

Characterization of a dust storm on Mars with REMS measurements and MARCI / MRO images

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Abstract

The REMS instrument (Gómez-Elvira et al., 2012) on board the Curiosity rover, has been collecting meteorological data from Gale crater on Mars since August 2012 (Ordóñez-Etxeberria et al., 2018). Although it is possible to observe frequent dust storms on Mars atmosphere, during these years only one local dust storm has passed directly above the rover. This storm was visible for a few days at the end of December 2014 on imagery data acquired by the MARCI instrument on the Mars Reconnaissance Orbiter (MRO). The storm initiated on the 852 sol of the MSL mission northwest of Gale crater and spread over Gale during sols 852-856 (Ls 263°, late spring in the southern hemisphere). MARCI images show that the storm raised up material to altitudes of 19 km. The storm evolved very quickly depositing most of its material in 2 sols. However, UV measurements obtained by REMS from the ground show increased optical depth of the atmosphere well after the storm ceased to be observable from orbit. REMS measurements show that the amplitude of the daily pressure tides at Gale increased by about a 15% the sol the dust arrived and then returned to usual values during that season over the next three sols. The air temperature in the surface at noon also increased by about 15K (although previous studies (Guzewich, S. D. et al., 2016; Zurek, R. W., 1981) suggest that air should cool down by the reduced solar flux at the surface). Our interpretation is that the dust raised by the storm had descended to low altitudes when it arrived to Gale heating the lower part of the atmosphere. The atmospheric response to this small storm can be used to understand better the atmospheric response to large-scale storms as the global one that covered nearly the full planet over July 2018. (See poster).