



## Mars Science Laboratory (MSL) - First Results of Pressure Observations

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The Mars Science Laboratory (MSL) called Curiosity made a successful landing at Gale crater early August 2012. MSL has an environmental instrument package called the Rover Environmental Monitoring Station (REMS) as a part of its scientific payload. REMS comprises instrumentation for the observation of atmospheric pressure, temperature of the air, ground temperature, wind speed and direction, relative humidity, and UV measurements. The REMS instrument suite is described at length in [1]. We concentrate on describing the first results from the REMS pressure observations and comparison of the measurements with modeling results.

The REMS pressure device is provided by the Finnish Meteorological Institute. It is based on silicon micro-machined capacitive pressure sensors developed by Vaisala Inc. The pressure device makes use of two transducer electronics sections placed on a single multi-layer PCB inside the REMS Instrument Control Unit (ICU) with a filter-protected ventilation inlet to the ambient atmosphere. The absolute accuracy of the pressure device ( $< 3$  Pa) and zero-drift ( $< 1$  Pa/year) enables the investigations of long term and seasonal cycles of the Martian atmosphere. The relative accuracy, or repeatability, in the diurnal time scale is  $< 1.5$  Pa, less than 2 % of the observed diurnal pressure variation at the landing site. The pressure device has special sensors with very high precision (less than 0.2 Pa) that makes it a good tool to study short-term atmospheric phenomena, e.g., dust devils and other convective vortices.

The observed MSL pressure data enable us to study both the long term and short-term phenomena of the Martian atmosphere. This would add knowledge of these phenomena to that gathered by earlier Mars missions and modeling experiments [2,3]. Pressure observations are revealing new information on the local atmosphere and climate at Gale crater, and will shed light on the mesoscale and micrometeorological phenomena. Pressure observations show also planet-wide phenomena and are a key observation for enhancing our understanding of the global atmospheric flows and CO<sub>2</sub> cycle of the Martian atmosphere.

The surface pressure is rising at this time of the Martian season, and this is clearly seen by the MSL pressure observations. The current surface pressure is slightly over 8 hPa, which represents a rise of a few % since the beginning of the mission. Our Mars Limited Area Model (MLAM) produces similar results to the observations with some deviations. They are currently under investigation.

### References:

- [1] Gómez-Elvira J. et al. (2012), Space Sci. Rev. 170, 583-640.
- [2] Haberle, R.M. et al. (2013) Mars, submitted.
- [3] Smith, M. et al. (2006), J. Geophys. Res., 111, E12S13.