

Sedimentary Geology of the Jezero Crater Western Fan as Seen by Nasa's Mars Perseverance Rover

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The Mars 2020 Perseverance rover, NASA's most recent flagship Mars rover mission, landed in Jezero crater in February 2021. Mars 2020 is the first step of a multi-mission effort to return samples from Mars to Earth. Perseverance's mission includes characterizing the geology and habitability of its exploration area, seeking signs of ancient life, collecting a cache of scientifically compelling, return-worthy samples, and preparing for future human exploration of Mars. During the first three years of its mission, Perseverance has traversed over 15 miles, captured innumerable images and geochemical measurements of the Martian surface, and collected 21 rock samples with high potential for biosignature preservation or to constrain the geologic history of Mars, 2 regolith samples, and 1 atmospheric sample.

Throughout roughly the second two years of its mission, Perseverance collected observations of and samples from the sedimentary rocks of the Jezero crater western fan. Before exploration by Perseverance, interpretations of these rocks based on high-resolution satellite images converged on the hypothesis that the sedimentary rocks in Jezero crater were deposited as a mud-rich, lacustrine delta. However, rover observations of these rocks seem to reveal a much more complex, dynamic, and coarse-grained depositional system than proposed from orbital data. This system evolved through time in response to both changes in lake level and changes in discharge and deposited a variety of sedimentary rock types in a stratigraphically complex succession.

In this talk, I will review major observations made by Perseverance of sedimentary rocks in the Jezero crater western fan, and what those rocks can tell us about the history of water on Mars, their potential for habitability, and the context for return sample science.

Biography: Dr. Libby Ives is a Postdoctoral Fellow on the Mars 2020 Science Team at the Jet Propulsion Laboratory in Pasadena, CA, where is contributing to the Mars 2020 team by helping describe and interpret the geologic context of sedimentary rocks in Jezero crater using data collected by the Perseverance rover. She is a geologist, clastic sedimentologist, geomorphologist, and geologic mapper who developed her expertise by studying a diverse suite of sedimentary systems, landscapes, and depositional processes on Earth. This work was primarily conducted through field observations of such field sites as modern glaciers in Iceland, Quaternary glacial deposits of the northern United States, Cenozoic marine sediments of Baffin Bay, and Paleozoic successions in Argentina, Australia, and Antarctica. Libby earned her Ph.D. Geosciences (2021) from the University of Wisconsin–Milwaukee, an M.S. Geology (2016) from Iowa State University, and a B.S. Earth Science (2013) from Northern Michigan University.