

Dome Dune

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Definition

Circular to elliptical, relatively flat mounds often without external slip faces.

Synonyms

Dome; Shield dune (obsolete)

Morphometry

On Mars, they are 40–100 m across and <30 m high with 100–1,000 m spacing (De Hon 2006).

Formation

They form where dune height is inhibited by unobstructed strong winds. Strong unidirectional winds retard normal upward growth of dune crests, leading to the formation of dome dunes. Alternatively, they may form when wind velocities are low (Pye and Tsoar 1990 and references therein). Dome dunes may transform into other dune forms. Computer modeling (Parteli et al. 2009) suggests that dome dunes may form if the wind oscillates between two prevailing directions with a period shorter than 0.01 % of the dune's turnover time, which is the time needed for the dune to cover a distance equal to its own size.

Domes may also be dunes smaller than the critical size for a barchan development where slip faces and horns are not able to evolve (Parteli 2007).

On Mars, dome dunes are smaller (<100 m across) than adjacent barchans (>100 m) (De Hon 2006) (Fig. 1). The occurrence of dome dunes in Chasma Boreale in the northern polar region of Mars might be explained by induration of the dune's sand due to frozen carbon dioxide or the presence of salts as an intergranular cement. According to the hypothesis of sand induration, the slip face of an indurated crescent-shaped dune becomes progressively smaller as the sand arriving at the fixed dune from the upwind accumulates at the lee (Schatz et al. 2006; Hermann et al. 2008).

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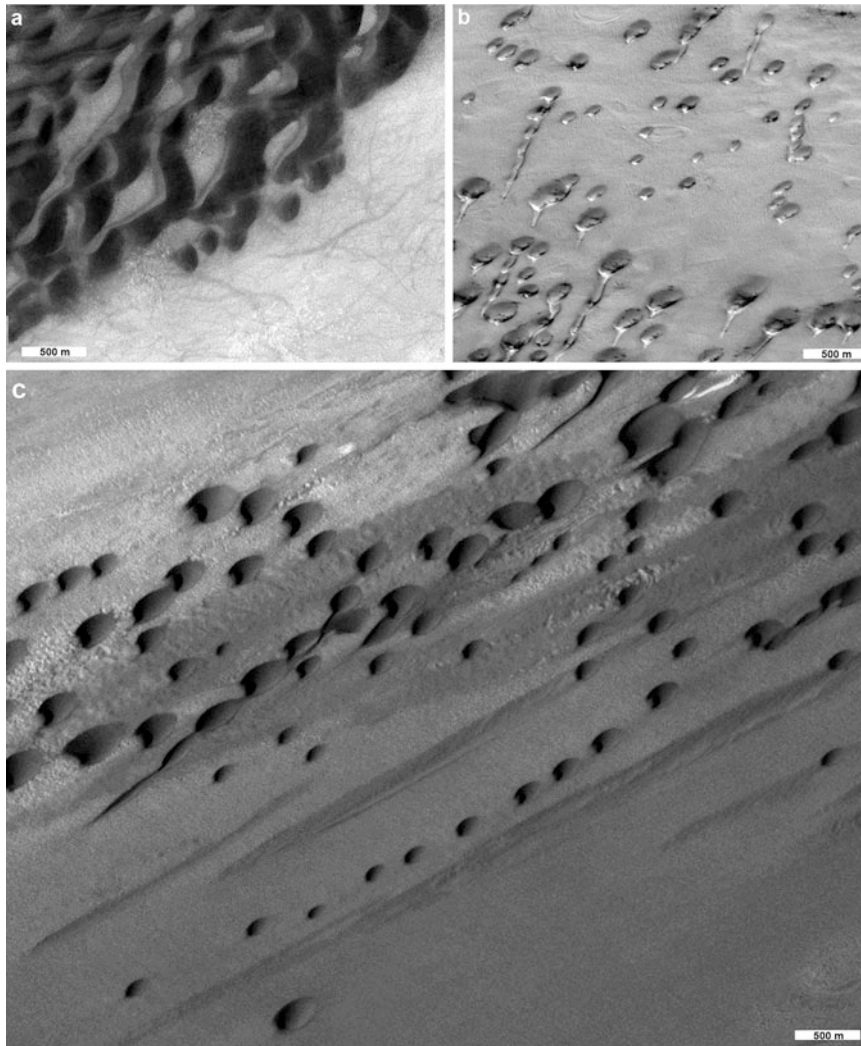


Fig. 1 Dome dunes (a) in Liu Hsin crater on Mars at 53.6°S, 188.7°E (Tirsch 2008), CTX: D09_030852_1265_XI_53S171W, (b) at the northern margin of the North polar sand sea at 81°N 235°E, CTX P17_007747_2625_XN_82N128W, (c) in Chasma Boreale 84.5°N, 331.9°E, CTX: B01_009914_2755_XN_84N028W (NASA/JPL/MSSS)

Distribution

Present on Earth and Mars. On Earth, they are absent in many deserts but are common in the Takla Makan. Elongate dome dunes are a common bedform type in the Lower Victoria Valley, Antarctica (Bristow et al. 2010). Dome dunes often occur close to the upwind margin of dune fields (Pye and Tsoar 1990).

History of Investigation

The term shield was first assigned to oval dunes and its transient forms to barchans by Hogbom in 1923. Mainguet described them as “cake-like sand dunes” with a convex profile (Mainguet 1984).

See Also

► [Indurated Dune](#)

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