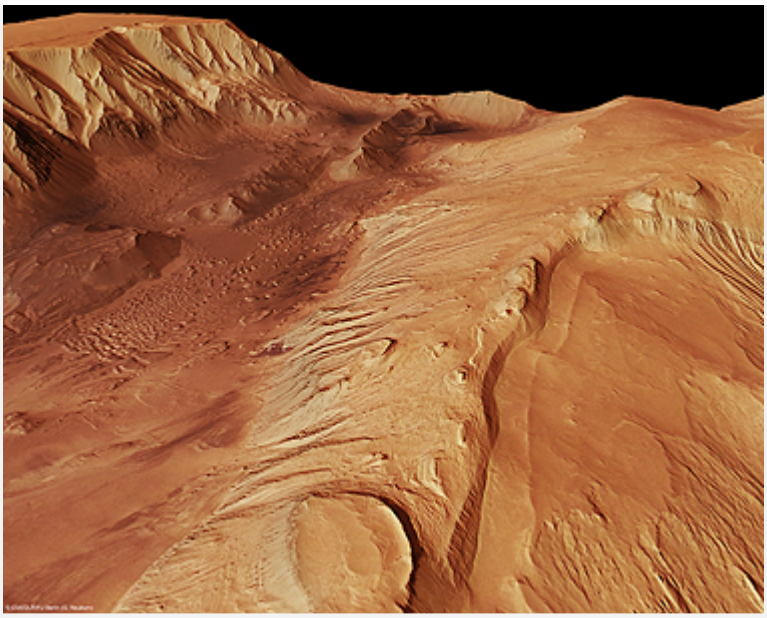
News Archive 2008

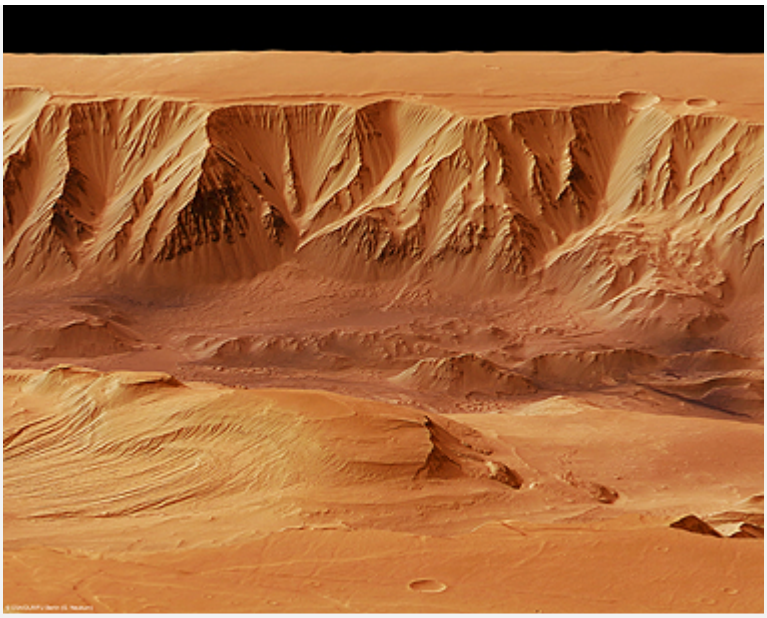
The Deep Gorges of Candor Chasma

15 February 2008

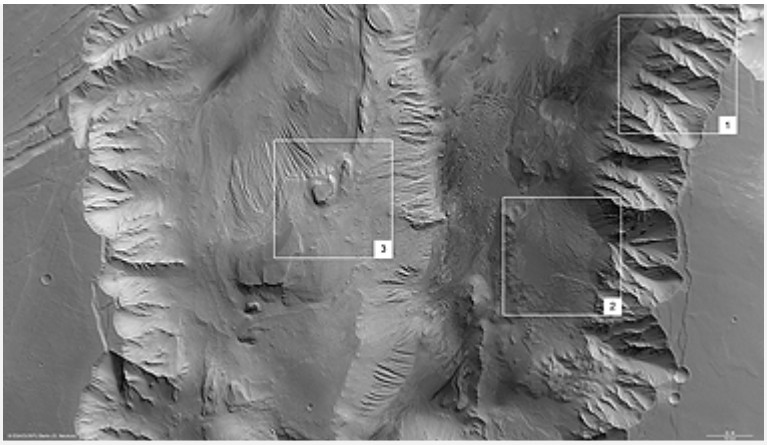


Layered geological formations in Candor Chasma

On 6 July 2006, the HRSC (High Resolution Stereo Camera) on board the ESA space probe Mars Express, operated by DLR (the German Aerospace Center), took images of Candor Chasma, a lateral valley that runs parallel to the northern part of the Valles Marineris, a 3000-kilometre-long canyon system on Mars. Candor Chasma's steep cliffs are characterised by protruding rocks, reaching down as far as eight and a half thousand metres. The images obtained have a resolution of 20 metres per pixel and were taken on orbit 3195, depicting a section of the planet located at 6 degrees south and 290 degrees east.



Cliffs of Candor Chasma - over eight kilometres in height



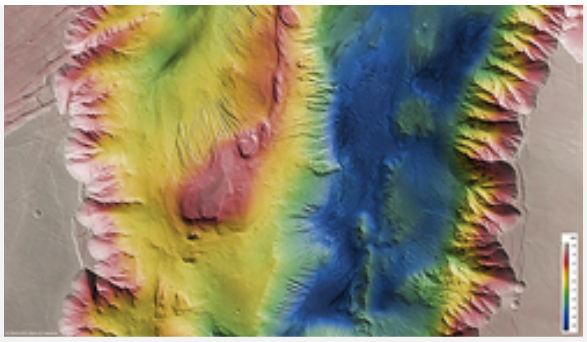
Part of the Candor Chasma gorge on Mars

Valles Marineris is an approximately 3000-km-long canyon system on Mars that surrounds the high plains of Tharsis. Candor Chasma, situated in northern Valles Marineris, is part of a radial graben system. A graben is a feature bound by parallel normal faults, where the graben floor moves downward relative to the adjoining material. The grabens in the area were created radially, as the Tharsis bulge formed due to volcanic uplift.

Bird’s eye view of a segment of Candor Chasma in colour

The steep walls of the graben rise to a height of 8500 m above the floor. They are characterised by remnant rock (small veins of rock branching from the main material) and branching gullies.

They can be recognised using the colour-coded topographic map created with the help of the Digital Terrain Model (DTM), which is based on the stereo images obtained from the HRSC. These terrain models give us a three dimensional view of the surface of Mars, including its many gorges, valleys, mountain ranges and volcanoes. Rugged and unevenly weathered rocks can be observed at the sides of the top segment.



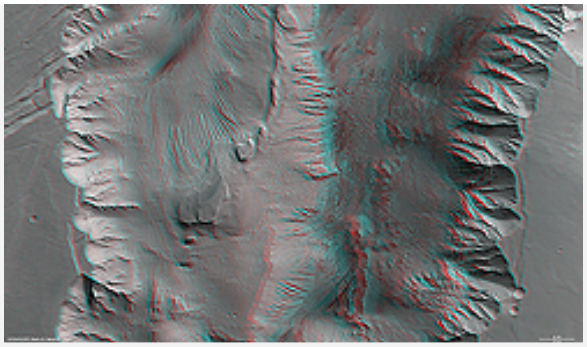
Topographic map of a segment of Candor Chasma

The upper part shows rugged, irregular material and appears to be a remnant of the older, basaltic plateau. In contrast, the lower part is smoother and is made up of run-off rock debris and material from larger landslides that formed a slope.

The graben floor shows flat-topped, hilly deposits which rise up to 1200 m. The deposits show characteristic layering which is known as "Interior Layered Deposits".

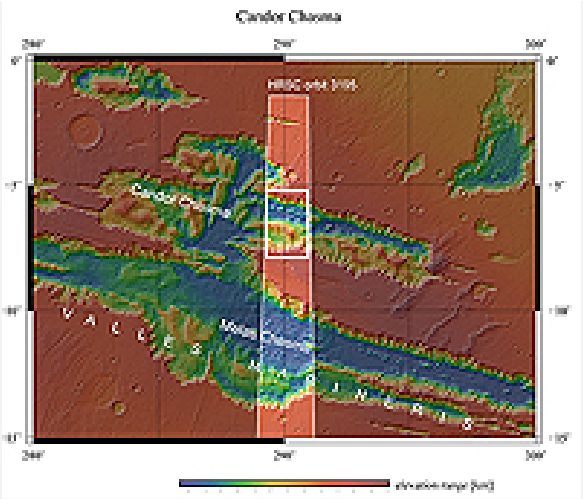
The OMEGA spectrometer on board Mars Express has identified compounds such as calcium sulphate and kieserite in these layers, minerals which are usually created in water. It is therefore probable that water played an important role in the development of these layered deposits.

This interesting geological area has been cited as a possible landing site for the future American Mars Science Laboratory for this reason.



Anaglyph image of a segment of Candor Chasma

There are different theories explaining how Candor Chasma came to its present form. One of these states that the volcanism in the Tharsis region uplifted the entire area.

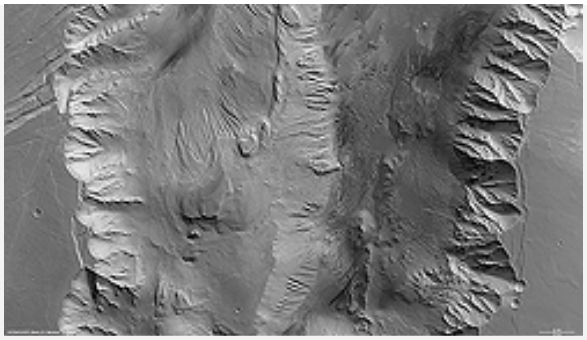


Candor Chasma context map

In the course of the uplift, a lot of stresses were exerted on the crust causing it to thin out and form large grabens. Such a natural process, where stresses exerted in opposite directions deform the rocky material, is called extensional tectonics.

The colour scenes have been derived from the three HRSC-colour channels and the nadir channel. The perspective views have been calculated from the digital terrain model derived from the stereo channels.

The anaglyph image was calculated from the nadir and one stereo channel stereoscopic glasses are required to view it. The black and white high-resolution images were derived from the nadir channel which provides the highest detail of all channels.



Bird’s eye view of a segment of Candor Chasma in black and white

The High Resolution Stereo Camera (HRSC) experiment on the ESA Mars Express Mission is led by the Principal Investigator (PI) Prof. Dr Gerhard Neukum who also designed the camera technically.

The science team for the experiment consists of 45 Co-Investigators from 32 institutions and 10 nations. The camera was developed at the German Aerospace Center (DLR) under the leadership of the PI G. Neukum and built in cooperation with industrial partners (EADS Astrium, Lewicki Microelectronic GmbH and Jena-Optronik GmbH). The experiment on Mars Express is operated by the DLR Institute of Planetary Research, through ESA/ESOC. The systematic processing of the HRSC image data is carried out at DLR.

The scenes shown here were processed by the PI-group at the Institute for Geosciences of the Freie Universitaet Berlin in cooperation with the German Aerospace Center (DLR), Institute of Planetary Research, Berlin.

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