17th MSS-Seminar
Wednesday, May 18th, 15:30, Nägelsbachstr. 49b

Modeling of sand dunes

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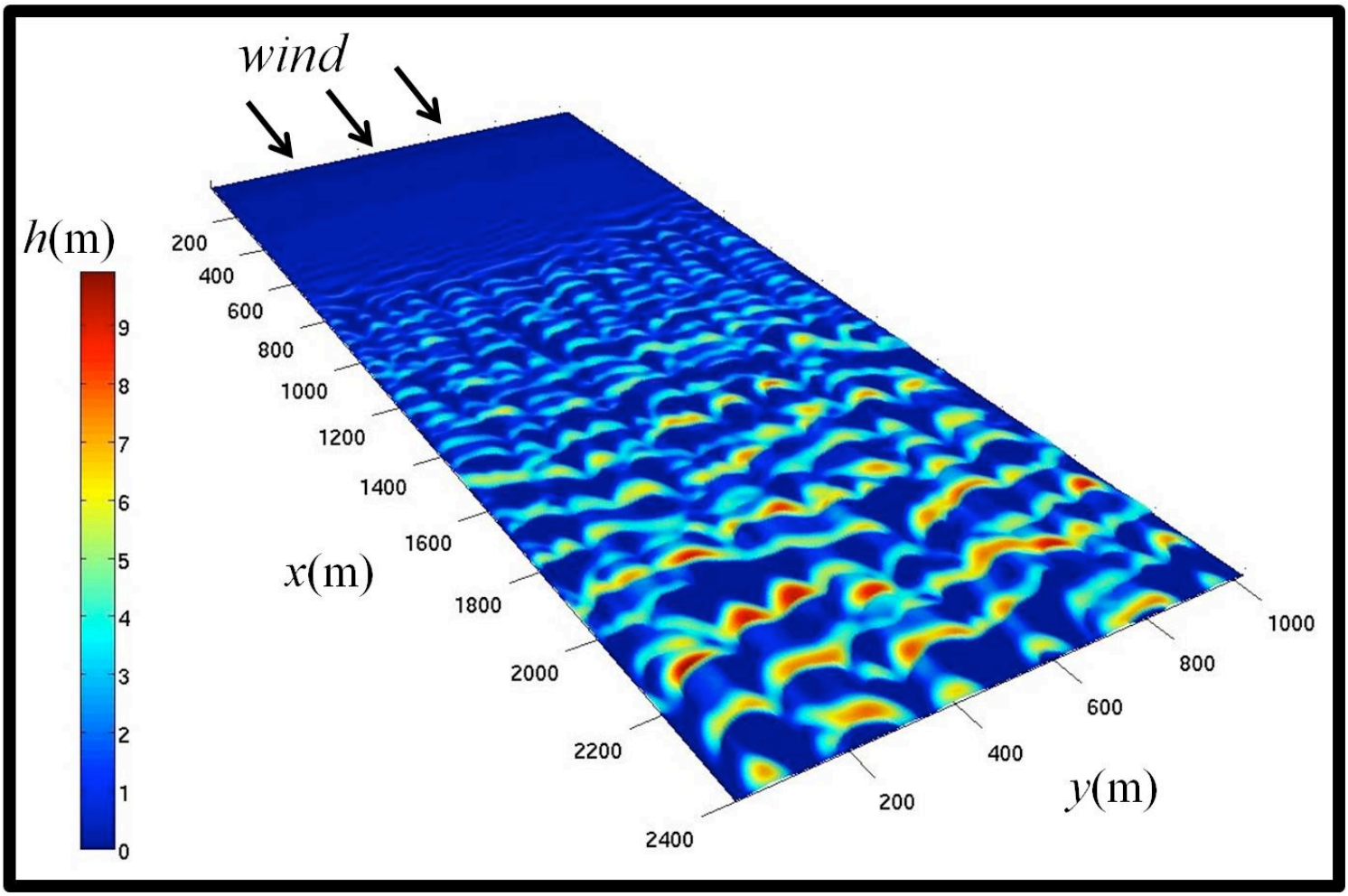

Sand dunes are beautiful patterns formed by the wind. Dunes are widespread on Earth, Mars and even on the sea bottom. Dune mobility poses a technological and environmental problem of relevance not only for the coastal management, but also for the planetary science. We present a recently formulated continuum model that incorporates the essential mechanisms for dune formation, and has proven to reproduce the shape of dunes with good quantitative agreement with measurements. We apply the dune model to study dune formation under varying wind directions and on granular surfaces with a water table that can rise and sink as a result of seasonal variations in rainfall. Our calculations shed light on the formation of different types of dunes occurring in nature, and explain the emergence of large dune fields from a localized sand source, such as a sand beach. Finally, we calculate dune formation using parameters for Mars. Our results show that Martian dunes could have been formed by the occasional wind gusts occurring today on the red planet. From the shape of Martian dunes, we estimate the average speed of sand-moving winds, the dune migration velocity and also the time-scale of wind changes leading to some exotic Martian dune shapes that do not occur on Earth.