High lithium in Kimberley and Pahrump outcrops; Gale Crater, Mars

O. FORNI[1*], L. LE DEIT[2], D. T. VANIMAN[3], N. MANGOLD[2], D. L. BLANEY[4], S. M. CLEGG[5], A. COUSIN[1], O. GASNAULT[1], S. MAURICE[1], H. E. NEWSOM[6], V. SAUTTER[7], M. T. TOPLIS[1] AND R. C. WIENS[5]

[1]Université de Toulouse, UPS-OMP, IRAP, 31028, Toulouse, France (*correspondence : olivier.forni@irap.omp.eu)
[2]LPGN, 44000, Nantes, France
[3]PSI, Tucson, AZ 85719,USA.
[4]JPL, Pasadena, CA 91109, USA
[5]LANL, Los Alamos, NM 87544,USA
[6]UNM, Albuquerque, NM 87131,1 USA
[7]MNHN, 75005, Paris, France

Lithium has been detected [1] for the first time on Mars with the ChemCam Laser Induced Breakdown Spectroscopy instrument on board MSL-Curiosity [2, 3]. The average Li content was about 5 to 10 ppm, consistent with that previously estimated for bulk Mars [4]. We report Li contents of about 25 to 40 ppm on average in two outcrops, Kimberley and Pahrump.

Curiosity spent sols 572-632 analyzing outcrops of sandstone, siltstone, and conglomerate at the Kimberley formation which is characterized by its high K content [5]. The average lithium content is of the order of 25 ppm for the 676 observations. Fluorine [6] ranges from 0.1 to 0.8 wt% in the outcrop and is correlated with Li. For F-bearing targets, Li averages reach 50 ppm with a maximum value of 130 ppm and is correlated with Si, Al, Mg, and K suggesting that these phases are either micas or poorly crystalline phases such as those detected by CheMin [7]. Curiosity subsequently explored the Pahrump outcrop, which is characterized by three main different facies: the first one consists of decimeter-high resistant layers, the second one is characterized by recessive laminated layered terrains and the third one has platy and often fractured slabs [8]. The 400 ChemCam observations exhibit an average Li content of about 40 ppm [9]. The highest Li values are found in the resistant layers and Li is correlated with higher Mg and Cr. These observations constrain the formation conditions as well as the sources of these sediments.

[1] Ollila *et al*. (2014) *JGR*, **119**, 1–31 [2] Maurice et al. (2012) *SSR,* **170**, 95-166 [3] Wiens et al. (2012) *SSR,* **170**, 167-227 [4] Beck *et al*. (2004) *Geochim. et Cosmochim. Acta*, **68**, 2925–2933. [5] Le Deit *et al*. (2015) *LPSC*, **1438** [6] Forni *et al*. (2015) *GRL* DOI :10.1002/2014GL062742 [7] Rampe *et al*. (2014) AGU Fall Meeting. [8] Stack (2015) *LPSC*, 1994 [9] Forni *et al*. (2015) *LPSC*, **2099**