UNIT 4 AIR MASSES

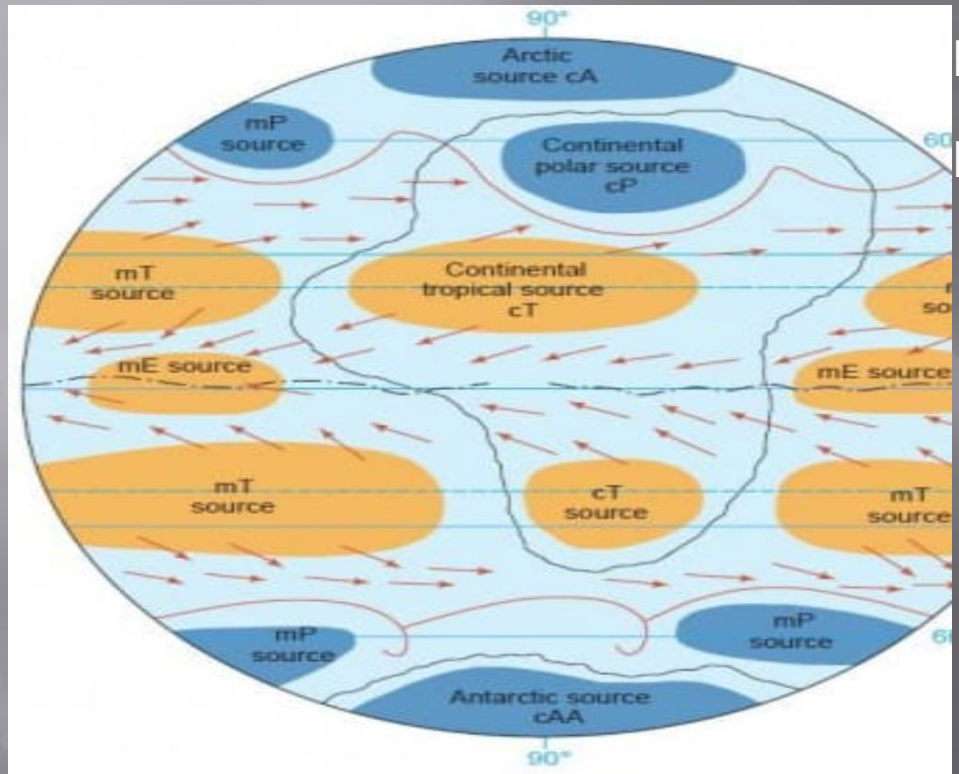
DEFINITION :

According to Barry and Chorley (2003) :
"Atmosphere, Weather and Climate", air masses are defined as:"...large volumes of air, extending over hundreds or thousands of square kilometers, in which the horizontal gradients of temperature and humidity are relatively small compared with the vertical gradients."

(**Trewartha & Horn, 1980**)
Air masses are large-scale regions of the atmosphere where the air has similar temperature and humidity properties, and are often classified based on their latitude of origin and the surface characteristics of the source region.

(Ahrens, 2013)
Air masses are vast bodies of air that have distinct temperature and humidity properties, and are formed when air remains stationary over a particular region for a prolonged period." **(Ahrens, 2013)**

Air Mass in Asia



6.3 Global air masses and source regions

In the center of the figure is an idealized continent, which produces continental air masses (m). Tropical (T) and equatorial (E) source regions provide warm- or regions provide colder air masses of low specific humidity. Polar air masses (mP zone. Meteorologists use the word "polar" to describe air masses from the subarctic referring to air masses.

- Air Mass in Asia
- Learn about air masses in Asia and the impact they have on climate and weather patterns. Discover how pollution affects air masses and explore future prospects and challenges.

COMPOSITION OF AIR MASSES

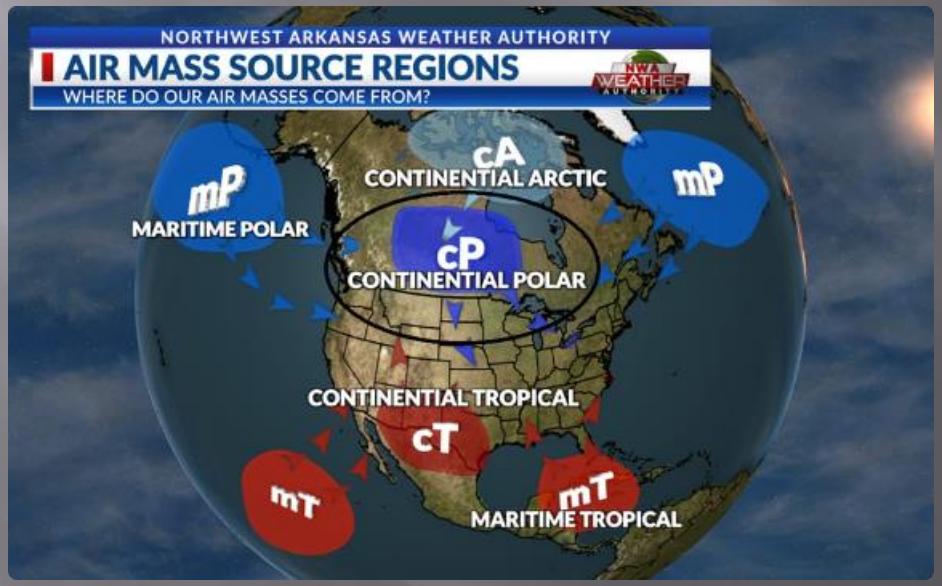
- Air masses can be influenced by a land or sea, which can affect their temperature and humidity.
- Air mass formed over the interior of Asia would be a continental polar air mass, characterized by its cold and dry nature. However, an air mass formed over the Indian Ocean would be a tropical air mass, characterized by its warm and humid nature.

Air masses in Asia

- In Asia, as in other parts of the world, various air masses form due to differences in temperature and moisture content. These air masses can significantly influence the weather and climate of the region.
- Here are some basic definitions of air masses commonly found in Asia:

Classification of Air Masses

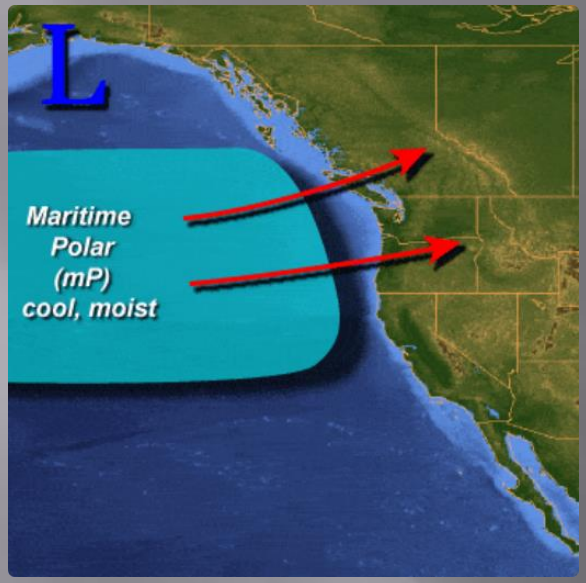
- Continental Polar (cP)
- MARITIME POLAR (mP)
- MARITIME TROPICAL (mT)



Continental Polar (cP)

- Continental arctic" air mass designated by "cA", which originates over the poles and is therefore very cold and dry and Originates over northern Canada and Alaska .

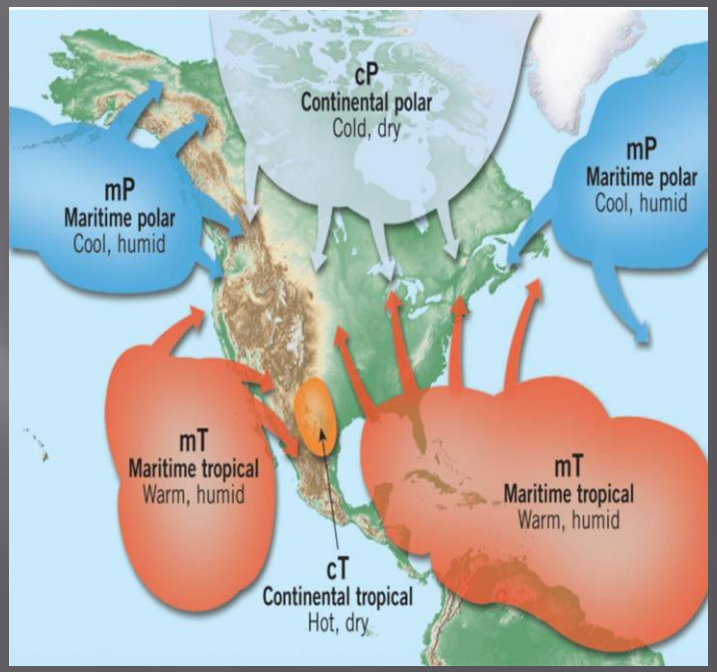
- Continental polar (cP) is not as cold as the Arctic air mass but is also very dry. Originates over Siberia, Mongolia and Central Asia.
- The temperature of -40 degree celsius is recorded in the portion of continental polar in siberia.



- northern Atlantic and the northern Pacific oceans. They most often influence the Pacific Northwest and the Northeast and the Aleutians and Bering Sea.
- It influence is limited to the coastal regions of siberia, manchuria and korea. the mainland of china remains completely from them.

Maritime Tropical (mT)

- Maritime tropical (mT) are usually Warm and humid. Originates over the South China Sea and Bay of Bengal.
- The air masses involved in the summer monsoon circulation are maritime tropical.
- In summer entire southeast asia is dominated by summer monsoon.



- In the winter the maritime tropical air masses originate over the southern portions of the ocean. these air masses pick up large quantities of moisture from over the eastern mediterranean sea.

The Impact of Air Masses on Asia's Climate

Summer Monsoon

mT type air masses bring warm, humid air and cause heavy rainfall.

Cold Waves

cP and cA type air masses bring cold and dry air, which causes severe winter weather in some countries.

Desertification

cA type air masses that originate from Central Asia contribute to the dry and dusty weather conditions affecting other parts of Asia.

Effects of Pollution on Air Mass

Acid Rain

Chemicals in pollution break down and mix with rain water, which makes air masses unhealthy.

Smog

Pollution from urban centers and burning fossil fuels can transform air masses into smog, which is a hazardous air pollutant.

Ozone Depletion

Chemicals in pollution can destroy the atmospheric ozone layer, which can negatively impact air masses in Asia.

Future Prospects and Challenges

Climate Change

Rising temperatures due to climate change will affect air masses and cause shifts in their origins and movement patterns.

Industrialization

The growth of industrialization in Asia will lead to more pollution and further deterioration of air masses.

Regional Conflicts

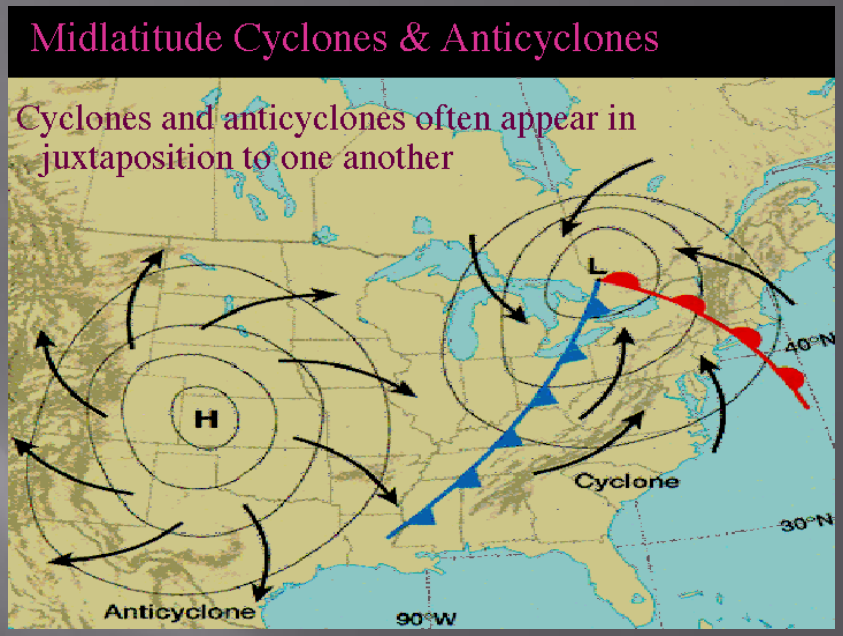
Conflicts and wars in the region may change air mass patterns and increase pollution, leading to unpredictable consequences.

REFERENCE

- Lal, D. S. (2003a). Climatology (2015th ed., Vol. Air masses of Europe, Ser. 250-252). Sharda Pustak Bhawan.
- Gamma. (2023, Septembre 24). Air masses in Asia. https://gamma.app/docs/Air-Mass-in-Asia-okc9o27laxmmqvq

Middle Latitude Anticyclones

Anticyclones in middle latitudes are a common phenomenon that can affect weather globally. In this presentation, we will explore their formation, characteristics, impacts, and a case study of the Siberian High anticyclone.



Definition of Middle Latitude Anticyclones

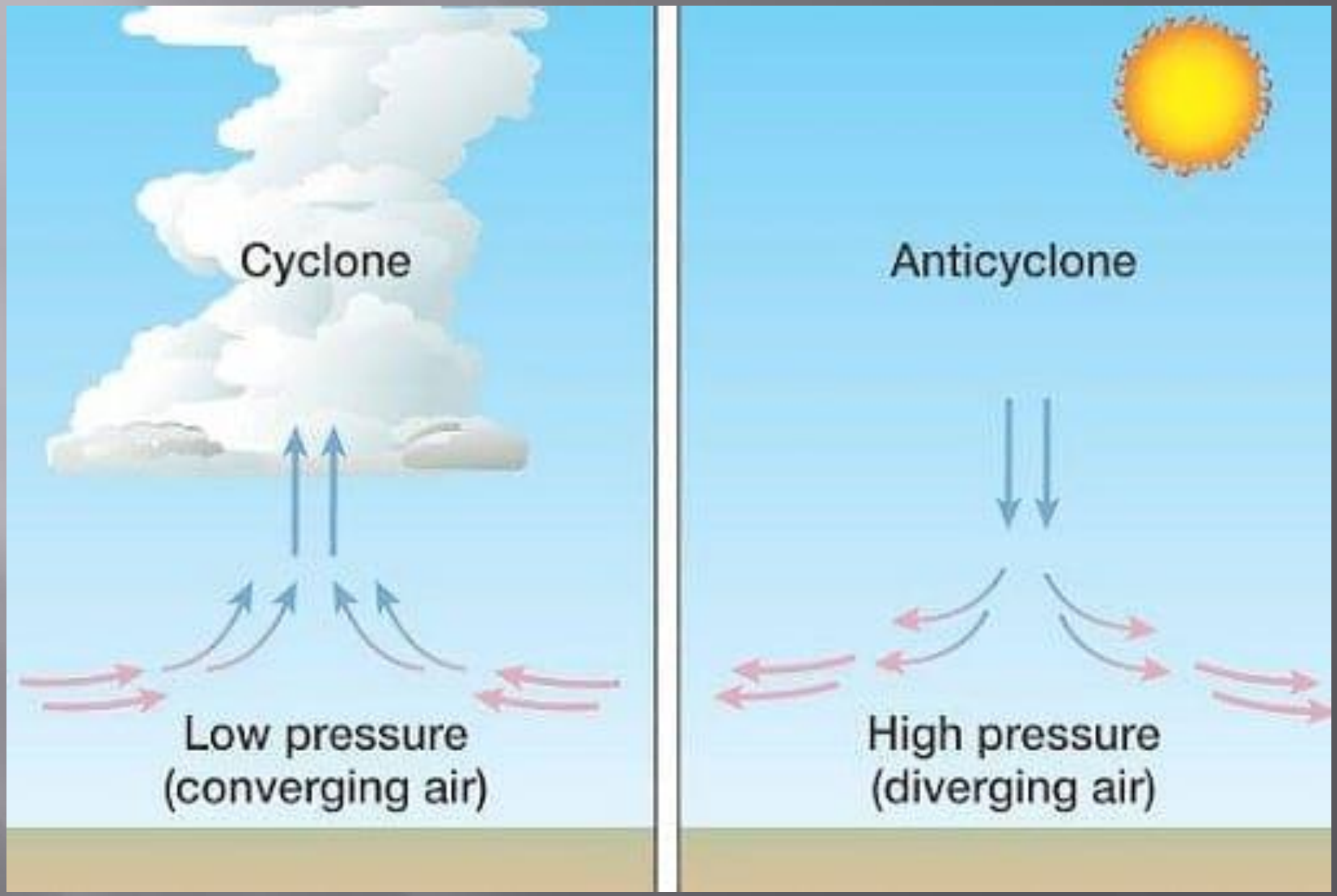
Middle latitude anticyclones are high-pressure systems that are characterized by clockwise winds in the Northern Hemisphere. These typically form between 30 and 60 degrees latitude and can have a significant impact on the weather. The pressure difference between the anticyclone and nearby low-pressure systems leads to the formation of strong winds.

High Pressure

Anticyclones are associated with high-pressure systems, usually formed due to subsidence of air.

Wind Direction

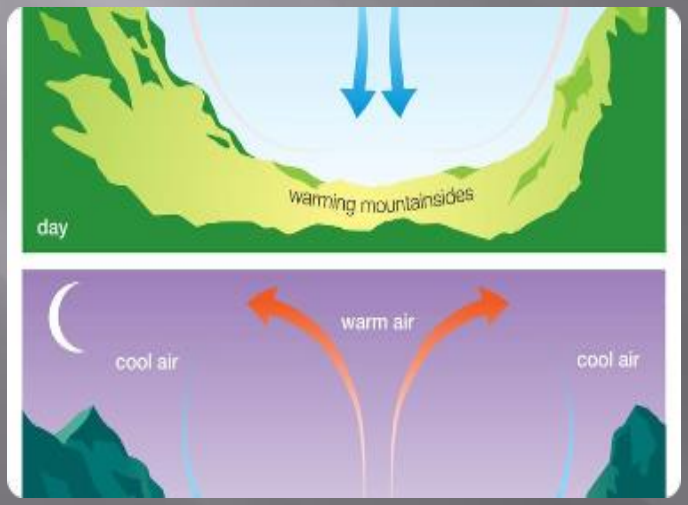
Winds in a middle latitude anticyclone move in a clockwise direction in the Northern Hemisphere, and anti-clockwise in the Southern Hemisphere.


Cyclone
Low pressure
(converging air)
Anticyclone
High pressure
(diverging air)

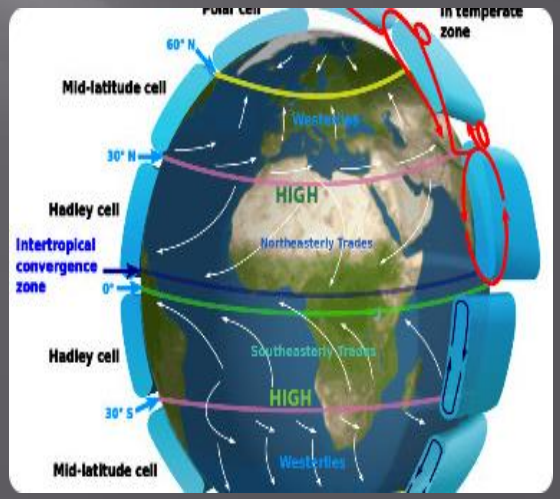
Formation of Middle Latitude Anticyclones

Anticyclones in middle latitudes are typically formed due to a combination of factors including descending air from high altitudes, loss of heat and moisture, and the Coriolis effect. Over land, cold, dry air masses are settling, forming high pressure. These conditions often result in the formation of anticyclones.

Temperature differences



Global weather systems



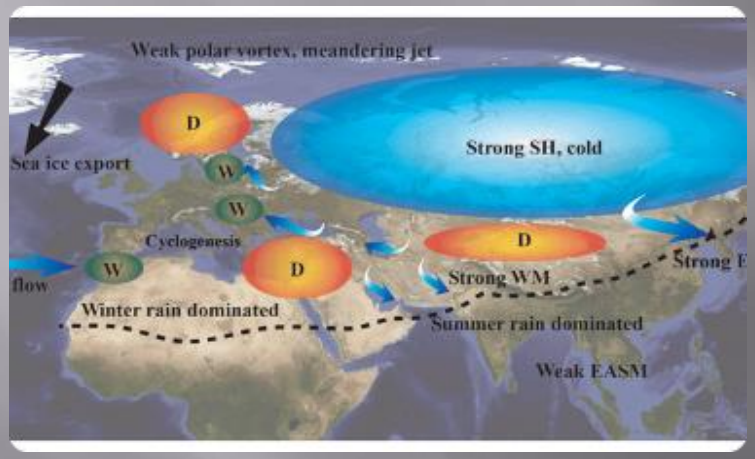
Characteristics of Middle Latitude Anticyclones

Anticyclones are seen as areas of high pressure. Winds tend to diverge around high-pressure areas and blow clockwise (In the Northern Hemisphere) and anti-clockwise (in the Southern Hemisphere). Anticyclones tend to reflect light and can create beautiful sunrises and sunsets.

- The subsiding air leads to a lack of clouds, making for clear skies.
- The high-pressure center leads to clockwise winds north of the equator and anti-clockwise south of the equator.
- Clear skies

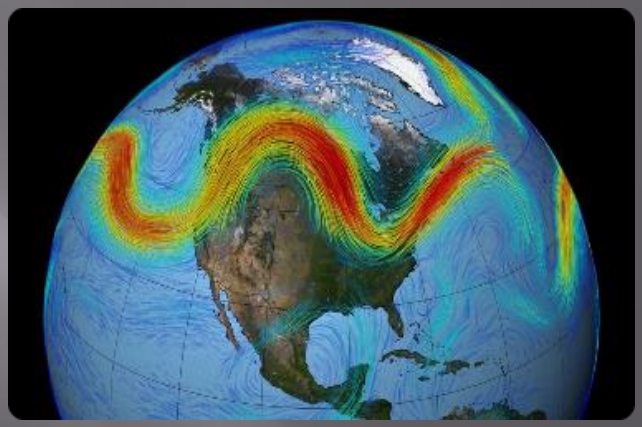
Case Study: The Siberian High Anticyclone

The Siberian High is one of the planet's strongest and most persistent anticyclones. It usually develops from October to December and punishes the region with frigid temperatures and relatively clear conditions.



Location and Impact

The Siberian High is an anticyclone that forms in Siberia and is responsible for extremely cold weather conditions in Asia.



Jet Stream

Siberian High affects the jet stream, which can affect the weather conditions further afield.

Global Distribution of Anticyclones

Anticyclones are high-pressure systems that are characterized by the downward motion of air and are often associated with fair weather conditions. They can be found in various regions around the world, including:

- The subtropical regions, such as the subtropical highs in the Northern and Southern Hemispheres.
- The polar regions, where polar anticyclones form.
- The interior of continents, where continental anticyclones can develop.
- The upper levels of the atmosphere, where upper-level anticyclones exist.

Understanding the global distribution of anticyclones is important for studying weather patterns and their impacts on regional climates.

Conclusion

Middle latitude anticyclones are weather phenomena that can significantly impact the surrounding regions. They are characterized by high-pressure systems and are known for influencing droughts, heatwaves, as well as extremely cold conditions that can sometimes result in fatalities. Mitigation measures can help people to prepare for and manage the risks associated with these weather phenomena. In conclusion, we must respect nature's power and prepare accordingly for its changes in order to prevent harm to individuals and entire communities.

Unit 4 Links

Air Mass

https://www.slideshare.net/2329383/air-masses-and-fronts-113753835

https://www.youtube.com/watch?v=XMg0YExFMUA

https://www.youtube.com/watch?v=QxvF1nnWRwg

Cyclones

https://www.youtube.com/watch?v=K0su_ssAGk8 (Tamil)

https://www.youtube.com/watch?v=3nCqhCYB7zM (Tamil)

https://www.youtube.com/watch?v=UQTTilw5oCo (Tamil)

Tropical Cyclone

https://www.youtube.com/watch?v=_yzCbbzfKLo (Tamil)

Tropical Cyclones and Anticyclones
https://www.youtube.com/watch?v=OoIUfIIFkfo (Tamil)

Tropical Cyclone and Anti cyclone
https://www.youtube.com/watch?v=oqbZB2UYJ5I (Tamil)

Cyclones, Fonts, Frontogenesis
https://www.youtube.com/watch?v=dfAronP3cck (Tamil)
https://www.youtube.com/watch?v=Ac72Om2ArmU (Tamil)
https://www.youtube.com/watch?v=db-lDm034ag (English)

Extratropical Cyclones
https://www.youtube.com/watch?v=d29XoUML6Do (English)

Weather Fonts
https://www.youtube.com/watch?v=naarbGHoAGU (English)

Frontogenesis and Frontolysis
https://www.youtube.com/watch?v=0xOkK7MLaOQ (English)