Wind

One of the major means of erosion, transport, and deposition of sediment is by wind. It may be an important factor in any location where there is material light enough to blow around.

Locations:
1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________

Transport of Sediment by Wind

Any process that involves wind is called an ____________________ process. Wind is a turbulent fluid and therefore has many of the same transportation characteristics as water flowing in channels.

How dense is air compared to water? ________________________________

How does this affect the size of the sediment that air can carry? ________________________________

Wind can suspend clay and silt size particles; very strong winds may be able to suspend small grains of sand. Similar to rivers, the wind-transported sediment load can occur as:

1) ____________________ and
2) ____________________.

What two processes move the bed load?

1) ____________________ - grains hop and bounce along in small jumps, like in water
2) ____________________ - grains of sand are rolled across the ground by the wind

Saltating grains are rarely lifted higher than about 1 meter. As individual grains hit the ground again, they dislodge new grains and cause them to saltate too.

How high can suspended sediment be carried? ____________________

How far can suspended sediment be carried? ____________________

Examples of where sediment transport by wind has been significant:

1) ____________________
2) ____________________
3) ____________________
Erosion by Wind

Wind can erode in two ways: _______________ and ________________.

Abrasion is due to saltating grains of sand impacting against a surface and causing small fragments to chip off, whether it be the surface of another sand grain, a rock face, or some other surface.

Abrasion modifies the existing landscape. Individual sand grains become pitted, meaning that they have small pits or gouges in them due to collisions with other grains. Rock surfaces may become smoothed by abrasion, exhibiting a polished appearance.

As a rock fragment or stone gets abraded by the wind, the side facing the wind becomes polished and faceted like a gemstone. These rock fragments are called ________________.

If the stone rolls over at some point, or the wind direction changes, a new side faces the wind and a new facet develops. The end result is a stone with several smooth, flat edges at various angles to each other.

In some deserts, long, elongate ridges of rock form aligned with the prevailing wind direction. They resemble an upturned ship hull and are called ________________.

Deflation is the removal of fine sediment by wind. It is most common where there is little vegetation or where the surface sediment is not bound together. This may cause depressions or hollows to develop, called ________________ or ________________.

They may be small: a few meters across and less than 1m deep, or they may be many kilometers across and several 10s of meters deep.

Example of a very large deflation basin: ______________________________ (Sahara)

Removal of fine sediment by deflation may also leave behind a surface of boulders, cobbles and pebbles called a ________________, which protects underlying fine sediment from further removal by wind.

Deposition by Wind

Sediment carried by wind can be carried great distances before being deposited. It can then form a variety of landforms, the most important ones being _______________ and ________________.

Loess is a thick and uniform deposit of wind transported silt, sometimes containing small amounts of clay and fine sand. The mineral grains can consist of quartz, feldspar, mica, and calcite. Loess is derived from deserts, river floodplains, and recently glaciated surfaces.

How much of the Earth is covered by loess? ____________

How much of the U.S.A. is covered by loess? ____________
Development of Dunes

A dune is a mound or ridge of sand deposited by wind. Dunes form when wind blows around an obstacle and deposits sand around it, which accumulates and builds up into a mound. As the mound gets bigger, it acts as a barrier to the wind, causing it to slow down and deposit even more sand.

In profile, a dune is asymmetrical. The side facing the wind has a shallow slope and is called the ______________ slope. Sand grains constantly saltate up this slope and then cascade over the top of the dune and down the steeper slope, which slopes in the direction of the prevailing wind and is called the ______________ slope or the ______________.

What is the angle of repose of the steep slope? ______________

If this angle is exceeded, sand tumbles to the base of the slope to re-attain the angle of repose. In this way, dune sand is constant moving forwards, and the entire dune migrates in the direction of the prevailing wind.

The cascading sediment forms a sedimentary structure within each bed of sediment called ______________. Each cross-bed represents the position of the slip face in the past, before the dune migrated forwards. This is why ancient sand dunes that are preserved in sandstone can be used to determine ancient prevailing wind directions (called ______________). The cross-beds are always inclined downwards in the direction the wind was blowing.

Dune Types

What 4 factors control the shape of a sand dune?

___________________________  _____________________________

___________________________  _____________________________

The five dune types are:

• ______________ – these are crescent shaped dunes, like giant croissants, with the tips, called ______________, pointing in the direction the wind is blowing. They form on flat, dry surfaces where there is little vegetation, a limited sand supply, and almost constant wind, and are usually <30 m high.
  
  How rapidly do they move or migrate? ______________

• ______________ – also called ______________. They form long, parallel ridges aligned with the prevailing wind direction in regions of moderate sand supply. They usually form where wind blows from two different directions, converging to form a prevailing wind. They can be up to 100m high and >100 km long.

  Where are they found? ______________ and ______________

• ______________ – these form ridges aligned perpendicular to the prevailing wind direction in areas where sand supply is high and vegetation is sparse. They are up to 200m high. From the air, they
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resemble ocean waves and so are referred to as sand seas. Where sand supply diminishes, transverse dunes become isolated and develop scalloped crests that somewhat resemble barchan dunes. Such transverse dunes are called ____________________ dunes.

• ____________________ – these are common in coastal areas where there is ample sand supply and vegetation. They are crescent shaped, like barchan dunes, but their horns point in the direction the wind blows from. They can be distinguished from barchan dunes because the shallow windward slope is on the inside of the crescent, and the horns and edges may be stabilized by vegetation.

Where does the sand come from that forms the dune?

• ____________________ – these form in deserts where wind directions are variable. From above, they resemble a star, with several ridges of sand radiating away from a central point. They may be up to 100m high.

Do star dunes move around? YES or NO

Deserts

How much of the Earth is desert? ________________

Warm air at the equator, produced by the sun’s rays hitting Earth with the greatest intensity, rises and cools, producing rain. This is why equatorial regions are warm and wet. The dry air left behind then moves northwards or southwards, getting cooler and more dense, causing it to sink. As it sinks, it gets warmer and is perfect for the creation of a desert environment.

So what is the latitude of most of the world’s deserts? ________________

Types of Deserts

We can classify 5 different types of deserts:

• ____________________ – the largest deserts, between 20-30° latitude.
  Examples: ____________________, ____________________ and ____________________

• ____________________ – areas so far from the ocean that air loses all its moisture before reaching them. Example: ____________________

• ____________________ – mountains block the flow of warm, moist air causing it to rise and produce rain on the windward side but dry desert conditions on the leeward side of the mountains.
  Examples: ____________________, ____________________ and ____________________
• ___________________ – where cold ocean currents cool the air and lowers rainfall along the coasts. Examples: ___________________ and ___________________

• ___________________ – the polar regions are considered to be deserts because cold descending air causes the small amount of precipitation to be in the form of snow, which accumulates to form the ice caps. Example: ___________________

Desert Landforms

There are several types of landforms specific to deserts:

• ___________________ - temporary lakes after rainstorms

• _______________ - dry lakebed of a playa lake, also called a ________________

• ___________________ and bajadas

• ___________________ - steep-sided erosional remnant sticking above the desert plain

• ___________________ - flat-topped erosional remnant with steep sides. A resistant layer produces the flat top.

• ___________________ - a more eroded mesa that has become taller than it is wide

FINAL QUESTION:

What do we call an eroded butte that is much taller than it is wide?

______________________________