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Aggradational Channels on Mars

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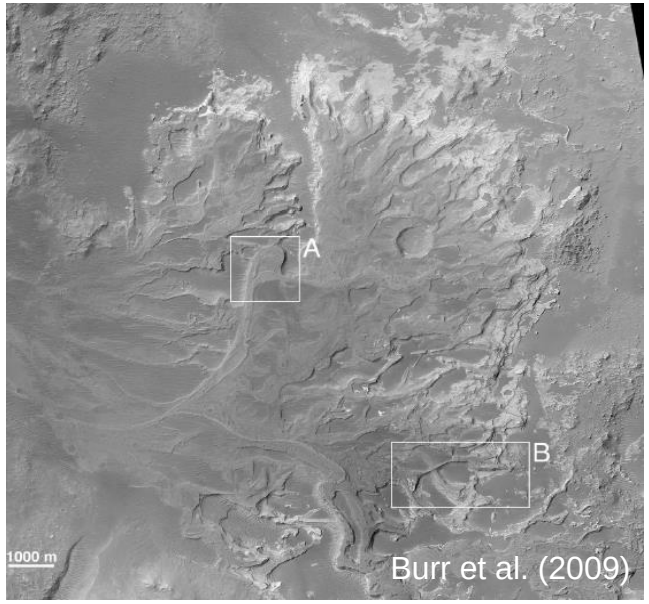
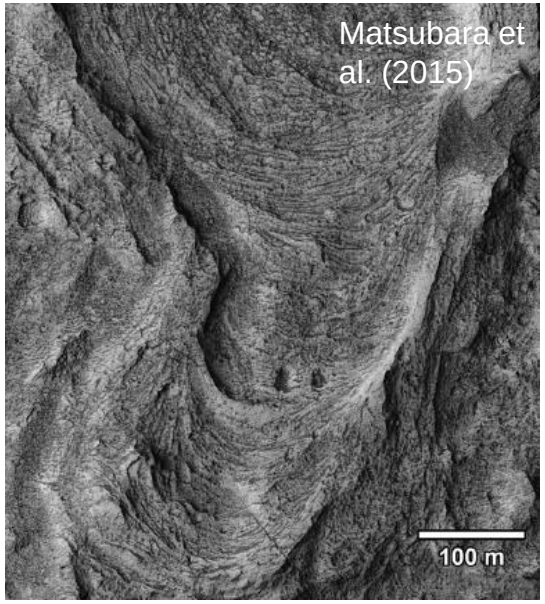
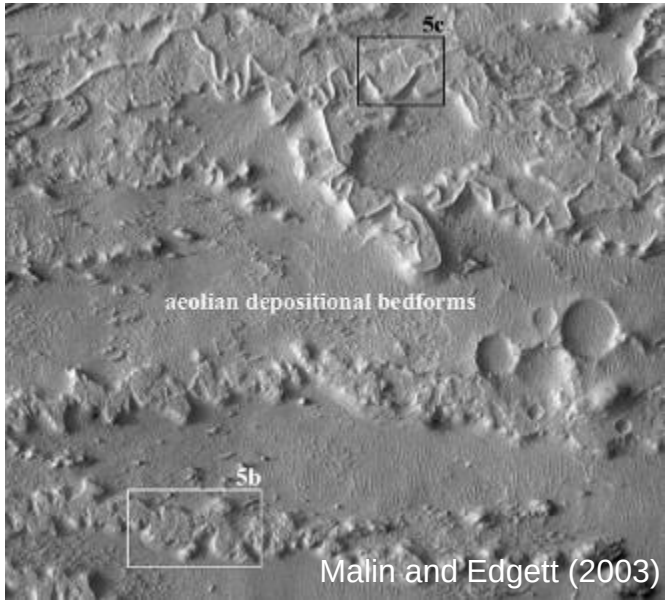
@GeomorphicJosh

Context

- Though cold and arid now, there is widespread evidence to suggest liquid water was once common across Mars.
- However, the timing, persistence, and magnitude of this water is disputed.

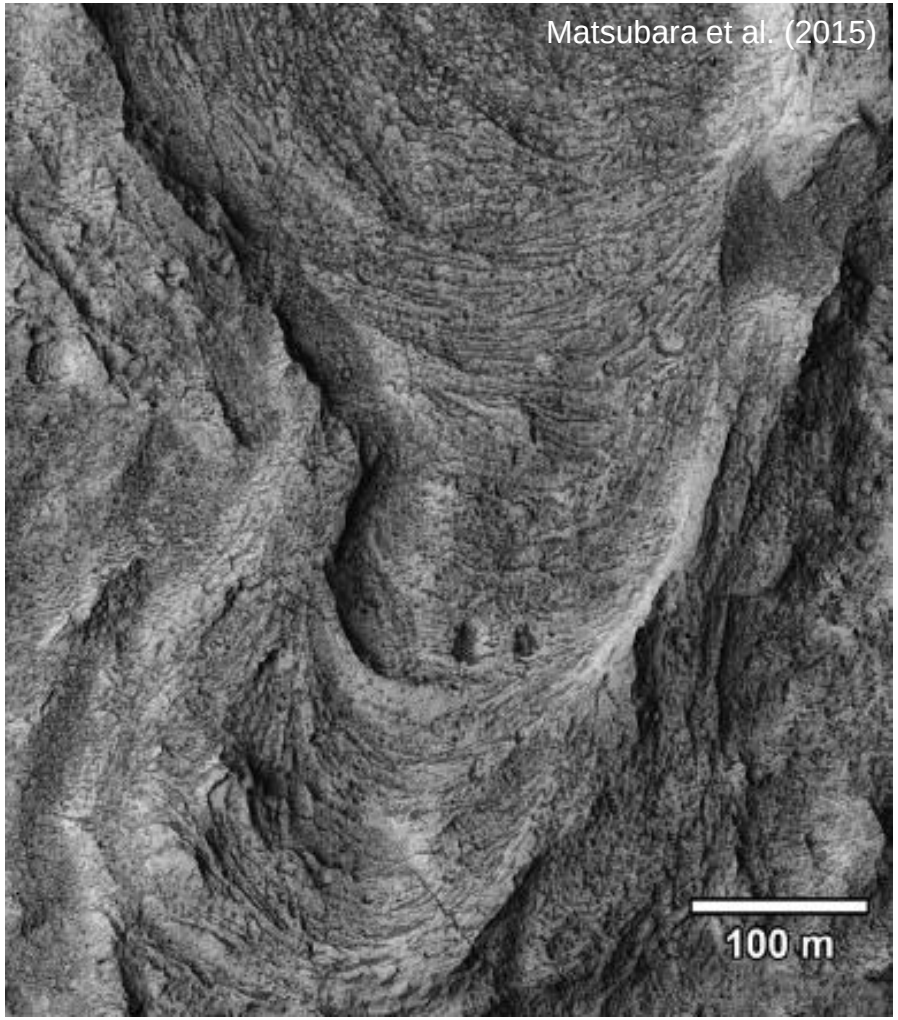






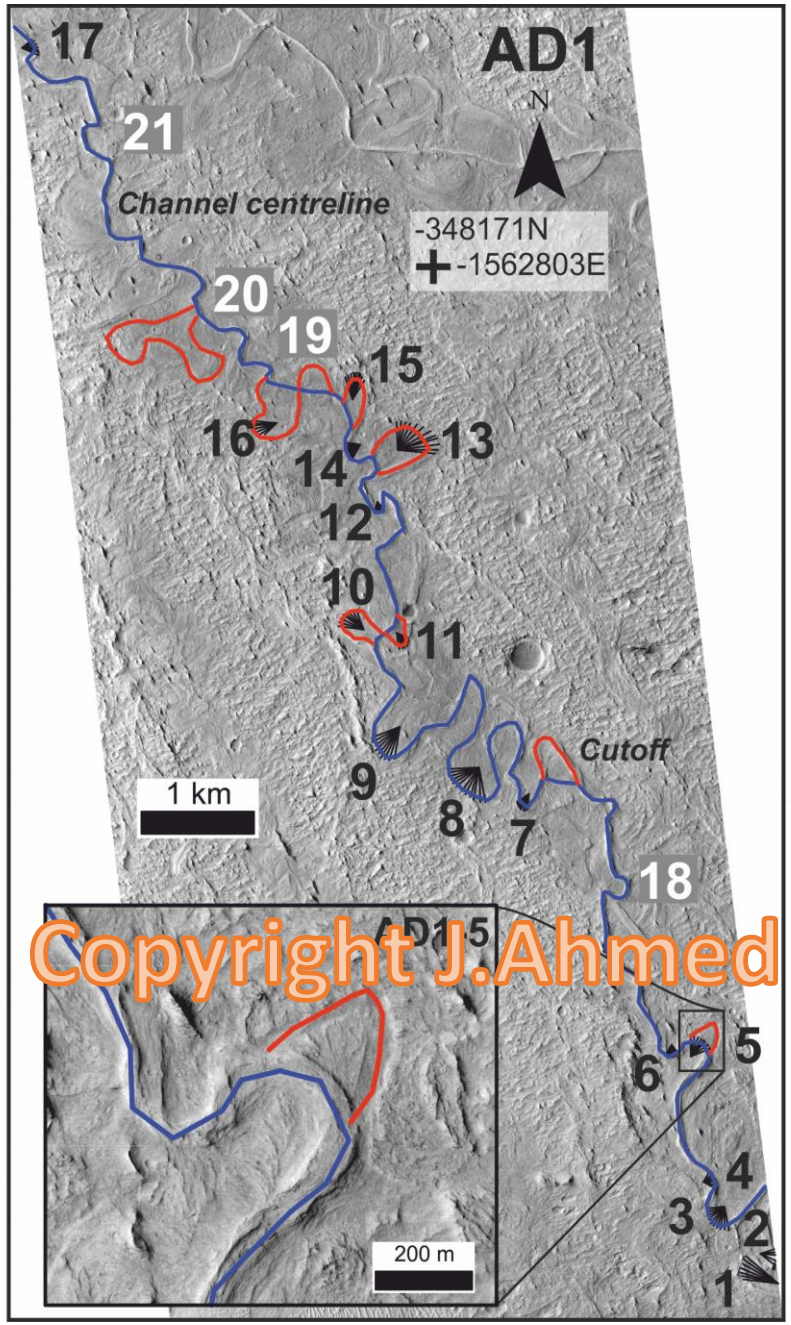
Challenge

- On some of the preserved Martian topography, we were fascinated by the preservation of growth increments on the inside of meander bends (inferred to represent scroll bars or lateral accretion packages) on some of these sinuous channels
- Most studies have neglected to examine topography at the meander-scale, thus potentially missing vital information that would provide insights to their formation.
- **Here we examine the a preserved sinuous meandering channel in the Aeolis Dorsa to make inferences about the necessary conditions required to produce the observed topography.**



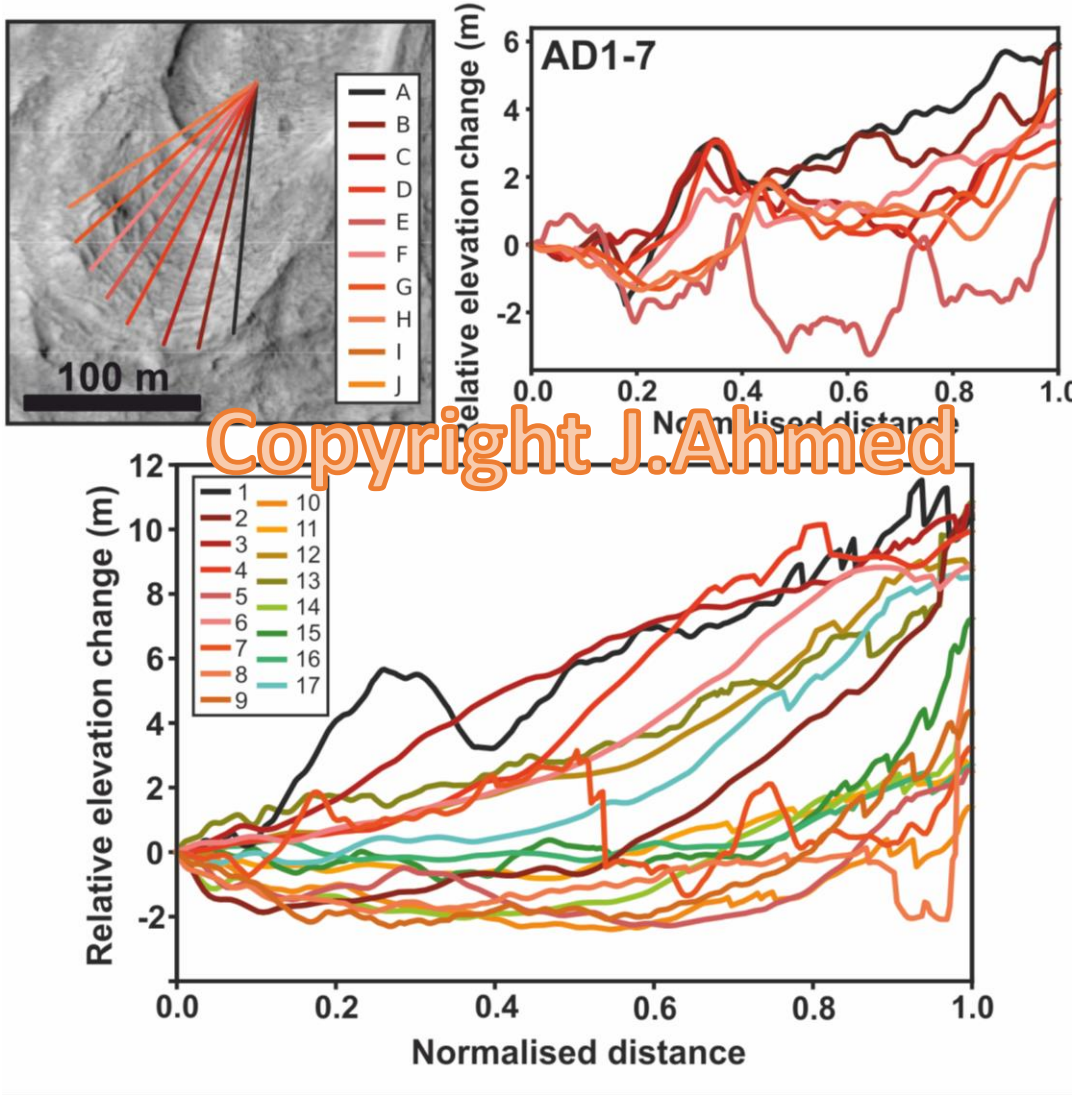
Methods

- We use a 1-m resolution HiRISE DEM to identify topographic changes in 17 meanders for a channel in the Aeolis Dorsa
- We calculate changes in scroll bar elevation and levee slope with distance and compare with terrestrial analogues to deduce possible formative conditions.



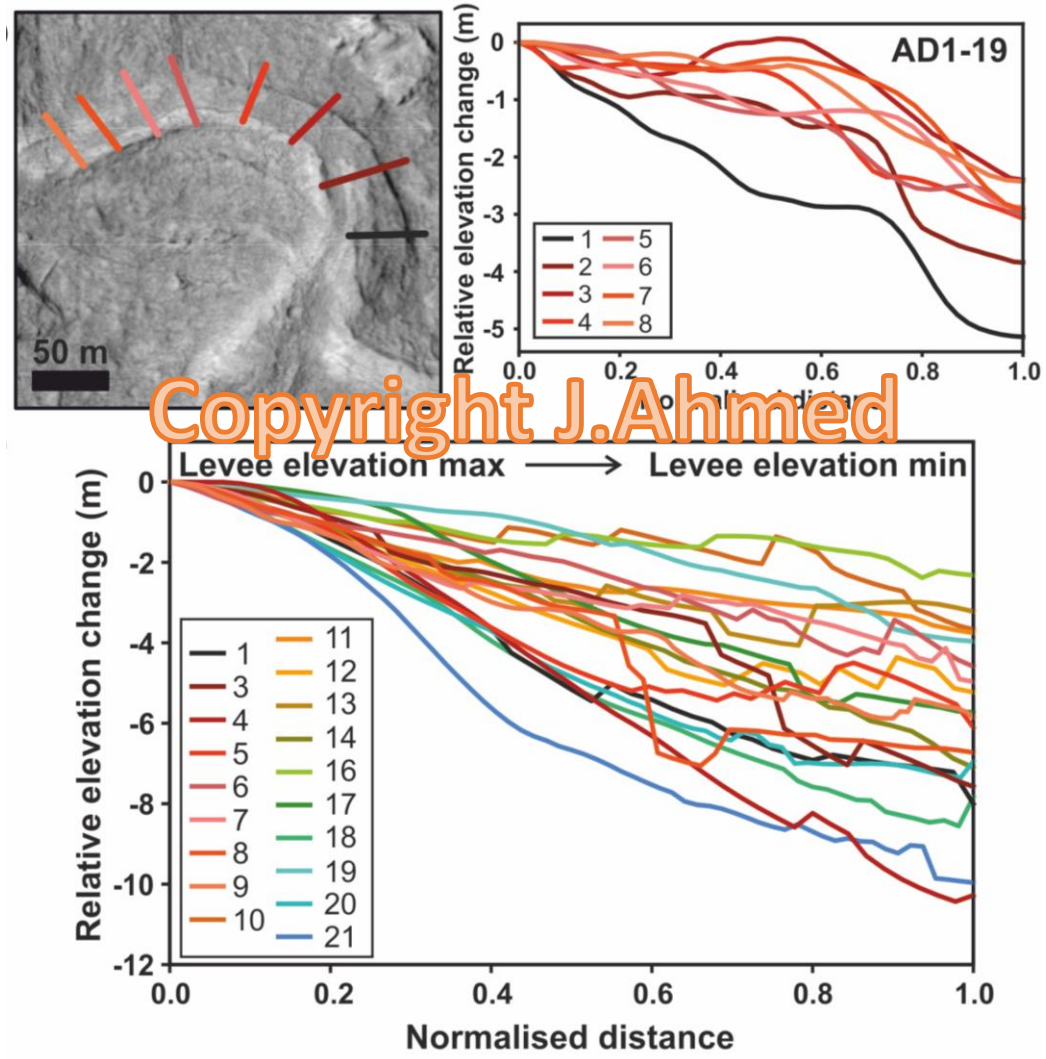
(some)Results

- Profiles emanated at the inner bank and extended up to the preserved channel crest.
- Profiles show some variation due to preservation quality (or depositional dynamics)
- Average topographic profiles for each of the 17 meanders indicates a general rising trajectory in elevation of the scroll bars with distance from a centre point at the inside of the bend



(some)Results

- Profiles emanated from the channel crest and descended into the flood basin.
- Profiles were variable suggesting the focus of sediment deposition changed through time (or preservation quality varied)
- Levee thicknesses exerted a strong control on slopes which were much larger than those observed on active terrestrial rivers.



Interpretations and model

- Vertical growth of scroll bars is indicative of aggradational conditions
- Aggradation requires an adequate and persistent sediment supply, flow variations, and relatively stable river banks (to confine channel flow)
- Previous work has shown that high sediment loads enhance channel migration in non-cohesive river banks. However, the introduction of cohesion (e.g., from fine-grained clays as are widespread on Mars), could provide feasible conditions in which moderate sediment supply, variable discharge, and slow migration co-exist.

- **This work is currently being prepared for journal submission, so you will be able to read more about it soon!**
- **Feel free to drop me a message via email or via Twitter if you have any questions that don’t make it to the chat.**