Feldspar-rich rocks at Gale Crater: a ChemCam campaign.

V. SAUTTER[1]*, C. FABRE[2], A. COUSIN[3], M. TOPLIS[4], R.WIENS[3], O.FORNI[4]AND S.MAURICE[4]

[1]MNHN, Paris, France
[2]GeoRessources, Nancy, France
[3]LANL, Los Alamos, USA
[4]IRAP, Toulouse, France
(violaine.sautter@mnhn.fr)

Introduction

The hummocky unit at Gale crater is characterized by abundant gravel (small pebbles of various shapes, sizes and color) with igneous float rocks and conglomerates, which appear to comprise the bedrock in this region [1]. ChemCam Remote Micro Imager (RMI) and Laser Induced Breakdown Spectroscopy (LIBS) offer the first opportunity to assess mineralogical diversity at grain-size scales (~100µm) and, from this, lithological diversity [2].

Results

Feldspar appears to be a principal mineral in almost all of the studied rocks and ChemCam provides the first *in-situ* evidence of coarse-grained (possibly intrusive) magmatic rocks as well as porphyritic lava containing feldspar phenocrysts. Feldspars range in composition from oligoclase to bytownite in coarse soils, pebbles in conglomerate and coarse intrusive floats. In evolved alkali rocks such as Jake-Matijevic, plagioclases have an andesine composition. Finally in light-toned materials, showing either pumice or granular texture, major and trace elements (i.e., Ba and Rb) clearly point to the existence of feldspars with a significant K-rich orthoclase component. Furthermore, low molar Al/Si ratios (<0.33) indicate the presence of excess silica, providing evidence for a silica-saturated subalkaline trend that contrasts with under-saturated rocks such as Jake-M. We note that feldspar-rich lithologies have been described recently for the first time as noritic and monzonitic clasts in the Noachian martian meteorite breccias NWA 7034/7533 [3,4].

Conclusion

Overall, the ChemCam *in-situ* data from Gale provide unprecedented insights into the diversity of igneous rocks at the surface of Mars. The abundance of feldspar-rich lithologies is thus one of the most striking magmatic features encountered so far at Gale crater. From these MSL data, it appears likely that both subalkaline and alkaline feldspar-bearing rocks are present as ejecta and alluvial fan detritus in Gale landing site, potentially representative of primitive material from the region surrounding Gale.

[1] William *et al* (2013) *Science* **340**, 1068-1072 [2] Sautter *et al* (2014) *JGR-Planets*, **119**, 1-17 [3] Agee *et al* (2013) *Science* **339,** 780-785 [14] Humayun *et al* 2013 *Nature,* doi :10.1038/nature 12764**.**