Geophysical Research Abstracts
Vol. 20, EGU2018-6197, 2018
EGU General Assembly 2018

Deposition and removal of dust from the UV sensor of the MSL mission

Alvaro Vicente-Retortillo (1), German M. Martinez (1), Nilton O. Renno (1), and Mark T. Lemmon (2)

(1) University of Michigan, Ann Arbor, USA (avicenteretortillo@gmail.com), (2) Texas A&M University, College Station, USA

The Rover Environmental Monitoring Station (REMS) onboard the Mars Science Laboratory (MSL) mission has a UV sensor (UVS) that for the first time is measuring the UV radiation flux at the surface of Mars. The UVS is comprised of six photodiodes to measure the UV flux in the range 200-380, 320-380, 280-320, 200-280, 230-290 and 300-350 nm [1]. The UVS has completed more than two Martian years (MY) of measurements at Gale Crater (4.6°S, 137.4°E), providing coverage ranging from diurnal to interannual timescales [2, 3].

Due to its location on the rover deck, the UVS has been exposed to dust deposition. Dust deposited on the UVS causes underestimation in measured UV fluxes and complicates the analyses of the seasonal and interannual evolution of UV radiation at the surface of Gale Crater.

We have developed a methodology to correct UV fluxes from the effect of dust deposition by calculating a parameter (called dust attenuation factor) that depends only on the amount of dust deposited on the UVS and thus can be used to quantify this effect. The dust attenuation factor is obtained from photodiode output currents (TELRDR products), ancillary data records containing the geometry of the rover and the Sun (ADR products), in combination with UV radiances simulated with a Monte Carlo radiative transfer model [2] that includes radiative properties calculated from refractive indices provided in [4] and which is in excellent agreement with DISORT and COMIMART [2,5], fed with Mastcam opacities at 880 nm [2].

Here we present the temporal evolution of the attenuation of the UV radiation caused by the dust deposited on the UVS. The most striking feature is the increase in the dust attenuation factor, which indicates removal of dust from the UVS, observed around Ls = 270º.

We plan to calculate the dust attenuation factor for the six UV channels and to further analyze potential explanations for its temporal evolution [6]. Furthermore, dust deposition on the UVS and also a non-physical discontinuity in the calibration functions when the solar zenith angle is above 30º cause time-dependent errors in the UV fluxes that can be found in the Planetary Data System (PDS). We plan to correct the UV fluxes on each of the six UVS bands and to make these results available in the PDS [7].

[1] Gómez-Elvira, J., et al. (2012) Space Sci. Rev. 170 (1-4), 583-640. [2] Vicente-Retortillo, Á., et al. (2017) Geophys. Res. Lett., 44, 3502-3508. [3] Smith, M. D., et al. (2016) Icarus, 280, 234-248. [4] Wolff, M.J., et al. (2010) Icarus, 208 (1), 143–155. [5] Vicente-Retortillo, A. et al. (2015) J. Space Weather Spac., 5, A33. [6] Vicente-Retortillo, A. et al. (2018a) Geophys. Res. Lett. (in preparation). [7] Vicente-Retortillo, A. et al. (2018b) J. Geophys. Res.: Planets (in preparation).