Felsic rocks on Mars

J. FLAHAUT[1], C. BRUSTEL[2,3], V. PAYET[1], P. ALLEMAND[2], C. QUANTIN[2]

[1]CRPG, CNRS/Université de Lorraine/UMR7358, Vandoeuvre–lès-Nancy, France. flahaut@crpg.cnrs-nancy.fr
[2]LGL-TPE, Université de Lyon/CNRS/UMR5276, Villeurbanne, France.
[3]Vrije Universiteit (VU) Amsterdam, Faculty of Science, Geology and Geochemistry, The Netherlands.

Remote-sensing data and *in situ* analyses show that the Martian surface is broadly basaltic in composition (e.g., McSween et al., 2003). However, most of these outcrops, if not all, likely correspond to late volcanic additions rather than Mars primary crust (e.g., Taylor and McLennan, 2009). If preserved, ancient, primary outcrops, are likely buried at depth, but could be exposed by impacts or scarps. Building on this hypothesis, Flahaut et al. (2013) proposed that the unusual, massive, light-toned, cumulate rocks observed at the bottom walls of the Valles Marineris canyon system, characterized by low Ca pyroxene signatures, could represent remnants of Mars' primary crust. This study however also raises the possibility that these rocks represent early volcanic products (Elkins-Tanton et al., 2005; Baratoux et al., 2013).

The recent identification of felsic rocks on Mars raises even more questions about the true nature of Mars early crust. Nearly pure anorthosite detections (>90% plagioclase) in the surroundings of the Hellas and Argyre impacts suggest that Mars may have had a lunar-like, plagioclase-rich, floatation crust, now buried at depth (Carter et al., 2013; Wray et al., 2013). These observations would be consistent with the recent geophysical models that suggest the existence of a lower density material buried below surface basalts, at least in the southern hemisphere (Baratoux et al., 2014). Alternatively, this density anomaly could be related to the presence of buried continental crustal material, similar to the granodiorite rocks identified in Gale Crater (Sautter et al., 2015,2016).

In the present contribution, we attempt to bracket the felsic component abundance, and to determine the origin of the massive, light-toned rocks identified in the Valles Marineris lower walls, and surrounding impact craters. We use a custom-made algorithm on CRISM spectroscopic data to determine the VNIR properties of these outcrops and to specifically isolate putative feldpar signatures. Our results will be compared with Mars ancient meteorites (ALH84001, NWA7034) compositions, previous *in situ* analyses of igneous rocks and former remote detections of felsic rocks (e.g., Cousin et al., 2017; Christensen et al., 2015…) in order to draw potential implications for Mars magmatic evolution.