Perseverance’s radar revealed ancient subsurface river delta on Mars

When NASA’s Perseverance rover landed in Jezero Crater in 2021, its primary mission was to scour the remnants of a dried-up Martian lakebed for signs of ancient life. Scientists have been focused on the crater’s spectacular Western Delta, a fan-shaped geologic feature deposited by a river flowing into the basin billions of years ago. But now Perseverance’s ground-penetrating radar (called RIMFAX) detected what is likely another, even older river delta buried tens of meters beneath it.

“I think it’s a promising place to look for signs of biosignatures at depth,” says Emily L. Cardarelli. “Microbial life could have potentially developed in those types of environments.” Cardarelli, an astrobiologist at the University of California Los Angeles, led the team interpreting RIMFAX imagery.

Peeking underground

Perseverance’s RIMFAX, the Radar Imager for Mars Subsurface Experiment, continuously fires radar waves into the ground, acquiring soundings each time the rover traveled 10 centimeters. When these radio waves hit boundaries between different types of rock, ice, or sediment layers, some of the signal bounces back. The timing and intensity of these reflections allow scientists to construct a two-dimensional, vertical slice of the subsurface, much like a sonogram of the Martian crust.

During a campaign spanning from September 2023 to February 2024, or over 250 Martian sols, Perseverance drove across a geological zone known as the Margin unit. The Margin unit is an expansive deposit flanking the inner rim of Jezero’s inlet valley, occupying the space between the western fan deposits and the crater rim. It is rich in magnesium carbonates, which was one of the main reasons Jezero Crater has been chosen as the Perseverance’s landing site: on Earth, carbonates are exceptionally good at preserving the chemical fingerprint of life. “You can think of the Cliffs of Dover, for example, that are all carbonate—they have tons of fossils in them,” Cardarelli says.

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