

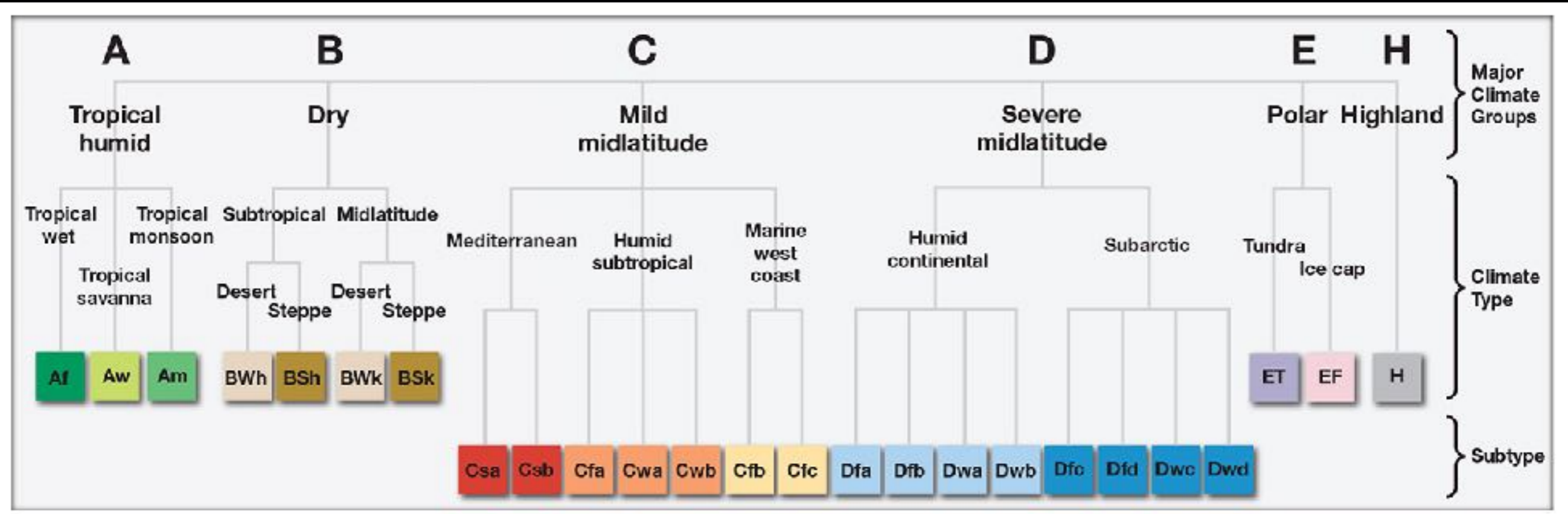
Unit 4 SG 2

Climate Classifications

I. Climate Classification

- A. Temperature & precipitation are generally chosen as the most significant & understandable features of climate when narrowing down climatic characteristics to classify.
 - 1. Climate is a complex phenomenon to understand given its ability to change over time.

- B. The Köppen Climate Classification System is the most widely used system in the world today.
 - 1. It's database uses only the mean annual & monthly values of temperature & precipitation.
 - a. Four of five zones are defined by temperature; the fifth by moisture.
 - (1) each of the five zones is subdivided according to various temperature & precipitation types.
 - (2) A sixth zone has been added for high-elevation climates.



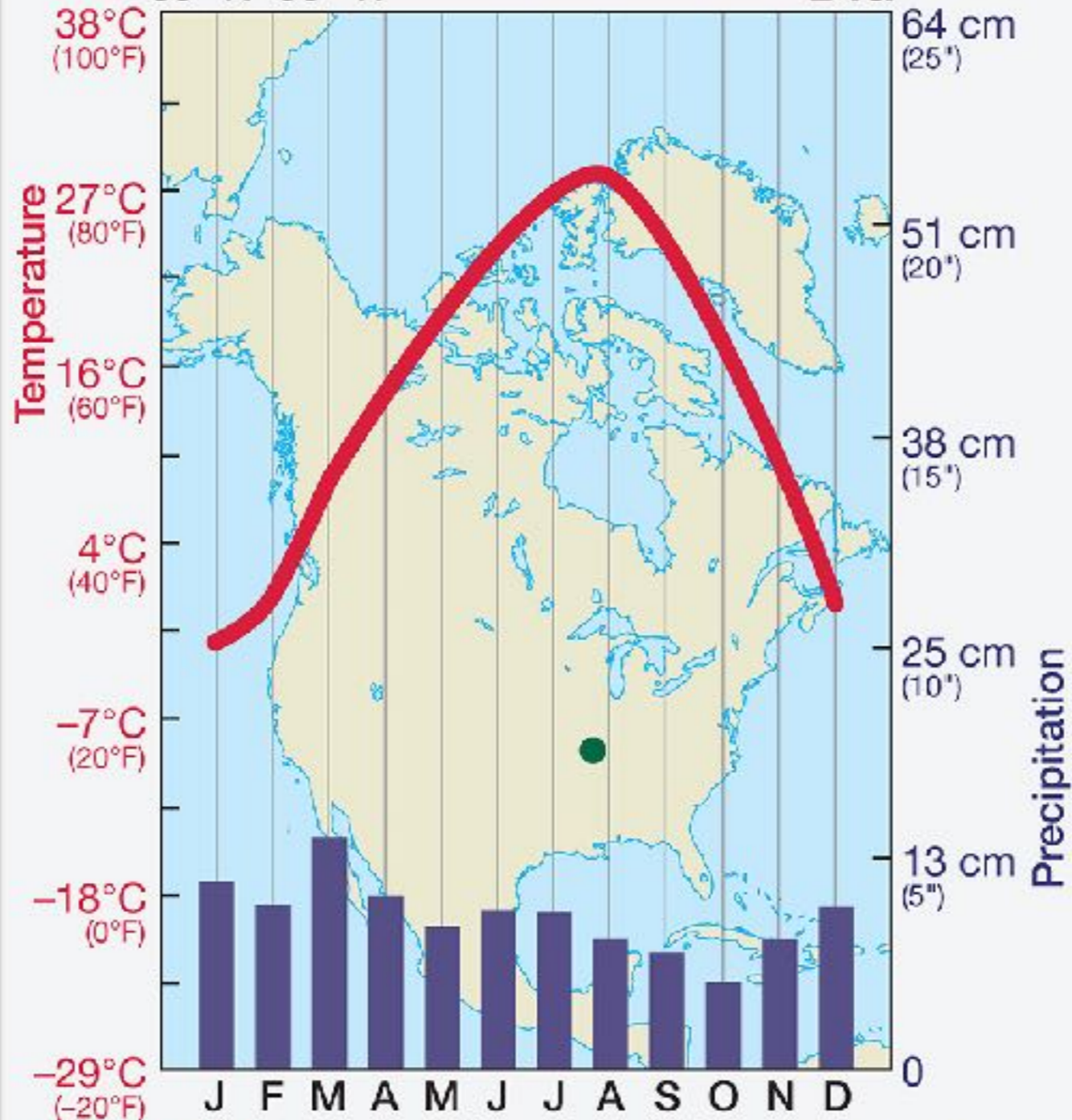
- C. The Köppen Letter Code System uses a descriptive name followed by a series of classifying letters
 - 1. The letters are defined by specific temperature and/or precipitation values.
 - a. The first letter designates the major climate group.
 - b. The second letter usually describes precipitation patterns.
 - c. The third letter (if any) describes temperature patterns.

- D. Climographs are simple graphic representations of monthly temperature & precipitation data gathered from a specific weather station.
 - 1. They are the most useful tool for studying world climate classification.
 - a. They display precise details of important aspects of the climate of a specific place.
 - b. They can be used to classify the climate of that place.

St. Louis, Missouri

39° N 90° W

Dfa



Temp. range:
26°C (47°F)

Month

Precipitation:
102 cm (40")

Each climate group has a general description that can be found in certain latitudes.

Mountains and water features can affect these zones making them different at the same latitudes.




A TROPICAL HUMID CLIMATES

	Tropical wet	Af	(Wet all year)
	Tropical savanna	Aw	(Dry winter; wet summer)
	Tropical monsoon	Am	(Dry winter; very wet summer)

B DRY CLIMATES

	Subtropical desert	BWh	("Hot" desert)
	Subtropical steppe	BSh	("Hot" semiarid)
	Midlatitude desert	BWk	("Cold" desert)
	Midlatitude steppe	BSk	("Cold" semiarid)



C MILD MIDLATITUDE CLIMATES

	Mediterranean	Csa	(Hot, dry summer)
		Csb	(Warm, dry summer)
	Humid subtropical	Cfa	(Wet all year; hot summer)
		Cwa	(Dry winter; hot summer)
		Cwb	(Dry winter; warm summer)
	Marine west coast	Cfb	(Wet all year; warm summer)
		Cfc	(Wet all year; cool summer)


D SEVERE MIDLATITUDE CLIMATES

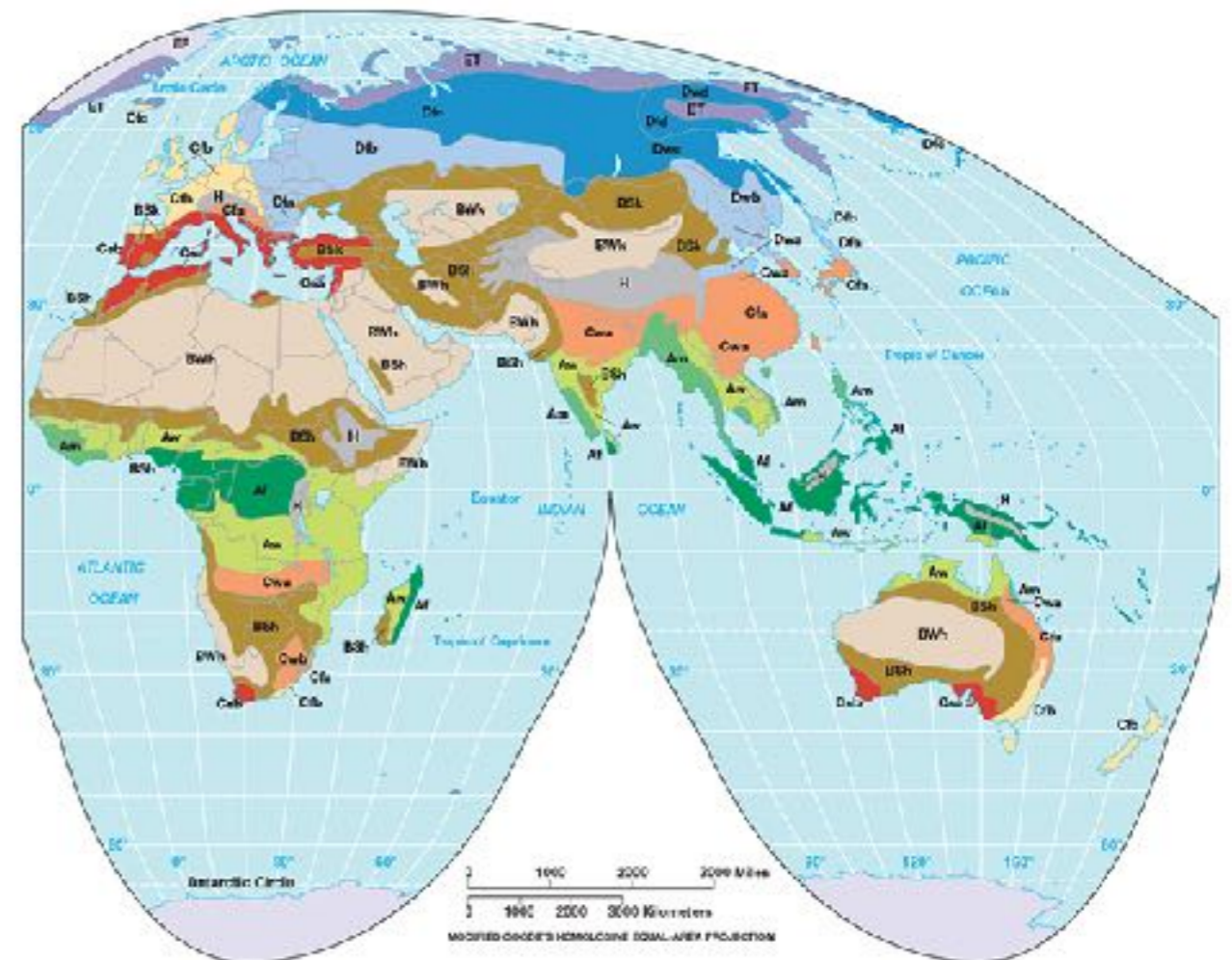
	Humid continental	Dfa	(Cold winter; wet all year; hot summer)
		Dfb	(Cold winter; wet all year; warm summer)
		Dwa	(Cold, dry winter; hot summer)
		Dwb	(Cold, dry winter; warm summer)
		Dfc	(Cold winter; no dry season; cool summer)
	Subarctic	Dfd	(Very cold winter; no dry season)
		Dwd	(Cold, dry winter; cool summer)
		Dwd	(Cold, dry winter; cool summer)
		Dwd	(Very cold, dry winter)

E POLAR CLIMATES

	Tundra	ET	(Polar tundra; no true summer)
	Ice cap	EF	(Polar ice cap)

H HIGHLAND CLIMATES

	H	(High elevation climates)
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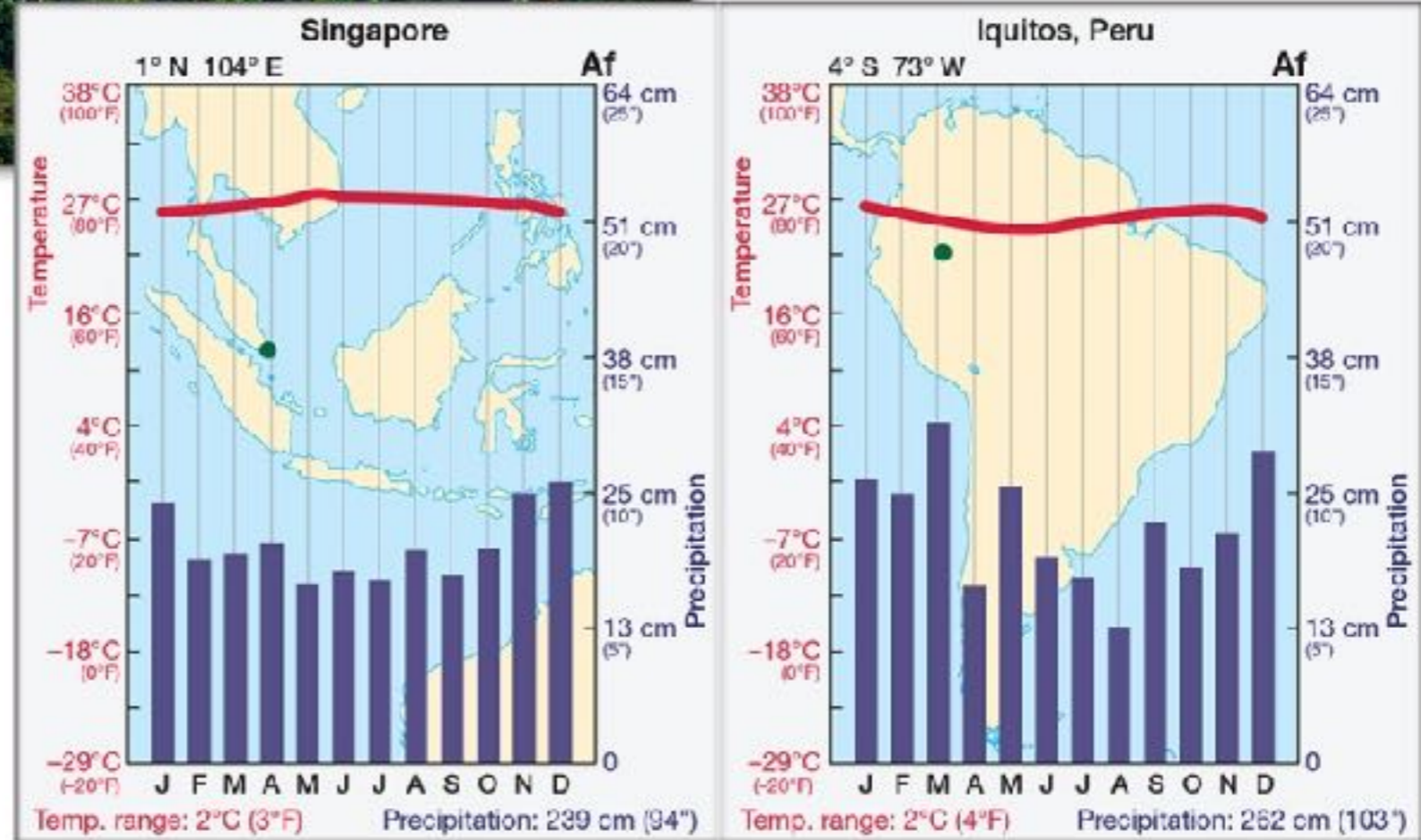
II. World Distribution of Climate Types

- A. Tropical Humid Climates (Group A) are the only truly winterless climates of the world.
 - 1. Latitudinal location molds the basic character of zone A climates.
 - a. They dominate the equatorial regions extending to about the 20° N & S of the equator.

- 2. Prevalence of moisture: most locations in zone A are among the wettest places in the world
 - a. Abundant sources of moisture (80 in. or more/year) & mechanisms for uplift (convection).
- 3. There are three types of zone A climates (Af, Aw, Am):
 - a. Tropical wet (Af) is a seasonless climate with the same weather day after day.
 - (1) Latitude is the primary determinant caused by uniform (the same) solar radiation (insolation) all year.
 - (2) There is little to no temperature variation (averages about 80° F all year).



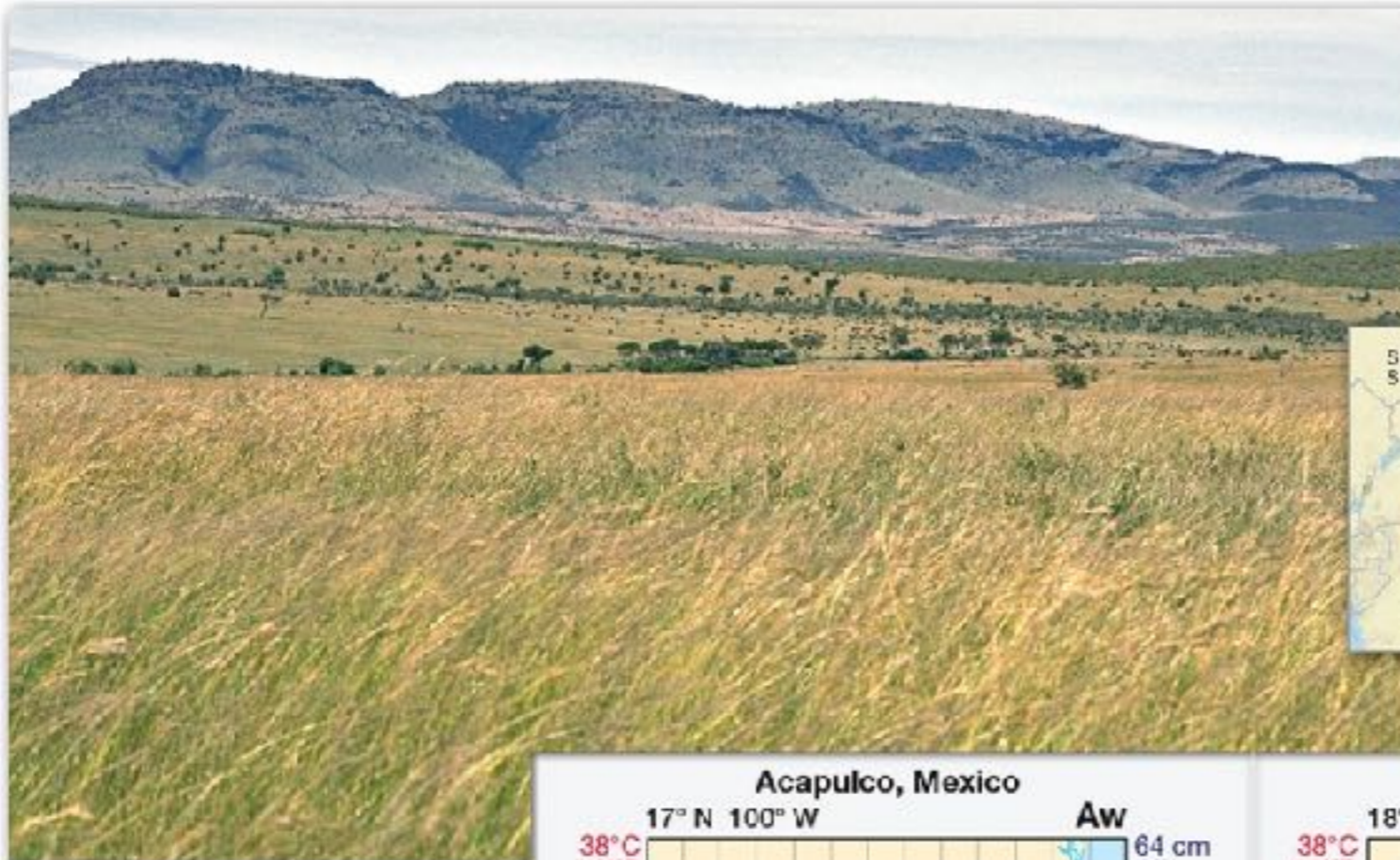
(a) Tropical wet climate



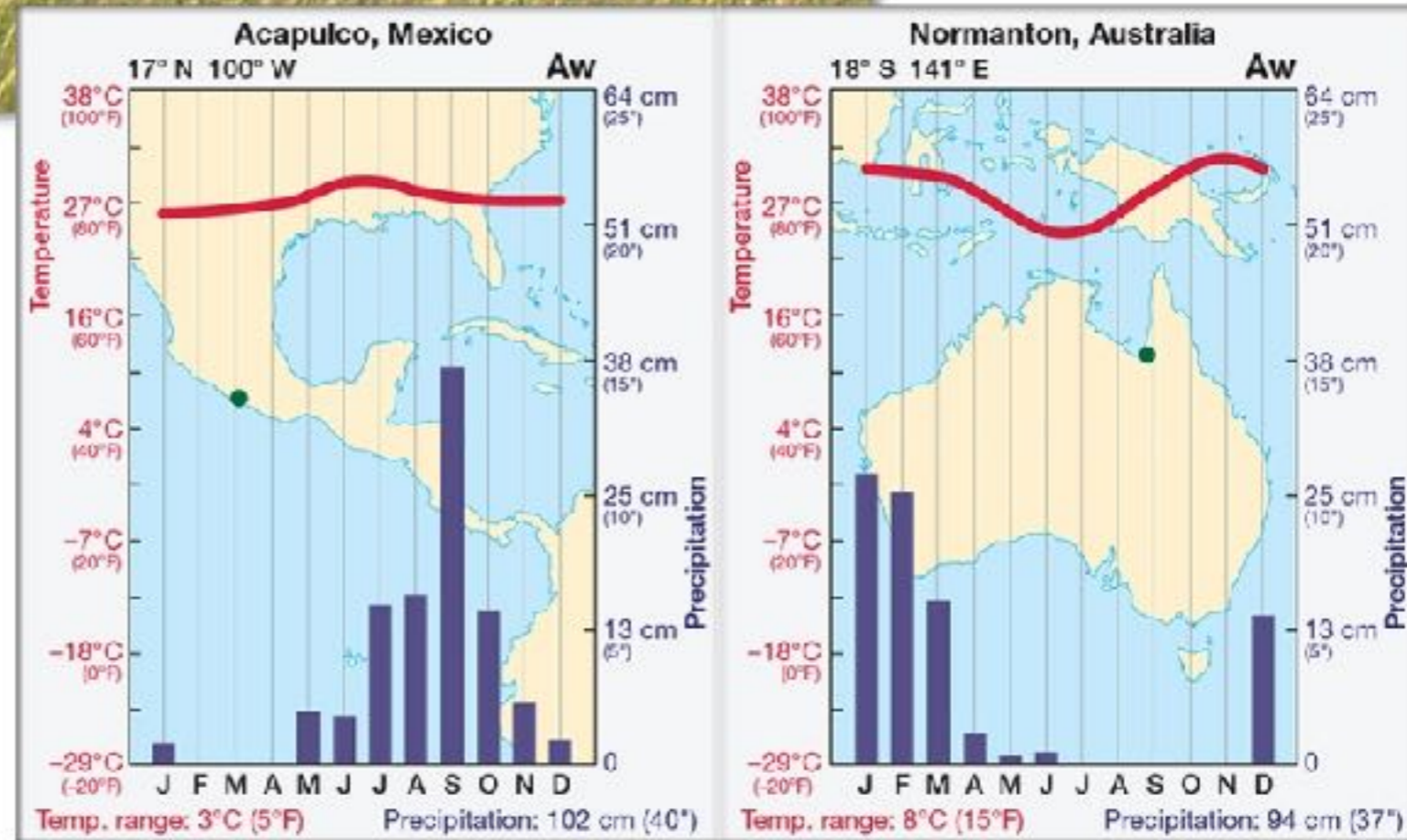
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- b. Tropical savanna (Aw) (averages about 80° F all year) is the most extensive of the A climates.
 - (1) There is a clear-cut seasonal alternation of wet & dry periods.
 - (2) Annual rainfall is generally less than the other two A climates
 - (a) Wildfires are common during the dry season.
 - (3) The migration of the ITCZ coincides with upper limits of the tropical savanna climate.



(a) Tropical savanna climate



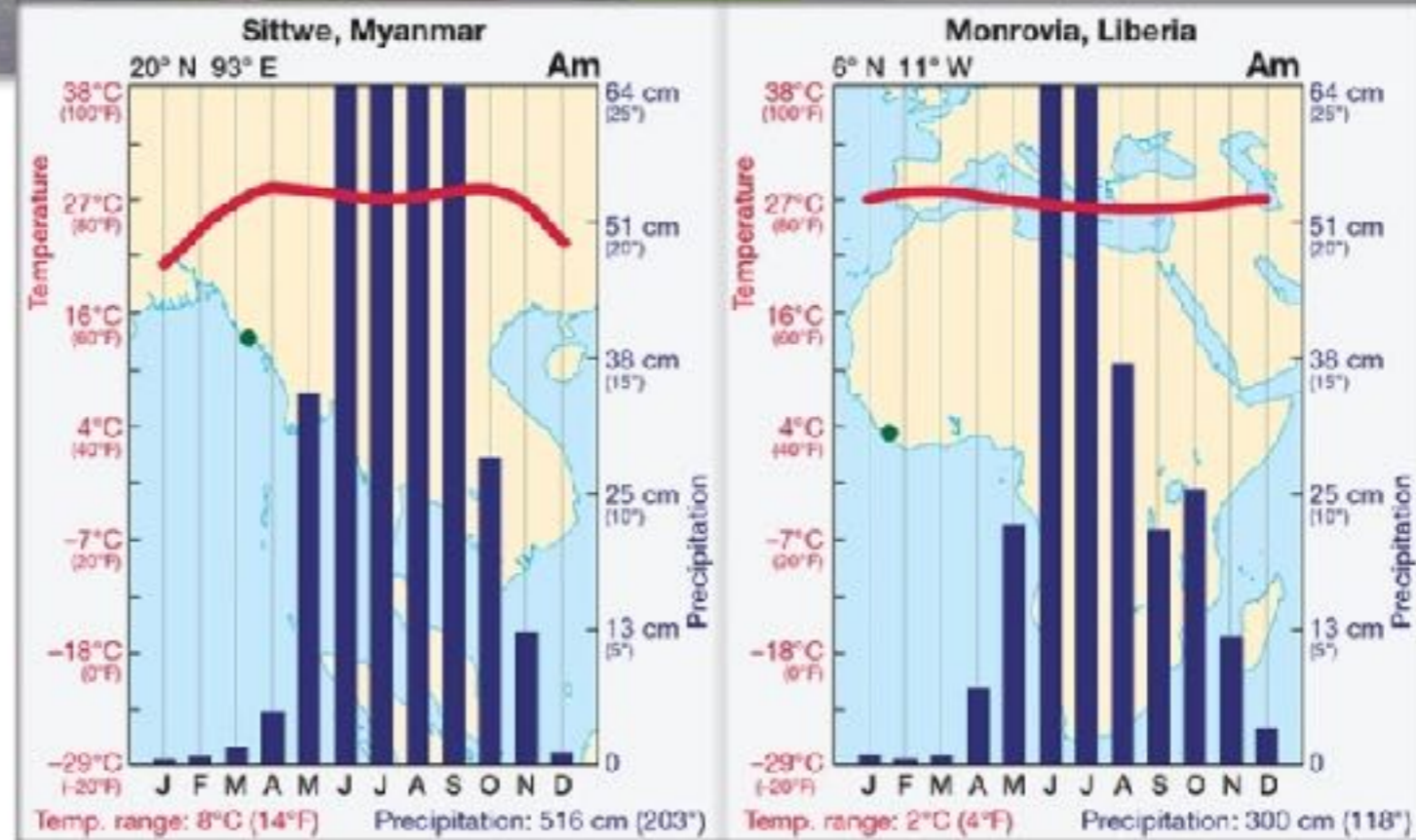
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- c. Tropical monsoonal (Am) climate is similar to tropical wet, except for heavy rainfall (averages about 200 in./year) & lower temperatures that occur with the summer monsoon season (heavy cloud cover reflects some of the insolation)
- d. Collectively, tropical savanna & tropical monsoon are sometimes referred to as tropical wet/dry climates.



(a) Tropical monsoon climate

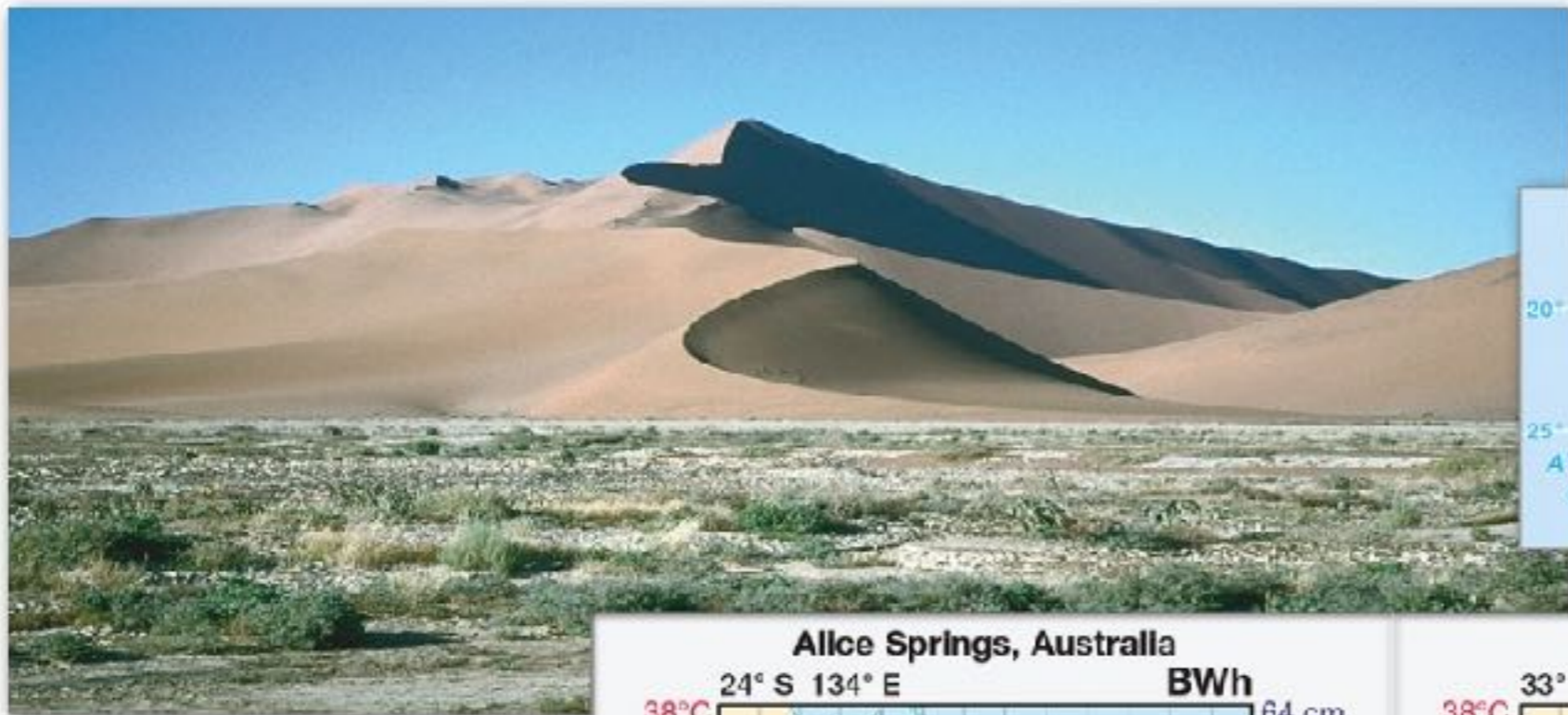


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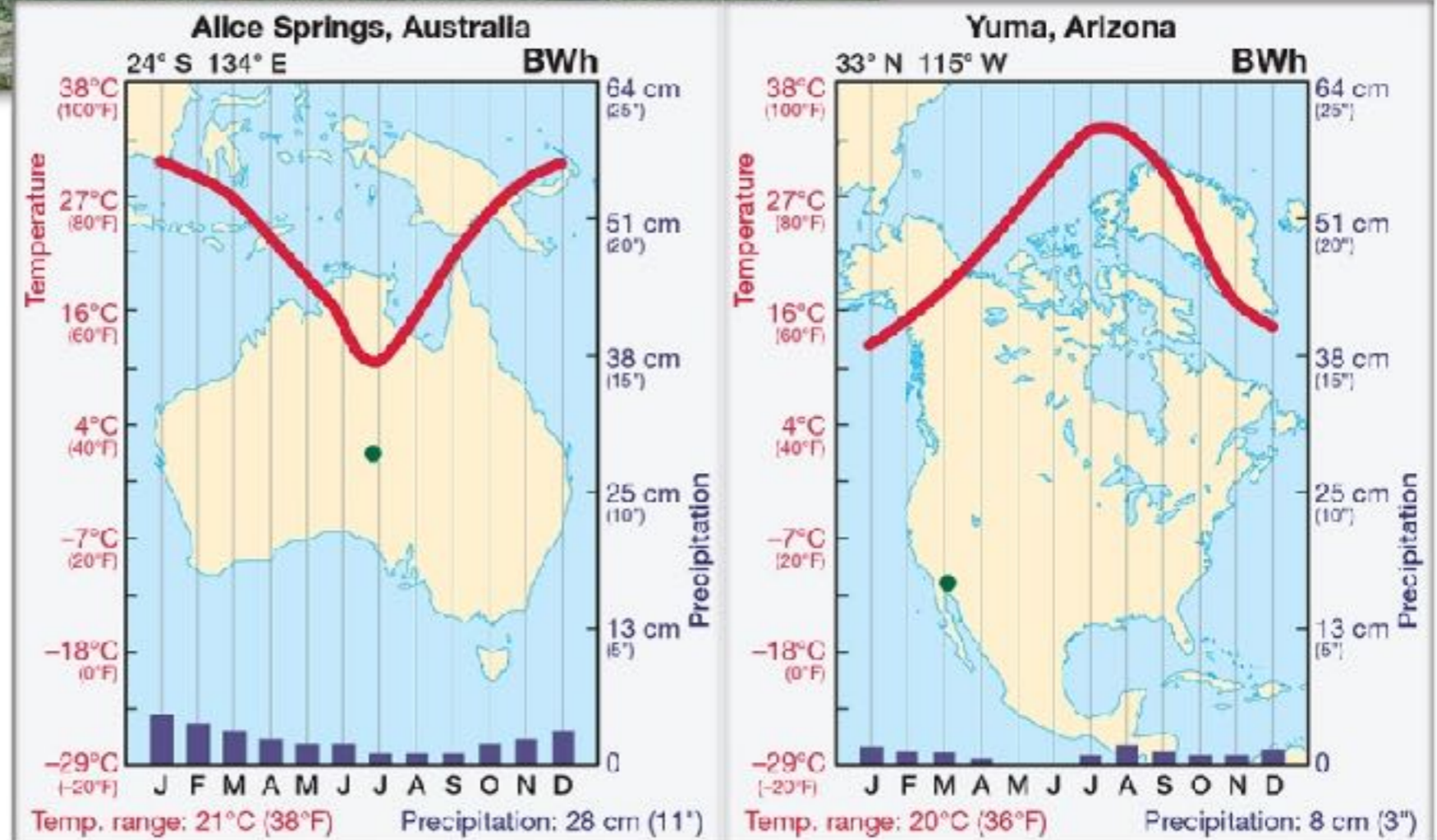
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- B. Dry Climates (Group B) cover more land area than any other climatic zone; about 30% of the Earth's land surface.
 - 1. They are caused more by a lack of uplift rather than lack of moisture in the air.
 - 2. Dry climates are divided into four types (BWh, BWk, BSh, BSk), with a distinction made between steppe & desert, and where they occur.

- a. The subtropical desert climate (BWh) (arid) lies either in or very near 30° N & S of the equator (w/in the band of subtropical highs).
 - (1) the Sahara & the Arabian deserts are examples
 - (2) many of the deserts are found along the western coasts of continents due to cold water currents off their coasts (the Atacama in S.A., the Namib in Africa)
 - (3) Precipitation is scarce, unreliable, but intense, local, & brief when it does occur.
 - (4) They can possess astounding daily temperature variations, commonly with as much as a 50°F difference between day and night in the spring & fall.

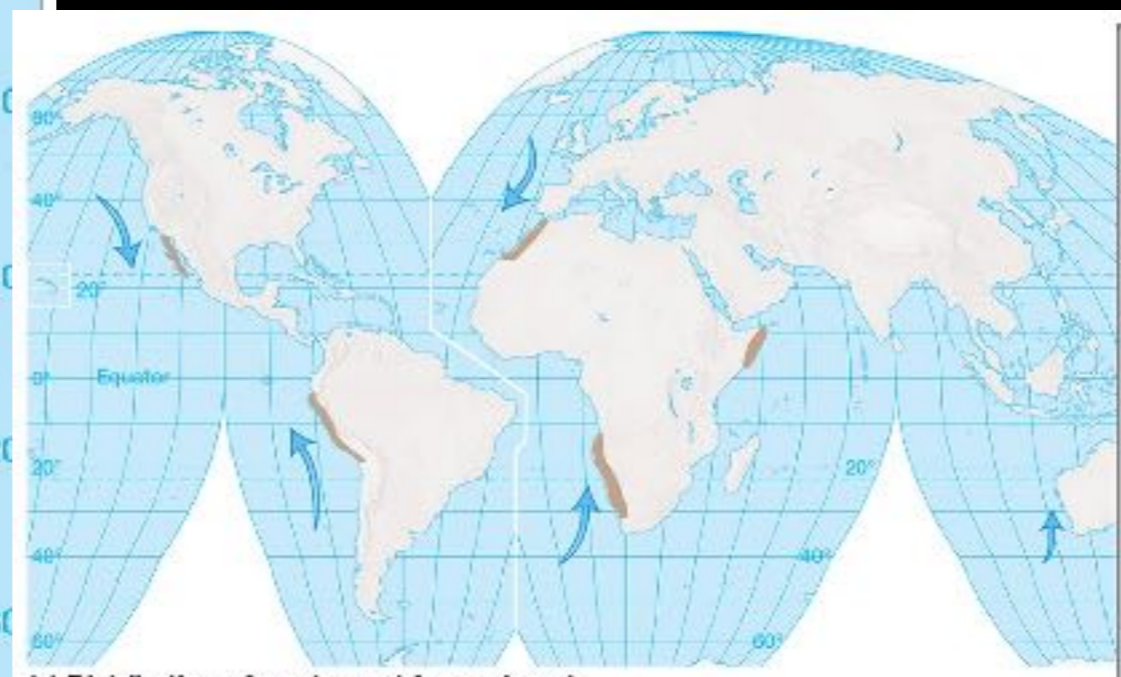


(a) Subtropical desert climate

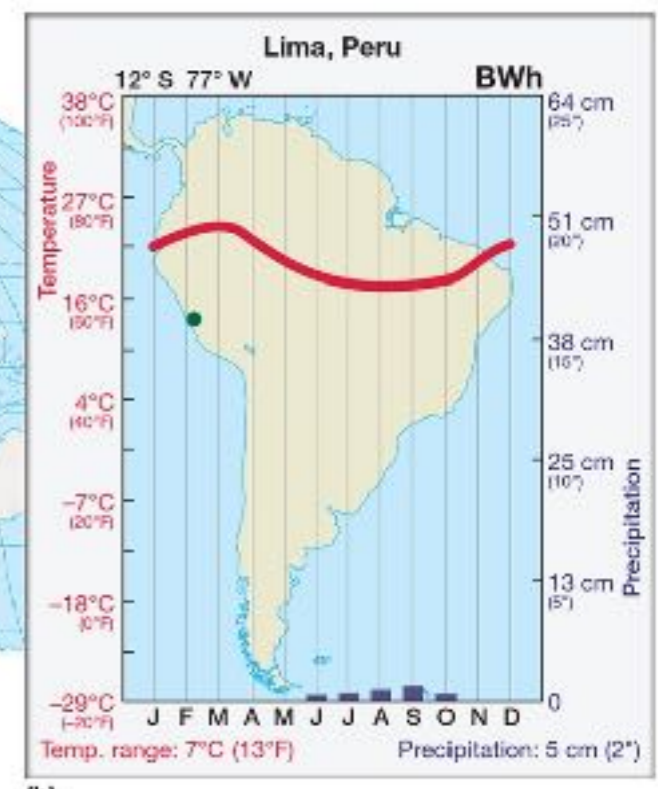


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(a) Distribution of west-coast foggy deserts

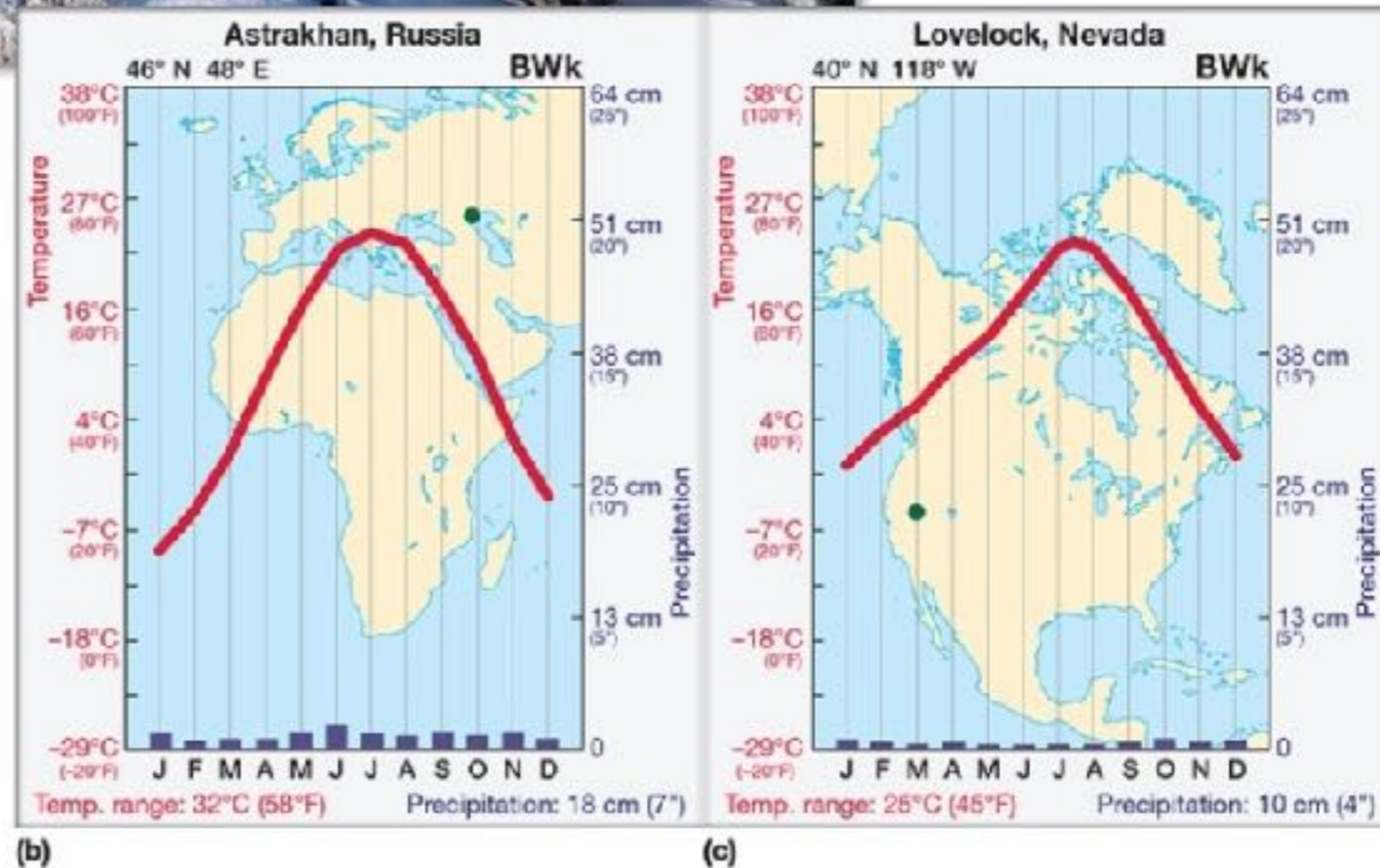


(b)

- b. The mid-latitude desert climate (BWk) (arid) occurs deep in the interior of continents.
 - (1) Precipitation is similar to subtropical deserts, except their is seasonality
 - (2) Temperature is very different from subtropical deserts in that they have severely cold winters.



(a) Midlatitude desert climate



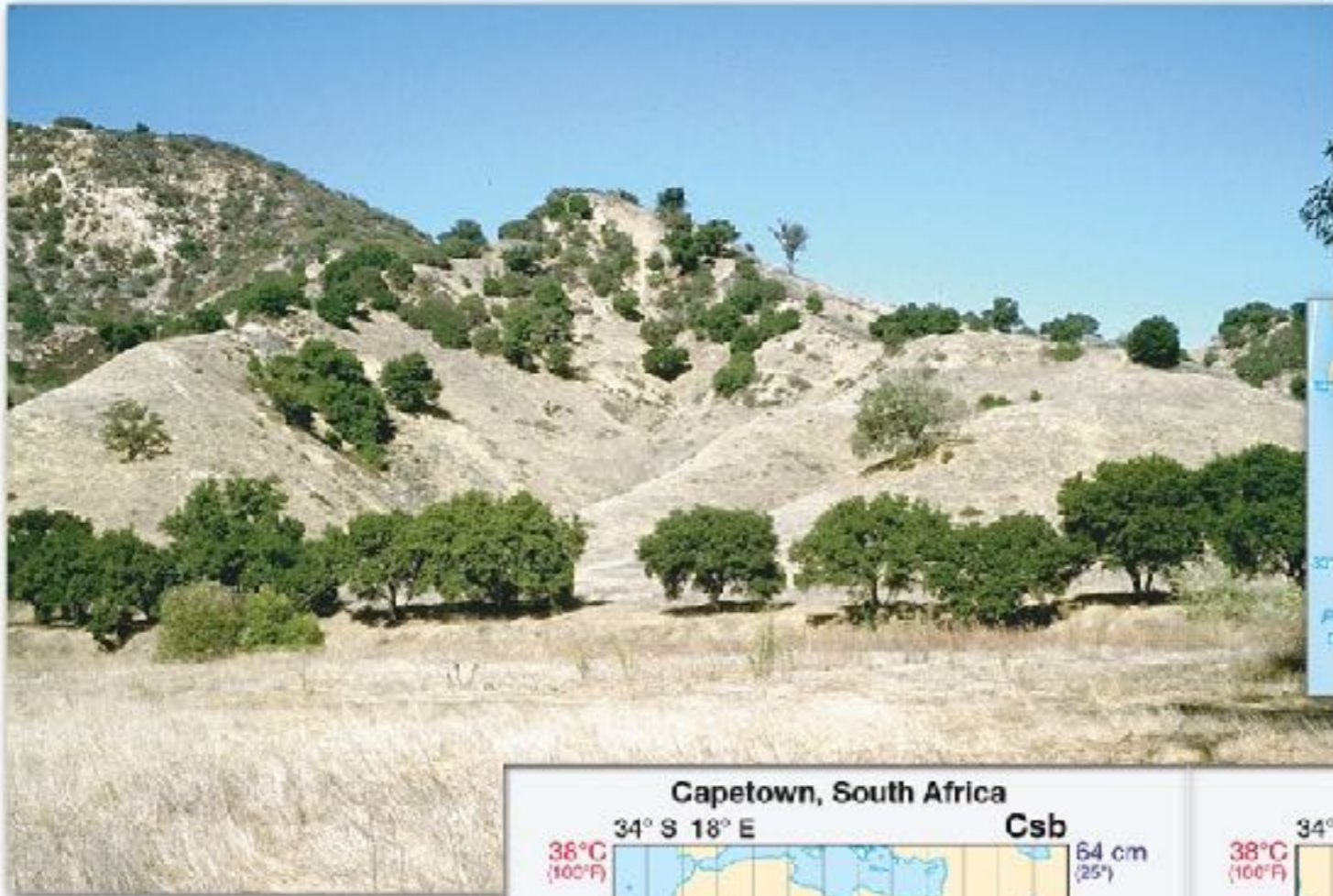
- c. The subtropical steppe climate (BSh) (semi-arid) typically surrounds subtropical deserts & has similar temperature & precipitation patterns, just not as extreme.
 - (1) Rainfall is somewhat greater & more reliable.
 - (2) Temperatures are more moderated, not as extreme.

- d. The mid-latitude steppe climate (BSk) (semi-arid) occupies a transitional zone between mid-latitude deserts & humid climates.
 - (1) There is more precipitation & less temperature extremes than neighboring deserts.

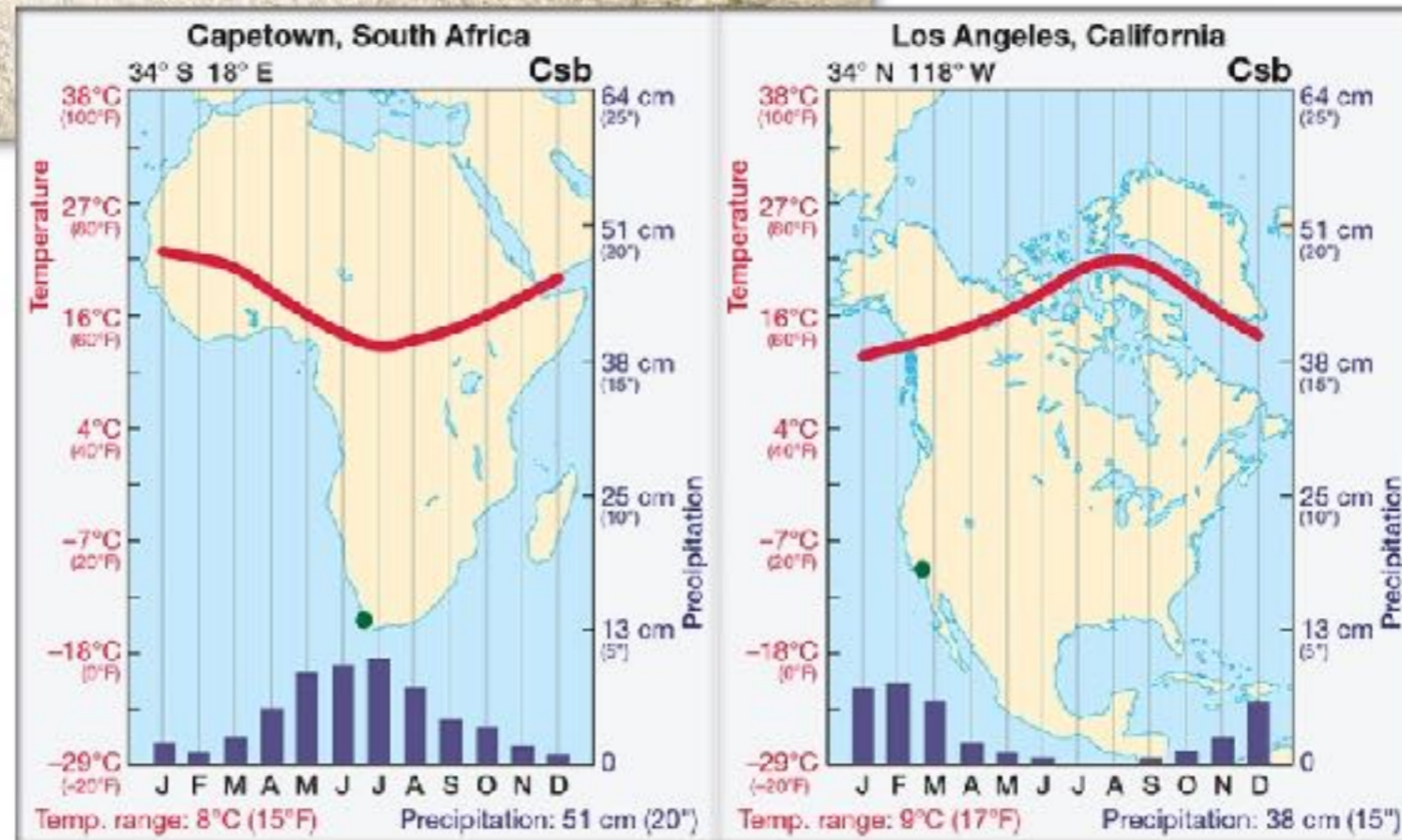


- C. Mild Mid-Latitude Climates comprise Group C & occupy a region generally from the equatorward margin of the middle latitudes & extending into the subtropics; also extending poleward along western coastal areas.
 - 1. They are known for having long & usually hot summers & short, relatively mild winters.
 - 2. They do not have a year-round growing season.
 - 3. Precipitation is highly variable across the subdivisions.
 - 4. Subdivisions of the C climates are determined primarily on precipitation seasonality & secondarily on summer temperatures.

- a. The Mediterranean climate zones (Csa, Csb) are found mainly on the western sides of continents.
 - (1) Influenced by westerly winds; almost all precipitation comes from west moving mid-latitude storms.
 - (2) Coastal areas have much milder summers than inland areas due to the sea breeze.



(a) Mediterranean climate

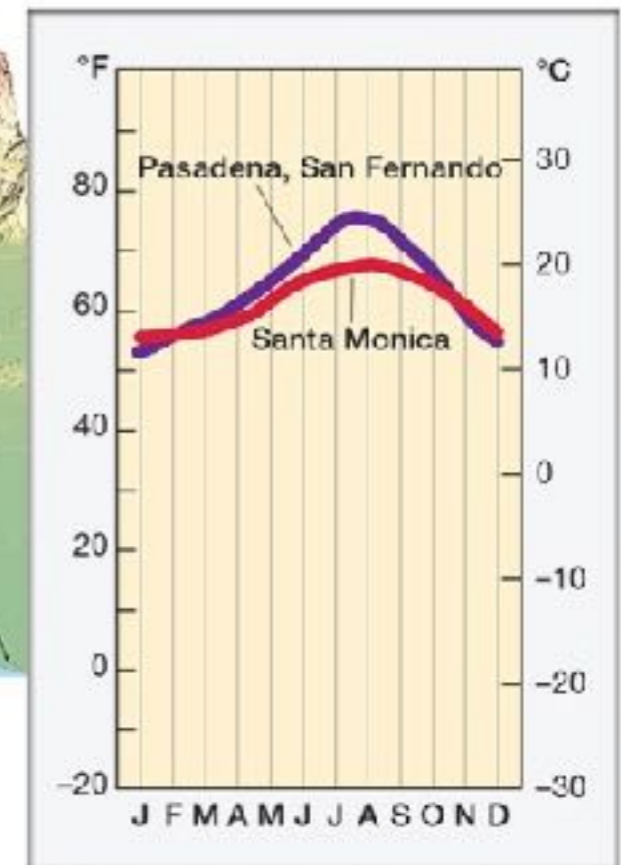


(b)

(c)



(a) Mediterranean areas: coastal versus inland

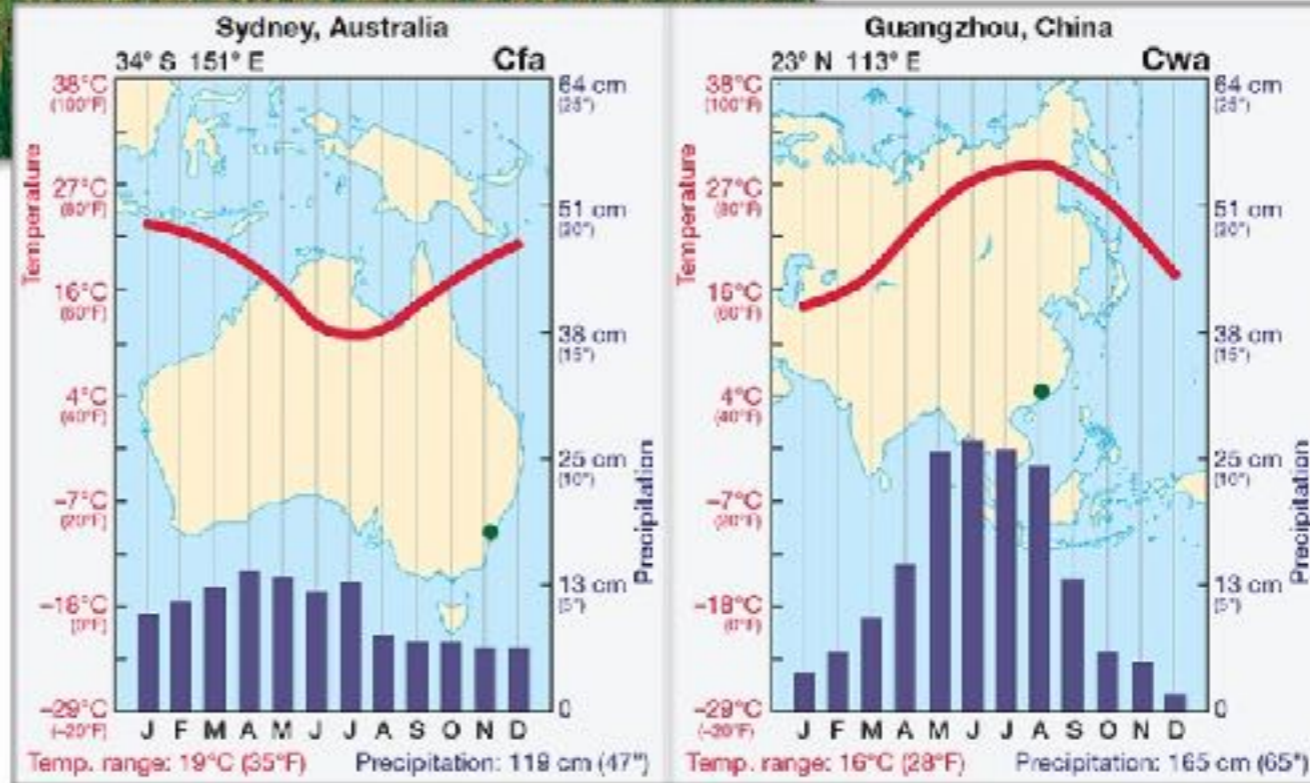


(b) Temperatures of coastal and inland stations

- b. The humid subtropical climates (Cfa, Cwa, Cwb) are generally found on the east coast of continents.
 - (1) They extend across more latitudes than the Mediterranean climates.
 - (2) Summer temperatures are warm to hot and summers possess high levels of humidity.
 - (3) Winter temperatures are generally mild, but can have episodes of severely cold weather brought by west moving cold air fronts.



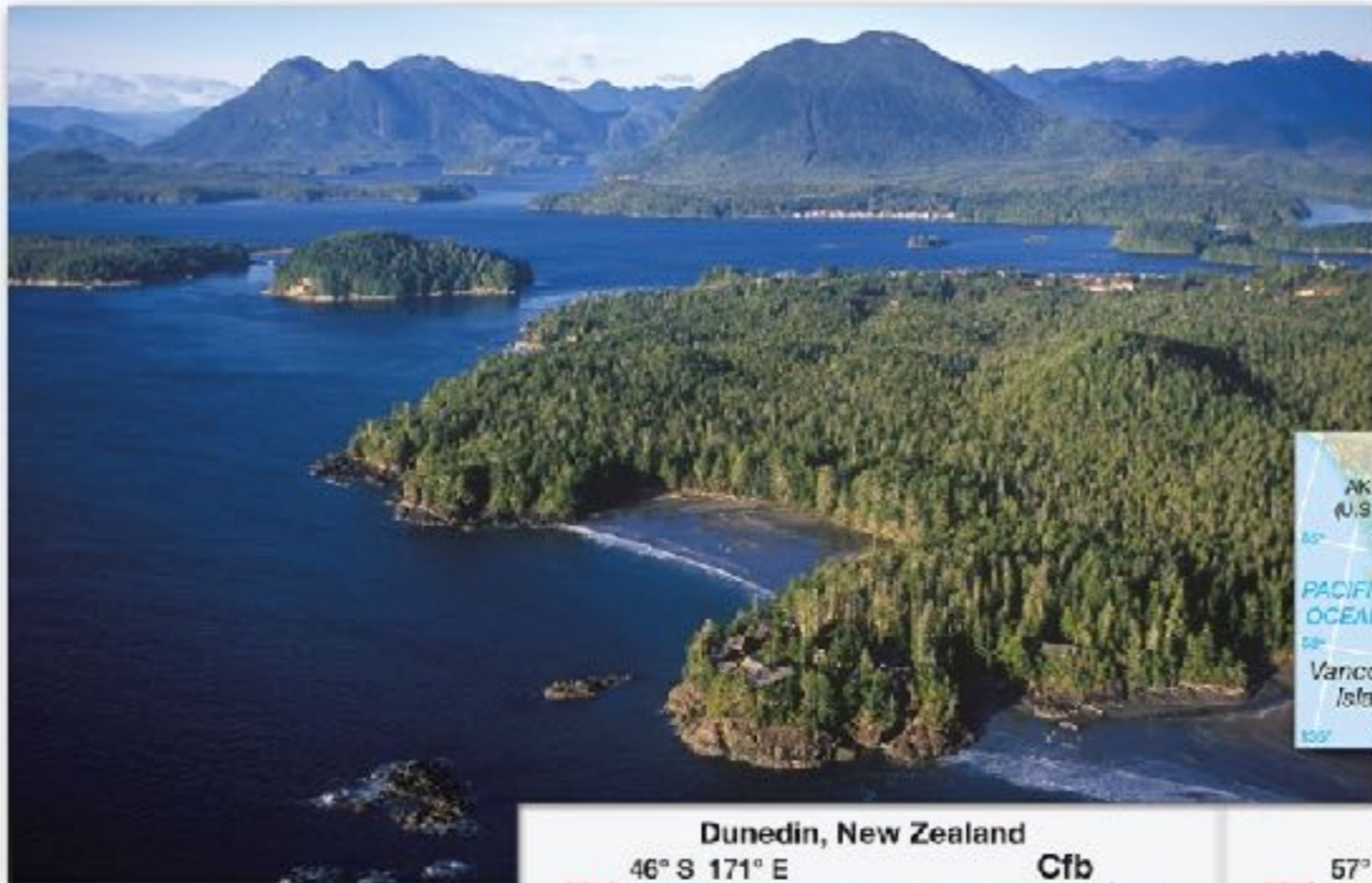
(a) Humid subtropical climate



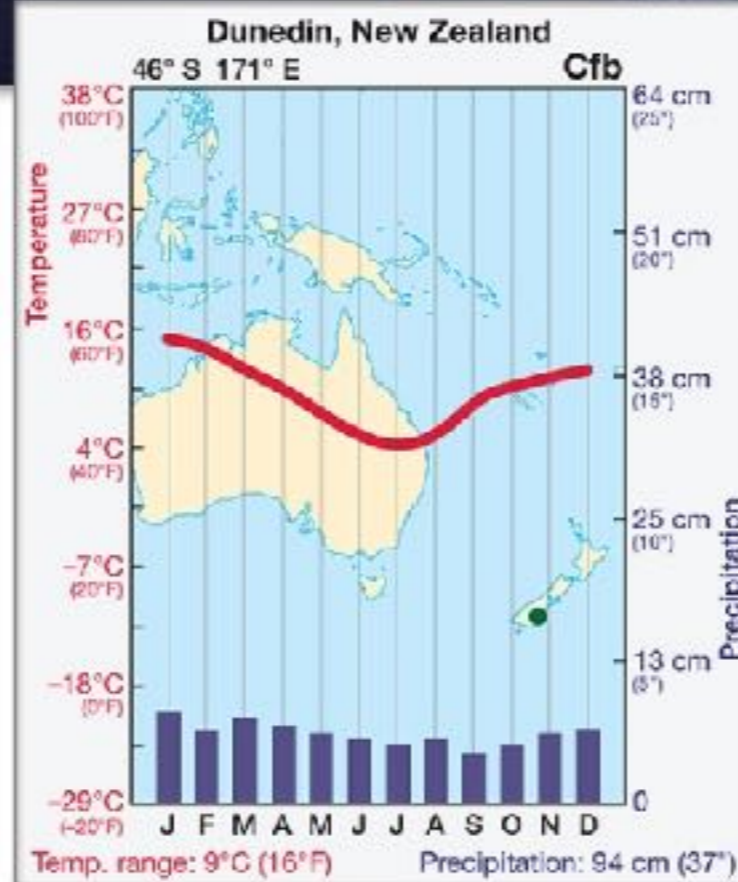
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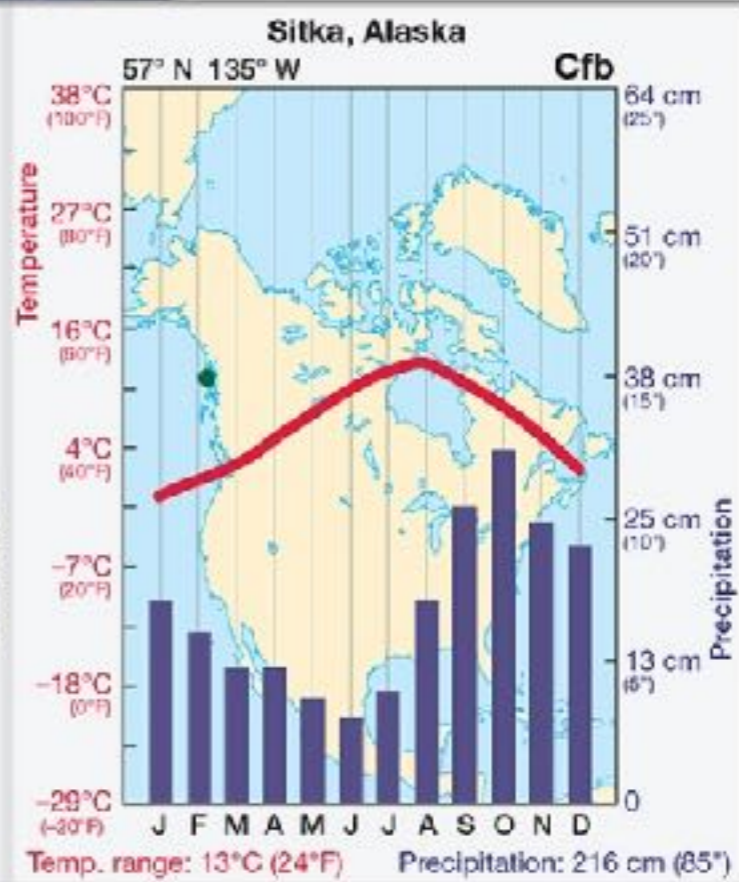
- c. Marine west coast climates (Cfb, Cfc) occur about 40° to 60° in latitude and on the west (windward) side of continents.
 - (1) It extends to the east coast in some Southern Hemisphere areas (example: South America).
 - (2) Temperatures are milder with few extremes due to the moderating effects of the oceans.
 - (3) It is among the wettest of the mid-latitude climates.
 - (4) Lowland areas rarely get snow, but higher altitudes can receive some of the heaviest snowfalls in the world along their west-facing slopes.
 - (5) Rainfall probability and reliability is high; the intensity low.



(a) Marine west coast climate



(b)



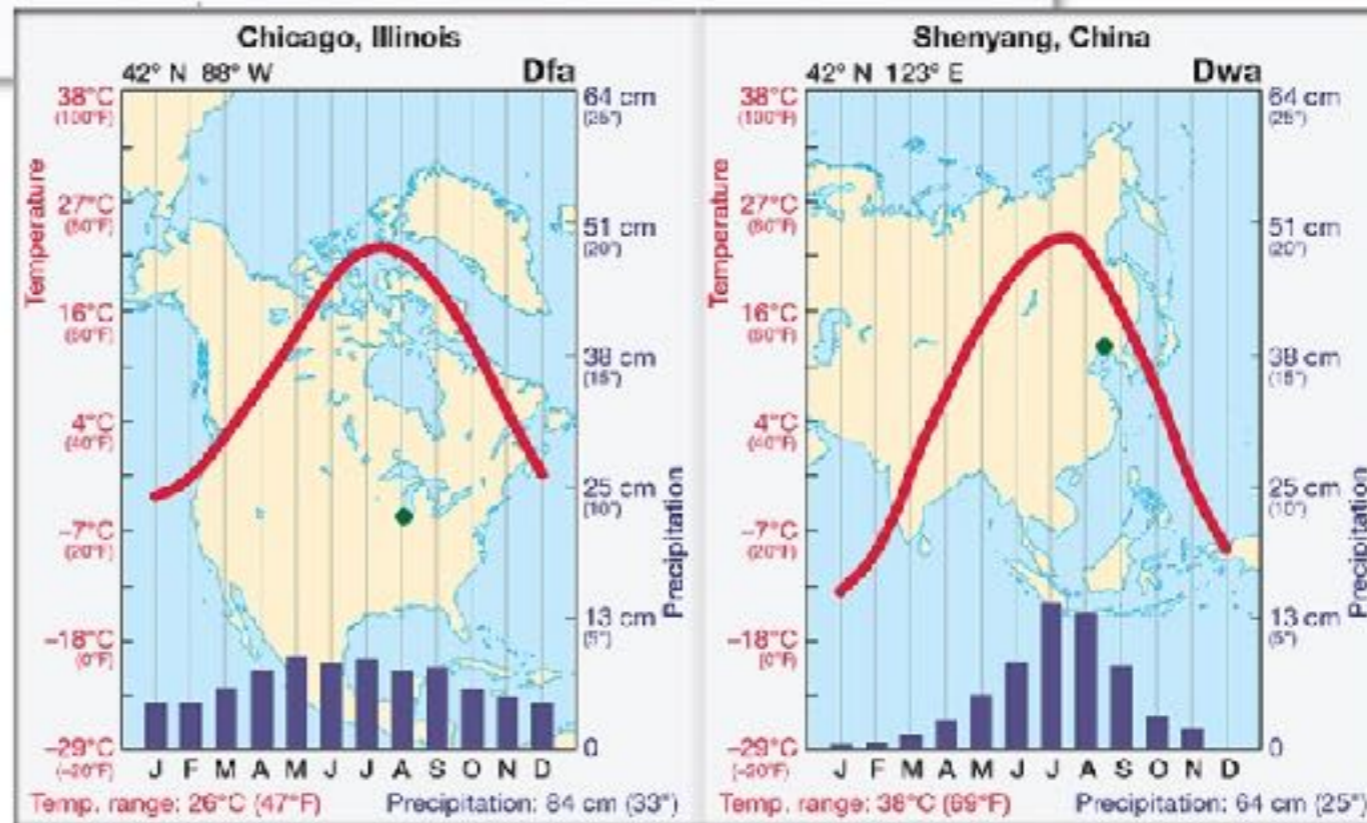
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- D. The severe mid-latitude climates only occur in the Northern Hemisphere between about 40° & 70° N. There is little landmass at these latitudes in the Southern Hemisphere.
 - 1. Continentality generates extremes between summer & winter temperatures due to the lack of the moderating effects of water.
 - 2. There are four distinct seasons.
 - 3. Moderate precipitation with good soil moisture.
 - 4. Divided into two subtypes: humid continental & subarctic.

- a. Humid continental climates (Dfa, Dfb, Dwa, Dwb) are generally found between 35° & 60°.
 - (1) There are four subtypes based on latitude.
 - (2) Variability in weather is the main characteristic both seasonal and daily.
 - (i) cold fronts, warm fronts, heat waves, blizzards, thunderstorms, tornados, etc...
 - (3) Westerly prevailing winds cause frequent weather changes especially in the winter.
 - (4) Summers are as warm as humid subtropical, but shorter.



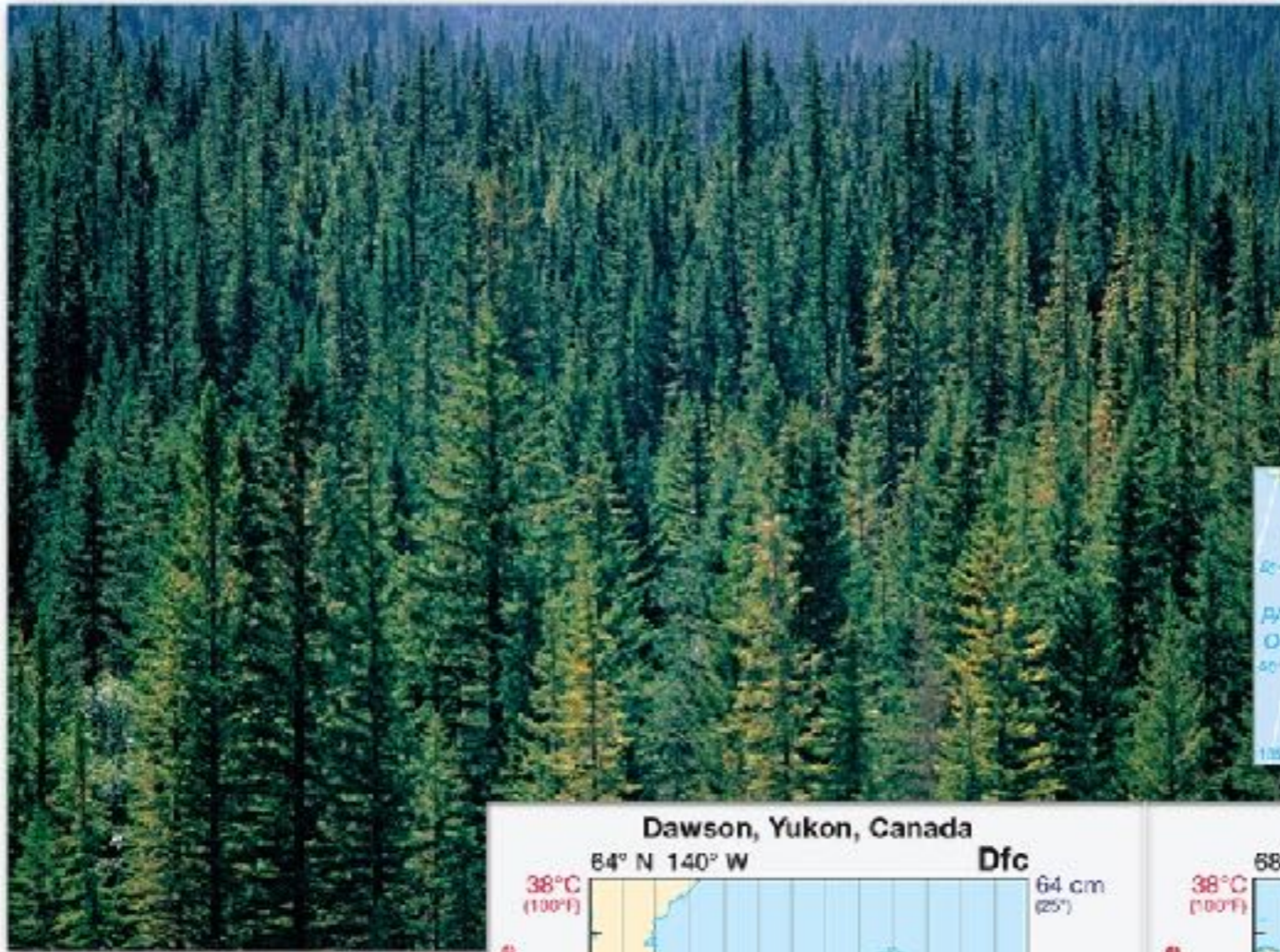
(a) Humid continental climate



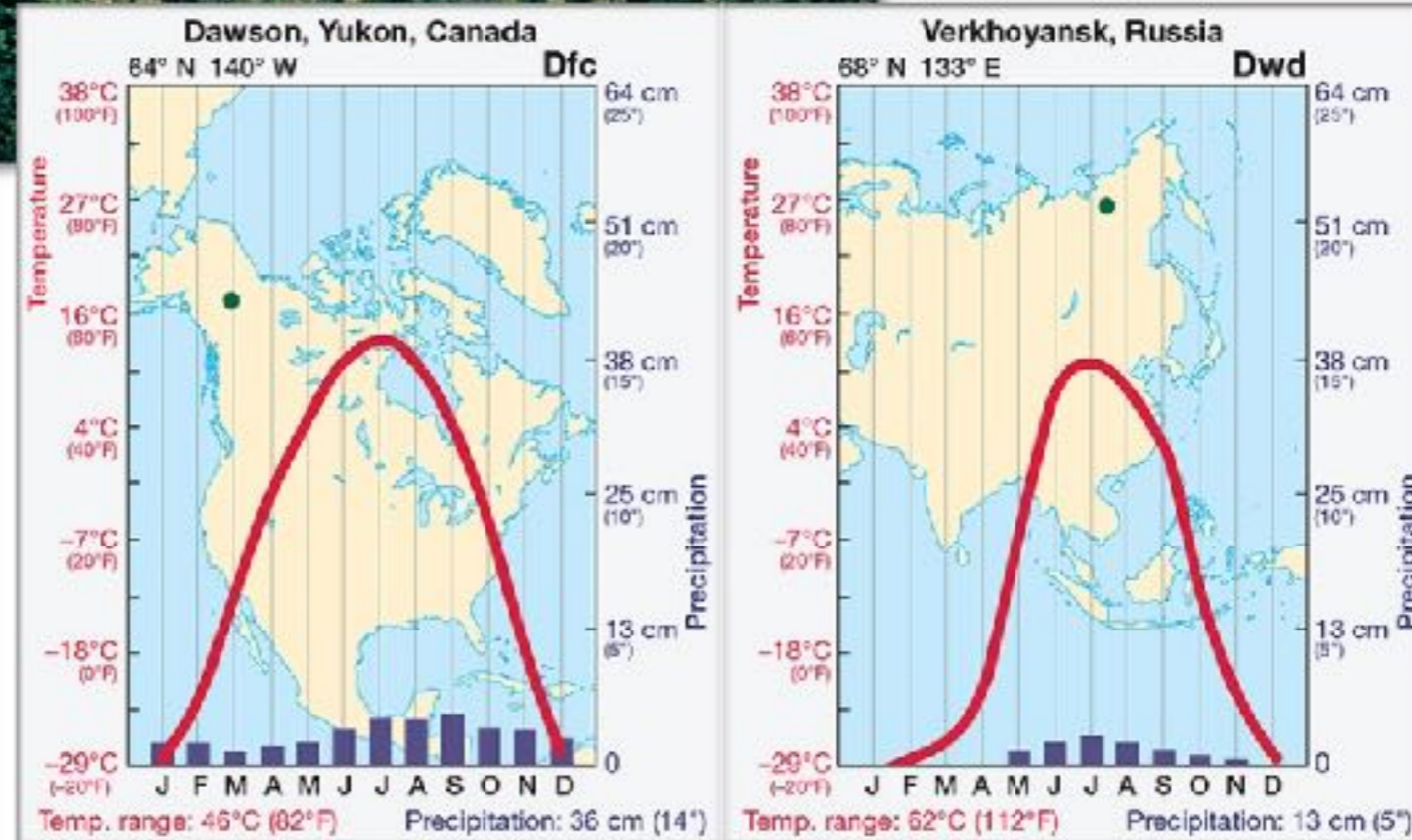
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- b. The subarctic climates (Dfc, Dfd, Dwc, Dwd) occupy high mid-latitudes generally between 50° & 70°.
 - (1) They create two vast uninterrupted expanses: Alaska to Greenland & from Scandinavia to the easternmost part of Siberia in Russia.
 - (2) “Boreal” means northern and is used in Canada.
 - (3) “Taiga” is the term used in Eurasia, named after the forests.
 - (4) Long, dark, bitterly cold winters, the dominant season.
 - (5) Mild summers very short.
 - (6) Largest annual temperature ranges in the world
 - (7) Very little precipitation.



(a) Subarctic climate



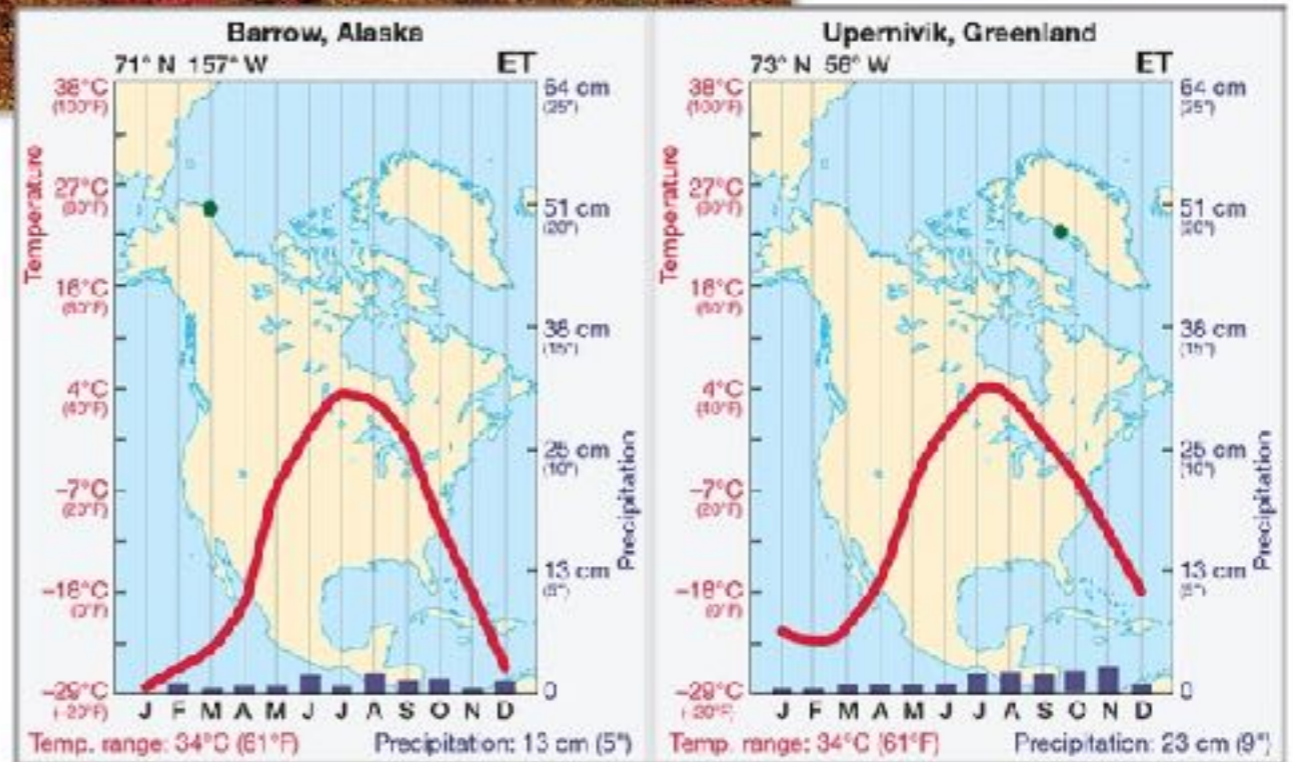
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(c)

- E. Polar climate comprise Group E. No month has an average temperature above 50° F.
 - 1. Lowest annual temperatures in the world.
 - 2. Extraordinarily dry, but humid due to low evaporation.
 - 3. Two subtypes (ET, EF) tundra and polar ice cap.
 - a. The tundra climate (ET) has grasses but no trees due to the ground being permanently frozen starting just a few inches from the surface (permafrost).
 - (1) Freezing temps can occur at any time.
 - (a) Only one to four months have average temps above freezing.



(a) Tundra climate



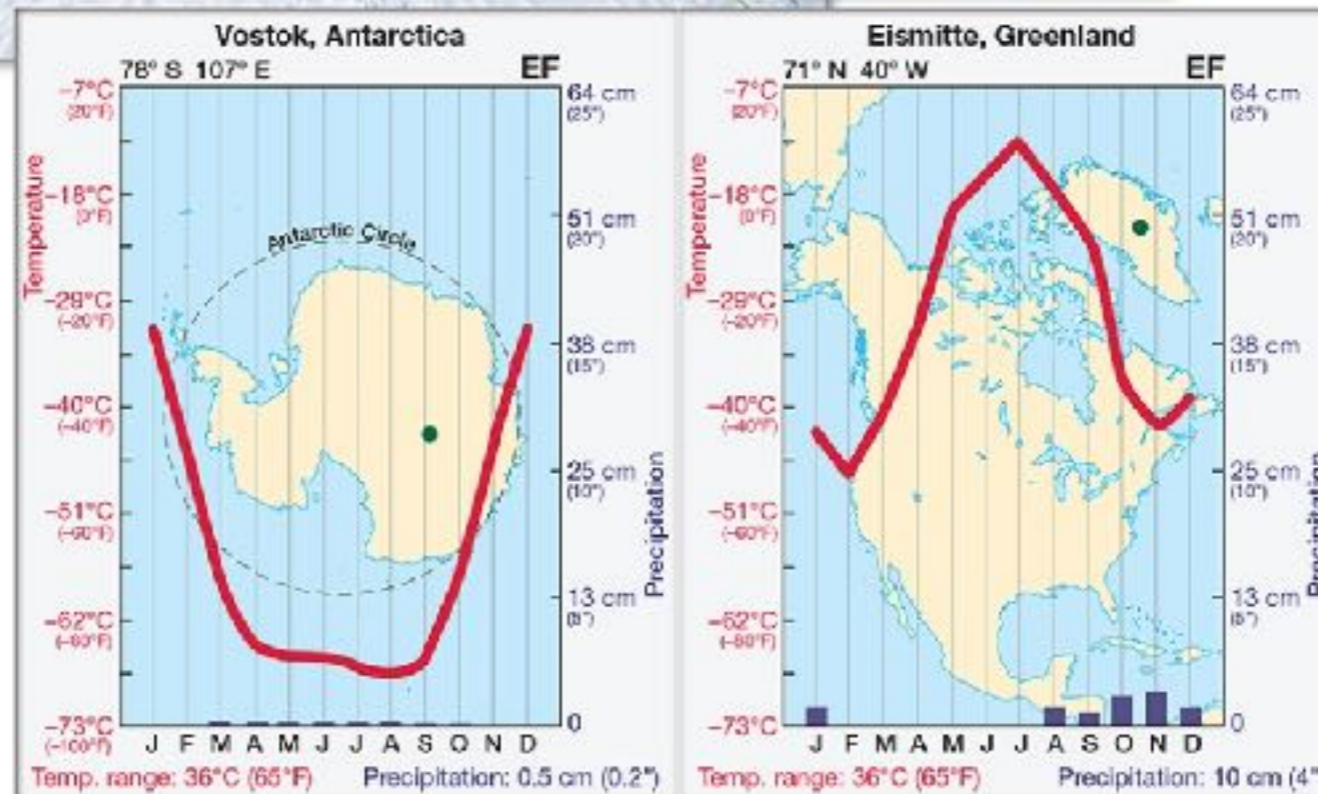
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- b. The ice cap climate (EF) occurs in Greenland and most of Antarctica.
 - (1) All monthly temperature averages are below 32° F.
 - (2) Permanently covered with ice and snow.
 - (3) Strong winds are prevalent.



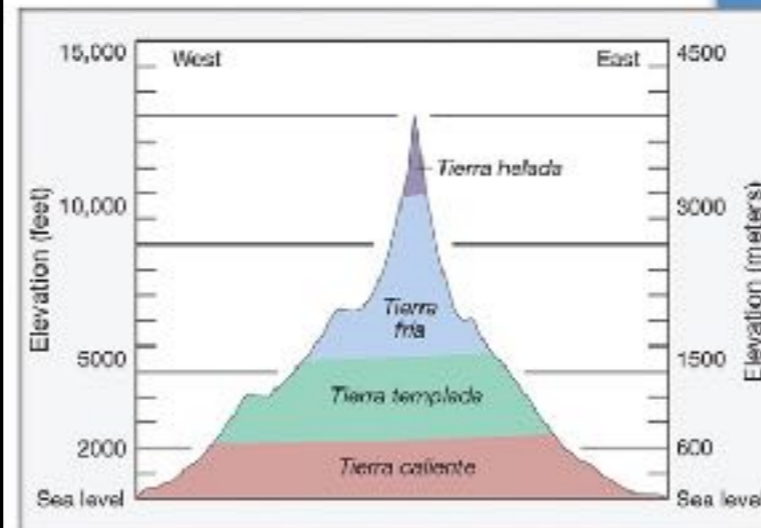
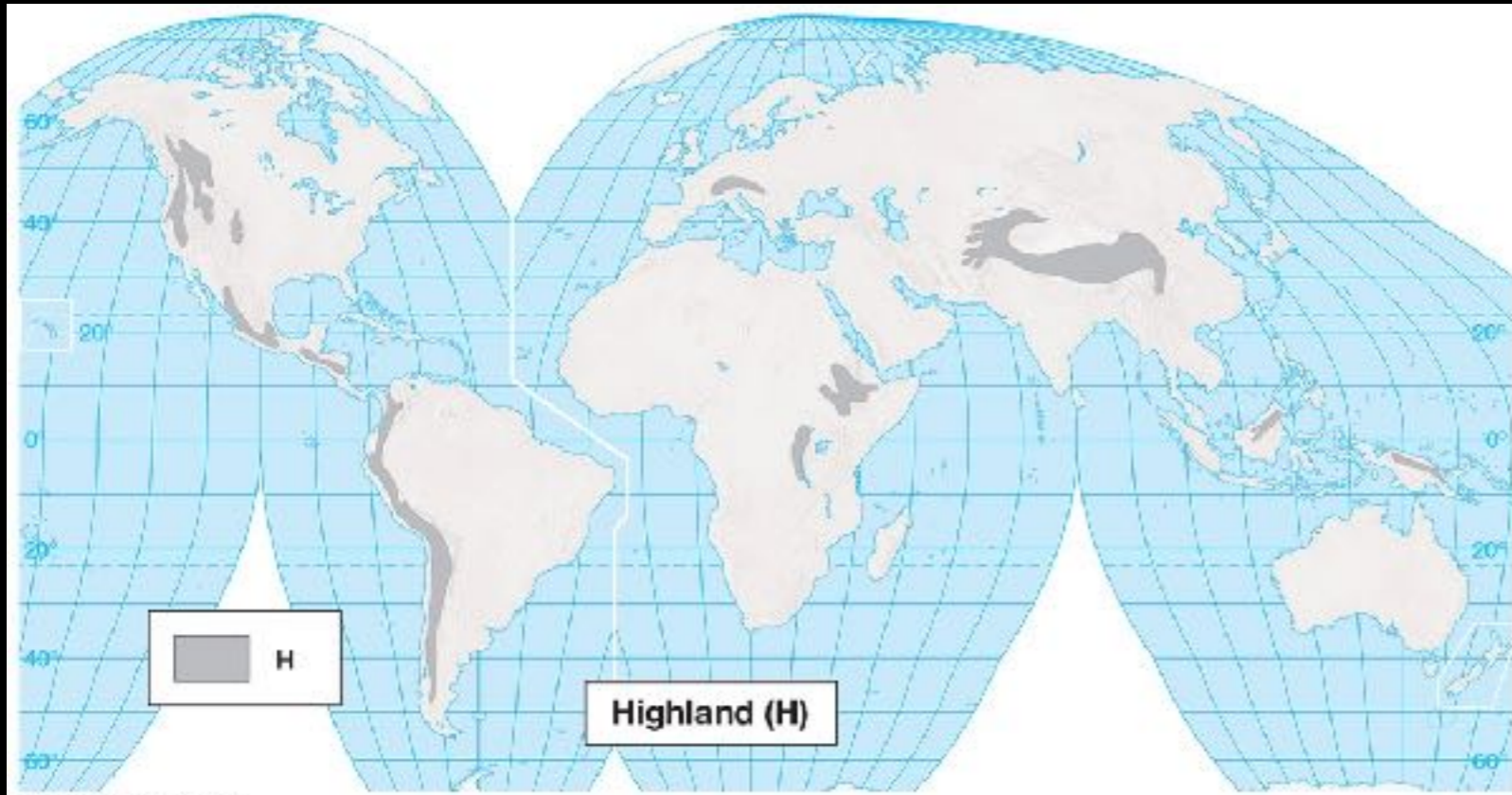
(a) Ice cap climate



(b)

(c)

- F. The highland climate (Group H) is determined by altitude not latitude.
 - 1. Very complex local climate variations in small areas at different altitudes.
 - 2. Climate controls are elevation & angle of exposure to the Sun and winds.
 - a. Latitude is less important, altitude is more.
 - b. Leads to patterns of vertical zonation especially in tropical highlands.
 - c. Highlands have a windward and leeward side of exposure.
 - (1) Heavier precipitation and winds on the windward side. Rapid cloud development due to uplift.
 - (2) Dry on the leeward side (rainshadow deserts)
 - d. Daily temperature changes can be very high.



(a) Vertical zonation



(b) Highland climate



