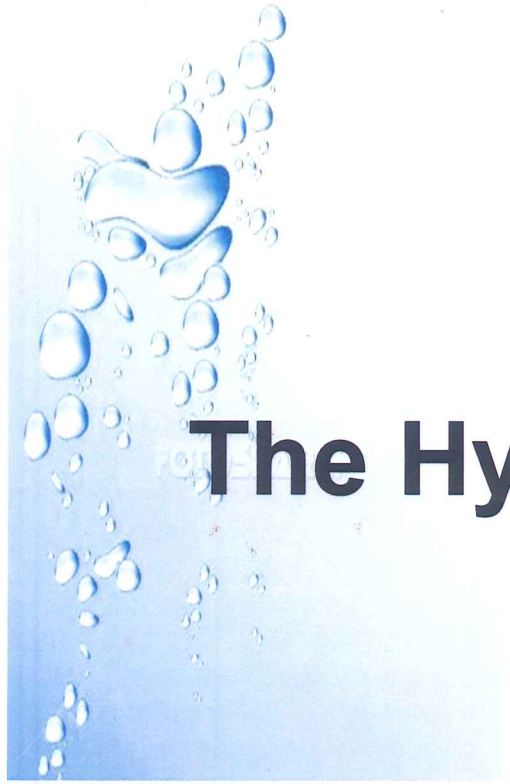


The Hydrologic Cycle and Weather Systems
Lecture 1, 04/02/2013

Arturo Leon, Oregon State University (Spring 2013)

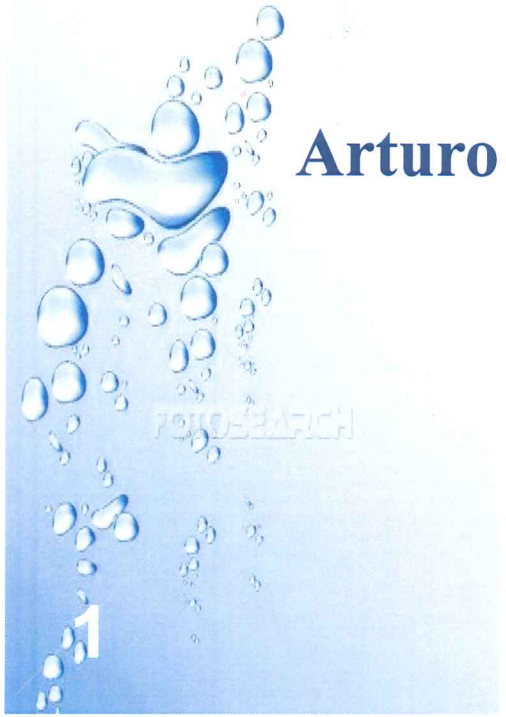
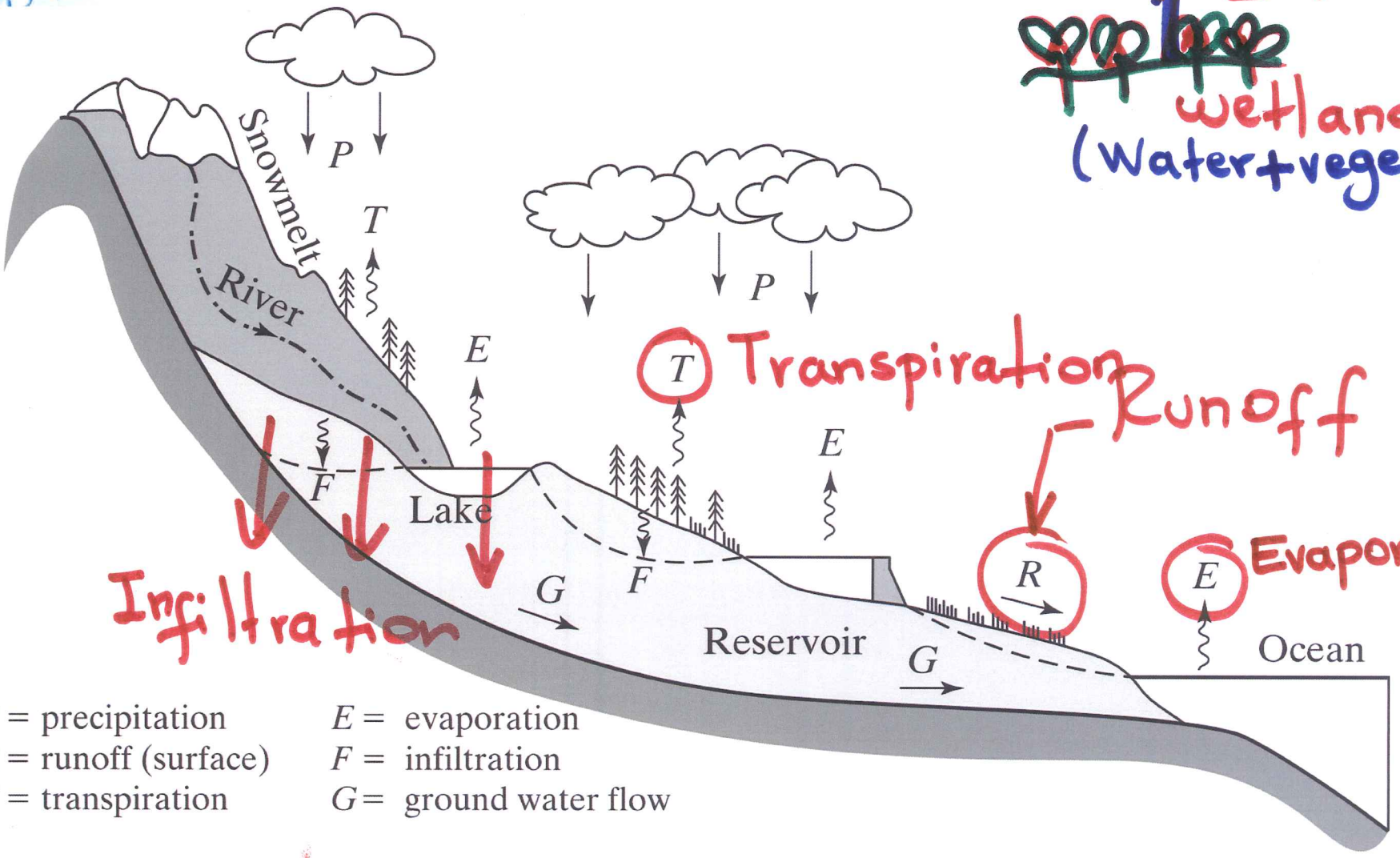


Figure 1-1a The hydrologic cycle



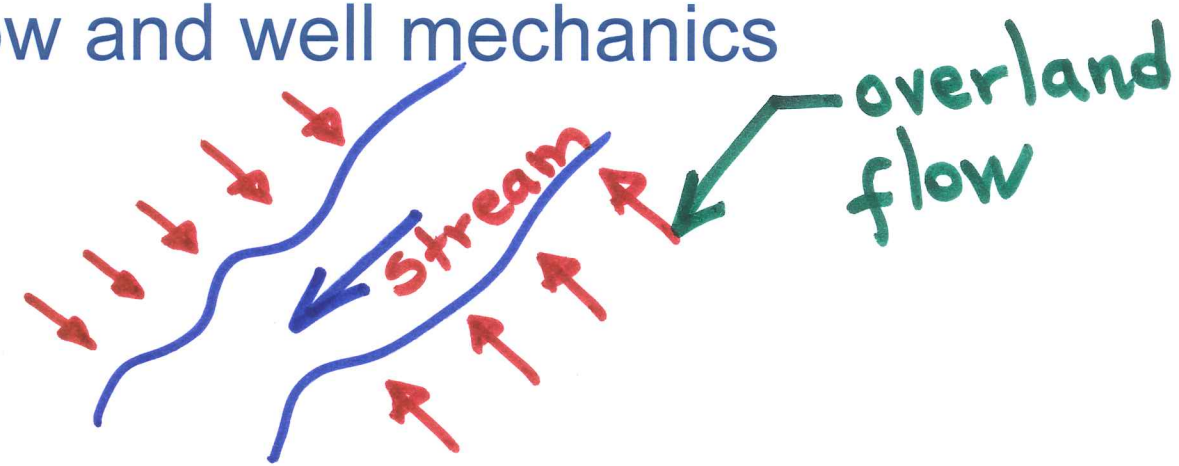
2b

Video of Hydrologic cycle

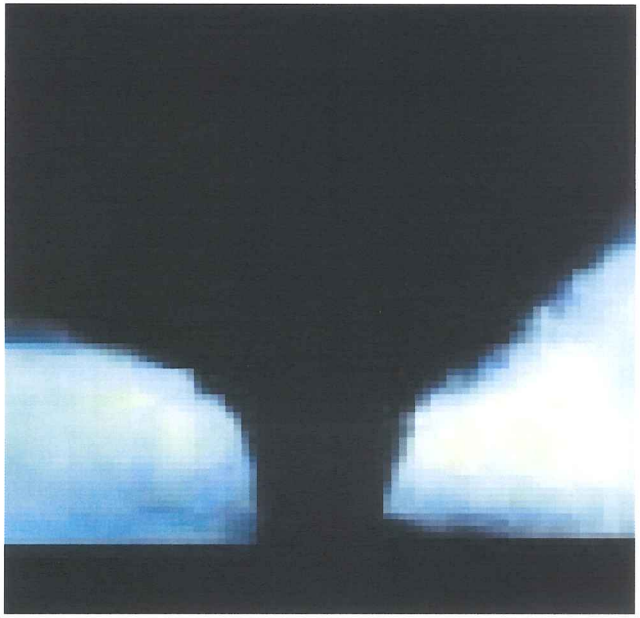
- http://www.youtube.com/watch?v=0_c0ZzZfC8c

Major Hydrologic Processes

- Precipitation (measured by e.g., radar or rain gage)
- Evaporation or ET (loss to atmosphere)
- Infiltration (loss to subsurface soils)
- Overland flow (sheet flow toward nearest stream)
- Streamflow (measured flow at stream gage)
- Ground water flow and well mechanics



Weather Systems



Severe Storms

Atmospheric Water

Many meteorological processes occur continuously within the atmosphere.

- The processes of precipitation and evaporation are the most important for hydrology.

- Much of the water precipitated on the land surface is derived from moisture evaporated from the ocean and transported long distances by Atmospheric Circulation.

7a

Global Atmospheric Circulation

The two basic driving forces of global atmospheric circulation result from

1) The rotation of the earth (Coriolis effect)
2) The transfer of heat energy between equator and the poles

Coriolis effect

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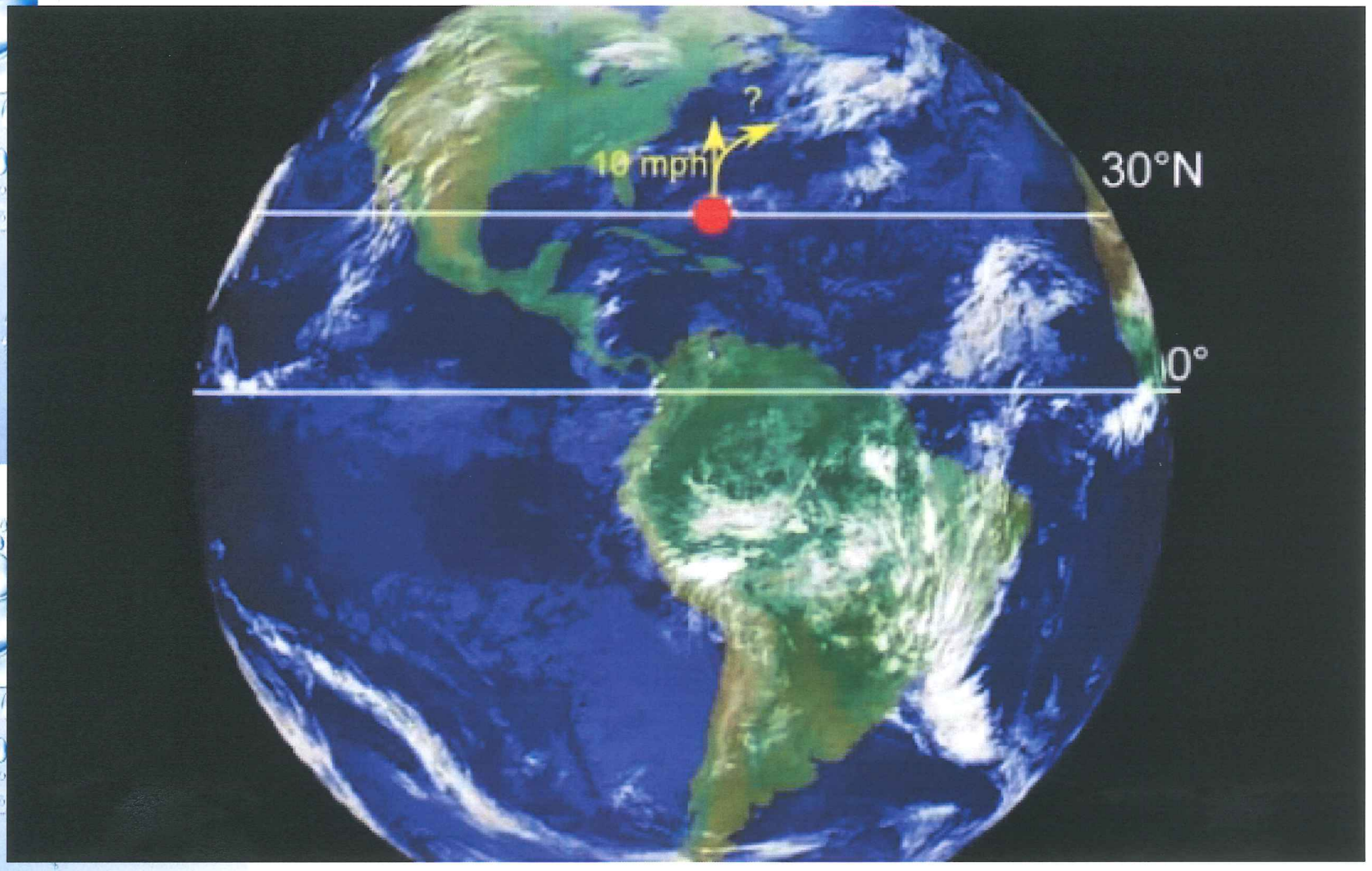
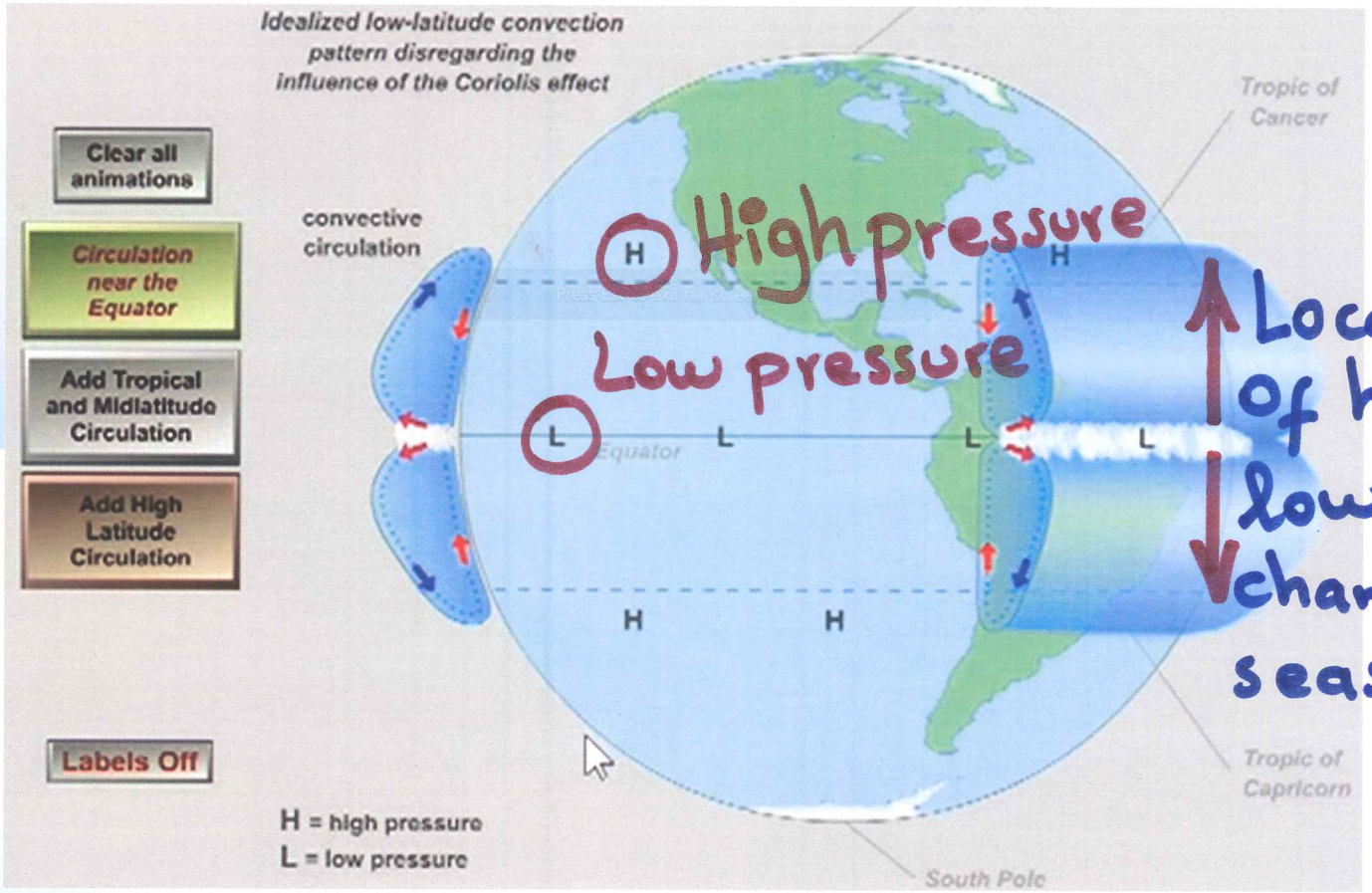


Link: http://www.youtube.com/watch?v=aeY9tY9vKgs

Global Atmospheric Circulation



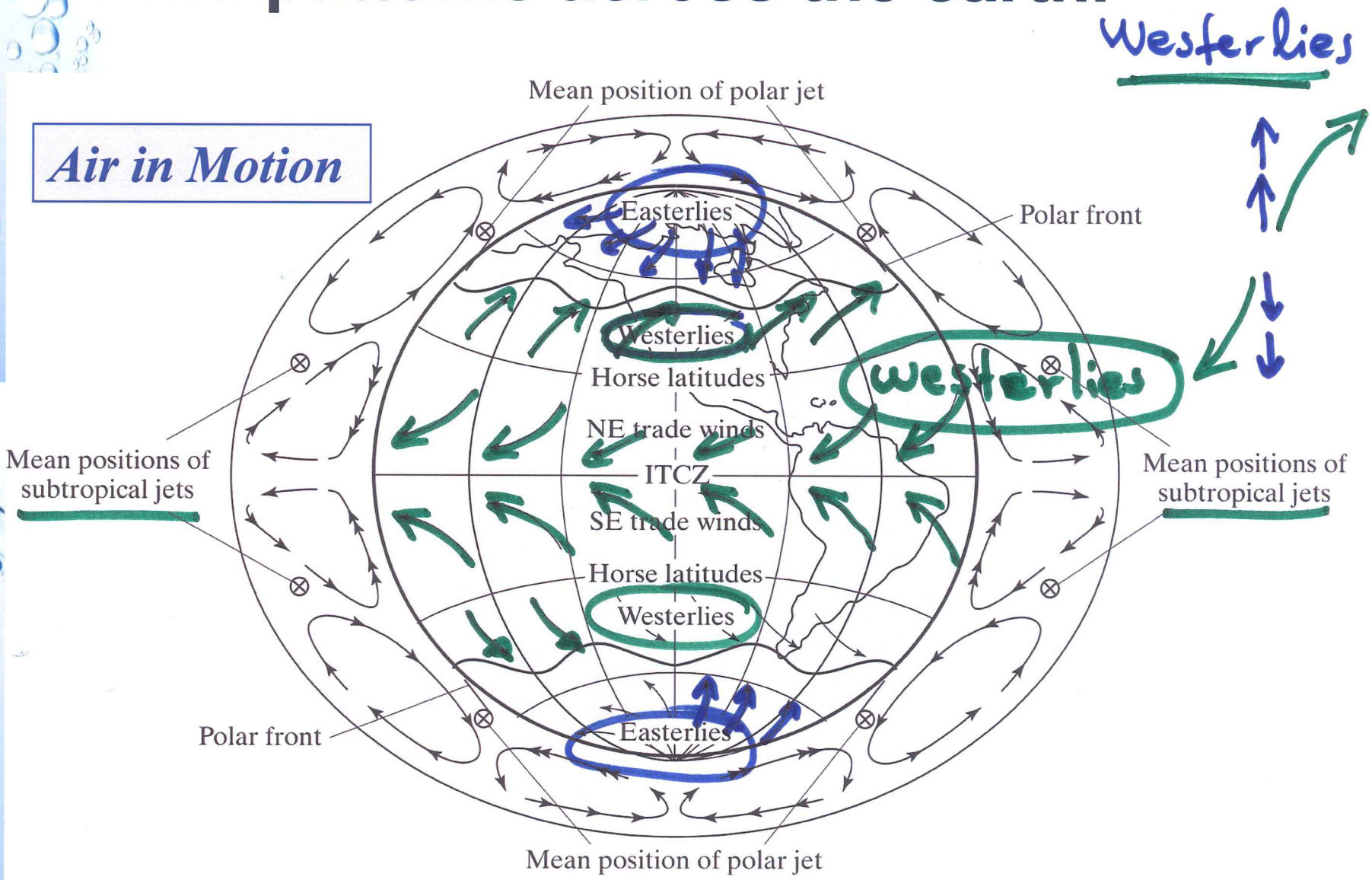
High pressure

Low pressure

Location of high and low pressure changes with season

Link: http://www.youtube.com/watch?v=Ye45DGkqUkE&list=PL81068075ADD8EA8D

Figure 1-3 General circulation of currents and wind patterns across the earth.



Air masses and Fronts: Direction of the cold and warm fronts in the eastern United States.

10

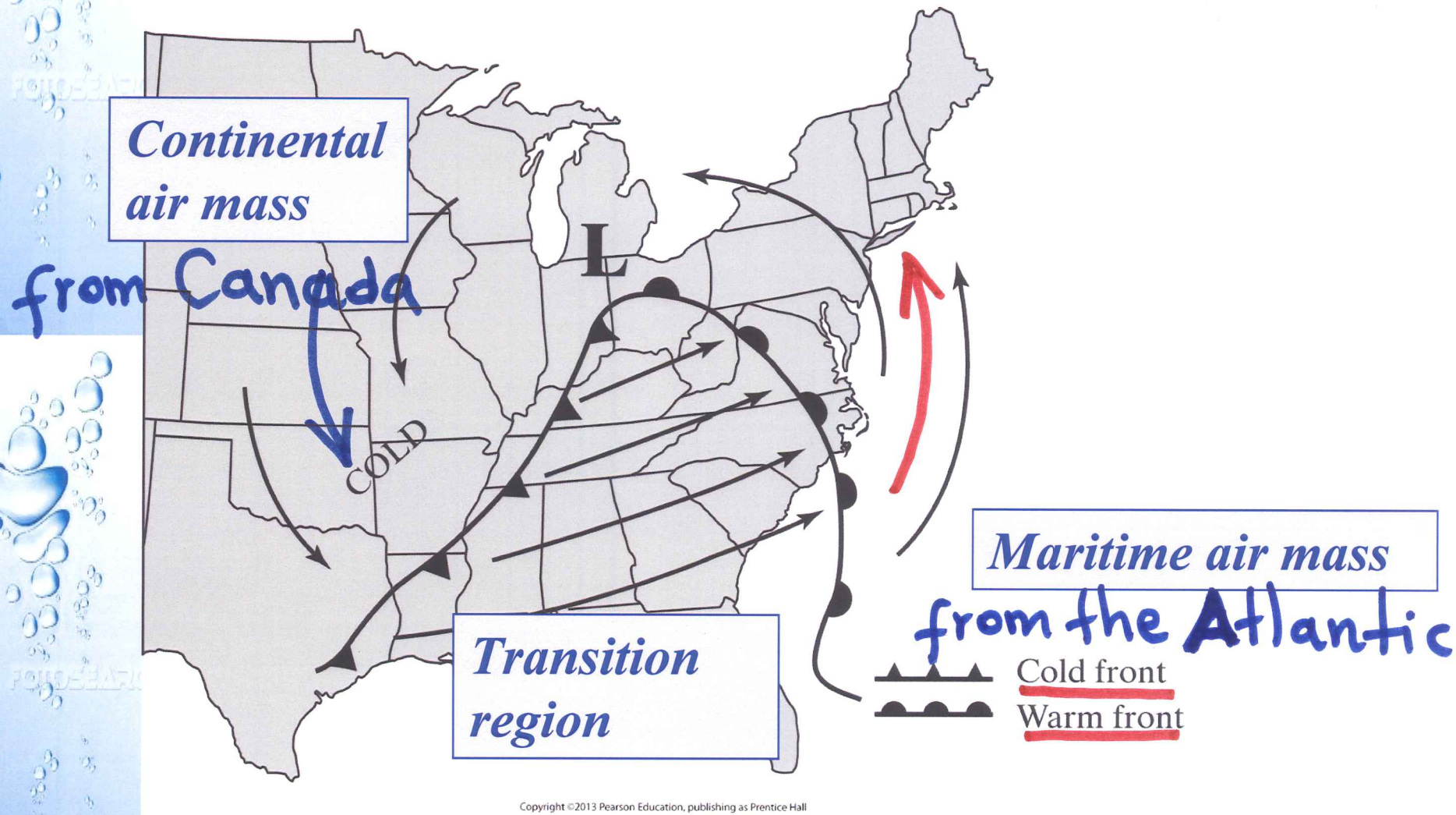


Figure 1.4 Direction of the cold and warm fronts in the eastern United States. The cold fronts come from the North toward the Gulf and the warm fronts start from the Gulf to push inland.

The Saffir-Simpson Hurricane Wind Scale

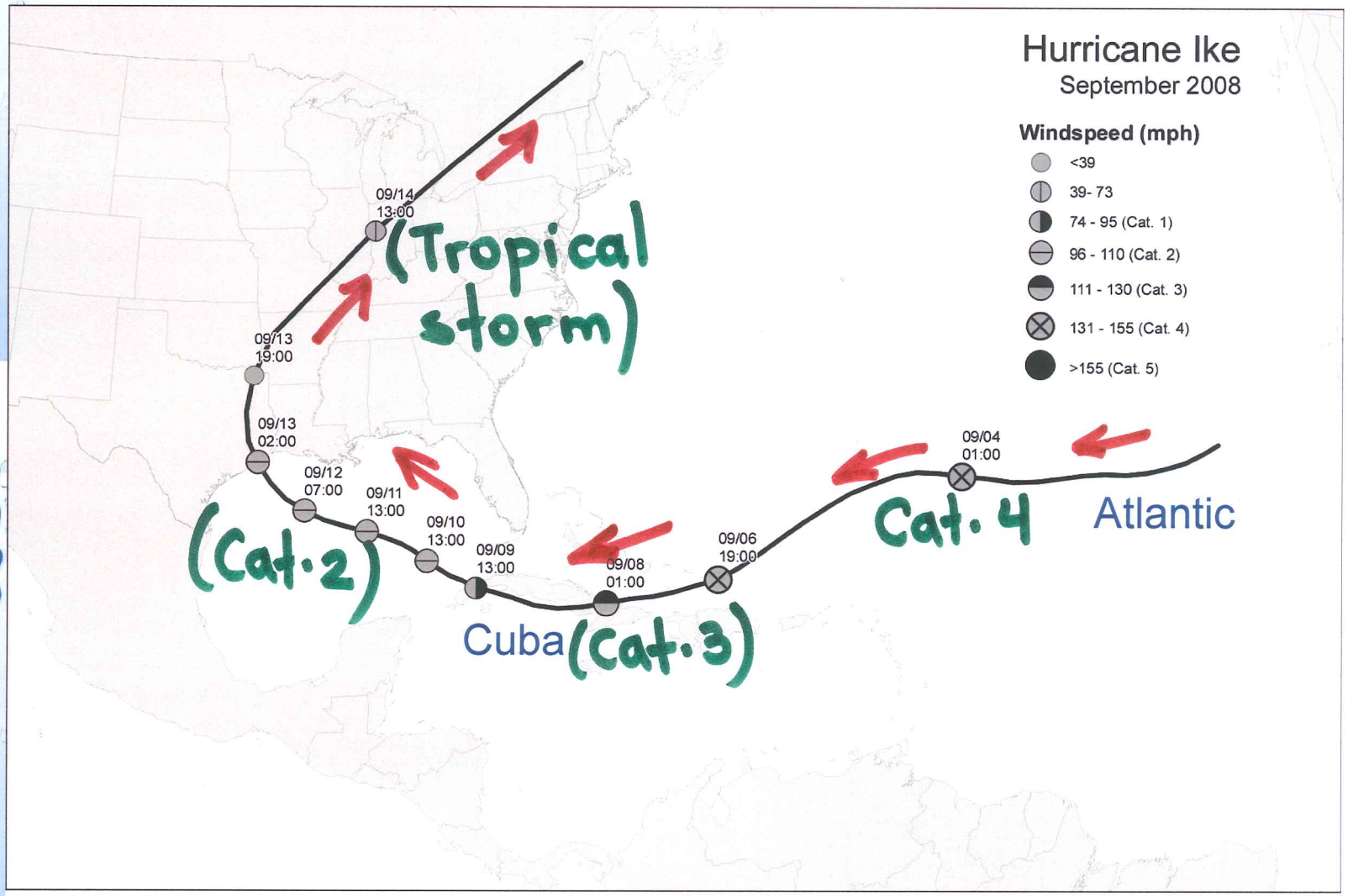
11

If wind speed < 74 mph (not hurricane)

Table 1–1. The Saffir-Simpson Hurricane Wind Scale

Category	Wind Speed (mph)	Extent of Damage	Damage Description
Tropical Storm	39–73	Minor	Some flooding
1	74–95	Minimal	Damage limited to unanchored mobile homes, shrubbery, and trees
2	96–110	Moderate	Some roof, door and window damage to buildings, some trees blown down
3	111–130	Extensive	Some structural damage to residences and utility buildings, trees defoliated and many blown down
4	131–155	Extreme	Extensive curtainwall failures and some complete roof failures, shrubs, trees, and all signs blown down
5	156+	Catastrophic	Complete roof failure and some complete building failures

Hurricane Ike's track, September 2008



Mechanisms of Precipitation Formation:

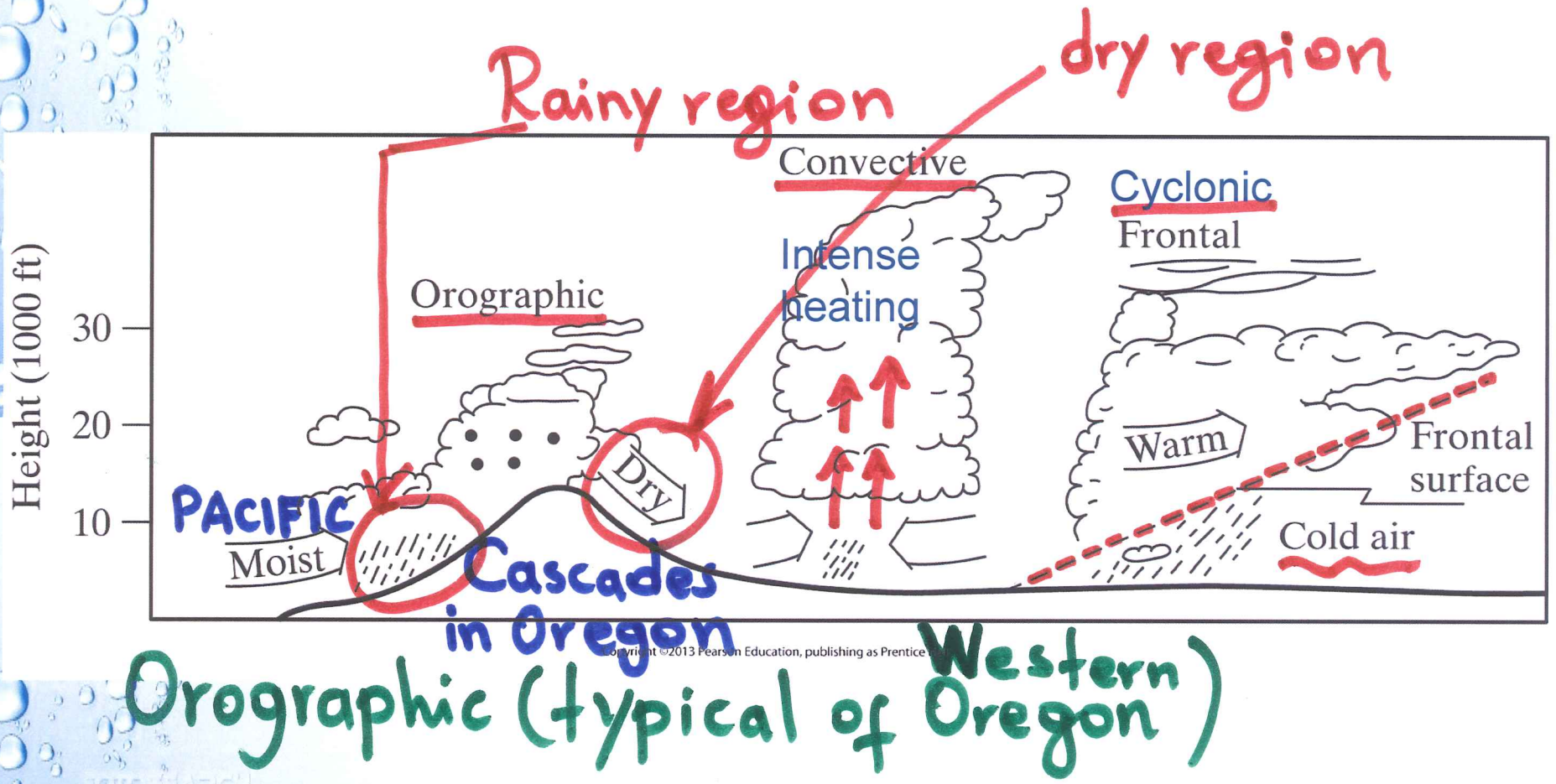
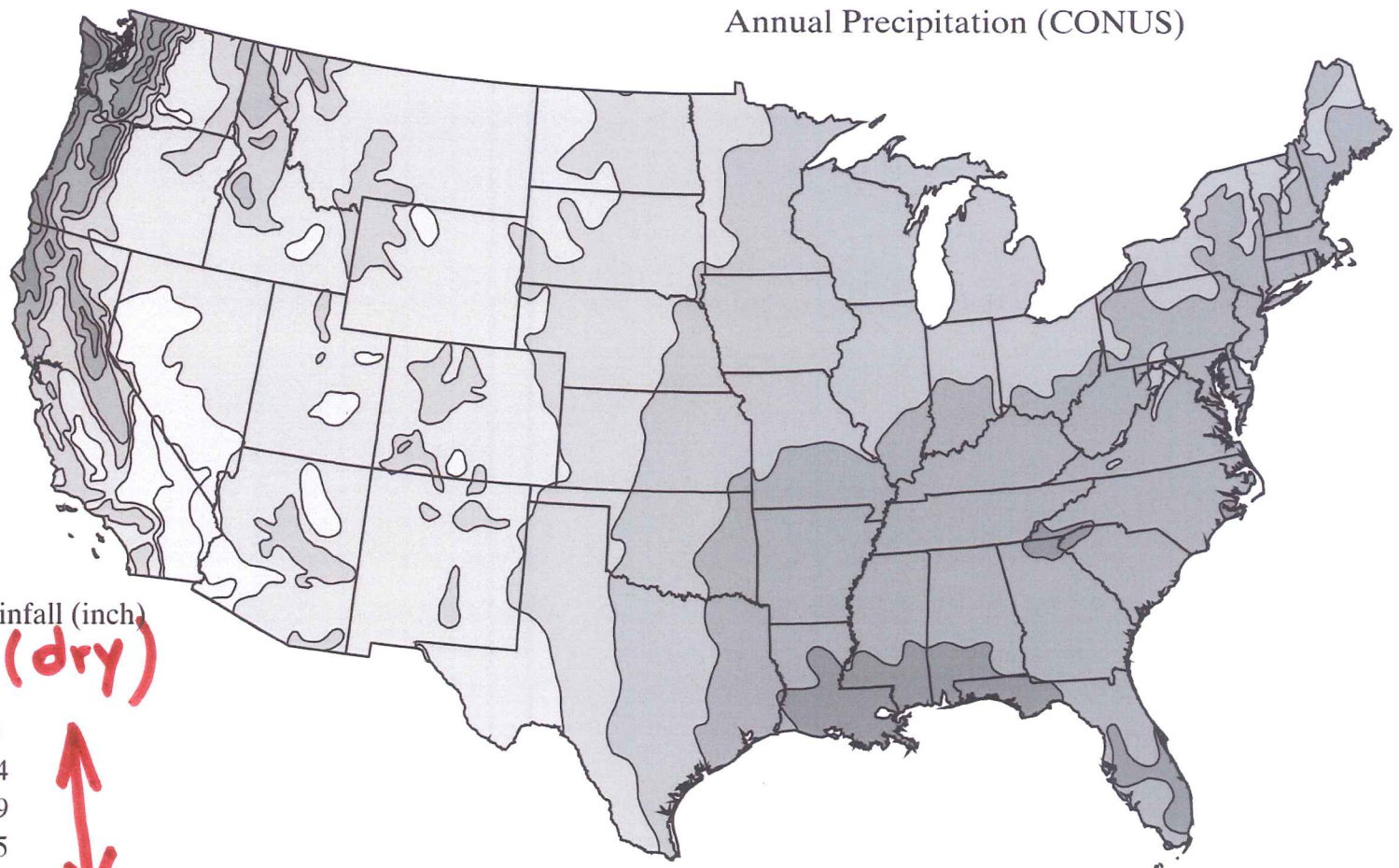


Figure 1-9 The three different precipitation lifting mechanisms that result when air at different temperatures meet in different topographies.

Distribution of average annual precipitation across the United States.



Normal monthly distribution of precipitation in different U.S. cities (inches)

Least rainy during summer

Most Rainy during summer

homogeneous