CLARITAS PALEOLAKE STUDIED FROM THE MEX HRSC DATA. J. Raitala[1], M. Aittola[1], J. Korteniemi[1], V.-P. Kostama[1], E. Hauber[2], P. Kronberg[3], G. Neukum[4] and the HRSC Co-Investigator Team. [1]Astronomy, Univ. of Oulu, Finland, (jouko.raitala@oulu.fi), [2]Inst. of Planet. Res., DLR, Berlin, Germany, [3]Inst. of Geology, TU at Clausthal-Zellerfeld, Germany, [4]Inst. of Geosci., Dept. of Earth Sciences, Freie Universität, Berlin, Germany.

Claritas Fossae (CF) deforms the southern Tharsis slope. The history of its southern reach has included volcanic, tectonic, and water- and ice-related phases. Water was transported from the upland peaks into the Claritas basin. The drainage carved a channel from the paleolake into Icaria Planum. Along the channel, there were also sapping, a crater lake with delta, and an alluvial fan formation.

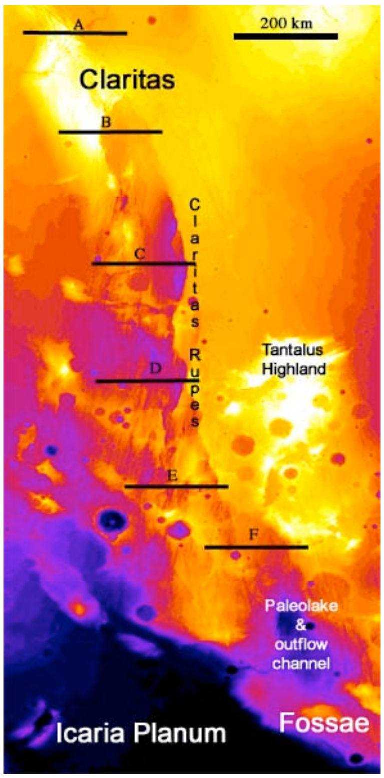

Fig. 1. MOLA topography of Claritas Fossae.

Introduction. The N-S to NNW-SSE faults of CF cut the ancient (Hesperian to Noachian) uplands, Tharsis-related lava plains [1], and fluvial and eolian formations. In the south, CF crosses the NEE-SWW -trending set of faults of Thaumasia Fossae. The Claritas-Thaumasia tectonics may reflect plume-related dike intrusions [2] and/or rifting [3,4,5]. The fault intersection has numerous channels, including Warrego Valles, indicating previous activity of flowing water. An intrusive body heating was proposed to have resulted in hydrological channel-forming activity [6,7]. Thaumasia channels were correlated to volcanoes, rift systems and craters in order to show how excavation of fluvial valleys depended on volcano-tectonic influences [6,7].

Claritas Rupes (CR), well visible in the MOLA topogaphy (Fig. 1), extends from the high reaches of Tharsis down to Thaumasia-Icaria Planum. In the north, the CR scarp steps down from high in the west to lower in the east (Fig. 2a). To the south of this, it is a wide graben (Fig. 2b). The middle section of CR has a higher eastern and lower western side (Fig. 2c-e). In the south, CF forms a basin (Figs. 1, 2f). The relative youth of CR makes it a geologic marker.

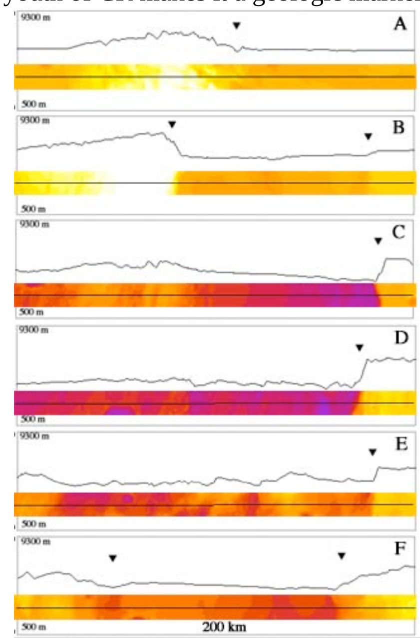

Fig. 2. MOLA profiles (cf. Fig. 1) across Claritas Fossae and Claritas Rupes –related graben (arrows).

Lava plains cover most of the Tharsis' slope leaving only the highest uplands to peak out [cf. 8]. These uplands (Figs.1,3,4) provide clues to the Claritas paleostuctures by revealing sets of old troughs. Many original grabens have later been occupied by lava flows or served as fluvial or glacial channels, and later cut by younger CF faults. Five main phases were identified [cf. 8; Figs. 1, 3,4]: The old uplands (a) were cut by old CF grabens (b), which provided channels for glacial(?) flows (c) which opened and smoothened the grabens, and for water (d) which resulted in sinuous channels. The lowest reaches of the basin were covered by the paleolake sediments (e). Finally, the area was cut by the youngest CF/CR faults (f) in places.

Claritas Paleolake and Channel. In the southern CF area, the rugged ancient uplands enclose a topographic depression which has been studied using several Mars Express HRSC data sets (Figs. 4,5,6). High elevations accumulated water on their tops, most probably in the form of snow or ice. They also served as temporary water sources. The basin was a sink for water flowing from the near-by uplands[cf. 8,9]. After the paleolake reached the level of the lowest barrier valley floor it broke through the lowest

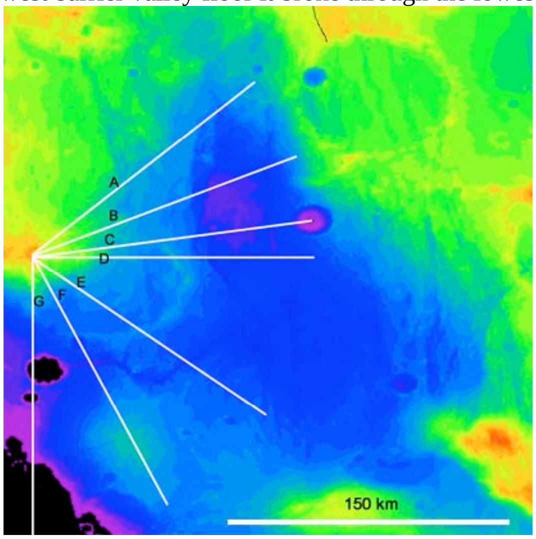

Fig. 3. MOLA topography over the Claritas paleolake.

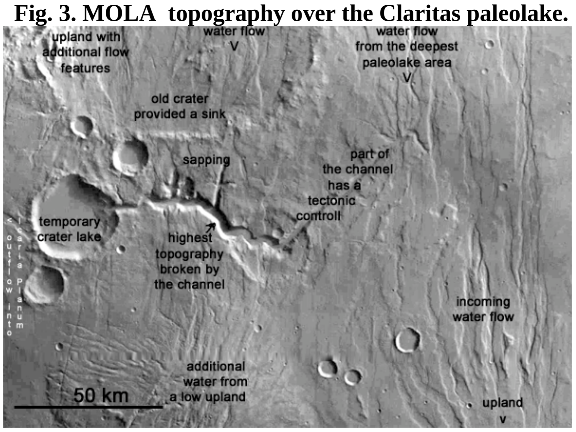

Fig. 4. The HRSC red image of the channel (centre) which broke the paleolake (right) rim through a saddle valley via an impact crater into Icaria Planum (left). Sapping added water from a larger crater (top).

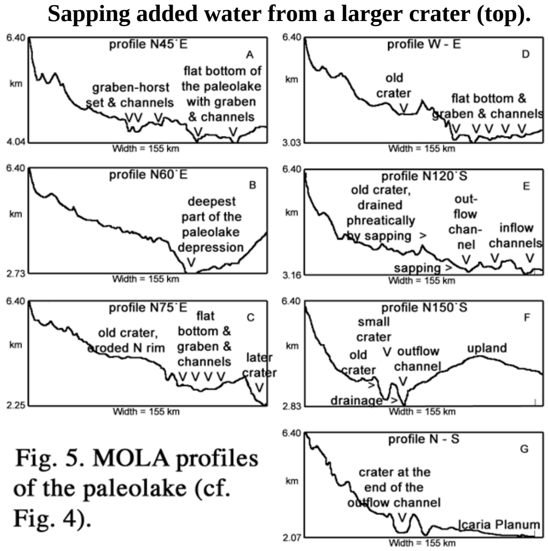

Fig. 5. MOLA profiles of the paleolake (cf. Fig. 4).

western saddle valley and formed a channel. Water was led into an impact crater and further into the lowlands of Icaria Planum (Fig. 6).

Additional sapping channels connect into the channel from north. This, together with on-surface channels, indicates previous (ground)water supply at first into - and then from - the direction of the older impact crater locating on the northern side of the saddle valley midway from it and the local topography high. The water emerged into the surface on the crater's outer rim slope (Figs. 3,5). Sapping resulted in abrupt canyon heads with close relationship to faults (Fig.4).

The main channel, together with the sapping valleys, is deeply carved into the surface with steep sidewalls. Within the basin, the main channel is straight as controlled by a fault. The rest of the channel is eroded into permeable and fractured breccia regolith.

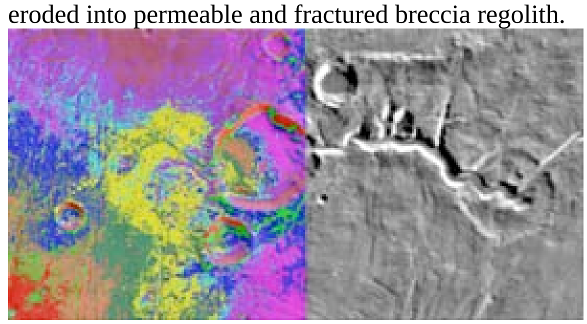

Fig. 6. The temporary impact crater lake (centre) has a delta at the channel mouth. The floor is lower than the channel neck out of the crater. The flow and alluvial fan units in Icaria Planum (left) are visible in the MEX-HRSC color data classification.

Conclusion. The MEX-HRSC data give a versatile insight into the Martian paleolake systems [8,9]. Areothermal heat [6,7] was probably not the only reason for the Claritas paleolake and channel formation because volcanism does not explain the original volatile accumulation. An evident reason for the volatile distribution on the peaks and subsequent melting may be found in frequent Martian climate variations due to changes in the orbital and rotational parameters of Mars [10,11].

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