

2.1. What are Tropical Cyclones

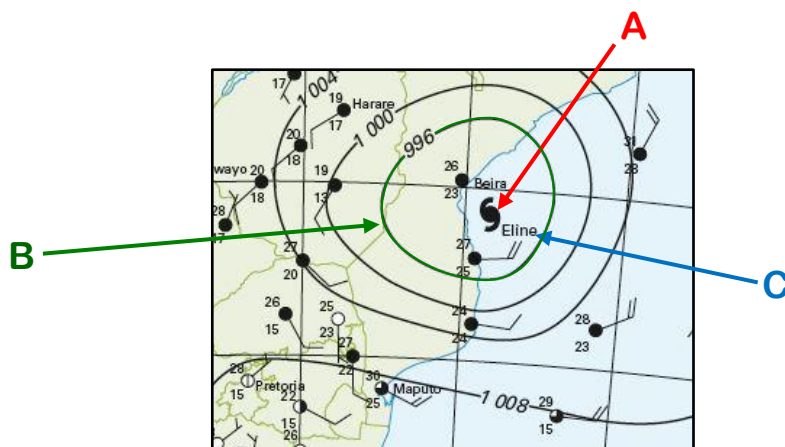
- Tropical cyclones are intense low-pressure cells that form over warm tropical oceans and cause severe weather.
- A tropical cyclone is a warm-core, low pressure system **WITHOUT** any "front" attached.

2.2. Origin of Tropical Cyclones

- Tropical Cyclones originate in the Tropical Easterly wind belt.
- Over the western side of warm oceans where the sea surface temperature is at least 27°C or warmer.
Reasons:
 - It causes a lot of evaporation.
 - Warm temperatures provide thermal (heat) energy.
 - Convection currents cause warm air to rise.
 - Low pressure forms as air rises.
- Tropical cyclones need a high humidity and a large area of ocean.
Reason:
 - Condensation needs to occur so that latent heat is released which provides thermal energy.
- LOW pressure – less than a 1000 mb.
Reasons:
 - Air rises quickly and a steep pressure gradient strengthens Coriolis force and causes air to spiral.
 - Convergence causes air to rise, creating a low pressure.
- They originate between 5° and 10° North or South of the Equator.
Reason:
 - They need Coriolis force and does NOT form over the Equator because there is not enough Coriolis force to deflect the wind to start a vortex (circulating air).

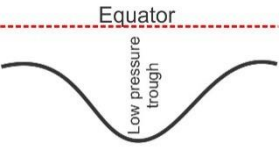
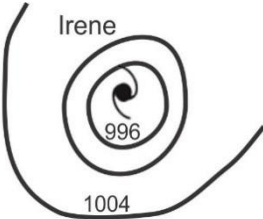
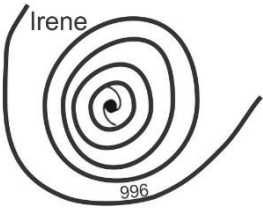
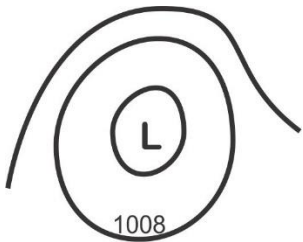
2.3. Recognition of tropical cyclones on a synoptic weather map

- A. The **map symbol**.
- B. The **round isobars**.
- C. The **name**.

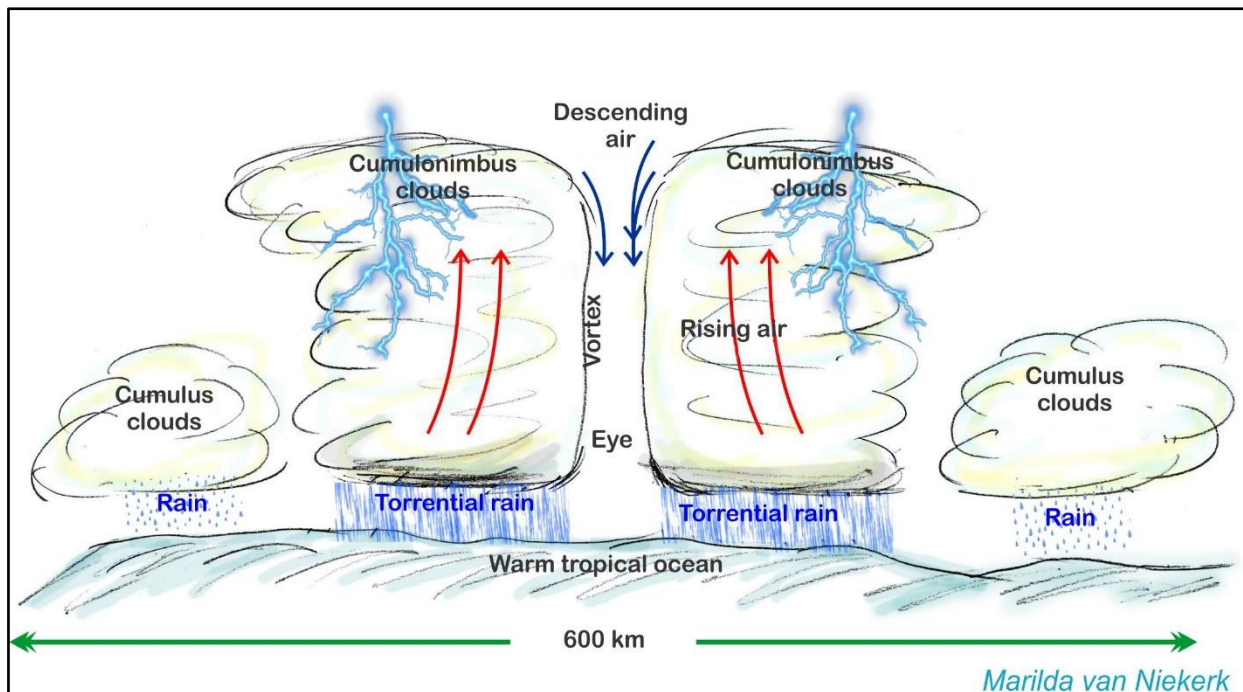


Adapted by Marilda van Niekerk

2.4. Stages of development of Tropical Cyclones

	1. Formative Stage • Troughs of low pressure develop in the Tropical Easterly winds. • The isobars bend AWAY from the equator.
	2. Immature Stage • Pressure drops to BELOW 1 000hPa. • An EYE develops. • The storm is given a NAME. • The storm is indicated on a synoptic chart with the symbol. • Winds are now hurricane strength (150 km/h) in the area 30–50 km from the eye.
	3. Mature Stage • Lowest pressure is reached. • The system stops growing. • Wind speeds reach hurricane strength as far as 300 km from the eye. • The calm, clear eye is well developed and the air pressure drops to less than 980 hPa (or lower). • The low pressure and the fast wind over the ocean cause a storm surge. • The worst weather is experienced in the forward left-hand quadrant (Dangerous quadrant). • In the dangerous quadrant, the speed of the wind is increased due to the fact that the whole system is moving in the same direction as the winds are blowing.
	4. Dissipating Stage • Pressure starts to increase, thus weakening the strength of the wind and the system dies out. • Pressure increase can be due to any of the following: ➤ The storm moves over land so there is less water vapour in the air. ➤ The storm moves over land and friction slows the wind down – less convergence, less uplift. ➤ The storms move further from the equator, so the sea temperature is too cold.

2.5. A cross section of a tropical cyclone



2.6. Associated weather

As you can see from the cross section above, tropical cyclones are **symmetrical** – they are the same on both sides, with an **eye of clear weather** in the middle. They bring a specific set of weather conditions listed below, which result in destruction and flooding.

- In the eye the pressure is very low (lower than 980hPa)
- There is a very steep pressure gradient (isobars very close).
- Air is pulled to the low pressure (This is called convergence).
- This results in gale force winds (up to 300 km/h) around the eye.
- The winds and low pressure cause a **storm surge** – high seas.
- As the air spirals to the centre it rises quickly to form cumulonimbus clouds.
- These clouds bring **torrential rain**.
- This chain reaction causes the air to rise quickly to higher than 10 - 15 km.
- The cloud bank along the eye is called the vortex.
- Some of the air moves into the eye and descends in the eye.
- **NB!** Because the **air** in the eye is **descending**, there are **no clouds**.



Tropical cyclone Idai, 2019

2.7. Impact on the environment and people

2.7.1. FOUR main causes of damage:

1. **Strong winds** of over 130 km/h. In extreme cases, the wind can reach over 300 km/h.
2. **Storms** over the oceans and **high waves** may flood coastal areas.
3. **Floods** are not only caused by the ocean, but also by the **heavy rainfall** associated with the storm.
4. **Landslides** occur on all slopes where there is human activity in relatively unstable areas, whether rural or urban.

2.7.2. Other consequences:

- Storm surges cause coastal flooding.
- Destroy homes and other buildings.
- Heavy rain causes flooding inland.
- Crops are ruined, buildings damaged, bridges washed away, telecommunications disrupted.
- Infected water can cause the spread of diseases such as cholera.
- Bridges and roads can be destroyed, cutting off access for emergency personnel.
- Pressure on the economy as food may need to be imported and buildings and infrastructure needs to be rebuilt.

Storm surge damage in Cameron, Louisiana after Hurricane Laura on 27 August 2020



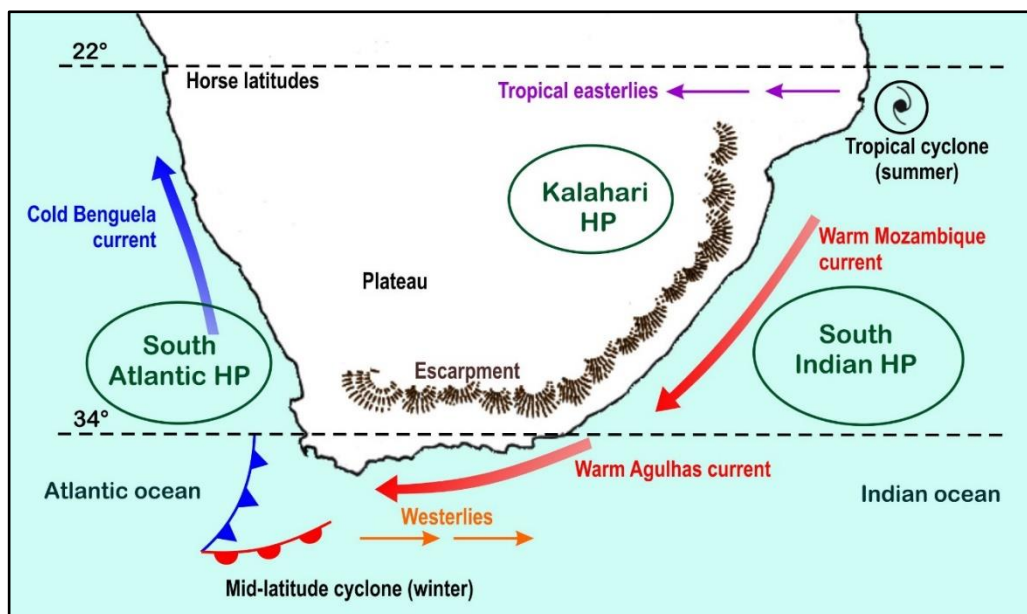
[indianexpress.com](https://www.indianexpress.com)

2.8. Precautions:

- The only way to protect and lessen the damage is through proper management strategies.
- The authorities and the public must be aware of the specific actions to take.
- Information and evacuation procedures need to be planned in advance so that people know how to prepare themselves and their property.
- People may still not evacuate the area or move to shelters due to personal perceptions, and cultural or economic factors.

3. ANTICYCLONES (High Pressure cells that dominate South Africa's weather)

- South Africa is situated between the latitudes 22°S and 34°S. This means that our climate is dominated by the belt of subtropical high pressures.
- The three high pressure cells that affect South Africa's weather are:
 - the South Atlantic High
 - the Kalahari High and
 - the South Indian High.



Focus Geography Gr 12 adapted by Marilda van Niekerk

Need to know:

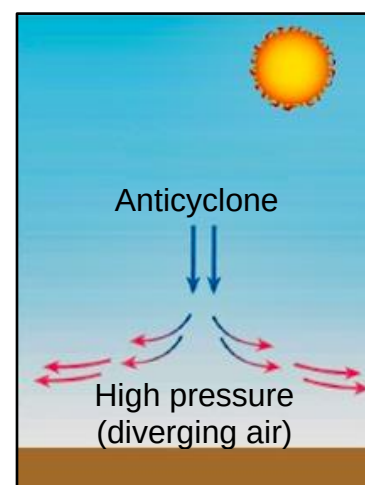
- What are anticyclones.
- Characteristics of anticyclonic circulation.
- The impact that each of the three anticyclones have on South Africa's weather.

3.1. What are anticyclones

- Anticyclones are high pressure cells caused by descending air.

3.2. Characteristics of anticyclonic circulation

- South Africa lies between latitudes 22° S and 35° S.
- This position means our climate is dominated by the belt of subtropical highs that circle Earth at 30° S.
- High pressure cells (anticyclones) are associated with sinking air.
- While the air is sinking, it circulates in an anti-clockwise direction in the Southern Hemisphere.
- As the air sinks, it heats adiabatically.
- The descending air causes clear skies with dry, stable air.
- When the air reaches the ground, it diverges.
- The three high pressure cells are found more north in winter and are further south in summer.



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3.3. The impact of the three anticyclones on South Africa's weather

The anticyclones that affect South Africa's weather

- South Atlantic Anticyclone
- Kalahari High (Kalahari Anticyclone)
- South Indian Anticyclone