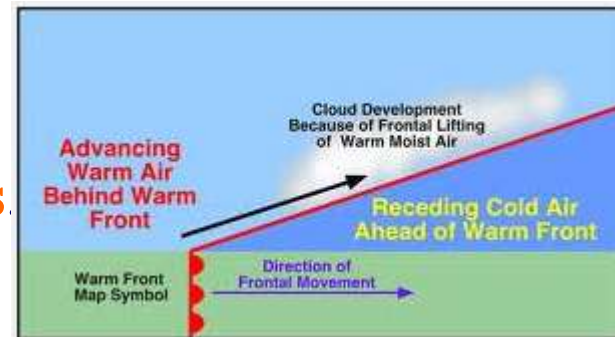
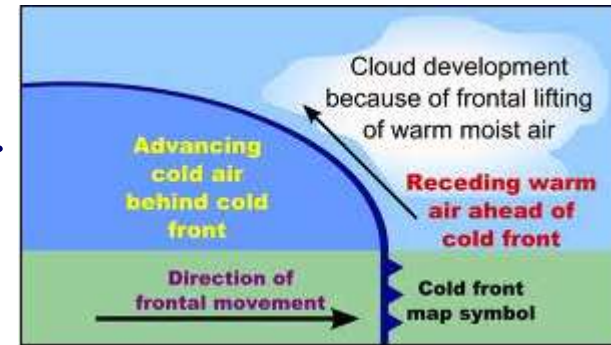
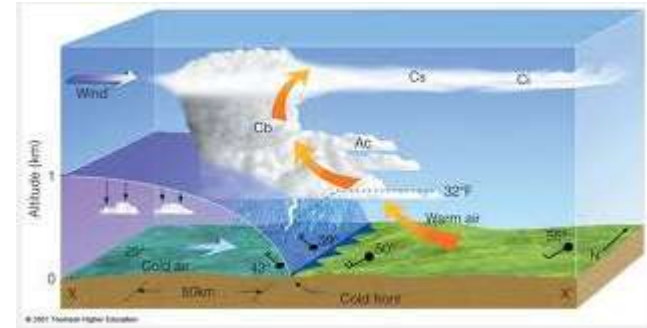


Temperate / Mid-latitude Cyclone

[Click here](#) for playlist

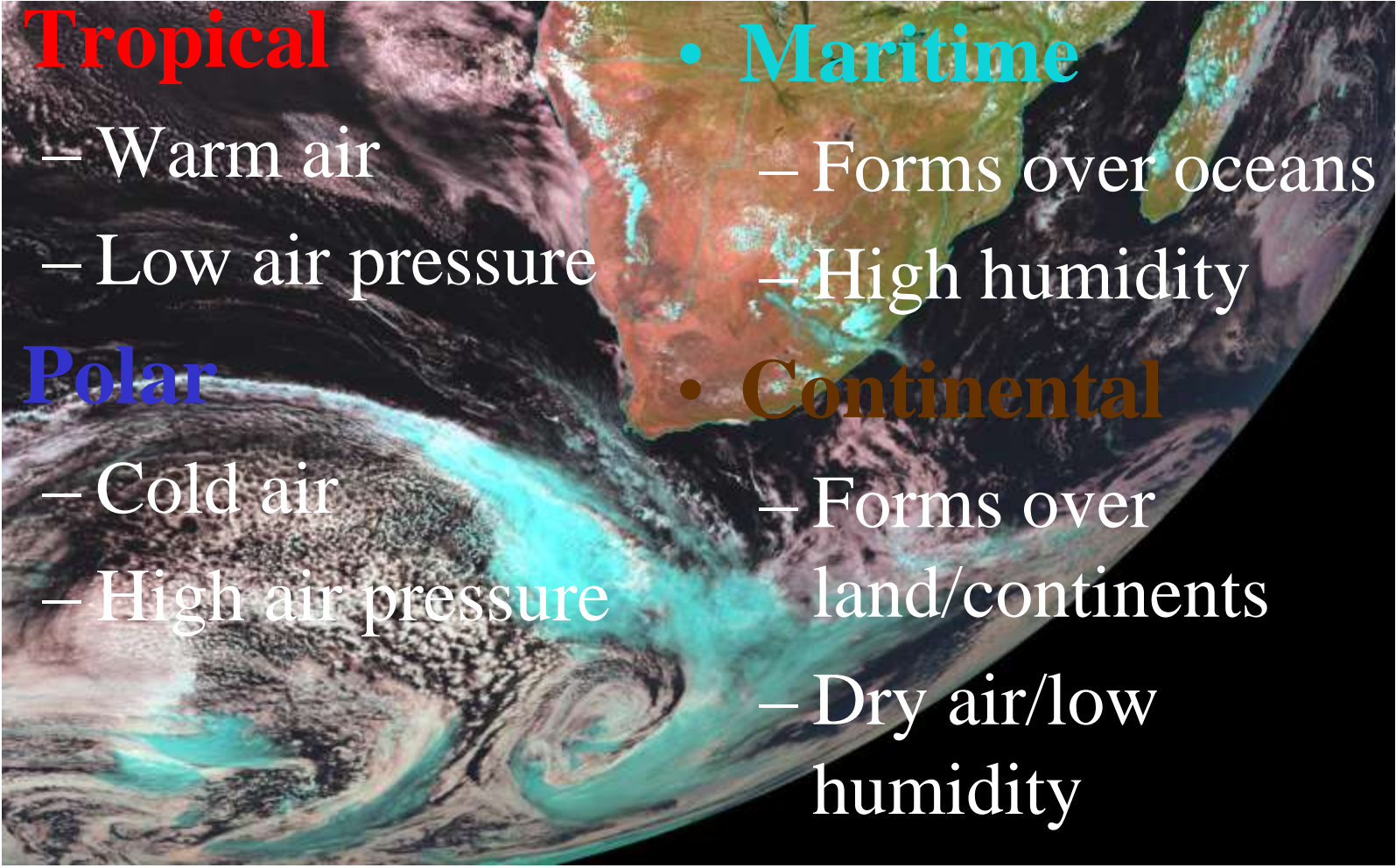
- The different types of **Air Masses and fronts.**
- Areas where Temperate Cyclones **form.**
- **Conditions necessary** for their formation.
- The **stages of development.**
- **Cross sectional diagrams** and **weather conditions.**
- **Characteristics** of Temperate Cyclones.
- Reading and interpreting **Satellite Images.**



Scoop It

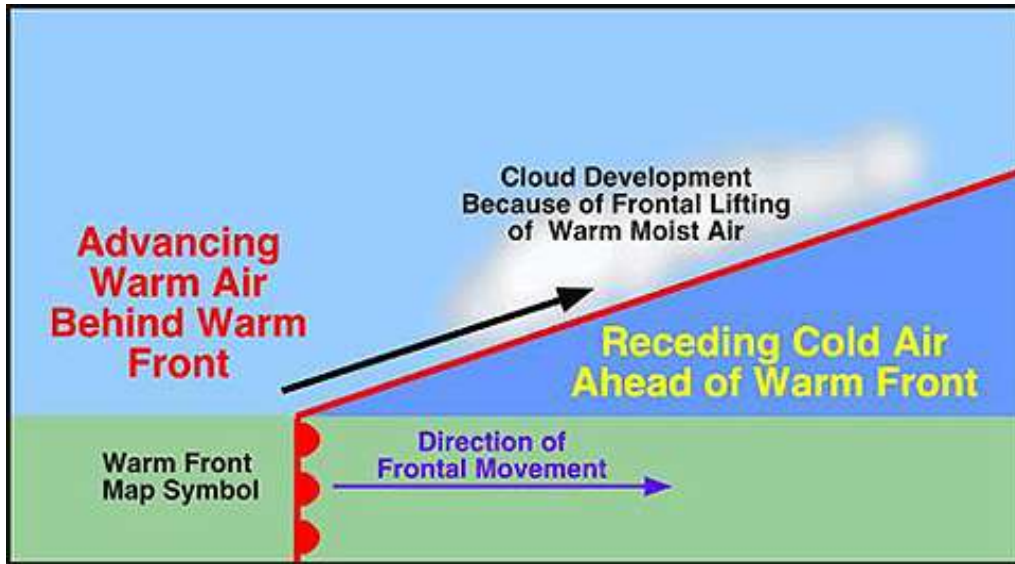


Kinds of Air Masses

- **Tropical**
 - Warm air
 - Low air pressure
 - **Polar**
 - Cold air
 - High air pressure
 - **Maritime**
 - Forms over oceans
 - High humidity
 - **Continental**
 - Forms over land/continents
 - Dry air/low humidity
- 
- A satellite image of Earth showing cloud patterns and air mass boundaries. The image is a false-color composite where different cloud types and atmospheric conditions are represented by various colors. Darker areas represent high-level clouds, while lighter, more textured areas represent low-level clouds and precipitation. The image shows a large-scale weather system with a prominent low-pressure center and associated cloud bands.

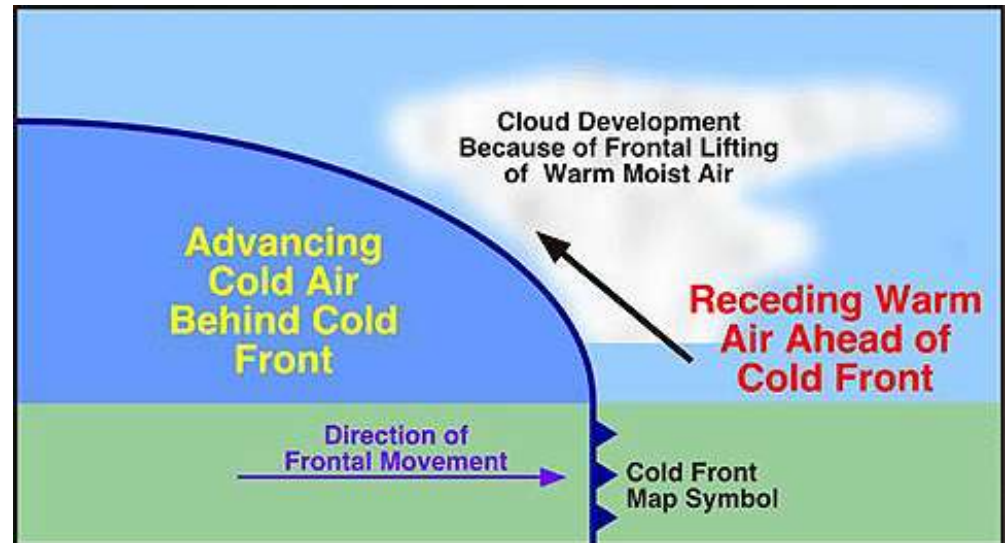


MID LATITUDE CYCLONES: CONCEPTS



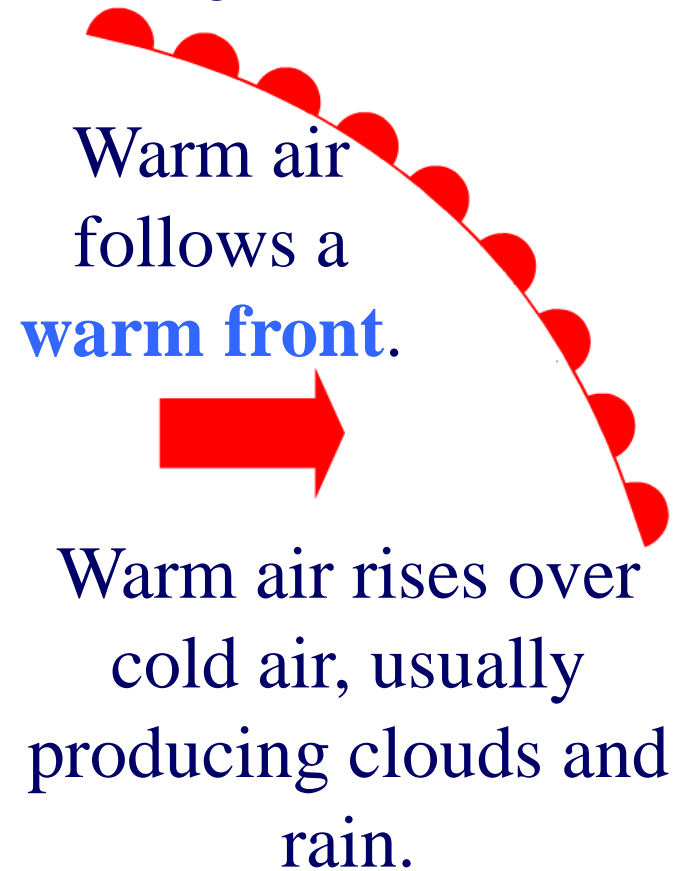
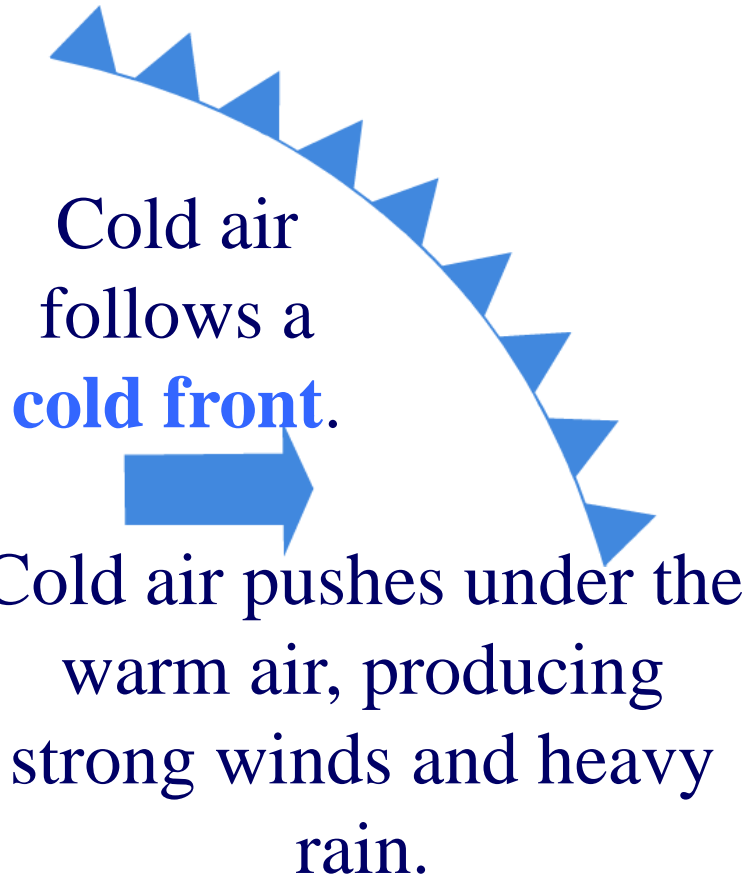
WARM FRONT

COLD FRONT



What happens when air masses meet?

The junction between two different air masses is called a **front**. A front is associated with a change in the weather.



Depressions (low pressure systems) form when a cold air mass meets a warm air mass.

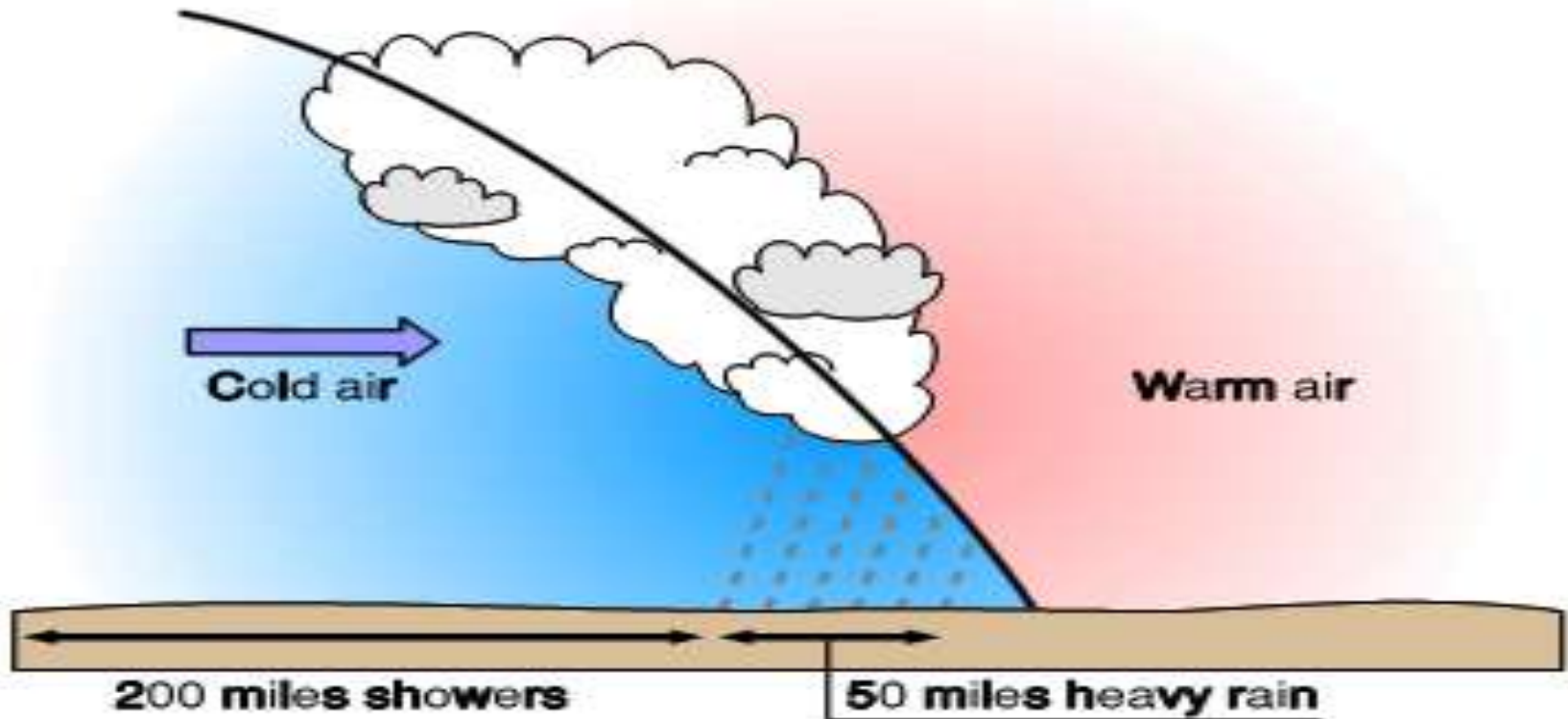


Cold Front

- Rapidly moving cold air runs into slowly moving warm air, and the cold air slides under and pushes the warm air upwards
- As the warm air rises, it cools, forming clouds and releasing heavy rain or snow
- Quickly moving, can cause abrupt weather changes



Cold Front



1. Cold air advances into the warm air, forcing the warm air the rise.
2. Cold air is heavier than warm air, thus the warm overruns the cold air.
3. Slope is 1:100, i.e. the frontal surface rise 1 km in height over 100 km distance on the ground.
4. Intense precipitation over shorter period of time compared to warm front.

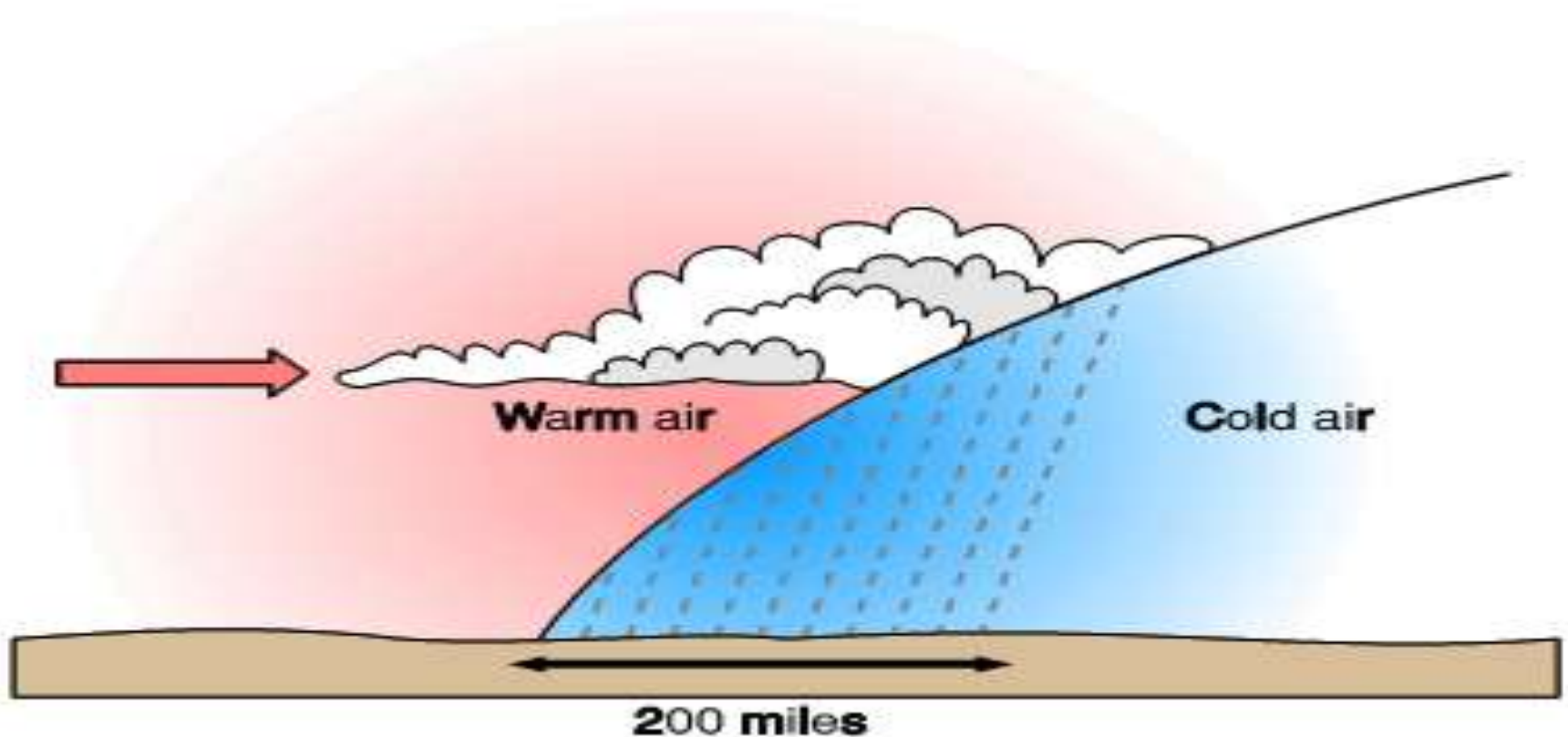


Warm Front

- A warm air mass collides and with slowly moving cold air mass, and the warm air moves over the cold air
- Can cause showers, light rain, and fog for several days



Warm Front



1. warm air advances, pushing the cold air to retreat.
2. Cold air is heavier thus more difficult for the warm air to displace.
3. Slope is 1:200, i.e. the frontal surface rise 1 km in height over 200 km distance on the ground.
4. Light-to-moderate rain over large area for an extended period.

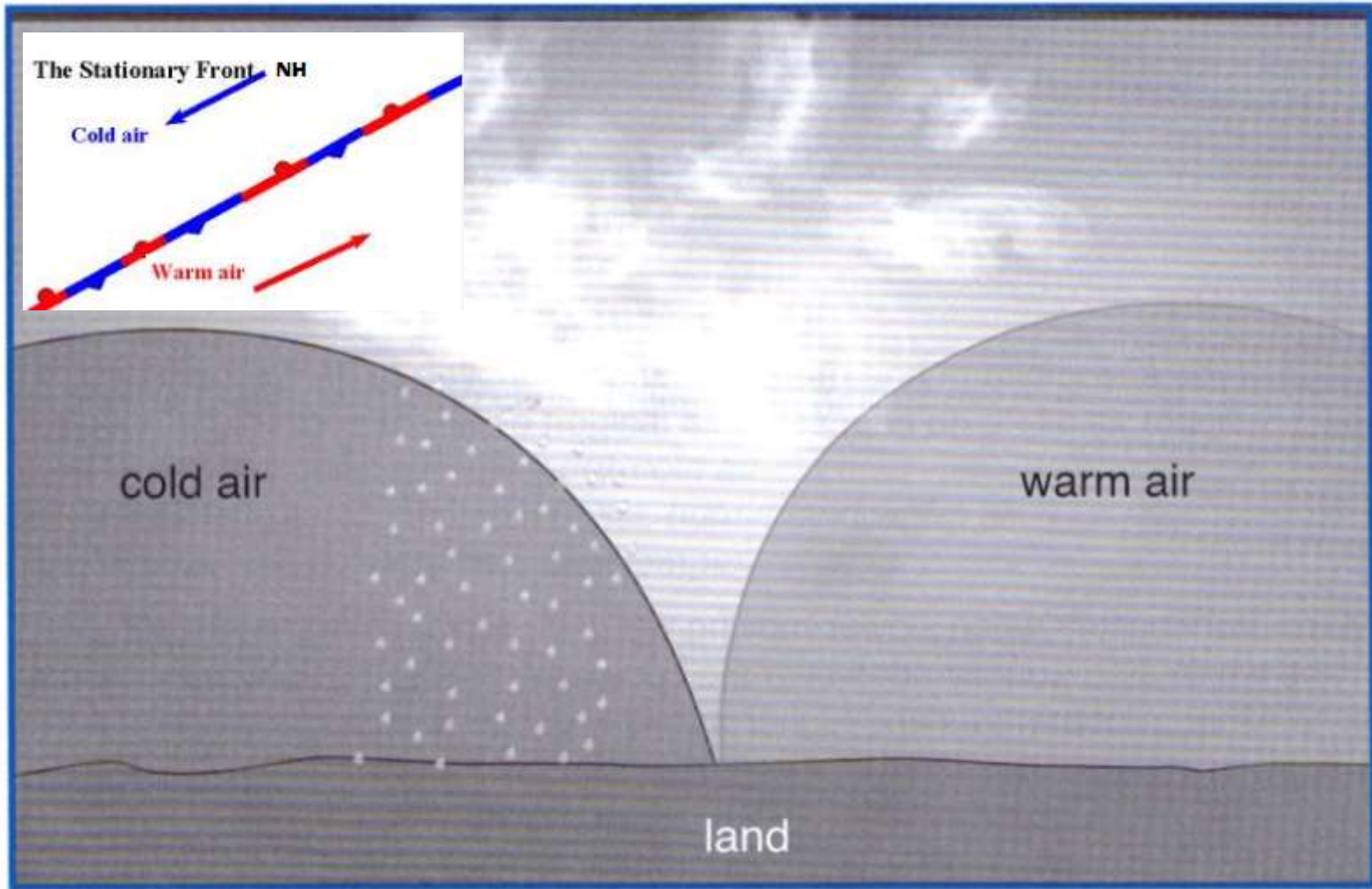


Cold Front and Squall Line

This is a cold front seen from space. Due to the rapid lifting of warm air by the advancing cold air, a sharp line of cumulonimbus clouds can occur, called the squall line.



Stationary Front

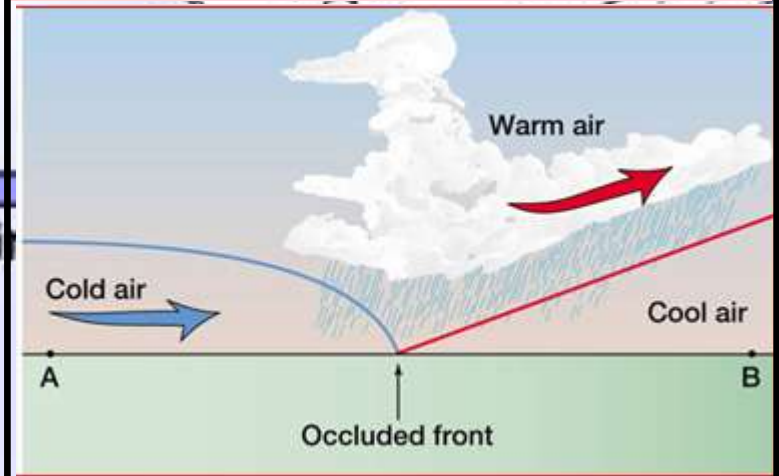
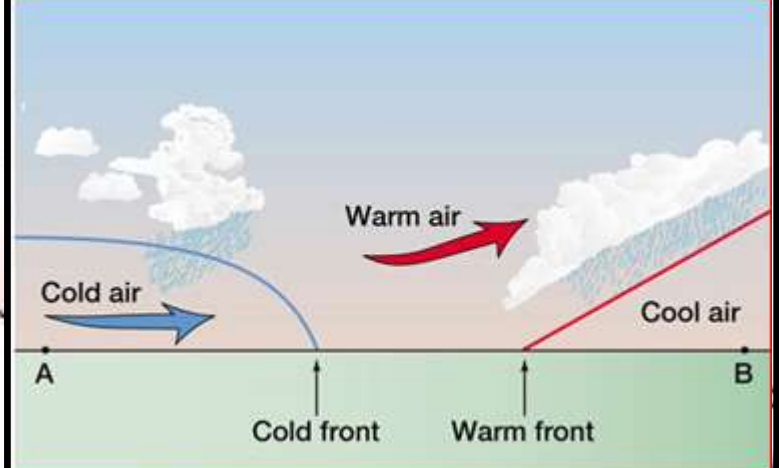


Occluded Front

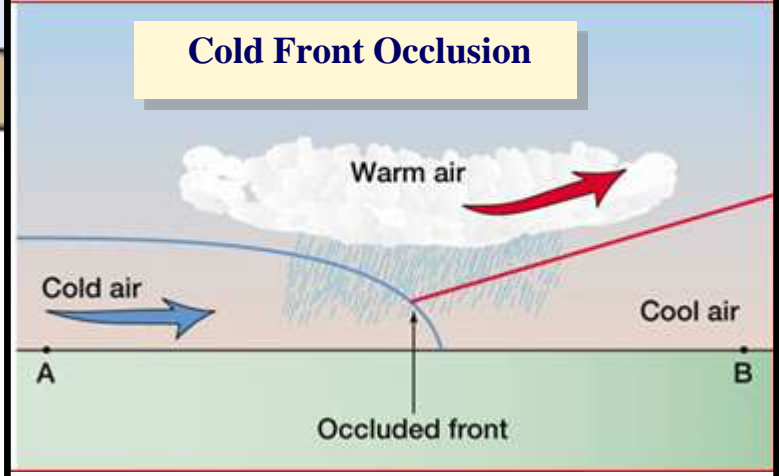
- A warm air mass is caught between two cooler air masses
- The warm air mass is pushed upwards by the two denser cooler air masses
- Weather may turn cloudy and rainy or snowy



Occluded Front



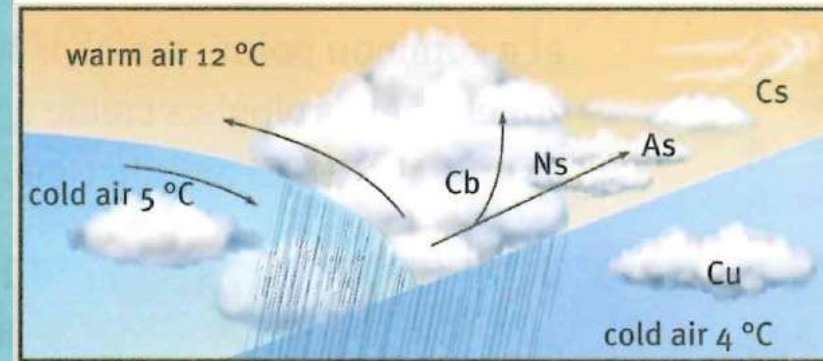
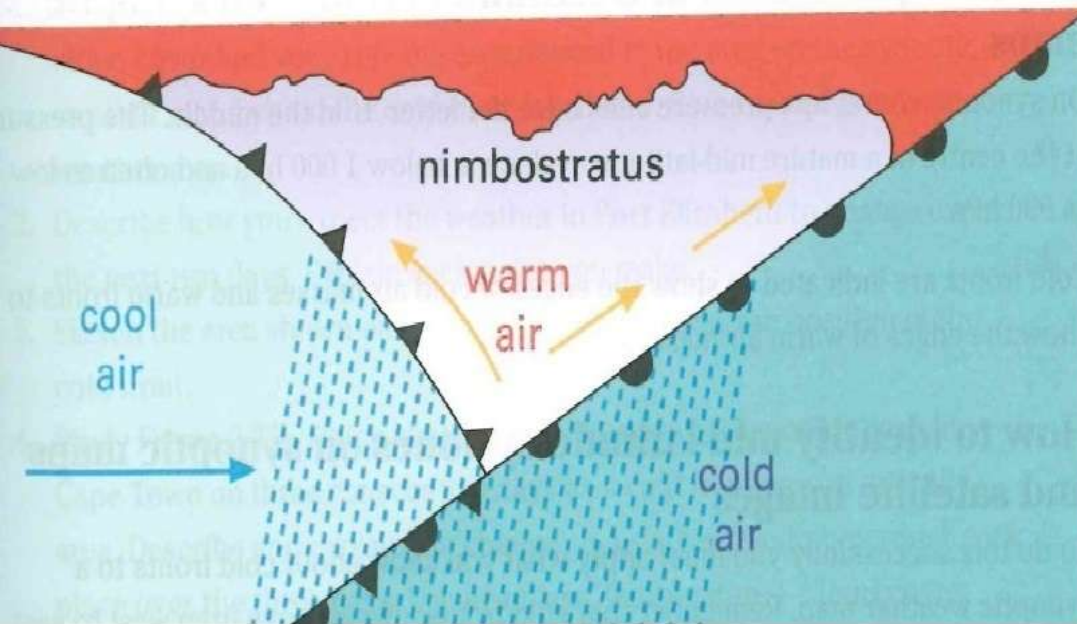
Cold Front Occlusion



Occluded Front

Cold/ Warm Front Occlusions

Warm Front Occlusion



Stationary Front

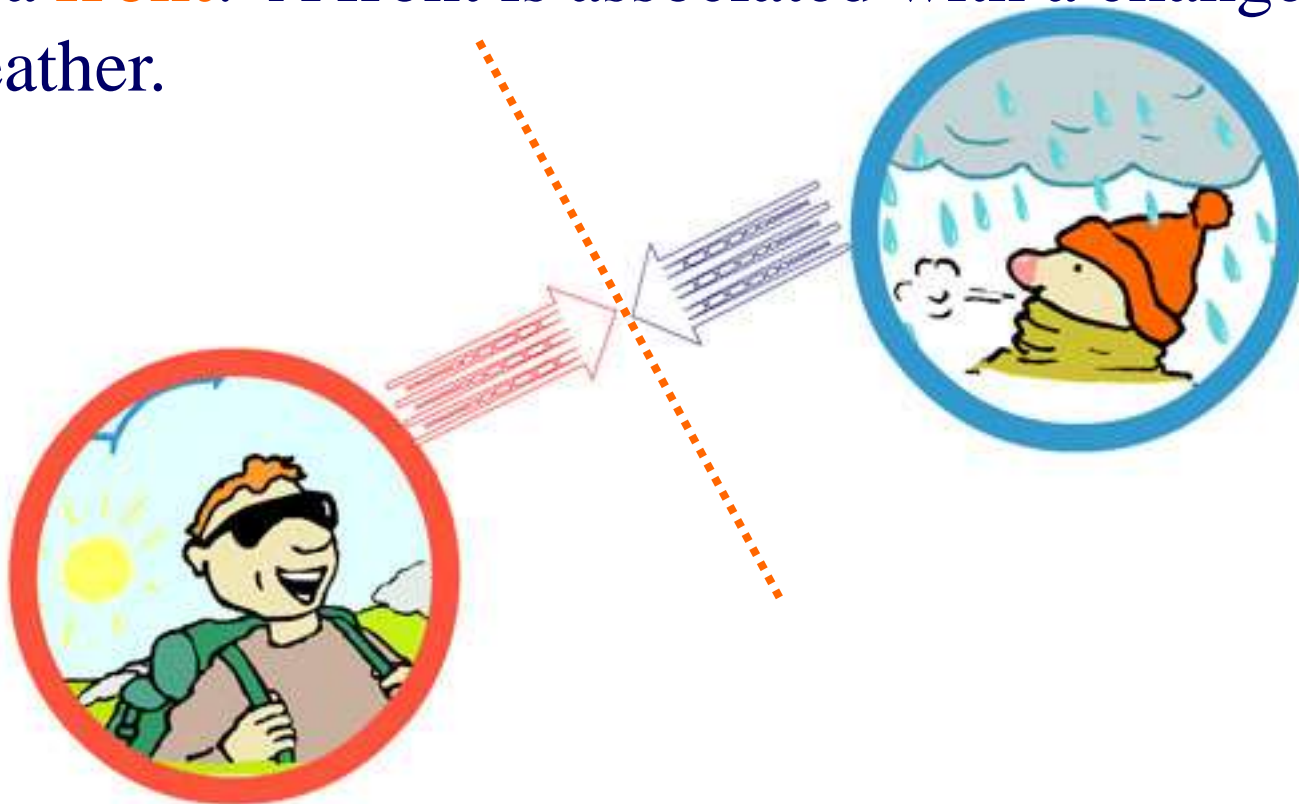
- Occurs when cold and warm air masses meet, but neither one has enough force to move the other
- Water vapor in the air condenses into rain, snow, fog, or clouds for many days



What happens to the weather when the air masses meet?

Depressions (low pressure system) form when a cold air mass meets a warm air mass.

The junction between these two different air masses is called a **front**. A front is associated with a change in the weather.

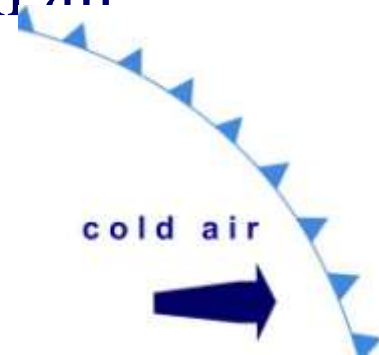


What happens at fronts?

A **warm front** means that warm air is coming. At a warm front, warm air is rising over cold air. This usually produces clouds and rain.



A **cold front** means that cold air is coming. At a cold front, cold air pushes under the warm air. This produces strong winds and heavy rain.



MID-LATITUDE CYCLONE

Menu

SOUTH
ATLANTIC
HIGH PRES.

SOUTH
AFRICA

COLD FRONT

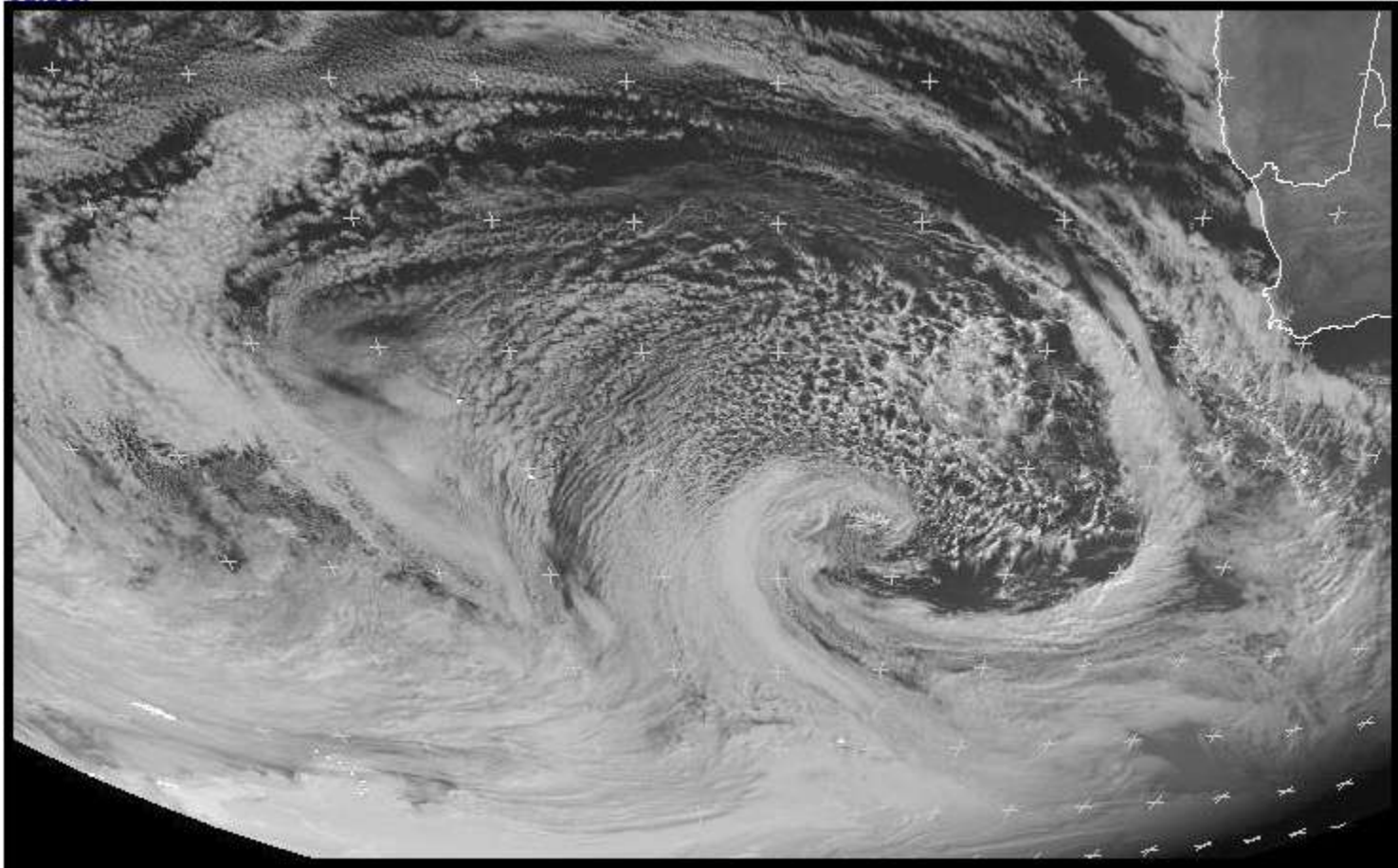
Warm Sector

W TO E
MOVEMENT

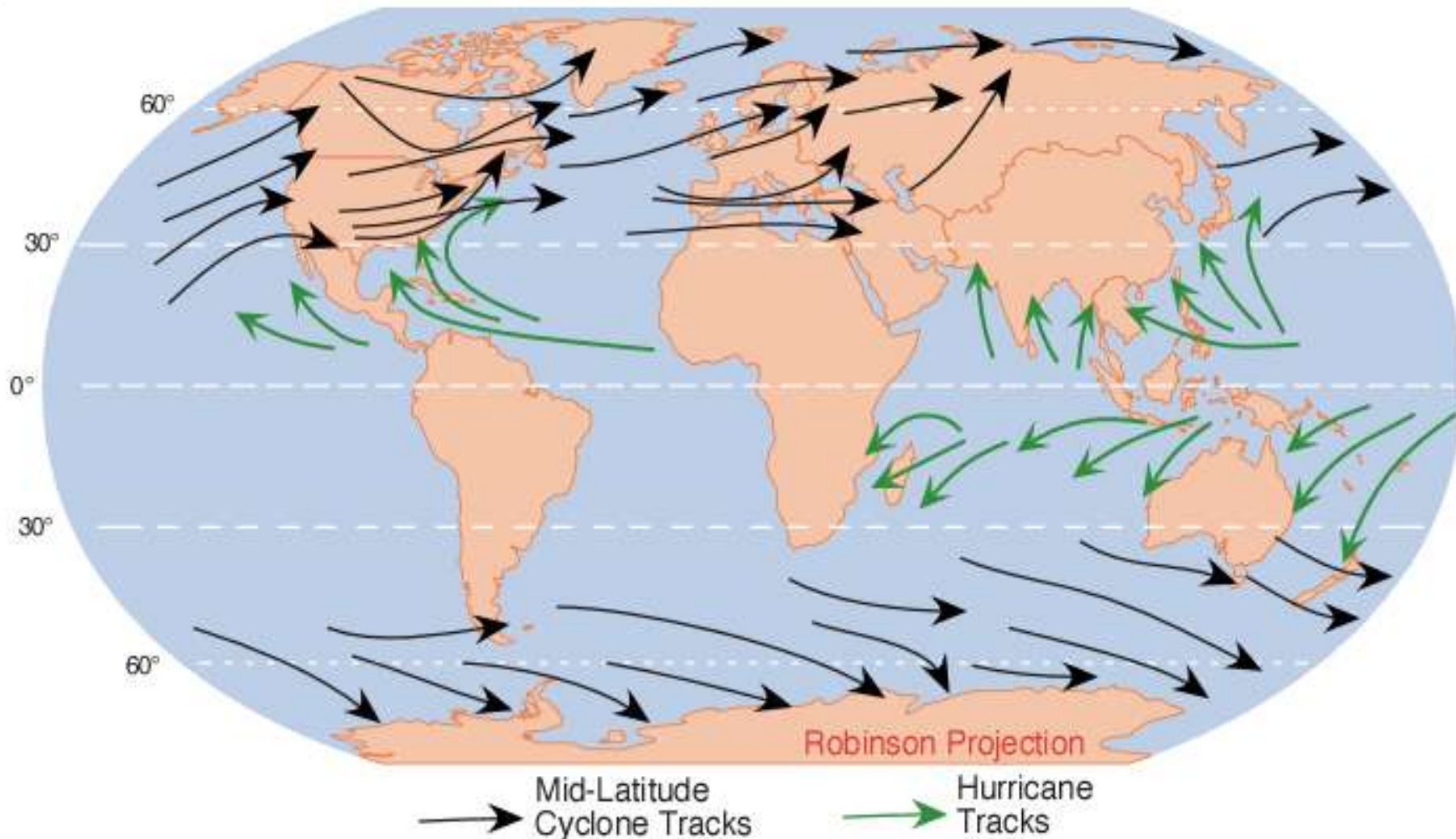
CONVEX
SHAPE FRONT



Label the **LP**, **cold front**, **cold sector**, **warm sector**, direction of **movement**, direction of **rotation**.



MID-LATITUDE CYCLONE AND HURRICANE TRACKS



Where do Mid-latitude Cyclones occur?



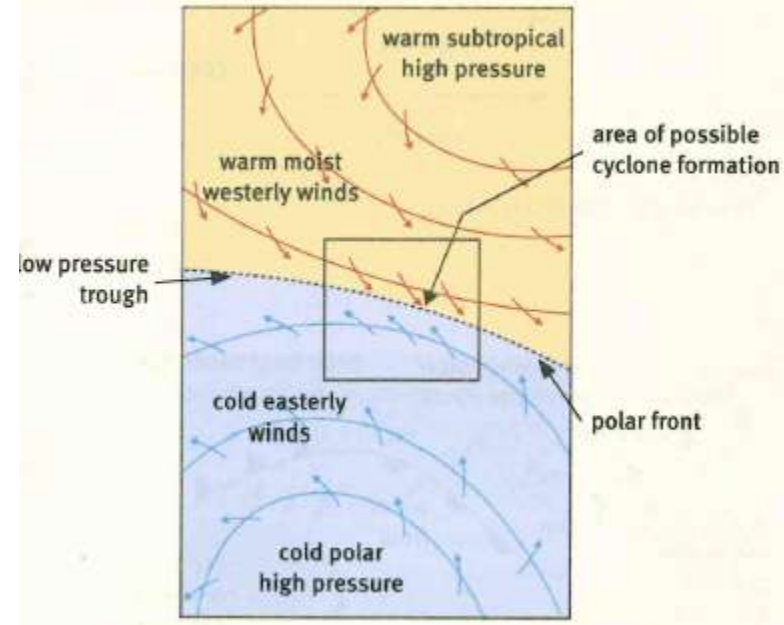
CONDITIONS NECESSARY FOR THE DEVELOPMENT OF MID-LATITUDE CYCLONES

Two **High Pressure** systems are in contact at the **polar front**.

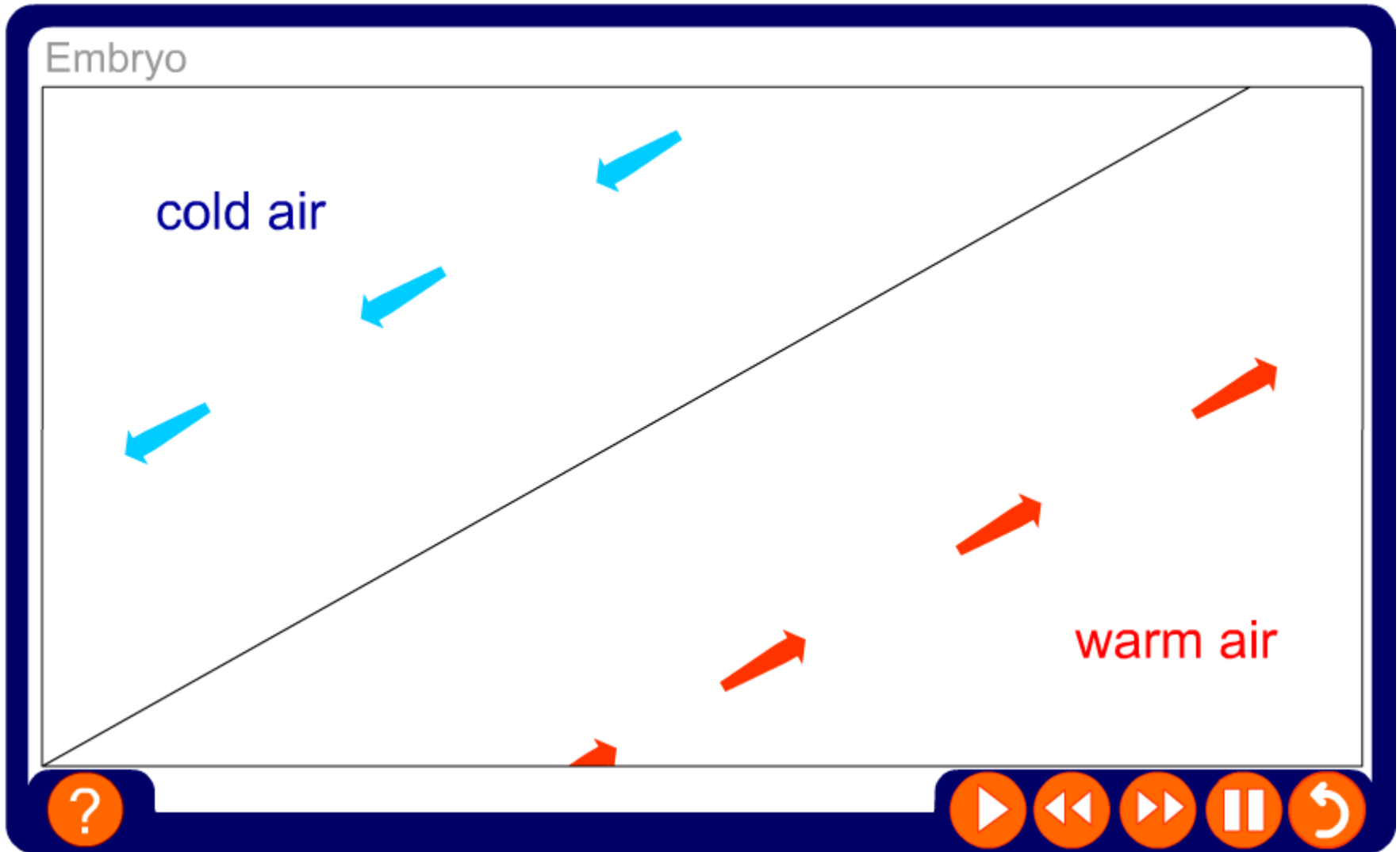
The **warm, subtropical high pressure** contains a warm, moist maritime air mass.

The **polar high pressure** contains a cold, dry air mass. The **air flow** converges from opposite directions on the two sides of the polar front.

Disturbances on the polar front result in an unstable situation, creating a local low pressure into which air will flow and around which air will circulate.

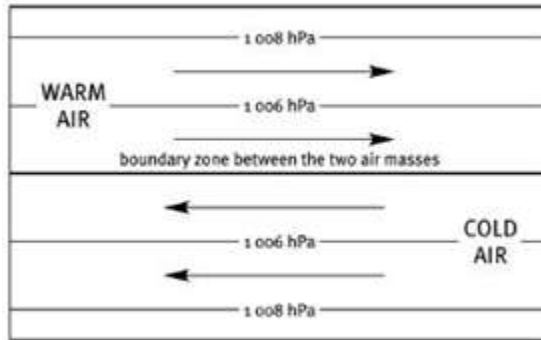


Formation of a Temperate / Mid-latitude Cyclone

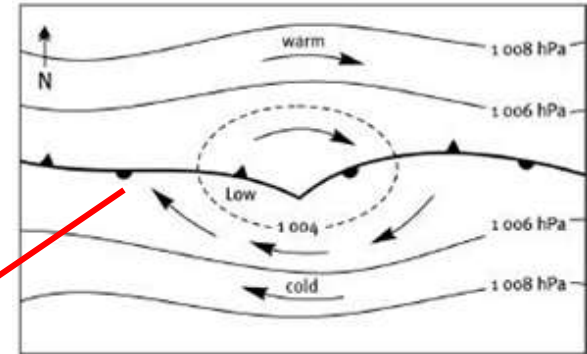


MIDLATITUDE CYCLONE: DEVELOPMENT

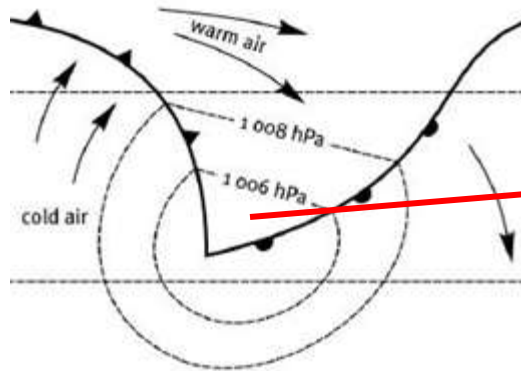
1 INITIAL STAGE



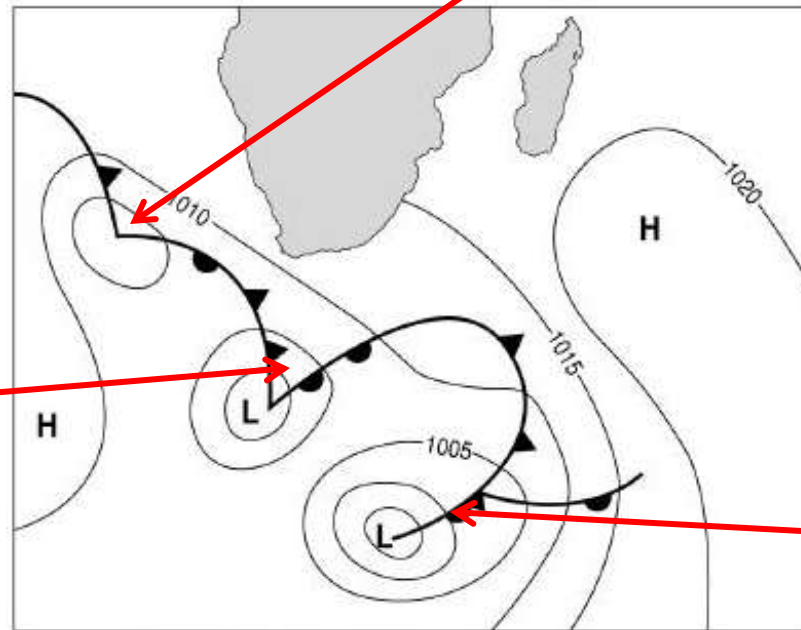
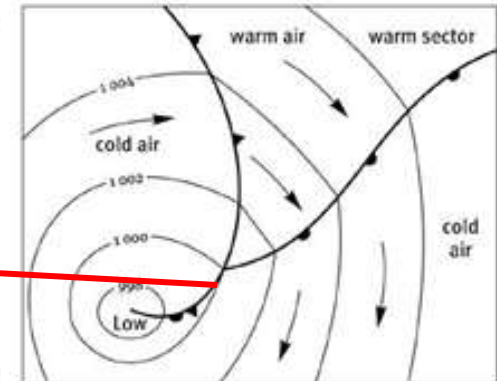
2 DEVELOPMENT STAGE



3 MATURE STAGE



4 OCCLUSION



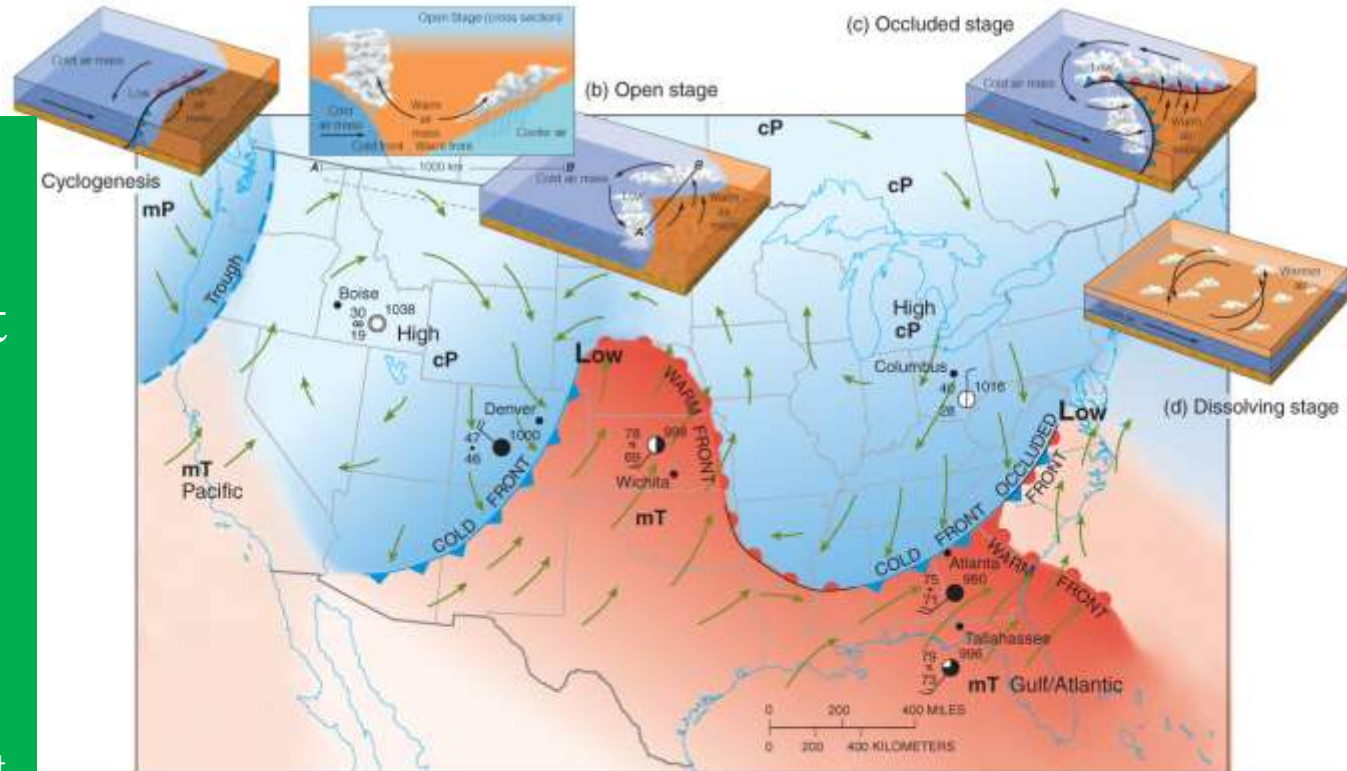
FAMILY OF CYCLONES



Mid-latitude Cyclone

Several factors can disturb the front and cause it to form a “wave”

- (1) Frictional drag between the 2 air masses.
- (2) Temperature contrast between land and sea masses.
- (3) Air is disturbed because it flows over an uneven surface e.g. a mountain.



WEATHER STATION SYMBOLS



PRECIPITATION TYPE



WIND SPEED (kph/mph)

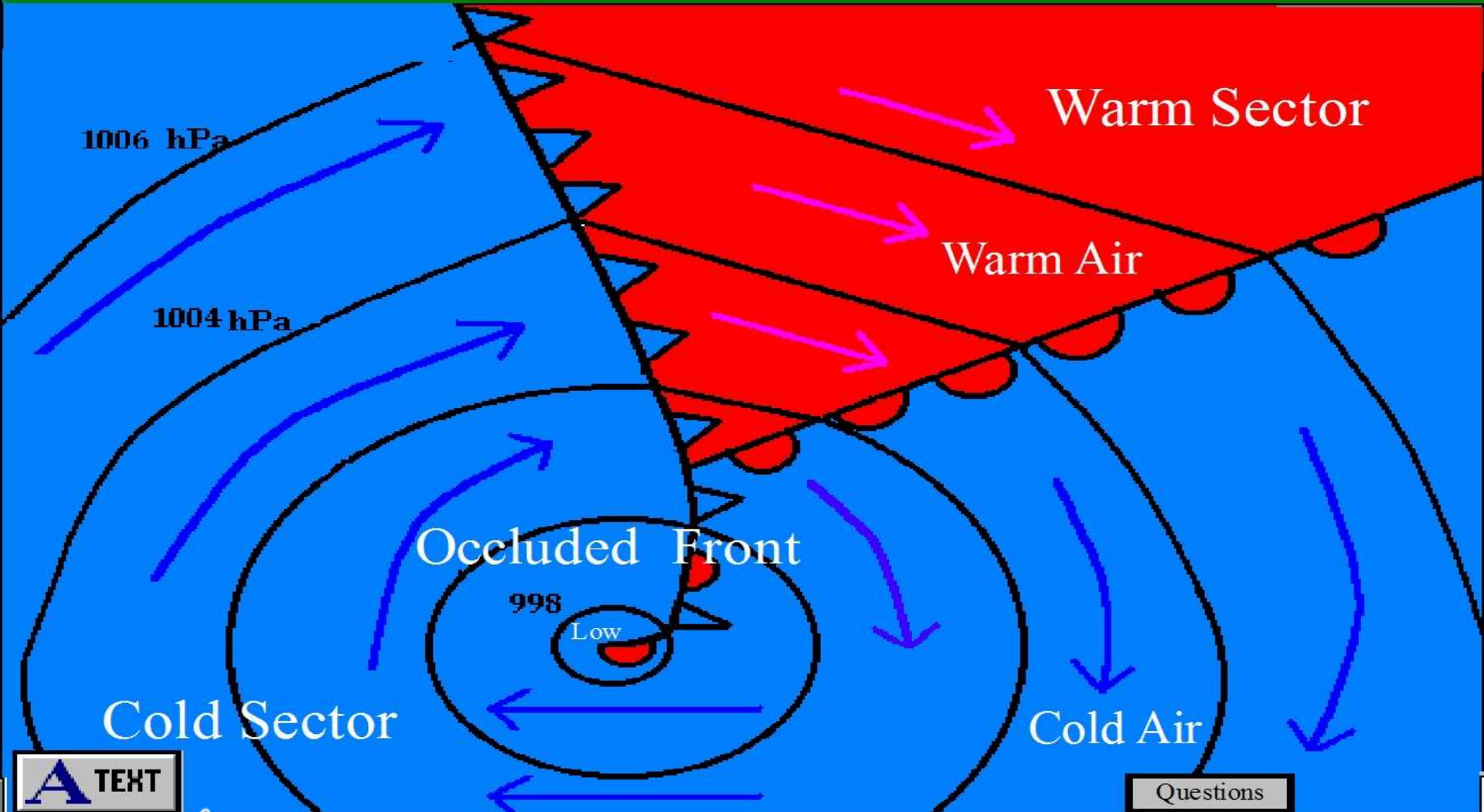


CLOUD COVER



Stages of a Temperate / Mid-latitude Cyclone

Occlusion \ Old Age stage of a Temperate Cyclone



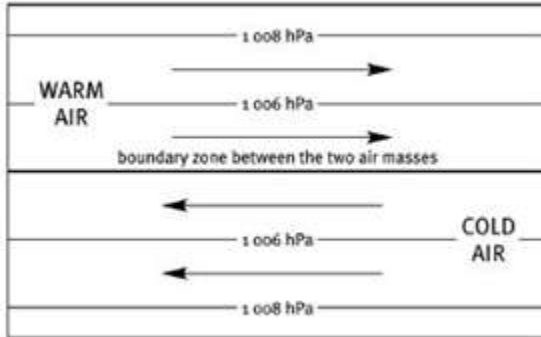
A TEXT

Questions



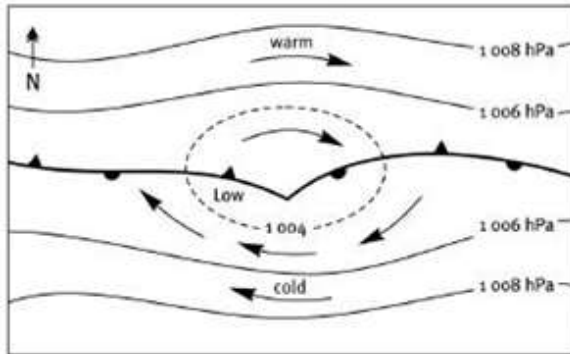
MID-LATITUDE CYCLONE: DEVELOPMENT

1 INITIAL STAGE



Describe what happens in the Initial Stage.

2 DEVELOPMENT STAGE

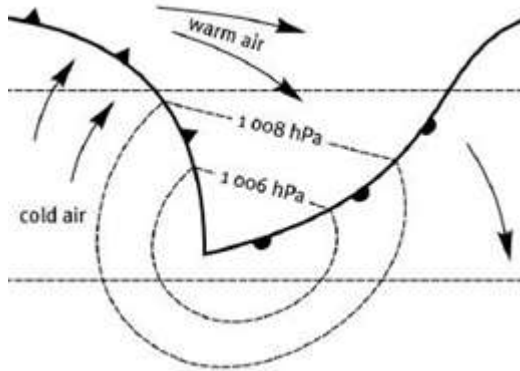


Describe what happens in the Development Stage.



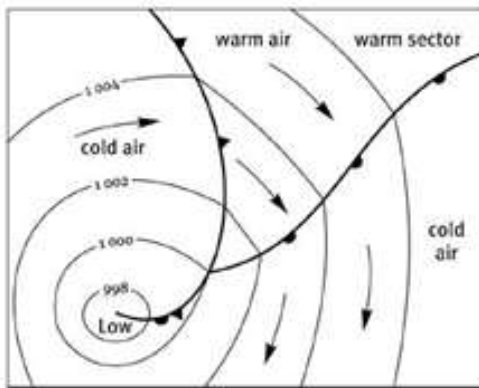
MID-LATITUDE CYCLONE: DEVELOPMENT

3 MATURE STAGE



Describe what happens in the Mature stage.

4 OCCLUSION



Describe what happens in the Old Age / Occlusion stage.



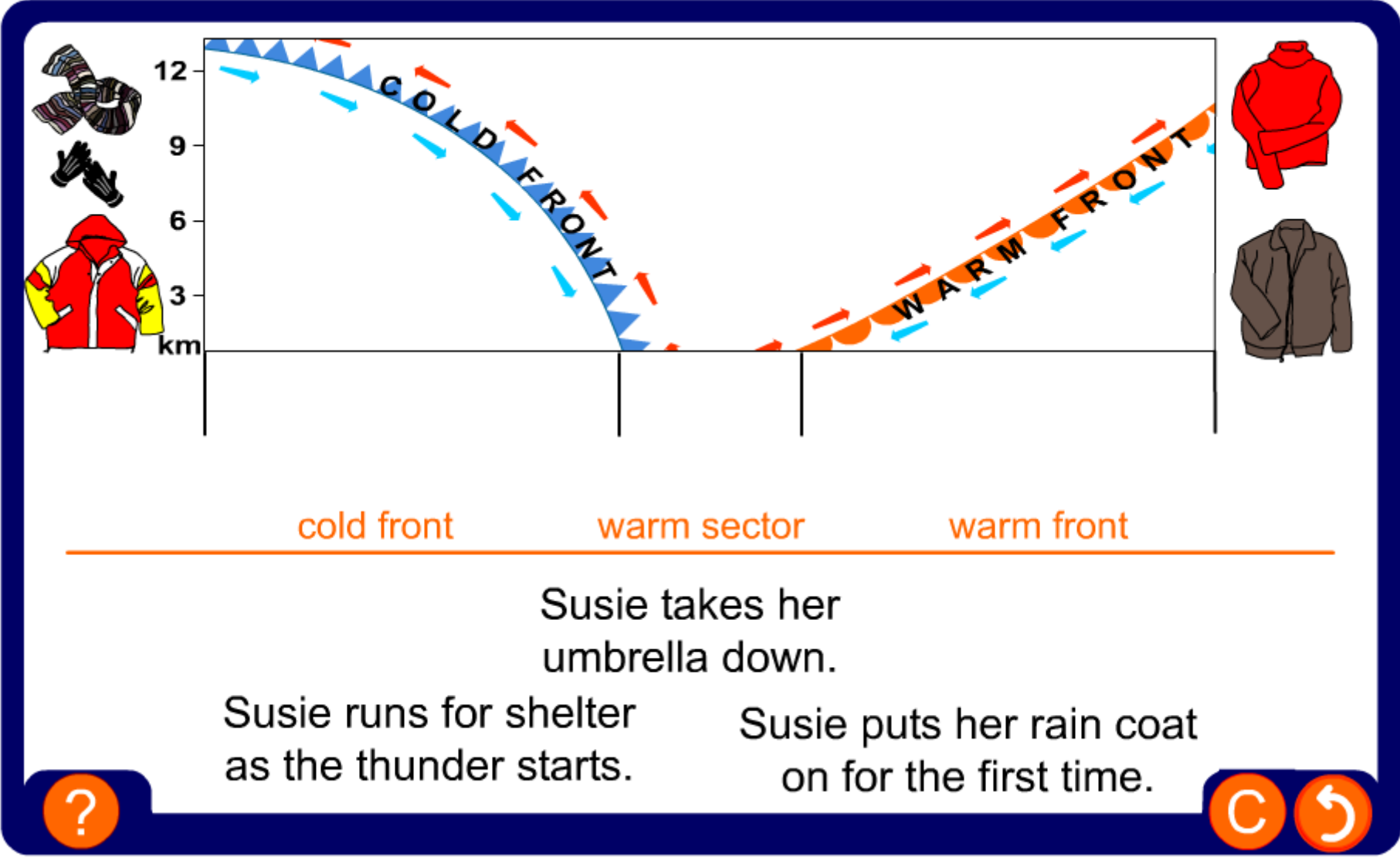
Passage of a Temperate / Mid-latitude Cyclone

The image shows a large whiteboard with a thick blue border. In the center of the whiteboard, there is a small stick figure holding a red umbrella, standing next to a light blue rectangular area. Below the whiteboard, there is a dark blue navigation bar containing several orange circular icons: a question mark, a play button, a double left arrow, a double right arrow, a pause button, and a refresh button.

Source: <http://www.boardworks.co.uk/>



Depressions – the changing weather!



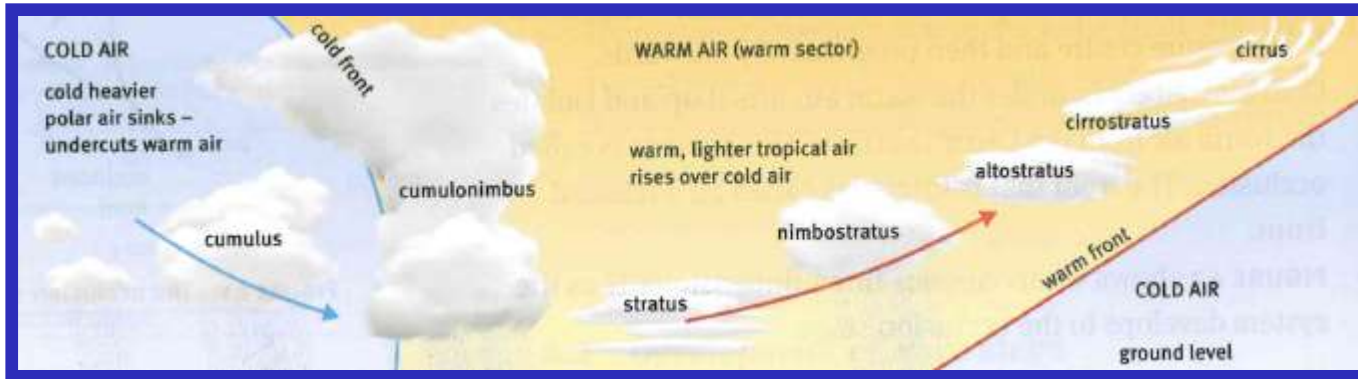
Source: <http://www.boardworks.co.uk/>



Passage of a depression



Cross section through a cold and warm front

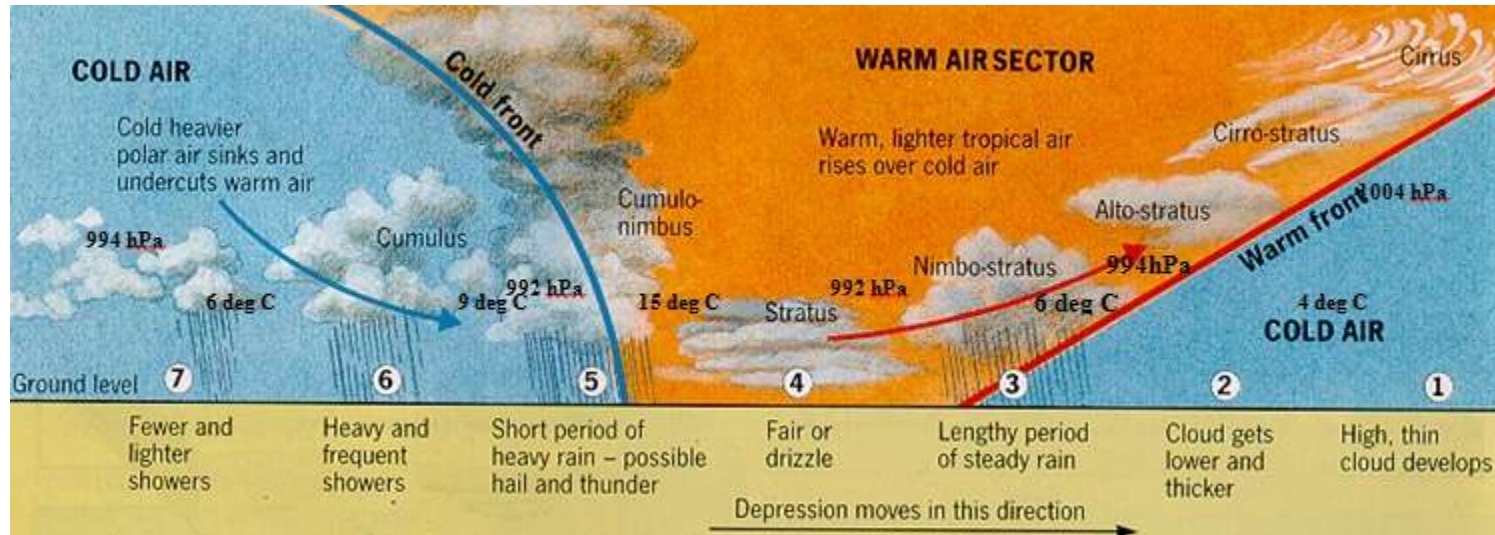


WEATHER	Behind cold front	Cold front passing	Warm sector	Warm front	Cyclone approach
Air pressure	increase continues at a slower rate	sudden increase	remains steady	decrease stops	steady decrease
Wind direction	south	backing from west to southwest	west	backing from north-west to west	northwest
Wind speed	gusty, decreases slowly	very strong to gale force	decreases	strong	increases slowly
Temperature	cold, around 5 °C	sudden decrease	warm to mild, around 12 °C	sudden rise	cool, around 8 °C
Relative humidity	rapid fall	high during precipitation	steady and high	high during precipitation	slow rise
Cloud cover	decreasing in succession cumulonimbus to cumulus	very thick and towering cumulonimbus clouds	low stratus clouds, with clear patches in-between	low and thick nimbostratus	high and thinner clouds altostratus, cirrostratus and cirrus
Precipitation	heavy and later soft, persistent showers	short period of heavy rain or hail	intermittent drizzle or stop	continuous rainfall – steady and quite heavy	none
Visibility	very good, but poor in showers	poor, especially in showers and fog	often poor	decreases rapidly	good, but decreasing with nearing front

FIGURE 44 Cold and warm front conditions at the Earth's surface in the Southern Hemisphere with explanatory notes on weather changes



Cross section through a cold and warm front

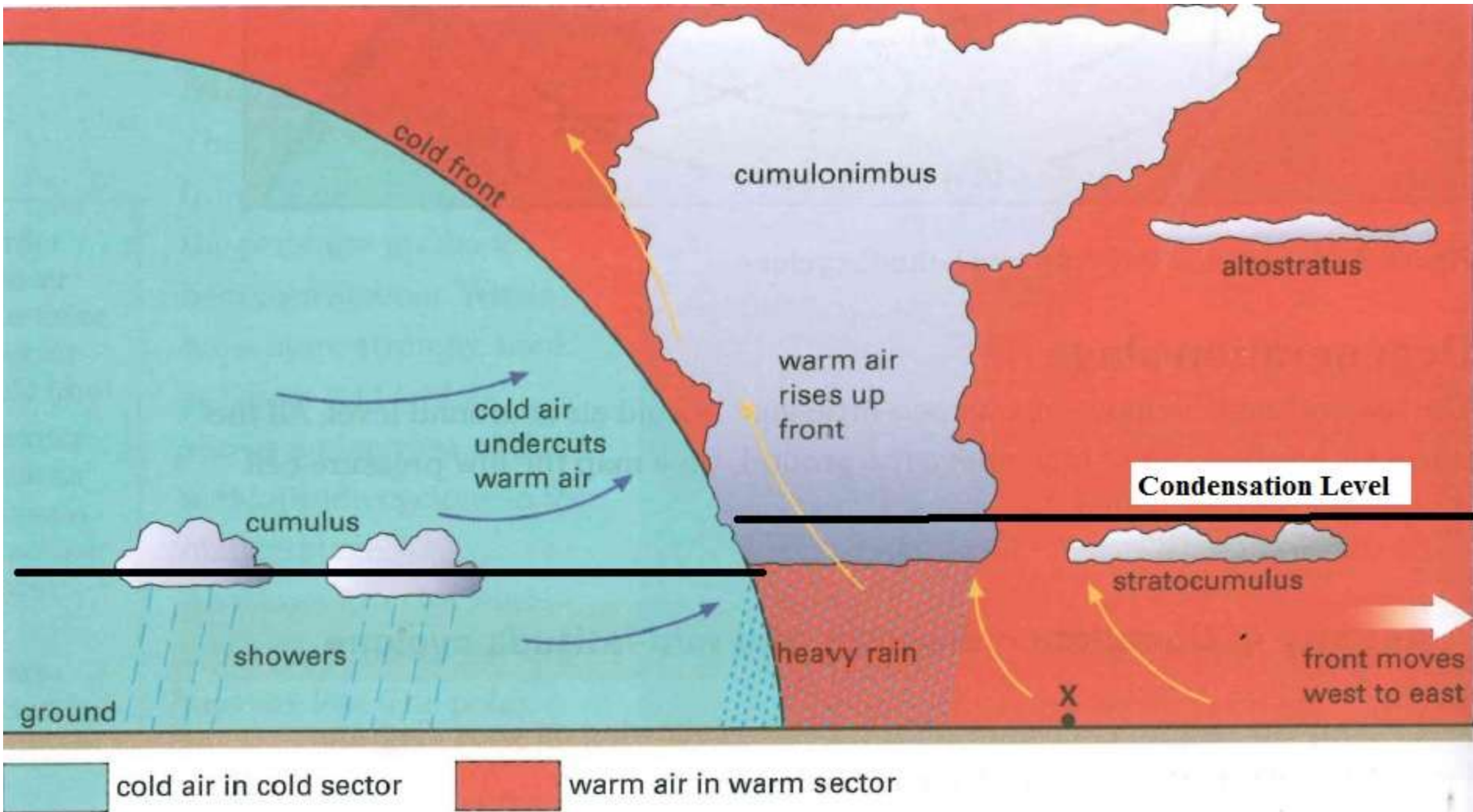


After the cold front passes (See no. 7)	During the warm sector (See no. 4)	2) As warm front passes (See no. 3)	Weather conditions
6 deg	16 deg	6 deg C	Temperature
994 hPa	992 hPa	994 hPa	Pressure
Cumulus	Stratus	Nimbostratus	Cloud type
Light showers	Drizzle or no rain	Rain	Precipitation

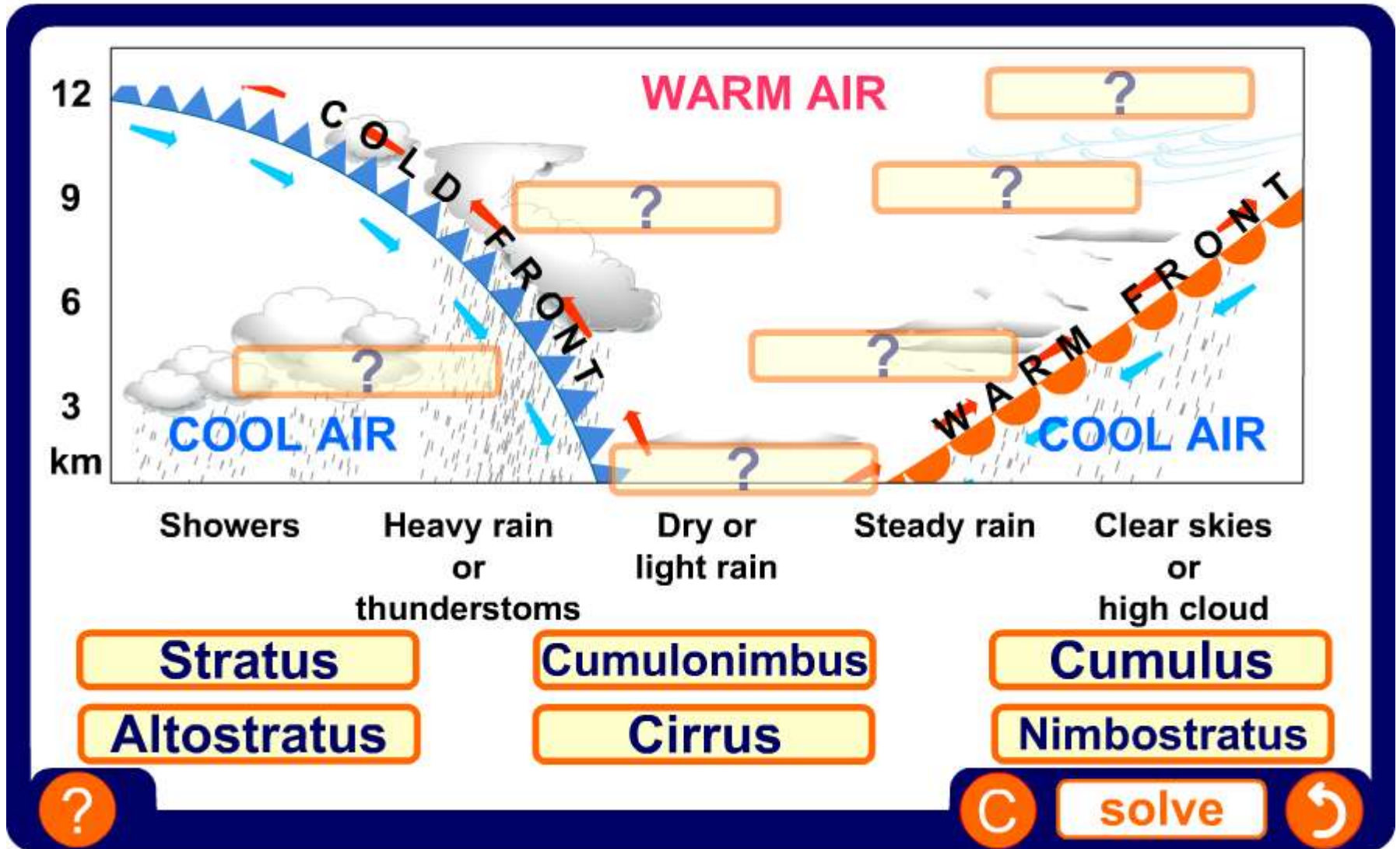
Go into editing mode and fill in the missing information!



Cross section through a cold front



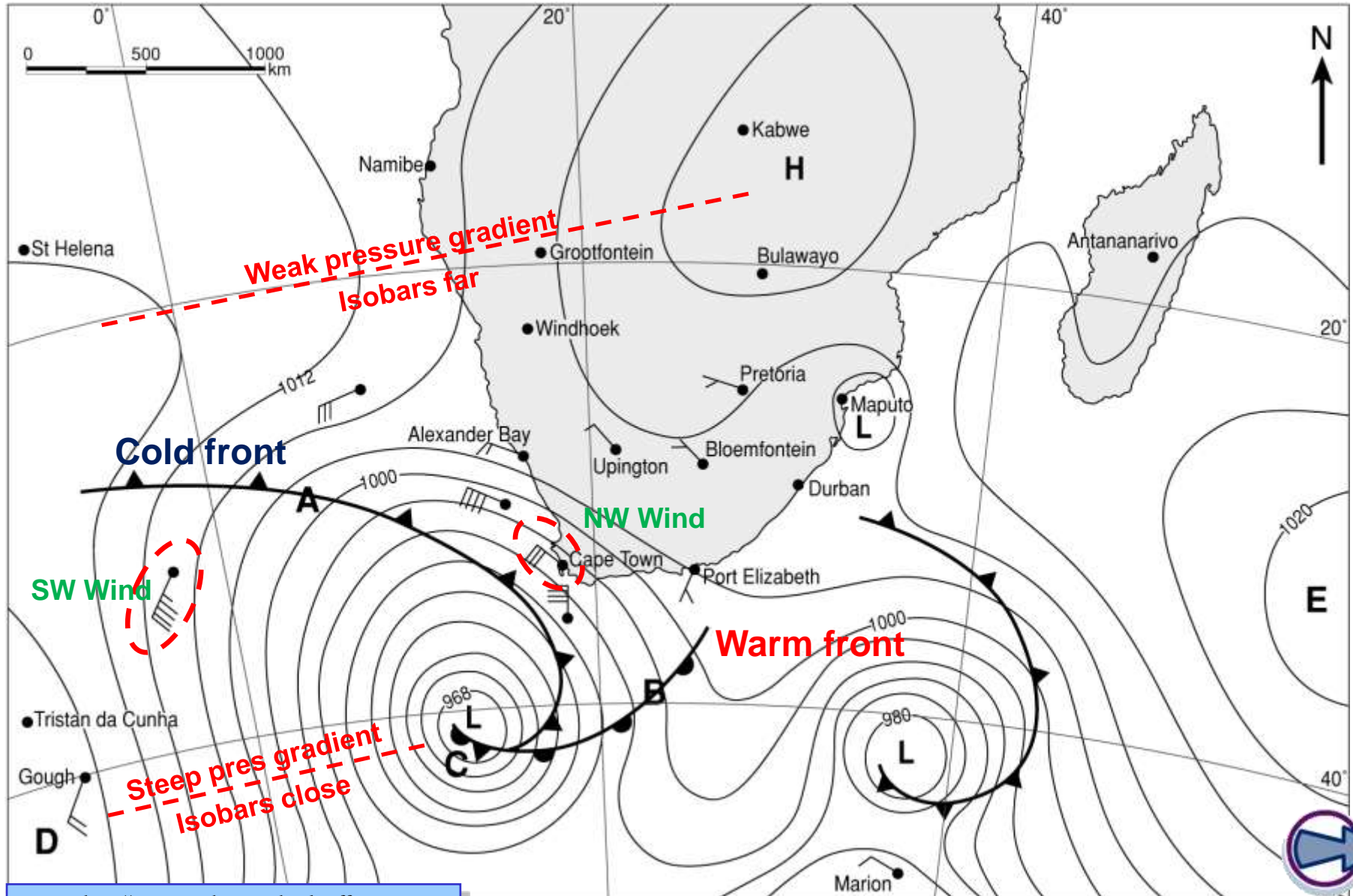
Cross Section through a Mid-latitude / Temperate Cyclone



Source: <http://www.boardworks.co.uk/>



WEATHER CHANGES COLD FRONT



Cross section through a cold and warm front

What are the different types of fronts?

Cold front - defined as the transition zone where a cold air mass is replacing a warmer air mass, i.e. when the air behind the front is cold.

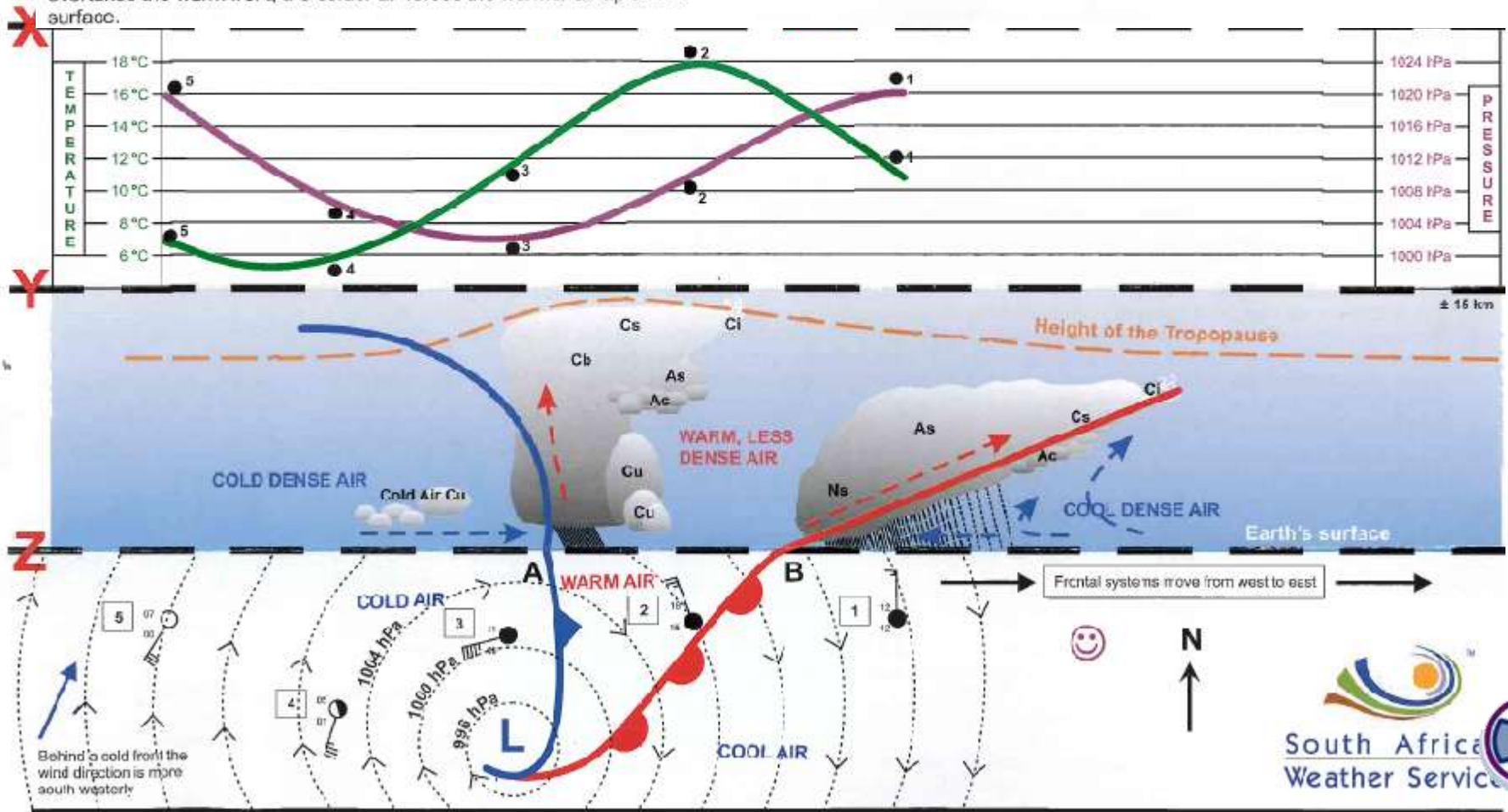
Warm front - defined as the transition zone where a warm air mass is replacing a colder air mass, i.e. when the air behind the front is warm.

Stationary front - when a warm or cold front stops moving.

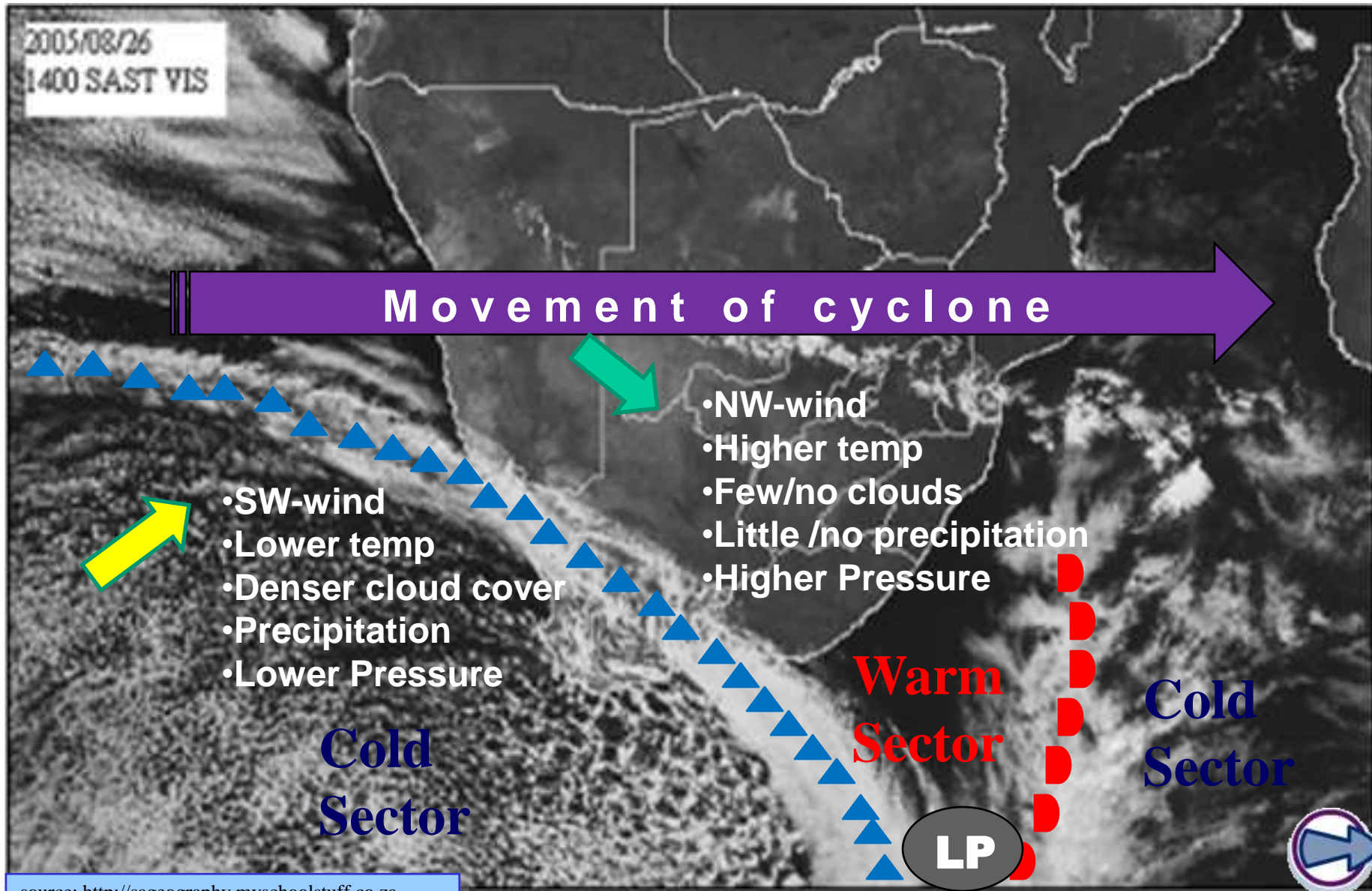
Occluded front - when the cold front moves faster than the warm front and overtakes the warm front, the colder air forces the warmer air up off the surface.

What weather is associated with fronts?

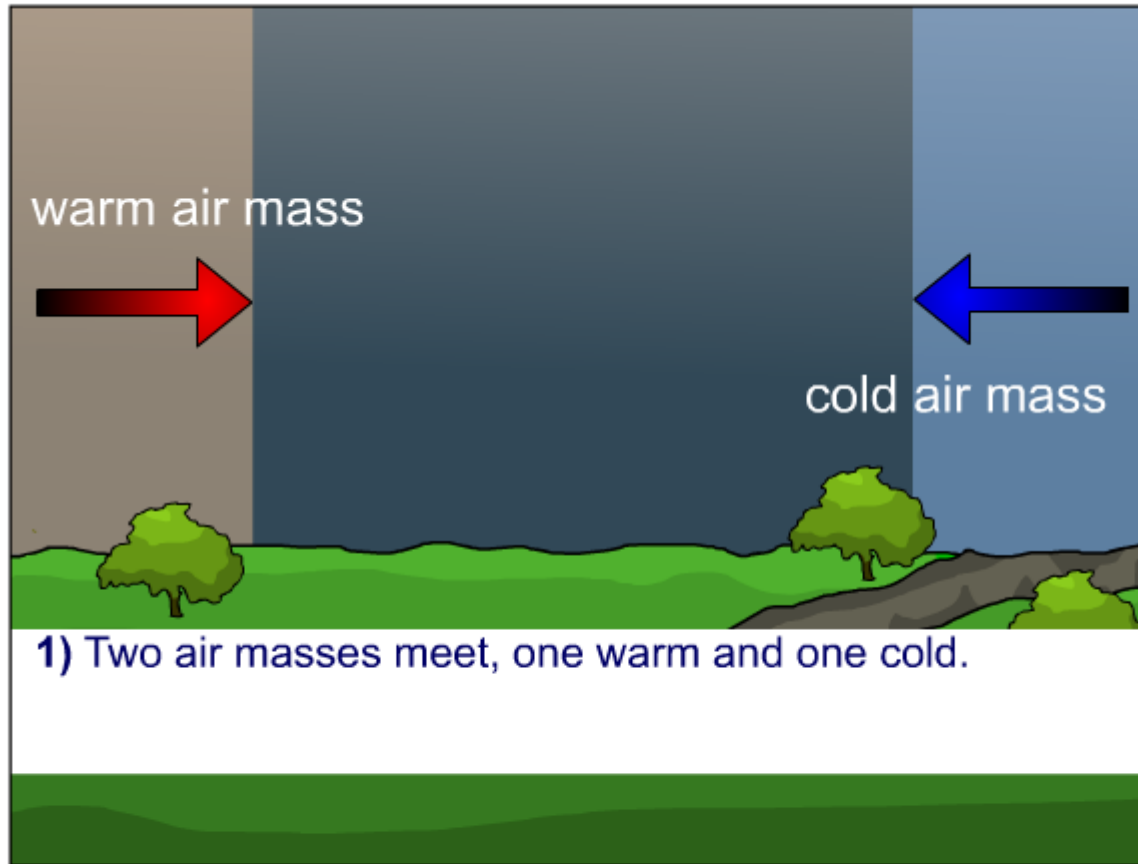
- A **Cold front** - Cumulus clouds develop into Cumulonimbus clouds from which showers can occur as the front passes and is accompanied by a sudden drop in temperature, rising pressure and a change of wind direction from the north west to the south west.
- B **Warm front** - Cirrus and Cirrostratus clouds occur before thickening into Altostratus and Nimbostratus clouds from which rain falls. A slow but steady decrease in air pressure also occurs. Calm and mild to warm weather follows as the front moves away.



WEATHER CHANGES: COLD FRONT



Frontal rain



Weather conditions associated with the passage of a front

Describe the weather conditions that will be experienced by  in the next 24 hours.

● Temperature:

● Pressure:

Cumulonimbus

Cirrostratus

● Cloud cover:

● Precipitation:

Cold Air

Warm Sector

● Wind direction:

Sector

● Wind speed:

GROUND



Coriolis effect

Source: <http://www.boardworks.co.uk/>



N

Describe how the wind direction changes when it Backs:

W

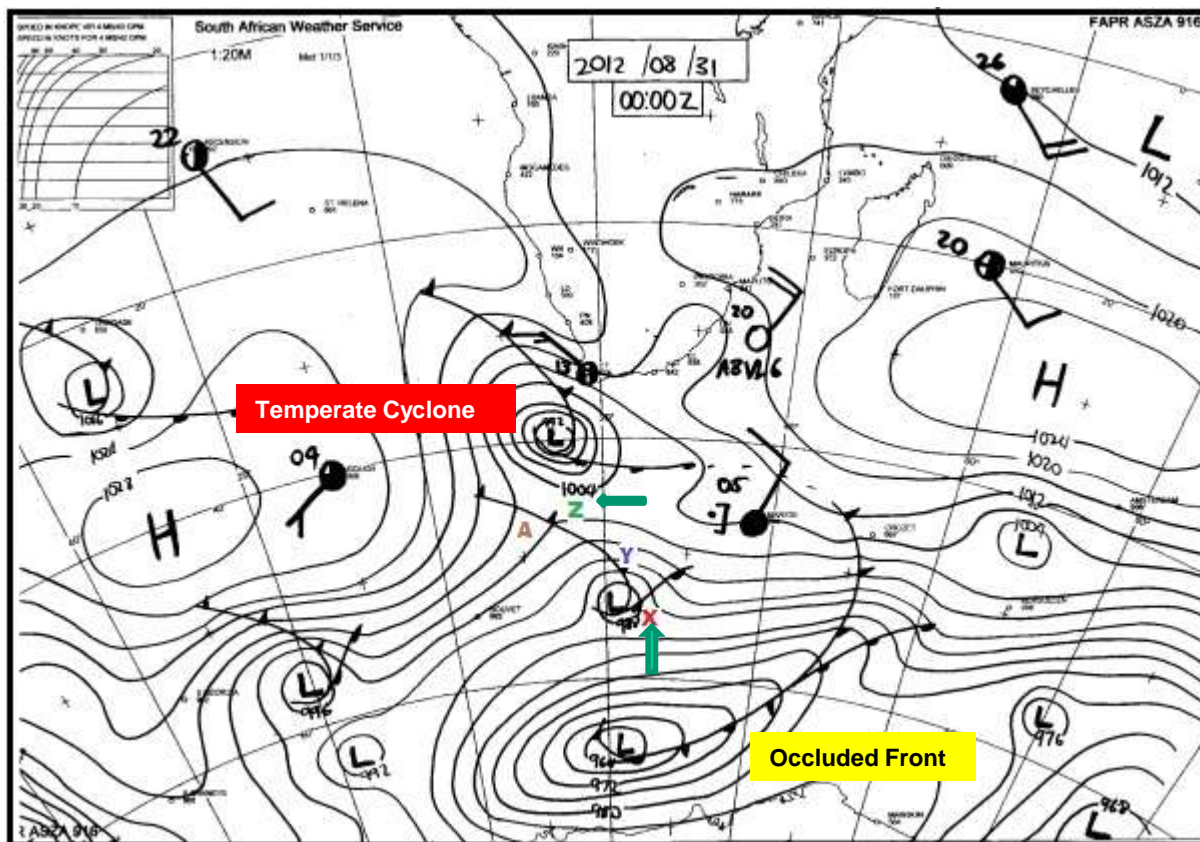
E

S



Change in wind direction with the passage of a cold front

What is the wind direction at A, X, Y and Z?



Characteristics of a Temperate Cyclone!

Complete the following details! Go into editing mode to do so.

● Originate (Latitude):

● Movement (direction):

● Rotation:

● Wind belt:

● Diameter:

● Weather:

● Life Cycle:

● Caused by:



Weather definitions

Isotherms are

a warm ocean current.

The North Atlantic Drift is

a low pressure system that forms when a cold air mass meets a warm air mass.

Low pressure occurs

a large block of air with uniform temperature and humidity.

High pressure occurs

when air rises and cools.

An air mass is

lines joining areas of equal temperature.

A front is

when air sinks and warms.

A Depression is

the junction between two different air masses.



solve

