

# MEETING

## Priorities for Future Research on Planetary Dunes

***Planetary Dunes Workshop: A Record of Climate Change; Alamogordo, New Mexico, 28 April to 2 May 2008***

PAGE 447–448

Landforms and deposits created by the dynamic interactions between granular material and airflow (eolian processes) occur on several planetary bodies, including Earth, Mars, Titan, and Venus. To address many of the outstanding questions within planetary dune research, a workshop was organized by the U.S. Geological Survey, the Planetary Science Institute, the Desert Research Institute, and the Search for Extraterrestrial Intelligence Institute and was sponsored by the Lunar and Planetary Institute and the Jet Propulsion Laboratory.

The workshop brought together researchers from diverse backgrounds, ranging from image analysis and modeling to terrestrial analog studies. The group of approximately 45 international researchers had intense discussions in an attempt to identify the most promising approaches to understanding planetary dune systems. On the basis of these discussions, the group identified the following 10 priorities for future planetary dune research:

1. Better communication should be facilitated among scientists studying dunes on all planetary surfaces through joint research, future workshops, and special sessions at meetings.

2. More studies of terrestrial analogs are needed to better understand fundamental processes.

3. Fundamental differences in atmospheric properties (especially density) between planetary bodies have an important effect on boundary layer characteristics and therefore sand transport processes. Such issues should be addressed via a combination of laboratory experiments and numerical modeling.

4. The relationships between dune orientation and winds are known in general terms, but information on specific dune fields is often lacking. To learn more, scientists should increase their use of small-scale higher spatial resolution climate models for comparison with observed wind directions and dune orientations.

5. Development and expansion of planetary dune databases is required.

6. Additional research is needed to develop or refine dune classification schemes to reflect both morphology and formation processes. For instance, dune morphology classification should indicate the effects of different wind regimes.

7. More research on the formation process of linear dunes is also needed to help explain differences from one planetary body to another. For example, linear dunes, which are widespread on Earth, are rare on Mars but have recently been identified on Titan.

8. Additional research is required to constrain physical properties (e.g., grain size, degree of induration, and composition of dune sediments) of linear dunes on Mars, Titan, and Earth. More specifically, the effects of these physical properties on remote sensing signatures in visible/near-infrared, thermal, and microwave wavelength regions must be determined.

9. Modeling of dune morphodynamics has progressed rapidly in recent years; however, additional numerical and analog (e.g., flume) studies are still needed to increase our understanding of observed dune patterns.

10. Quantification of atmospheric parameters important to eolian processes (e.g., wind speed, wind direction, wind shear stress) is necessary for understanding fundamental aspects of sediment transport on planetary surfaces. Nevertheless, such data are rarely acquired by landers and rovers. Therefore, future planetary missions must include instruments that can be used to advance understanding of the dynamics of wind transport of sediment on planetary surfaces.

A follow-on meeting to assess research progress is planned for spring 2010 at the Great Sand Dunes National Monument, in Colorado. For additional information about the workshop, contact the authors or visit <http://www.mars-dunes.org>.

The full text of this meeting report can be found in the electronic supplement to this *Eos* issue ([http://www.agu.org/eos\\_elec](http://www.agu.org/eos_elec)).

—TIMOTHY N. TITUS, U.S. Geological Survey, Flagstaff, Ariz.; E-mail: [ttitus@usgs.gov](mailto:ttitus@usgs.gov); NICK LANCASTER, Desert Research Institute, Reno, Nev.; ROSE HAYWARD, U.S. Geological Survey, Flagstaff, Ariz.; LORI FENTON, NASA Ames Research Center, Moffett Field, Calif.; and MARY BOURKE, Planetary Science Institute, Tucson, Ariz.