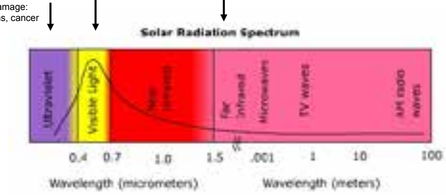
Physical geography and the functioning of the Earth

Peak in Sun's spectrum

Peak in Earth's spectrum (not shown) (why?)

Photodamage: sunburns, cancer



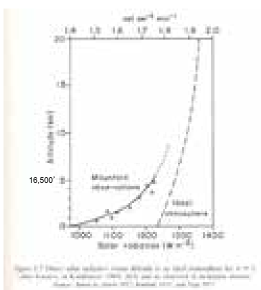
Photosynthesis (why?)

www.uwsp.edu/geo/faculty/ritter/geog101/uwsp_lectures/lecture_radiation_energy_concepts.html

Physical geography and the functioning of the Earth

Solar/UV radiation as a function of elevation/altitude

For every 1000 m increase in elevation, 1-2% increase in total solar radiation



Barry, 1992

For every 1000 m increase in elevation, 12% increase in UV radiation

/www.familydoctor.co.uk/htdocs/SKINSUN/SKINSUN_specimen.html

Physical geography and the functioning of the Earth

Global climate

Control on temperature: elevation

TABLE 3.1 *The influence of elevation on climate*

Site	Elevation (m)	Temperature (°C) Mean January	Mean July	Lowest	Highest	Mean annual precipitation (cm)
Tucson, Arizona	765	10.9	30.7	-9.4	46.1	27.5
Mt. Lemmon, Arizona	2791	2.0	17.6	-21.7	32.8	70.0
Salem, Oregon	60	3.2	19.2	-24.4	40.0	104.3

Source: Data from U.S. Weather Bureau.

Note: [illegible]

Lomolino et al., 2006

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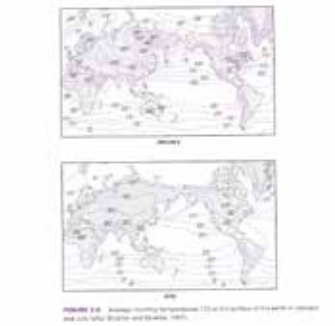
Global temperature patterns



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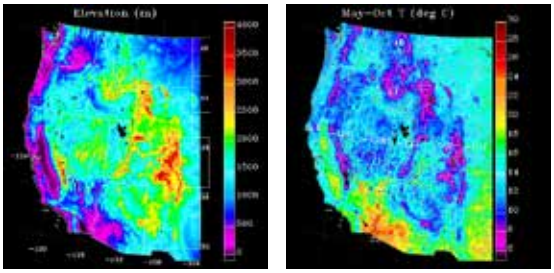
Orographic influences on temperature



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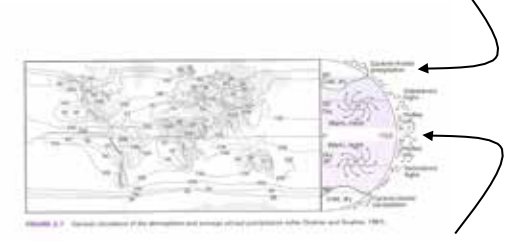
frontal precipitation



precipitation due to convergence: ITCZ

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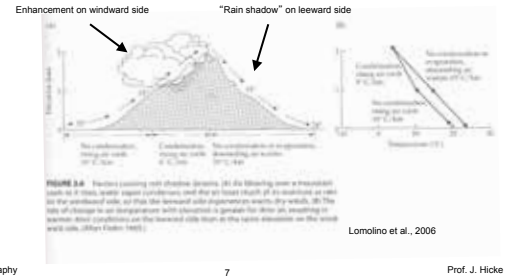
Global climate

Orographic influences on precipitation



Lomolino et al., 2006

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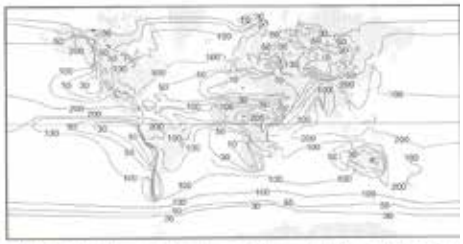
Global climate

Precipitation (cm per year)



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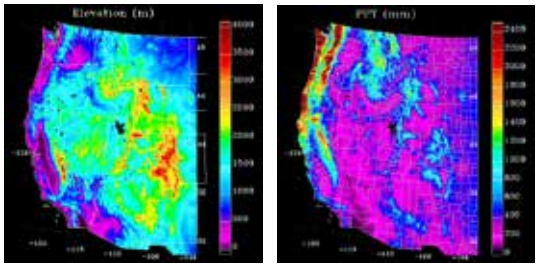
Physical geography and the functioning of the Earth

Orographic influences on precipitation



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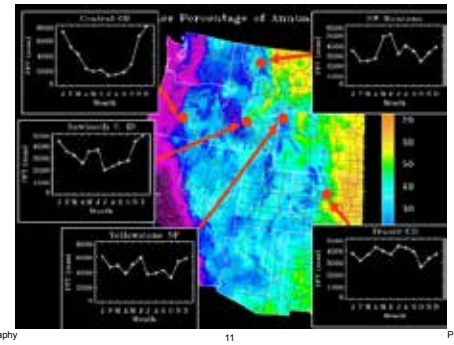
Seasonal distribution of precipitation: % summer precip



Physical geography and the functioning of the Earth

Global climate

Climate classifications: Köppen

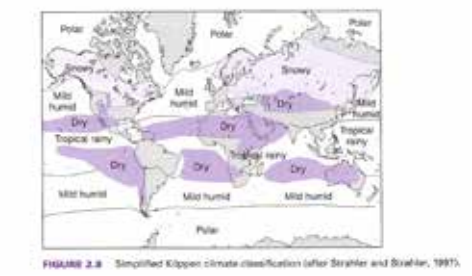


FIGURE 2.8 Simplified Köppen climate classification (after Strahler and Strahler, 1997).

Physical geography and the functioning of the Earth

Microclimate

Aspect

West of Denver, CO

Physical geography and the functioning of the Earth

Microclimate

Slope

Drainage: Boreal bog

http://www.chem.ucla.edu/~alice/explorations/churchill/landscapes.htm

Disturbance

http://xpda.com/junkmail/junk154/PICT1778.jpg

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Microclimate

Vegetation

pinker.wjh.harvard.edu/photos/new_zealand/pages/meadow%20S%20Alps.htm

http://photos.jibble.org/Longleat/Forest_canopy_at_Longleat

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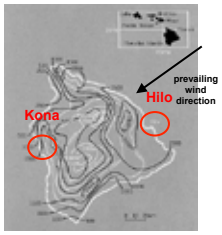
Microclimate: *Windward, leeward*

	Hilo - East - Windward		Kona - West - Leeward	
	daylight (H)	Rain (" / month)	daylight (H)	Rain (" / month)
Jan-Mar	11	11	11	4
Apr-Jun	11	15	11	2
Jul-Sep	12	10	12	0
Oct-Dec	11	15	11	1

http://www.hawaii.islands-holiday.com/weather.html



www.mlo.noaa.gov

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Microclimate: *Shelter*

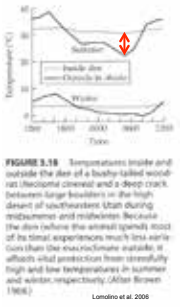


FIGURE 3.18 Temperatures inside and outside the den of a bushy-tailed woodrat (*Neotoma cinerea*) and a deep crack between large boulders on the high desert of southeastern Utah during midsummer and midwinter. Because the den (where the animal spends most of its time) experiences much less variation than the microclimate outside, it affords vital protection from stressfully high and low temperatures in summer and winter, respectively. (After Brown 1968.)

Lomolino et al. 2006

Nurse trees

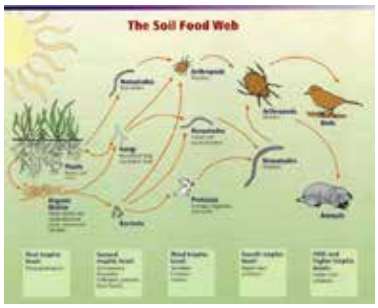
Saguaro in shade of limber bush

Subalpine fir in shade of whitebark pine

helios.bto.ed.ac.uk/bto/desbiome/nursery.htm

Physical geography and the functioning of the Earth

Soil provides habitat for a variety of organisms



soils.usda.gov

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Soil classification

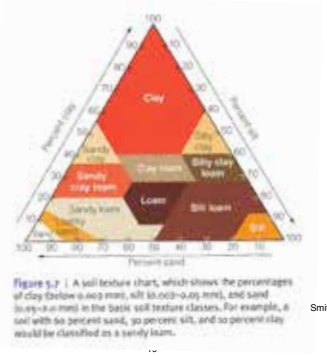
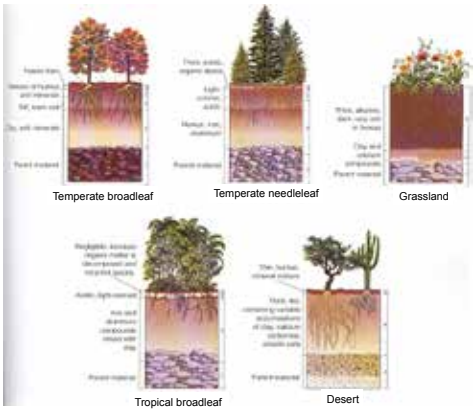


Figure 5.7 | A soil texture chart, which shows the percentages of clay (below 0.002 mm), silt (0.002–0.05 mm), and sand (0.05–2.0 mm) in the basic soil texture classes. For example, a soil with 50 percent sand, 30 percent silt, and 20 percent clay would be classified as a sandy loam.

Smith and Smith, 2006



Physical geography and the functioning of the Earth

Physical Environment of Oceans

State variables

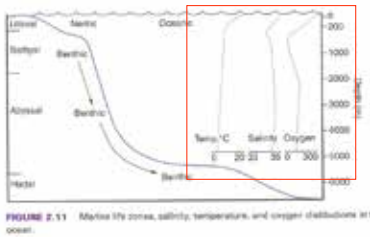


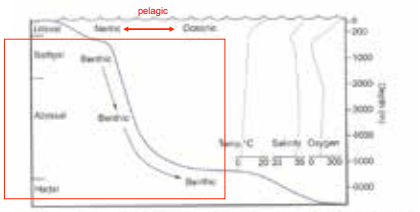
FIGURE 2.11 Marine life zones, salinity, temperature, and oxygen distributions in the ocean.

Pattern of what other state important variable?

Physical geography and the functioning of the Earth

Physical Environment of Oceans

Life zones



Differences in benthic habitat near coast versus well away?

Physical geography and the functioning of the Earth

Ocean temperatures

Ocean salinities

Ocean circulation

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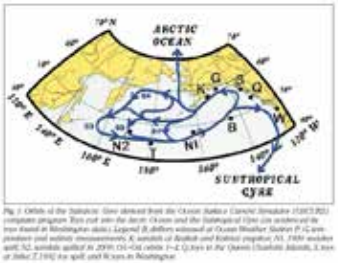
Studies of ocean circulation

- 1990: 80,000 Nike sneakers
- 1992: 29,000 bath toys, tracked 4000 km
- 1992: 28,800 plastic animals
- 2000: 10,224 Nike sandals



Ebbesmeyer et al., 2007