Mineralogical Results from the Mars Science Laboratory Rover Curiosity

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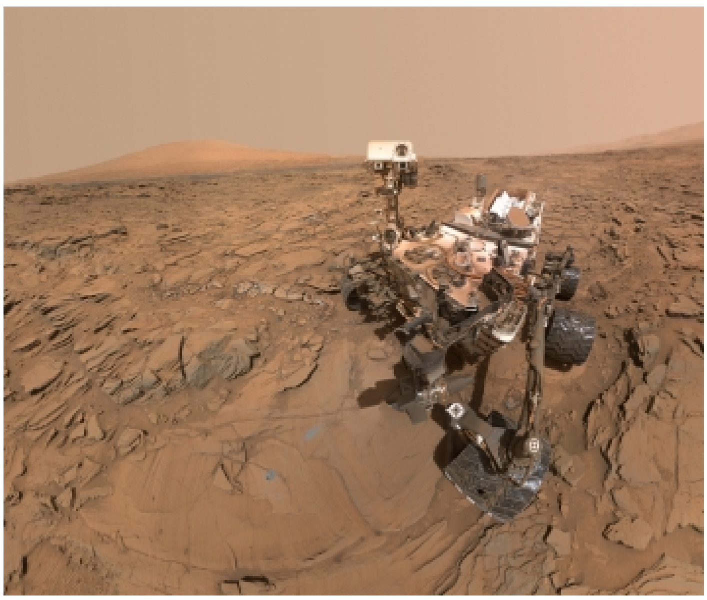
NASA's CheMin instrument, the first X-ray Diffractometer flown in space, has been operating on Mars for nearly five years. CheMin was first to establish the quantitative mineralogy of the Mars global soil (1). The instrument was next used to determine the mineralogy of a 3.7 billion year old lacustrine mudstone, a result that, together with findings from other instruments on the MSL Curiosity rover, documented the first habitable environment found on another planet (2). The mineralogy of this mudstone from an ancient playa lake was also used to derive the maximum concentration of CO2 in the early Mars atmosphere, a surprisingly low value that calls into question the current theory that CO2 greenhouse warming was responsible for the warm and wet environment of early Mars. CheMin later identified the mineral tridymite, indicative of silica-rich volcanism, in mudstones of the Murray formation on Mt. Sharp. This discovery challenges the paradigm of Mars as a basaltic planet and ushers in a new chapter of comparative terrestrial planetology (3). CheMin is now being used to systematically sample the sedimentary layers that comprise the lower strata of Mt. Sharp, a 5,000 meter sequence of sedimentary rock laid down in what was once a crater lake, characterizing isochemical sediments that through their changing mineralogy, document the oxidation and drying out of the Mars in early Hesperian time.

1. D.F. Blake et al. (2013) Science 341, 1239505;

2. D.T. Vaniman et al. (2014) Science 343, 1243840.

3. R.V. Morris et al. (2016) PNAS, www.pnas.org/cgi/doi/10.1073/pnas.1607098113



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