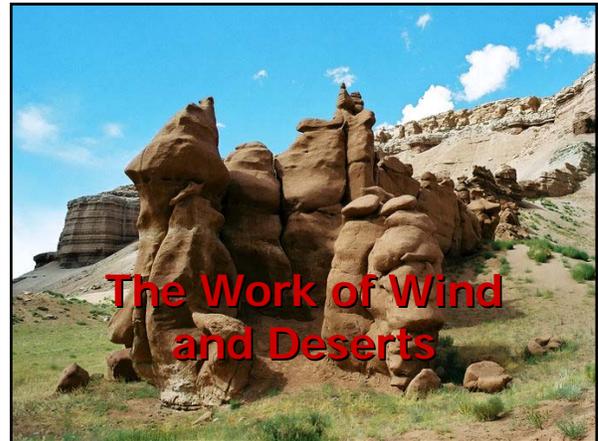


Essentials of Geology

David Sallee

Chapter 12



The Work of Wind and Deserts

Introduction

- Wind is an effective agent of erosion and transportation in desert regions
- Wind also moves loose sediment in a variety of other environments



How Does Wind Transport Sediment?



- Bed load
 - Sediments too large or heavy to be carried in suspension by water or wind
- Suspended load
 - Silt- and clay-sized particles constitute most of this load, held aloft for many miles



How Does Wind Erode?

- Wind is an efficient sorter of sediment
- Wind erosion produces many unusual features



Wind Erosion: Abrasion

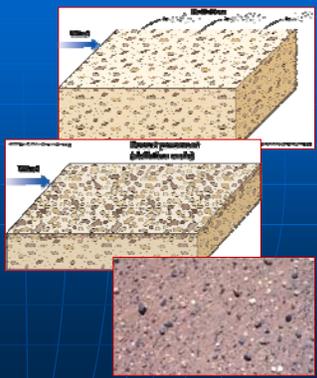


- The impact of grains during saltation is much like sandblasting, but limited to less than 1m above the ground surface
- Etching, polishing, and pitting are some of the effects
- Ventifacts are stones with shape modified by abrasion

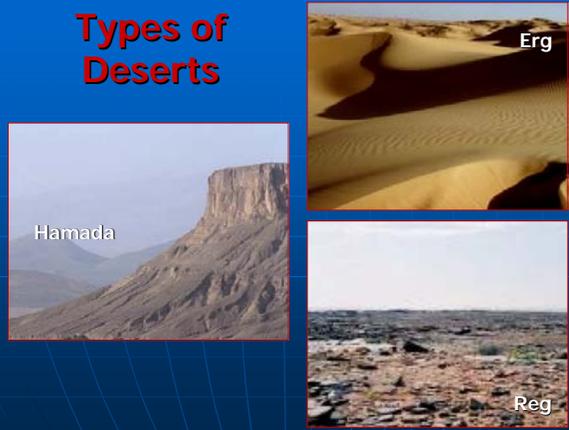


Wind Erosion: Deflation

- The removal of loose surface sediment by wind erosion creates blowouts
- Desert pavement is left behind after wind has removed the finer-grained material and it protects the underlying material from deflation



Types of Deserts

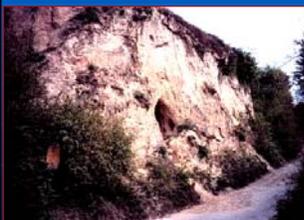


Erg

Hamada

Reg

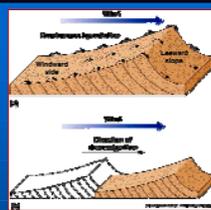
What Are the Different Types of Wind Deposits?



Loess is the silt-sized till, which can be picked up and blown very far distances by wind. Loess makes up much of the rich soils of the Midwest U.S. grain belt.

- Dunes occur in several distinctive types, consist of sand, and are deposited near their source
- Loess consists of windblown silt and clay deposits often found far from their source

The Formation and Migration of Dunes



- Dunes are mound- or ridge-shaped deposits of sand
 - form when an object on the surface slows the wind so that deposition takes place
 - usually are asymmetrical in cross-section, with a steeper downwind slope
 - migrate downwind as sand accumulates on that side of the dune

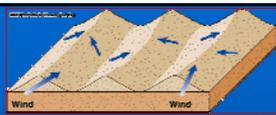
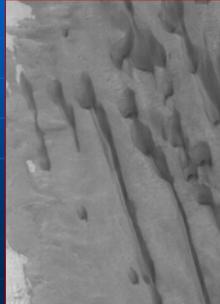


Dune Types




- Barchan dunes
 - crescent-shaped
 - tips point downwind
 - form on flat, dry surfaces with little vegetation, limited sand supply
 - constant wind direction
 - the most mobile dune - up to 10m/yr

Dune Types

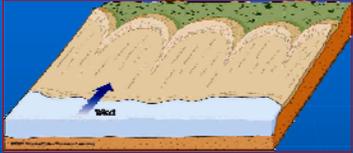
- Longitudinal or seif dunes
 - long, parallel ridges of sand
 - aligned generally parallel to wind direction, but result when winds converge from slightly different directions
 - can be up to 100m high, common in Australia, Saudi Arabia, and Egypt

Dune Types




- Transverse dunes
 - form long ridges perpendicular to the prevailing wind direction
 - abundant sand supply
 - crests up to 200m high
 - barchan dunes or barchanoid forms may form along edges

Dune Types



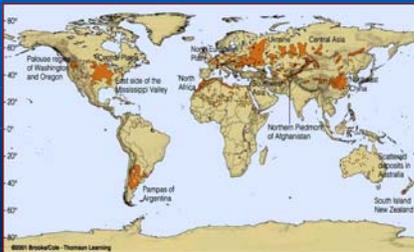

- Parabolic dunes
 - common in coastal areas
 - abundant sand supply
 - strong onshore wind
 - tips point upwind, anchored by vegetation
 - center is often blown out

Dune Types



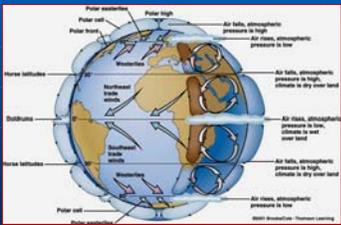

- Star dunes
 - common in Saudi Arabia
 - pyramidal hills of sand
 - several ridges radiate from the crest
 - form where wind direction is variable
 - stable dunes, many are landmarks for desert travelers

Loess



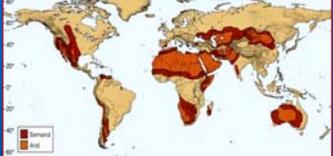
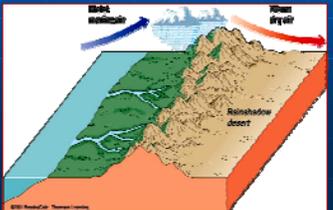
- Windblown silt and clay deposits, far from their source
- Soils on loess deposits are some of the most fertile in the world

Distribution of Air-Pressure Belts and Global Wind Patterns



- Warm air rises, cool air sinks
 - low pressure systems are dominant at low latitudes, high pressure at poles
 - descending atmosphere cells in between (at about 30° N and S latitude) result in another high pressure system
 - the Coriolis effect describes the deflection of winds in the hemispheres due to the rotation of Earth

Where Do Deserts Occur?

- Where evaporation exceeds precipitation
 - majority of the world's deserts found in the low to middle latitudes, associated with high-pressure belts
 - some found in the deep interiors of continents
 - others are rainshadow deserts

What Are the Characteristics of Deserts?



- Temperature, Precipitation, and Vegetation
 - temperatures vary greatly - extreme highs and lows
 - receive less than 25cm of precipitation/year
 - plants are diverse, yet widely spaced, small, and slow-growing

What Are the Characteristics of Deserts?

- Weathering and Soils
 - mechanical weathering is dominant due to temperature fluctuations and frost wedging
 - rock varnish coats many rocks with iron and manganese oxides
 - soils are thin and patchy



What Are the Characteristics of Deserts?

- Mass Wasting, Streams, and Groundwater
 - running water accounts for most of the erosion in deserts
 - rainfall comes in brief, heavy cloudbursts that moves large amounts of sediment quickly downstream
 - internal drainage describes a desert stream that never reaches the sea, depositing its load within its bed
 - water table is beneath the stream channels

What Types of Landforms are Found in Deserts?



- Alluvial Fans
 - form when sediment-laden streams flow out from mountain fronts into the flat desert floor
 - poorly sorted, fans out from the mouth of the stream
 - may coalesce to form a bajada

Landforms in Deserts

- Playa
 - results from the evaporation of a playa lake, leaving a salt pan
 - characterized by mud cracks and salt crystals
 - salts are often concentrated enough to be mined commercially



Landforms in Deserts

- Pediments
 - erosional bedrock surfaces
- Inselberg
 - resistant, projecting high in deserts
- Mesas and Buttes
 - steep sided, flat topped

