Meteorology

5.07 Wind

References:

Air Command Weather Manual Chapters 5 and 11

FTGU Pages 129-132

5.07 Wind

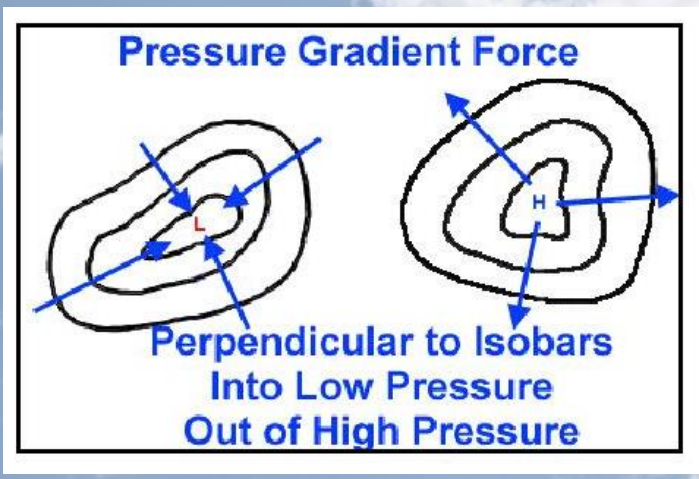
- MTPs:
  - Pressure Gradient
  - Veering and Backing
  - Coriolis Force
  - Surface Friction
  - Gusts and Squalls
  - Diurnal Effects

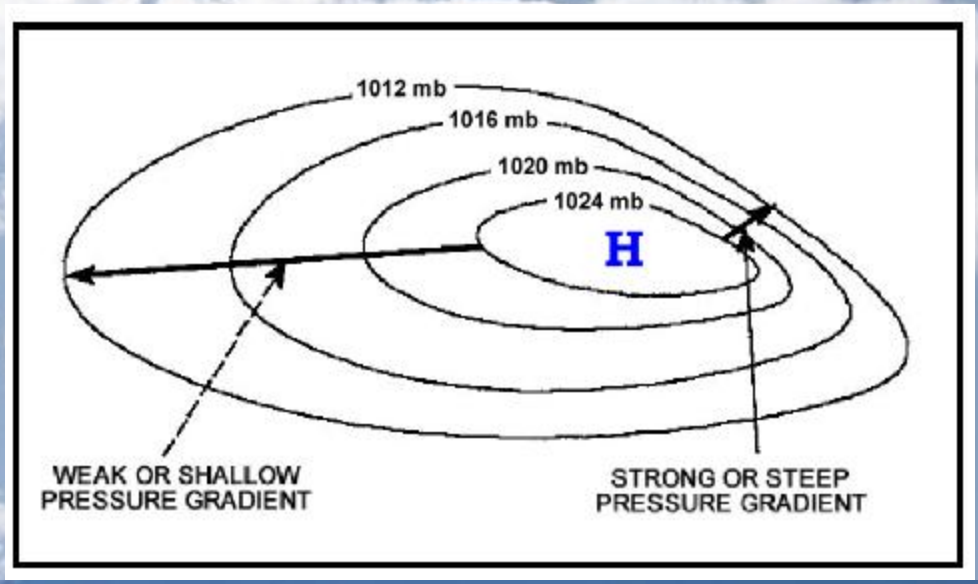
Pressure Gradient

- Wind
  - the horizontal movement of air
  - caused by pressure differences in the horizontal

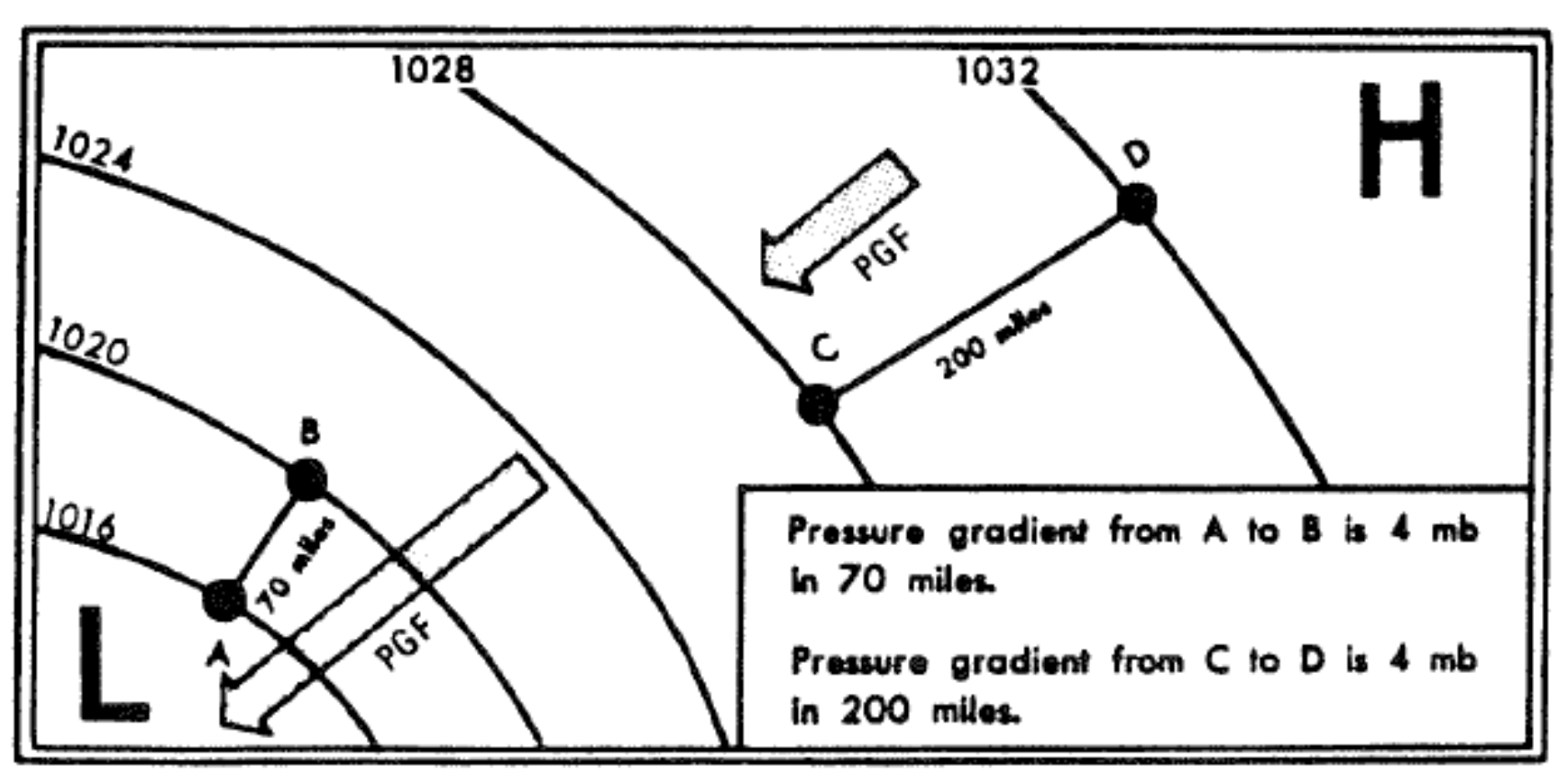
Pressure Gradient

- Pressure Gradient
  - the rate of change of pressure over a given distance
  - measured at right angles to the isobars
    - close together = *steeper* gradient and *stronger* winds
    - further apart = *shallower* gradient and *weaker* winds





Pressure Gradient



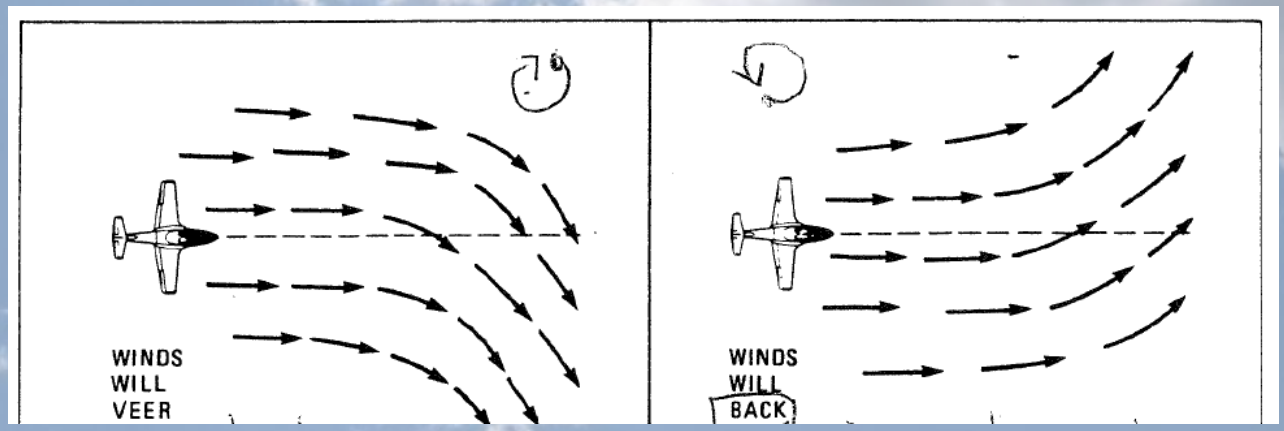
Veering and Backing

Veering

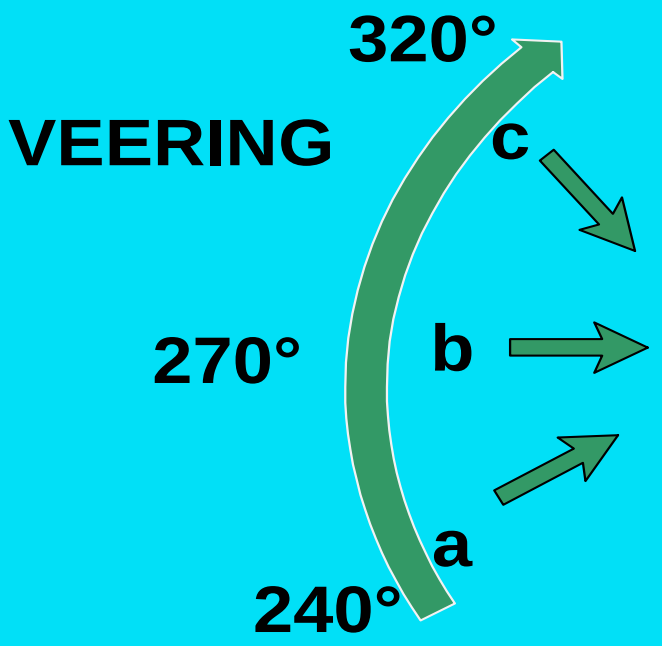
- Wind changes direction clockwise
- Wind veers and increases during the day
- Wind veers and increases with increase in altitude

Backing

- Wind changes direction counter-clockwise
- Wind backs and decreases at night
- Wind backs and decreases with decrease in altitude

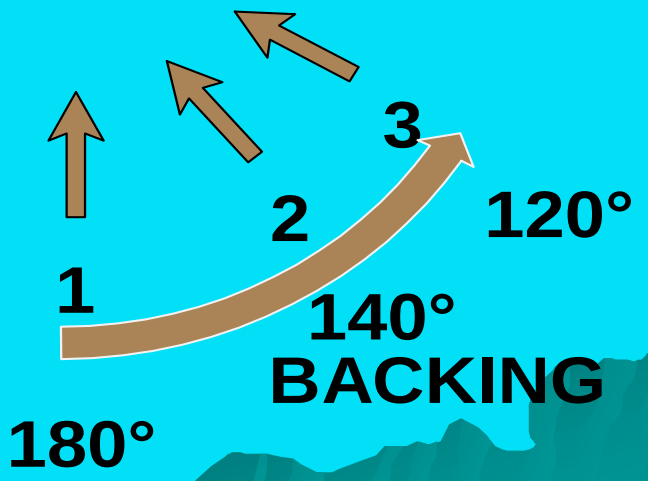


Veering and Backing



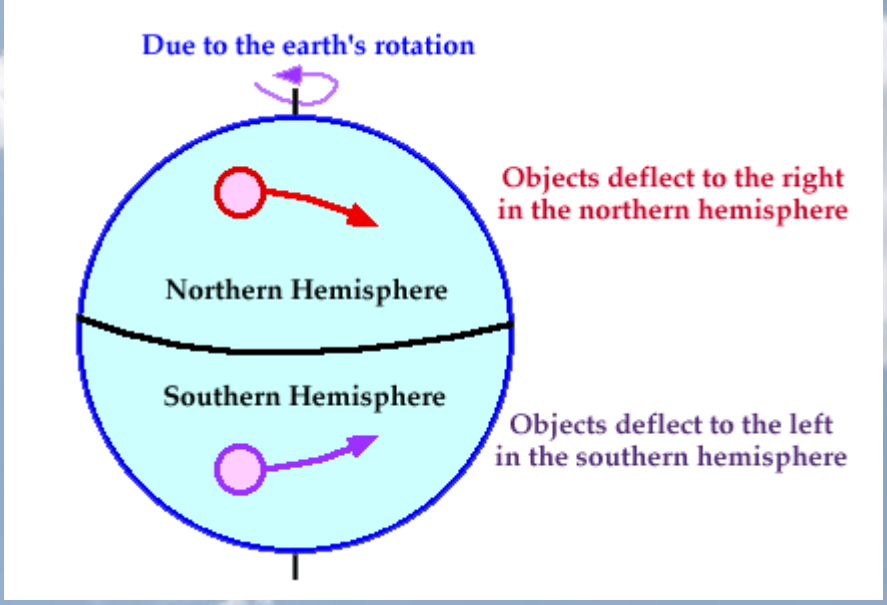
Example:

Winds start the day at 300° and by 1400 the winds are 340° and by night they are 310°



Coriolis Force

- Coriolis Force:
  - Earth turns below atmosphere
    - In N Hemisphere deflected to the right
    - To left in S Hemisphere
    - http://www.youtube.com/watch?v=_36MiCUS1ro

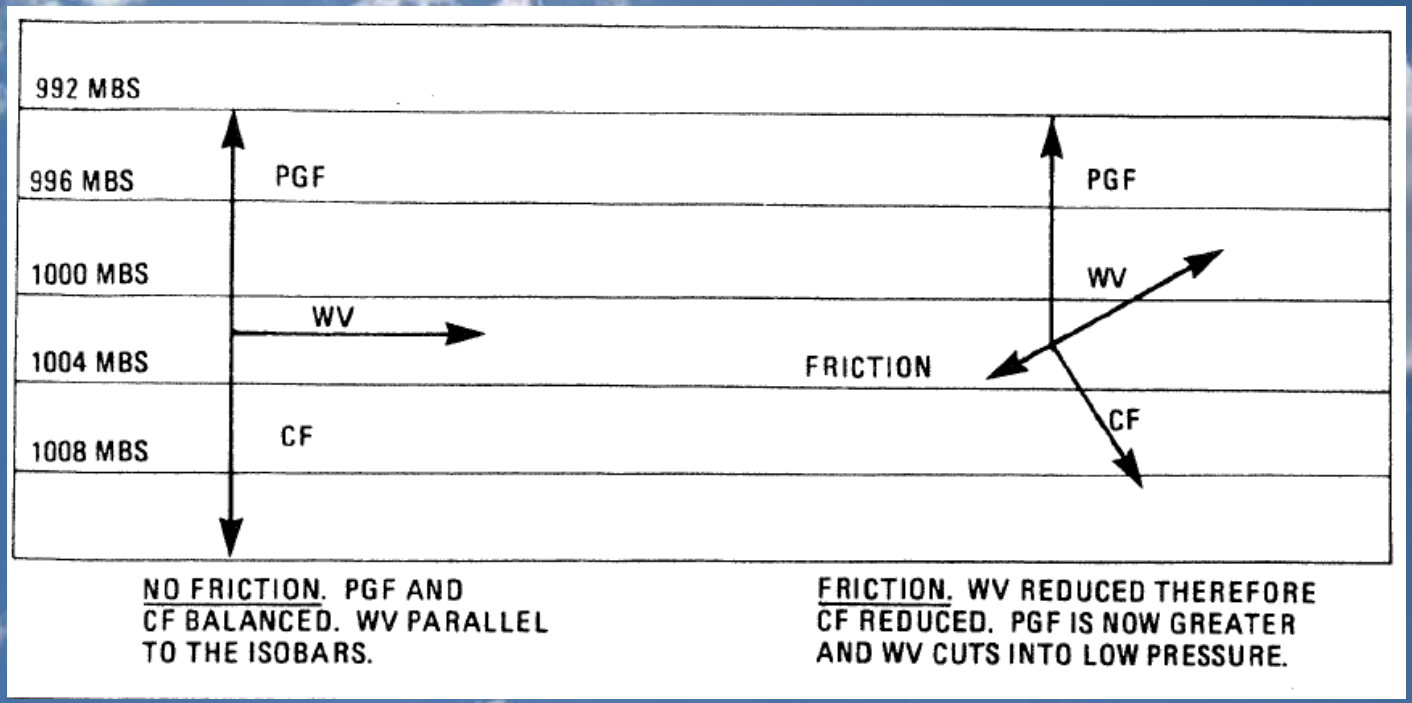


Confirmation

- Wind is:
  the horizontal movement of air created by a pressure gradient
- Pressure Gradient is:
  the rate of change of pressure over a given distance – measured at right angles to the isobars
- Backing is:
  The change in direction anti-clockwise
- Describe Coriolis Force.
  The earth turns below the atmosphere and this causes a deflection to the right in the northern hemisphere

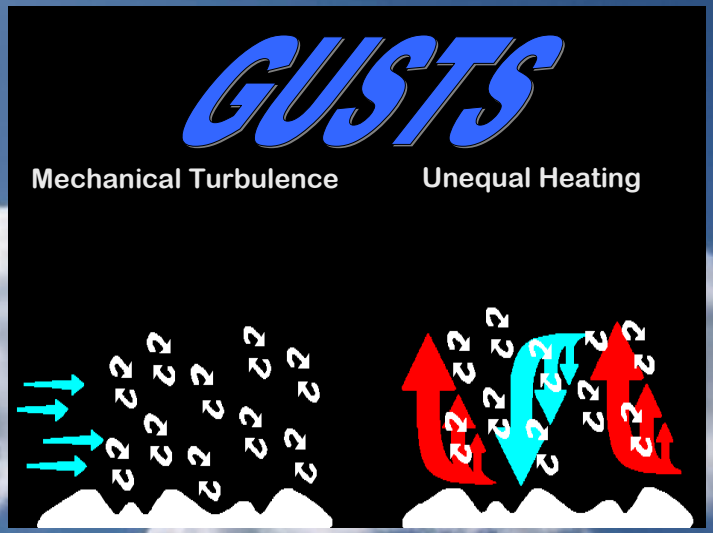
Surface Friction

- Surface friction
  - Friction between surface and atmosphere slows movement of air, this in turn slows Coriolis force
  - Only up to a few thousand feet (except in mountainous regions)



Gusts and Squalls

- *Gusts*
  - a brief rapid increase of wind speed.
  - may be associated with a rapid change in wind direction
  - Causes may be related to mechanical turbulence and unequal heating



Gusts and Squalls

- Squalls
  - A sudden increase in wind strength
  - Longer than a gust
  - May be caused by a fast moving cold front or thunderstorm
  - May be accompanied by a rapid change in direction

Confirmation

- What is surface friction and what are its effects?

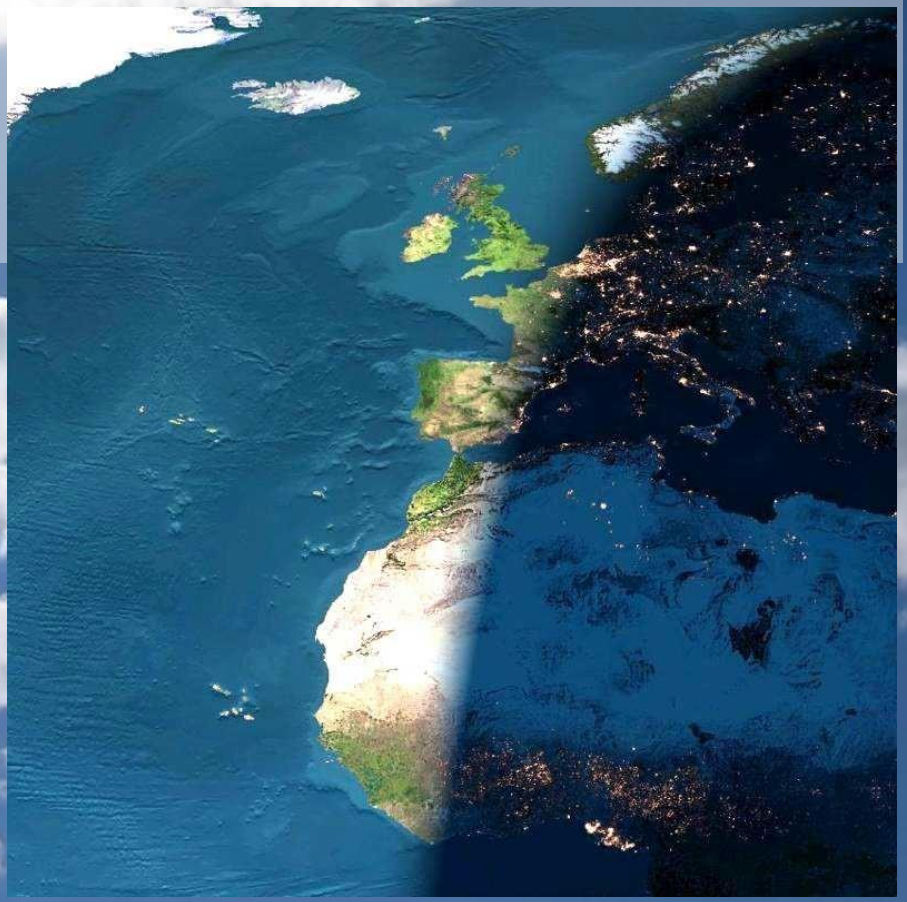
  Force causing a slow down in the air flow next to the surface of the earth

- Gusty conditions may be caused by

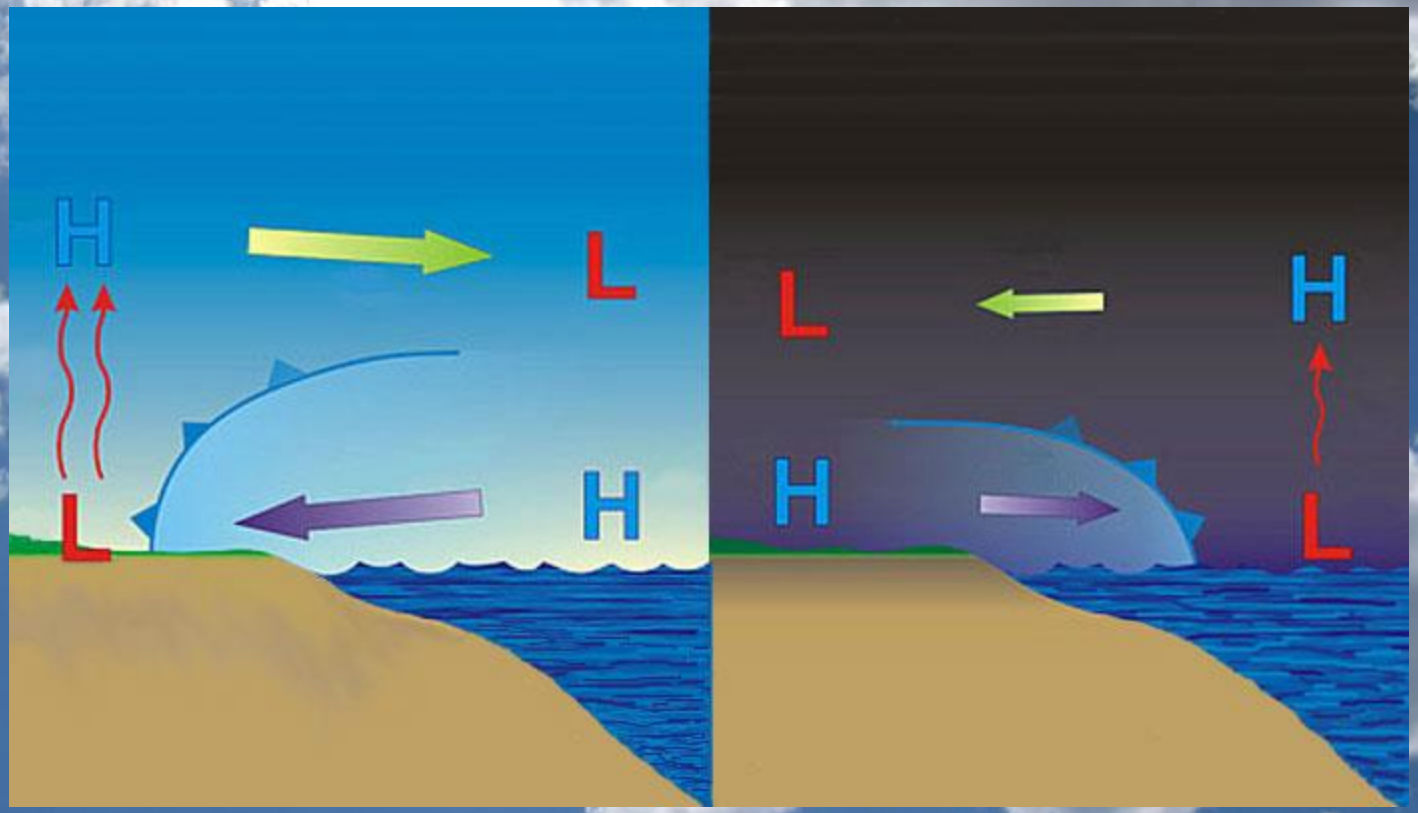
  Instability in the air caused by unequal heating and mechanical turbulence

Diurnal Effects

- If isobaric pattern and pressure gradient are identical
  - During day…
  - At night…



Diurnal Effects



Land and Sea Breezes

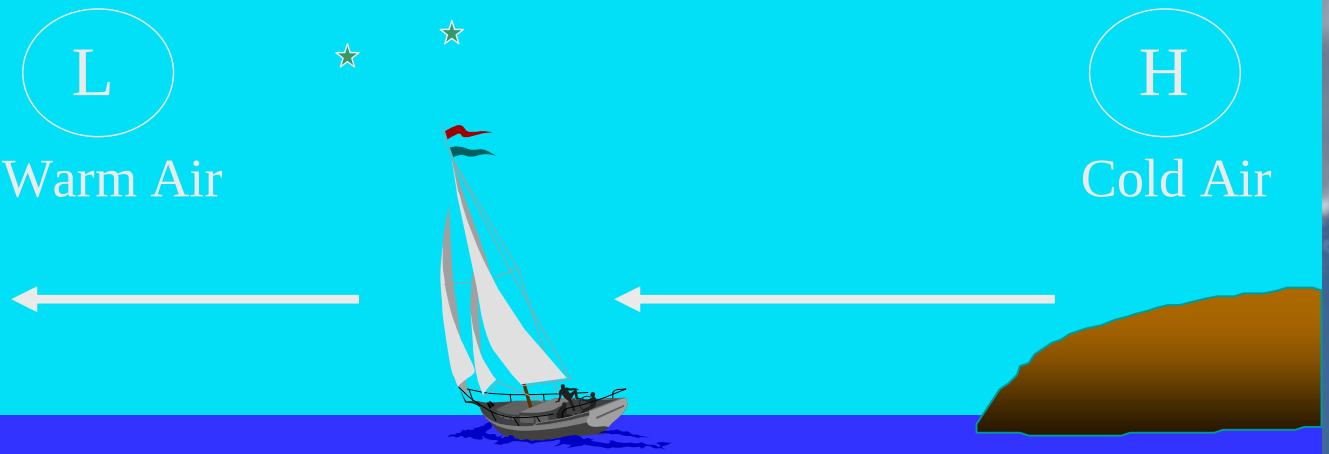
Diurnal Effects

Land Breeze

This condition is very local and affects only a narrow area along the coast:

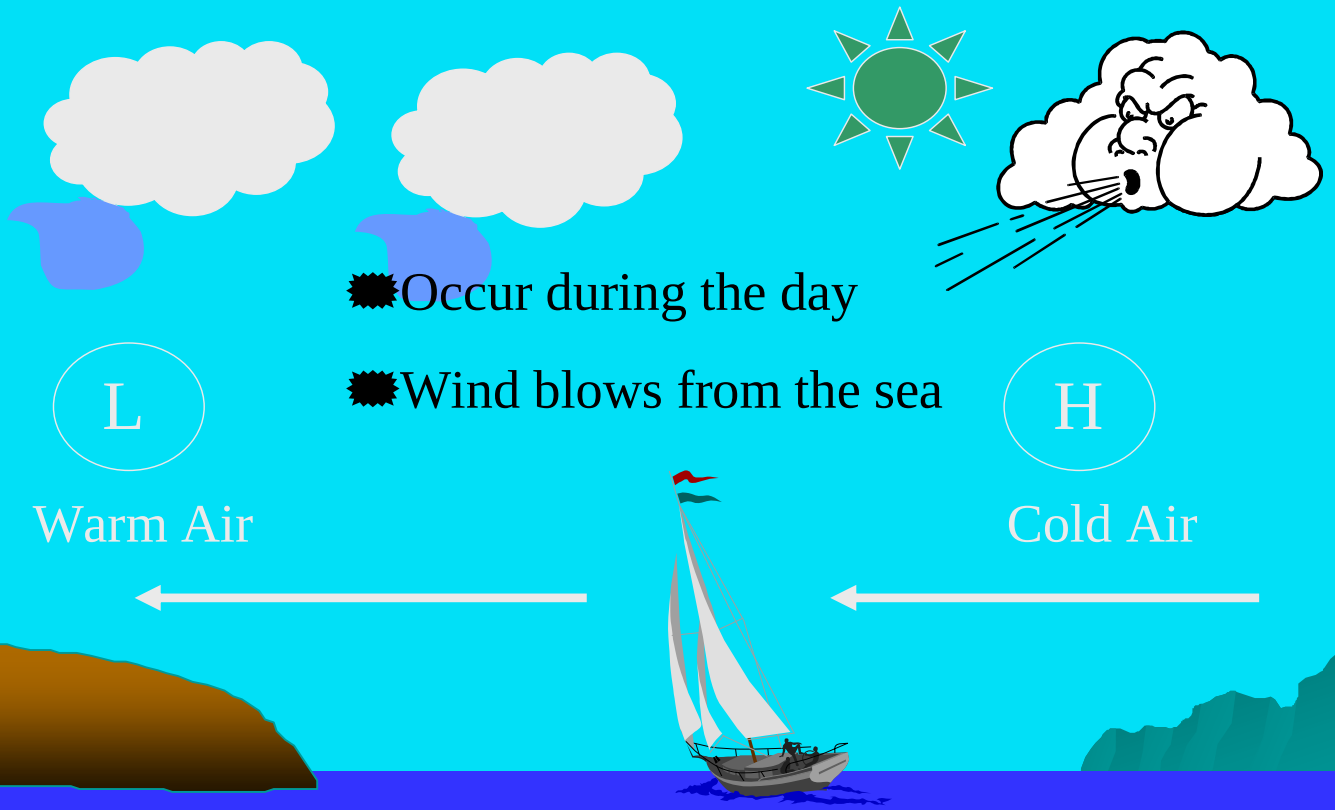
Occurs at night; and

Wind blows from the land (high pressure) towards the warm water (low pressure area)



Diurnal Effects

Sea Breeze



- Occur during the day
- Wind blows from the sea

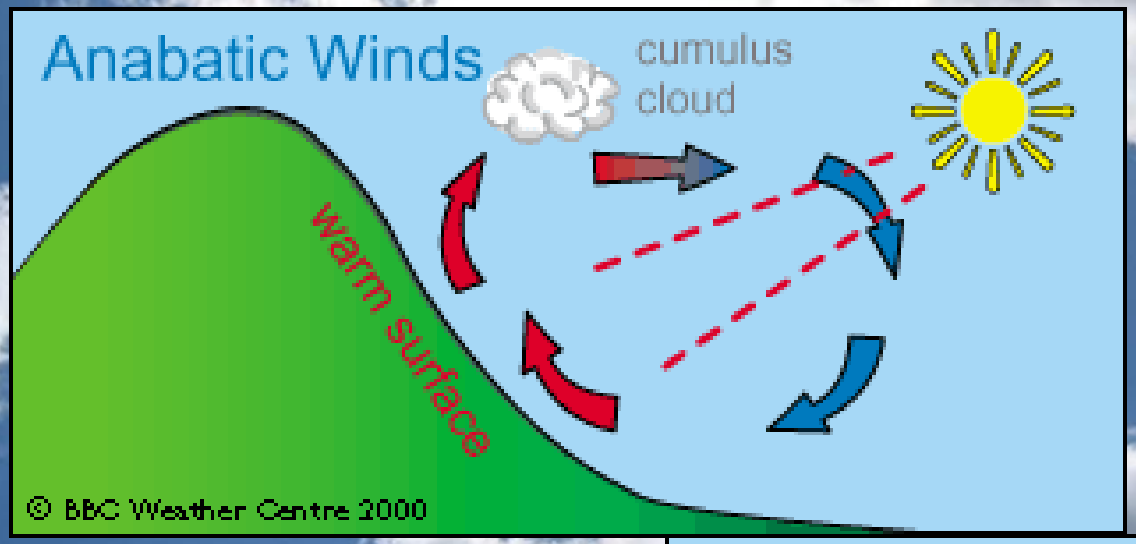
L

Warm Air

H

Cold Air

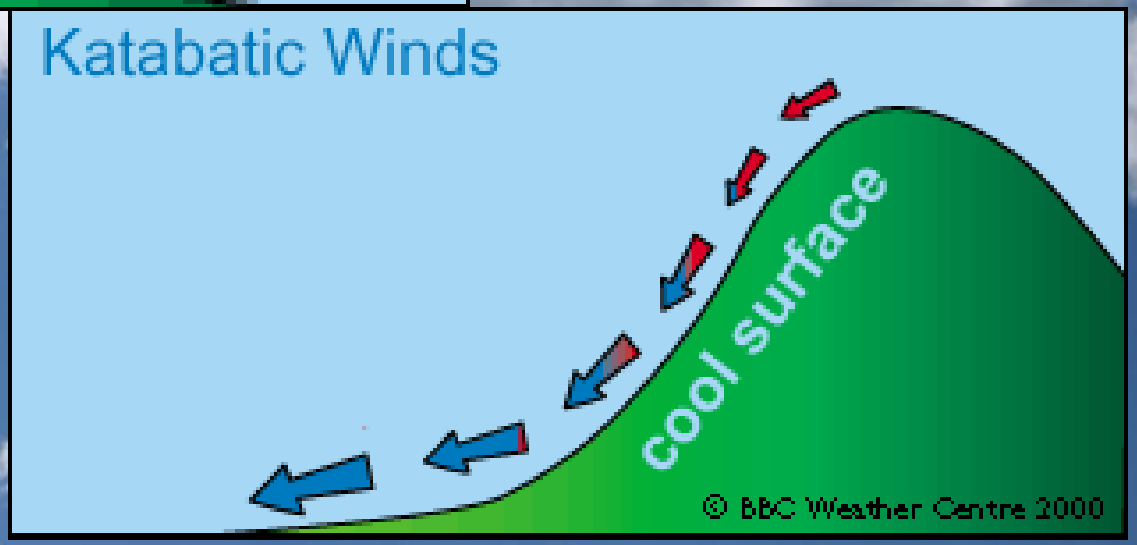
Diurnal Effects



Memory Tool

Ana goes up and throws the Kat down.

The Kat comes down at night



Diurnal Effects

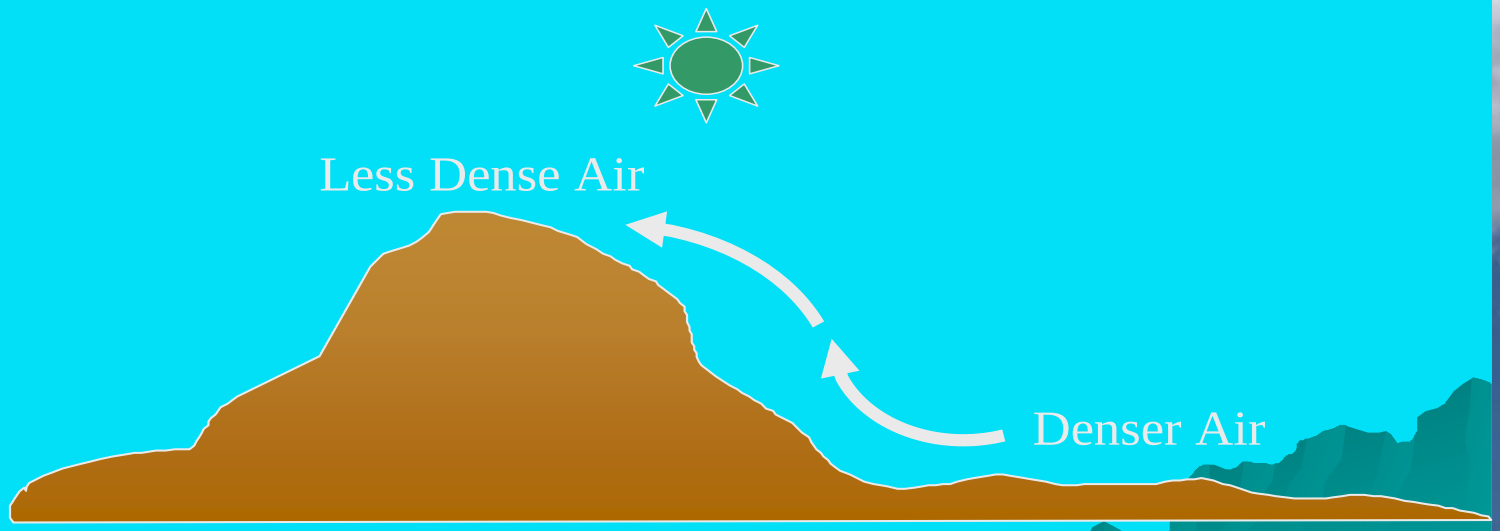
Katabatic Wind

At night, the slopes of hills cool. The air contact with them becomes cooler and therefore denser and it blows down the slope. Also known as a Mountain Breeze.

Diurnal Effects

Anabatic Wind

Slopes of hills not covered by snow will be warmed during the day. The air in contact with them becomes warmer and less dense and therefore flows up the slope. Also known as a Valley Breeze.



Confirmation

- When do sea breezes occur?

  During the day – high pressure over the water(sea) and low pressure over the land

- What causes a Katabatic wind?

  During the night – mountain landscape cools and the air goes down the slope into the valley

- What is it called when vapour changes to liquid?

  Condensation

The Effects of a Hurricane