NEW 1:20,000 SCALE MAPPING OF THE JEZERO WATERSHED: IMPLICATIONS FOR BOTH CHANNELIZED AND UNCHANNELIZED FLOW NEAR THE JEZERO CRATER RIM.

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Introduction: In a new, high-resolution mapping effort, evidence for both channelized and unchannelized flow has been observed in the watershed that feeds the western fan in Jezero Crater (Figure 1; [1], [2]), investigation of which has been a primary goal of the Perseverance Rover team. Goudge et al. [2] produced the first geomorphic map of the watersheds that feed the northern and western fans with a focus on the understanding the large-scale source to sink transport of materials within the Jezero Crater system. Work by Mangold et al. [3] then focused on specific measurements regarding the largest channels within the watershed. These results suggest an erosional volume of 56 km\textsuperscript{3} for the primary fluvial channels, which is comparable to the earlier estimate of 59 km\textsuperscript{3} by Fasset and Head [4].

The high-resolution mapping effort described here identifies not only the large channels noted by previous researchers, but also identified morphological evidence for widespread stripping of the substrate within the western fan watershed. Mapping used orthorectified 6 m/pixel CTX images, and a 50 m/pixel DTM was created using HRSC images and derived topographic contours to assist with map interpretations. Features were identified using contour lines and geomorphic mapping on printed 24” by 36” quads with 1 km overlap (currently undergoing digitization). This method allowed for a broad view of features while retaining the details of 1:20,000 scale. Identified morphological features were then catalogued and integrated to facilitate interpretation of the fluvial history within the watershed.

Results: Figure 2 illustrates the key observations that indicate both channelized and unchannelized flow near the Jezero crater rim. The primary Neretva Vallis channel (red solid line) intersects with the crater rim and continues onward where it is observed as a primary channel in the western fan. Within the watershed, however, this channel (which is often > 50 meters deep) is indistinct and appears buried by ejecta from Angelica crater. In this region, a shallow channel (red dashed line) is visible at higher spatial resolution using 10 m contours. This channel, which is bounded to the north and south by small bedrock ridges where eject has been partially removed, is interpreted as a partially buried segment of the original channel and connects the two segments of the primary Neretva Vallis channel.

Outside the estimated ejecta extent of Angelica crater is a broad zone with a myriad of interconnected and branching valleys (pink dotted lines). These valleys cut into bedrock and have a topographic gradient supportive of water flow. Across a ~2 km wide plain these inferred flow paths veer around tear dropped shaped bedrock remnants (eastern portion) and carve sinuous lines into a dark infill material (western portion). These flow paths rejoin with the primary Neretva vallis channel in additional to branching off to the south. This data suggests that the Angelica crater impact event may have had a substantial effect on rerouting the flow of Neretva Vallis.

To the South of Neretva Vallis, and connected to the This basin is represented by a large low lying region with sand and dust accumulation and exposes a distinct bedrock unit at its lowest point. Intersecting this basin are three valley. Two valleys (blue dashed lines) connect overland flow to Neretva Vallis. An additional green dashed line indicates a small valley that cuts across the western fan watershed.
across the Jezero crater rim and may have supported water flow if the basin was filled to ~350m depth. This basin is interpreted as a possible sink for flood waters that may ultimately have spilled into the crater south of the main Nevetra vallis channel. Additional valleys north of the Nerevta Vallis inlet (green dashed lines) connect with a meander of Nevetra Vallis that are not associated with a discrete basin, but may represent pathways for waters to breach the Jezero crater rim.

Finally, along the segment of Nevetra Vallis most proximal to the crater rim, there are three obvious plains that abut meanders of the main channel (pink polygons). These regions are both topographically and visually smoother than surrounding bedrock and are partially filled with sand dunes and dust sheets. The edges not adjacent to Nevetra Vallis are bound by ridges that are cut through with 100-300m wide valleys (pink and yellow dotted lines). In each case, these low-lying areas also contain at least one point (typically at the distal end) where the plains appear to through the Nevetra vallis levee, permitting flow to be recaptured by the main channel. These regions are therefore interpreted as unchannelized flood scours that originated via overland flow and ultimately were recaptured by the Nevetra Vallis channel.

Conclusions: The features described above and outlined in Figure 2 provide evidence for at least one flooding event that significantly rerouted the flow of Nevetra vallis and resulted in a combination of channelized and unchannelized flow. The spatial occurrence for between these geomorphic features and suggests a potential linkage between the two events, such as increase in flow resulting from impact melting of local ground ice. Alternatively, these features may represent a large flood even originating further away from the crater rim, but which occurred after the Angelica crater impact restructured the Nevetra Vallis channel. Either flooding event, however, is proximal to the Jezero crater inlet and carved into local bedrock within the watershed. Such event(s) may have therefore produced the boulder deposits seen on the fan top ([1], [5]). Continued mapping within the Jezero watershed will enhance understanding of the fluvial history of Jezero crater and will provide additional context for identifying potential targets for Mars Sample Return.