Local Winds

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Winds are formed by the differential heating of Earth's surface, whether it's due to the difference in water and land, the difference with altitude, or something else.

Study Tip

To understand the characteristics of local winds better, make a chart of the 7 types of local winds and list some similarities and differences between these wind types.

- Local winds result from air moving between small low and high pressure systems.
- Created by a variety of conditions.
- Water has a very high specific heat, so it maintains its temperature well.
    - Water heats and cools more slowly than land.
- Large temperature difference between the surface of a body of water and the land next to it→ high and low pressure regions form →local winds.

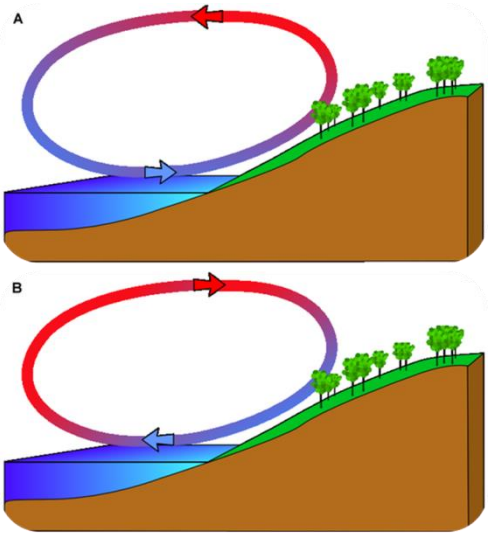
Land and Sea Breezes

Sea Breezes (summer)

- Blow from the cooler ocean over the warmer land in summer.

Land Breezes (winter)

- Blow from the land to the sea in winter.
    - Some warmer air from the ocean rises and then sinks on land
        - Causes temperature over the land to become warmer.



Sea Breezes (A) Land Breezes (B)

Monsoon Winds

- **Monsoon** winds are larger scale versions of land and sea breezes.
    - Blow from the sea onto the land in summer and from the land onto the sea in winter.
- Occur where very hot summer lands are next to the sea.

Mountain and Valley Breezes

- Temperature differences between mountains and valleys → mountain and valley breezes.
- Day
    - Air on mountain slopes is heated more than air at the same elevation over an adjacent valley.
- As Day Progresses
    - Warm air rises and draws the cool air up from the valley, →**valley breeze**

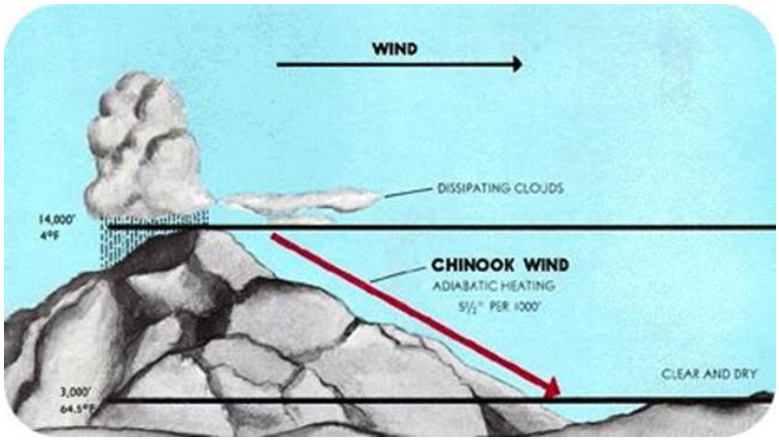
- Night
    - Mountain slopes cool more quickly than the nearby valley, creating **mountain breezes** that flow downhill.

Katabatic Winds

- **Katabatic** winds are stronger mountain and valley breezes.
- Wind speeds depend on the difference in air pressure over the plateau and over the surroundings
- Form over a high land area, like a high plateau.
    - Plateau is usually surrounded on almost all sides by mountains.
- Winter
    - The air above the plateau grows cold and sinks down from the plateau through gaps in the mountains.

Chinook Winds (Foehn Winds)

- **Chinook winds** (or Foehn winds) develop when air is forced up over a mountain range.
- As relatively warm, moist air rises over the windward side of the mountains, it cools and contracts.
- The descending air warms and creates strong, dry winds.
- If air is humid, it may form clouds and drop rain or snow.



- When the air sinks on the leeward side→ it forms a high pressure zone.
    - Windward side of mountain range is side that receives wind.
    - Leeward side is the side where air sinks.
- Chinook winds raise temperatures and rapidly decrease humidity.
- Precipitation falls as the air rises over the mountains→ air will be dry as it sinks on the leeward size.
    - This dry, sinking air causes a **rainshadow** effect, which creates many of the world's deserts.

Santa Ana Winds

- Santa Ana winds are created in the late fall and winter when the Great Basin east of the Sierra Nevada cools→ high pressure zone.
    - The high pressure forces winds downhill and in a clockwise direction (because of Coriolis).
    - The air pressure rises, so temperature rises and humidity falls.

- The winds blow across the Southwestern deserts and then race downhill and westward toward the ocean.
- Air is forced through canyons cutting the San Gabriel and San Bernardino mountains.
- The Santa Ana winds often arrive at the end of California's long summer drought season.
    - The hot, dry winds dry out the landscape even more.

The winds are especially fast through Santa Ana Canyon, for which they are named. Santa Ana winds blow dust and smoke westward over the Pacific from Southern California.

Desert Winds

- High summer temperatures on the desert create high winds.
- Desert winds pick up dust because there is not as much vegetation to hold down the dirt and sand
- **Haboob** (desert sandstorm) forms in downdrafts at thunderstorm front.
- Dust devils (whirlwinds) form as ground becomes so hot that the air above it heats and rises.
    - Air flows into the low pressure and begins to spin.
    - Dust devils are small and short-lived.

Concept Check

- What is the relationship between water having a high specific heat and weather?
- What is the difference between sea breezes and land breezes? List examples of both.
- What is the difference between mountain and valley breezes? List examples of both.