# Quantifying erosion rates on Mars (and field work on Earth)

**Contact persons**
Sébastien CASTELLTORT (sebastien.castelltort@unige.ch),
Abdallah ZAKI (Abdallah.Zaki@etu.unige.ch)

## Context

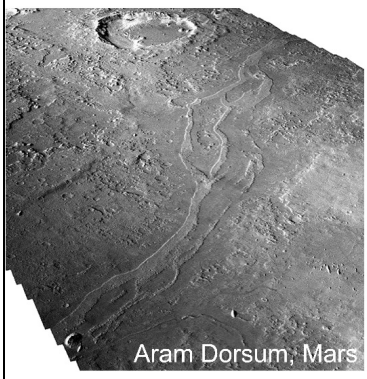
Geomorphological landforms, including fluvial and aeolian landscapes, suggest a widely Martian global transition from a complex history of fluvial activity to long-lived aeolian processes, most likely, ca. 3 billion years ago (e.g., Carr and Head; 2010; Kite, 2019). A quantitative understanding of landscape response to this climatic transition is fundamentally important to constrain the landscape evolution on Mars.

## Aims and Methods

This project aims to quantify the landscape response to wet to arid climatic transition. The formation of fluvial ridges is intimately tied to climate as they record a regional and a planet-wide lowering of the surface due to net landscape lowering by differential erosion during the transition from wet-to-dry conditions (Zaki et al., 2021). Thus, they can be used as a proxy to estimate the minimum erosion/exhumation rates at different sites across the Martian surface. Erosion/exhumation rates can be simply calculated by dividing the ridge thickness by the ages modeled from the crater-counting technique. Surveying High-Resolution Imaging Science Experiment (HiRISE) and Mars Reconnaissance Orbiter Context Camera (CTX) images with resolutions ranging from 0.25 to 6 m/pixel to select the fluvial ridge sites that morphologically are amenable for this investigation. The ridge thickness will be measured from CTX and HiRISE digital terrain models (DTMs). A field trip is also planned to apply this method to a natural system in Caspe Formation, Spain, and constrain the uncertainties on measuring ridge thickness from DTMs.

## References

*Carr, M. H., & Head, J. W. (2010). Geologic history of Mars. Earth and Planetary Science Letters, 294(3–4), 185–203.* https://doi.org/10.1016/j.epsl.2009.06.042
*Kite, E. S. (2019). Geologic Constraints on Early Mars Climate. Space Science Reviews, 215(1).* https://doi.org/10.1007/s11214-018-0575-5
*Zaki, A. S., Pain, C. F., Edgett, K. S., & Castelltort, S. (2021). Global inventory of fluvial ridges on Earth and lessons applicable to Mars. Earth-Science Reviews, 216, 103561.* https://doi.org/10.1016/j.earscirev.2021.103561.





**Website**

https://sites.google.com/view/earthsurfacedynamics

## Prerequiste

Students interested in this project would be advised (but not required) to choose "**Geobiosphere, Climate and the Sedimentary Rock Records"** as their main module