Earth Systems and Resources

AP Environmental Science

Plate Tectonics

Earth's crust is broken into **plates** 板块 that slowly move on the mantle –**plate tectonics** 板块构造. At **divergent** boundaries plates spread apart (new crust); at **convergent** they collide (mountains, volcanoes, earthquakes); at **transform** they slide past (earthquakes). Boundaries create hazards but also volcanic soils and mineral resources.

Soil Formation and Erosion

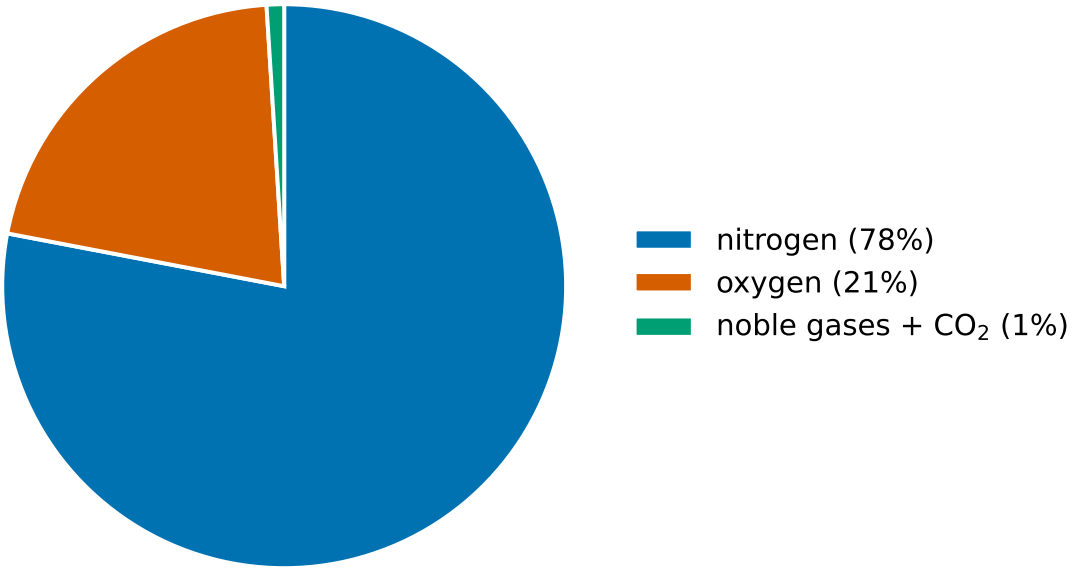
Soil 土壤 forms slowly as rock **weathers** 风化 and organic matter builds up. **Erosion** 侵蚀 is the removal of soil by wind and water, sped up by removing vegetation (farming, deforestation, overgrazing). Because soil forms so slowly, erosion faster than formation depletes a vital resource.

Soil Composition and Properties

Soil is a mix of sand, silt, and clay (its **texture** 质地), plus organic matter, water, and air, layered in **horizons** 土层. Texture controls **porosity** 孔隙度 and **permeability** 渗透性–how well soil holds water and nutrients. **Loam** (a balanced mix) is best for plants.

Earth's Atmosphere

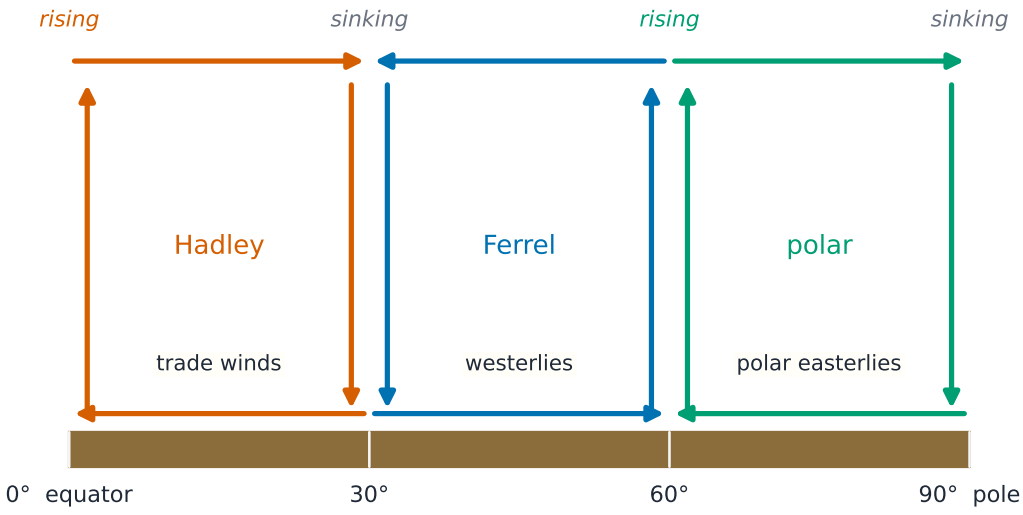
The **atmosphere** 大气层 is layered: the **troposphere** 对流层 (weather, where we live), the **stratosphere** 平流层 (holding the ozone layer), and higher layers. It is mostly nitrogen and oxygen, with trace gases (including greenhouse gases) that regulate temperature.



Clean dry air is about 78% nitrogen, 21% oxygen, and 1% other gases

Global Wind Patterns

Uneven solar heating drives **global wind patterns** 全球风带. Warm air rises at the equator and sinks at about 30°, creating **convection cells** 对流环流 (Hadley, Ferrel, polar) and prevailing winds (trade winds, westerlies). The spinning Earth deflects winds –the **Coriolis effect** 科里奥利效应–shaping weather and climate.



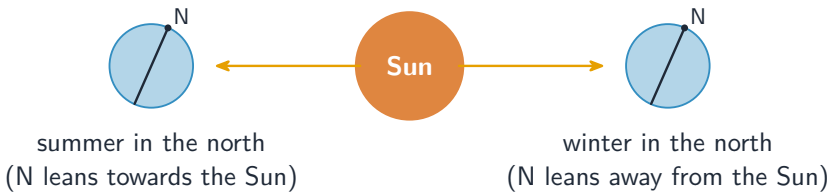
Three circulation cells per hemisphere set the prevailing surface winds

Watersheds

A **watershed** 流域 is all the land that drains to a common body of water. Everything that happens on the land –farming, paving, pollution –affects the water it drains into, so watersheds are key units for managing water quality.

Solar Radiation and Earth's Seasons

Seasons come from Earth's **tilted axis** (about 23.5°), not its distance from the Sun. The hemisphere tilted toward the Sun gets more direct sunlight and longer days (summer). The tilt also makes the **tropics** warm year-round and the **poles** cold.



The tilt of the Earth's axis causes the seasons

Earth's Geography and Climate

Geography shapes climate: **latitude** (sunlight angle), **elevation** (cooler with height), proximity to **oceans** (moderating temperature), and mountains creating a **rain shadow** 雨影 (wet windward side, dry leeward side). These factors decide which biome forms where.

El Nino and La Nina

El Niño 厄尔尼诺 and **La Niña** 拉尼娜 are periodic shifts in Pacific Ocean temperatures and winds. El Niño (warm eastern Pacific) and La Niña (cool eastern Pacific) alter rainfall, storms, and fisheries **worldwide** –for example, floods in some regions and droughts in others.

Exam tips

- **Seasons come from the Earth's tilt**, not its distance from the Sun.
- Soil forms very slowly, so **erosion faster than formation** permanently depletes it; know soil texture (sand/silt/clay) and horizons.
- Explain global wind patterns from uneven heating + the **Coriolis effect**, and a **rain shadow** (wet windward, dry leeward).
- Name the atmospheric layers (troposphere = weather, stratosphere = ozone) and air composition (~78% N , 21% O).
- **El Niño / La Niña** are Pacific temperature shifts that change rainfall worldwide.