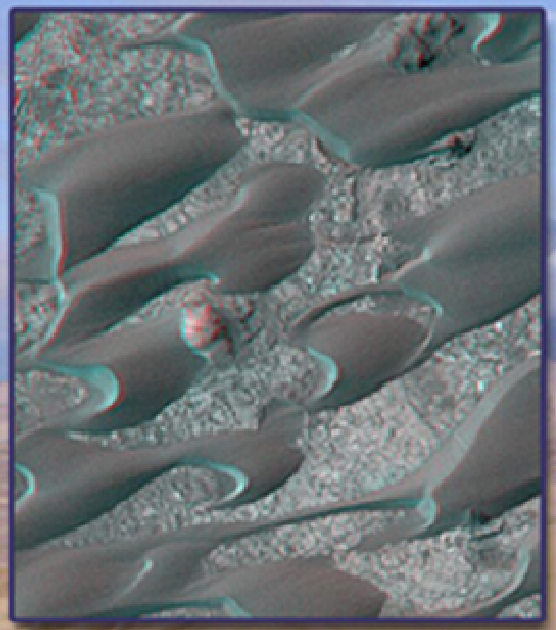
Second International Planetary Dunes Workshop:

Planetary Analogs — Integrating Models, Remote Sensing, and Field Data



May 18-21, 2010 Alamosa, Colorado

Mars Exploration Program Advisory Group
Monrovia, Ca
1 OCT 2010

Objectives

- Facilitate cross-talk and collaborations between Aeolian disciplines and planets
- Produce a top priority list.
- Publish the Meeting Proceedings in EOS
- Publish an expanded Meeting Proceedings in an Aeolian Journal.

  - Has become a grass-root movement.
  - Moved beyond Earth-Mars to the entire solar system.

What was the result of the last Workshop?

- Hayward, R. K., et al (2009), Aeolian dunes as ground truth for atmospheric modeling on Mars, J. Geophys. Res., 114, E11012, doi:10.1029/2009JE003428.
- Chojnacki, M., et al. (*in press*), Climbing and Falling Dunes in Valles Marineris, Mars, *Geophysical Research Letters,* 2009GL042263R, doi:10.1029/2009GL042263.
- Steve Scheidt – White sands paper
- Simone Silvestro – published (specific reference?)
- Mary Bourke – Emilie Gardin went to PSI after the workshop which led to publication.

What was the result of the last Workshop?

- Jani Radebaugh – research in the Namib that she is trying to get funded through PG&G
- Cynthia Dinwiddie – Tim Michaels and multilevel weather station
- Graduate Student Career saved.
- Paper Reviewers Found
- Ralph Lorenz – talked to Nick and Jani which led to a mini-workshop held last year

Workshop Format

- Tuesday
  - Full Day of Talks
  - Evening Reception/Poster Session
- Wednesday
  - Field Trip to Great Sand Dunes
- Thursday
  - Full Day of Talks
  - Group Dinner
- Friday
  - Half Day/Wrap-up

1. Collaborations and Research Approaches:

1. Process-oriented research that includes all planetary bodies is valuable. Interdisciplinary research and collaborations are encouraged in order to advance the understanding of aeolian processes and forms across all planetary bodies. The workshop was organized to encourage discussion of processes that are common to multiple bodies as opposed to planet-specific discussions. This approach proved to be highly successful and highlighted the need for research interactions based on common processes.

2. Dune fields do not form in isolation – but interact with topography and other processes, e.g. fluvial or lacustrine sand sources and cementing volatiles. In order to better understand dunes and dune fields, aeolian studies must include the effects from other types of processes.

Winds and Surface-Atmosphere Interactions:

1. There is an increased need to compare remotely-sensed and in-situ wind indicators (e.g. dune morphologies or convection patterns using clouds) to high resolution wind models (e.g. MRAMS). An example of this type of study resulted from the first planetary dune workshop (Hayward et al., 2009).

2. Numerical simulations that explore the link between dune form, wind direction and sediment supply have shown great promise in applications to Mars and Titan and should continue.

3. All future landers and rovers launched should be equipped with wind instrumentation, specifically an anemometer.

Composition and Age:

1. The concept of 'mineralogical maturity' is important in terrestrial dune research. It is likely to be significant on Mars as well. Research should be done to determine what 'mineralogical maturity' would be for the mafic minerals on Mars. This concept should be expanded to other planetary bodies as compositional data become available.

2. Given the antiquity, atmospheric compositions and mineralogical composition of planetary surfaces, what absolute dating methods are appropriate to determine the age and time scales of evolution of aeolian forms?

3. Higher resolution images have made it possible to identify aeolianites in stratigraphic outcrops on Mars. The location, age and nature of the aeolianite record will help extend our understanding of the nature, timing and geomorphological importance of major phases of aeolian activity on Mars.

Aeolian Feature and Change Detection:

- Higher resolution images have made it possible to detect changes in aeolian form during current missions (e.g., disappearing dunes and moving ripples). The development of automated methods of change detection may assist in this labor-intensive task.
- In order to facilitate the development and testing of automated feature and change detection software, researchers should compile and make publically available databases of aeolian features that will provide 'ground truth.' Hayward et al. (2007) is an example of such a database. However, this database only contains dune fields of moderate to large size in the equatorial region of Mars.

Interactions with Volatiles:

- Determine the composition of dune volatiles and the nature of volatile emplacement.
- More physical experimental work is needed (e.g. aggregate transportation, physical weathering in periglacial climates).

Field Work and Planetary Analogs:

- There is a need for additional studies of relevant dune analogues. Field work can be expensive, but must be funded if progress in understanding aeolian processes is to continue. Relevant analogues:
  - Climate analogues: Antarctic (cold and hyperarid).
  - Mineralogical analogs: Hawaii, Iceland (also cold, but humid) plus other sites outlined in Edgett and Lancaster (1993).
  - Morphodynamic analogs: especially active hyper-arid deserts (e.g. Namib and Atacama Deserts).

Expected Outcome

- EOS Meeting Proceeding
- Special Issue in an Aeolian Journal
- Several continuing and new collaborations
- Continued grassroots movement

Next Workshop

1. Mid/Late 2012
2. Flagstaff, AZ