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ASSESSING SOURCE REGION CHARACTERISTICS FROM GALE CRATER LACUSTRINE MUDSTONE.

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The NASA *Curiosity* rover has encountered mudstones deposited in a lake environment within the respective Yellowknife Bay^[1] (YKB) [Bradbury Group] and Murray^[2] [Mt Sharp Group] formations of Gale crater, Mars. Chemical and mineralogical studies conducted on YKB mudstones show a habitable lake environment at the time of deposition^[1]. The Chemistry and Camera (ChemCam) instrument suite has acquired major, minor and trace element compositions through Laser-Induced Breakdown Spectroscopy^[3,4] generating an extensive dataset of ~9500 observation points (where one observation point is the average of 30 – 50 spectral analyses). This study has excluded targets that have not hit *in situ* host rock to assess host rock geochemical variation between stratigraphic groups^[5].

Our results show that Murray is enriched in SiO₂, Al₂O₃, and K₂O, but depleted in CaO and MgO compared to YKB mudstone. Despite Murray demonstrating higher Chemical Indices of Alteration than YKB^[6,7], Murray's dominant basaltic mineralogy and secondary mineralogy infers that open system alteration has not masked source characteristics^[8]. Hence, we hypothesise that Murray's geochemical difference is related to a change towards a more silica-rich, tholeiitic provenance from the regional, subalkaline basalt that was initially eroded and deposited at YKB^[9,10].

References: [1] Grotzinger et al. (2014) doi:10.1126/science.1242777. [2] Grotzinger et al. (2015) doi:10.1126/science.aac7575. [3] Wiens et al. (2012) doi:10.1007/s11214-012-9902-4. [4] Maurice et al. (2012) doi:10.1007/s11214-012-9912-2. [5] Bedford (subm.) *GCA*. [6] Siebach et al. (2017) doi:10.1002/2016JE005195. [7] Mangold (2017) *LPSC XLVIII*, Abstract 1894. [8] Rampe et al. (2017) doi:10.1016/j.epsl.2017.04.021. [9] Anderson et al. (2015) doi:10.1016/j.icarus.2014.07.025. [10] Sautter et al. (2015) doi:10.1038/ngeo2474.