

An aerial photograph of a coastal region. A river with a winding, meandering course flows through a landscape of wetlands and marshes. The water in the river and surrounding areas is a deep blue, contrasting with the brownish-green and tan colors of the land. The coastline is irregular, with various inlets and peninsulas. The overall scene depicts a natural, undeveloped coastal environment.

# **The Landforms; Waves and Wind *Presentation***

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# The Work of Waves

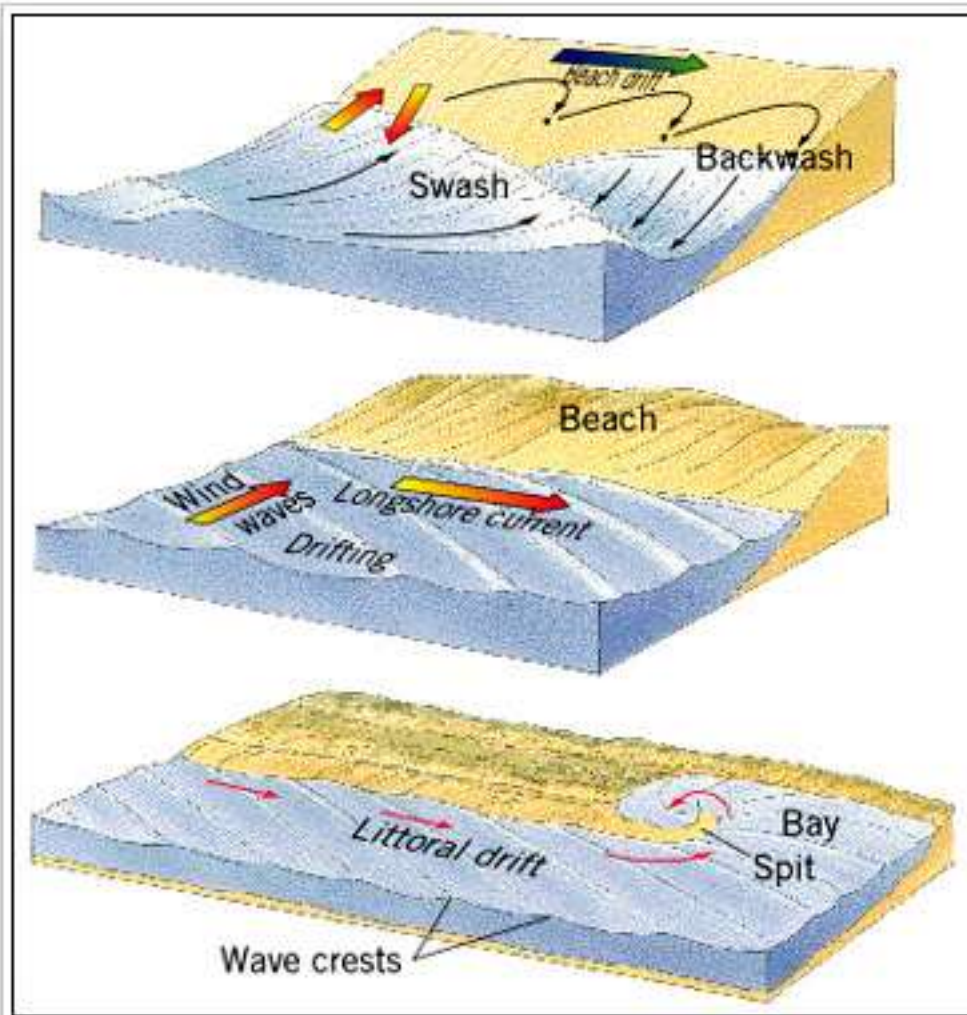
**The most important agent shaping coastal landforms is wave action. The energy of waves is expended primarily in the constant churning of mineral particles and water as waves break at the shore.**

**\*See movie on waves and currents in the geodiscoveries section of your text's website.**

# Littoral Drift

The shifting of beach materials through the swash and backwash of breaking waves also results in a side-wise movement known as beach drift. In the shore zone, a longshore current runs parallel to the shoreline to also carry sand along the sea bottom (longshore drift). The combination of beach drift and longshore drift is referred to as littoral drift.

# Littoral Drift

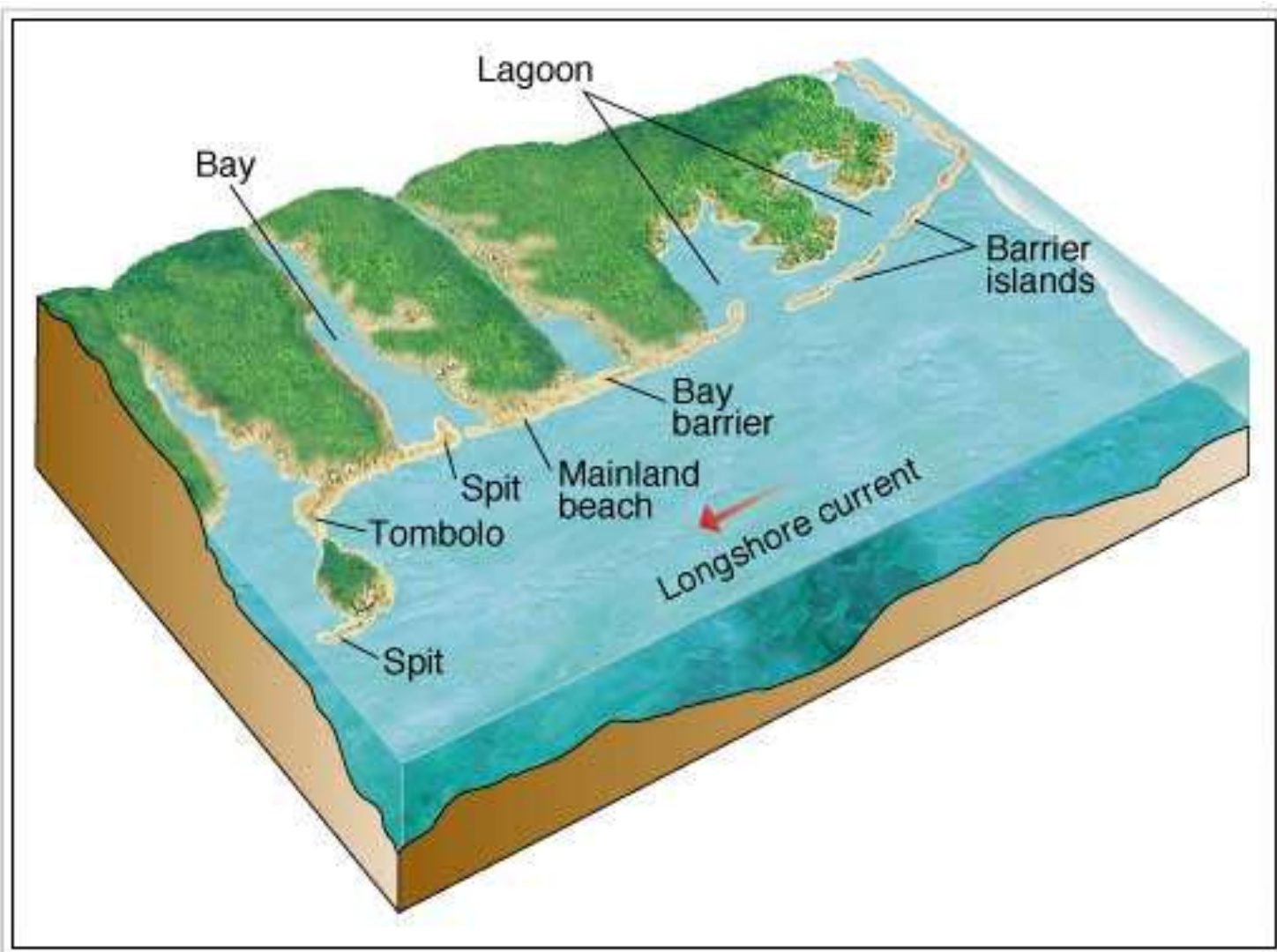


How waves move sediment by littoral drift. (a) Swash and backwash move particles along the beach in beach drift. (b) Waves set up a longshore current that move particles by longshore drift. (c) Littoral drift, produced by these two processes, creates a sandspit.

# **Landforms of Littoral Drift**

**Beach drift and longshore drift deposit and shape debris to produce a variety of landforms. A spit is an elongated deposit that extends from the land edge out to sea. It may be shaped to produce a distinctly curved end, as in Cape Cod. Another landform that attaches an island to the mainland is known as a tombolo, while deposits may also accumulate to create barriers such as a bay barrier.**

# Landforms of Littoral Drift



Depositional landforms along a coast.

# Landforms of Littoral Drift



**A. Aerial view of the Outer Banks, Cape Hatteras, North Carolina. B. Cape Cod, Massachusetts. C. Long Island, New York.**

# Wave Refraction

**In deep water, away from the coastline, waves arrive undistorted. As the wave begins to arrive at the coastline, the water becomes shallow and so the wave begins to be bent by the process of wave refraction.**

**\*See animation on wave refraction in the geodiscoveries section of your text's website.**

# Tides

**The Earth orbits around the Sun in a cycle of 365 days.**

**The Moon orbits the Earth in a 28-day cycle, while the Earth also revolves on its axis on a one-day cycle.**

**The Moon's gravitational attraction creates a tidal bulge experienced at the Earth's surface as a high tide. There is a corresponding high tide on the opposite side of the Earth due to inertia. Between each high tide, separated by 12.5 hours, are corresponding low tides.**

**The Sun also exerts gravitational attraction, creating the highest of tides when the Sun and Moon are aligned.**

**When the Sun and Moon are at right angles, the lowest tides result.**

**\*See animation on tides in the geodiscoveries section of your text's website.**

# Wind Action

Ordinarily, wind is not strong enough to dislodge mineral matter from the Earth's surface. However, in dry, sparsely vegetated areas, the action of wind in eroding and transporting sediment creates a distinct array of landscapes studied in eolian geomorphology. Such processes dominate desert and coastal landscapes.

# Wind Action

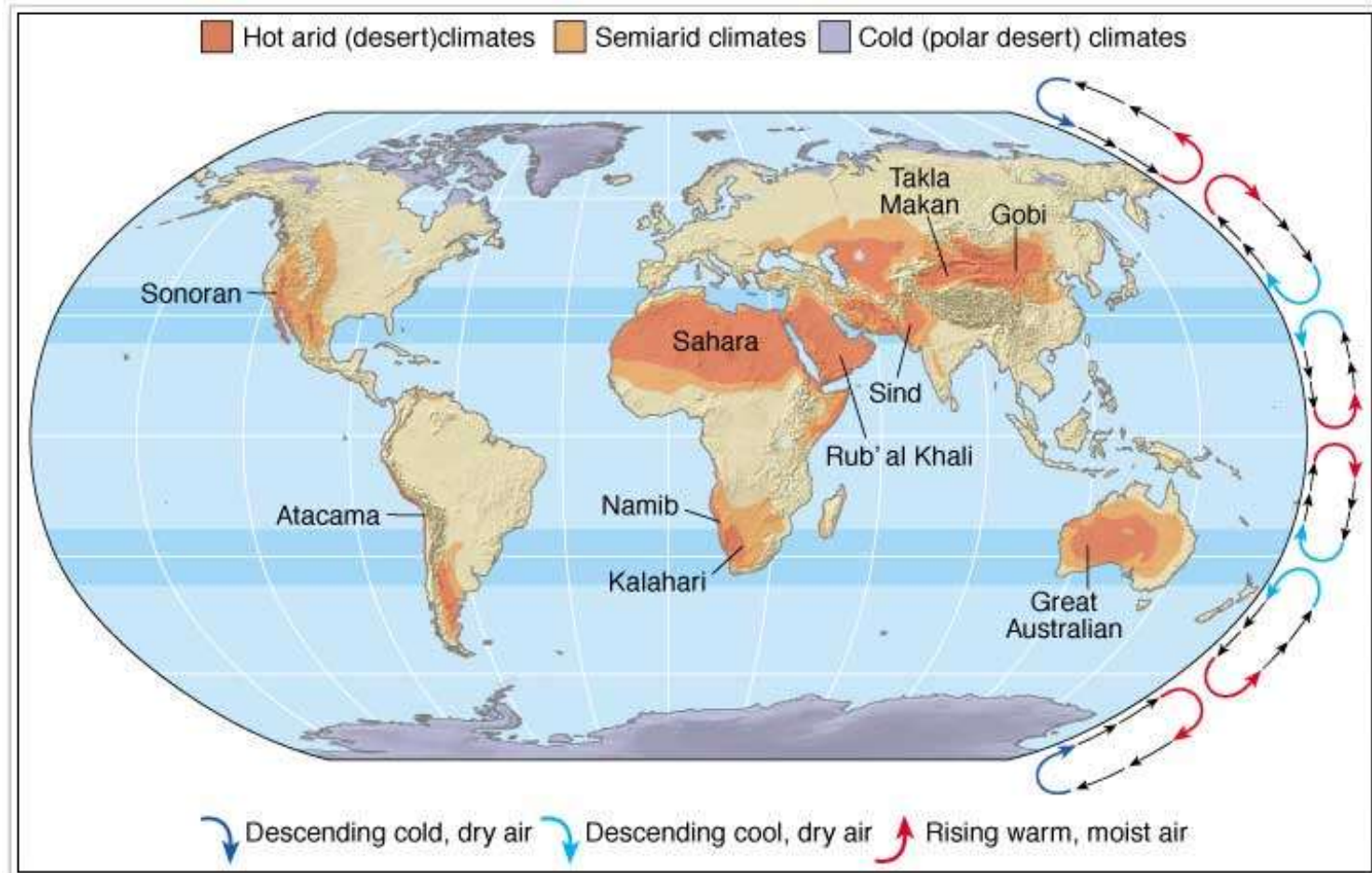


**An approaching duststorm, Coconino Plateau.**

# Desert Regions

The Earth's major desert regions are associated with the descending air of the subtropical high at around 30 degrees North and South. These include deserts such as the Sahara. However, deserts also occur in continental interiors, such as the Gobi desert; in mountain rainshadows, such as the Sierra Nevada; and at coastlines associated with cool upwelling such as the deserts of Chile and Peru.

# Desert Regions



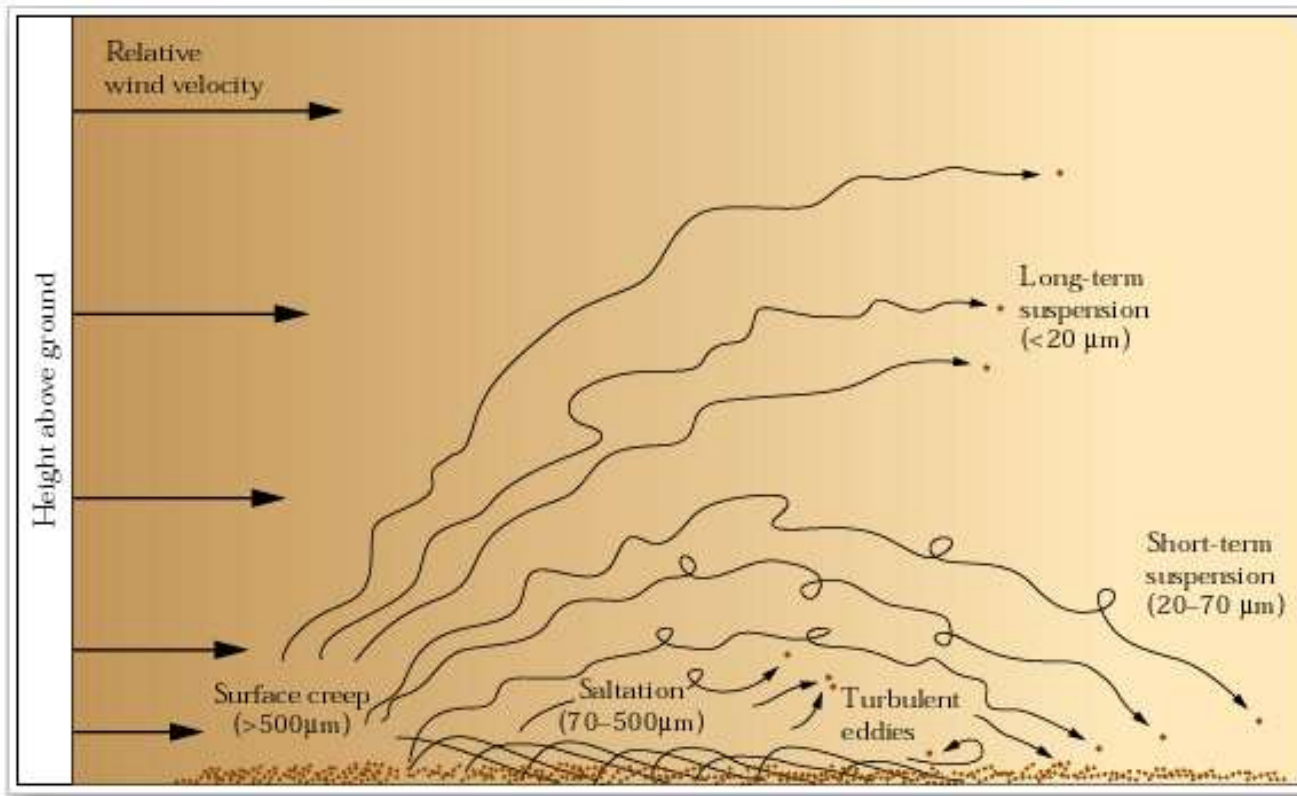
**The World's Deserts:** This map shows the distribution of arid and semi-arid climates and the major deserts associated with them. Many of the world's great deserts are located where belts of dry air descend along the 32nd S latitudes.

# Wind Transport

Wind is capable of carrying fine, dry material for considerable distances. Large particles remain near the ground and tend to be moved by surface creep and saltation. Very fine particles may become suspended in the air.

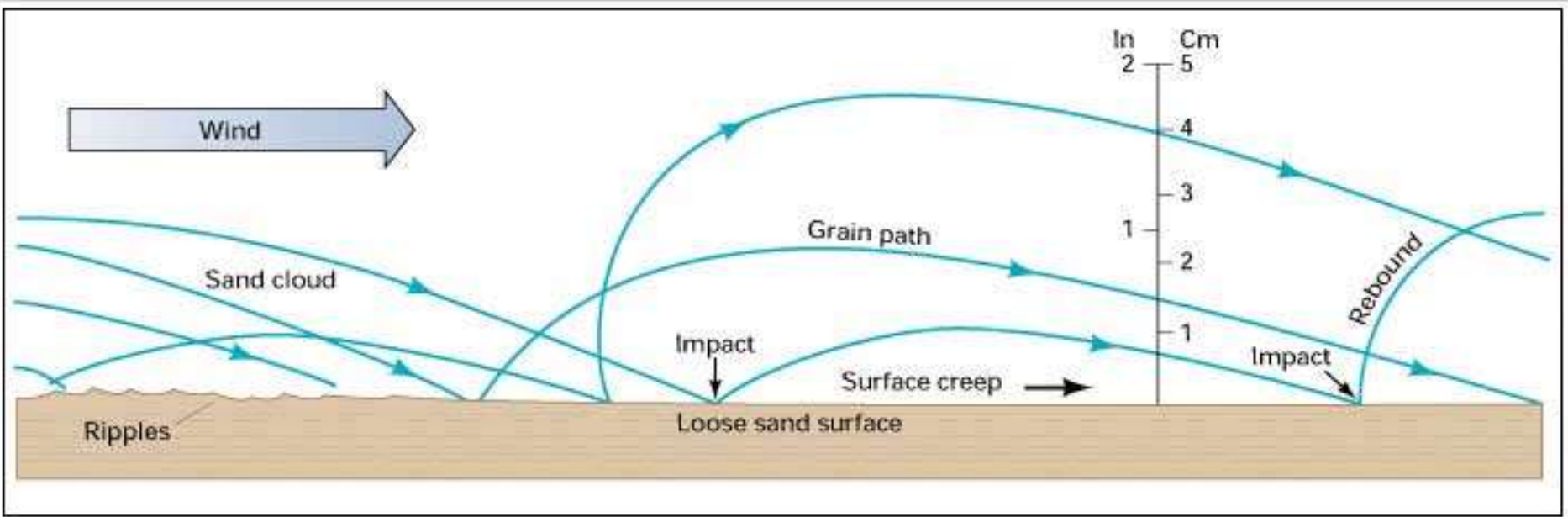
Saltation is the process whereby particles bounce along the ground surface tracing an asymmetrical trajectory, with steep take-off and shallow return.

# Wind Transport



**How wind moves sediment:** Moderate winds move the largest sand grains by surface creep. Slightly smaller sand grains move forward by saltation (bouncing). Finer particles are carried aloft where faster wind transports them downwind before they slowly settle to the ground. The very finest dust particles reach greater heights and are swept along in suspension as long as the wind keeps blowing.

# Wind Transport



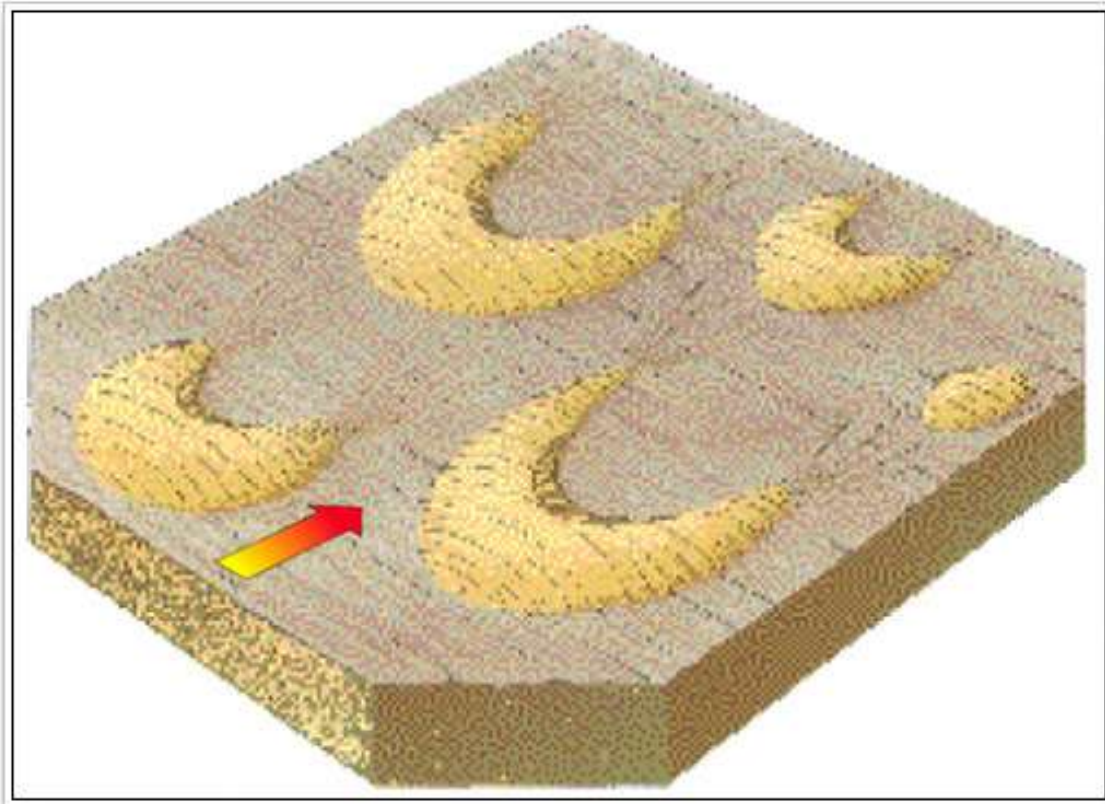
**Saltation: Sand particles travel in a series of long leaps.**

# Sand Dunes

Types of Sand Dunes include barchan dunes, transverse dunes, and parabolic dunes.

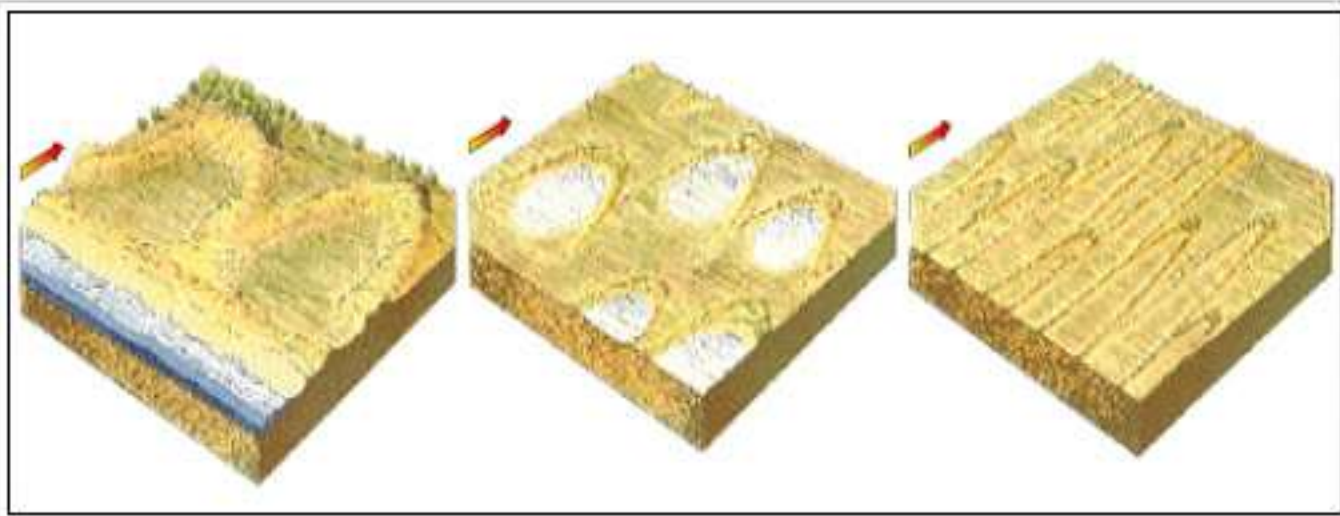
\*See animation on types of dunes in the geodiscoveries section of your text's website.

# Sand Dunes



**Barchan dunes. The arrow indicates wind direction.**

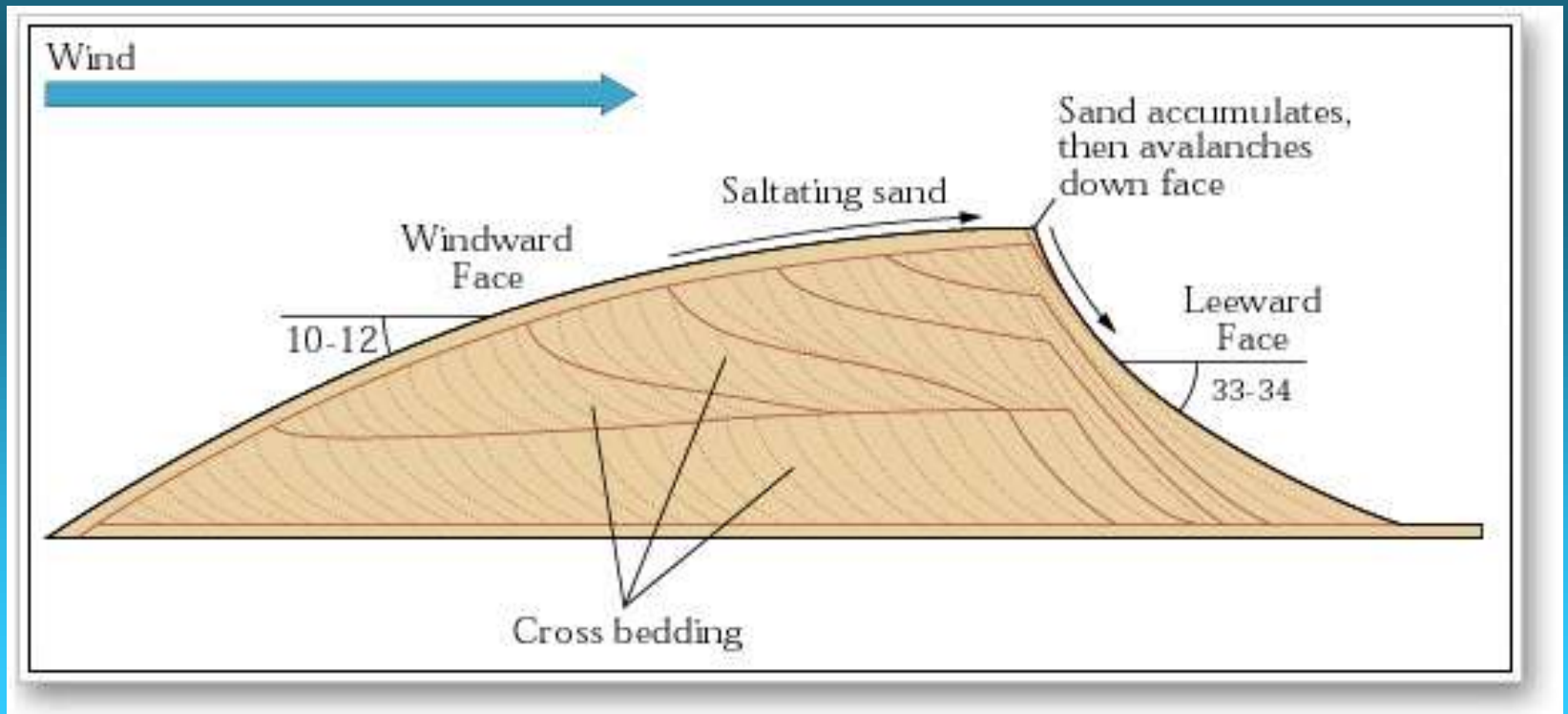
# Sand Dunes



**Three types of parabolic dunes. The prevailing wind direction is the same for all three types. (a) Coastal blowout dunes. (b) Parabolic dunes on a semiarid plain. (c) Parabolic dunes drawn out into hairpin forms.**

# Barchan Dunes

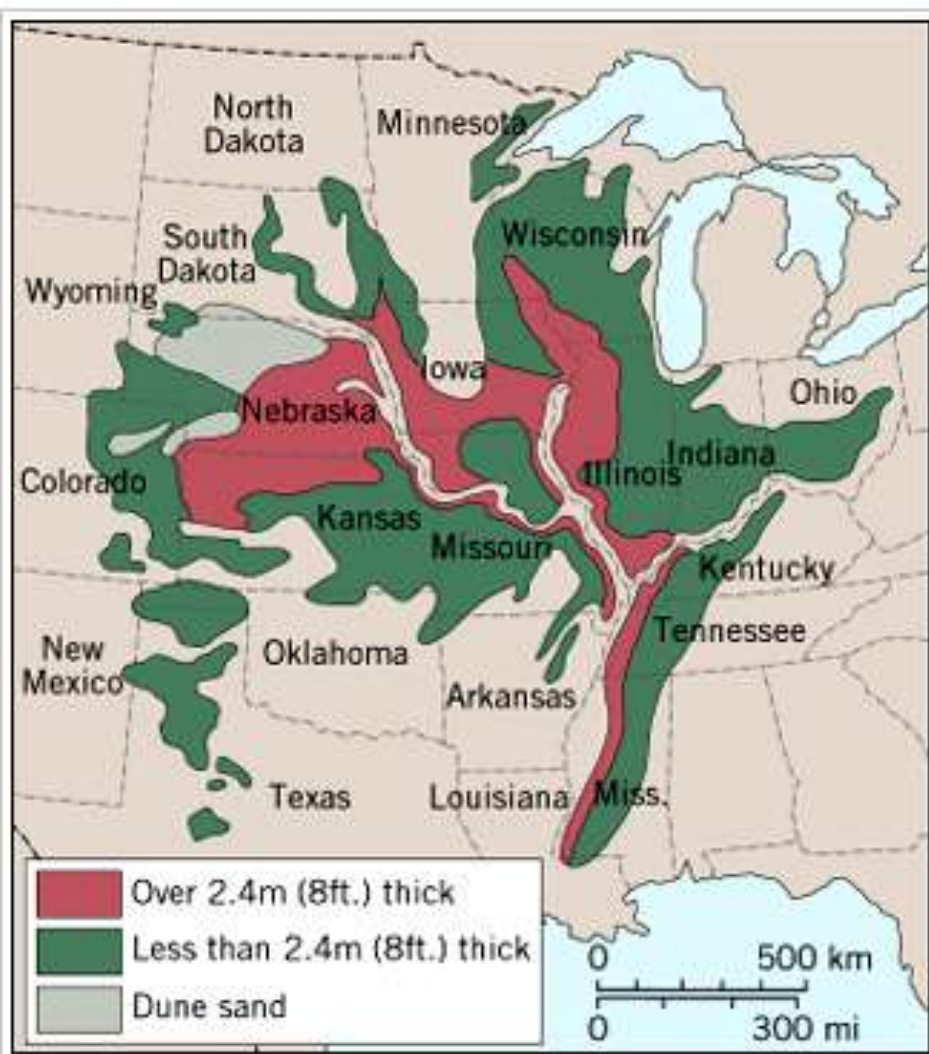
Barchan dunes develop through the saltation of sand grains up their gentle sloping windward slope, and settle by the angle of repose down the leeward or slipface. These dunes grow with the addition of sand and also move forward.



# Loess

In several large midlatitude areas of the world, the surface is covered by deposits of wind-transported silt, which has settled out from dust storms over many thousands of years. This material is known as loess.

# Loess



**Map of loess distribution in the central United States.**

**This concludes the  
presentation on  
Landforms; Waves and  
Wind.**