Royal Holloway Geography for Schools Lecture Series

Global atmospheric & ocean circulation systems

- Climate is the average weather conditions (e.g. temperature, precipitation, sunshine, winds, etc) in a given region over several decades (usually 30 years).
- The Earth's climate system is composed of five main elements: the atmosphere, the hydrosphere, the cryosphere, the lithosphere, and the biosphere. These elements absorb solar energy to heat the planet and reflect the surplus back to space. These elements are responsible for transforming the solar energy into climate.
- INSOLATION: INcoming SOLAr radiation
- Because of the Earth tilts, insolation is unevenly distributed round the globe. There is a surplus of heat at the equator, and a deficit in the polar regions.
- Atmospheric circulation. 3 convection cells in the troposphere move the heat from the equator the poles: the Hadley cell (0-30° N and 0-30° S), Ferrel cell (30-60° N and 30-60° S) and Polar cell (60-90°N and 60-90°S).
- 90% of the heat absorbed by the ocean is stored in the first 100 me of depth.
- Ocean circulation. Ocean currents move the heat from the equator to the polar regions. Continents and surface winds control the location, direction, and speed of surface ocean currents.
- Deep water formation. In the polar regions, the ocean radiate heat back into the atmosphere (ocean-atmosphere coupling) and surface waters sink to the ocean bottom.
- The thermohaline circulation is the global system of surface and deep ocean currents driven by temperature and salinity gradients. The thermohaline circulation plays an important role in the carbon cycle and climate change.
- Glacial and interglacial periods in the Quaternary period can be partly explained by changes in the thermohaline circulation.

In-class activity: https://arcg.is/0bmfSX