Global Climate Systems

Physical Geography Lecture - GEOG B1

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Climate

Climate - collective pattern of weather over many years.*
Climatology - the study of climate and its variability **
Similarities among local climates allow for grouping into climatic regions. ***

Classifying Earth's Climates *

Classification - the ordering or grouping of data or phenomena into general categories

- **Empirical classification** - climate classification based on data measured and collected.
- **Genetic classification** - climate classification based on causative factors (e.g.: interaction of air masses)

Boundaries? **

Earth's Climates

Six Climate Categories * **Fig. 10.2**

- Tropical climates - tropical latitudes / winterless
- Mesothermal climates - midlatitudes / mild winters
- Microthermal climates - mid- and high-latitudes / cold winters
- Polar climates - high latitude and polar regions
- HIghland climate - high elevations at all latitudes
- Dry climates - permanent moisture deficits at all latitudes
- Interactions of several components created our climate

p. 260-261, GIA 10

Tropical Rain Forests

Constantly moist and warm **p. 264-Map**

Fig 10.3

Temp range is about 2 C° (3.6 F°)

Daily convective thunderstorms *

Precipitation follows migrating ITCZ

High rainfall sustains lush forests **

Dense surface vegetation near rivers due to more available light

Tropical Monsoon Climates

Rainfall brought by ITCZ - falls 6-12 months per year
Dry season occurs when the ITCZ moves away *
Lie along coastal areas within the tropical rainforest realm
Vegetation typically consists of evergreen trees grading into thorn forests on drier margins near adjoining savannas
Fig. 10.4

Tropical Savanna Climates

Poleward of tropical rain forest climates **p. 264-Map**
Fig. 10.5

Can have two temperature maximums because the sun is overhead twice
Summers wetter than winters
When ITCZ is farthest away, high pressure dominates and conditions are dry
Grasslands with scattered trees
Highly variable precipitation

Humid Subtropical - Hot Summer

Either moist all year OR have a pronounced winter-dry period
Influenced by mT air masses off eastern coasts during summer
cP air masses interact and generate storms in fall, winter, and spring
Dramatic thunderstorms
P. 267-Map **Fig. 10.6** and **10.7** *

Humid Subtropical Winter-Dry

Extend poleward from tropical savanna climates
Summers get 10 times more precipitation
Seasonal flooding
Related to the winter-dry seasonal pulse of monsoons
Dramatic thunderstorms
p. 267-Map **Fig. 10.8** *

Marine West Coast

Middle- to high-latitude west coasts
Moist all year
p. 267-Map **Fig. 10.2**
Mild winters and cool summers
mP air masses (cool, moist, unstable) dominate - unpredictable weather
Mild climates, especially for their latitudes
30-60 days of coastal fog

Mediterranean Dry-Summer

Hot, dry summer / wet winter **Fig. 10.2**
and **10.11**
70% of annual precipitation drops during winter
Subtropical high-pressure air masses block moisture in summer
Cool offshore currents produce stability in air masses along west coasts *
Summer water balance deficits - winter precipitation recharges, but not enough
Areas with large scale irrigation for agriculture

Humid Continental Hot-Summer

Warm summers **Fig. 10.2**
mT air masses influence precipitation - may be consistent, or have winter-dry period (**Fig. 10.12**) *
mT and cP conflict - frequent weather activity
In U.S., before European settlement - area covered in vast forests, giving way to tall-grass prairies **

Humid Continental Mild-Summer

Located farther toward poles **Fig. 10.14**

Fig. 10.2

Slightly cooler

Precipitation is less than hot-summer areas, but snowfall is notably heavier and important for soil-moisture recharge

Dry-winter only in Asia

Agriculture important *

Subarctic

Cool summers *
Very cold winters **
Receive 25 cm (10 in) or more of precipitation - covered in snow forests ***
Short growing season during long summer days
Precipitation and potential evapotranspiration are low - soils are moist and partially or totally frozen beneath (permafrost)

Tundra

Tundra refers to the characteristic vegetation of high latitudes and high elevations
Snow cover for 8-10 months **p. 276-Map** **Fig. 10.17**
Temperatures never warm above 10°C (50°F)
Occur only in Northern Hemisphere, except at high elevations in mountains of Southern Hemisphere
In spring, many plants appear and persist through the short summer *
Most of area experiences permafrost and ground ice conditions

Ice-Cap and Ice Sheet

Ice sheets are continuous layers of ice covering extensive continental regions *
Ice caps are smaller than ice sheets, but still cover land
All months average below freezing **
Dominated by dry, frigid air masses
Fig. 10.18 p. 276-Map

Polar Marine

More moderate than other polar climates in winter
No months below -7°C (20°F)
Ocean temperatures range between 0°-4°C (32°-39F) and help to moderate the climate
Average precipitation is 150 cm (59 in) and it can snow any time *
Fig. 10.19

Characteristics of Dry Climates

Subdivided into deserts and steppes - deserts have a greater moisture deficit.
Steppe - a regional term referring to huge semiarid grasslands - too dry to support forests, but too moist for a desert *
15°-30° - subtropical high-pressure cells dominate
Deserts extend to western edges of continents **
These climates exist in higher latitudes due to orographic lifting over mountains creating a rain shadow
Fig. 10.20 ***

Tropical, Subtropical Hot Desert

True tropical and subtropical deserts are mostly on the west side of continents
Rain is from localized summer convectional showers
Some regions have almost no rain
Fig. 10.20 and **Fig. 10.21** *

Midlatitude Cold Desert

Fig. 10.22

Small areas *

Precipitation low - 15 cm (6 in)

Lower temperatures and lower moisture demand

Tropical, Subtropical Hot Steppe

Exist at periphery of hot deserts **p. 279-Map**
Shifting subtropical high-pressure cells create a distinct summer-dry and winter-wet pattern
Average precipitation is below 60 ccm (23.6 in)
Can only support short grasses
Fig. 10.23

Midlatitude Cold Steppe

Occur poleward of about 30° latitude
Not generally found in the Southern Hemisphere
Rain is highly variable and undependable
Fig. 10.24 *

Climate Regions & Climate Change

Boundaries of climates are changing worldwide.
Tropical climates are expanding, so subtropical high-pressure areas and dry conditions are also expanding.
Warming temperatures are making areas more prone to drought.
Storm systems are being pushed further into the midlatitudes.
Ecosystem Evidence:

- More trees are growing in tundra climate regions
- Animal ranges are expanding to higher latitudes.