PLANETARY DUNE WORKSHOP EXPANDS TO INCLUDE SUBAQUEOUS PROCESSES AS POSSIBLE VENUS ANALOGS. T. N. Titus[1], D. Rubin[2] and G. Bryant[3], [1]USGS (2255 N. Gemini Dr., Flagstaff, AZ 86001, ttitus@usgs.gov), [2]Department of Earth & Planetary Sciences, UC Santa Cruz, Santa Cruz, CA (drubin@ucsc.edu), [3]Physical Sciences Department, Dixie State University, St. George, UT (gbryant@dixie.edu).

Introduction: Dune-like structures appear in the depths of Earth's oceans, across its landscapes, and in the extremities of the Solar System and beyond. These structures rise up within the thick dense atmosphere of Venus and have also been found on a comet, with perhaps the most ephemeral atmosphere imaginable. Understanding how similar bedforms originate under such a wide range of environmental conditions is key to our comprehension of surface dynamics throughout the Solar System.

The 2017 International Planetary Dune Workshop at Dixie State University, the fifth in a series focusing on planetary dunes, brought together 65 terrestrial, marine, and planetary researchers, including students, from diverse backgrounds. The goal of fostering collaborative interdisciplinary research was accomplished through small-group interactions, both in formal meetings and through associated field trips. The 2017 workshop was unique due to the involvement of members of the terrestrial subaqueous research community; this involvement was key to the workshop's success.

It Flows, Not Blows: The first session of the workshop focused on subaqueous analogs, experiments and models. Dave Rubin [1], one of two keynote speakers, provided a comparison of morphology, dynamics, and stratification of eolian and subaqueous dunes. Jacob Nienhuis [2], another keynote speaker, reported on recent developments towards a firm mechanistic understanding of subaqueous ripple spacing that is essential for accurate ripple-derived (paleo) flow reconstructions of distant environments. Neakrase [3] discussed the comparison of terrestrial subaqueous seafloor dunes morphology to Venusian dunes. He examined similarities in flow environments and how they relate to morphological similarities observed between the two environments. Sutton [4] presented a classification of aeolian fluid ejections and transport based on observations from high atmospheric density wind tunnel experiments in the Titan Wind Tunnel. Implications for transport on Venus and Titan were discussed. Wang [5] discussed large-eddy simulation and experimental measurements that were used on four different stages of two proximal deformed barchan dunes in high Reynolds number. Special fluid structure and sediment migration had been found in the flow channel area. Sakimoto [6] used a Computational Fluid Dynamics (CFD) approach with commercial software to model particle trajectories within Venusian and sub-aqueous environments as a function of particle size, density, flow field velocity, and ambient conditions.

Dune Morphology Records the Winds: In addition to the Venus session, participants also discussed the effect of prevailing wind directions and strengths in determining dune morphology. In general, barchans result from unidirectional transport winds while longitudinal dunes are formed by seasonally reversing transport winds. Variations of these morphological endmembers result from other combinations of multidirectional winds [7]. However, research presented at the workshop suggests that not only is the number of transport wind directions important, but also the dispersion of those wind modes [7]. Participants agreed that a more complete understanding of these dynamics would enable us to interpret wind directions and dispersions from remote sensing images of planetary dune morphologies. Since there are no meteorological stations on Venus, dune morphology may be the best way to determine the direction (and perhaps magnitude) of prevailing winds.

Planetary Dunes Goals Document: One recommendation from the workshop was the development of a planetary dunes goals document – similar to the goals documents for each of the NASA Assessment Groups (e.g. VEXAG Goals, Objectives and Investigations for Venus Exploration). The focus of this document will be to address science questions and identify needed investigations to answer those questions for the wide range of surfaces where Aeolian processes are observed. Venus exploration will have a prominent role within this document, including an emphasis on the need for studies of sub-aqueous dunes as analogs for Venus.

The Next Workshop: The 6th International Planetary Dunes Workshop is tentatively scheduled for mid-May 2019, somewhere along the U.S. West Coast. The workshop will continue to emphasize the need for more input from the Venus and subaqueous research communities.

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