

The 6th International Conference on Mars Polar Science and Exploration: State of knowledge and Top Five Questions. I. B. Smith¹, S. Diniega², D. W. Beaty², T. Thorsteinsson³, P. Becerra^{4,5}, A. M. Bramson⁵, S. M. Clifford⁶, C. S. Hvidberg⁷, G. Portyankina⁸, S. Piqueux¹, A. Spiga⁹, T. N. Titus¹⁰. ¹Planetary Science Institute, Lakewood, CO; ²Jet Propulsion Laboratory/California Institute of Technology; ³Icelandic Meteorological Office, Reykjavík, Iceland; ⁴Phisikaliches Institut, Universität Bern, Bern, Switzerland; ⁵Lunar and Planetary Laboratory, University of Arizona; ⁶Lunar and Planetary Institute, Houston, TX; ⁷Niels Bohr Institute, University of Copenhagen; ⁸Laboratory for Atmospheric and Space Physics, University of Colorado; ⁹LMD, Université Pierre et Marie Curie, Paris, France; ¹⁰U.S. Geological Survey, Flagstaff, AZ. Contact: ibsmith@psi.edu

Introduction: Mars' polar regions are of special interest to scientists of diverse scientific backgrounds. Unique atmospheric processes have caused large amounts of ice and volatiles to be deposited at the poles, and periodically at lower latitudes. The ice units are geological deposits that are intimately connected to the atmosphere and record climate variations. Thus, this geologic record can only be interpreted in the context of the climate conditions that formed it. In this sense, Mars polar science is uniquely multi-disciplinary, and for the last two decades, the Mars polar science community has benefitted from periodic International Conferences of Mars Polar Science and Exploration (ICMPSE), the most recent of which was held in Reykjavik, Iceland in September, 2016.

The International Conference on Mars Polar Science and Exploration (ICMPSE) has been held six times since 1998, a period of 20 years [1-5].

6th Conference: To discuss observations and interpretations since the 5th ICMPSE in 2011 [5], more than 100 attendees from eleven countries attended the 6th iteration. Nearly a quarter of the Mars polar conference attendees (22) were students, which shows that the field and its many new, exciting discoveries, are attracting new researchers. Institutional support was provided by the NASA Mars Program Office, the European Geophysical Union, and the International Association of Cryospheric Sciences, with additional support coming from the Icelandic Meteorological Office, Planetary Science Institute, and the University of Iceland in Reykjavik.

Presentations highlighted a number of new and exciting results. Researchers found evidence for active atmospheric and surface processes that shape the polar layered deposits (PLD) and nearby landforms. The periodic layering of water ice and dust in the north and south PLDs (as well as CO₂ layering in the south) are being used to constrain the history of accumulation at the poles and to invert for climate records. Finally, ongoing geomorphic activity points to widespread volatile transport between the mid-latitudes and the poles, a process that modifies the surface of sand dunes, gullies, and landforms particular to carbon dioxide frost, such as spiders.

In addition to the oral and poster plenary technical sessions, a total of seven field trip were available to participants and guests. There was widespread participation in visiting the outstanding Mars glacial and volcanic analog sites that Iceland has to offer.

The conference was organized with the goal of enu-

merating the most important outstanding scientific questions for Mars polar science, and a team of synthesizers collected points of interest from the discussions. Five major questions were defined (no priority order):

- 1). Polar Atmosphere: What are the dynamical and physical atmospheric processes at various spatial and temporal scales in the polar regions, and how do they contribute to the global cycle of volatiles and dust?
- 2). Perennial Polar Ices: What do characteristics of the Martian polar ice deposits reveal about their formation and evolution?
- 3). Climate Record: How has the Martian (polar) climate evolved through geologic history, and what is its connection to Mars' astronomical parameters? What are the absolute ages of strata in the observable climate record?
- 4). Non-polar Ice: What is the history and present state of the mid- and low-latitude volatile reservoirs?
- 5). Present-day Surface Activity: What are the roles of volatiles and dust in surface processes actively shaping the present polar regions of Mars?

These top questions are mapped into sub-questions that more directly highlight the most pressing directions of investigation for the near-future.

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To view the full conference program and abstracts, visit: <http://www.hou.usra.edu/meetings/marspolar2016/>

References: [1] Clifford et al., (2000) *Icarus*, 144 2, 205-209; [2] Clifford et al, (2001) *Icarus*, 154 1, 1-2; [3] Clifford et al., (2005) *Icarus*, 174 2, 291-293; [4] Fishbaugh et al., (2008) *Icarus*, 196 (2), 305-317; [5] Clifford et al., (2013) *Icarus*, 225, 864-868. [6] Smith et al., *in press*, *Icarus*.