Exercise session #7

Science of Climate Change

Oct. 30, 2025

- Quizz & recap from the lecture on climate variability and IPCC introduction
- Time to work on the assignment and poster

Atmospheric Circulation, questions/recap

- What are the three main atmospheric circulation cells in each hemisphere ?

  - A. Tropical cell, Mid-latitude cell, and Arctic cell
  - B. Hadley cell, Ferrel cell, and Polar cell
  - C. Trade wind cell, Jet stream cell, and Monsoon cell
  - D. Equatorial cell, Subtropical cell, and Polar vortex cell

Connect to Mentimeter to answer

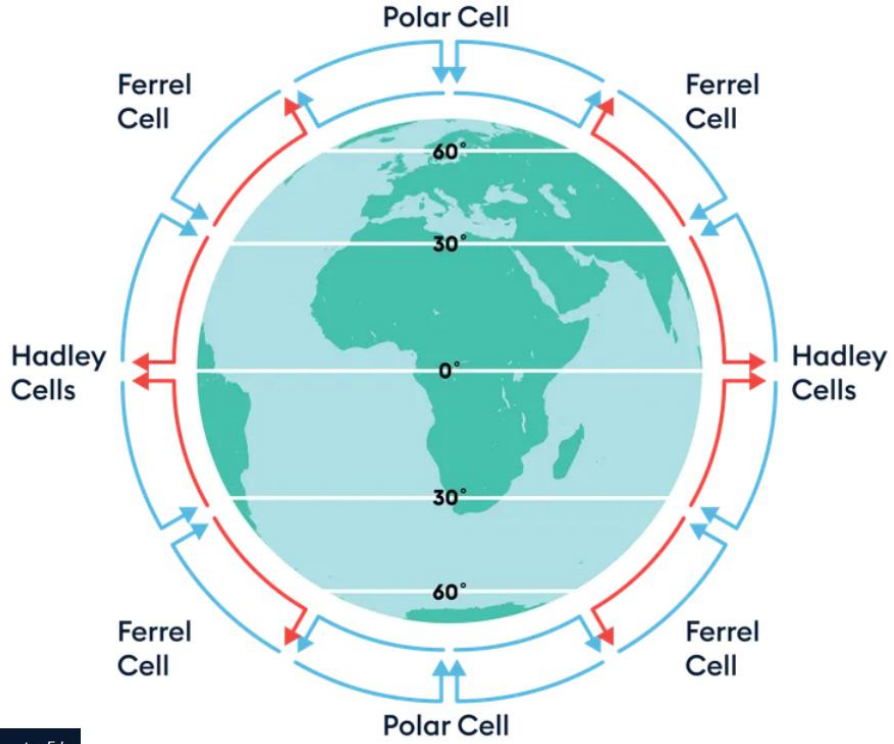
Atmospheric Circulation, questions/recap

- What are the 3 atmospheric cells?

Hadley cell: at low latitudes, air moves toward the equator, where it is heated and rises vertically→ **convection cell**

Ferrel cell: air near the surface flows poleward and eastward, while air higher in the atmosphere moves equatorward and westward → **circulation cell**

Polar cell: at higher latitudes, air rises and travels toward the poles, then, the air sinks, forming ahead of high atmospheric pressure.



Global atmopheric circulation model

https://www.noaa.gov/jetstream/global/global-atmospheric-circulations

Atmospheric Circulation, questions/recap

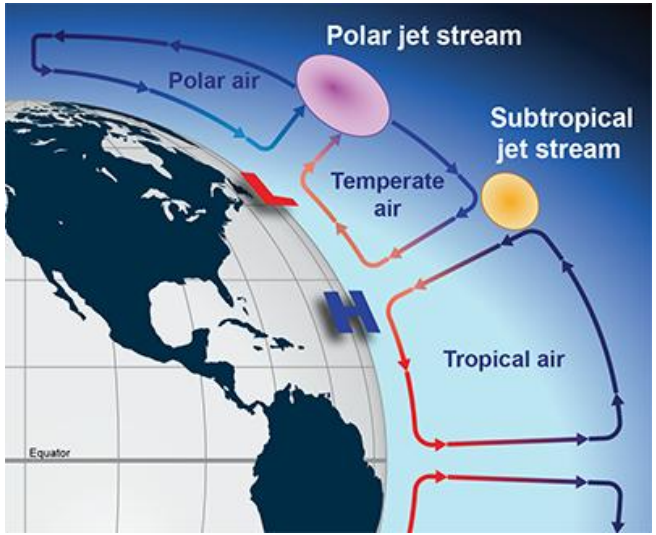
- What is a jet-stream?

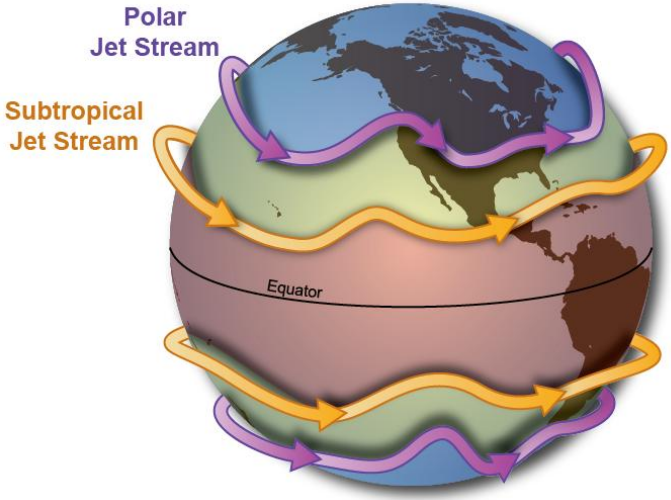
  - A. Current in the Atlantic Ocean circulating from East to West.
  - B. Prevailing wind blowing from North to South.
  - C. Fast-flowing current of air encircling the globe at high altitudes.
  - D. River of air generated by an increase of sea surface temperature.

Connect to Mentimeter to answer

Atmospheric Circulation, questions/recap

- What is a jet-stream?





Jet streams are relatively narrow bands of strong wind in the upper levels of the atmosphere. They blow from west to east, but the band often shifts north to south following the boundaries between hot and cold air.

The rotational speed of the Earth's surface varies with latitude, being fastest at the equator. As air moves north or south, it retains the eastward speed of its original latitude, which causes it to appear deflected relative to the Earth's surface.
→ **Coriolis effect**

https://www.noaa.gov/jetstream/global/jet-stream

Climate Variability, questions/recap

- Between which two pressure systems does the **North Atlantic Oscillation (NAO)** occur ?

  - A. Greenland high and Icelandic low.
  - B. Azores high and Icelandic low.
  - C. Bermuda high and Arctic low.
  - D. Azores low and Icelandic high

Connect to Mentimeter to answer

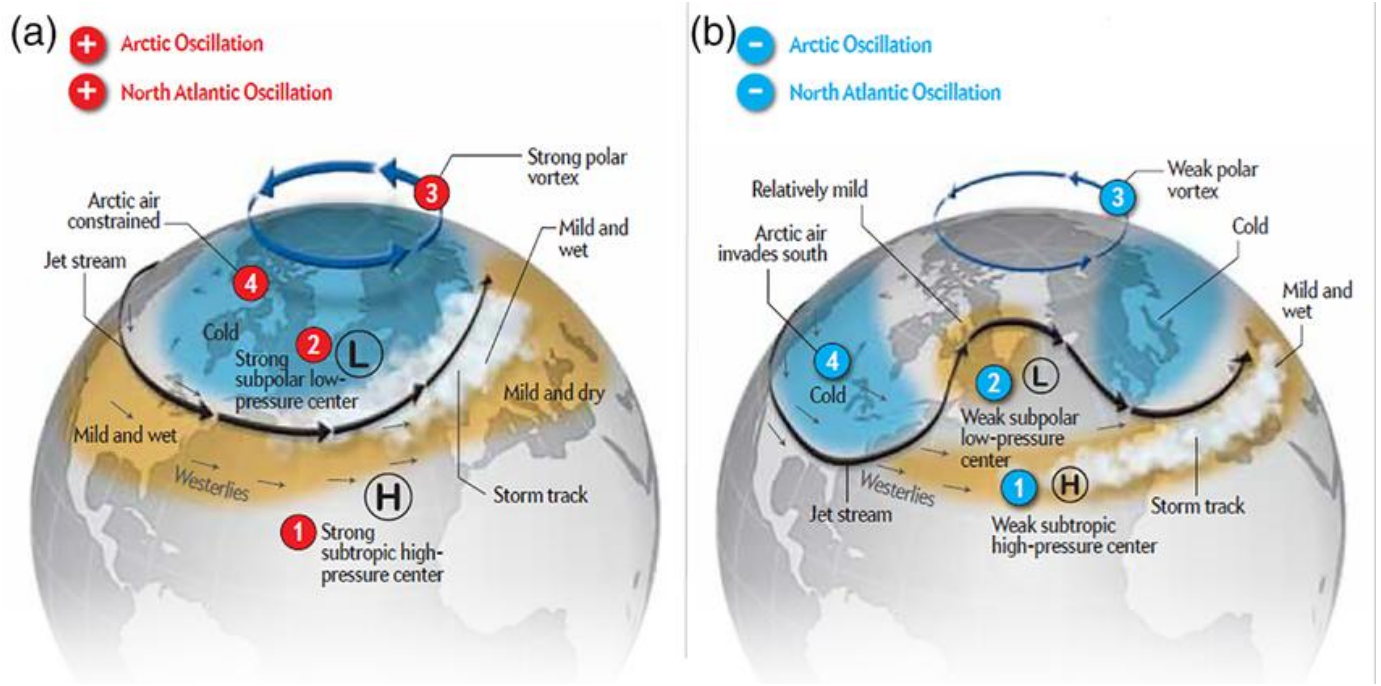
Climate Variability, questions/recap : NAO

- Choose the correct statements about the **North Atlantic Oscillation (NAO)** :

  - A. The NAO is a coupled ocean-atmosphere mode.
  - B. The NAO influences extreme weather in Europe and eastern North America.
  - C. A positive NAO has weak highs and lows ; a negative NAO has strong highs and lows.
  - D. The NAO index compares pressure between 35°N–65°N and 35°S–65°S.

Connect to Mentimeter to answer

Climate Variability, questions/recap : NAO



Walker et al., 2020

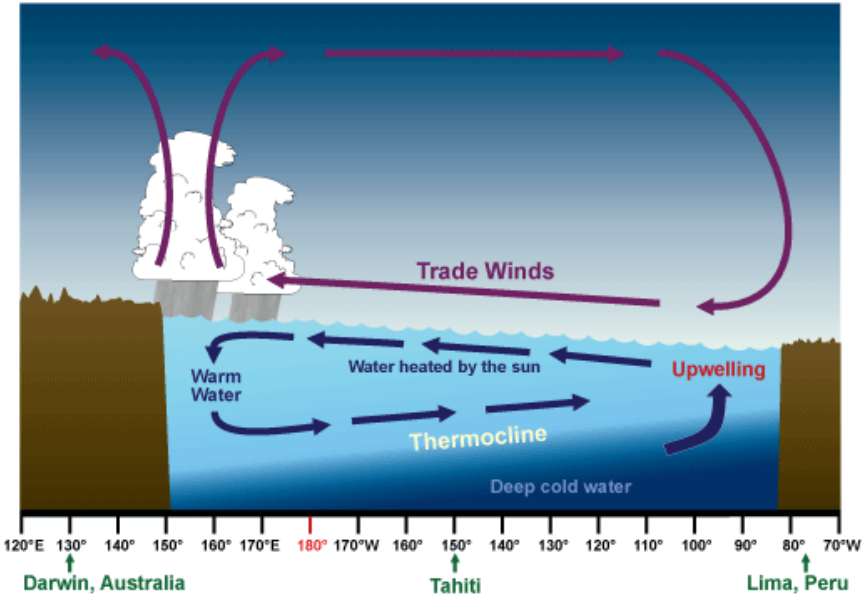
Climate Variability, questions/recap: ENSO

- El Niño Southern Oscillation (ENSO) is an atmospheric-only climate variability mode. **False**
- ENSO is varying on a monthly cycle. **False**
- La Niña conditions are usually associated with cooler temperatures at a global scale. **True**

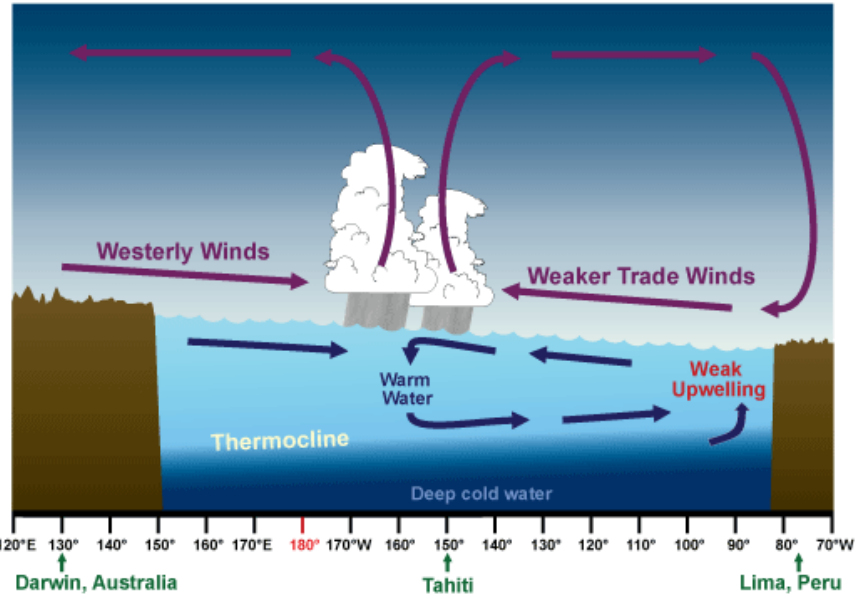
Connect to Mentimeter to answer

Climate Variability, questions/recap : ENSO

Normal conditions



El Niño conditions



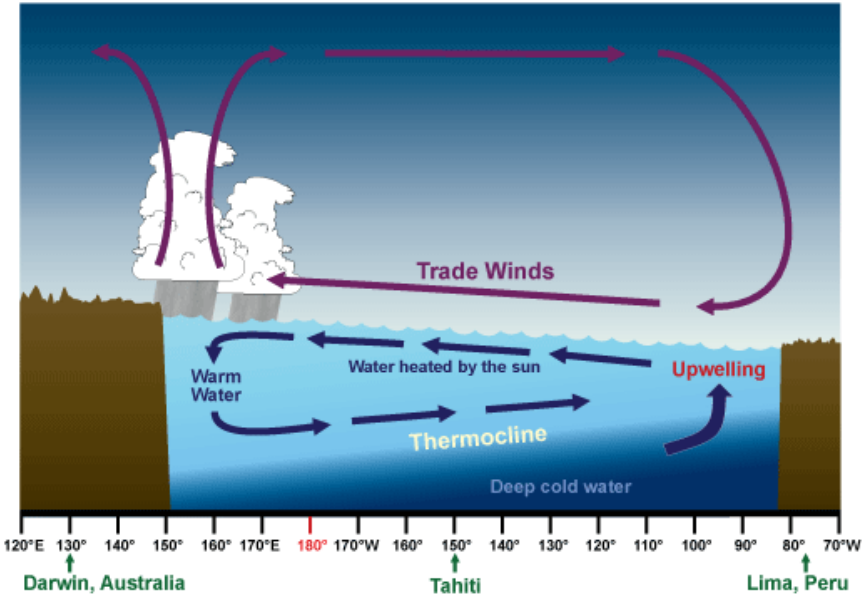
Trade winds blowing from East to West along the Equator, allowing the upwelling of cold, nutrient rich water from deeper levels.

When the air pressure is higher in Australia than at Tahiti, the trade winds decrease in strength. The flow of water away from South America decreases, this pushes the thermocline deeper and decreses upwelling → shift in prevailing rain pattern, dry Western Pacific, rainy Central Pacific

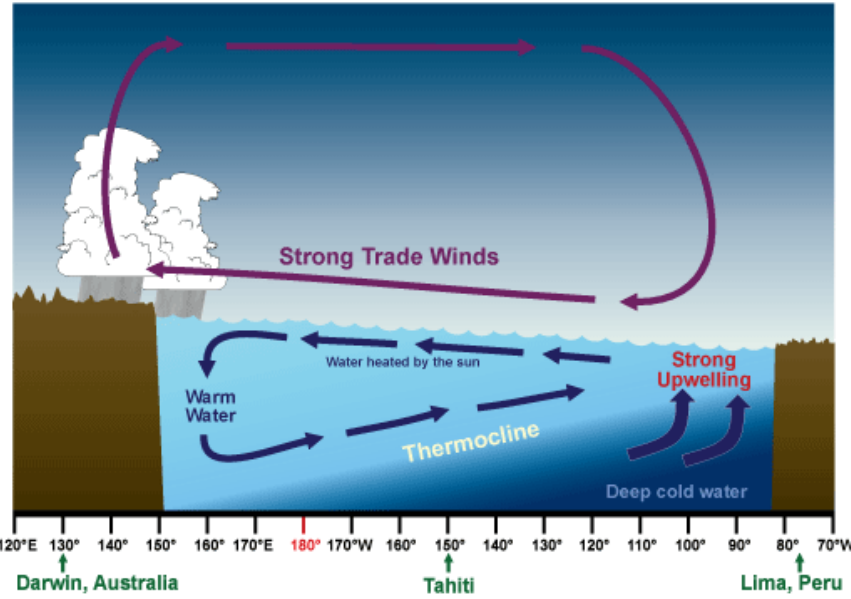
https://www.noaa.gov/jetstream/tropical/enso/enso-patterns

Climate Variability, questions/recap : ENSO

Normal conditions



La Niña conditions



Trade winds blowing from East to West along the Equator, allowing the upwelling of cold, nutrient rich water from deeper levels.

The trade winds blowing West are stronger than normal. The winds pile up warm surface water in the West Pacific, increased upwelling off South America, lower than normal sea surface temperatures. → shift prevailing rain pattern.

https://www.noaa.gov/jetstream/tropical/enso/enso-patterns

Climate Variability, questions/recap : NAO

- What does the **Paris Agreement** stand for ?

  - A. A trade deal between European countries.
  - B. A ban on fossil fuels worldwide.
  - C. An EU carbon market agreement.
  - D. A global pact to limit global warming below 2°C.

Connect to Mentimeter to answer

Climate Variability, questions/recap : NAO

- What are the objectives of the **IPCC assessments** ?

  - A. Determine the current state of the climate.
  - B. Estimate the environmental consequences.
  - C. Set binding international climate policies.
  - D. Estimate the socio-economic consequences.

Connect to Mentimeter to answer