Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08455, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08455
EGU General Assembly 2008
© Author(s) 2008

Dielectric stratigraphy of density and humidity at a barchan sand dune

H. Mint Babah(1), M. Louge(2), A. Valance(1), P. Dupont(3), A. Ould El Moctar(4)

(1)Institut de Physique de Rennes UMR CNRS 6251, Université Rennes 1-35042 Rennes Cedex-FRANCE, (2)Cornell University, Ithaca, NY 14853, USA, (3)INSA Rennes - FRANCE,(4)Ecole Polytechnique de l'Université de Nantes, Laboratoire de Thermocinetique, UMR CNRS 6607, 44306 Nantes Cedex 3-FRANCE

By erecting a porous barrier slowing down mass transfer to the ambient, dunes can trap considerable amounts of water, thus fostering bacterial growth. To inform this process, we report stratigraphic measurements of solid volume fraction and water mass fraction near the surface of barchan dunes.

For these measurements, we designed and developed field-portable capacitance instruments capable of recording such quantities at the surface and in the depth. Laboratory calibrations showed that the real part of the complex effective dielectric constant of a granular pile is directly correlated to the volume fraction of the medium, while the ratio of the imaginary part to the real part correlates well with water mass fraction.

Stratigraphic data at selected points on a test barchan dune (dune foot, stoss slope, crest, horn Ĕ) were collected, as well as surface profiles of sand ripples. The analysis of our data revealed the existence of strong gradients of solid volume fraction and water mass fraction in the first centimeters below the surface of the dune. Besides, we evidenced significant spatial variations of the solid volume fraction at the dune surface, that we tried to correlation with the past transport events and the location at the dune. More surprising is the solid volume fraction variation at the ripple length scale. We found indeed much higher volume fraction in the ripple throughs than at the ripple crests.

We finally analyzed the consequences of the variation of the sand bed volume fraction

on the sand transport processes.