THE ANCIENT LAKES IN HELLAS BASIN REGION AS SEEN THROUGH THE FIRST YEAR OF MARS EXPRESS HRSC CAMERA. H. Lahtela[1], J. Korteniemi[1], V.-P. Kostama[1], J. Raitala[1], G. Neukum[2] and the HRSC CO-Investigator Team, [1]Div. of Astronomy, Dep. of Phys. Sciences, P.O. BOX 3000, FI-90014 University of Oulu, Finland (hlahtela@student.oulu.fi), [2]Institute of Geosciences, Freie Universität Berlin, Germany.

Introduction: Water on Mars is already a proven fact [e.g. 1]. There are also many studies on ancient lacustrine features [e.g. 2-4]. However, there is still a lot to learn and discover of the processes related to them. This still ongoing study concentrates on mapping and detailed descriptions of numerous paleolakes on Hellas Basin region using the Mars Express High Resolution Stereo Color- images (HRSC) [5].

Hellas is one of the largest impact structures in our Solar System. It is located on the southern hemisphere of Mars. After the first year, the HRSC-coverage in the area is already large enough to give preliminary view of regional processes. In closer study we also use the dataset of THEMIS, MOLA and MOC instruments.

Paleolakes: In this study the paleolakes are divided into three categories: 1) closed and 2) open paleolakes and 3) paleolake chain. This division is made in accordance with previous works by Cabrol and Grin [e.g. 6] and it is thus based on the channels in contact with the lake basin.

The closed paleolake. When there is only inlet channels connected to the lake it is classified as a closed paleolake. Such craters were the end points of the local flows. Inlets brought water into the lake where it is trapped.

The open paleolake. In contrast to the previous group, the open paleolakes have also outlet channels. Additionally, paleolakes having only outlet channels and no inlets are also categorized into this group.

The paleolake chain. The craters which lakes were connected by channels formed a lake chains. Now the dry basins are visible. They are joined together by channels like a string of pearls with additional branches.

Preliminary mapping of possible paleolakes in Hellas Basin region: Selection of paleolake candidates was made based on connection to feeding and drainage channels. The preliminary survey came up with 48 closed paleolakes, 103 open paleolakes and 19 paleolakes constituting a total of 9 chains (Fig.2). Combined this makes 170 different kind and sized paleolakes in the area of $4 * 10^6$ km^2. These potential lake remnants are distributed fairly uniformly around the imaged area of the Hellas rim, with few specimens found also on the basin floor. Most of the open lake systems are located on the eastern rim region near the outflow channels of Dao, Niger, Harmakhis and Reull Vallis and adjoining fluvial channel network. Whereas the closed systems are found mainly on the highlands north of the Hellas Basin. Only few images showed no clear traces of lacustrine processes.

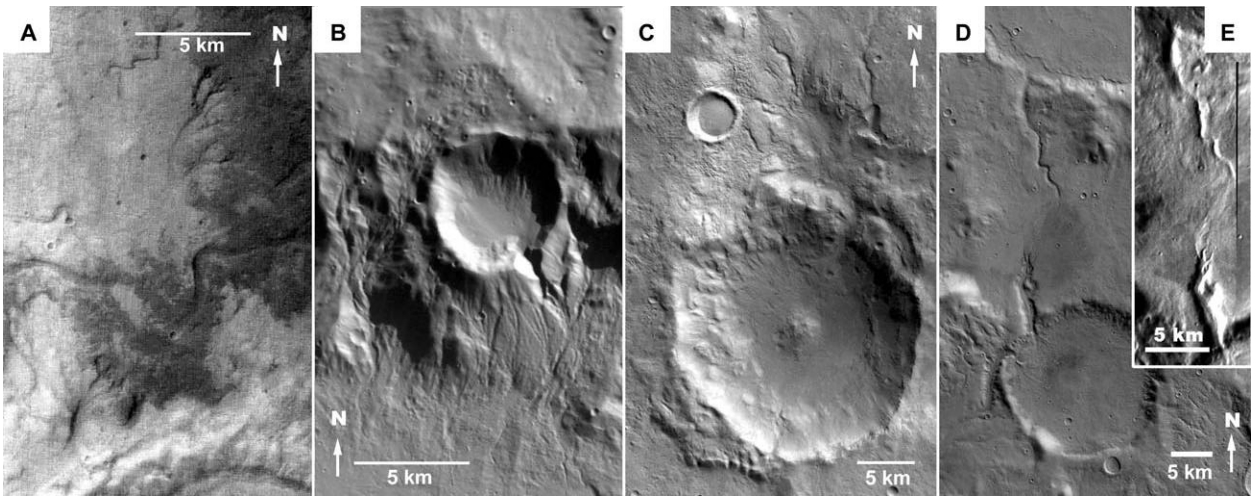

Figure 1. Examples of paleolakes. A) Open paleolake with inlet channel on the right and outlet on the left (part of h0047). B) Open paleolake with only outlet channel (part of h0528). C) Closed paleolake with inlet channel on the north and delta-like structure at the mouth of it (part of h0411). D) Paleolake chain composed of darker sedimentary basin, crater lake and connecting channel (part of h0451). E) THEMIS image of braiding river on the top of sedimentary basin seen in image D (mosaic of THEMIS day-time IR-images I06376002, I08211002 and I01882002).

Paleolake examples: Most paleolakes mapped in this study belong to group open (Fig.1A). From these a small group of paleolakes stands out. Its lakes have only outlet channels without distinct inlet channel (Fig. 1B). They are usually located on steep slopes.

The closed paleolakes are another notable group (Fig. 1C). From these, it is harder to tell whether the amount of water was adequate to form a standing body of water or if the channel just ended on dry surface.

Paleolake chains in this studied area were surprisingly small in terms of number of connected lakes; three was the maximum. Usually connecting channels were also quite short. In one case (Fig: 1D and 1E), studied more detailed in [7], a route of water can be traced over 650 km from Hesperia Planum to the Hellas basin.

Conclusions: Fluvial and lacustric processes have shaped the surface of Mars. The MEX-HRSC data is a valuable addition to the previous Martian datasets when analyzing paleolakes. The more precise images are obtained with reasonable coverage, the more paleolakes can be identified.

Just after the first year the HRSC data is showing large number of possible paleolakes in the vicinity of the Hellas Basin. Preliminary amount is a total of 170 candidates.

Further studies: After more careful studies, the number of 170 paleolakes within the studied region will definitely change. All candidates must be checked using the topographic data of MOLA. Other datasets such as THEMIS and MOC will give insight whether e.g. delta-like structures were actually formed under water or just sedimented on dry surface. The sizes of the basins also indicate of what kind of evidence we should look for. Shorelines can't be recognized unless the area of influence has been large enough. On the other hand, small bowl- shaped craters don't have much features which could have been smoothened by the sheets of lacustrine sediments.

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References: [1]Carr, M.H (1996) *Water on Mars*, N.Y, Oxford, Oxford univ. press., p. 229. [2] Goldspiel, J.M., and S.W. Squyres. (1991) *Icarus 89*, 392-410. [3] De Hon, R. A. (1992) *EMP* 56, 95-112. [4] Newsom, H.E., et al. (1996) *JGR*, 101, 14951-14955. [5] Neukum, G., R., et al. (2004) *ESA* SP-1240, 27-45. [6] Cabrol, N. A., and E.A. Grin (2001) *Icarus*, 100, 1-25. [7] Lahtela H., et al. (2004) 40th Vernadsky-Brown, abstract #ms055.

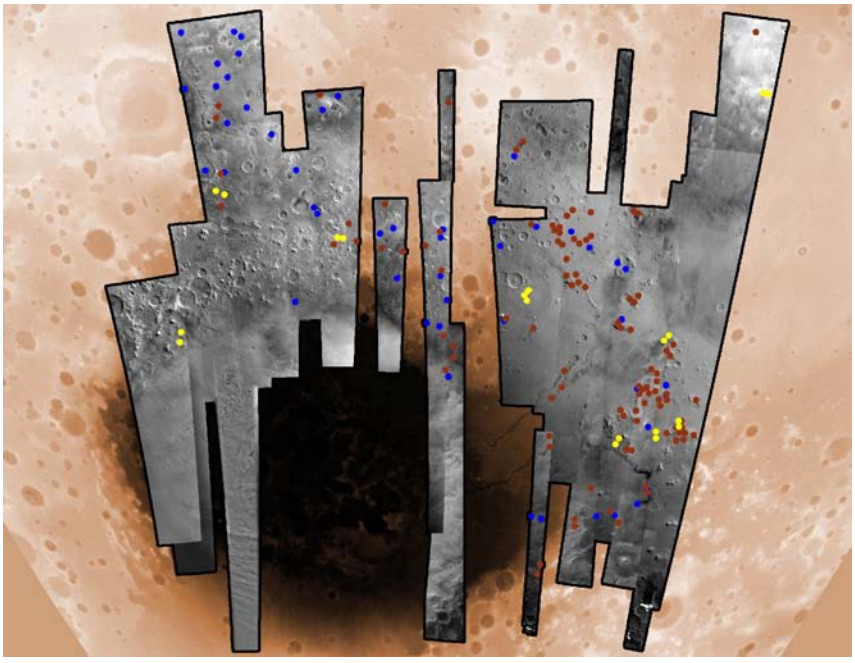

Figure 2. HRSC-image on MOLA data shows coverage after one year of mission. Red dots signify the open paleolakes and blue ones the closed ones. Yellow dots mark ancient lakes which are part of a paleolake chain. Closed paleolakes dominate areas north from Hellas Basin, but the open ones are most numerous on the eastern rim region.