

Geog 1000 - Lecture 23

Water and Wind Erosion and Deposition

<http://scholar.ulethbridge.ca/chasmer/classes/>



Today's Lecture (Pgs 386 to end of Ch.)

1. The work done by water and wind
2. Coastal erosion and deposition
3. Beach formation
4. Controlling coastal transport
5. Erosion by wind (or Eolian Erosion)
6. Ventifacts
7. Eolian transportation and landforms
8. Eolian deposition
9. Problematic wind erosion – the Dirty 30's; Wind erosion management

The work done by water and wind

Erosion → Action of water, wind, abrasion by sediments.



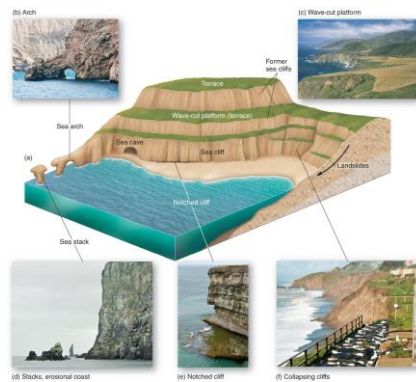
Transportation → of eroded materials



Deposition → Landforms shaped as streams and wind run out of energy used to erode and transport materials



Coastal Erosion by Water



Coastal Deposition by Water

Wave built terrace → gently sloping underwater surface – from waves.

Wave-cut platform → Narrow flat along shoreline – from waves

Tombolo → small island attached to mainland by spit or bar

Barrier spit → curved island and spit caused by ocean currents

Lagoon → Shallow water separated by sand islands or reefs.

Bay barrier → A spit that goes across a bay.



Beach Formation

Beaches → Can be located along an ocean, sea, lake or river



Comprised of: Rock, sand, gravel, shingle, pebbles, cobblestones



Beach 'berms' → actively influenced by waves and the tide. Berm has a 'crest' and a face (the slope leading down to the water).

Controlling Coastal Transport



Erosion by Wind



Also termed: *Eolian* or *Aeolian Erosion* → Major source of land degradation, evaporation, desertification. Causes crop damage

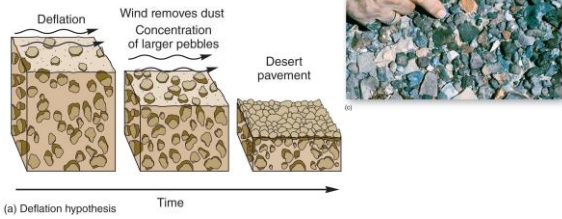
Deforestation, urbanisation and agriculture increase wind erosion.

More severe in arid areas during drought: E.g. Great Plains (which includes Lethbridge) can lose up to 6100 x more soil during drought than when it is wet.

Deflation

Two types of wind erosion:

1. **Deflation** → Wind picks up and carries away loose sediment



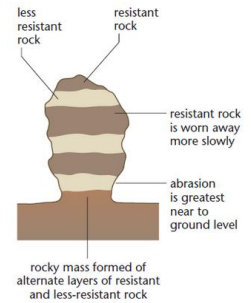
Abrasion

Two types of wind erosion:

2. **Abrasion** → surfaces are worn down by airborne sediments hitting them



Yardangs → Undergo wind abrasion by dust/sand & deflation.
→ Look long and narrow like a boat, one side blunt, the other sharp

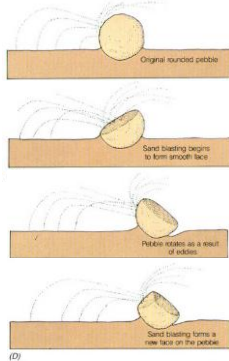


Ventifacts

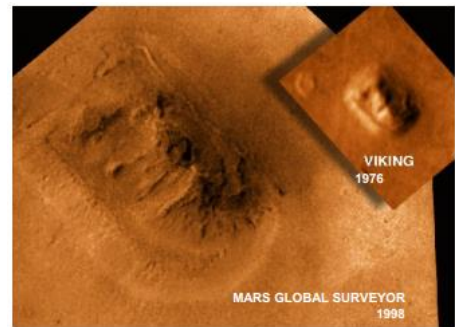
Rocks with faces that have been abraded by prevailing winds



May be 3 or 4-sided.

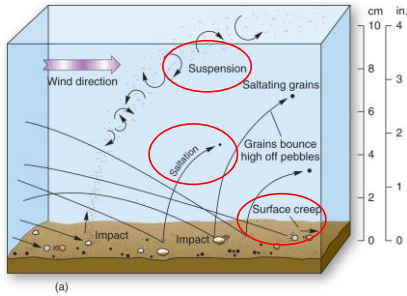


Do Winds Exist on Mars?



Eolian Transportation

Net Transport:
 80% Saltation
 20% Creep
 1% Suspension

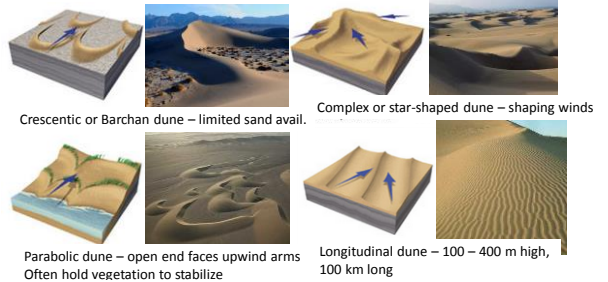


Saltation → Skipping and bouncing sand sized particles up to 10 cm from ground
Creep → rolling or sliding along ground
Suspension → Air currents support weight of particles < 0.2 mm in diameter.

Eolian Landforms: Dune Shapes

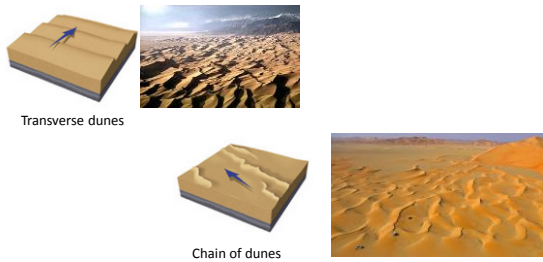
Dunes → Hill of sand formed by wind
 → Longer on windward side: sand is pushed up the dune creating shorter "slip face"
 → Valleys between dunes = Slack

Examples of dune formations:



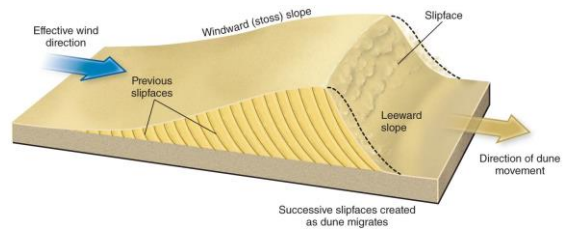
Eolian Landforms: Dune Shapes

More examples of dune formations:



Eolian Deposition: Dune cross section

< 30 cm = ripple
 > 30 cm = dune



Problems with Wind Erosion

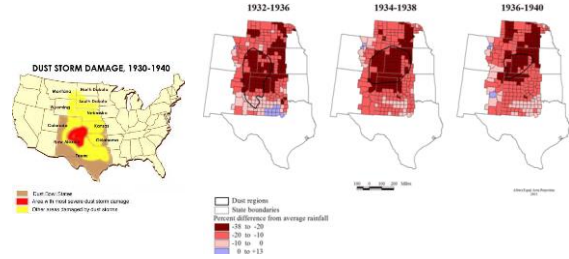
1930's to 1940's Dust bowl (Dirty 30's)



Problems with Wind Erosion

1930's to 1940's Dust bowl (Dirty 30's) → Causes:

1. 1930's → Time of the Great Depression, also a period of drought
2. Prone to large dust storms lasting days to months



Causes of the Dust bowl

1930's to 1940's Dust bowl (Dirty 30's) → Causes:

Sunday April 14th, 1935 → Massive black cloud of dust moving south-south-east, 40 kph, temperatures dropped

Great Plains thought unsuitable for agriculture → no surface water, few trees.

Settlement during short "wet" period encouraged by Government.

Overgrazing + increased agriculture prices after WWI = increased cultivation

Severe drought picked up the soils → increased erosion, elimination of workable land



Dust bowl Government Response

President Franklin D. Roosevelt first 100 days in office → Program to conserve soil & restore ecological balance: Soil Erosion Service, August 1933.

Stabilization of prices, increased food for drought relief.

Civilian Conservation Corps → planted belt of more than 2,000,000 trees from Canada to Texas.

What did the trees do?

Also educated farmers on soil conservation, crop rotation, contour plowing, terracing, etc.

By 1938, soil transport significantly reduced.

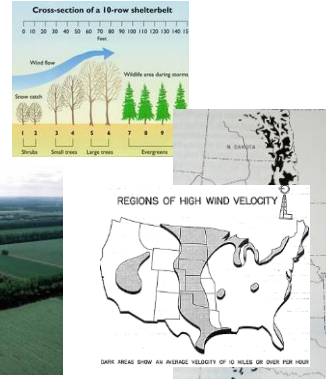


Dust Storms in Lethbridge: Erosion removes topsoil



Wind Erosion Management:

Shelterbelts:
 → Need to know prevailing wind direction
 → May be used to regulate soil moisture (create or prevent snow drifts)



Wind Erosion Management:

Vegetation:

Coastal Dunes, Netherlands

Helm (European Dune-grass)



Southern Alberta

Crested Wheat Grass vs. Blue Grama



Yes to Blue Grama!



Current Dust Bowls:



Encroaching Gobi Desert – 868,000 acres lost per year

Dust storm over China – Herds of cattle increased from 52 million in 1980 to 105 million in 2000

