

These revision notes cover just the basics - the bare essentials. Detailed notes and case studies can be found in the prescribed textbooks.

These revision notes cover the following sections:

1. **MID-LATITUDE CYCLONES**
2. **TROPICAL CYCLONES**
3. **ANTICYCLONES**
4. **TRAVELLING DISTURBANCES THAT AFFECT SOUTH AFRICA'S WEATHER**
5. **VALLEY CLIMATES**
6. **URBAN CLIMATES**

When checking whether you understand each section, try to explain the following questions about each section:

What?

Where?

When?

Why?

Associated weather?

Human Impact?

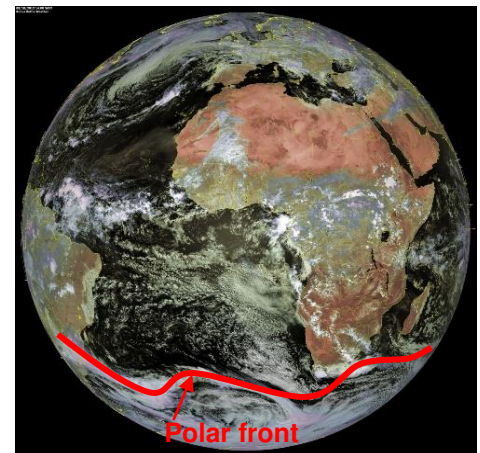
1. MID-LATITUDE CYCLONES

Other names

- Mid-Latitude Depressions
- Sub-tropical cyclone
- Frontal depression
- Temperate cyclone

Need to know:

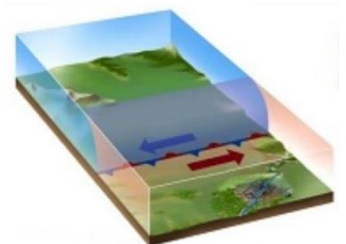
- What mid-latitude cyclones are
- Place of origin
- Life cycle (formation process)
- Weather associated with each front
- The impact they have on the environment and people



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1.1. What are mid-latitude cyclones

- Mid-latitude cyclones are low pressure cells that have **warm** and **cold fronts** attached to them.
- A **front** is the interface between two air masses with different temperatures and moisture content.
- **Warm** (humid) and **cold** (dry) air do not mix!



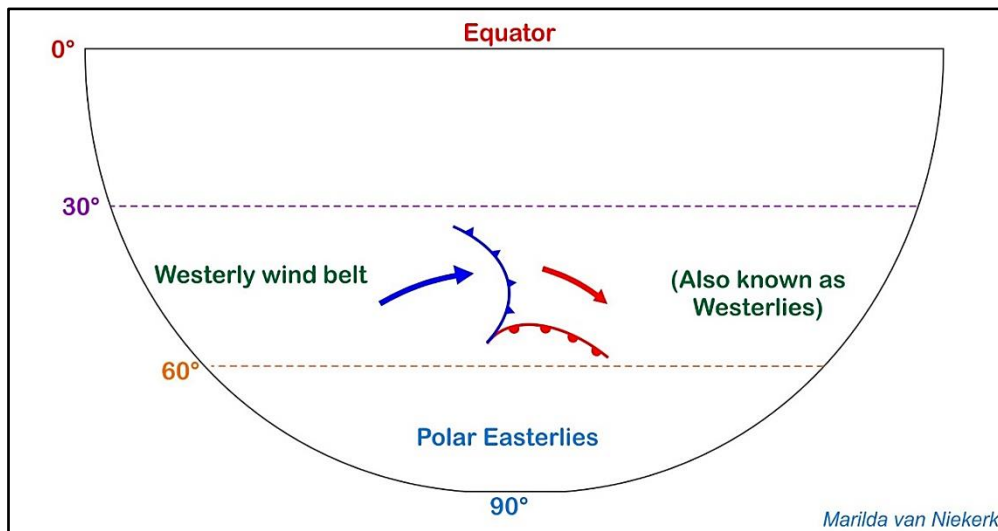
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1.2. Where do mid-latitude cyclones occur

- They are found between 40° and 60° latitude in both hemispheres, within the Westerly Wind Belt.
- As the mid-latitude cyclone move eastward, they approach continents from the west and bring winter rains to these parts.
- It is called a Mediterranean Climate.
- They are carried by westerly winds moving from WEST to EAST.

- Initially they move in the direction of the equator but is then turned in the direction of the poles.
- This change in direction is due to the stronger cold front that moves faster and their deflection from the subtropical high-pressure belts by Coriolis force.

Position of mid-latitude cyclones



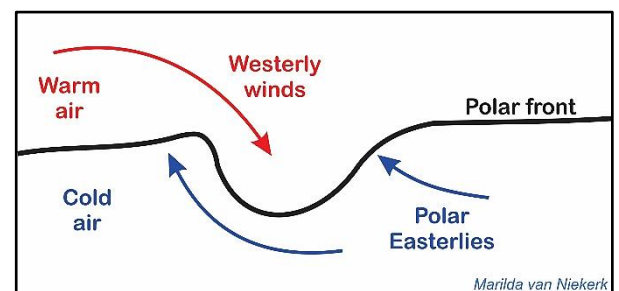
1.3. Characteristics of a Mid-Latitude Cyclone

- Rotation around the centre of low pressure in the southern hemisphere is clockwise.
- Warm air rises at the cold front and subsides at the warm front.
- Speed of movement** is 30-50 km/h.
- Lifespan is 4 to 14 days.
- An extended core of low pressure occurs.
- The diameter of the entire system can be up to 3 000 km.
- The isobars are oval shaped.
- Occur in families where a cold front from an earlier depression connects with a cold front from a younger depression.

1.4. Life Cycle (formation process) of a Mid-Latitude Cyclone

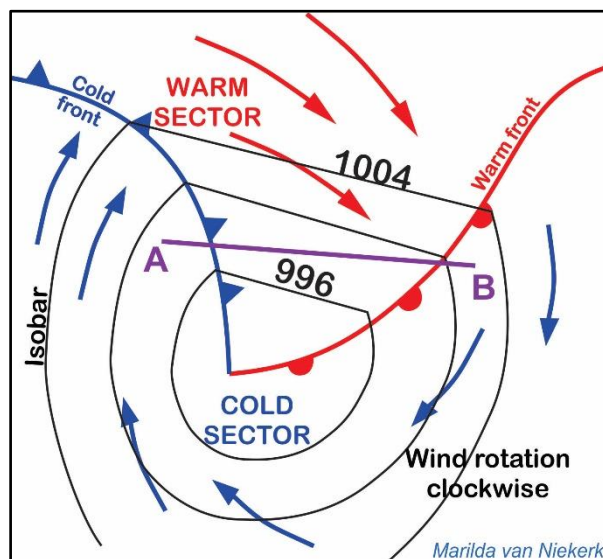
1.4.1. Initial or Formative Stage

- A mid-latitude cyclone originates at the polar front - $\pm 60^\circ$ north and south of the equator.
- Friction between the Westerlies and Polar Easterlies causes a disturbance in the polar front as warm air pushes up over cold air.
- A wave is formed and the low pressure cell begins to form.

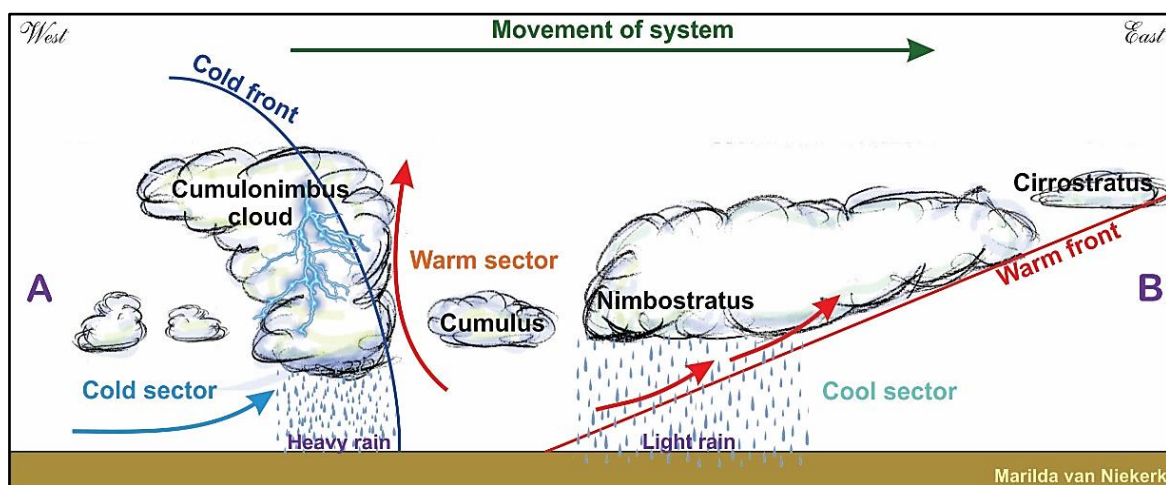


1.4.2. Mature Stage

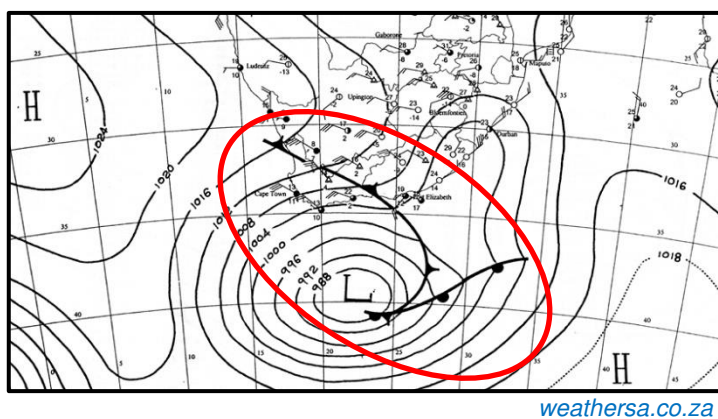
- A cell of low pressure forms.
- Air circulating around the low pressure cell causes the Polar Front to break up into a separate cold front and warm front.
- You must be able to recognise the Mature Stage on a synoptic map (plan view) and as a cross section.



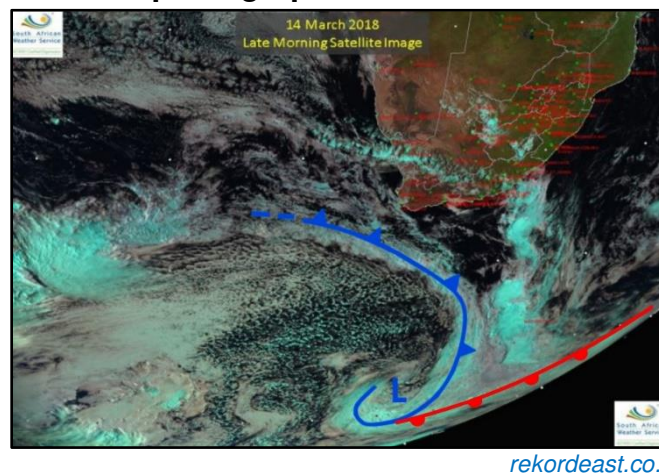
Cross section from A to B of a mid-latitude cyclone



Synoptic weather map

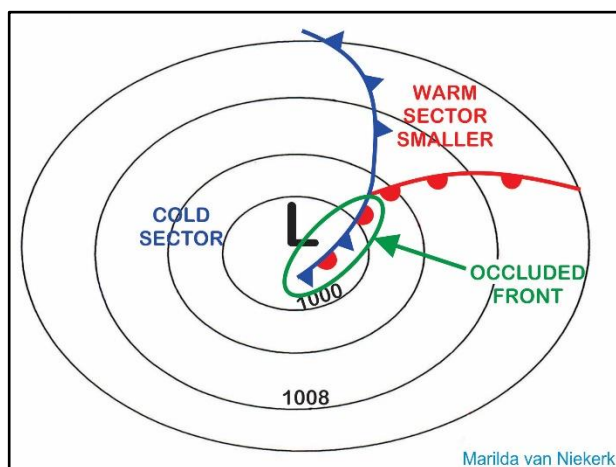


Satellite photograph

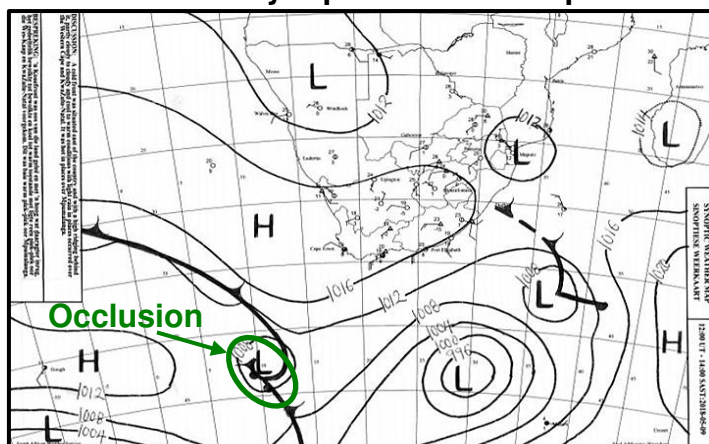


1.4.3. Occluded Stage

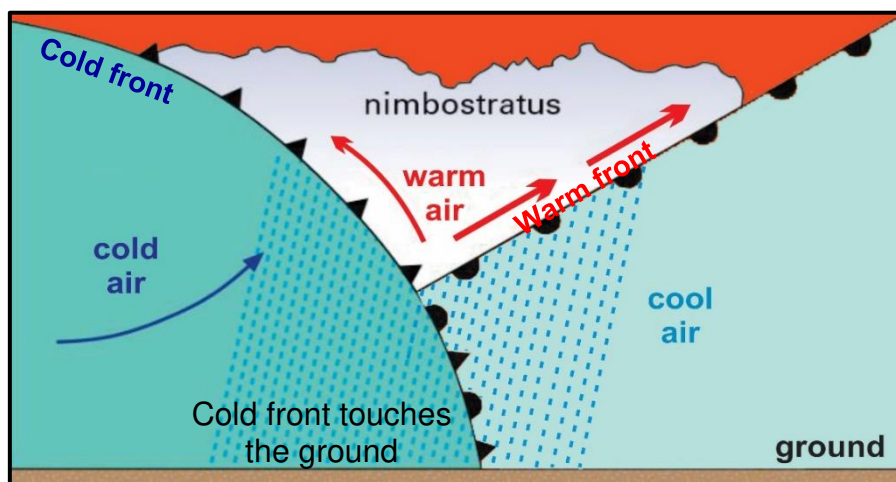
- The cold front catches up to the warm front and wedges in below the warm sector.
- The warm sector narrows.
- The two fronts combine to form an **occluded front**.
- Nimbostratus clouds with rain are present.



Occlusion on a synoptic weather map

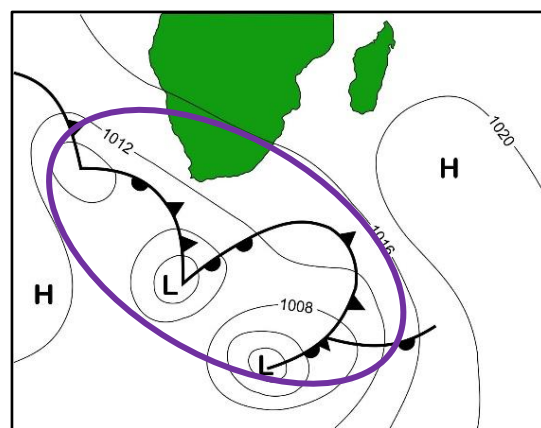


Cross-section of a cold front occlusion of a mid-latitude cyclone



1.5. Weather associated with Mid-Latitude Cyclones

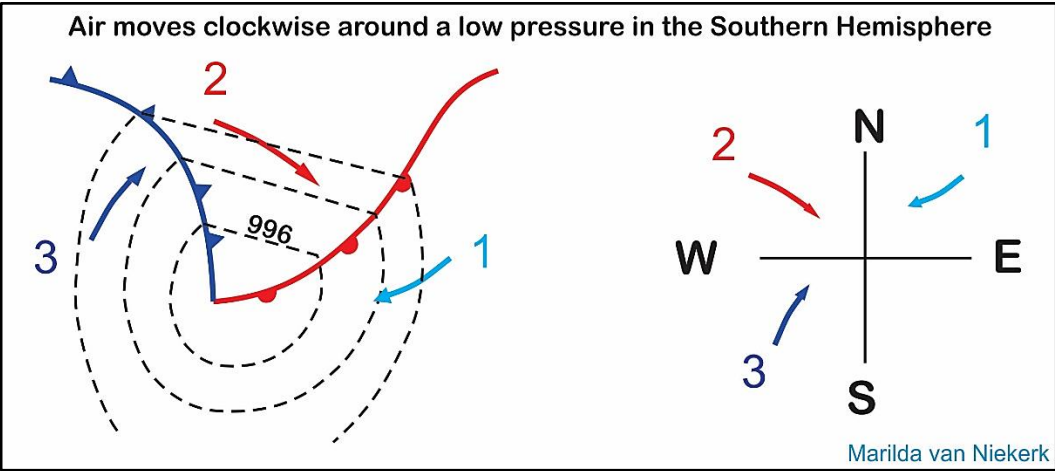
- Mid-Latitude Cyclones move from west to east.
- The warm front is experienced first, followed by the warm sector, then the cold front and cold sector.
- Warm fronts bring warm air and longer periods of gentle rain.
- Cold fronts bring cold air and heavy rain often with lightning and thunder or even snow.
- They can form **families** when one mid-latitude cyclone connects with the next one.



- The following changes occur as each front moves west:
 - Temperature
 - Pressure
 - Cloud
 - Rainfall
 - Wind direction (wind always BACKS in the Southern Hemisphere)

WARM FRONT	COLD FRONT with reason for change
Temperature gradually increases.	<i>Temperature decreases abruptly.</i> Reason: The cold air behind the front arrived.
Pressure rises.	<i>The pressure drops but rises again.</i> Reason: The pressure is at its lowest just before the front, but increases when the front passes and the cold air arrives
	<i>The cloud cover increases.</i> Reason: The warm air rises over the incoming cold air, it cools and condensation occurs.
As the warm front approaches cirrus clouds are seen first, giving way to alto stratus clouds and finally stratus and nimbostratus clouds.	<i>Cumulonimbus clouds forms.</i> Reason: The cold air forces the warm air to rise sharply and condensation takes place up to high altitudes
Light rain which is set in for a couple of days.	<i>Heavy rainfall occurs over a small area.</i> Reason: In an active cold front (big temperature difference between the warm and cold sectors) Cumulonimbus clouds with thunderstorms occur.
The wind backs. The wind direction usually shifts from Northeast to Northwest. (Diagram below from 1 to 2)	<i>The wind backs.</i> The wind direction usually shifts from Northwest to South Westerly. (Diagram below from 2 to 3) Reason: The air circulates clockwise around a low pressure.
	<i>Snowfall can occur on the mountains.</i> Reason: Because of the high altitudes snow does not melt before it reaches the ground.

Diagram illustrating backing wind



1.6. Impact of Mid-Latitude Cyclones on the environment and people

- Mid-Latitude Cyclones are responsible for winter rainfall in the Western Cape.
- A steep pressure gradient can result in very strong winds and violent storms which cause property damage.
- Strong winds, lightning, hail and heavy rain, sometimes snow can disrupt people's lives and sometimes loss of life occurs.
- Communication is disrupted, shipping and aviation could not continue as normal and outdoor activities are limited.
- More often, rainfall is gentle and set in for a day or two.
- This gentle rain is good for farming as there is time for the rain to seep into the soil.

1.7. Precautions

- Closure of mountain passes.
- Driving with fog lights in heavy weather.
- Ships cannot depart from port.
- Alerts can be sent out to tourists.
- Small aircraft may be grounded.

2. TROPICAL CYCLONES



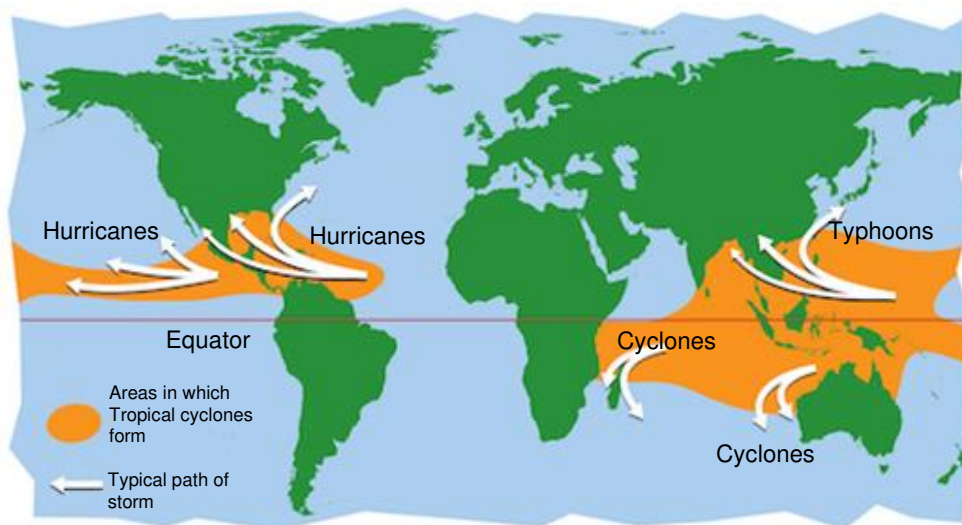
Names

- Associated with the area of appearance
 - Hurricanes - Atlantic & Eastern Pacific oceans
 - Typhoons – Western Pacific Ocean
 - Cyclones – Indian ocean



arabnews.pk

Global distribution of Tropical Cyclones



spaceplace.nasa.gov

Need to know:

- What Tropical Cyclones are,
- Their place of origin (where they start forming),
- Life cycle (stages of development)
- Impact on the environment and people.