Flume experiments of the deformation of barchans by the variation of flow velocities

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Barchan dunes, isolated crescent-shaped bedforms, are generally believed to develop where wind (or water flow) is unidirectional and the available sand is insufficient to cover the dune field. Several field observations showed that barchan dunes indicated the peculiar deformed features where flows have variations of flow direction and flow velocity. It is likely that these features are caused by the variation of flow conditions. We previously conducted water flume experiments under bidirectional flows with several angular variations. As a result, we could estimate two types of Martian deformed barchans: 'gull-wing shaped' barchans in Proctor crater developed under bidirectional flow with 180 degree angular variation, and 'teardrop-shaped dunes', which had single horn and rounded body, changed from barchan dunes under oblique bidirectional flows.

In this presentation, we show the results of flume experiments about the relationship between morphology of barchans and the variation of flow velocities. We used diatomite instead of silica sand as particles because the diatomite can be moved by slower flow than the silica sand can be. We observed the eddy provided in leeward side of the barchans and the sand movement on the surface of the barchans and found the morphological features under very fast flow.