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MLAM Simulation of Martian Atmosphere around Curiosity Landing Site

Evgeny Atlaskin (1), Ari-Matti Harri (1), Janne Kauhanen (1), Anni Määttänen (3), Mark Paton (1), Hannu Savijärvi (2), Walter Schmidt (1), and Tero Siili (1)

(1) Finnish Meteorological Institute, Earth Observation, Helsinki, Finland (walter.schmidt@fmi.fi, +358 29539 4658), (2) University of Helsinki, Finland, (3) Centre National de la Recherche Scientifique CNRS, Université Versailles St Quentin, LATMOS (Laboratoire atmosphères, milieux, observations spatiales), Guyancourt, France

The NASA Mars Science Laboratory 'Curiosity' landed successfully in the Martian Gale crater close to the equator on 6 Aug 2012. As part of the environment monitoring instrument package REMS [1] the Finnish Meteorological Institute (FMI) provided the pressure and humidity sensors. A similar pressure sensor was successfully flown earlier on the Phoenix lander mission in 2008 and on the Cassini / Huygens probe to Titan in 2005.

The behaviour of the Martian atmosphere inside the Gale crater is dominated by its location close to the equator, the steep outer rims and the slopes of the central mountain. These complex topographical features make it ideally suited for a mesoscale atmospheric model like the Mars Limited Area Model (MLAM), developed jointly by the University of Helsinki (UH) and FMI to study mesoscale phenomena in the Martian Atmosphere [2]. MLAM is based on the hydro-static dynamical core of the HIgh Resolution Limited Area Model (HIRLAM), an operational weather prediction model-analysis system used by several European countries.

Using the simulation tools already published observational data from the first three months of Curiosity's operations and detailed topographical feature information we will show the observations in the context of the atmospheric conditions in the wider Gale crater region. In preparation of the simulation also the UH 1-dimensional model [3] is being used to study the boundary layer behaviour in that area. The expected long operation time of the rover will additionally provide insight in the seasonal change of atmospheric conditions at the equator. Some aspects might already become visible by the time of the conference. Newest Curiosity/REMS data will be shown in session PS2.5 "Curiosity on Mars: First results".

Reference:

[1] Gómez-Elvira J. et al. (2012), Space Sci. Rev. 170, 583-640.
[2] Kauhanen, J., Siili T., Järvenoja, S. and Savijärvi, H. (2008) , The Mars Limited Area Model (MLAM) and simulations of atmospheric circulations for the Phoenix landing area and season-of-operation, JGR 113, E00A14
[3] Savijärvi H. Mechanisms of the diurnal cycle in the atmospheric boundary layer of Mars. Quarterly Journal of the Royal Meteorological Society. 2012;138(663):552-560.