

Köppen Climates and Characteristics

Overview

- * Köppen system most used climate classification - based on precip. & temperature
- * used letter system to designate major climates
- * A = tropical; B = deserts; C = temperate; D = severe; E = polar; H = highlands
- * upper case designation correlates to **latitude** change except highlands
- * **precipitation** lower case: s = summer drought; w = winter drought; f = wet year-round; m = monsoon
- * **temperature** lower case: a = hot; b = cool; c = cold summer periods

Tropical Rainforest (Af)

- * constant heat & humidity (no variation)
- * steady, year-round rains associated with doldrums & convergence
- * daily afternoon rain showers due to convection
- * near oceans associated with greatest precipitation in world
- * produces true "selva" or canopy rainforest (not jungle)
- * greatest climatic stability and biodiversity in world

Tropical Monsoon (Am)

- * reversal of winds associate with shifting of ITC
- * summer lands heat and draw in moist ocean air
- * further exacerbated by orographic lifting
- * short dry season (winter) followed by intense rainy season (summer)
- * more jungle like vegetation and less biodiversity

Tropical Savanna (Aw)

- * flanks tropical rainforests & monsoons areas
- * abundant rain received during the high sun period (summer)
- * little to no rain during the low sun period (winter)
- * prone to winter drought or unpredictable weather conditions
- * precipitation caused by the shifting ITC (i.e. shifting sun)
- * classic savanna grasslands, strange trees and shrubs
- * home to large ungulates (grazing animals) & predators
- * African Serengeti, Venezuelan Llanos, Brazilian campos
- * hardpan soils called "laterites" leached from heavy rains
- * not well-suited for agriculture yet under population stress
- * home to last nomadic people and animal herders like Masai

Dry Desert Climates (BW)

- * based on precip effectiveness - actually available to plant
- * low relative humidity (less than 1/2 potential *evapotranspiration*)
- * when precip comes, it comes all at once (yearly level - one day)
- * high temps and shallow soils produces hardy, drought tolerant plants
- * "xerophytic" vegetation has thick bark, no leaves, large storage
- * prickly cactus, Joshua trees, creosote bush
- * large deserts correlate with subtropical high cells

Steppe Climates (BS)

- * fringes of deserts with controls such as continentality, rain-shadow, high pressure
- * greater precip but never reaches potential evaporation (deficit of moisture)
- * received between 10 and 20 inches
- * found in cold regions, like Montana and Nevada, with slightly higher humidity
- * i.e. (greater than 1/2 potential *evapotranspiration* but less than full *evap.*)
- * excellent for grasslands and large ungulates (grazers)
- * delicate system of fragile life-providing crust and bunch grasses
- * vulnerable to overgrazing and easy destruction
- * while native vegetation is drought tolerant, crops can easily fail

Mediterranean (Csa)

- * remarkable regularity around world (30 - 40 latitude)
- * result of subtropical high pressure system
- * summer drought (opposite norm)
- * months of no rain at all (May to Dec.)
- * two subdivisions
- * hot (Csa)
- * mild summers (Csb)
- * coastal summers moderated by fog
- * cool at night; compare San Francisco to Red Bluff
- * westerly winds (jet stream) in winter
- * most rain in winter from cyclonic storms
- * 15 to 30 inches
- * evaporation rates lower, water retained in ground
- * plants adapted to harsh summer droughts
- * called *sclerophyllous* (hard-leaved)
- * tough, leathery, shiny, deep roots
- * low scrubby bushes called *chaparral*

Humid Subtropical (Cfa)

- * 40 degrees west coast & 15 to 20 east coast
- * roughly same as Med. but on east coast
- * humid conditions created by lack of subsidence & warm ocean currents
- * sticky from high relative humidity (sensible heat); sultry evenings
- * year-round rains (no dry season like Med. climate)
- * from 25 to 100 inches of rain yearly (frontal & convection)
- * receives maximum precip in summer
- * monsoon effect bringing moisture inland in summer
- * southeast Asia
- * mild winters influenced by warm waters and distance from continental air
- * typically lush and tropical feeling with broad-leaf deciduous trees
- * long growing season for agriculture and plants
- * abundant pine forests (plantations in southern U.S.)
- * 2 to 4 times growth than in colder regions such as New England
- * limited fertility of soils due to rapid removal of soluble nutrients
- * drier regions are great grasslands (Pampas, Argentina)
- * intensive agriculture such as rice, tobacco, cotton (limited irrigation)
- * feeds much of the world with careful stewardship and soil conservation

Marine West Coast (Cfb)

- * between 45 and 65 (extremely high lat) when influenced by winds
- * most temperate climate with moderating effect of ocean
- * North Atlantic Drift warms northern Europe (Norway to Arctic)
- * ocean influence even stronger than latitude
- * compare Portland, OR with Eau Claire, Wisconsin
- * rains through the summers but cool
- * daily temperature ranges are mild, although can swing
- * limited to adjacent coastal areas; mtns can block effect
- * limited growing season due to frost
- * crops like hops, grains, sod, (grapes); ranching
- * in winter, dreary and cloudy due to instability & fog
- * greatest precip. along coast windward mtns sides
- * great temperate rainforest such as in British Columbia
- * some snow but melts, esp. in lowlands
- * Pacific Northwest, Germany & France, New Zealand

Humid Continental - hot summer (Dfa)

- * limited on Eurasian landmass with greatest agricultural potential
- * US from eastern seaboard to midwest
- * produces great grain crops with longer growing seasons
- * rich glacial & alluvial soils from past ice ages
- * land of tall prairie grasses, also adding to soil richness
- * distinct four seasons marked by temp changes
- * summers in hot zone are often long and produce much rain
- * afternoon thunder showers and humidity help grow tall corn
- * in winter saturated with frontal storms

Humid Continental - mild summer (Dfb)

- * less precipitation, less humid and drier
- * winter is dry in regions like eastern Russia (Vladivostok)
- * shorter growing season (1 to 3 months shorter)
- * more firs, pines and spruce and less oak, hickories, and maple
- * more root crops (like potatoes, beets, turnips) and spring wheat
- * corn does not have enough time to mature; apples, plums, cherries
- * dairy products where soils are thin and cool summers
- * wide areas of wilderness, lakes and standing water

Subarctic (Dfc, Dfd, Dwc, Dwd)

- * furthest poleward regions with at least 1 mo. above 10 (50 F)
- * forest cannot survive without some warmth
- * line between Polar and Subarctic clear (no trees)
- * severe winters with clear skies from dominant High pressure
- * larger areas on Eurasian continent compared to N. America
- * in summer can actually get hot from long days and high sun
- * largest temperature range of any climate (see climograph)
- * limited precip because air hold little moisture (>20 in)
- * anticyclones (Highs) block lifting and movement of moist, southerly air
- * great rolling tracts of single species, stunted growth "taiga" forests
- * also known as boreal forest with patches of open areas
- * no agriculture and little permanent occupation

Polar (E)

- * averages do not rise above 10 (50 F) mark (no warm summer)
- * for 9 months below freezing
- * trees cannot survive where tundra covers surface
- * other areas covered with ice year-round
- * above arctic circle all sunlight and no sunlight
- * permafrost of soils creates marshy lands "muskeg" in Canada
- * lots of insects and large migratory herds (Caribou, reindeer)
- * precip is low, yet mass amount of snow with no thaws

Highlands (H)

- * like moving poleward in latitude (Sierra Nevada example)
- * create variations in climate zones, even Tropical regions
- * become enclaves of heat relief, yet exposed by sun & wind
- * become biotic island with coolness and moisture
- * home to remnants like Sequoia, bristle cone pine, birds in desert
- * at roughly 10,000 feet reach tree line
- * areas of precip for drier regions (Med. & deserts) with orographic precip
- * in S. America serve as zones of agriculture and habitation (see figure)
- * last preserves for wildlife and pristine habitat