

Investigation of the petrogenetic relationship between the two igneous formations in Jezero crater by using trace element concentrations acquired by the Perseverance SuperCam instrument

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During the first year after its landing in Jezero crater in Feb 2021, the Mars2020 Perseverance rover has been investigating the igneous lithologies located at the bottom of the crater. As such, two main formations have been identified mainly based on their MgO and Al₂O₃ wt.% obtained by the SuperCam instrument [1]: the Máaz formation (<5 wt.% MgO and 9 wt.% > Al₂O₃; basaltic to basaltic-andesite) and the Séítah formation (>20 wt.% MgO and 4 wt.% < Al₂O₃; olivine-rich cumulate with few plagioclase [2]). The Séítah formation underlies the Máaz formation and Máaz dips down away from Séítah in all directions [3].

The relationship between those two units is still unclear. It has been proposed there could be related by magmatic differentiation, for example by fractionation and accumulation of olivine [1]. However, thermodynamic modeling using the MELTS software has challenged this hypothesis, as the two formations are not at equilibrium with each other for their pyroxene compositions [4]. This would imply that the two formations are not related to the same magmatic event, hence bringing the corollary question of the origin of an olivine-rich layer.

Trace element concentrations are straightforwardly sensitive to magmatic differentiation processes. Strontium, barium and Rb concentrations have been obtained by the Supercam instrument. Those concentrations were obtained by adapting multivariate regression methods similar to the one described in [5].

Concentrations in Sr, Rb and Ba will be used to investigate the question of the petrogenetic relationship between the Máaz and the Séítah formations.

[1] R.C. Wiens et al., *Science Advances* **8**, eabo3399 (2022).

[2] Y. Liu et al., *Science* **377**, 1513-1519 (2022).

[3] S.-E. Hamran et al., *Science Advances* **8**, eabp8564 (2022).

[4] A. Udry et al., *Journal of Geophysical Research* (2023).

[5] R.B. Anderson et al., *Spectrochimica Acta B* (2023)