MARTIAN CHANNELS AND THEIR GEOMORPHOLOGIC DEVELOPMENT AS REVEALED BY MOLA. J.K.Lanz, R.Hebenstreit, R.Jaumann, *German Aerospace Institut (DLR), Rutherfordstrasse 2, 12489 Berlin, Germany*.

One of the most striking features of Mars are enormous channels and channel systems that shape its surface. Outflow channels more than 2000 km long and several 100 km wide reveal a vast amount of erosional landforms resembling terrestrial flood features. Runoff channels with dendritic networks and fretted channels with features resembling terrestrial rock glaciers show the variety of processes that shaped the landscape. Newly released MOLA tracks give a detailed insight in the development of the shape of cross sections along those Martian channels. We have studied numerous such cross sections (sometimes more than 100 per channel!) looking for the processes involved in the evolution of the channels.

The MOLA data also allowed the generation of longitudinal profiles, by extracting the deepest points of all cross sections as given by the MOLA tracks.

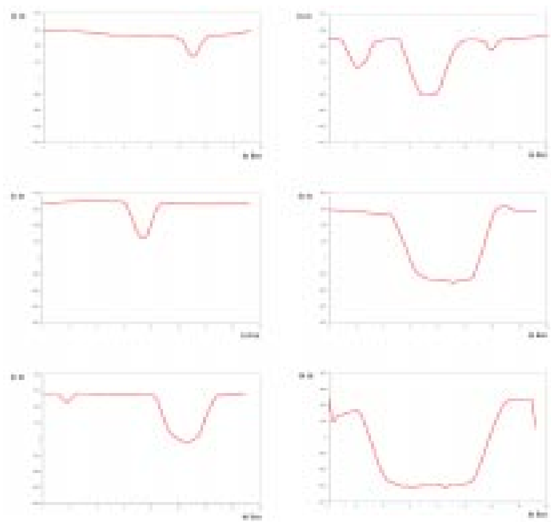

fig.1: Sample cross sections of Nirgal Vallis (top left: channel head, bottom right: end of the channel)

Cross sections of **runoff channels** (e.g. Nirgal Vallis) showed a striking similarity with terrestrial channel networks that were formed by sapping. They are U-shaped in the upper parts of the channels and box-shaped in the lower parts. They generally increase in width and depth downstream but often stagnate over long distances. No inner channels were found, possibly because of the limited vertical resolution of the MOLA tracks.

The longitudinal profile of Nirgal Vallis shows a continuous downstream slope as one would expect from a channel formed by sapping as well as by surface runoff. These observations currently are compared with MOLA tracks of the more dendritic type of runoff channels hoping to find similarities or differences that might reveal more about the evolution of those channels and the processes involved.

Outflow channels show a more irregular developement. Up to now we have concentrated our studies on clearly defined channels such as Shalbatana or Kasei Vallis in the circum Chryse region. Cross sections of Shalbatana Vallis for example (see fig.2) reveal a discontinuity in width and depth. Depth decreases dowstream by more than 1500 m while width changes irregularly.

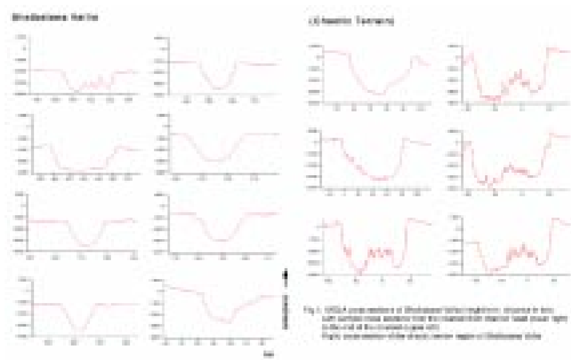

fig.2: Shalbatana Vallis cross sections

The decrease in depth is not gradual. About 100 km from the channel head (chaotic terrain) there is a sharp change in depth from 3500 m to 2500 m. The longitudinal profile of Shalbatana Vallis shows that on the first 100 km the channel floor ascends by 1000 m (see fig.3). The gradient of the surrounding terrain decreases gradually towards Chryse Planitia.

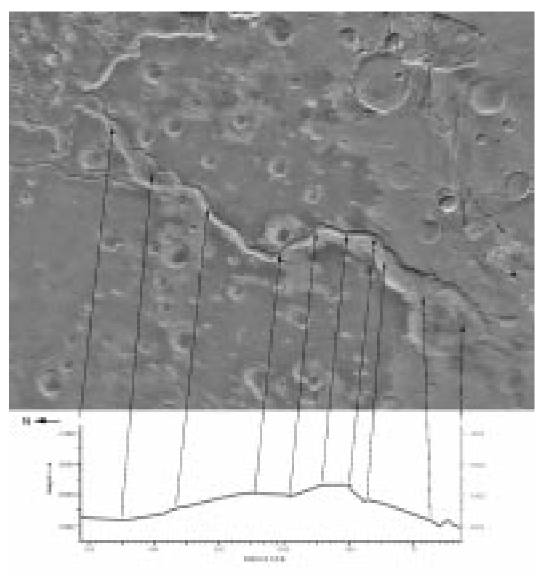

fig.3: Longitudinal profile of Shalbatana Vallis; note the strong ascend by 1000 m on the first 100 km

Tectonic processes therefore do not seem to be responsible for the discontinuity in the longitudinal profile. Emptying of the reservoir below the chaotic terrain and a resulting collaps of the whole structure might have led to the observed discontinuity. It is also imaginable that water (covered with ice?) filled the depression until it reached the appropriate level, eventually flowing out towards Chryse Planitia following the given gradient and eroding Shalbatana Vallis.

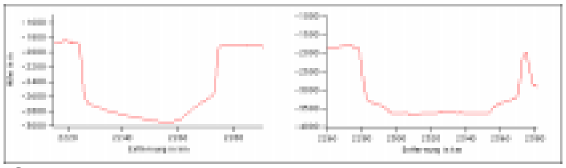

fig.4: Typical cross sections of a fretted channel; debris aprons can be seen to merge at the channel floor (left)

Fretted channels revealed a rather unique appearance dominated by box-shaped valleys with long debris aprons at the bases of most of the steep slopes which not allways could be recognized on high resolution imagery. Opposing debris aprons could often be seen to merge at the channel floor which leads to the characteristic shape of the MOLA profiles (see fig.4).

A longitudinal profile along a fretted channel (38° N, 342° W) showed many irregularities without any continuity in the slope direction.

As more MOC images are released we will try to include those in the interpretation. Up to now high resolution imagery for the channels are still sparse (one MOC-image for Shalbatana Vallis, two MOC-images for Nirgal Vallis, none for the fretted channels so far worked on) and the answers they reveal are rather limited. High resolution stereo data, as those which will be taken by the european Mars Express Mission in 2003, will contribute greatly to the interpretation of the processes involved in the evolution of the martian channels.

References:

[2]Carr M.H. (1981) The Surface of Mars, 232p.

[1]Leopold L.B. et al. (1992) Fluvial Processes in Geomorphology, 522p.