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Version: Not Set

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ASSESSING SOURCE REGION CHARACTERISTICS FROM GALE CRATER LACUSTRINE MUDSTONE.

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The NASA \textit{Curiosity} rover has encountered mudstones deposited in a lake environment within the respective Yellowknife Bay\textsuperscript{[1]} (YKB) [Bradbury Group] and Murray\textsuperscript{[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\textsuperscript{[1]}. The Chemistry and Camera (ChemCam) instrument suite has acquired major, minor and trace element compositions through Laser-Induced Breakdown Spectroscopy\textsuperscript{[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 \textit{in situ} host rock to assess host rock geochemical variation between stratigraphic groups\textsuperscript{[5]}. Our results show that Murray is enriched in SiO\textsubscript{2}, Al\textsubscript{2}O\textsubscript{3}, and K\textsubscript{2}O, but depleted in CaO and MgO compared to YKB mudstone. Despite Murray demonstrating higher Chemical Indices of Alteration than YKB\textsuperscript{[6,7]}, Murray’s dominant basaltic mineralogy and secondary mineralogy infers that open system alteration has not masked source characteristics\textsuperscript{[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\textsuperscript{[9,10]}.