

WIND



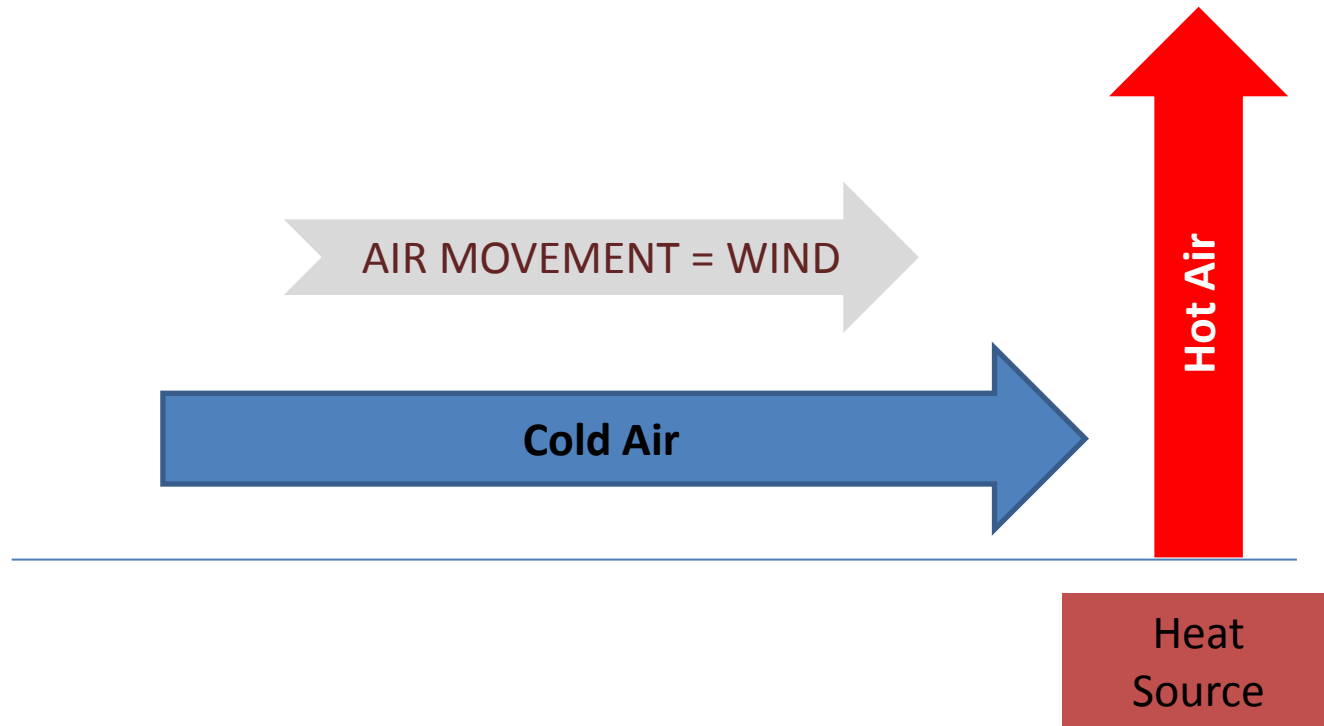
What Causes it
Why it Changes
&
How to React to it

What Causes Wind?

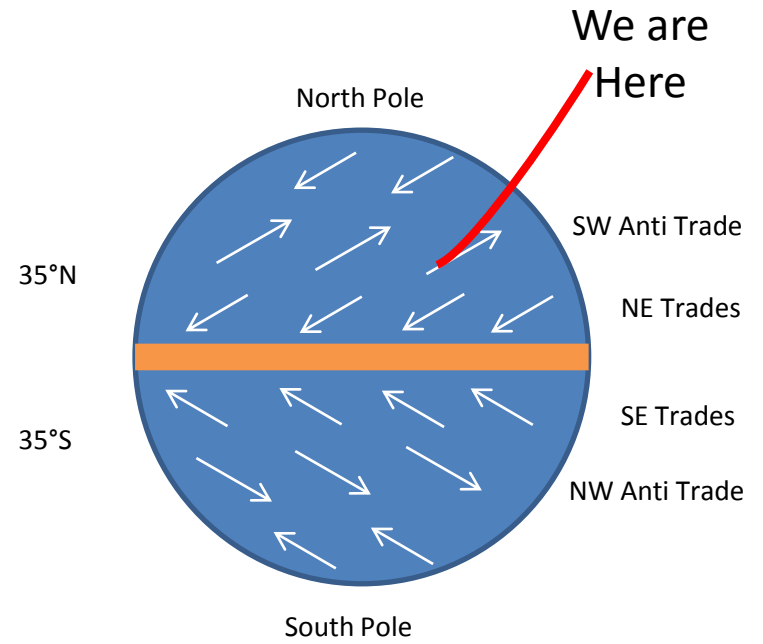
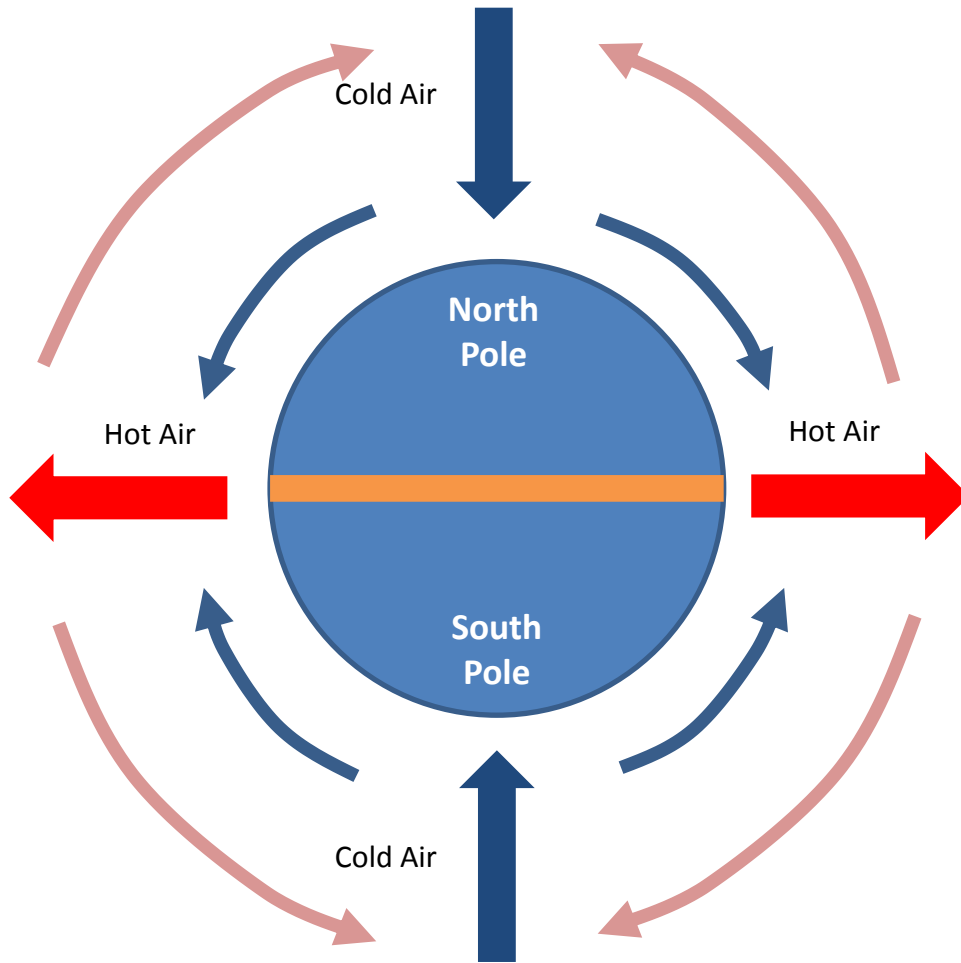
Hot Air Rises

Cold air is drawn in to replace it

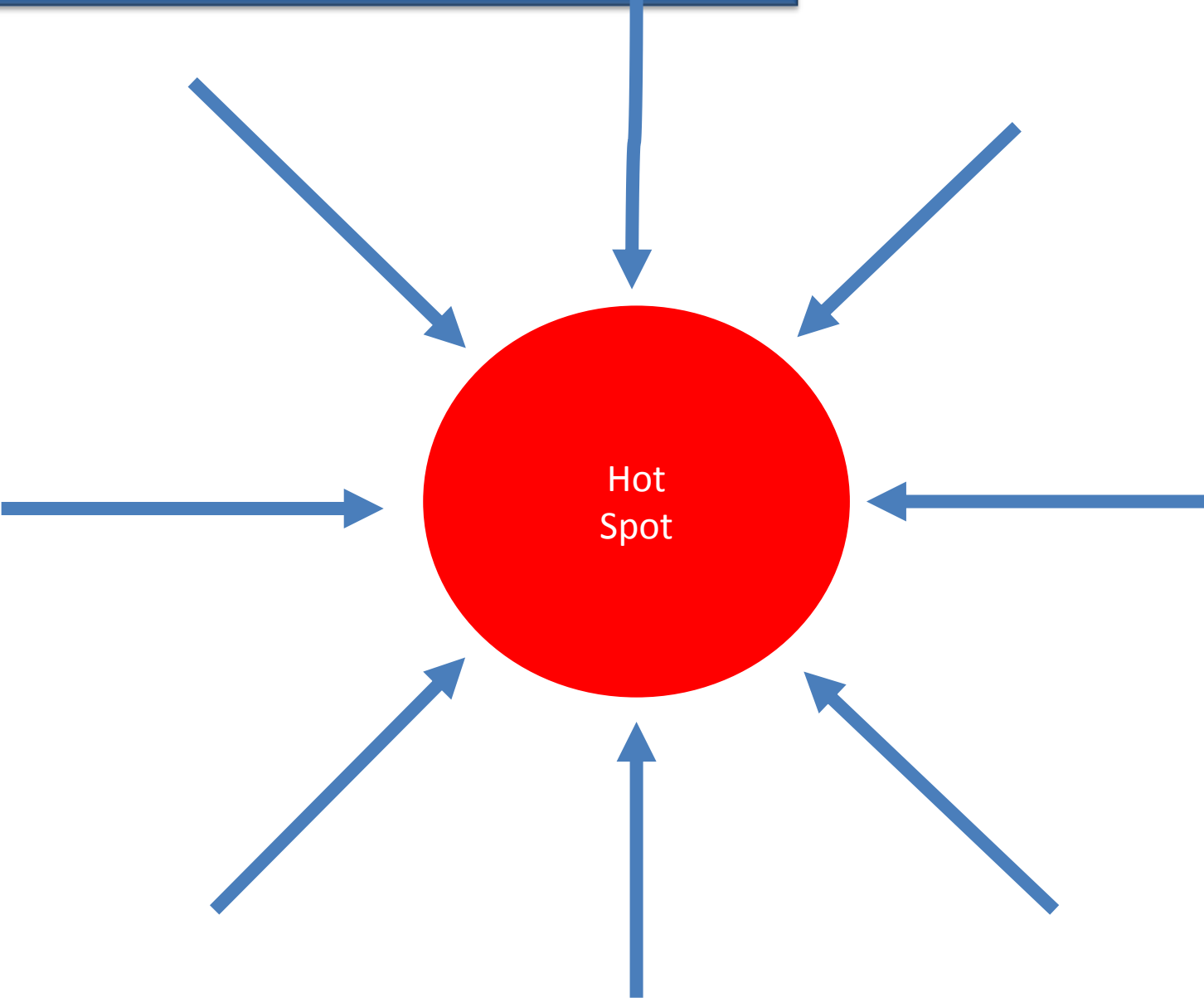
Wind is movement of Cold Air to replace rising Hot Air



Planetary Winds

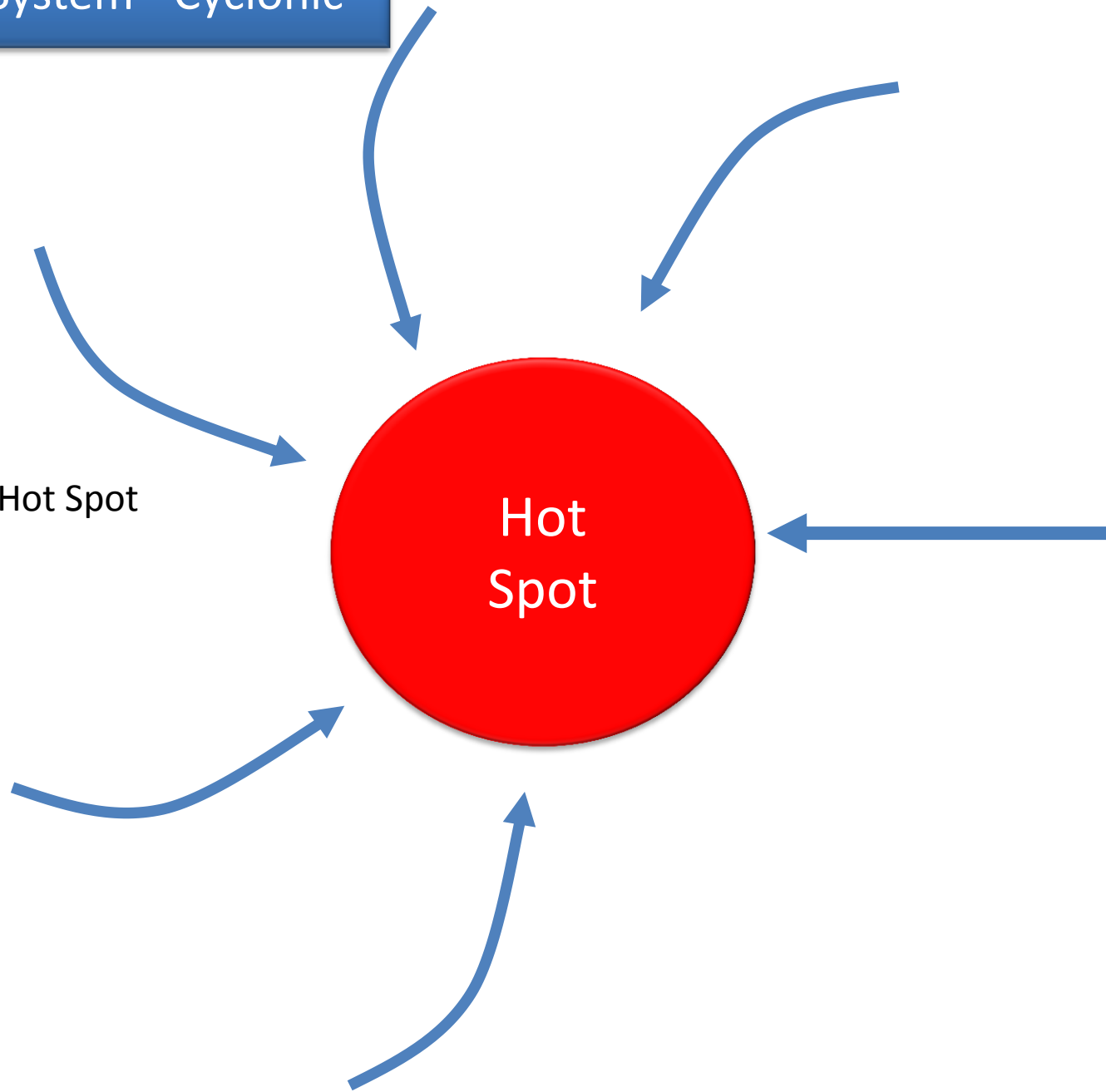


Birth of a Weather System - Cyclonic



Birth of a Weather System - Cyclonic

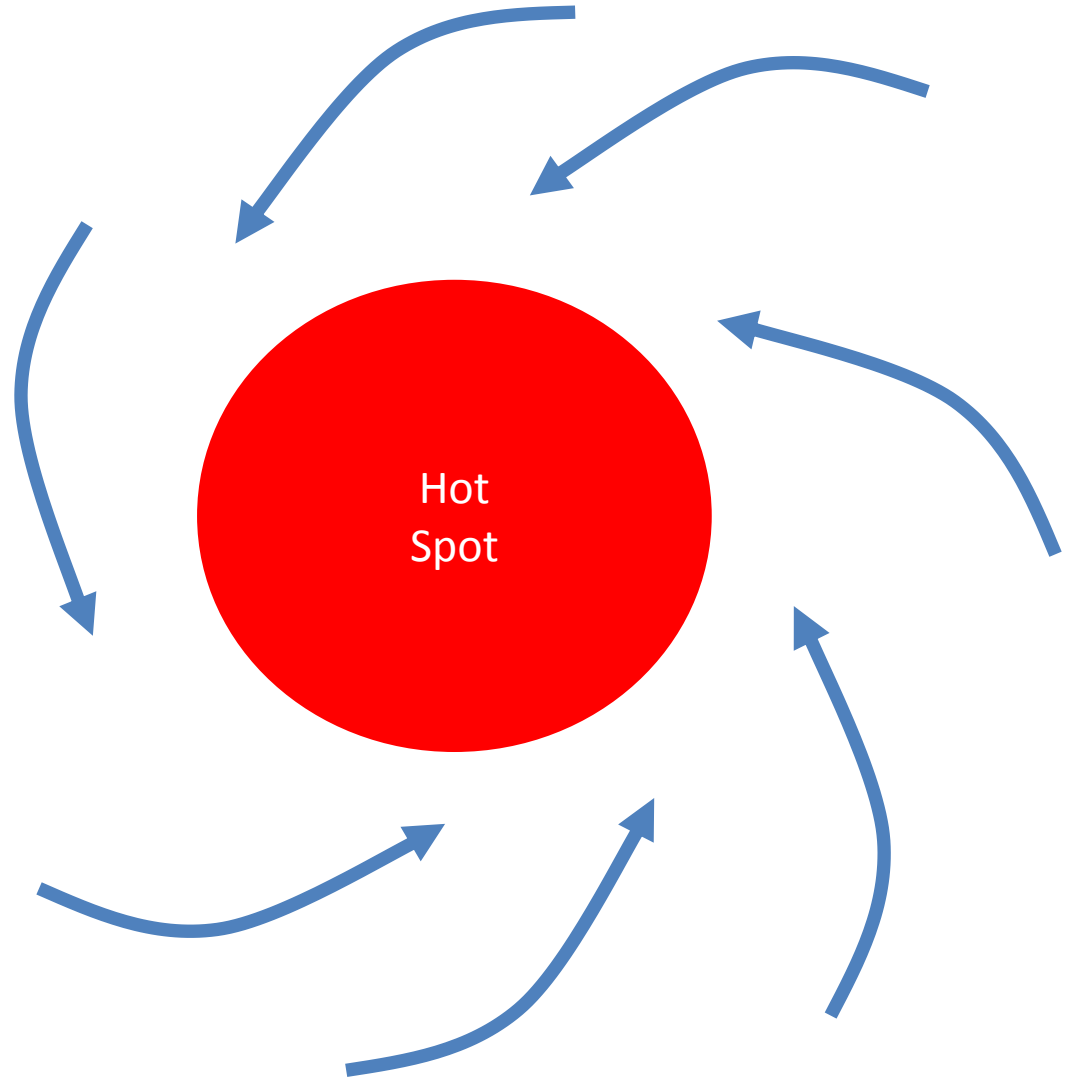
Rotation of Earth Moves Hot Spot
Wind



Birth of a Weather System - Cyclonic

Rotation of Earth Moves Hot Spot
Wind tries to follow

Creating rotating low pressure
system



Birth of a Weather System - Cyclonic

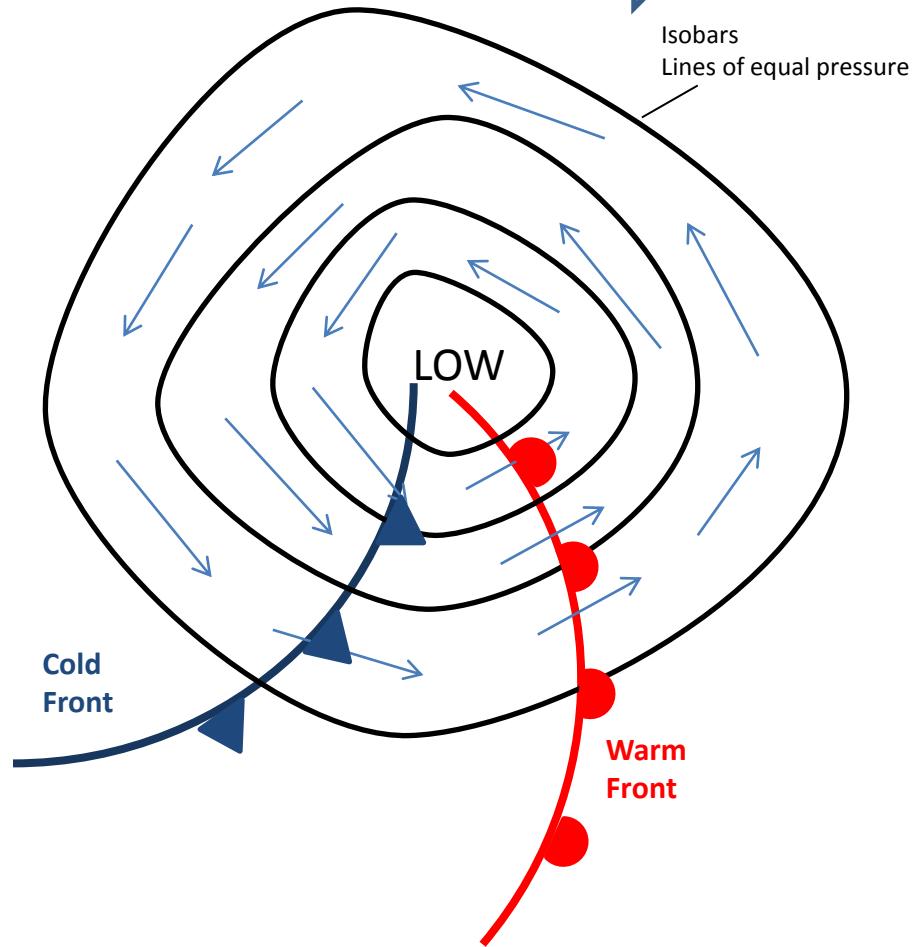
Rotation of Earth Moves Hot Spot
Wind tries to follow

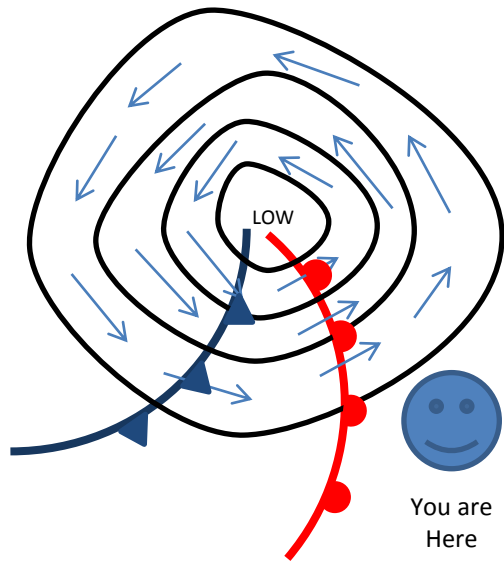
Creating rotating low pressure
system

Which looks like this

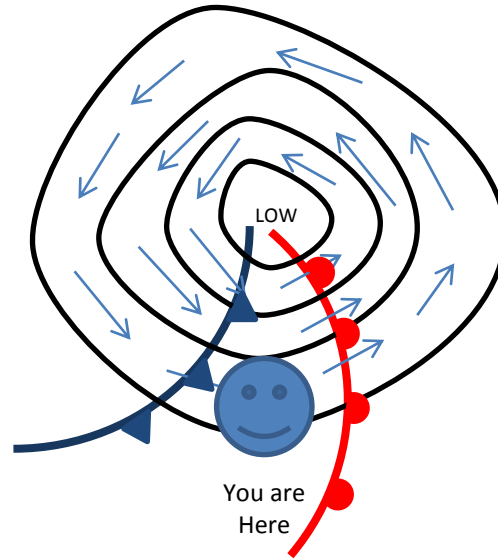
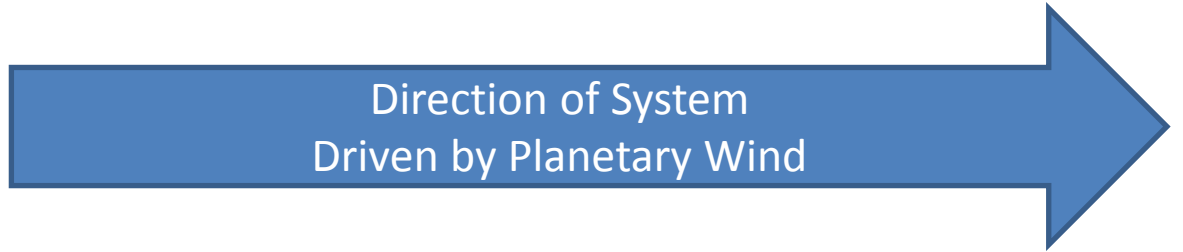


Direction of System
Driven by Planetary Wind



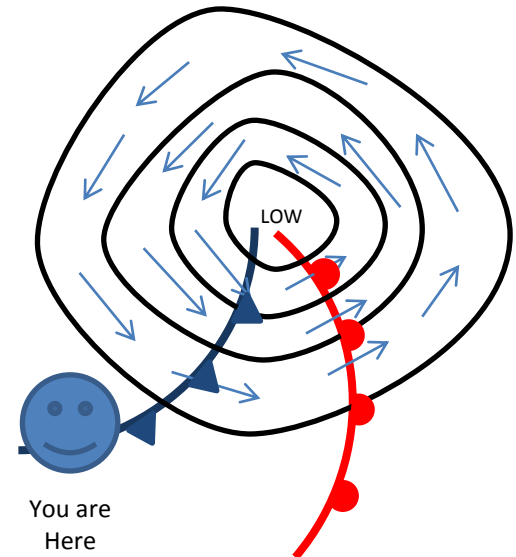


Steady SW Winds
Thickening Cloud
Maybe rain



Cloudy
Wind goes West
Drizzle

Sky Clears
Wind shifts WNW
Strong Gusts
Squalls and Showers

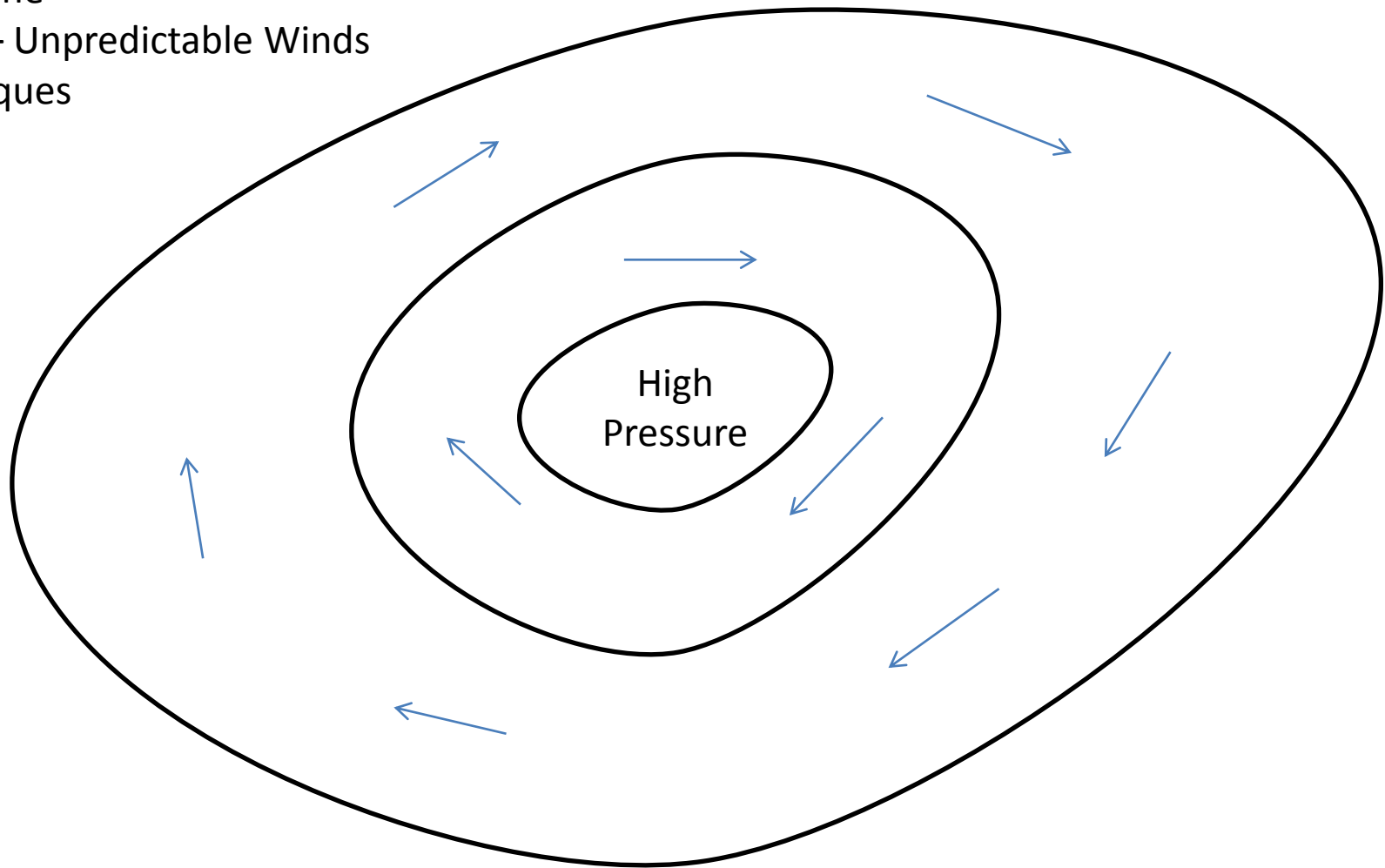


High Pressure - Anticyclone

Sunshine

Light – Unpredictable Winds

Barbeques



THINGS THAT CHANGE THE WIND?

Weather System Movement

Passing of fronts

Geography

Islands, Cliffs, Hills, Valleys and Headlands

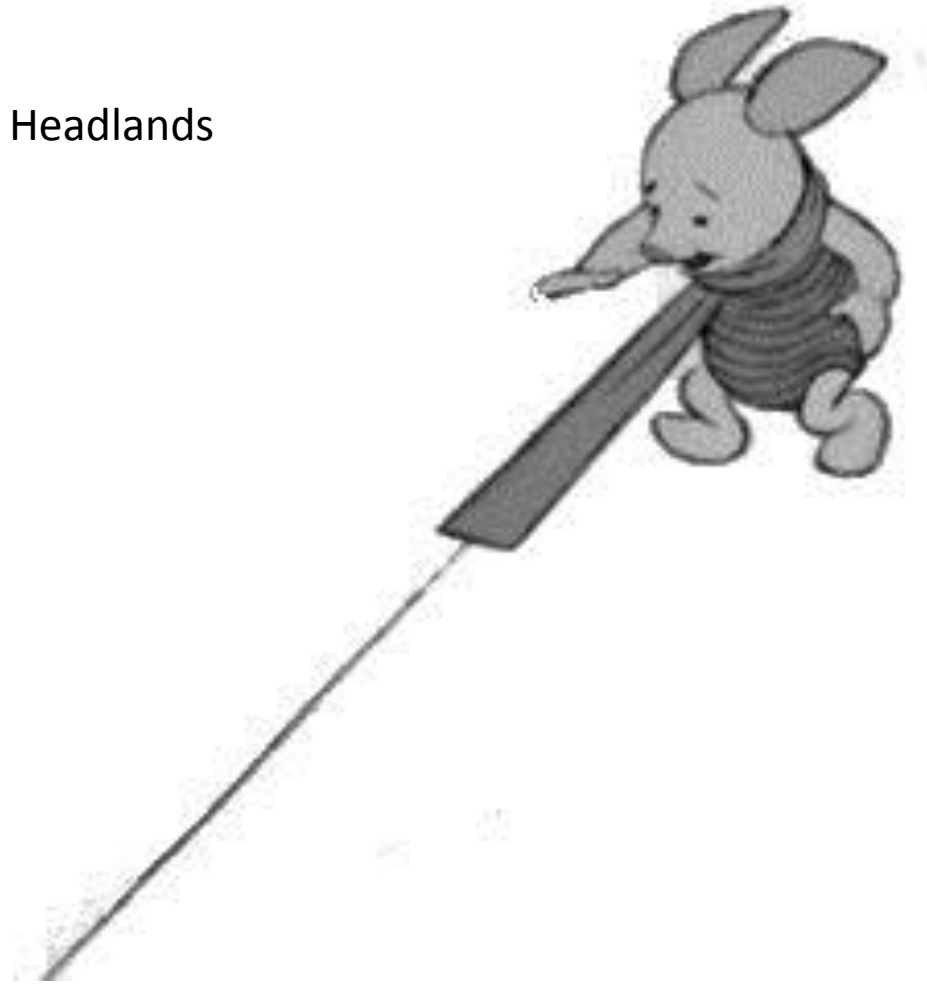
Local Temperature Changes

Sea Breeze

Changes in Surface

Land to Water

Gusts, Winds Shifts and Wind Bends



Wind Shift Definitions

Veer – Wind Shifts Clockwise

Back – Wind Shifts Anti-Clockwise

Lift – Shift that allows you to steer a course closer to your destination
You can push the helm down and luff up

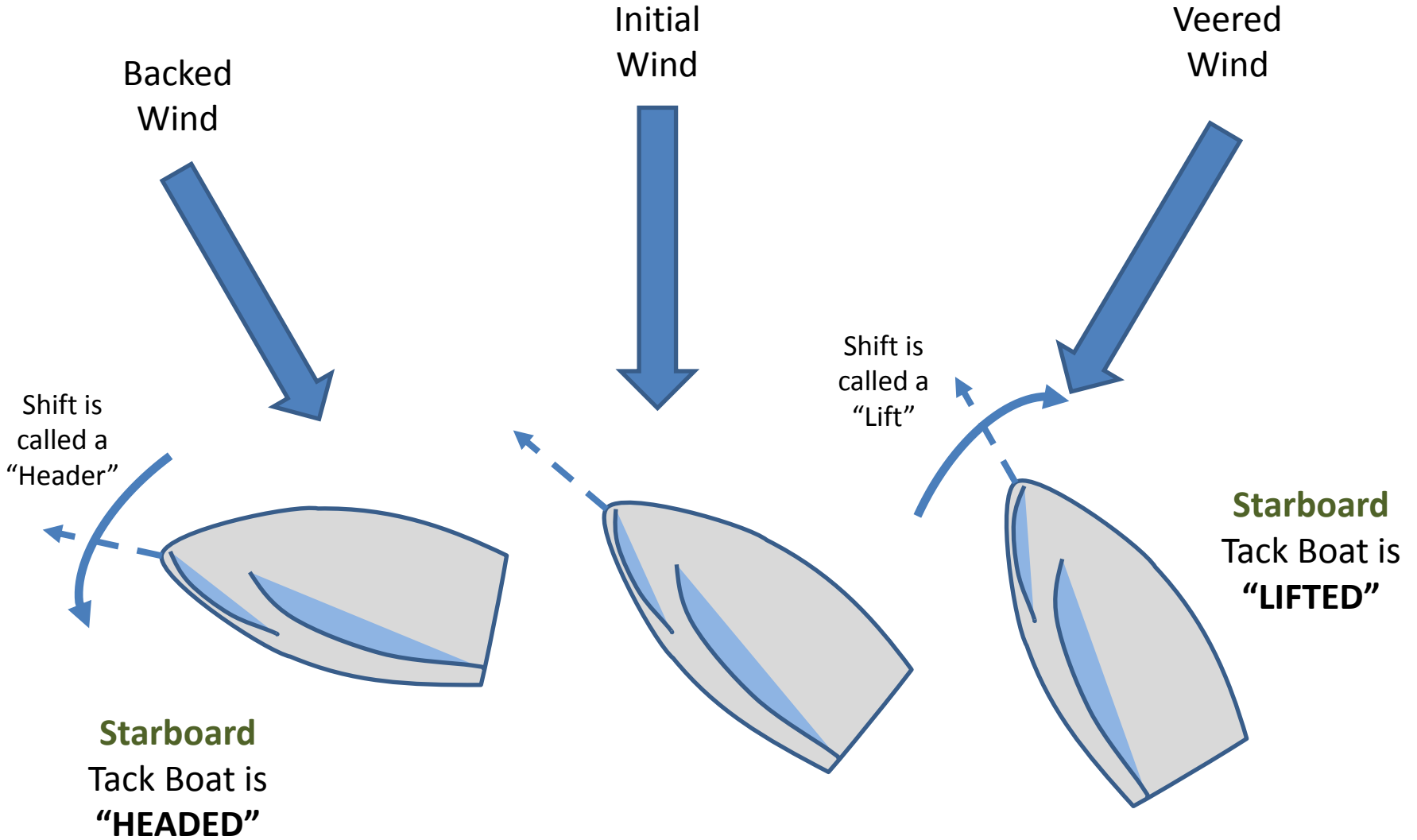
Header – Shift that forces you to sail a course further away from your destination
You are forced to bear away or the boat stalls, sometimes tacks involuntarily

Effect on Your Boat



Objective

e.g. Windward Mark

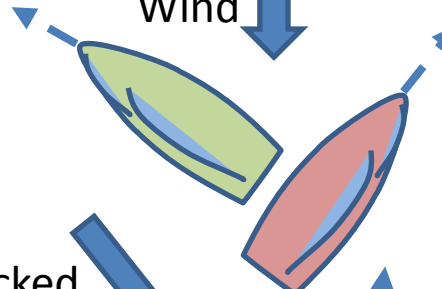


Effect on Your Boat



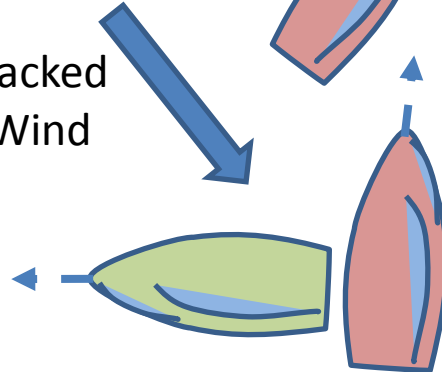
Objective
egg Windward Mark

Initial
Wind



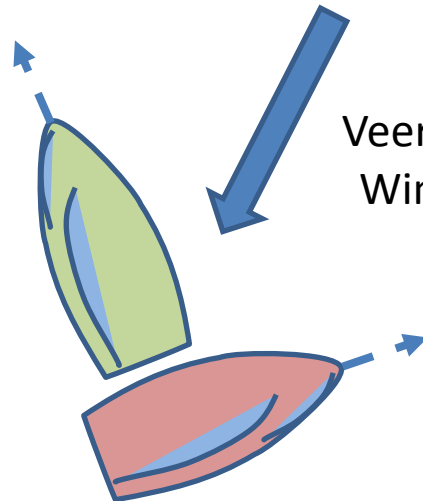
Both Boats at
Same angle to
objective

Backed
Wind



Port Tack
Boat is
"LIFTED"
And sailing closer to
objective

Veered
Wind

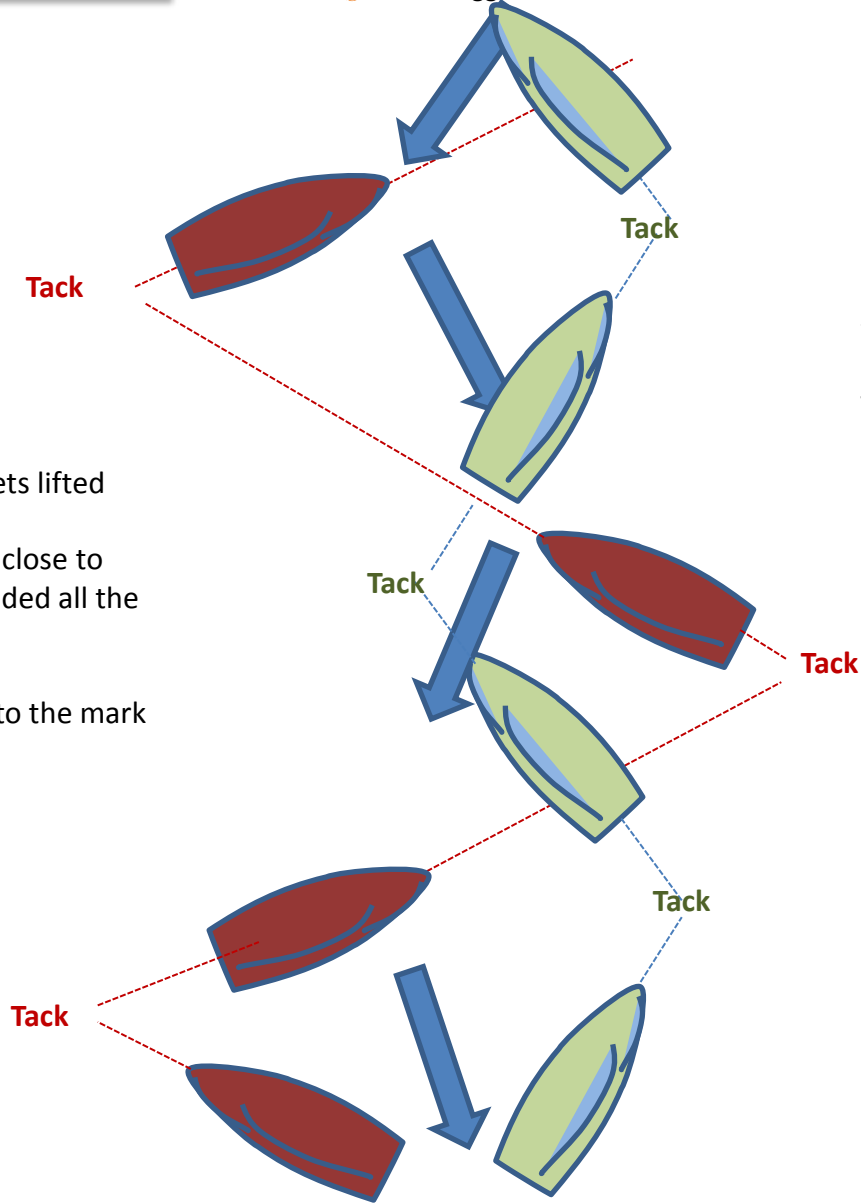


Starboard
Tack Boat is
"LIFTED"
And sailing closer to
objective

Port Tack
Boat is
"HEADED"
His solution is to Tack
on to Starboard Tack

Effect on Your Boat

Objective
egg Windward Mark



Green sails on the lifted tack all the time

Tacking every time he gets Headed

He sails a shorter distance to the mark

Red tacks every time he gets lifted

He cannot sail a course as close to mark as green as he is headed all the time

He sails a longer distance to the mark and arrives after Green

Effect on a Fleet

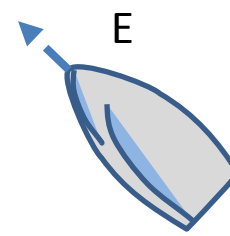
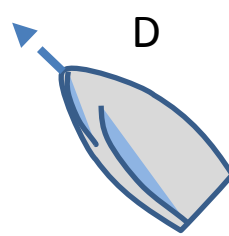
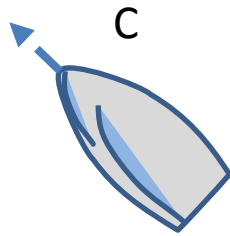
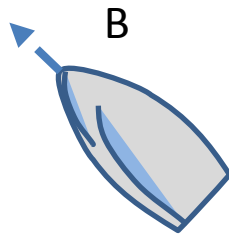
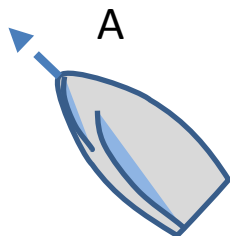


Objective
egg Windward Mark

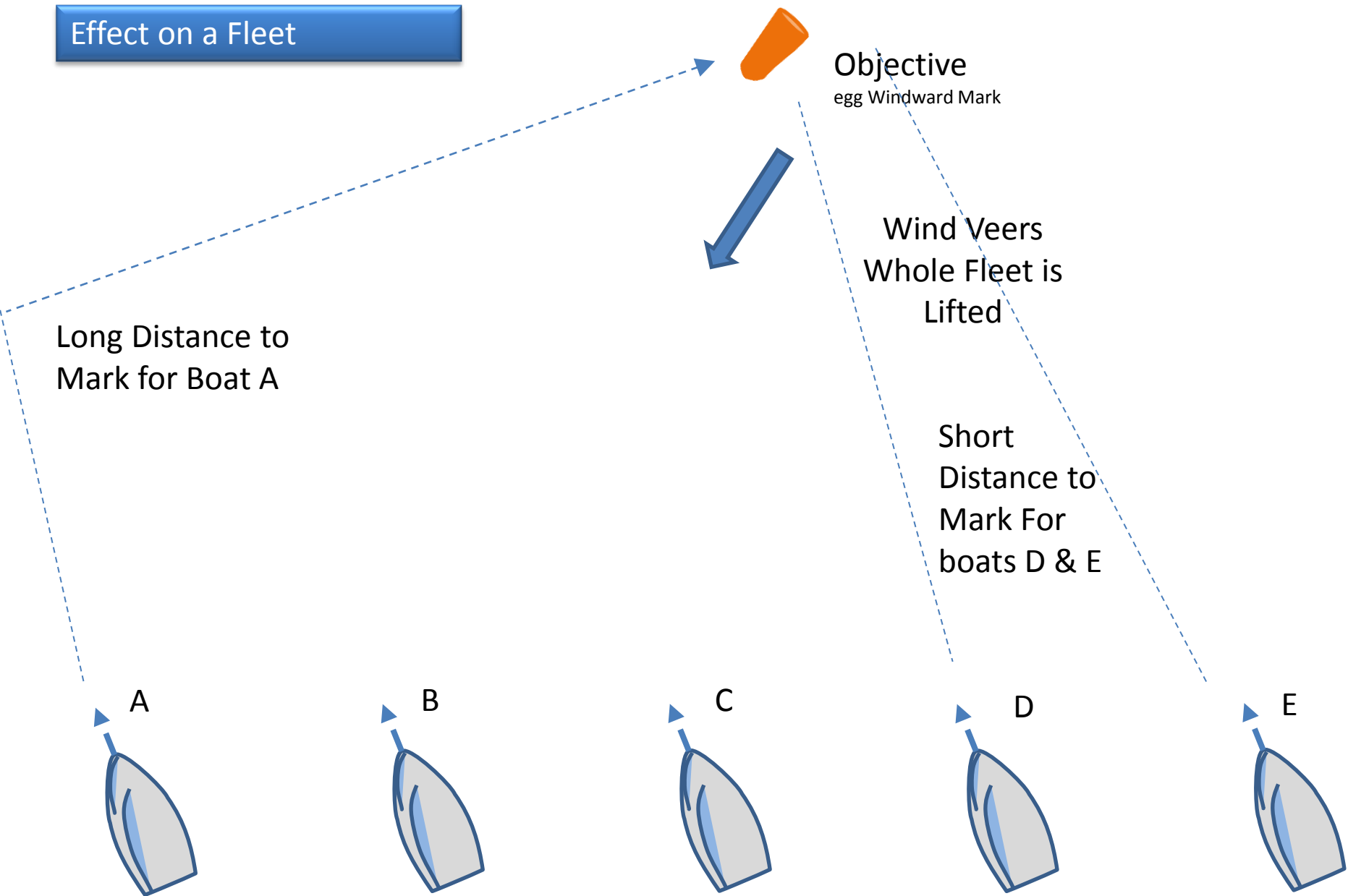
Initial
Wind



ALL BOATS EQUAL DISTANCE TO MARK



Effect on a Fleet



Objective
egg Windward Mark

Wind Veers
Whole Fleet is
Lifted

Short
Distance to
Mark For
boats D & E

Long Distance to
Mark for Boat A

A

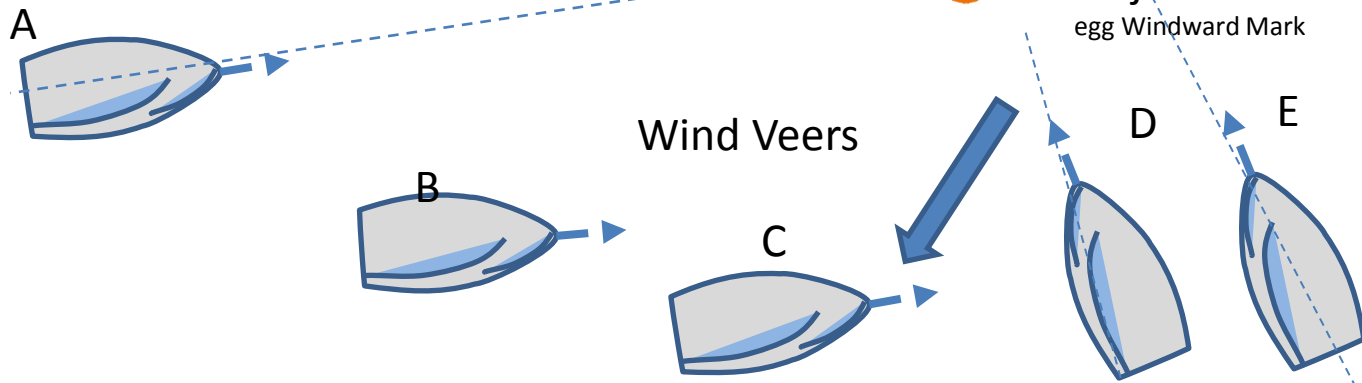
B

C

D

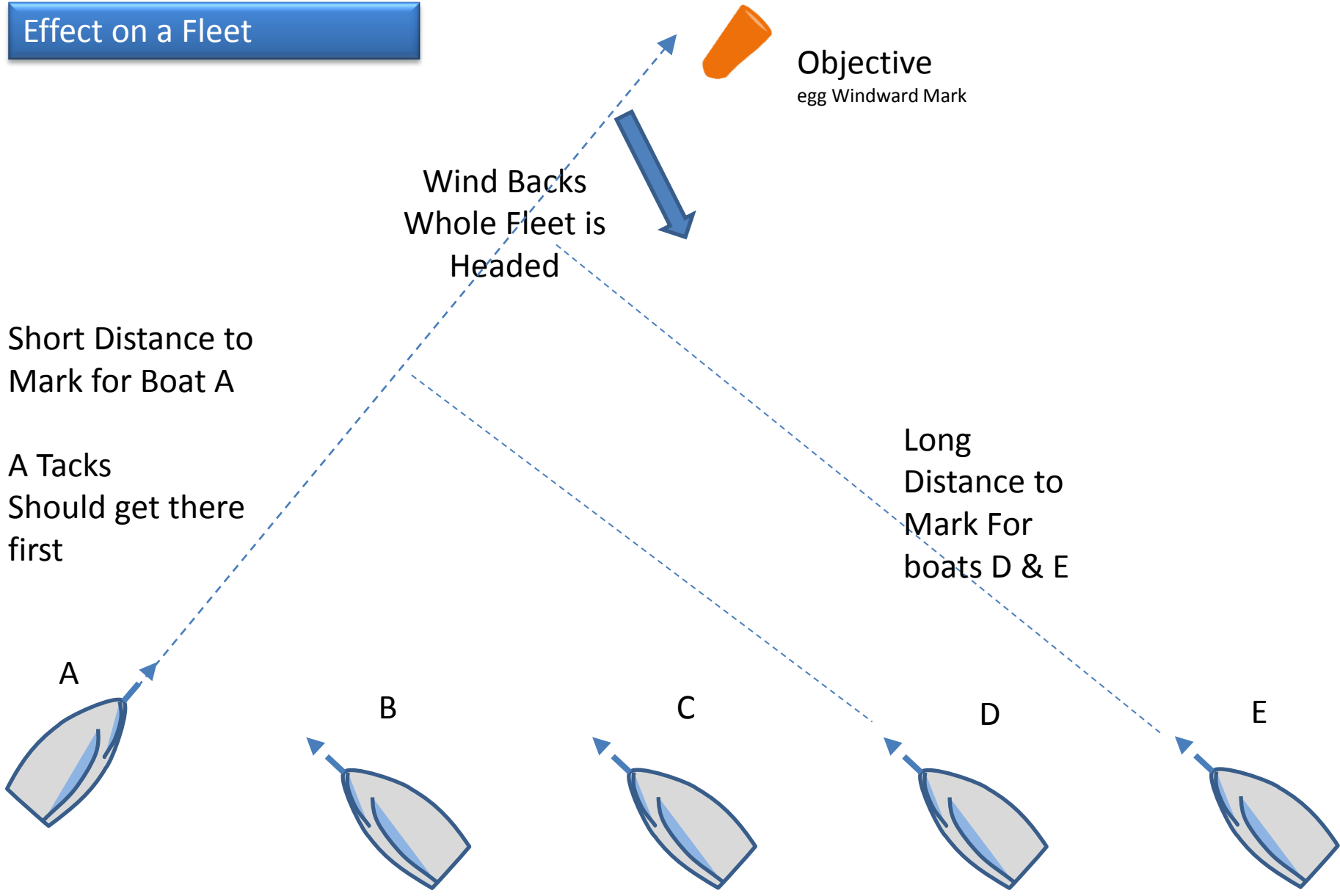
E

Effect on a Fleet



A, B & C cross behind E & D

Effect on a Fleet



Effect on a Fleet

Objective
egg Windward Mark

Wind Backs
Whole Fleet is
Headed

Short Distance to
Mark for Boat A

A Tacks
Should get there
first

Long
Distance to
Mark For
boats D & E

A

B

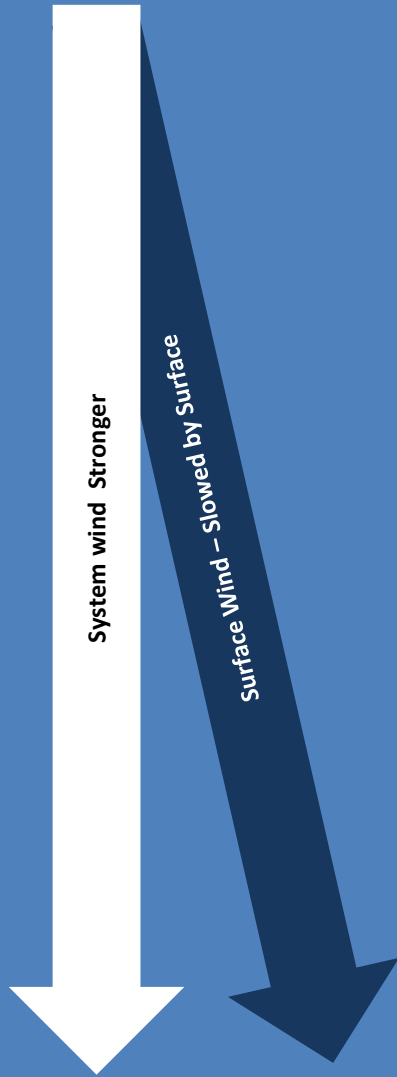
C

D

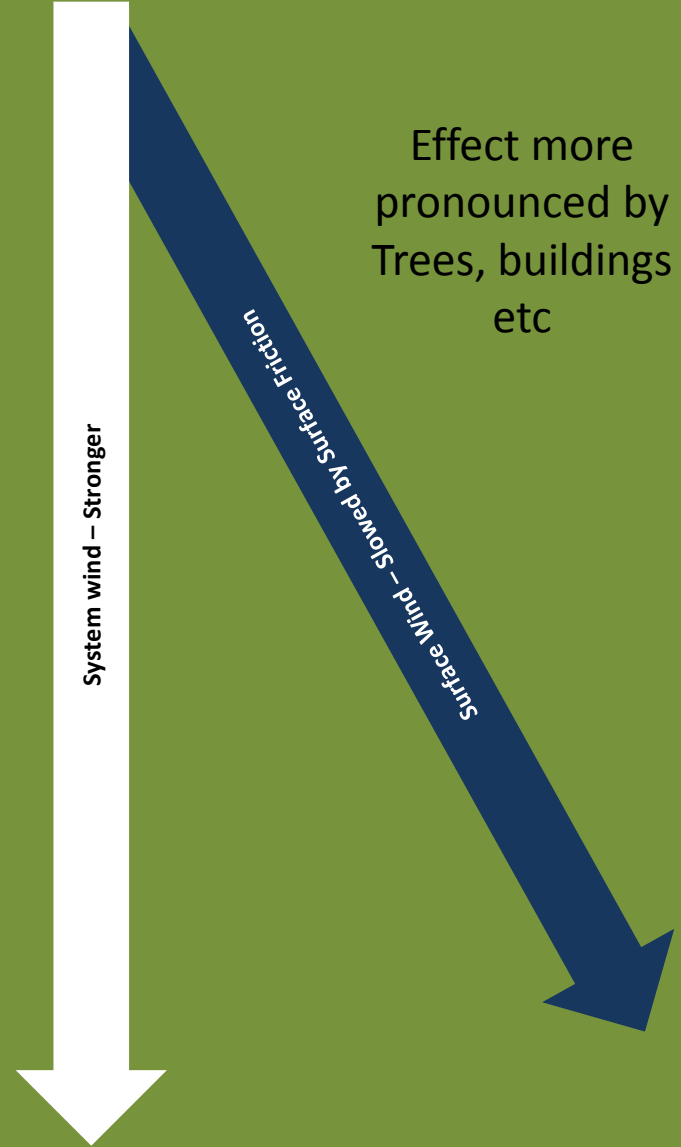
E

Effect of Surface Friction on Wind Direction

Sea



Land



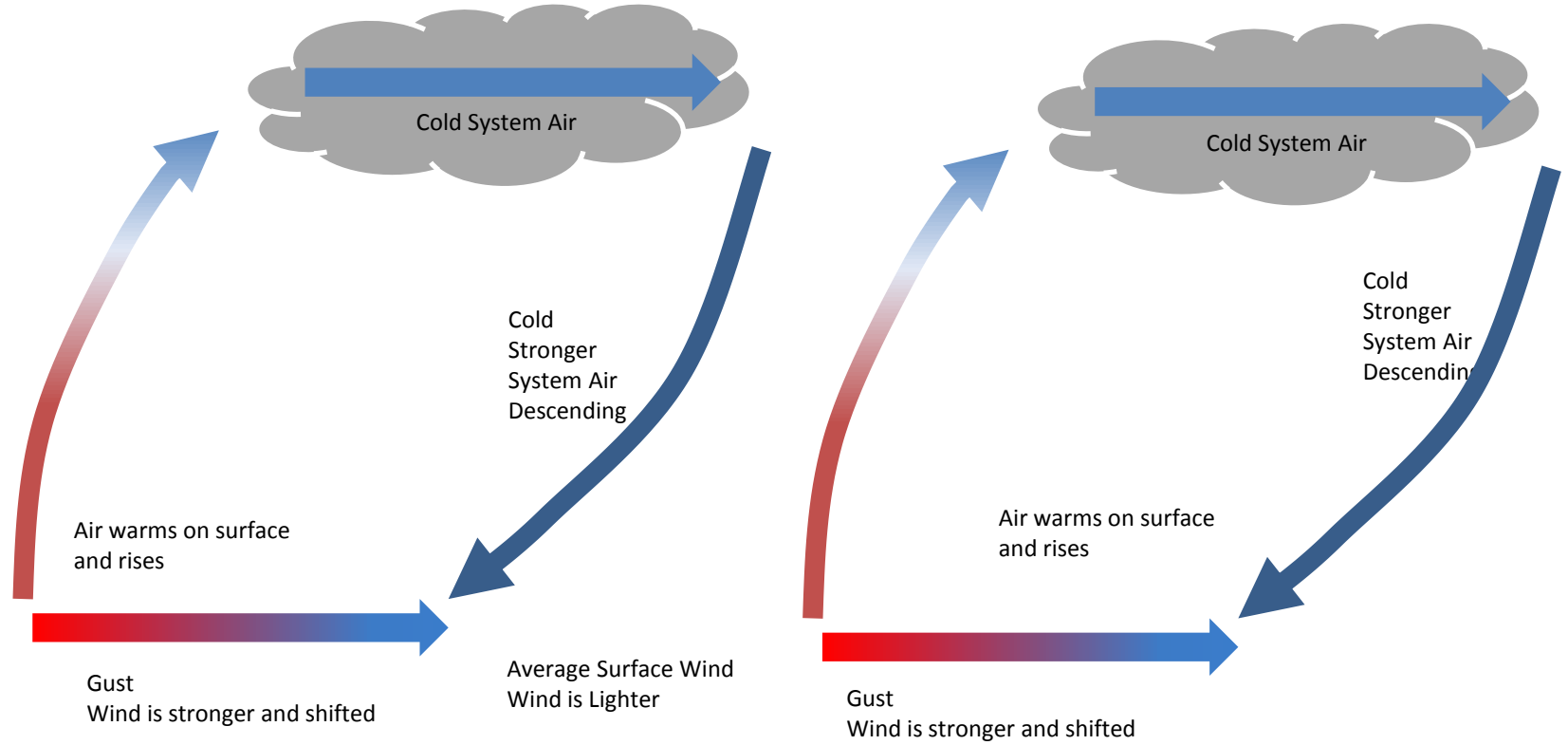
Effect more pronounced by Trees, buildings etc

Surface wind is usually backed compared to System wind in Northern Hemisphere

But not always

GUSTS – What are they?

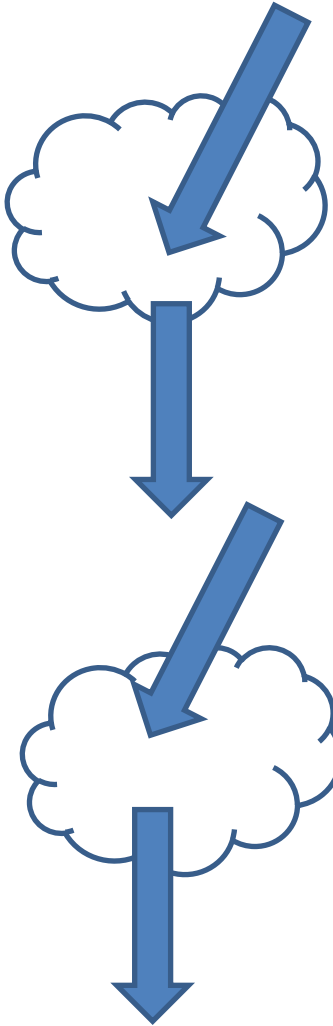
Gust are system wind brought down to the surface by rising and falling
System wind which has not been slowed and shifted by surface friction
The individual cycles are called “Gust Cells”



GUSTS – What are they?

From Above it looks like this – Typical Northern Hemisphere (Penarth) Pattern

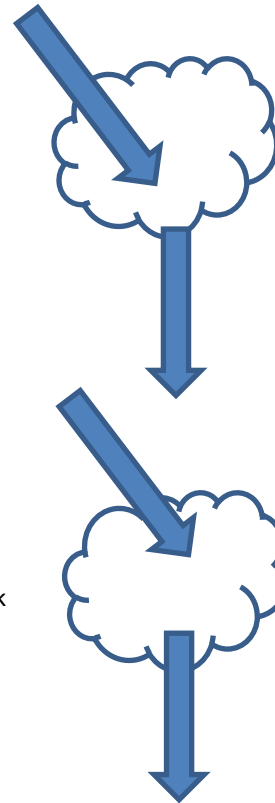
Lift on
Starboard Tack



Lift on
Starboard Tack

- However it sometime does this
- When you go out – check it out and see what it's doing

Lift on
Port Tack



Lift on
Port Tack

Best Tactic:
Starboard
Tack under
the Trailing
Edge of the
clouds

Best Tactic:
Port
Tack under
the Trailing
Edge of the
clouds

Gusts – What do They Look Like



Wind Shifts when cloud is even or absent

Look for signs of wind bends

Land effects

Change in cloud alignment

Look for other signs

Smoke, flags on land, other fleets

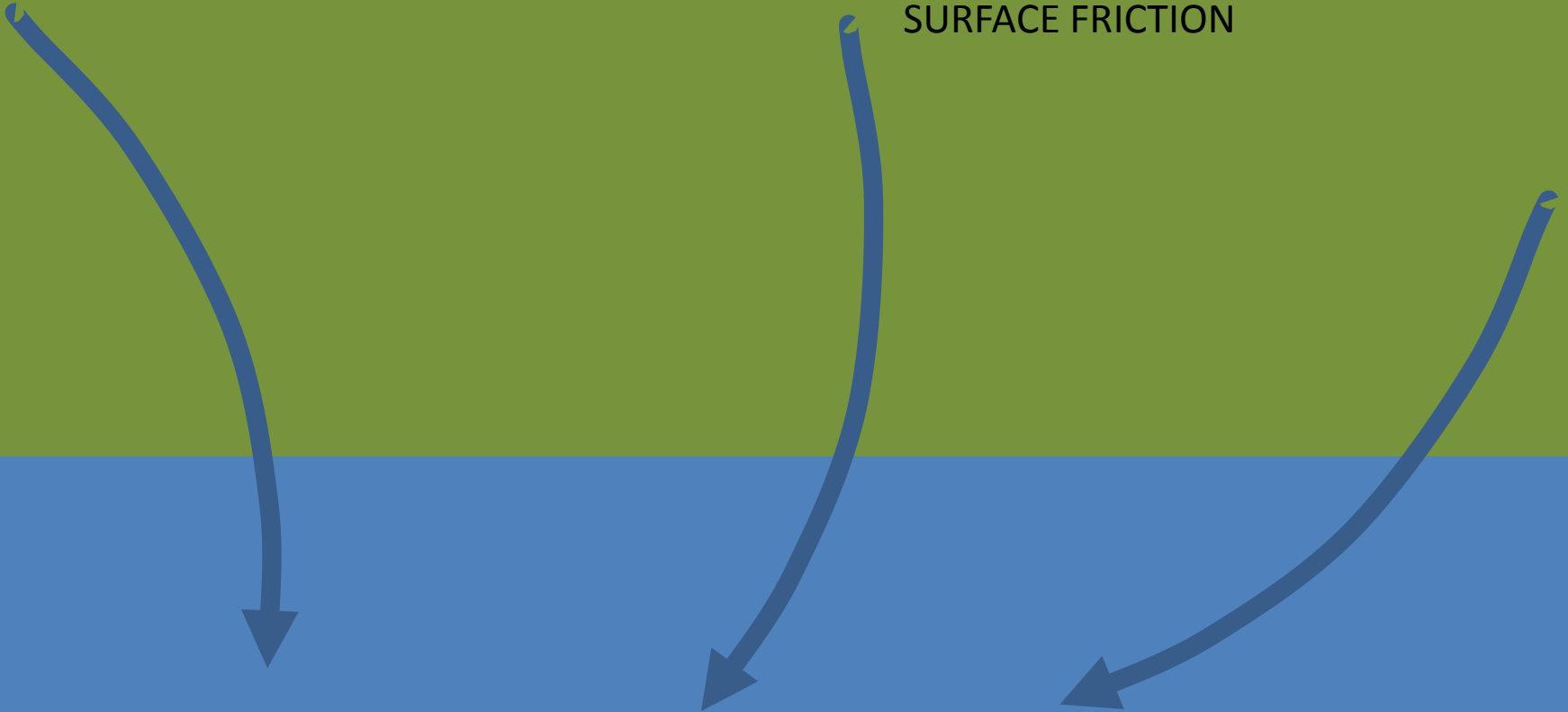
Use stop watch to time shifts against
compass – usually right

Temperature inversions – Warm air higher up –
Ask Derek or look it up

Effect of Changes in Surface Friction

WIND BENDS

CAUSED IN THIS CASE BY REDUCTION IN SURFACE FRICTION



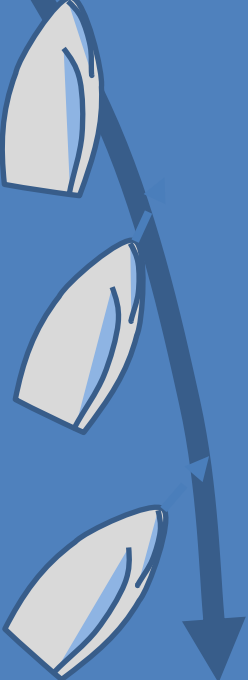
Effect of Changes in Surface Friction

This happens in Penarth with modification

Yacht Club

This a Wind Bend

ODM



Best Tactic:
Port Tack
Approach to ODM

Port Tack Boat is progressively lifted as it approaches the mark

P
I
E
R

The famous "Kymin Gust" Race winner
Sometimes present when wind shifts between **W** an **NW**

Optional Tactic:
Guess on **Starboard** Tack—
Might Work –
Never Know

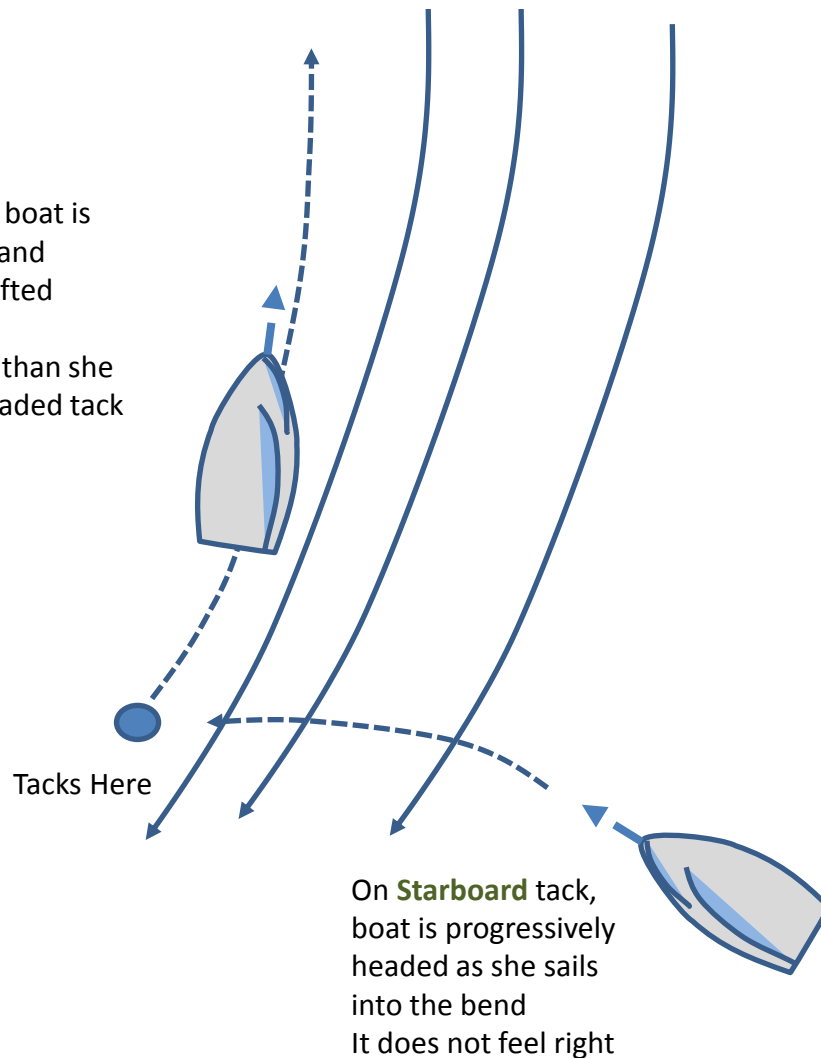
Dramatic Lift on **Starboard**

Ron Dungey Special

More on Wind Bends

Wind bends as it moved from land to sea or can also be caused by geographical obstacles such as hill, valleys, cliffs and islands

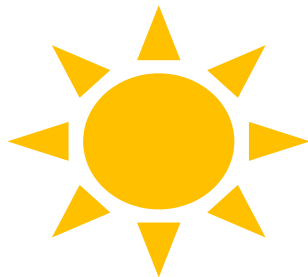
On **Port** tack, boat is progressively and dramatically lifted
Gaining more than she lost on the headed tack



The tactic is slightly different to normal temporary shifts as you need to sail on the headed tack first to gain full advantage of the later lift

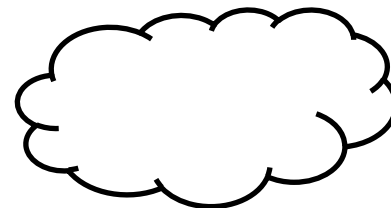
The Sea Breeze

Common on sunny days in high pressure systems



Land heats faster than sea during morning

Light Cumulus sometimes start to form



Hot Air Rises



Cool air comes in from sea to replace hot air

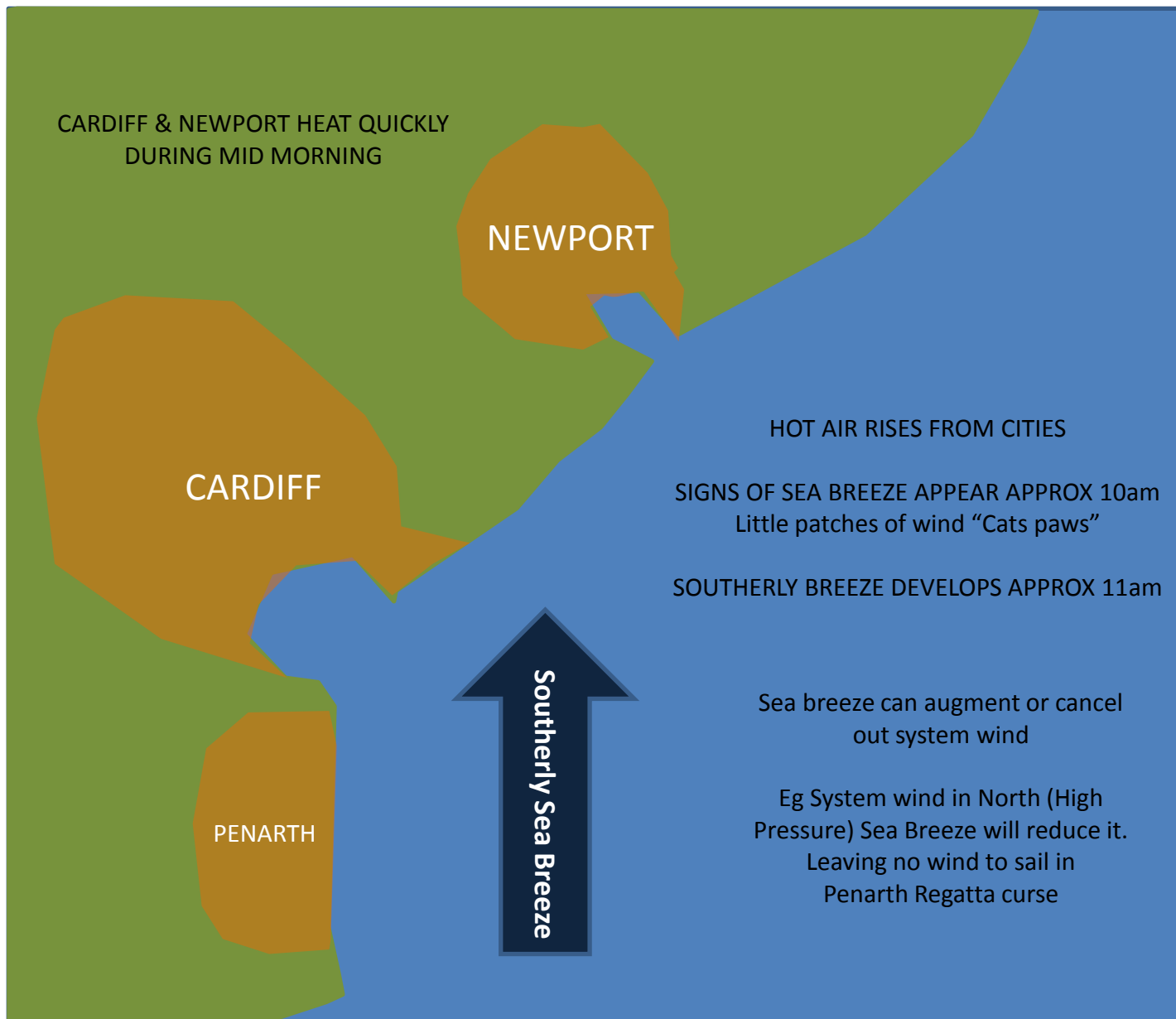
Can reach force 4 in afternoon and be surprisingly cold



SEA

LAND

The Sea Breeze in Penarth



MESSAGES IN THE CLOUDS

Flat Clouds



This is Alto Stratus
Typical of stable air

Difficult to read in terms of wind changes

However there are sometimes obvious things like
curved lines showing a wind bend

Or a straight line indicating a pressure ridge or
front bringing more, shifted wind

Lumpy Clouds



Its called Cumulus really

Typical of Unstable air

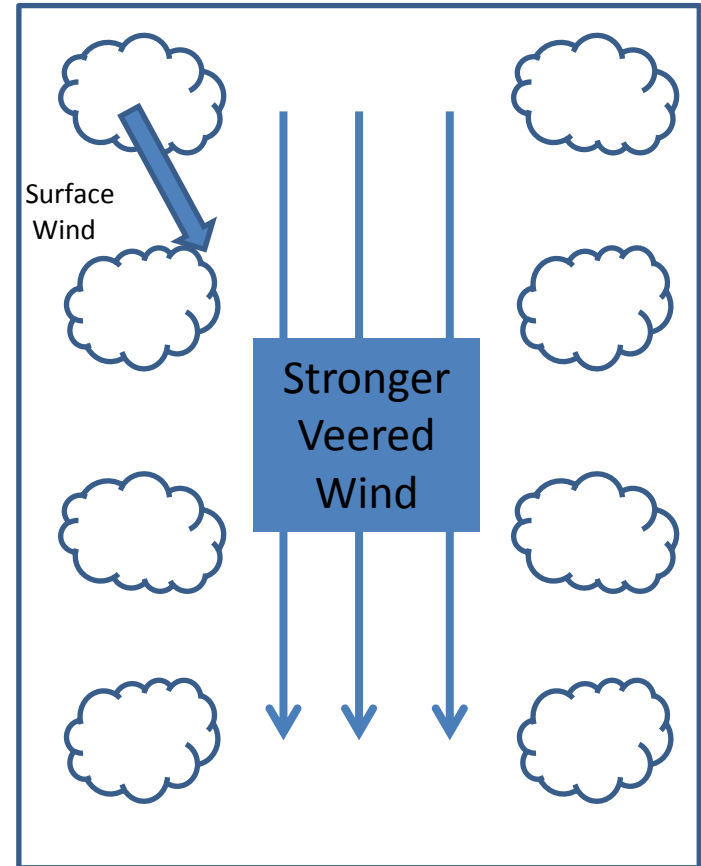
This is quite a windy day but there are signs of wind changes

Gusts at the back of each individual cloud

Probably a good predictable pattern

In this case the wind will be stronger between the lines of clouds

CLOUD "STREETS"

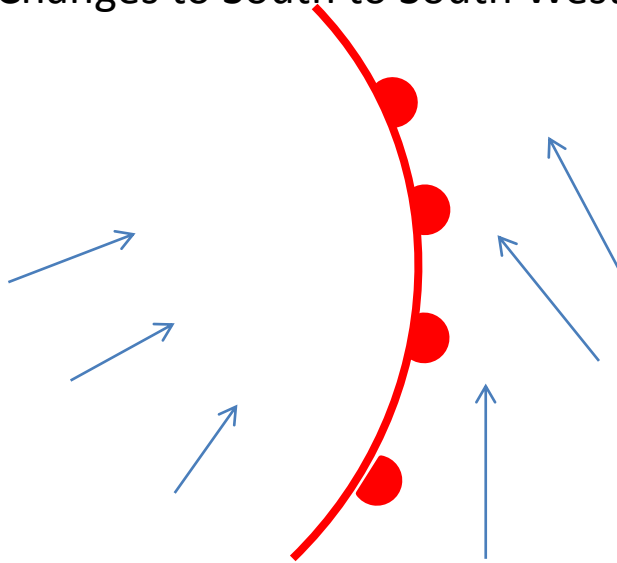


Warm Front

Approaching Low Pressure

Wind South or South East - backing (Anticlockwise) prior to Front Passing

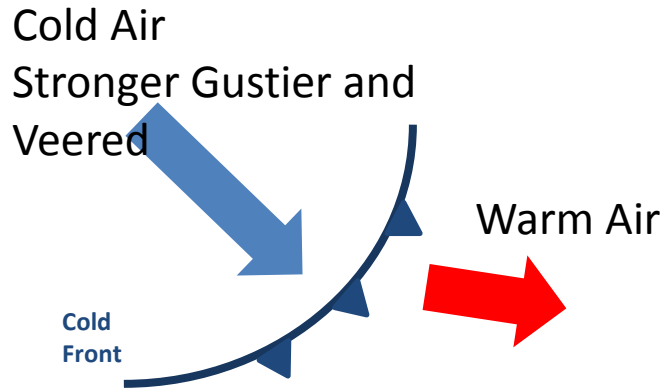
Changes to South to South West – Veering (Clockwise) after front passes



Cold Front

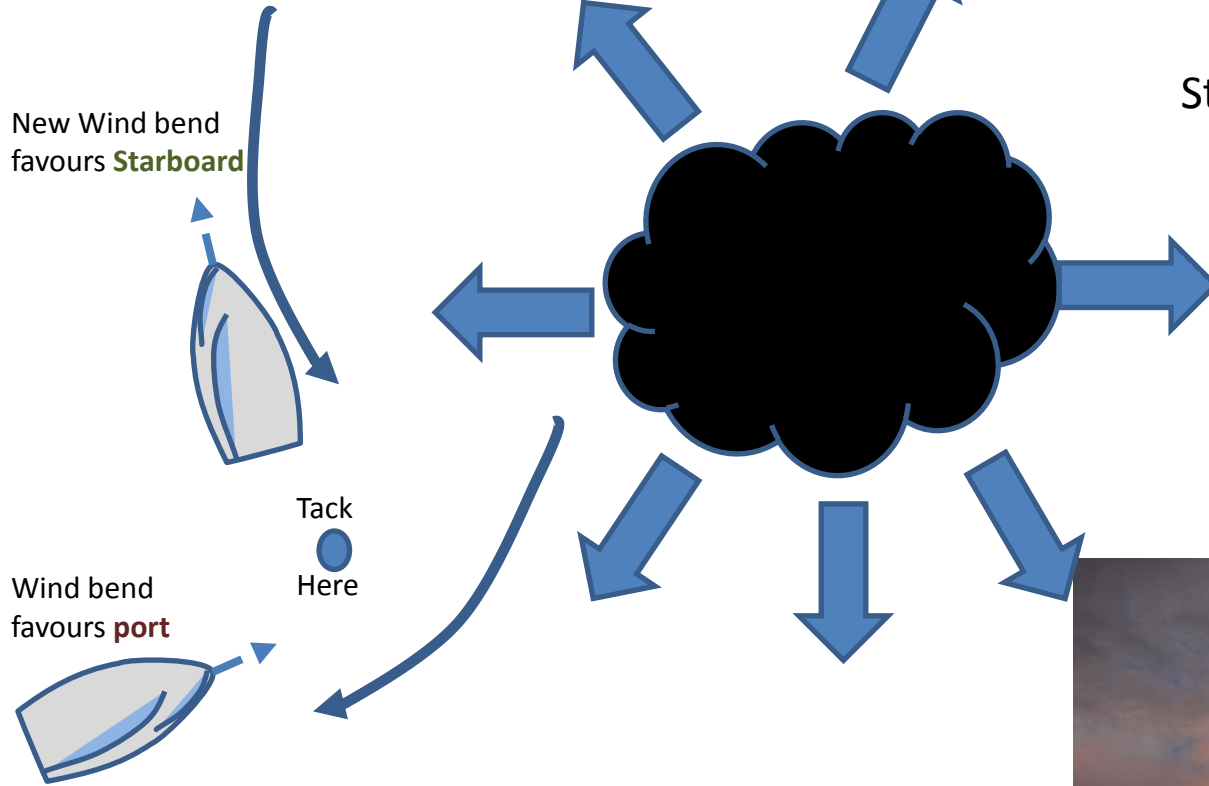
You know the feeling, the drizzle has gone, the air is clearer, colder and with showers and stronger wind – It's a cold front

What does it mean for a sailor and how do you spot it?



Squall Clouds

It's Spring - April Showers and Squalls



Nimbo-Cumulus
Probably raining
Strong winds varying direction
Violent Gusts

Fortune Favours
the Brave



ANTICIPATING CHANGES

Anticipation is the key

Study the sailing area. Penarth is great, stand on the cliff top on the way down, patterns are often obvious

“Eyes out of the Boat”

As you sail out, look for the signs,

- Cloud direction

 - Is it the same as the wind on the surface

- Bends in the cloud

- Is the wind bending off the cliffs

- Which way does the wind shift in gusts

- Look for wind variation on the water

- Flags and smoke in the distance

- Other boats, yachts out at sea etc

“Look to Windward”

Helm and crew watch water to windward

Anticipate the gust,

- Get ready to move weight as gust comes

- Anticipate course change

- Release some sail so as not to be overpowered

- Then bring it back in when comfortable

Anticipation allows **you** to stay in control – not the wind

GOLDEN RULES

ALWAYS CHECK WEATHER FORECAST

STUDY THE SAILING AREA

LOOK TO WINDWARD

SAIL TOWARDS NEW WIND

IT'S NOT AN EXACT SCIENCE

THERE IS LUCK INVOLVED

BUT REMEMBER

CHANCE FAVOURS THE PREPARED

Sources and Acknowledgements

Wind Strategy – David Houghton and Fiona Campbell

Wind and Sailing Boats – Alan Watts

Wind and Strategy – Stuart Walker

High Performance Sailing – Frank Bethwaite

UK Met Office