

**ARCHIVING EXPERIMENTALLY DERIVED THRESHOLD WIND SPEED DATA IN PDS4.** E. V. Nield<sup>1</sup> (enield@vols.utk.edu), D. M. Burr<sup>1</sup>, and L. D. V. Neakrase<sup>2</sup>, <sup>1</sup>University of Tennessee Knoxville, <sup>2</sup>NASA PDS Atmospheres Node, New Mexico State University.

**Introduction:** Aeolian activity has been documented on Earth, Mars, Venus, Titan and has been suggested to occur on some icy bodies [1-4]. To better understand the movement of sediment on these bodies, it is critical to understand the threshold wind speed. Since Bagnold's seminal research, data obtained in wind tunnels have been used to derive models of threshold speed [5-9]. In the 1970's, the Planetary Aeolian Laboratory (PAL) was established. This facility consists of wind tunnels designed to mimic specific atmospheric conditions such as density or kinematic viscosity. In the last 40 years, PAL has released a wealth of information about threshold wind speed [6-9]. This information has been dispersed to the aeolian community through a variety of journal publications, conference presentations, and technical memorandums. The threshold data published in these older papers are becoming increasingly inaccessible due to their analog nature, while data in recent publications may not be widely released due to the lack of a distribution platform. At the same time, newer planetary wind tunnels (e.g., from the Aarhus Mars Simulation Facility) are generating new data. Such wind tunnel data are critical for, e.g., understanding the onset of aeolian processes and calibrating threshold models.

**Purpose of the Archive:** The purpose of this work is to increase the amount and quality of aeolian threshold wind speed data available to the community. We will do this by creating a publicly available archive of threshold speed data, hosted by the NASA Planetary Data System (PDS) Atmospheres Node. With contributions from the community, the aim of the archive is to preserve all past, current, and future data from threshold experiments. Researchers can use it as part of their Data Management Plan for projects funded by NASA.

**Collecting Data:** Under the PDS4 archiving standard, data are arranged in bundles. Each bundle will contain all the data related to a single aeolian parameter. Currently, there is one bundle that hosts the threshold speed data products. Data for the bundle were collected from the following sources: 1) Journal and book publications where threshold wind speeds were derived from wind tunnel experiments under Earth, Mars, Venus, and Titan conditions; 2) Unpublished records detailing any threshold speed experiments conducted at PAL (ex. NASA Technical Memoranda, graduate student reports); 3) Ongoing threshold speed experiments in the Titan Wind Tunnel.

Graphs and tables from the first two sources are scanned into a computer and digitized into a numeric format using the freeware GetData. Other parameters explicitly stated in the publication (e.g., bed composition, atmospheric pressure) and variables that could be derived using parameters stated in the publication (e.g Reynolds number, kinematic viscosity) are transcribed. The collected data are compiled into spreadsheets that are converted to CSV files to be submitted to the PDS.

**Archive Format:** Under PDS4 the threshold wind speed bundle contains 'collections' of data by type (e.g., graphs, tables) and content (e.g., raw data, reduced data). Within the collections, data products are organized into project folders representing a single set wind tunnel experiment (Fig.1).

For the threshold wind speed data the collections are as follows:

- 1) *browse*: images of threshold experiments, organized by planetary body
- 2) *data\_raw*: experiment data, when available, in table format and organized by planetary body
- 3) *data\_reduced*: threshold speed data, in table format and organized by planetary body
- 4) *document*: supplementary material describing how the archive was created
- 5) *context*: used by PDS4 to manage internal references. The context collection contains a list of PDS-internal references detailing the facilities and instruments used in this bundle. (e.g., Planetary Aeolian Laboratory, Titan Wind Tunnel, etc.)
- 6) *XML\_schema*: used by PDS4 to list which versions of the XML schema were used in the bundle. The XML schema collection provides a list for internal cross-referencing.

**Future Work:** The threshold speed bundle is still in development stage; it is expected to go live within the next year for contributions from the community. Although this initial version of the archive will contain only threshold data, we are striving to make the archive readily extensible to other aeolian parameters. We hope it will be expanded with 1) more bundles representing different aeolian parameters (e.g., flux) and 2) data from computational models.

Thus, we are actively seeking data to put into the archive. Please contact us to learn more about how to contribute.

**Acknowledgments:** This work is supported by the NASA Planetary Data Archiving, Restoration, and Tools program.

**References:** [1] Greeley R. and J.D. Iversen (1985) *Wind as a Geological Process*. [2] Lorenz, R. D., and J. R. Zimbelman (2014) *Dune Worlds*. [3] Porco C. et al. (2006) *Science* 311, 1393-1401. [4] A’Hearn M. et al. (2011) *Science* 332, 1396-1400. [5] Bagnold, R. A.

(1941) *The Physics of Blown Sand and Desert Dunes*. [6] Iversen, J.D et al. (1976) *J. Atm. Sci.* 33, 2425-2429. [7] Iversen, J.D. and White B.R. (1982) *Sed.* 29, 111-119. [8] Iversen J.D. et al. (1987) *Sed.* 34, 699-706. [9] Burr D.M. et al. (2015) *Nature* 517, 60-63.

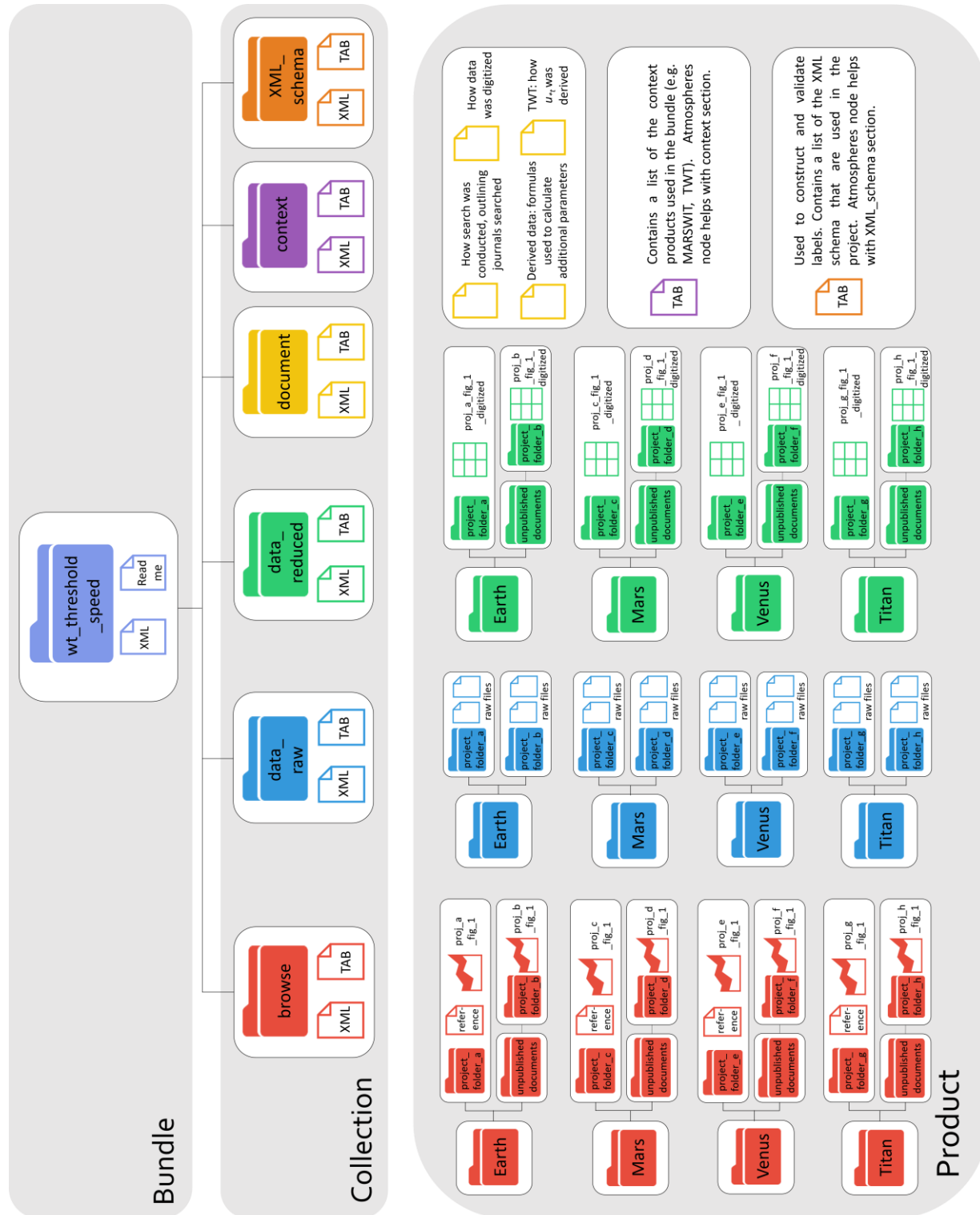


Figure 1: The structure of the planetary aeolian threshold experiment bundle.