MARS WIND AS SEEN BY THE NASA PHOENIX LANDER TELLTALE. C. Holstein-Rathlou[1], H.P. Gunnlaugsson[2], J.J. Iversen[2], P. Nornberg[3], L. Tamppari[4], P. Smith[5] and the Phoenix Science team. [1]Center for Space Physics, Boston University, 725 Commonwealth Ave., Boston, MA, 02215, USA (rathlou@bu.edu), [2]Department of Physics and Astronomy, Aarhus University, DK-8000 Aarhus C, Denmark, [3]Department of Geology, Aarhus University, DK-8000 Aarhus C, Denmark, [4]Jet Propulsion Laboratory, Pasadena, CA, USA, [5]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, USA

Introduction: The 2008 NASA Phoenix Mars lander operated in the northern polar regions of Mars (68.22°N, 125.75°W) during summer of MY 29 (Ls = 76-148°). The meteorological suite of instruments included three thermocouples on a meteorological mast with a mechanical anemometer, the Telltale (Fig. 1), at the top. Wind speeds and directions could be determined by analyzing the position of the Kapton cylinder in pictures taken with the lander's main camera, the Surface Stereo Imager (SSI). Depending on the availability of the SSI for data collection means that the Telltale dataset is intermittent, yet with a total of over 7700 images spanning 150 sols and the full diurnal cycle, and being only the third of its kind from Mars, the dataset is a valuable addition to the understanding of the Martian weather and climate.

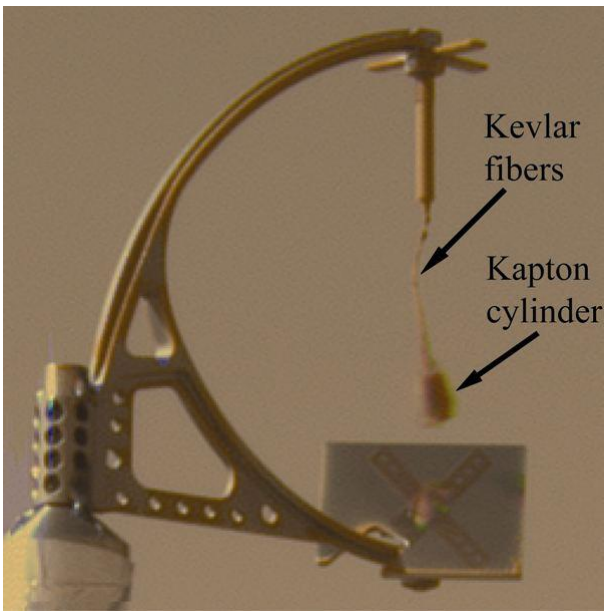

Figure 1: Color composite image of the Telltale taken on Ls ~ 119° by the SSI [1]

Results: Diurnal and seasonal variations showed daily wind speeds influenced by turbulence due to solar heating, with mean wind speeds increasing through the latter half of the mission. Wind directions first followed a full clockwise rotation during daytime before changing to come predominantly from west at the end of the mission (late summer).

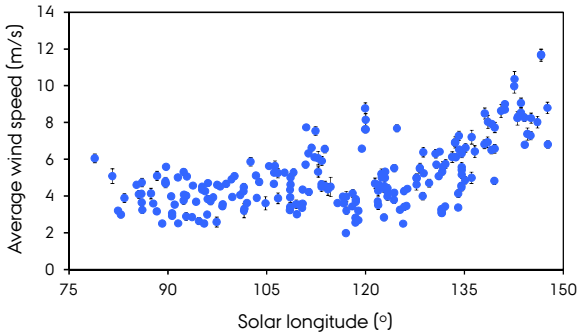

Fig.2: Average wind speeds of all image series of the Telltale from the Phoenix mission as a function of Ls.

A time dependent dust accumulation on the Telltale Kevlar fibers was observed to mimic the behavior of the average wind speeds. Removing dust-sized particles from surfaces on Mars usually requires higher wind speeds than the average daily wind speeds measured by the Telltale [2]. Passing dust devils can provide adequate wind speeds, however their presence might not be recorded in the Telltale dataset due to its intermittent nature. Laboratory experiments showed that the dust could be removed by wind speeds at or above 10 m/s, well within the Telltale wind speeds recorded, thus indicating the presence of sand-sized dust agglomerates on the fibers and demonstrating that the intermittent Telltale dataset has not missed any major wind events, as they would be evident in the dust factor.

Other studies of local weather and practical uses of the Telltale data with the daily operations of the Phoenix lander will be presented to the extent possible.

References: [1] Holstein-Rathlou, C. *et al.* (2010) *JGR*, 115, [2] Greeley, R. and J.D. Iversen (1985) *Cambridge University Press*, ISBN: 0-521-24385-8