August 2, 2021

Notes, News and Comments

Here are some news items I thought were interesting:

- Bjørn Lomborg "Global warming **saves** 166,000 lives each year". Note that Mr. Lomborg says that he accepts the evidence for anthropogenic global warming. See also the paper he references in the Facebook post; long story short: "Most excess deaths were linked to cold temperatures (8·52%), whereas fewer were linked to hot temperatures (0·91%)". Mr. Lomborg is an interesting author and I recommend his book *The Skeptical Environmentalist: Measuring the Real State of the World* (it was published in 2001, so if you want to buy it, you'll get a better deal on the book from here).
- Magnitude 8.2 earthquake 104 km SE of Perryville, Alaska, triggering a tsunami warning. Other recent earthquakes reported by the United State Geological Survey (USGS) are here; Lots of activity at the subduction zone near Alaska.
- Also from the USGS, a report on their monitoring of the Kilauea Volcano. More discussion on the Hawaiian Islands from the USGS here.
- More on tsunami warnings: California Geological Survey releases new tsunami hazard maps.
- The oldest sponge fossil found in the Canada's Northwest Territories, Smithsonian Magazine. This fossil is approximately 890 million years old, from the Tonian Period of the Neoproterozoic Era, predating the Ediacaran and the Cryogenian Periods. Spoiler, it's not SpongeBob SquarePants.
- The United States Energy Information Administration (USEIA) reports that Renewables became the second-most prevalent U.S. electricity source in 2020. Daily reports from the USEIA are here.
- There is a labour shortage for work on the Bakken Shale play in North Dakota and Baker Hughes reports that they expect to see a slowdown in drilling for oil in the second half of 2021.
- A Brief History of Earth: Four Billion Years in Eight Chapters, by Andrew H. Knoll reviewed in Forbes Magazine. It looks like a good book to me. The reviewer in Forbes really doesn't like the subject, probably too difficult for his narrow mind. This is why I suggest people do their own research.
- More research on the chemistry of volcanic rocks: Geologists take Earth's inner temperature using erupted sea glass.

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Depositional Environments for Sedimentary Rocks, Part 4, Sand Dunes

Figure 1 - Fishing at Athabasca Sand Dunes Provincial Park
Credit: Tourism Saskatchewan, J.F.Bergeron, Enviro Foto

I am going to continue the terrestrial depositional environments with a discussion of aeolian depositional environments, Table 1.

Table 1 Terrestrial Depositional Environments

Environment	Key Transport Processes	Depositional Settings	Typical Sediments
Glacial	Gravity, moving ice, moving water	Valleys, plains, streams, lakes	Glacial till, gravel, sand, silt, clay
Alluvial	Gravity, moving water	Where steep-sided valleys meet plains	Coarse angular fragments
Fluvial	Moving water	Streams	Gravel, sand, silt, organic matter
Aeolian	Wind	Deserts and coastal regions	Sand, silt
Lacustrine	Moving Water	Lakes	Sand, silt, clay, organic matter
Evaporite	Still water	Lakes in arid regions	Salts, clay

Figure 2 - Mesquite Flats Sand Dunes in Death Valley
Credit: Tuxyso, Creative Commons Attribution-Share Alike 3.0 Unported license

When we think of sand dunes, we often think of desert scenes such as in the Death Valley scene in Figure 2 above, or in movies such as *March or Die* (one of my favourites). However, windblown sand deposits are found in many terrestrial environments, often in places where sand was deposited as the result of glacial process, as in the outwash sands reworked by the wind at Lake Athabasca, see in Figure 1, or at the so-called Carberry Desert in Manitoba where sand deposits from Glacial Lake Agassiz were re-worked into sand dunes.

Wind Depositional Processes

Wind will blow sand along the surface of the soil, bouncing as the grains go along, a process called saltation. The wind drives the grains upslope until they reach the top of the dune, where they fall down the slip face of dune. The angle of the slip face will be approximately the angle of repose for dry sand, usually around 30 - 40 degrees.

The bouncing and abrasion result in well rounded grains of relatively uniform size; the grains are often frosted in appearance. Figure 3 shows the processes graphically

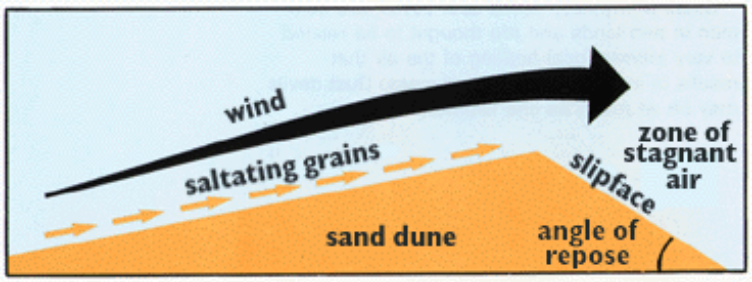

Figure 3 - Wind Blown Sand Processes
Credit: Po ke jung, Geography at College of Marin, Section 4, Aeolian Processes

Types of Sand Dune

The basic types of dunes are: crescent, linear, transverse, star, dome, and parabolic. The types of dunes that form will depend upon the amount of sand available, the strength and direction of the winds, and the presence of vegetation, as in Figure 4.

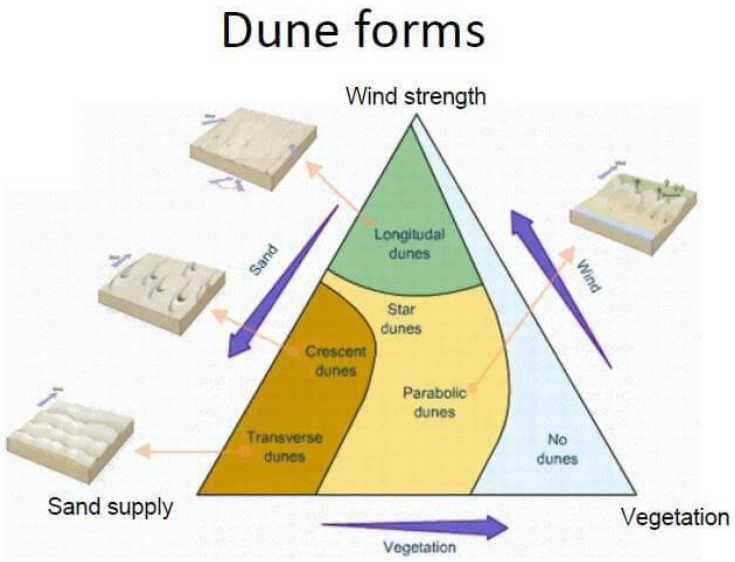

Figure 4 - Dune Forms
Credit: Harish Kumar

Crescent Shaped Dunes

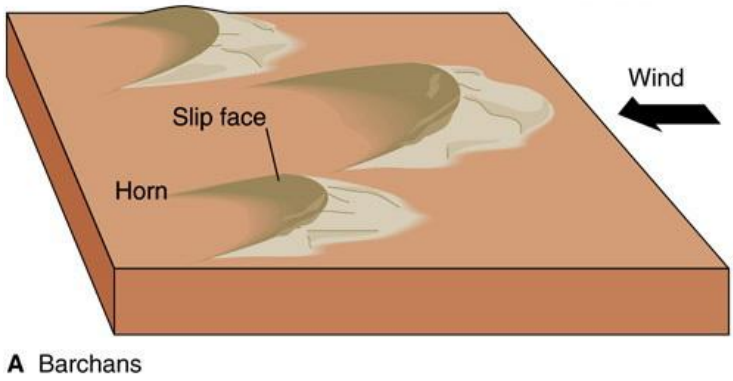

Figure 5 - Crescent or Barchan Dune
Credit: Po ke jung, Creative Commons Attribution-Share Alike 3.0 Unported license

Crescent dunes form under winds that blow from one direction. They also are known as barchans, or transverse dunes. These dues can migrate fast: in China's Ningxia Province a group of dunes moved more than 100 meters per year between 1954 and 1959; similar rates have been recorded in the Western Desert of Egypt. China's Taklimakan Desert has the largest crescentic dunes on Earth, with mean crest-to-crest widths of more than 3 kilometres.

Linear and Transverse Dunes

Figure 6 - Linear Dunes, Namibian Desert
Credit: NASA International Space Station Program, public domain

Linear and transverse dunes are straight or slightly sinuous sand ridges that are typically much longer than they are wide; some may be more than 160 kilometres long. Linear dunes generally form sets of parallel ridges separated by miles of sand, gravel, or rocky corridors between the dunes. They may occur as isolated ridges. In some cases, linear dunes merge to form Y-shaped compound dunes. Many linear dunes form in where the wind comes from two different directions over the year with the long axes of these dunes extending along the resultant direction of sand movement.

Star Dunes

Figure 7 - Star Dune, Badain Jaran Desert
Credit: 张骐, Creative Commons Attribution-Share Alike 3.0 Unported license

Star Dunes are pyramidal shaped sand mounds made up of three or more arms that radiate from the high center of the mound. They a generally found in areas where the wind blows in many different directions throughout the year. With the winds pushing from many sides, Star dunes grow upward rather than laterally. They are the most common type of dune in the Grand Erg Oriental of the Sahara. Elsewhere, they occur around the margins of the so-called sand seas, areas of extensive sand, particularly near topographic barriers. The star dunes are up to 500 meters tall in the southeast Badain Jaran Desert of China and may be the tallest dunes on Earth.

Dome Shaped Dunes

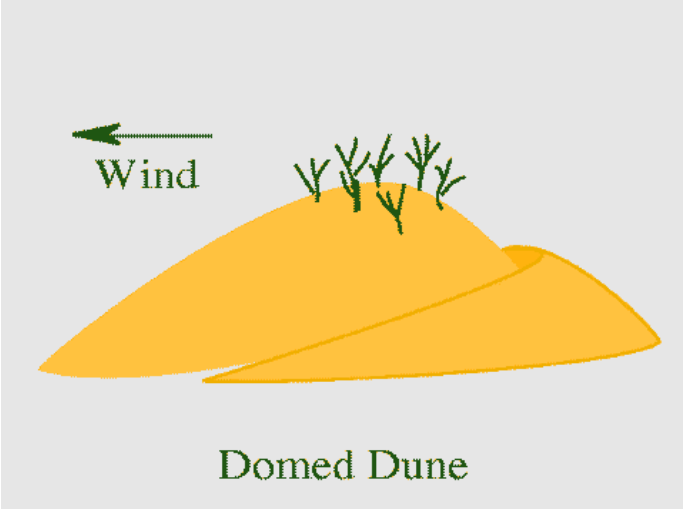

Figure 8 - Dome Dune
Credit: Harish Kumar

Dome Shaped Dunes are rare and similar to star dunes; they are low circular-shaped dunes that lack a slip face. The dome shape is due to unstable wind patterns.

Parabolic Dunes

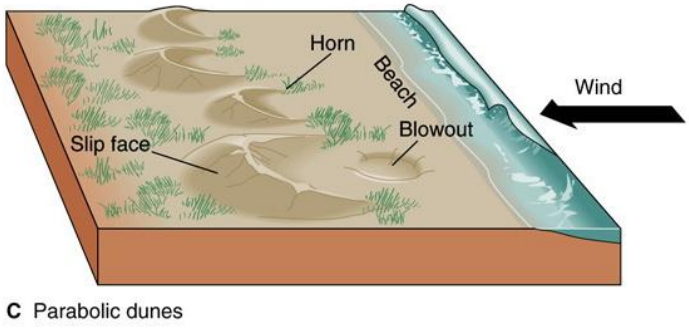

Figure 9 - Parabolic Dunes
Credit: Po ke jung, Creative Commons Attribution-Share Alike 3.0 Unported license

Parabolic Dunes are U-shaped mounds of sand with convex noses trailed by elongated arms. Also called U-shaped, blowout, or hairpin dunes, they are common in coastal deserts. With parabolic dunes, the crests point upwind. The elongated arms of parabolic dunes are fixed by vegetation, thus they follow rather than lead as the due migrates. The longest known parabolic dune has a trailing arm 12 kilometres long.

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.