

Paleoenvironment reconstruction from channel and valley morphometry on Mars

A. Kereszturi

Collegium Budapest, Eotvos Lorand University of Sciences, akos@colbud.hu

The characteristics of the channels and valleys on Mars hold information on various environmental conditions were present during their formation. This work focuses on their easily observable main morphological and morphometrical aspects from a point of view how much are they useful for paleoenvironment reconstruction.

The author analyzed longitudinal and cross sectional profiles of channels and valleys at Xanthe, Margaritifer, Noachis Terra and their surroundings from MOLA data, and morphological characteristics from MOC, THEMIS and HRSC images. During the work correlations were searched between the quantitative parameters (length, width, depth, slope, volume, curvature) and the geomorphological structures (regional topography, sedimentary infill, erodible/competent bedrock, inner channels etc.). The author tried to elucidate to what extent could the channels and valleys be used for the estimation of ancient environmental parameters (erosion, paleodischarge, ice covered/ice free surfaces, cutting into bedrock, water sources and sinks etc.).

Among the results concave and convex longitudinal profiles were observed at Bahram and Tyras Valles respectively, while no general trend was visible at many other valleys. Several longitudinal profiles showed signs of knickpoints and some short reaches with increasing elevation in the flow direction. The cross-sectional profiles of Tyras Valles showed more V-shaped of upper and U-shaped profiles of lower reaches, but the great variety of profiles of other channels suggests a complex relationship. Tyras Valles could be divided into upper and lower sections that probably formed at different periods and conditions. The largest observed valleys contain small, previously unnoticed inner channels. There is no correlation between the shape of cross-sectional profiles and the direction of curvature of the valley's long axis, as is found in riverbeds on the Earth, suggesting that they are probably valleys and not dry riverbeds.

The picture emerged from the analysis is diverse but shows the possibility to gain information with putting the pieces together on the ancient environments. The author points to possible ways to use individual and easily observable characteristics together for complex environment reconstruction. And also shows the necessity and possible output of a digital channel database connected to geomorphology and topography (based on for example HRSC global coverage) for paleoenvironmental reconstruction.