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Geologically recent wet-based valley glaciation on Mars

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We apply terrestrial glaciological principles to characterize and interpret the surface features of a ∼4 km long, mid-latitude Martian valley glacier imaged at ∼0.25 m/pixel by the HiRISE camera on the Mars Reconnaissance Orbiter. The glacier is bounded by a nested sequence of latero-terminal moraines, indicating several phases of growth or still-stands prior to a period of recession and stagnation. Within these moraines, the feature's upper basin is characterized by scaly and polygonized surfaces which are interpreted as a product of sublimation and/or periglacial processes. Surface channels are present on these terrains and the inner margins of the glacier headwall moraines, suggesting geologically recent fluvial erosion. Towards the glacier terminus the polygonized terrain gives way to linear forms and drumlin-like features, interpreted as a former temperate glacier bed. Former wet-based glacial conditions are also consistent with the presence of an extensive area of moraine-mound terrain located between the flow feature's terminal bounding moraines. These moraine mounds are interpreted to form as basal thrusts, basal crevasse fills, or ice-contact outwash deposits – all Earth analogues of which are strongly associated with wet-based glaciers. The balance of evidence suggests this flow feature is the relict bed of a former, at least partially wet-based glacier. However, the possibility that the original glacier still survives in the upper basin as a remnant debris-covered and degraded ice-dust mixture, cannot be definitively discounted.