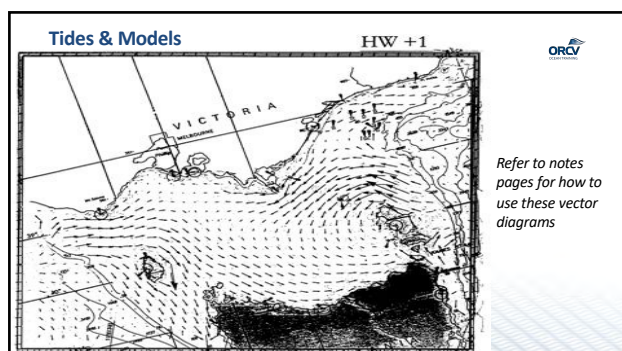
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12



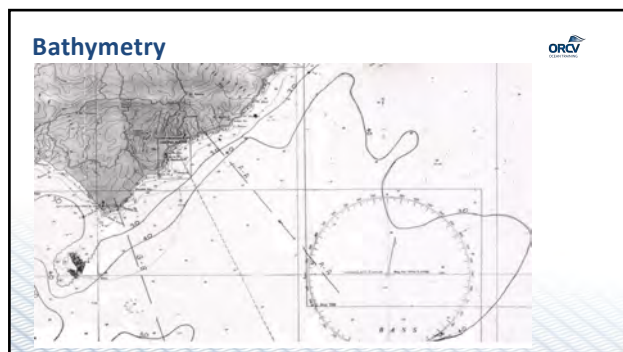
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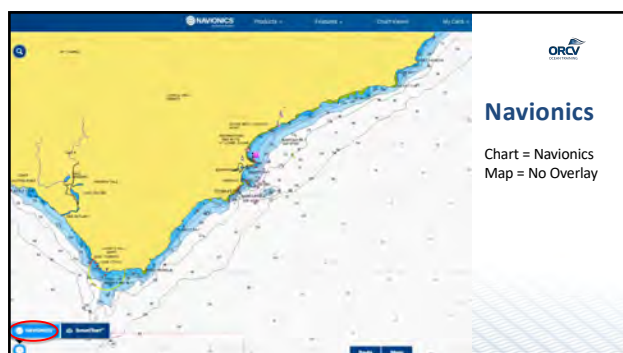
14

Prepare Table		
0620	HW	+1.0 (Heads)
0720	HW+1	
0820	HW+2	
1120	HW+5	
1210	LW	-0.1

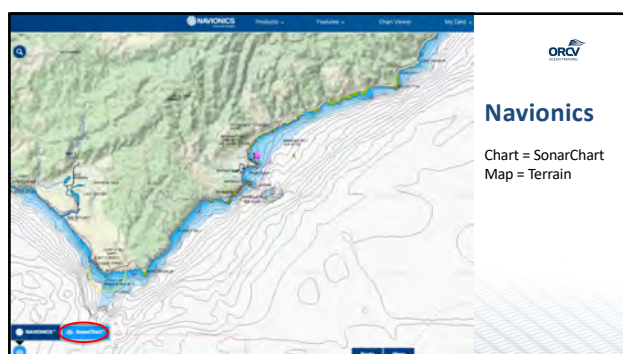
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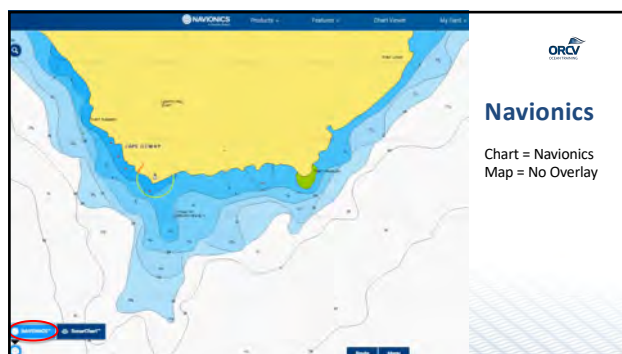
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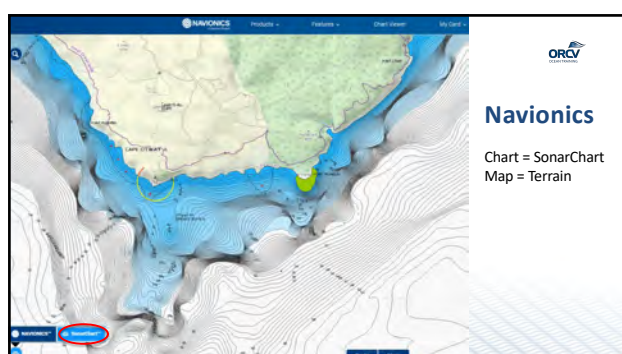
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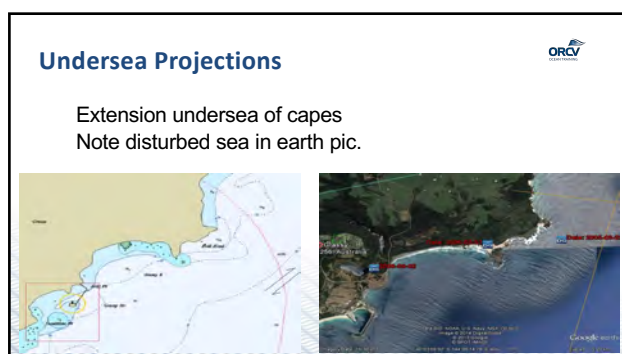
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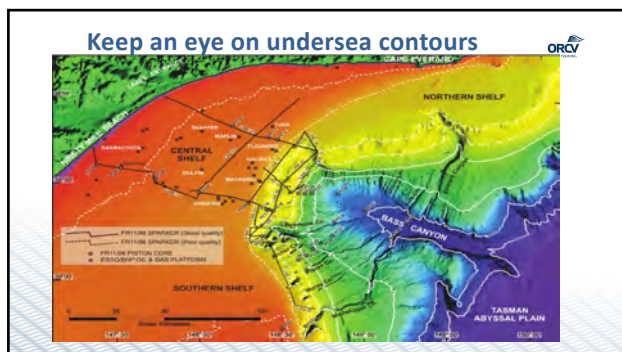
19



20




21



22

Forecasting Enroute

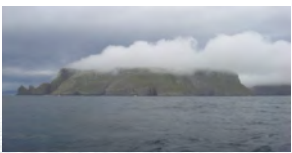
- Mark 1 eyeball! Sea, sky – changes
- Barometer – every hour
- Radio – VHF, HF, AM/FM
- Weather GRIB – download, caution
(is not Australian, is local different?)
- Grib file downloader-GFS model (Prognosis in Australia varies)
- Weatherfax
- Using Coastal Knowledge and Experience – i.e. topography
- Internet



23

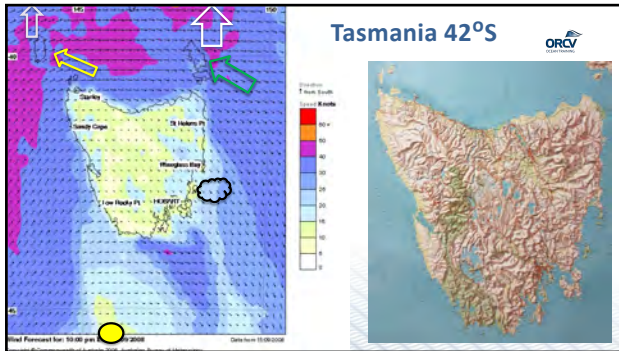
Coastal Topography

Coastal topography is a major influence for coastal passages and majority of ORCV events



Careful study of the topography can identify where winds might be bent, stopped, accelerated or where seabreeze, land breeze and/or katabatics may occur

24



25

Mountainous Coasts

Case Study – Port Fairy Race and the Otway Ranges

- Features a coast with steep cliffs and high hills
- Easter race – mid Autumn season
- Generally more stable conditions



26

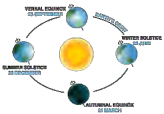
Autumn Background

Seasonal fluctuations of solar radiation
'Heat Bank Earth'

Autumn equinox – radiation in/out equalise

- Net radiation out as days shorten
- Land/sea temperature differential smaller
- High pressure band usually centred overhead

Autumn weather generally more moderate and stable



The diagram shows the Earth's orbit around the Sun. It illustrates the four seasons: Spring (increasing day length), Summer (maximum day length), Autumn (decreasing day length), and Winter (minimum day length). The Earth's axis is tilted, and the diagram shows how the angle of solar radiation changes throughout the year.

27

Orographic Lifting

Occurs when air is forced upwards by a barrier of mountains or hills

Orographic Lifting



Stable conditions Laminar Airflow - Possible Inversion

28

Orographic Lifting

- Convection effects and rotors
- Yachts on opposite tacks - eg. Cape Otway!

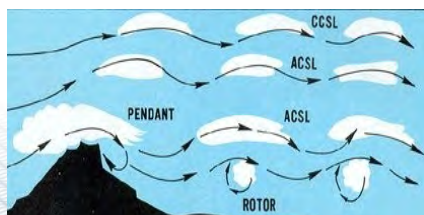


Convection breaks laminar flow - Rotors form seaward

29

Orographic Lifting

Lenticular clouds – signs of laminar, stable flow



30

Orographic Lifting

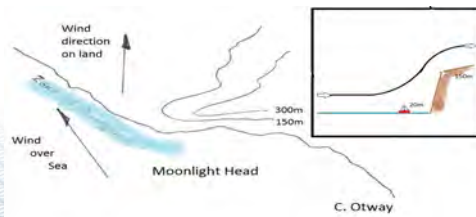
- More so in stable/laminar flow, air can flow smoothly over high terrain such that close underneath can be windless.....
- Parking Lots!



Recognising cloud forms as stable/unstable and the coastal topography are key to avoiding such situations

31

Cape Otway, Moonlight Head



32

Hot Spot

Lady Julia Percy, Vic.



33

Questions ?

34

System Awareness

- Intensifying or deepening Lows
 - East Coast Lows
 - Cut-off Lows
- Strong Persistent Winds

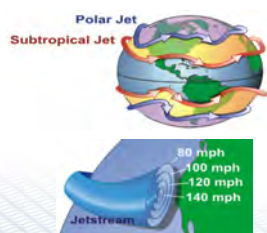


Jet Stream Influence

35

Jet Streams

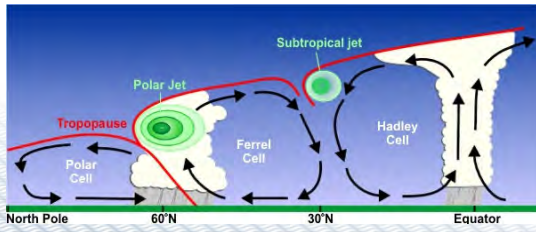
- Upper level 'Jet' of narrow band of very strong winds
- Two jets per hemisphere - Polar Jet and Sub-Tropical Jet
- A significant weather influence



36

Jet Streams

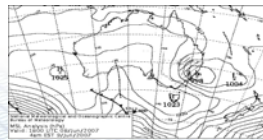
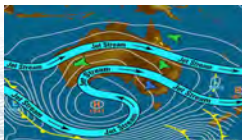
- Cross Section



37

Jet Streams – Case Study

- 'Pasha Bulker' East Coast Low of June 2007
- Rapid deepening of Low assisted by high amplitude Jet aloft



38

OrcaHome > Australia > Weather Maps

Weather Maps

Numerical Weather and Ocean Predictions Maps

- Interactive Stratiform and State Forecast Maps
- Numerical Weather Prediction (NWP) Products

Australian Region

- 6-hour Sea Level Pressure (MSLP) Maps
- Lowest Coastal Storm Sea Level Pressure Analysis and Derived Storm Surge Data
- Short-term Sea Level Forecast
- Forecast Maps for MSLP, Sea Level, and Sea Level Rise
- MSL Forecast

Tropical Region

- 6-hour Sea Level Pressure (MSLP) Maps
- Sea Level Pressure (MSLP) Analysis
- Gradient Level Wind (GLW) Maps
- Gradient Level Wind Analysis (GLWA) Maps
- Pressure Ocean Level (POL) Maps
- Pressure Ocean Level Analysis (POLA) Maps
- Indian Ocean Level (IOL) Maps
- Indian Ocean Level Analysis (IOLA) Maps

Southern Hemisphere

- Southern Hemisphere MSLP Analysis
- Pacific Ocean MSLP Analysis
- Indian Ocean MSLP Analysis

Related Information

- Analysis & Prediction Operations Bulletin
- Assessing the MSLP Analysis
- Assessing the Coastal Level Wind Analysis (Sea Region)

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NWP Data Files

- ACORN Data File Documentation
- AUSRA Data File Documentation

Map Archives

- Analysis Chart Archive
- Climate Map Archive

39

Jet Streams- Aviation Sig WX



40

Jet 040419 Sig WX



41

Jet Stream Cloud



42

Jet Stream from Space



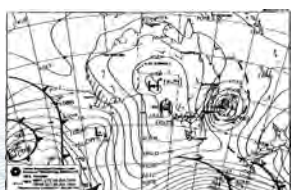
43

East Coast Lows - Summary



- Intense Low, usually 'bombing' (at least 24hPa drop in 24 hours)
- Occur 25-40° latitudes on eastern seaboard
- Most common May-September
- Vicious, gale to storm force winds, large confused seas

Map of July 2001 ECL



44

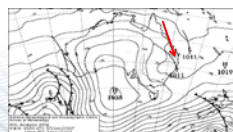
East Coast Lows

Watch:



- Coastal Forecasts and Warnings
- Weather map - synopsis and prognosis

A preceding inland trough (arrowed) over NSW/Qld is common



45

East Coast Lows



Several per year, famous ECLs:

- 1974 'Sygna Storm', June 2007 'Pasha Bulker' Storm, June 2016 'Black Noreaster'

Factors include:

- Warm, moist air infeed from north and cold dense air from south
- Upper pool of cold air
- Jetstream influence
- Great Dividing Range (orographic) and EAC warm water

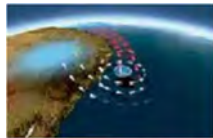
46

East Coast Lows - Features



ECLs commonly feature:

- Gale to storm force south quadrant winds on coast
- Rapid deepening early morning
- Are most intense just off coast
- Move into Tasman and weaken



47

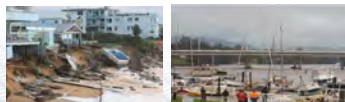
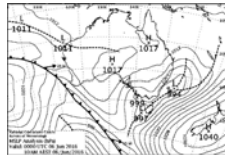
East Coast Low – June 2016



ECL 'Black Nor'easter'

Features:

- Upper cold pool
- ECL against strong High over NZ
- Jet Stream Influence
- Coastal NE rather than SE winds

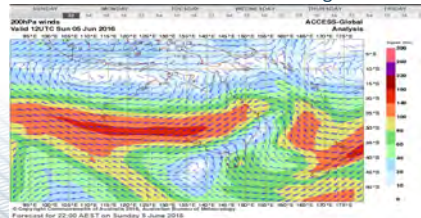


48

East Coast Low – June 2016 Jet



Jet Stream Influence – hook and divergence



49

‘Cut-Off’ Lows



Low ‘cuts off’ from westerly band of lows and its own entity:

Can occur in Bass Strait, common features:

- Imbedded trough in westerly band
- Warm moist infeed from north
- Cold infeed from south
- Jetstream ‘hook’
- Cold air pool aloft

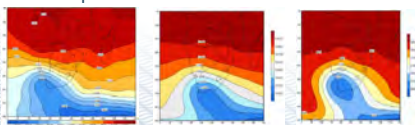
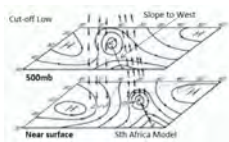
50

‘Cut-Off’ Lows



Cut off Low formation

- Low deepens and encloses
- Breaks from westerly flow, moves up

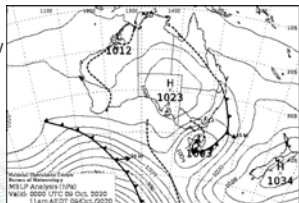


51

'Cut-Off' Lows – Oct 20 Example

8-9 October 2020 - cut off Low forms over Bass St/Tasmania

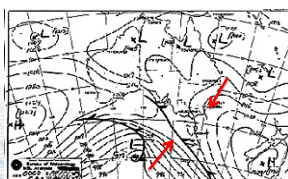
- North and West flanks of low generally strongest
 - Southwesterly gale on coast
 - Heavy rainfall – flooding (i.e. Port Fairy)



52

Cut off Lows – 1998 S2H

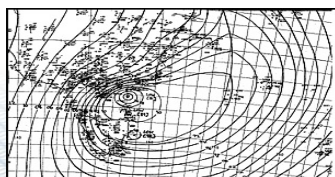
Cut-off low forms in W. Bass Strait and moves east as it 'bombs'



53

Cut off Lows – 1998 S2H

A 'Bombing Low'



54

Questions ?

55

Persistent Winds

Persistent wind patterns that can last for days can set up in Vic/Tas:

- Passage and race planning, deliveries home, cruising
- Racing in prevailing headwinds, running or reaching conditions
- Can be an advantage for fast passage or delay trip in shelter

Look at Westerlies and Easterlies

56

Persistent Winds - Westerlies

Although there are seasonal shifts, persistent westerly patterns can establish anytime of year. The influences of:

- Southern Annular Mode (SAM)/Antarctic Oscillation (AAO) and
- Upper Long Wave Trough (LWT) or Rossby Waves

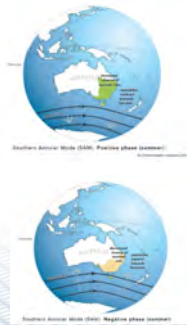
57

SAM or AAO

Westerly band expands or contracts – typically in 1-3 week cycles:

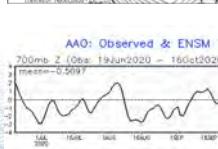
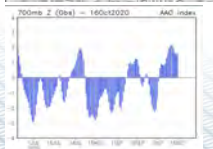
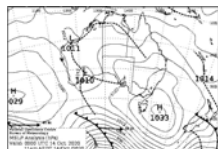
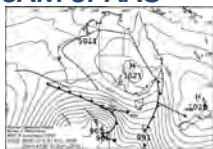
- Positive SAM (contracted) – westerly band more south
- Negative SAM (expanded) – westerly band more north

Measured as an index, also forecast.



58

SAM or AAO



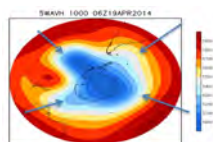
59

Long Wave Trough or Rossby Waves

Upper level ~500 hpa/5km eastward 'meanders' of polar air circulation

- Features a series of 'nodes' (~3-4)
- More nodes, faster LWT moves and the faster Lows move
- Position of node also influence the track of Lows in the westerly band

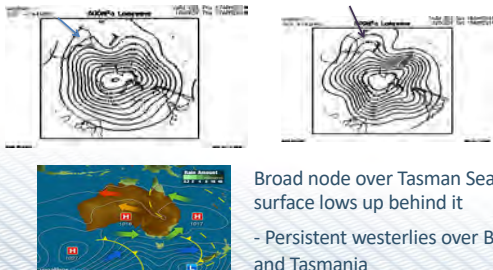
Prolonged westerly weather can occur behind a node – i.e Vic/Tas when node between Aus and NZ.



Polar view map – looking down over south pole

60

Long Wave Trough



Broad node over Tasman Sea drags surface lows up behind it


- Persistent westerlies over Bass St and Tasmania

61

Persistent Winds - Easterlies

Upper level (i.e. Jetstream, LWT and SAM) patterns can also influence movement of Highs.

A Blocking (near stationary) High can lead to persistent easterlies, particular in summer/early autumn when High centre is south



62

System Awareness – Recap

- Passage/cruise/race planning and preparation – alongside Nav:
 - Potential for lows to form (ECLs, Cut off Lows)
 - Potential for persistent patterns to dominate
- Broader features:
 - Westerly band position and width
 - Position of High and strength – to block
 - Upper level Jetstream and Long Wave Trough
 - Southern Annual Mode Trend and Forecast
- Homework done before going aboard

63

Questions ?

64

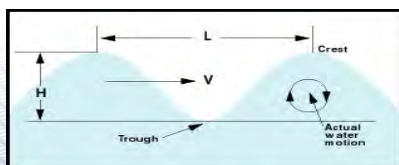
Waves

- Coastal Waters – waves much bigger factor than enclosed waters
 - Local waves can be much larger, developing over much longer distances (fetch)
 - Groundswell waves on coastal waters from distant weather systems
 - Waves effected by currents, tides and refraction

65

Waves

- Waves are generated by wind friction on the sea surface
- Wave size depends on depth, wind speed, duration and fetch
- Waves transfer energy, circular particle motion



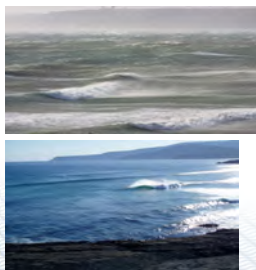
66

Waves

Localised waves - from local winds - short wavelength, choppy, confused

Distant waves - groundswell - generated from distant storms, long wavelength, groomed lines

Plus combination of both



67

Groundswell

Example west of Port Phillip Heads

- Groundswell size can be independent of local effects.
- Example here has moderate northwest winds (pleasant sailing) but with big swell.



68

Waves

- Currents - i.e Port Phillip Heads, NSW/Qld EAC
 - Current same direction as wave train - waves lengthen and flatten
 - Current against wave train - waves shorten, steepen, more prone to break
- Refraction
 - Waves 'feel' bottom and bend in shallow water - Grassy



69

Waves in Storm Force



What storm winds do to the sea state

- Significant wave height calculated for 50 knots of wind, fetch of 200km and water depth of ~200m is 10m, max of 20m
- Every two thousandth wave (5-6 hours) will be twice Sig. Wave Height.
- In a fleet of 20 yachts experiencing storm force winds they'll experience a 20 metre wave every 5-6 hours!

70

Waves – Recap



Waves in coastal waters

- Typically much larger than enclosed waters - more wind, longer fetch, longer durations
- Local waves and groundswell waves
- Influenced by tides, currents and refraction
- Steep, breaking waves and confused waves present highest risk and difficult to negotiate

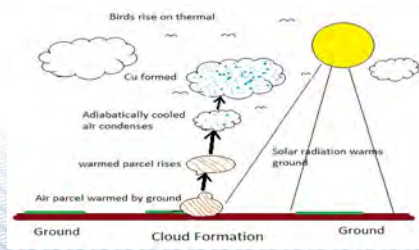
71

Questions ?



72

More on Clouds



73

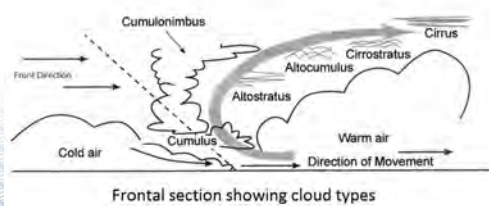
Basic Cloud formation

Condensation:
Air cooled by
conduction from iced
glass reaches
saturation and droplets
form



74

Clouds in frontal passage



75

Coastal Voyage Preparation



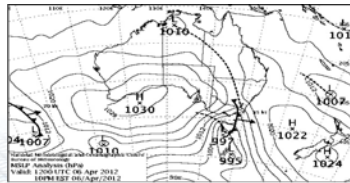
- Sample utilising
 - 4 Day MSL Prognosis Maps
 - Wind Maps
 - Tides
 - Forecasts

76

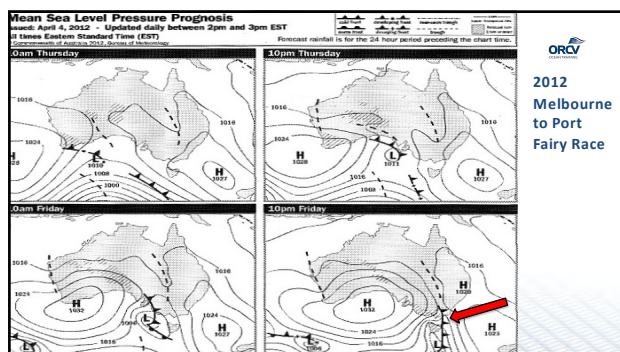
Coastal Voyage Preparation 2012 Melbourne to Port Fairy Race



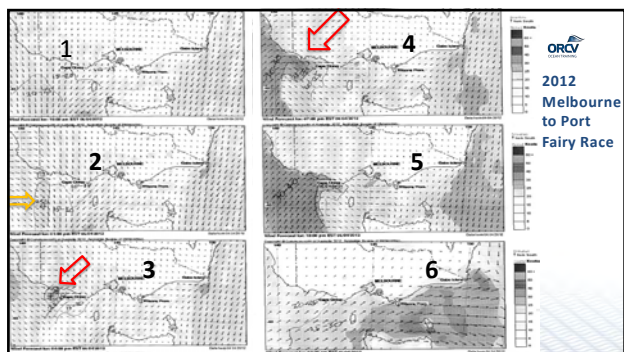
- Cut off Low.
- Begins as Low 1008 in Bight, deepens and moves SE
- Isobar 'kinks' and gale force winds



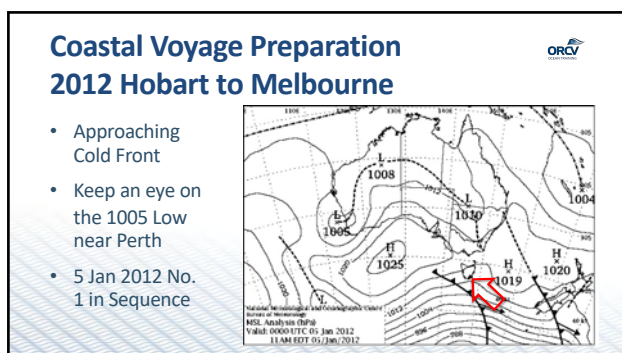
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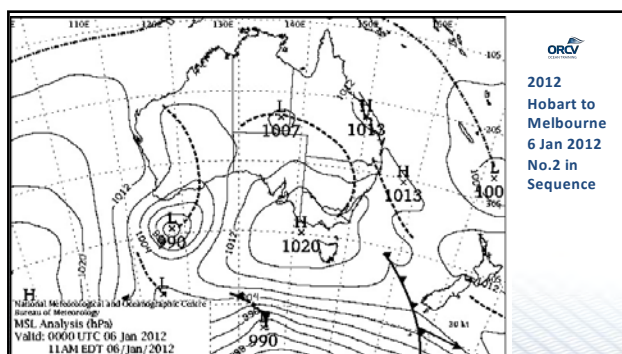
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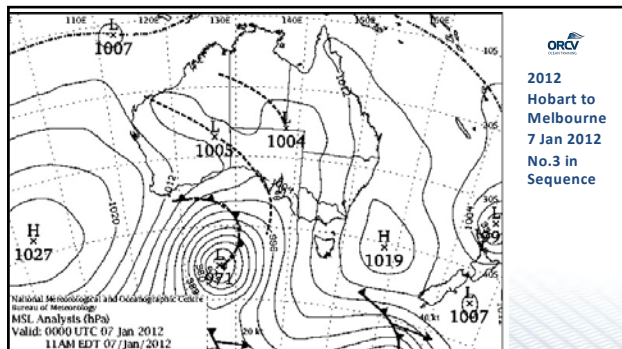
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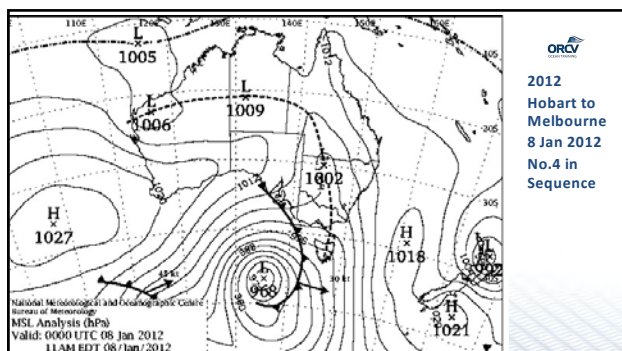
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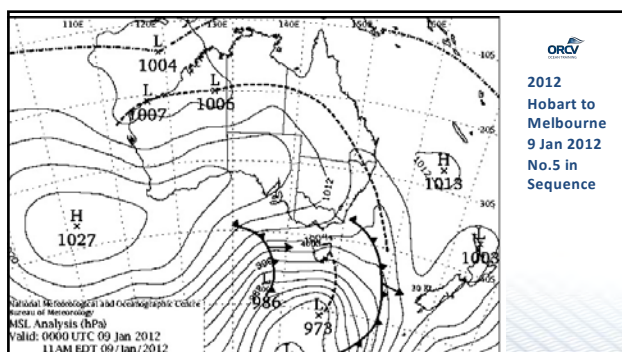
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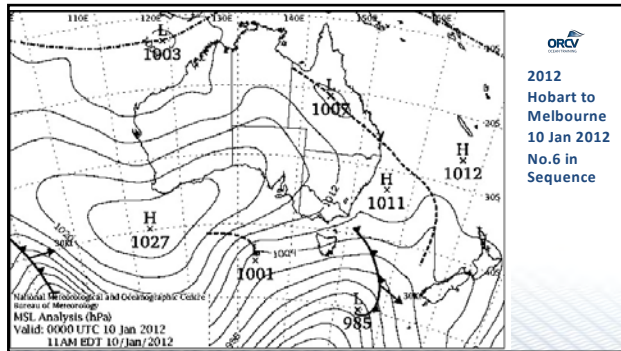
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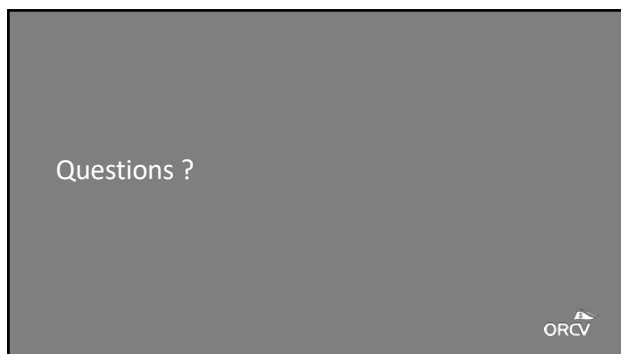
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84



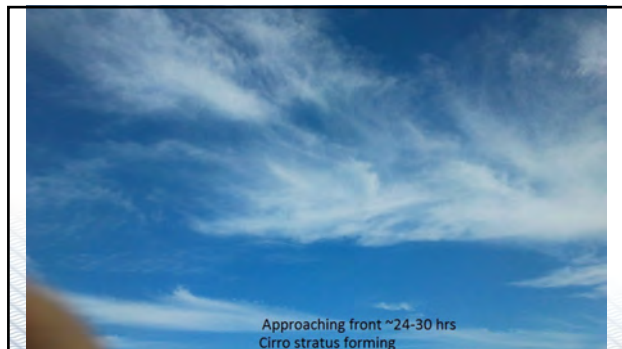
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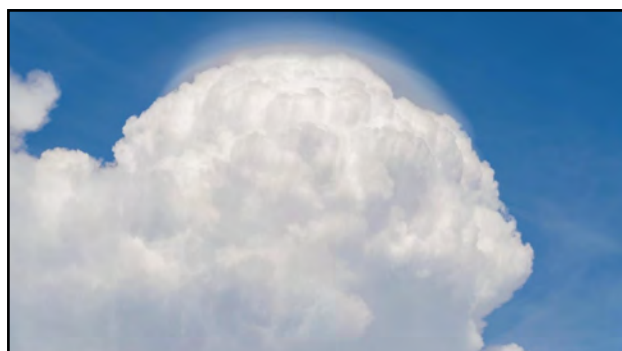
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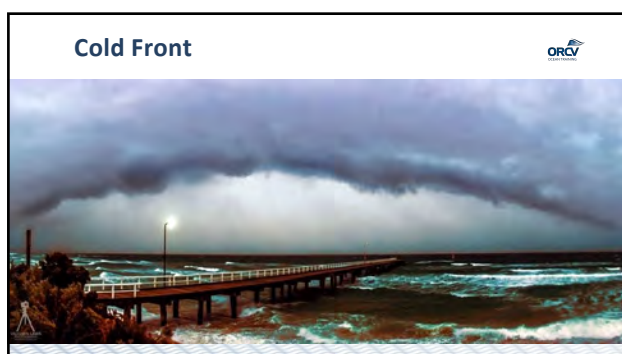
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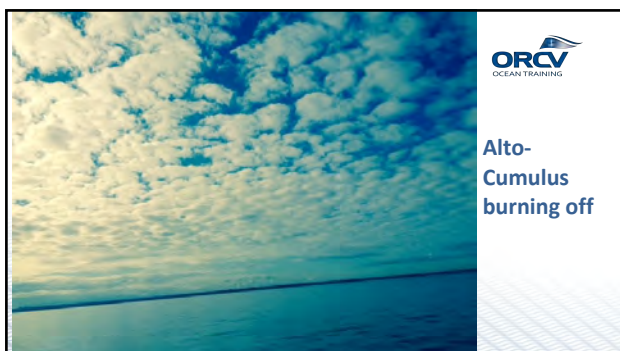
89



90



91



92



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