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# Landscape evolution reconstructions on Mars: a detailed analysis of lacustrine and fluvial terraces

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Liquid water was flowing on the surface of Mars in the past, leaving behind a wide range of geomorphic features. The ancient major Martian water fluxes vanished about 3.5 Ga. Meteoritic impacts, wind-erosion, gravity-related phenomena, tectonic deformations and volcanic activities deeply altered the landforms during the ages. Hence, the reconstruction of water-shaped landscapes is often complicated.

Fluvial and lacustrine terraces analysis and correlation is a useful approach to understand and reconstruct the past changes in Martian landscape evolution. These features are commonly used as reference for the top of water bodies on Earth, since they are void of the uncertainties or errors deriving from erosional or slumping processes that could have acted on the valley flanks or in the plateau, where the hydrological network was carved in.

The study area is located in the western hemisphere of Mars, in the Memnonia quadrangle, between latitude 9°10'-9°50'South and longitude 167°0'-167°30' West and it constitutes a transition region between the southern highlands of Terra Sirenum and the northern lowlands of Lucus Planum. Many water-shaped features have already been described near the study area, the most prominent of them being the Ma'adim Vallis and the Mangala Valles system.

Our results derive from the observations and the analysis of HRSC images (12.5 m spatial resolution) and Digital Elevation Models (DEMs) derived from the MEX-HRSC (75 m resolution), that allow the identification of elevation differences up to the tens of meter scale. We were able to reconstruct six main evolutionary stages of a complex hydrologic systems consisting of two main palaeorivers (up to 5 km wide) connected one another by a palaeolake that formed within a meteor crater ($\sim$20 km diameter). On the basis of Earth analogs, these stages/terraces should have evolved during a long period of time, at least thousands years long. Furthermore, crater counting date back the deactivation of the system to ca 3.5$\pm$0.1 Ga ago, suggesting the presence of a stable environment with subaerial water fluxes during the Late Hesperian, very close to the liquid-water disappearance.

Apart from the above mentioned reasons, the increasing interest and ongoing programs of on-site Martian exploration are additional reasons to study fluviolacustrine depositional environments. Together with the technology improvements that lead to more flexible safety constraints for landing/exploring, the possibility to focus on specific and more detailed scientific aspects is enhanced.