



**HAL**  
open science

## Observations of the Perseverance rover at the Jezero crater delta front using the SuperCam instrument

Nicolas Mangold, Gwénaél Caravaca, Erwin Dehouck, Olivier Beyssac, Pierre Beck, Elise Clavé, Agnès Cousin, Gilles Dromart, Olivier Forni, Thierry Fouchet, et al.

### ► To cite this version:

Nicolas Mangold, Gwénaél Caravaca, Erwin Dehouck, Olivier Beyssac, Pierre Beck, et al.. Observations of the Perseverance rover at the Jezero crater delta front using the SuperCam instrument. EGU General Assembly 2023, European Geosciences Union, Apr 2023, Vienna, Austria. pp. EGU23-4896, 10.5194/egusphere-egu23-4896 . hal-04052651

**HAL Id: hal-04052651**

**<https://hal.science/hal-04052651>**

Submitted on 30 Mar 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

EGU23-4896, updated on 30 Mar 2023

<https://doi.org/10.5194/egusphere-egu23-4896>

EGU General Assembly 2023

© Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



## Observations of the Perseverance rover at the Jezero crater delta front using the SuperCam instrument

**Nicolas Mangold**<sup>1</sup>, Gwenael Caravaca<sup>2</sup>, Erwin Dehouck<sup>3</sup>, Olivier Beyssac<sup>4</sup>, Pierre Beck<sup>5</sup>, Elise Clavé<sup>6</sup>, Agnès Cousin<sup>2</sup>, Gilles Dromart<sup>3</sup>, Olivier Forni<sup>2</sup>, Thierry Fouchet<sup>7</sup>, Olivier Gasnault<sup>2</sup>, Sanjeev Gupta<sup>8</sup>, Stéphane Le Mouélic<sup>1</sup>, Lucia Mandon<sup>9</sup>, Sylvestre Maurice<sup>2</sup>, Pierre-Yves Meslin<sup>2</sup>, Cathy Quantin-Nataf<sup>3</sup>, Clément Royer<sup>10</sup>, and Roger Wiens and SuperCam team<sup>10</sup>

<sup>1</sup>LPG-CNRS-UMR6112, Univ Nantes, Nantes, France (nicolas.mangold@univ-nantes.fr)

<sup>2</sup>IRAP, OMP, Université Toulouse, France

<sup>3</sup>LGL, Lyon, France

<sup>4</sup>IMPMC, Paris, France

<sup>5</sup>IPAG, Grenoble, France

<sup>6</sup>LAB, Bordeaux, France

<sup>7</sup>LESIA, Meudon, France

<sup>8</sup>Department of Earth Science and Engineering, London, UK

<sup>9</sup>Caltech, Pasadena, USA

<sup>10</sup>Purdue University, USA

The Perseverance rover landed on the floor of Jezero crater in February 2021. The initial set of images taken from the landing site of the residual butte Kodiak showed a deltaic architecture consistent with a paleolake, but at a level ~100 m lower than expected, suggestive of a closed lake system. After spending ~1 year studying the crater floor, the rover reached the front of the deltaic fan in April 2022. Here, we report observations of the facies, structure and composition of these sedimentary deposits using the SuperCam instrument. SuperCam can take images for texture analysis with the Remote Micro-Imager (RMI), visible and infrared reflectance (VISIR) spectra as well as Raman spectra for mineralogical analysis, and data from laser induced breakdown spectroscopy (LIBS) for chemical analysis. The rover investigated the basal strata of the delta along two traverses at the SE of the delta front. The transition between the crater floor and the delta is not well determined due to regolith and strongly degraded outcrops, and is currently under assessment. The ~20 m thick basal layers that are well-visible on orbital data consist of fine-grained sandstones and siltstones deposited in sub-horizontal planar beds with millimeter thick laminations. These deposits display a substantial alteration highlighted by the detection of both sulfates and phyllosilicates, with exception of local boulders of igneous texture lacking alteration. Texture and composition are both consistent with a quiet regime of deposition such as in lake deposits or distal delta slopes. These beds are considered of topmost importance for sample return and were cored in two locations. Pebbly sandstones and conglomerates with pebbles limited to a few centimeters are observed immediately above these strata. The texture is matrix-supported suggesting an emplacement through gravity sliding or turbidity flows below water

rather than fluvial deposition. The composition is more variable than in underlying finer-grained beds and includes local carbonate detections. Uppermost deposits have not been reached by the rover yet, but have been analyzed remotely by RMI images, and VISIR for some of them. They consist of cross-bedded sandstones and conglomerates in all locations of the delta front. The diversity in texture of these deposits suggests a variability in depositional regimes including high-energy floods, either during the lacustrine phase, or subsequently. Boulders present within these layers are rounded suggesting a substantial abrasion by fluvial transport. These boulders are also interesting targets for sampling distant crustal rocks. The top of the delta will be analyzed and sampled along the traverse of the rover in 2023.