Bridging the Gap: Evaluating Past Water Levels at Jezero Crater, Mars through Orbital and *In Situ* Data

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T117. Perseverance at Jezero Crater—Characterizing an Ancient Crater Lake Basin on Mars

Jezero crater is an ancient lake basin on Mars that hosts a well-preserved deltaic complex and may represent a past habitable environment. Geomorphological observations from orbital data have long been the linchpin in our understanding of the past lake levels within Jezero. Now, with the recent landing of the *Perseverance* rover, we have the opportunity to integrate *in situ* geological observations to provide additional constraints on historic water levels, lake volumes, and the relative timing of aqueous activity. Here, we synthesize the current knowledge of past lake levels from *in situ* observed geological units and orbitally-observed geomorphic units to constrain the hydrologic evolution within Jezero.

Observed clinoforms within the delta remnants provide new constraints on late-stage water levels, and putative paleoshorelines have been suggested along the crater rim (Fassett and Head 2005). We integrate these new constraints with testing for possible erosional terraces and lake levels by applying a quantitative paleoshoreline detection toolkit (Sholes et al. 2019). Using these combined mineralogical, topographic, geomorphic, and geologic assessments, we can provide a more complete picture of the how the lake evolved.

Additionally, we analyze the lake levels both in their current topographic positions as well as their paleotopography prior to the completion of the Tharsis volcanic province. Topographic deformation models (e.g., Citron et al. 2018) imply that the formation of Tharsis and infilling of the nearby Isidis basin would have significantly shifted the absolute (by >1 km) and relative (by >100 m) elevations of the region. This would have modified the basin geometry, including changing the volume of water at any given lake level and shifting any equipotential surfaces eroded into the bedrock.

Understanding where the different fluvial-lacustrine units within Jezero are exposed, how they might have been modified, and how they compare with the observed geology elsewhere within and outside of the crater allows us to piece together a framework for reconstructing the hydrologic evolution of the Jezero crater system with implications for the habitability and climate of past Mars.