

Flume experiments on the sand dunes under bidirectional flows with angular variation: the formation process and resultant topography depending on the angular variation and intensity ratio

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Sand dunes are formed by the interactions between sand particles and the surrounding fluid. The process is not yet understood in detail due to the large time scale of the deformation. The present study, using a flume experiment, aimed to understand the formation process of isolated sand topographies under bidirectional flows. A series of flume experiments showed the angular variation θ of the two flows has the greatest effect on the resultant type of topography. The process of deformation of the crest line depends on the angular variation, while the intensity ratio a changes the shape of crest line between linear and crescentic shapes. In addition, particular topographies were formed under flows with 75, 90 and 180 degrees angular variation. Based on the results, a new phase diagram for estimating the flow conditions of bidirectional flows from the dune forms is presented and applied to three field observations on Earth and Martian surfaces.