

Chapter 16: Mountain Snowstorms

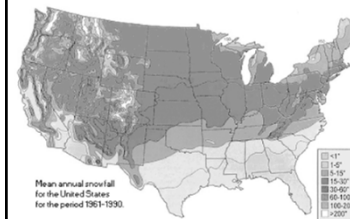


Courtesy of the California Department of Transportation

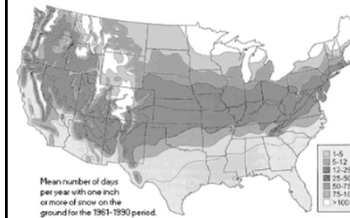
- ☐ Source of Mountain Snowstorms
- ☐ Storms along the West Slope of the US
- ☐ Storms on the East Slope of the Rockies



Annual Mean Snowfall



Mean annual snowfall
for the United States
for the period 1961-1990.



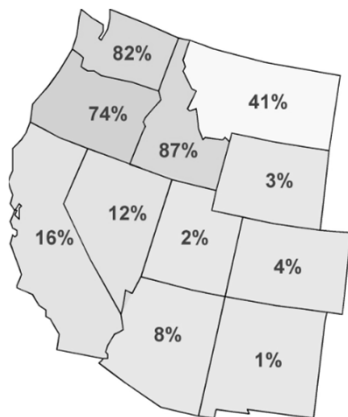
Mean number of days
per year with one inch
or more of snow on the
ground for the 1961-1990 period.

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- ☐ East of the Rockies, except locally around the Great Lakes and Appalachian Mountains, snowfall increase from south to north.
- ☐ From the Rockies westward to the Pacific, the amount of snowfall is related to elevation and mountains.
- ☐ All the mountain ranges are regions of heavy snowfall.



Importance of Mountain Snowstorms



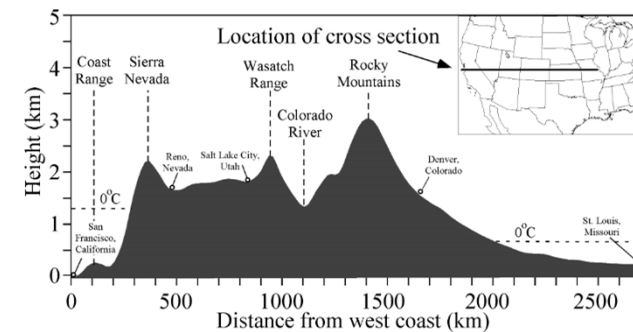
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Percentage of power generated by hydroelectric plants in 2006

- ☐ Water from winter snowfalls is the primary source of agricultural and urban water supplies.
- ☐ Water from melting snow also provides hydroelectric power, which provide one third power generated in the western states.
- ☐ Mountain snowstorms are monitored by National Weather Service, State Department of Transportation, and the Forest Service.



Major Mountain Ranges

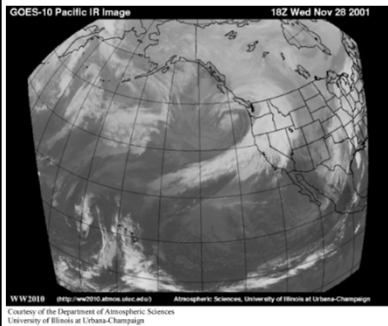


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- ☐ From west to east, the major mountain ranges include the Coast Range, the Sierra Nevada, the Wasatch Range, and the Rocky Mountain.
- ☐ The characteristics of heavy snowfalls on each of these mountains vary because of their distance to moisture sources and their elevations.



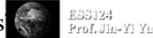
Weather Conditions for Mountain Snowstorms



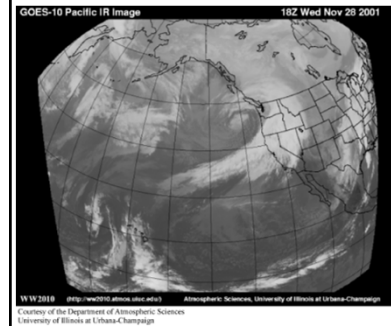
- ❑ Snowstorms in the mountain of western North America develop during the passage of large-scale weather systems, such as extratropical cyclones, fronts, and upper-level troughs, over the mountain ranges.
- ❑ Many of these weather systems have their origins over the central and western Pacific Ocean.

- ❑ The moisture streams in the atmosphere are concentrated along the frontal systems associated with extratropical cyclones.

- ❑ These moisture streams are termed “atmospheric rivers”



Pacific Winter Cyclones

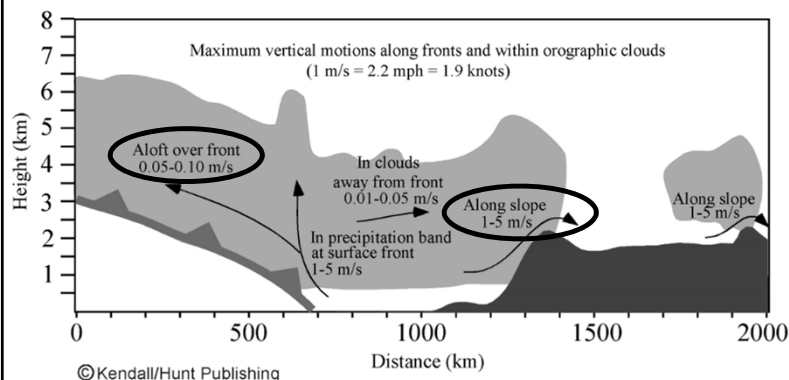


- ❑ Strong cyclones develop regularly over the Pacific, primarily south and east of the Aleutian Islands of Alaska.
- ❑ Most of these cyclones arrive at the West Coast during their occluded stage, with very deep low pressure and strong winds.

- ❑ Thunderstorms are rarely found with cyclones that originate over the cold North Pacific Ocean because the surface air temperatures are rarely warm enough to cause buoyancy-induced convections.



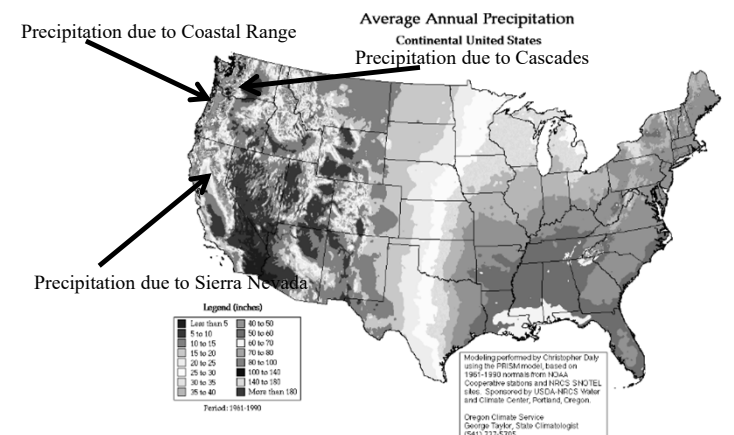
Orographic Lifting



- ❑ Mountains block the flow within these large weather systems, forcing air to rise sharply along their windward slopes, a process called orographic lifting.



Storms along the Western Slope of the US



Water Equivalent

- ❑ The water equivalent of snowfall is the depth of water that would be obtained if snow is melt.
- ❑ This number varies depending on many environmental conditions.

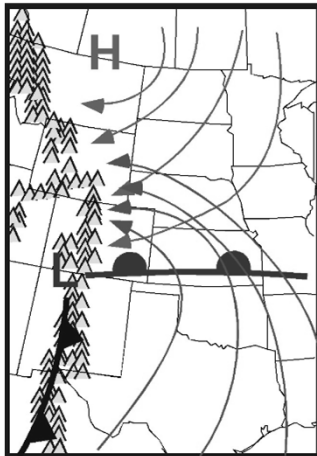


Storms on the Eastern Slope of Rockies

- ❑ The term “upslope storm” is used to describe a winter storm that occurs along the eastern slopes of the Rocky Mountains and on the Plains directly east of the mountains.
- ❑ These storms occur with low-level winds that have an easterly component.
- ❑ Upslope storms can produce enormous amounts of snow. Nearly 3 ft (~ 1 meter) of snow can fall during a single event in the foothills west of Denver.



Two Pressure Patterns for Upslope Storms

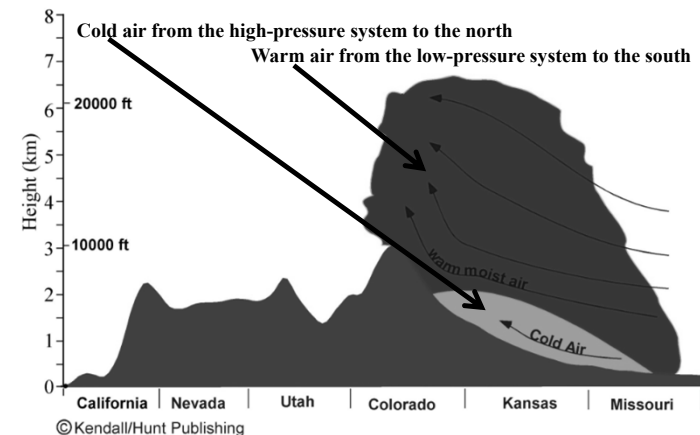


- ❑ Upslope storms occur when relatively moist, easterly winds blow westward across the plains and up the east slope of the Rockies.
- ❑ Two pressure patterns produce easterly winds: (1) a high-pressure system located north of the Colorado and (2) a low-pressure system located south of Colorado.
- ❑ For the high-pressure system, cold and relatively dry Canadian air produces light snow accumulation.
- ❑ For the low-pressure system, warm and moist air from Gulf of Mexico produces snow with higher water equivalent.
- ❑ Exceptionally blizzards occur when both pressure patterns occur simultaneously.

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Vertical Profile of Upslope Storm



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