The need of field test in developing in-situ instruments

(by Kris Zacny, Honeybee Robotics at http://www.ibnbattutacentre.org/why-field.html)

Geological uncertainty cannot be duplicated in laboratory

The test in natural environments allow you to check the natural variability of the geological environments. In Lab the operator create the conditions of the test that are not representative of the real operational situation

Operation Readiness Test (ORT)

For large and long field campaigns one should consider an Operation Readiness Test (ORT) close by to shake out potential logistical problems.

Logistics

Logistical support is critical especially in early TRLs. Easy of getting spare parts, tools, hardware for not only fixing equipment but also modifying etc.

Playground

Easy to try out different sampling approaches.

Experience

Gives instrument developers (engineers) an idea of environment where the instrument will be used. Scientists go to the field but engineers build hardware – information/lessons learned can be lost.

Team: scientists working with engineers.

Scientists learn about difficulty in robotic exploration and engineers learn what scientist care about. Problems are addressed by both sides and this interaction may result in better instrument/sampling system design.

Why testing aeolian process and interactions with instruments in natural representative environments

Large wind mass
The aeolian processes operate at an extremely large scale: wind current can be km high, tens of km wide and move over large distance even in excess of 10,000 km.

Influence over the boundary layer (surface/wind interface)
The entire wind mass is sustained by complex processes that influence every part of this system, mostly the boundary layer at the surface interface that is the one affecting the systems that we need to perform investigation

The impossibility to control and mimic all the sub-processes
The wind system is extremely complex and cannot be repoduced in lab

Dust devils
Dust devils are a major component of the aeolian system and are extremely importatnt for their interactions with with the interfaces and instruments. Dust devilks cannot be reproduced in laboratory.

Cost
Field tests are remarkably cheaper than laboratory tests

Why perform test in Sahara

Because Sahara is the desert with the most content of dust at the surface and in the atmosphere, comparable with the large dust content of dust on Mars

Bode´le´, Depression of Central Sahara	>30
West Sahara, Mali and Mauritania	>24
Arabia, Southern Oman Saudi border	>21
Eastern Sahara, Libya	>15
Southwest Asia, Makran coast	>12
Taklamakan, Tarim basin	>11
Etosha Pan, Namibia	>11
Lake Eyre Basin	>11
Mkgadikgadi Basin, Botswana	> 8
Salar de Uyuni, Bolivia	>7
Great Basin of the USA	>5

Maximum mean values of Aerosol Index for major desert determined by TOMS (After Goudie and Middleton, 2001)

Austrian Space Forum test of astronaut suit and human exploration

The Ibn Battuta Centre is a facility of the Europlanet Research Infrastructure financed by the European Union to conduct scientific and technical collaborative research.

The Ibn Battuta Centre for exploration and field activities was established in 2006 by the International Research School of Planetary Sciences (Pescara, Italy) to prepare and execute tests of rovers, landing systems, instruments and operations related to the exploration of Mars and Moon. The Centre has a major partner, the Universite' Cadi Ayyad of Marrakech (Morocco) where it is located.

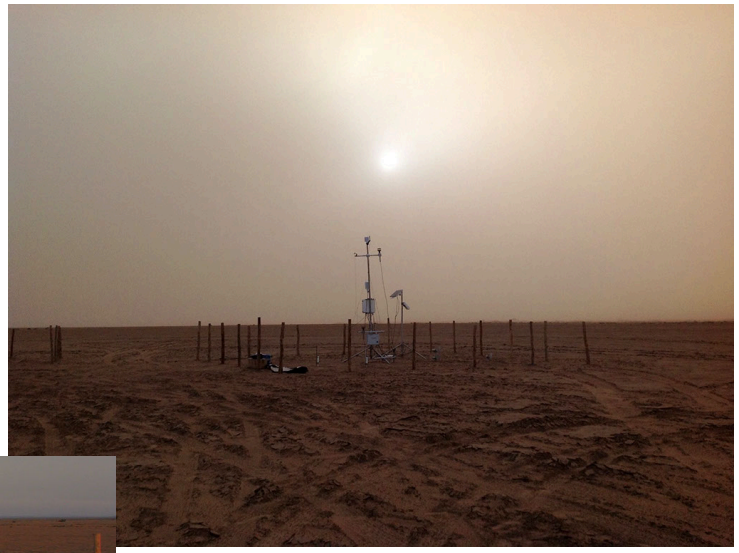
This picture is from the Human exploration test conducted by OWF in our site in Erfoud. Wind, sand and dust have been a problem for human and harware..

Curtesy OWF and Gernot Gromer

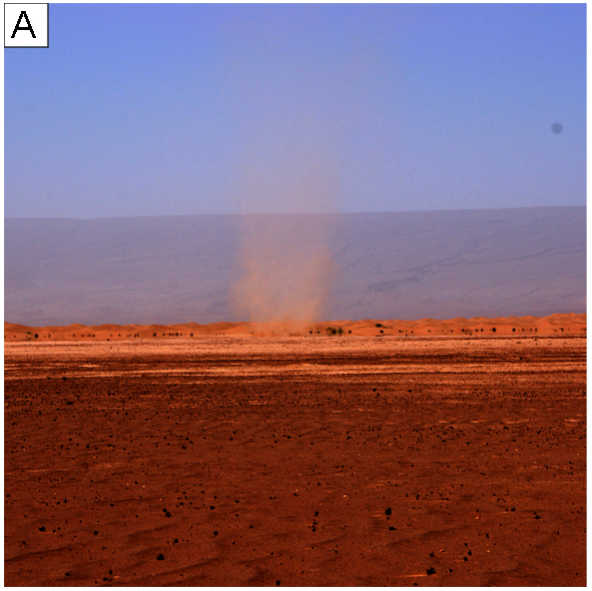
Eolian and dust research activities
Scioentific team of Dreams

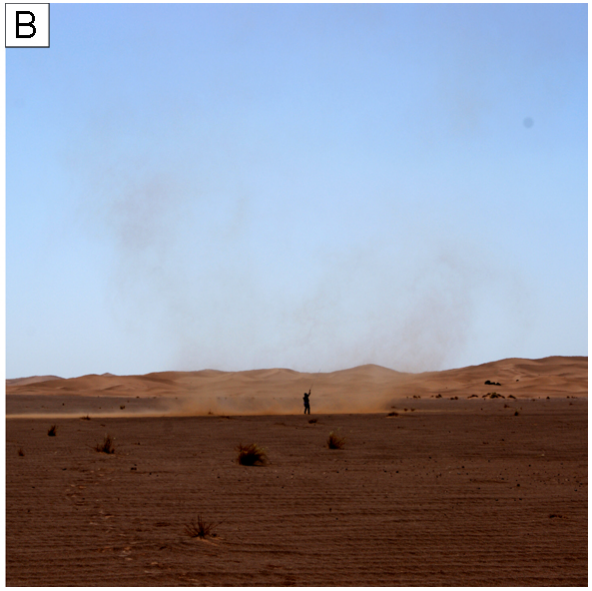
Dreams, ExoMars 2016

Three field seasons during sand/dust storm period testing the Dreams instruments in the Sahara desert, Francesca Esposito, INAF and Dreams PI

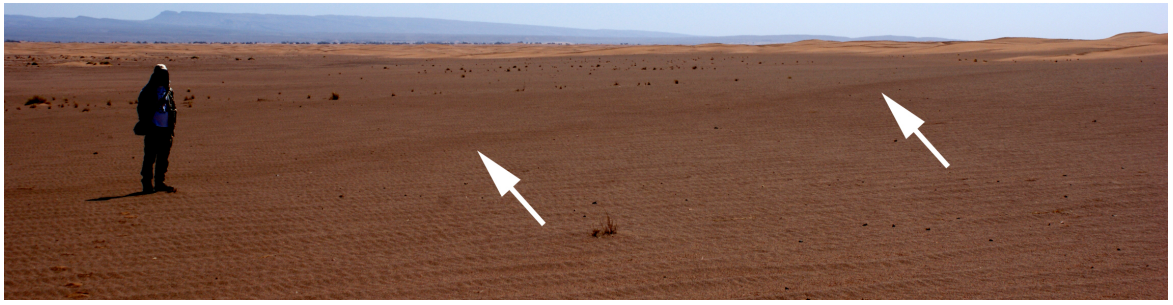


Analysis of the dust devil dynamics
Department of Planetology,
University of Munster

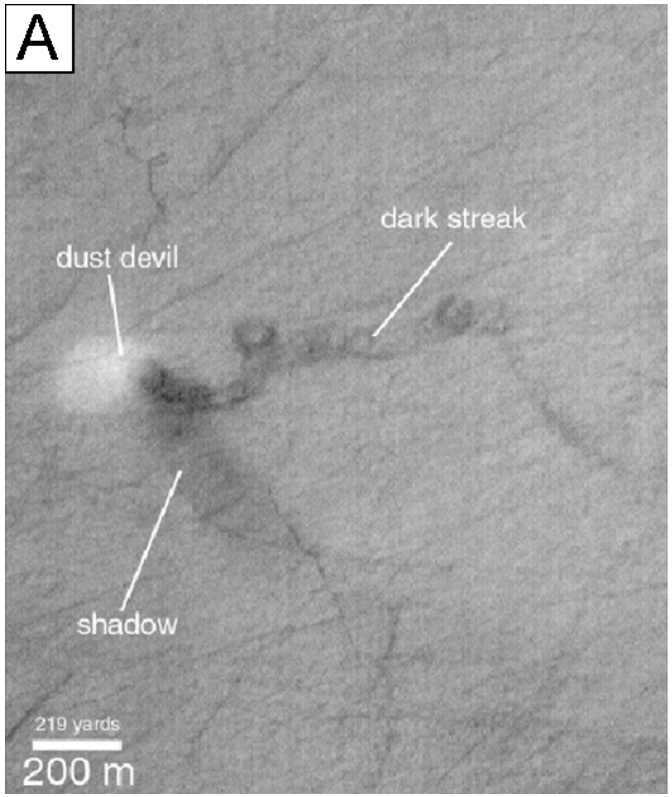




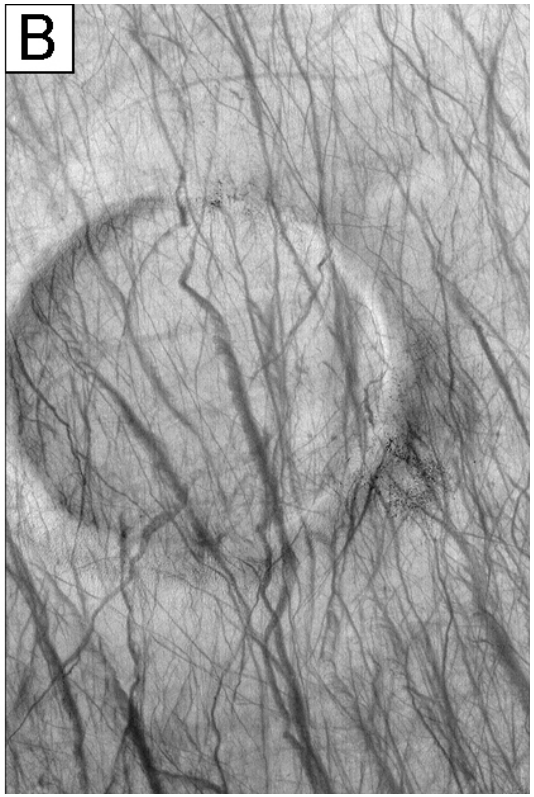
(A) One of the larger observed dust devils (~30 m in diameter) in the study area. (B) Active dust devil (~18 m in diameter) sampled during the field campaign.



Dust devil track analyzed during the field campaign



Satellite image of an active dust devil on Mars leaving a track (NASA/ JPL/MSSS).



Satellite image of numerous dust devil tracks in the southern hemisphere on Mars (image width 3 km, NASA/JPL/MSSS).