ANALYSIS OF THE MEANDERS OF SOME RUNOFF CHANNELS ON MARS. Ákos Kereszturi (Department of Physical Geography, Eötvös Loránd University, H-1083 Budapest, Ludovika tér 2., Hungary (E-mail: irodaweb@irodaweb.hu)

Introduction: The martian runoff valleys are thought to originate by sapping [1, 2, 3]. The exact style of the water flows, the sediment load, the discharge and many other factors are not fully understood [4, 5, 6]. The morphological and morphometrical results could help to resolve the circumstances of their origin, so it is an important field of work. In this article some part of the author's thesis [7] was summarized. The purpose of this is to show connections which possible can help in the future to understand the origin and evolution of these channels.

Working method: Based on the photos of the Viking-1 and –2 Orbiters [8] morphometrical parameters of the channels were measured by Surfer and Excel programs. The surveyed area is between 0°-31°N and 44°-76°W. Beside the morphological characteristics the channels' width, length, and the amplitude, wavelength, radius of the meanders were measured. The error in most of the measurements is below 20%.

Results: At the runoff channels 110 meanders' amplitude, wavelength and radius were measured. Some well confined parts of the Kasei and Shalbatana valleys were also measured in spite that they are outflow channels with different origin [9, 10, 11, 12]. These parameters were indicated versus the width of the channels, which could be as a very rough approach of the relative discharge. There is good connection between the meanders' parameters and the valley width (Fig. 1.). On the Earth this relation is obvious, and there are methods in the paleohidrology [13] to estimate the ancient discharge with the meanders' parameters. Of course, on Mars the case is far different from the case on Earth, and the runoff channels are thought to formed by sapping. In spite this fact the upper mentioned possible rules may be real and arise from the inner physical characteristics of the moving water. (On Earth meandering style was observed at marine or atmospheric currents too beside the rivers.) So it is interesting to analyze these possible relations.

The limited resolution of the Viking photos limited our work in the morphometric analysis. At several runoff channels there are small but visible morphological characteristics which are possible results of moving meanders and variable discharges. On Fig. 2. are some morphological examples for the variable discharges at the same channel, as curving erosional structures at the riverbanks, small channel-like structures on the riverbed, and terrace-like structures (1,2,3 for traces of smaller and smaller meanders, and T for terraces). Some parameters of the curvatures at the riverbanks were estimated as if they were meanders. Some of the results at three different channels are visible on Fig. 3.

If we indicate the amplitude/radius ratio versus the width at the first mentioned 110 runoff and 30 outflow meanders' parameters (Fig. 4.) the runoff and outflow channels are separated into two groups, where the outflows' meanders are less evolved and has always small amlitude.

If the relations on Fig. 1. are real than it may help in the estimation of the paleodischarges of these channels. Today there are many tophographic data from the MGS. With this data it is possible to estimate the the channels' cross section, and with the slope angle to estimate theoretical runoff speed. If these results are in good areement with the relative discharge results of the "meander method" than with the meanders' parameters we can estimate paleodischarges for many martian channles, and can compare them to results from other methods.

Acknowledgement: We would like to especiall thank László Mari, Szaniszló Bérczi, Gyula Gábris, Henrik Hargitai and András Sik from the Eötvös Loránd University.

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Figure 1.

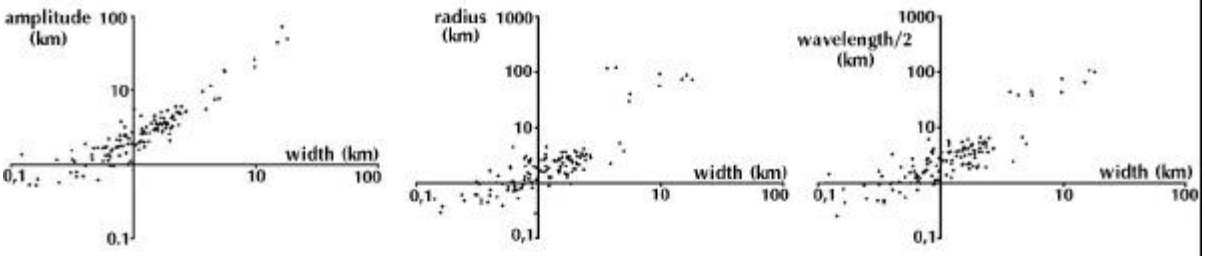

Figure 2.

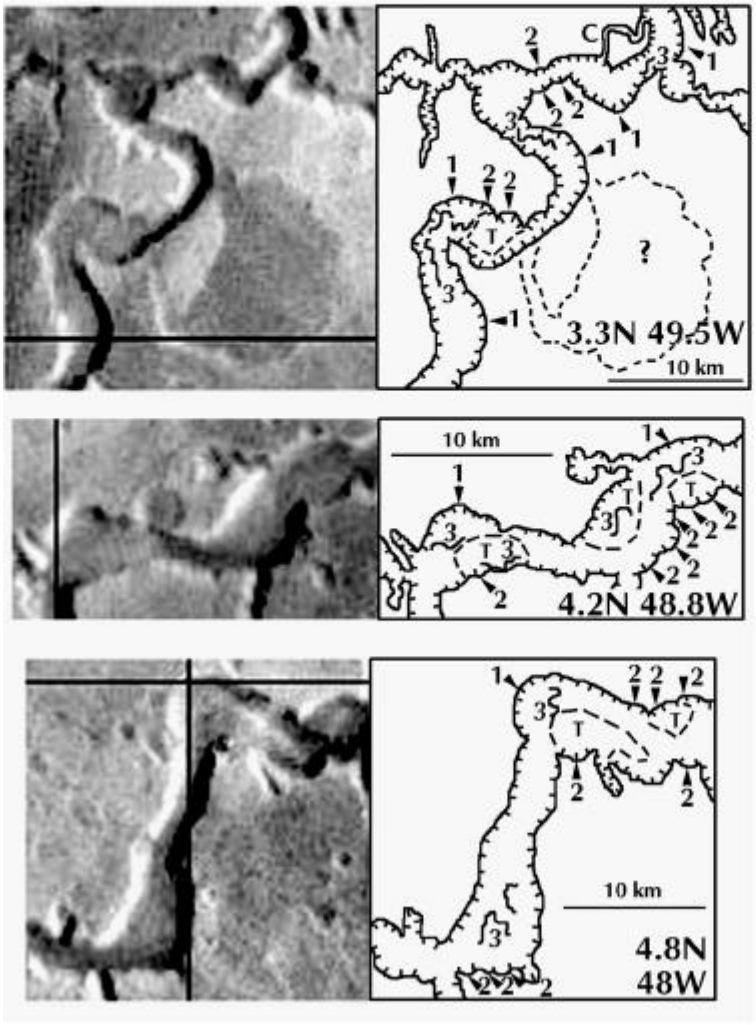

Figure 3.

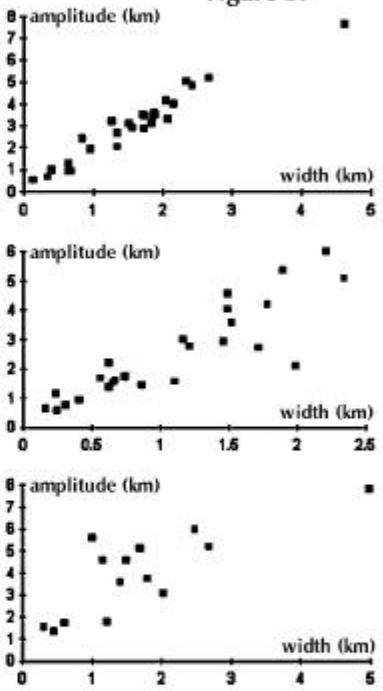

Figure 4.