

The Slipface Awakens : Evolution of Linear dunes to Megabarchans ? Examples from Liwa (UAE), Badain Jaran and Titan.

Ralph Lorenz (1), Jani Radebaugh (2), Jason Barnes (3), and Elizabeth Turtle (1)

(1) JHU Applied Physics Lab, Laurel, MD, USA. (ralph.lorenz@jhuapl.edu), (2) Brigham Young University, Provo, UT, USA,
(3) University of Idaho, Moscow, ID, USA

The term megabarchans, referring to large crescentic dunes, might be thought to suggest a link to common barchans. However, the spatial arrangement of megabarchans, such as those at Liwa in the United Arab Emirates where the recent Star Wars movie was filmed, is quite distinct from that found in barchan corridors, and the mechanism by which winds in a unidirectional regime might cause dunes to grow to such large sizes is not at all obvious.

Instead, we suggest that the growth and regular arrangement of megabarchans results from their prior accumulation as large linear dunes in a bidirectional wind regime, and the subsequent reduction in frequency or intensity of one of the wind directions. The more unidirectional wind then results in preferential slip face development on one side, and slow migration (slow, since the dunes are large – we report measurements of 50-80m high dunes at Liwa of $\sim 0.1\text{m/yr}$). The continuum of linear to hooked barchan forms in the Rub Al'Khali south of Liwa supports this paradigm. The Badain Jaran desert similarly has rather large dunes with a regular arrangement, but may have evolved further, with generally more well-developed crescentic slip faces.

The relevance of this evolution to Titan, where some hooked barchan forms have been identified, will be discussed. Another feature of Liwa and the Badain Jaran, that may also have a counterpart on Titan, is the existence of interdune sabkhas due to a near-surface water table. In the Badain Jaran these are quite often water-filled, and similarly in the Lençóis Maranhenses barchanoid dunes in Brazil, seasonal flooding of the interdunes occurs. The possible role of water on sand mobility and the resultant dune morphology will be discussed.