Variation in the Physical Environment

Educational Goals

You should be familiar with:

• **latitudinal gradients** in temperature and precipitation and their causes
• global patterns of **seasonal variability** in temperature and precipitation and their causes
• Atmospheric and oceanic circulation
• Patterns of seasonality of precipitation in the tropics and their causes
• Effects of topography
• Soil formation
Background

- **Climate** is perhaps the most important element of environmental variation.

Global Patterns in Temperature and Precipitation

- With increasing latitude, 2 gradients:

- Why?
Global Patterns in Temperature and Precipitation

Temporal Variation in climate with Latitude

- Temporal patterns are **predictable** (diurnal, lunar, and seasonal cycles).
- Earth’s rotational axis is tilted 23.5° relative to its path around the sun, leading to:
Temporal Variation in climate with latitude

Figure 4.2

Temporal Variation in climate with latitude

Figure 4.3
Hadley cells - principal patterns in atmospheric circulation
The Intertropical Convergence

- Surface currents of air in tropical Hadley cells converge near the equator.
- Warm, moist air rising in equatorial regions cools and loses much of its moisture content as precipitation there.
- As cool, dry air descends and warms near 30° N and S latitude, its capacity to hold moisture increases, resulting in prevalence of arid climates at these latitudes.

Latitudinal Climate Belts Set up
Dry and Wet Areas

KEY Annual Precipitation
- Under 25 cm
- Over 150 cm
- Deserts
- Tropical and subtropical rain forests
- Polar deserts
- Temperate rain forests
Ocean currents redistribute heat and moisture

Western coasts have Cold currents
Seasonal Variation in Climate

- Seasonal progression of sun’s zenith causes familiar patterns of temperature.
- Intertropical convergence also migrates seasonally

Seasonality of Rainfall in Tropics

Greatest seasonality:
- Mérida (20°N)
- Rio de Janiero (20°S)
- Bogotá (0°)
Topography can modify environment on local scale:

- steep slopes
- bottomlands
- S-facing vs. N-facing slopes

Topography and Local Precipitation

Figure 4.7
C.H. Merriam –

Why are there deserts?
Climate and Soil
Climate influences soil development →

Soils form as a function of
climate parent material time
vegetation and other organisms
local topography
Soils have structure - horizons

Soil Formation

Shows role of:

in creating variety of environments for life
Significance?

• Global environmental patterns - result of differential input of solar irradiation in different regions and redistribution of heat energy by winds and ocean currents.

• Seasonality - from latitudinal movement of solar equator

• Topography and geology superimpose local environmental variation on more general climatic patterns.