



Longitudinal dunes on Titan: Distributions and indicators of winds

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The Cassini Titan Radar Mapper has discovered thousands of longitudinal dunes on Titan's surface, similar in morphology and scale to longitudinal dunes in the African Namib, Saharan, Arabian, and Australian Simpson deserts. They are, however, quite different from those on Earth or Mars, in that they are radar- and optically-dark and are likely comprised of hydrocarbon and/or water ice "sands". Dune orientations, which are dominantly 90° as measured clockwise from north, are likely a direct reflection of the long-term mean wind direction, which is parallel to the dune axis for this dune type. Regional deviations from these patterns are typically due to deflections of wind by topographically elevated features. Vast, dry, sediment traps and basins near Titan's equator have become "sand seas", where dunes are closely spaced, have multiple junctions, and extend for hundreds of kilometers. Dunes are found in nearly 40% of the area observed by Cassini radar within $\pm 30^\circ$ of the equator, but no dunes are found outside these latitudes. Dunes poleward of $\pm 10^\circ$ are more widely spaced and form in patches as a result of a reduced sand supply, a pattern that is seen in terrestrial deserts. This dune study and its companion discovery of lakes at Titan's north polar regions point to a rough picture of Titan's climate of usually arid conditions prevailing at equatorial regions and wet conditions at the poles.