Geophysical Research Abstracts, Vol. 7, 10799, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10799

On the length at which dunes form: Martian dunes compared to laboratory measurement in water and field measurements of aeolian sand dunes.

B. Andreotti and P. Claudin
PMMH, ESPCI, Paris (andreotti @ pmmh.espci.fr

We show from a theoretical analysis that there is a single length scale in the problem of dune nucleation: the saturation length which is the length needed for the sand transport to saturate. By direct measurements, we show that this quantity scales as the grain diameter times the grain to fluid density ratio. We show that the wavelength of destabilization of a flat sand bed turns out to be proportional to the saturation length. This is verified for aeolian sand dunes (direct field measurements, density ratio 2250) and in a lab experiment in which we control the formation of submarine dunes (density ratio 2.65 and 7). We show, from the visualization of the grains composing Martian ripples, and from the scaling laws of erosion and suspension thresholds with respect to the grain diameter, that the grains in saltation are around 80 microns in diameter. Then, the wavelength of dune formation on Mars (density ratio of the order of 180000) is perfectly coherent with the scaling law validated in air and water.