

# Atmosphere 1

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Tropical cyclones are common as a hurricane. The frequency of hurricane has been increasing lately. Hurricane is classified by the speed of wind. As soon as wind speed increases above 110 it could be classified as a hurricane.

Atmospheric pressure:

- Atmospheric pressure (or air pressure) is the force produced by the weight of a column of air above a unit area of surface.

Measurements:

- Barometer is used to measure air pressure.
- Pressure normally ranges from 1050 mb ( high pressure ) to 950 (low pressure ) mb (or 105 to 95 kPa).
- The lowest pressures occur at the centre of tropical storms.
- The record low is 870 mb (87 kPas).
- The low pressure is associated with bad weather.

Wind and pressure gradients:

- **Wind** - horizontal motion across the earth's surface - is created by gradients in air pressure (or air density ).
- The vertical displacement of wind isn't wind.
- The greater the pressure difference or gradient, the stronger the winds.
- We named the wind after its point of origin.

The forces that determine winds:

- Any parcel of air near the surface is subjected to the following forces:
  - a. Pressure gradient force
    - Fluids like air and water move from areas of higher pressure to lower pressure.
    - This could generate wind.
    - Wind would blow perpendicular to the isobars from high pressure zone to a low pressure zone. ( iso means same) ( isobar is a line that is connecting all points with the same atmospheric pressure value).
    - If isobar are far from each other the we would a gentle

blowing wind, if isobars are close to one another we would have stronger winds.

b. Implication : convection loops

- Convection loops are created by unequal heating and cooling of the surface.
- Pressure gradient control horizontal air movement.
- We end up with low pressure spot in the ground level of the non-shaded spot and the high pressure at the top.
- In the shaded spot, we have high pressure at the area that closer to the earth and low pressure at the top.
- The warm air rises up the cool air moves down.
- This is called convection loop.
- Air temperature controls vertical air movement.

Coriolis “force”

- The Coriolis effect is an apparent force caused by the earth’s rotation.
- Coriolis force is a virtual force.
- Object in motion on the surface always appear to be deflected to the right in the N hemisphere.

Geostrophic wind

- With no friction, upper atmospheric winds are geostrophic.
- When Coriolis force equal to pressure gradient the wind will be parallel to isobars.
- In other words, upper level winds run parallel to the isobars, with low pressure to the left when you are facing away from the wind in the northern hemisphere.

Friction force

- Friction from the surface slows wind speed and combines with the other forces to influence wind direction.
- The effect of friction extends to about 500 m above the surface.
  - It explains the difference between surface winds and upper level winds. Friction slows down wind.
- $C.F < PGF$  so the wind does not blow parallel to the isobars.
- Friction slows down wind speed.
- Above 500m we have Coriolis force and pressure gradient force.
- Below 500m friction force is applied on the wind. Friction makes the wind travel in an oblique angle.

## A low pressure centres

- A low-pressure area, low or depression, is a region where the atmospheric pressure is lower than that of surrounding locations.
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- Low pressure center is called a 'Cyclone'

## Upper atmosphere: PGF + Coriolis

Cyclones are associated with low pressure centres. In the northern hemisphere the wind blows counter clockwise but in southern hemisphere the wind blows clockwise. A system with lower pressure centre at northern hemisphere (counter clockwise) is called cyclone and a system with high pressure centre is called anticyclone ( clockwise ).

- Cyclones spin in opposite directions in the Northern and Southern Hemispheres due to the Coriolis effect

## Breeze

- Sea breeze: afternoon wind that brings cool air off the water towards the land
- Land breeze: nighttime wind that brings cooler air from land towards the water