Quantifying Channel Network Morphometrics at Jezero and Eberswalde Craters

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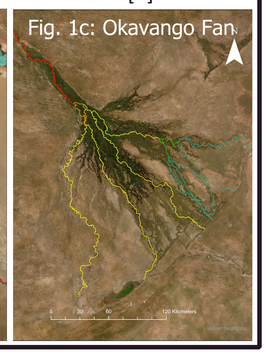
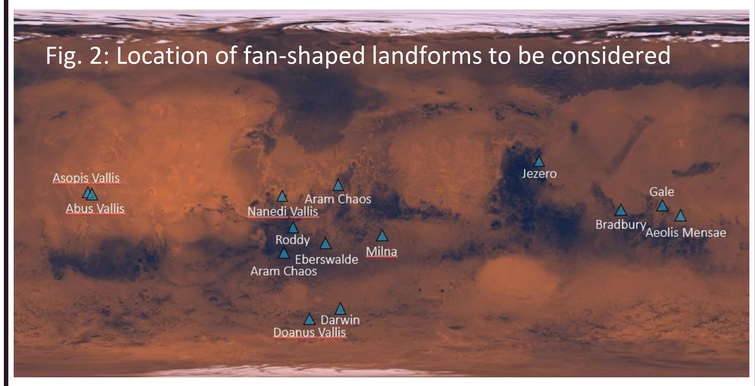
Background

- Deltas and fluvial fans are fan-shaped landforms found on Mars (Fig. 2)
- Deltas (Fig. 1a) form when a river enters a body of water causing mouth bar deposition and channel bifurcation (e.g., [1])
- Fluvial fans form from multiple channel avulsions due to the superelevation of channels above their floodplains (e.g., [2,3])
- Fluvial fans may form along shorelines (Fig. 1b) or inland (Fig. 1c)
- Angle of delta mouth bar bifurcation on Earth averages ~72° [4]
- Deltas exhibit basinward channel length and width shortening due to nonlinear decreases in discharge with successive bifurcations [1]

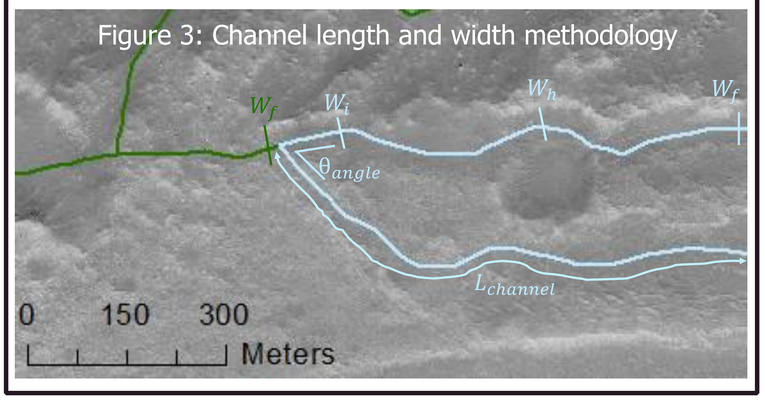


Methodology

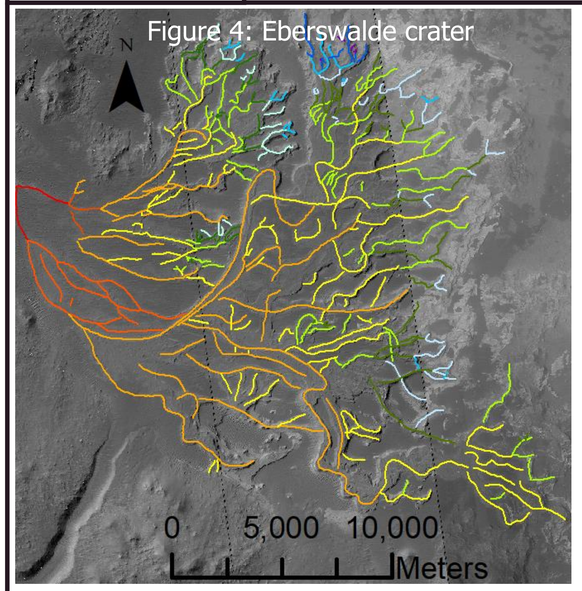
- Landforms mapped with ArcGIS using MRO HiRISE and CTX photographs
- Only fan-landforms with viewable paleochannel networks will be included in the study (Fig. 2)

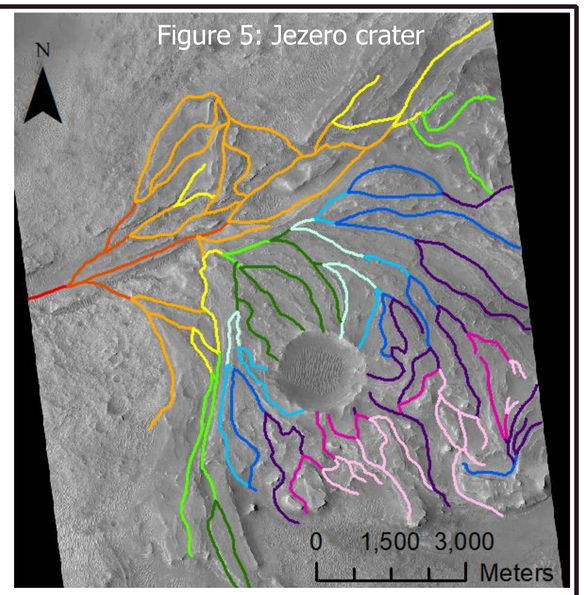


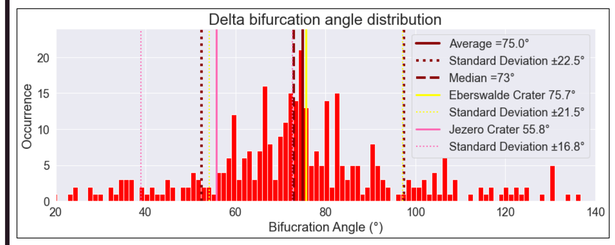
- Angle is measured where angle limbs are the length of the parent channel final width tracking alongside the mouth bar-water contact [4] (Fig. 2)
- Channel length measured from channel node to node [1] (Fig. 3)
- Channel width is averaged from 3 measurements: (i) immediately after bifurcation, (f) immediately before bifurcation, and (h) halfway between i and f (Fig. 3)

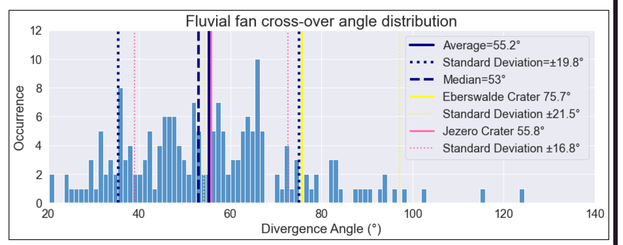


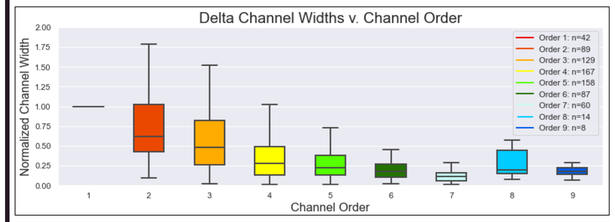
Results

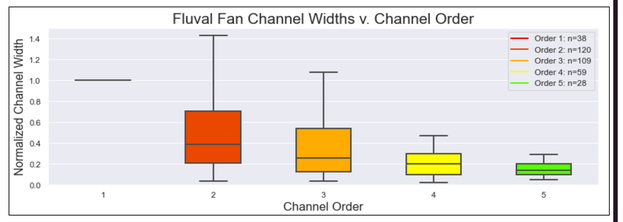


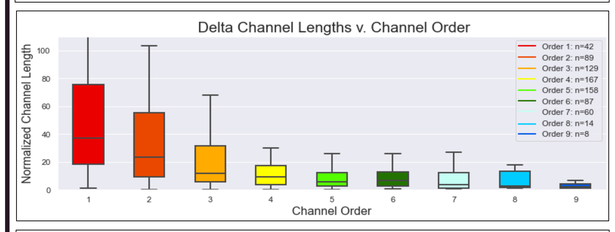


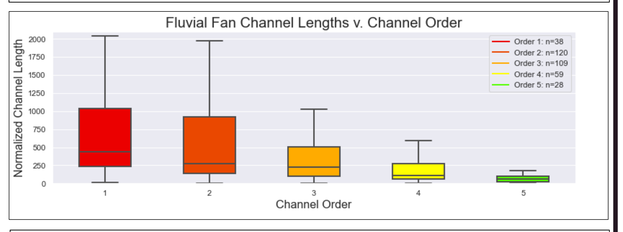


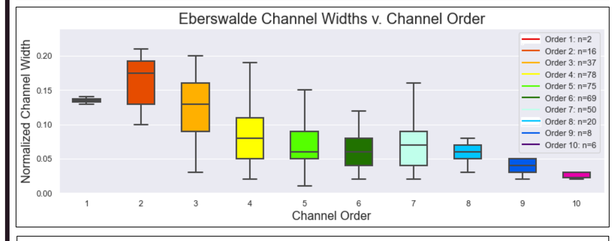


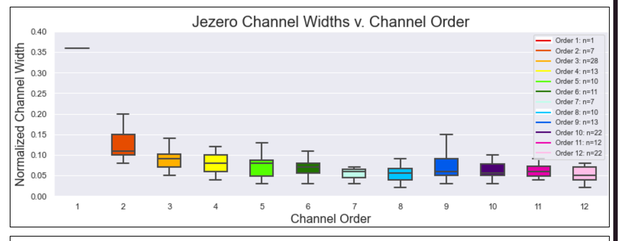


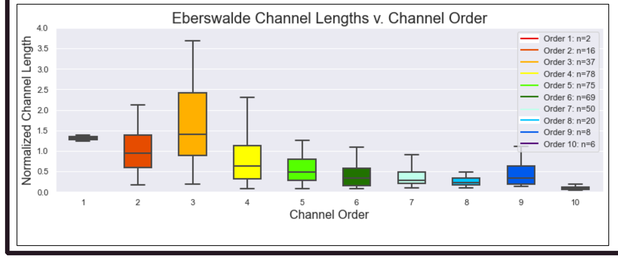


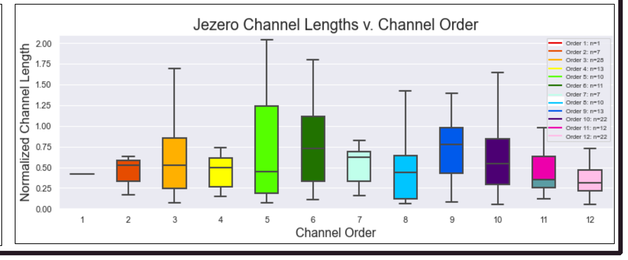










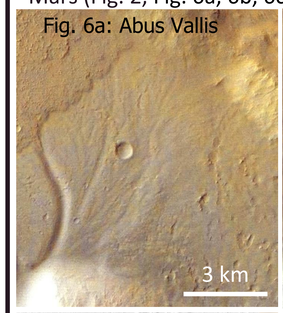


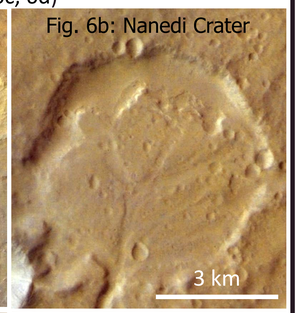
Conclusions

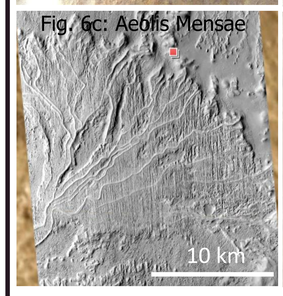
- Channel network morphometrics can be used to differentiate deltas from fluvial fans on Mars
- Eberswalde crater (Fig. 4) resembles an Earth delta based on angle measurements
- Jezero crater (Fig. 5) resembles an Earth fluvial fan based on angle measurements
- Misinterpreting deltas or fluvial fans can lead to misidentification of paleoshorelines
- Multiple lines of evidence should be used to identify these landforms

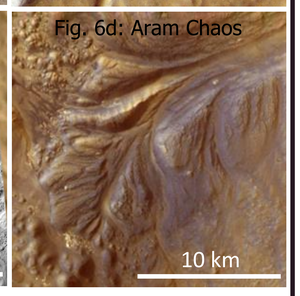
Future Work

- Map more fan-shaped paleochannel networks on Mars (Fig. 2, Fig. 6a, 6b, 6c, 6d)









- Apply methodology to more fan-shaped landforms to attempt to identify them (Fig. 2)
- If possible, quantify alluvial fan landforms to further assist in identification of fan-shaped landforms
- Compare outcrop deposition geometries from *Perseverance* images to Earth analogs

References

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