PROPOSAL FOR DRAINAGE NETWORK TYPES ON MARS. A. Kereszturi[1,2,3] and Gy. Gabris[1] ([1]Department of Physical Geography, Eotvos Lorand University of Sciences, Budapest, Hungary; [2]Collegium Budapest, Institute for Advanced Study, [3]Hungarian Astronomical Association, E-mail: kru@mcse.hu).

Introduction: The aim of this work is to outline five possible drainage network types on Mars, which can serve as bases for future development of drainage network classification. This helps analyze the origin and erosional/depositional process, connections between water-related structures to each other, like chaos [2], frozen ice bodies [3,4] and estimate paleoenvironmental conditions like discharges [1].

The origin of Martian channels and valleys is still controversial, with models for their formation by precipitation, groundwater sapping or both [5,6,7,8]. There were some attempts to define and describe drainage network types on Mars [9], but most papers analyzed only individual systems [10,11] and lacked general morphometric data except for certain cases.

Methods: In the *drainage network analysis on the Earth* linear erosional structures are classified, though not all of them formed probably by erosion of liquid water [12]. The first classification based on the genetic relations was made by Verstappen [13]. This analysis gives us information on the lithology, geological conditions and the regional climate. On Earth the orientation of certain valleys had already been analyzed based on satellite images, gave us examples for the method of similar work to be done on Mars. Various anomalies can also be observed inside the types on Earth and Mars, above all in the form of neighboring but different meanders.

In the case of *Martian drainage network analysis* the same problem appears: the role and dominance of erosion by liquid water can hardly be estimated (e.g. fretted channels). We took into account in this work those valleys, which based on publications from other authors formed dominantly by flowing water. In the following the general characteristics are summarized for the proposed network types.

Results: The proposed five classes for Mars are the following with temporary names and possible Earthly analogs in brackets: 1. weakly integrated, small, parallel valleys (centrifugal), 2. integrated small valleys (dendritic), 3. lonely medium valleys (disordered), 4. confined outflow valleys (catastrophic flood), 5. unconfined, braided outflow valleys (dichotomic). Their properties are summarized in table, and examples are given in Fig, where from left to right (a) image (Mars), (b) graph (Mars) (c) graph of resembling class on Earth is visible. Note the different scales for each subsets.

It is worth mentioning that strongly *fractured network types* are important on Mars because of the observed weak integration of valley systems. Despite the fractured characteristics, several types can be defined on Earth: multibasinal (many short valleys and lakes); collinear (parallel valleys on rocks with highly different permeability); and phantom (chaotic, spyder web like) network types. Resembling fractured types can be defined on Mars too.

Basic differences between the networks on the two planets: on Earth erosion and accumulation dominated systems are also present, on Mars most of them show only erosional structures (excluding the delta-like depositional structures). The only one group of exception can be analyzed at the braided patterned outflow cannels and valleys. Another important difference that on Mars watersheds had not been easily identified, partly because many systems start on plains, and also not all of them formed probably by surface precipitation and runoff.

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Name	1. weakly integrated	2. integrated, small	3. lonely, medium	4. confined outflow	5. braided outflow
source	steep hills	not marked	not marked	chaos	chaos
valley width (m)	<100-1600	200-1000	200-10000	2000-20000	200-20000
valley length (m)	2000-45000	1000-11000	1000-400000	1000-100000	200000-3000000
valley depth (m)	30-300	30-300	50-600	800-3000	50-1000
drainage density	0.11-0.16	0.1-0.6	0.01-0.1	0.04-0.1	0.02-
sinuosity	1.0-1.3	1.0-1.5	1.0-2.2	1.0-1.3	1.0-1.3
eroded volume (km/km^3)	0.001-0.1	0.01-0.6	0.01-5	5-20	hard to estimate

Figure: The five proposed drainage network types on Mars (left, middle) and possible analogy on Earth (right)