DESERTS & WIND

1- Desert means unoccupied land.

Second after polar areas of least population.

2-Deserts cover > 30% of Land surface forming the largest climatic group.

3- Great Sahara (North Africa) is the largest.

Distribution & Causes of Dry Lands:

Climatologists define "Dry Land" as one in which yearly precipitation is less than the potential loss of water by evaporation. So, "Dryness" is not a function of precipitation only but also "Evaporation" which in turn depends on Temperature; example:

250 mm rain/yr in Nevada may support only sparse vegetation while the same amount in Scandinavia is sufficient to support forests.

Temperature

1- The highest temperature ever recorded on Earth was 58 °C in the Libyan desert. The coldest temperature ever measured was -88 °C at Vostok Station in Antarctica.

2- Not all deserts are hot; Gobi Desert (China & Mongolia) has an average high temperature of -19C in January.

In the water-deficient regions 2 climatic types are common; they are:

1- DESERT = arid.

2- STEPPE (السهوب) = semi-arid; steppe is a transitional zone between dry and humid climates.

Geological Processes dominate in Deserts are related to:

1- Tectonic Forces.

2- Running Water.

3- Wind.

4- > Radiation.

Because these processes combine in different ways from place to place, the appearance of Deserts' Landscapes varies a great deal as well.

Weathering

- Although mechanical weathering predominates (resulting in unaltered rock & mineral fragments), chemical weathering still plays a role…
- Over time chemical weathering results in clays, thin soil, & oxidation of silicate minerals.

1- The Role of Water

- Contrary to common belief that wind is the most important erosional agent, it is actually **RUNNING WATER** that does most of the erosional work (especially Heavy rainfall).
- **most of the desert topography (landscape) is formed in cooperation with the running water**

The Role of Water

- Deserts have **ephemeral streams** (streams that occur during rainfall, so not filled with water year round).
- **Heavy Rainfall→ Flash Floods in Stream Beds→ Extensive Erosion (especially that is no vegetation)**

Heavy Rainfall

The Role of Water

- Video of a Flashflood….

https://www.youtube.com/watch?v=ORZQUlk8vxg

The Role of Water

- **Class Question:**

  The Nile runs through about 3,000 KM of the Sahara Desert, so how does it have water year-round???

Basins and Ranges Landscape

1- Deserts are subjected continually to SMOOTHENING their odd features through time by both sporadic rain & wind.

Stages of Landscape Evolution of Basin & Range

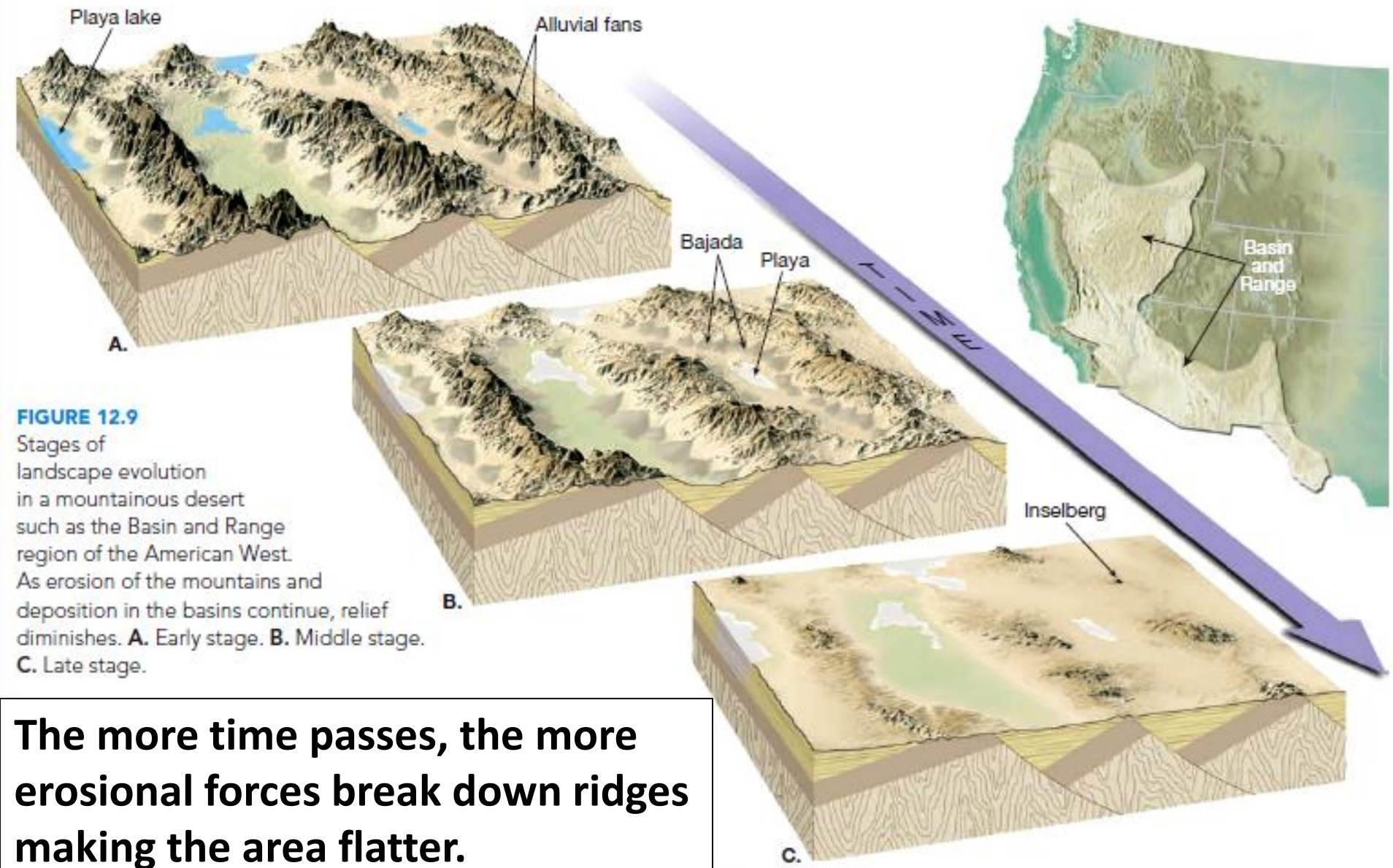


FIGURE 12.9
Stages of landscape evolution in a mountainous desert such as the Basin and Range region of the American West. As erosion of the mountains and deposition in the basins continue, relief diminishes. **A.** Early stage. **B.** Middle stage. **C.** Late stage.

The more time passes, the more erosional forces break down ridges making the area flatter.

PLAYA LAKES: بحيرات القيعان

Are seasonal lakes with cycles of silt/clay/salts depositional character. Most of the coming water evaporates, less infiltrates.

When dry, it is referred to as “Playa”.

2- WIND EROSION

FIRST: **Transports sediments; moving air carries and transports the loose debris (فتات) [mainly sand] as follows:**

A) **Bed load: Saltation – a Latin word meaning "to jump": mostly sand and it skips & bounced short heights**

"the movement of hard particles such as sand over an uneven surface in a turbulent flow of air or water".

B) Suspended load: Mostly fine particles such as silt & clay (more silt) that are carried high in the air by wind, which for short or far distances.

[dust from the Sahara was found in the West Indies].

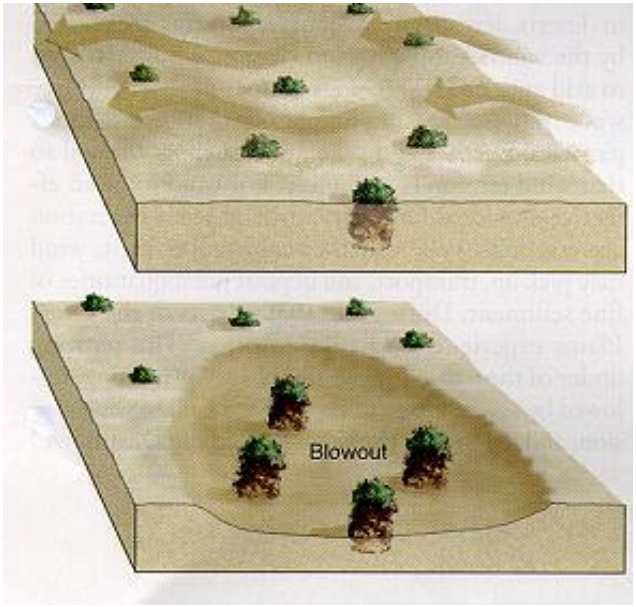
Second: Wind Erosion:

a- Deflation (السفوف): The lifting and removal of loose material by wind.

For the wind to be effective the land should be dry & free of vegetation. This process gives rise to the formation of many topographic features like:↓

- Blowouts:↓

- **They are sandy depressions caused by the removal of sediments by the wind.**



- Desert Pavements:↓

- **Is a layer of coarse pebbles and gravels, too large to be moved by the wind, that covers portions of many deserts *[this method of wind action is similar to sieving]***

Wind Abrasion:

- **Sand and other wind loads collide with surface during wind blowing times, leading to the cutting and polishing exposed rock surfaces.**

Rock pudding.

Wind Deposits: 1) Mounds & Ridges 2) Loess

Conspicuous landforms mainly 2 types:

1) Mounds ↓(هضاب) and Ridges ↓(سلاسل تلال): These are made up of sand from the winds' bed load called "DUNES".

2- As well as Extensive blankets of silt called "LOESS" that once were carried by wind. "***LOESS*** ***is a loosely compacted yellowish-gray deposit of windblown sediment of which extensive deposits occur, e.g., in eastern China and the American Midwest".***

TYPES OF SAND DUNES:

Factors influencing the formation and size of dunes:

1- Wind direction: Regular or random.

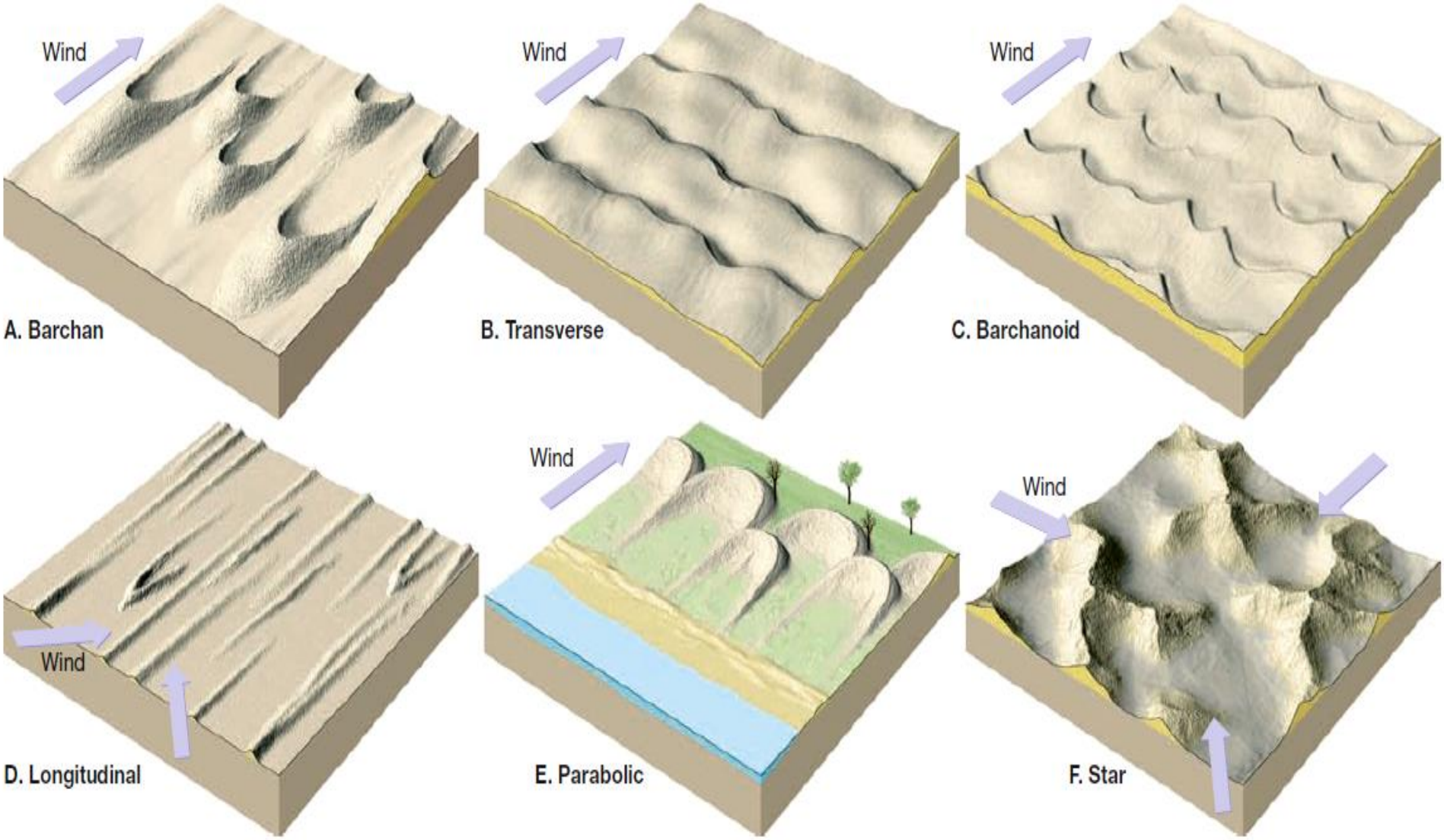
2- Amount of vegetation.

3- Wind Velocity.

4- Availability of sand.

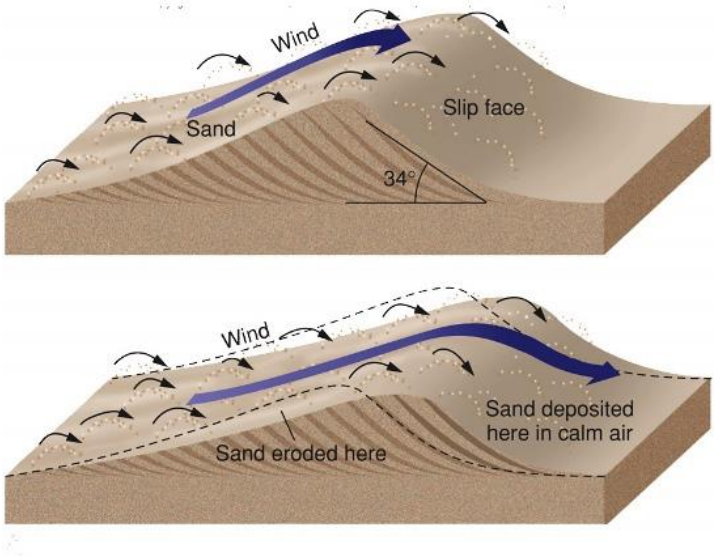
5- Man-made structures.

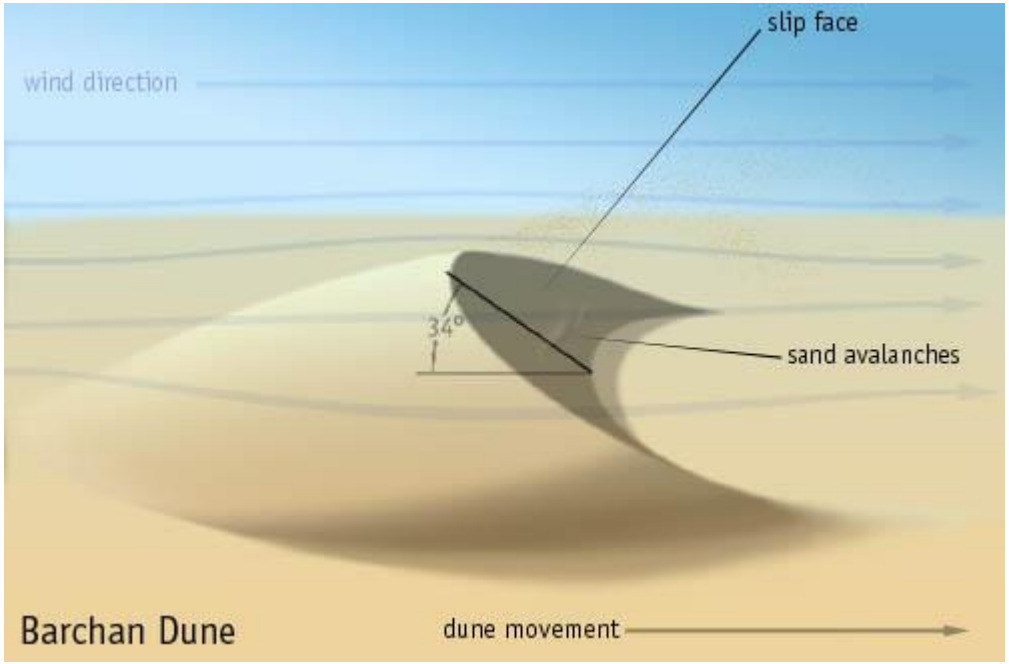
FIGURE 12.19 Sand dune types. **A.** Barchan dunes. **B.** Transverse dunes. **C.** Barchanoid dunes. **D.** Longitudinal dunes. **E.** Parabolic dunes. **F.** Star dunes.



Sand dunes can be accordingly "found" created in many forms:

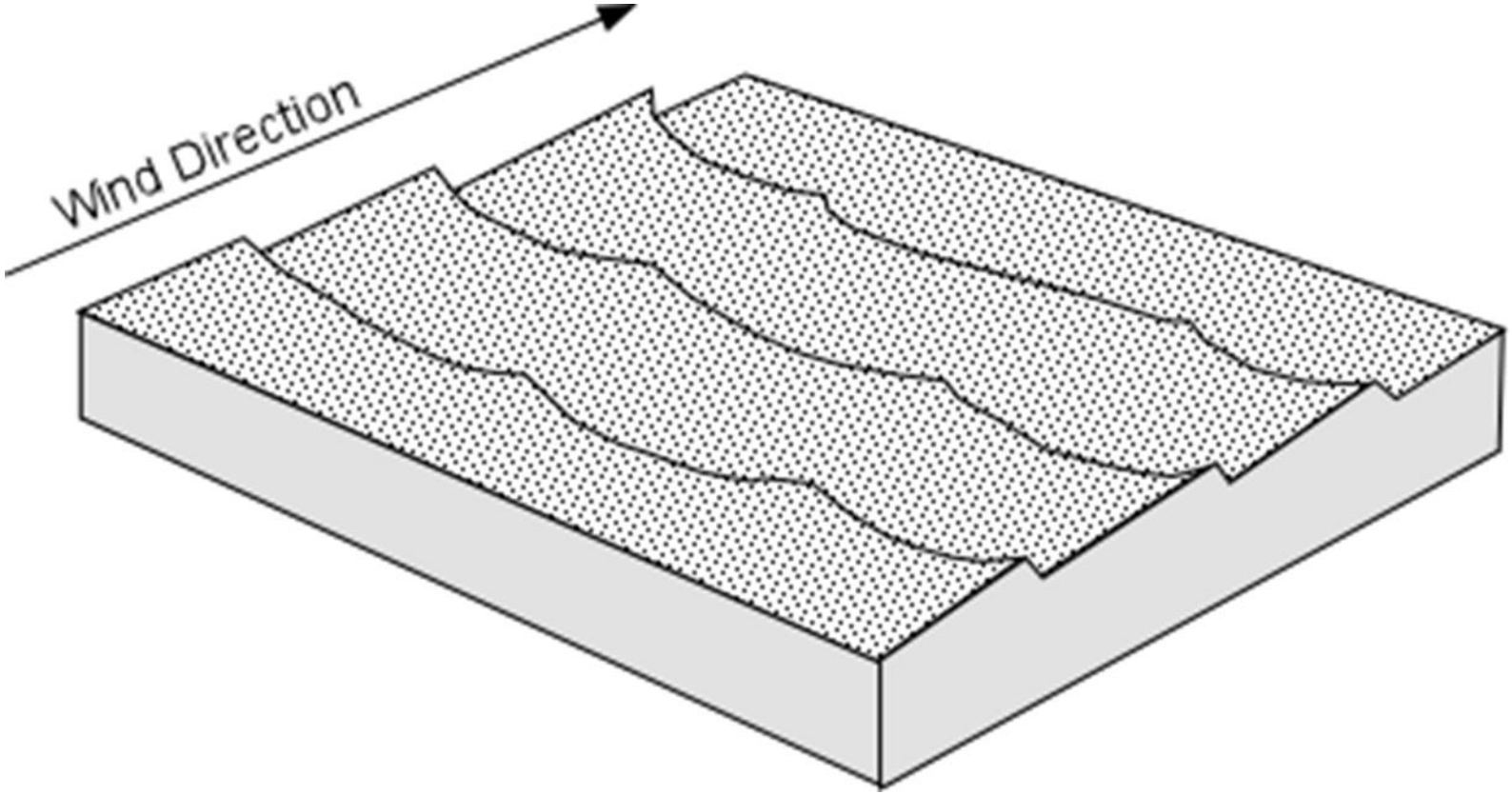
1- **Barchan Dunes: Solitary-shaped with their tips pointing downwind. Form when sand supplies are limited and the surface is hard and lacks vegetation.**





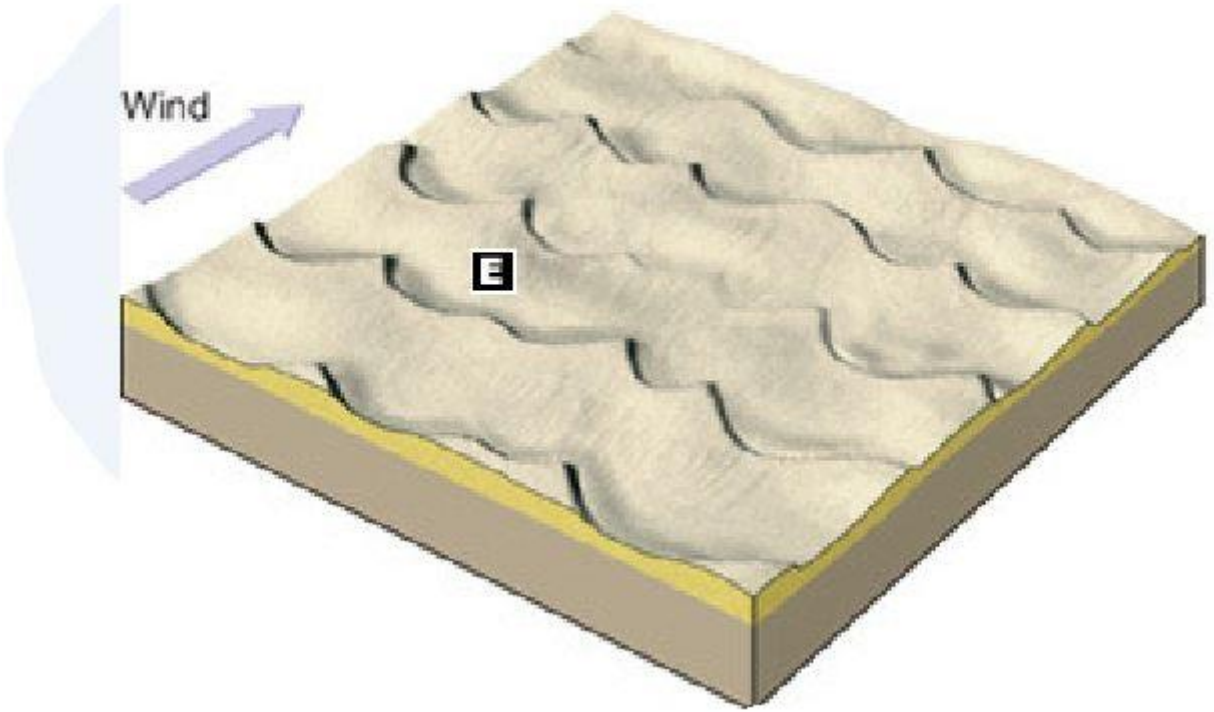
2- Transverse Dunes: Form when wind is steady + plenty of sand + no vegetation. It forms a series of long ridges separated by troughs oriented perpendicular to the wind direction. Some reach 200 m in height; 1-3 km across and extend to 100 km or more forming **SAND SEA**.

Transverse sand dune↓



Transverse Sand Dunes↓

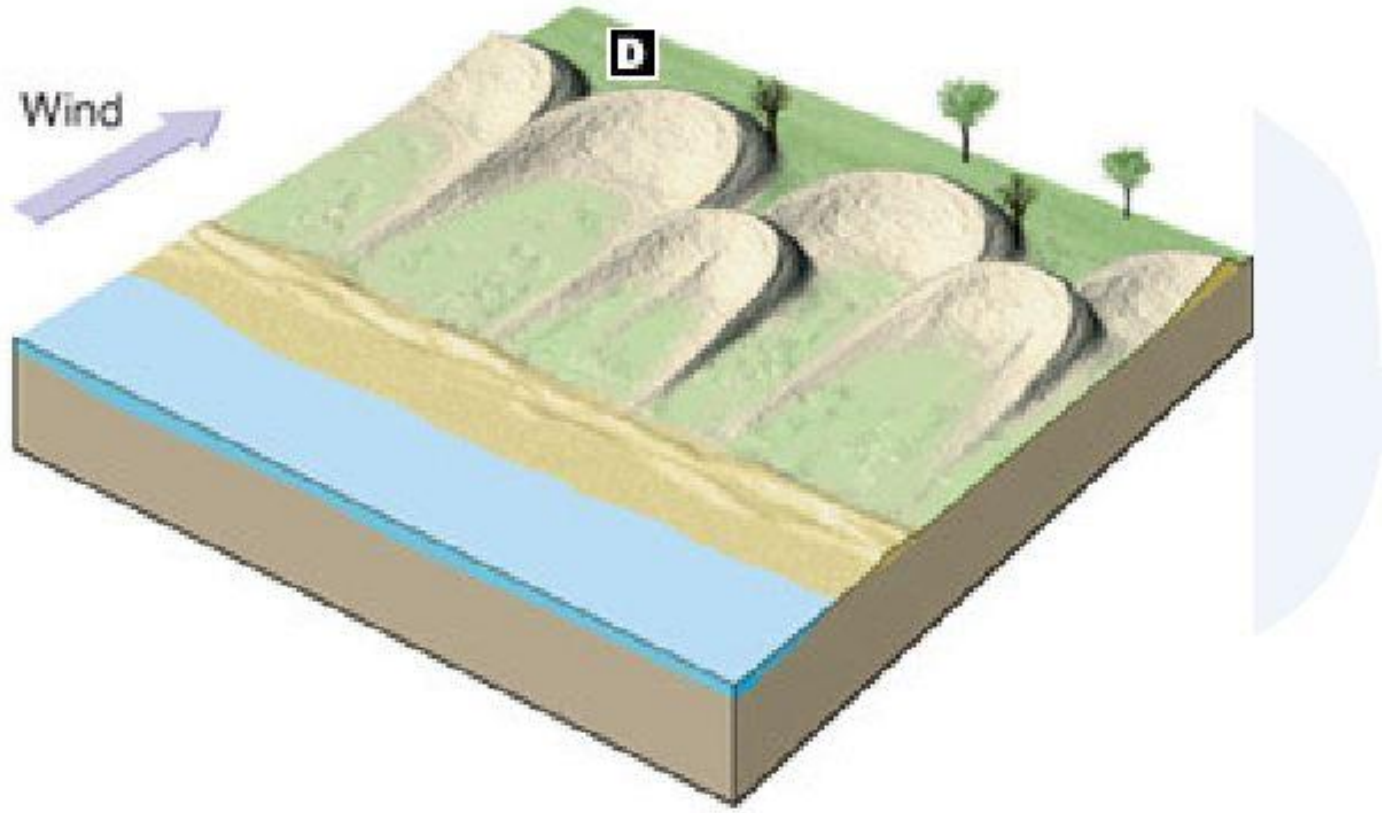
3- Barchanoid Dunes: Similar to transverse but with scalloped (اكليلية) rows of sand orientation.



Barchanoid Sand dune↓

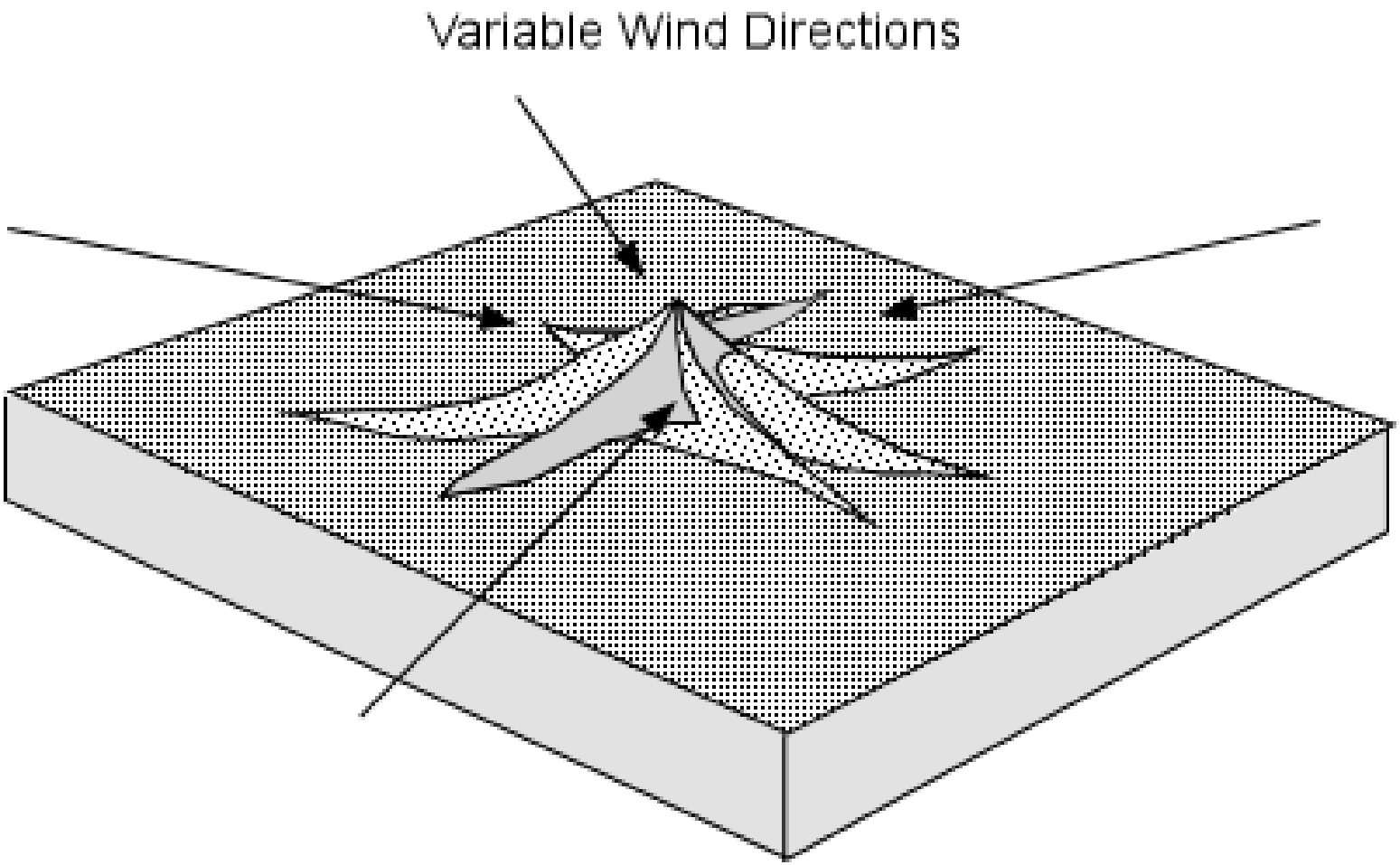
4- Longitudinal Dunes: Long ridges of sand parallel to the wind direction & many reach 100 m height and 100 km long. Form where sand supplies are moderate and wind direction varies a little.

5- Parabolic Dunes↓: When vegetation cover exists and covers the sand. Similar to barchan but mainly near shores.



6- Star Dunes↓: Isolated hills of sand with complex form. Confined to Sahara & Arabia. Reflect wind direction variations. Many reach 90 m height in the center.

…. Star Dune↓



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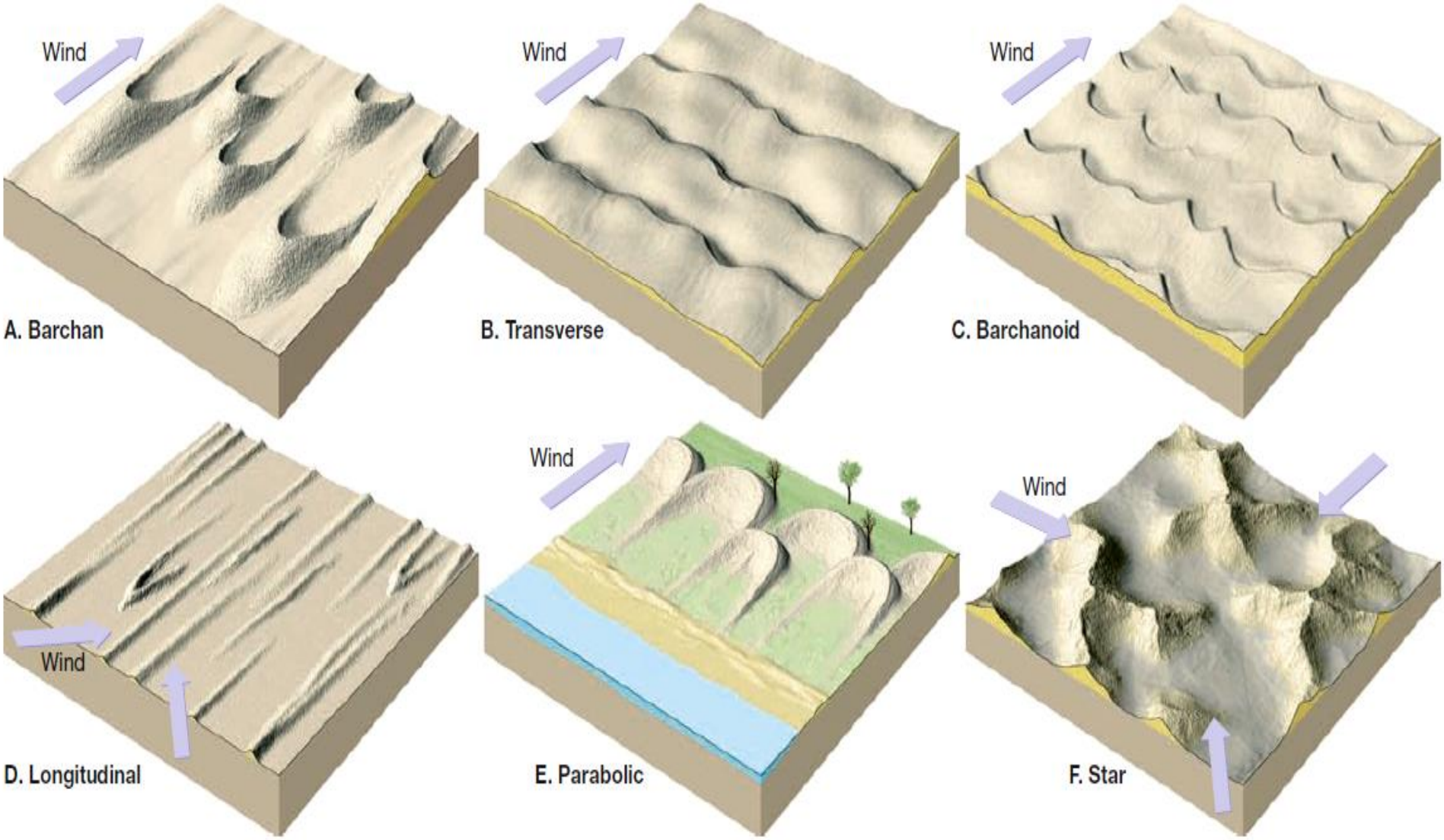

One of the well-known Aeolian Sediments is the LOESS

1- Composed of wind-blown silts.

2- Thick.

3- Lacks any visible layering.

4- Reflect long time of dust storms.

5- When broken by a stream or road cuts they tend to make vertical cliffs.

6- Can be formed by wind or glaciers.

Loess↓

Loess↓

Role of man in DESERTIFICATION

1- Global warming.

2- Trees cutting.

3- Overgrazing.

4- Resources Depletion.

5- Overpopulation.

6- Environmental pollution.

7- Modeling revolution.

8- Urbanization …… etc.