

VALLES

VALLES MARINERIS

Colour 3D View



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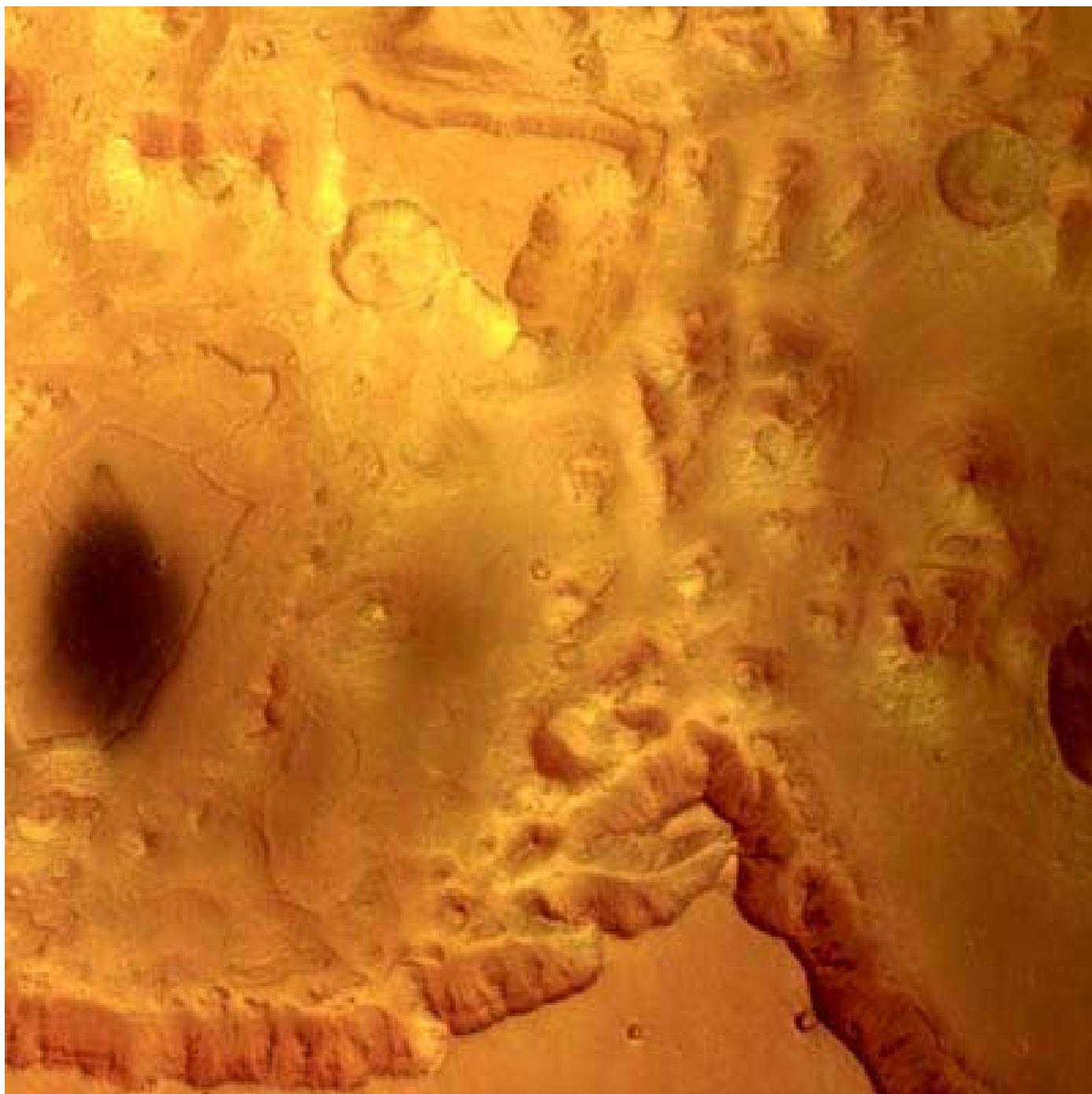
Picture taken on: 14th January 2004, during the 18th orbit around MARS.

Localisation: South of “VALLES MARINERIS” – latitude 15° South – longitude 323° East.

This colour image, in « 3 D », was taken from the vertical, the North being on the top of the image. The surface covered is a square of 50 km per side, representing an area of 2 500 km².

It shows a tectonically controlled karst-like structure.

Colour 3D View



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Picture taken on: 14th January 2004, during the 18th orbit around MARS.

Localisation: South of « VALLES MARINERIS » - latitude 5° North – longitude 323° East.

This colour image, in « 3 D », was taken from the vertical, the North being on the top of the image. The surface covered is a square of 50 km per side, representing an area of 2 500 km².

It shows mesas and cliffs as well as flow features which indicate erosion by the action of flowing water.

COPRATES CATENA - « collapsed » structures

Colour View



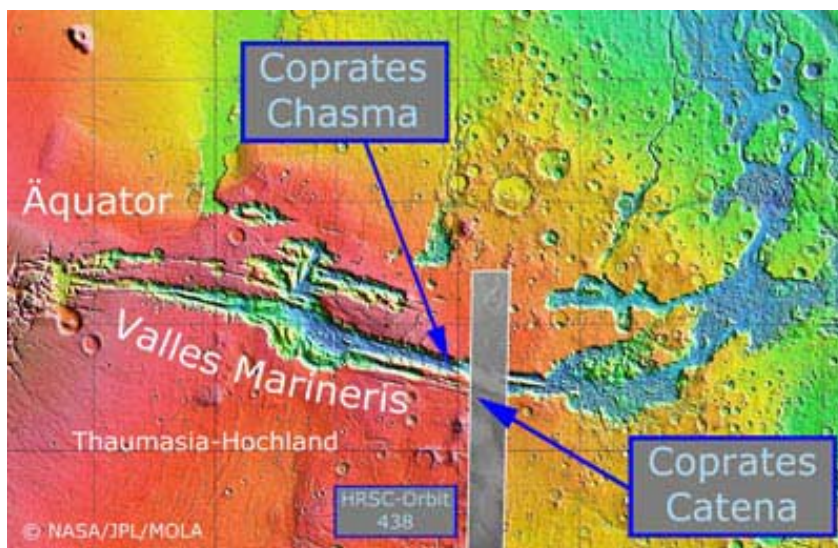
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These images show the detailed structure (organisation of the geological layers) of COPRATES CATENA, a southern part of the VALLES MARINERIS canyon system on Mars (see the map below).

The images were taken during orbit 438 with a ground resolution of approximately 43 metres per pixel. The displayed region covers an area centred at about latitude 14° South and longitude 301° East.

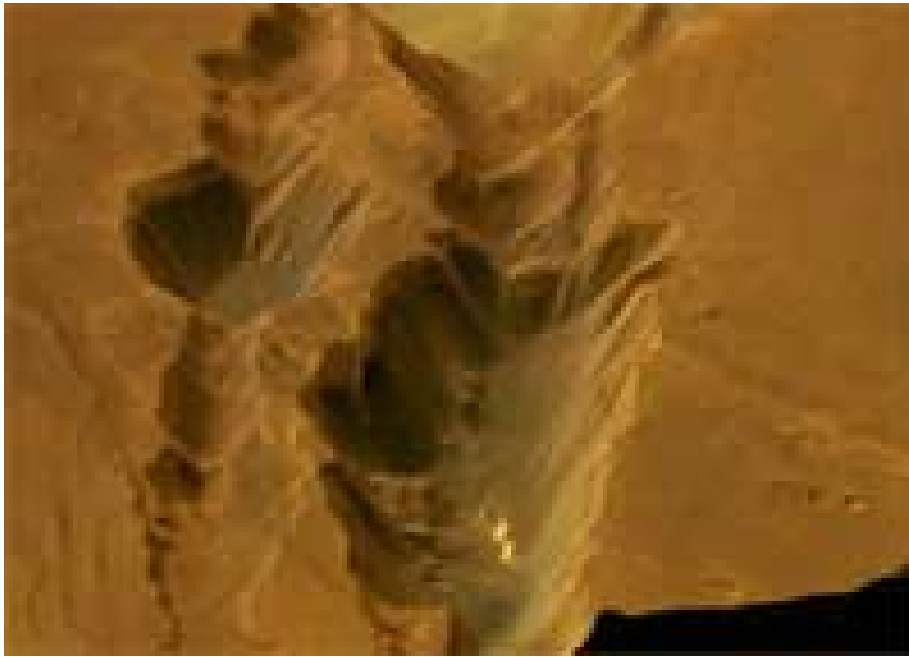
As shown by the arrow, North is towards the left of the image, therefore East is towards the top, West towards the bottom and South towards the right of the image.

Localisation



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Perspective View looking East



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COPRATES CATENA is a chain of collapsed structures (geological meaning), which run parallel to the main valley COPRATES CHASMA.

These collapsed structures vary between 2500 and 3000 metres deep, which is far less than the depth of the main valley at 8000 metres. A few landslides can be seen on the valley walls.

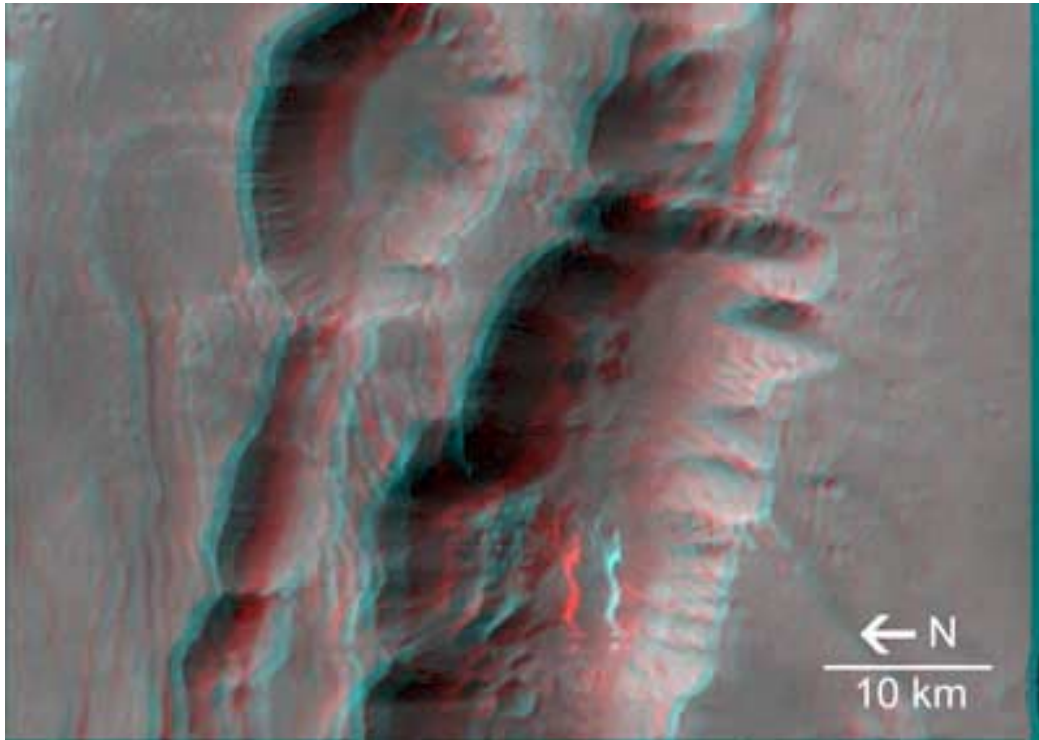
The valley chains have no connection to the lowland plains as compared to the main valleys. This indicates that their origin is solely due to the expansion of the surface, or collapse, with removal of underlying material (possibly water or ice).

Perspective View looking West



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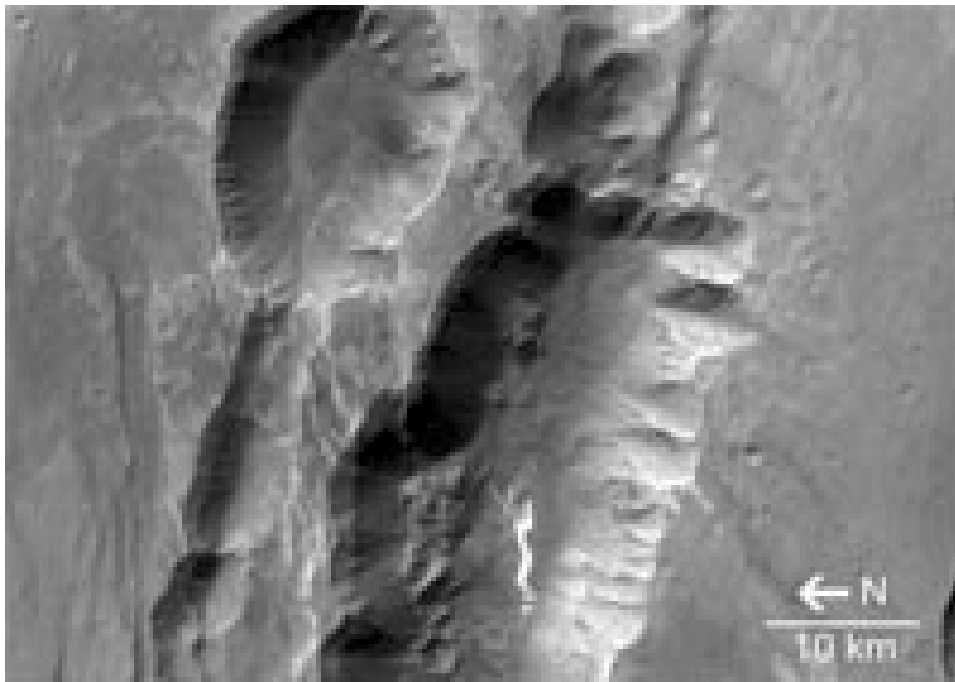
“3D” Anaglyph Image



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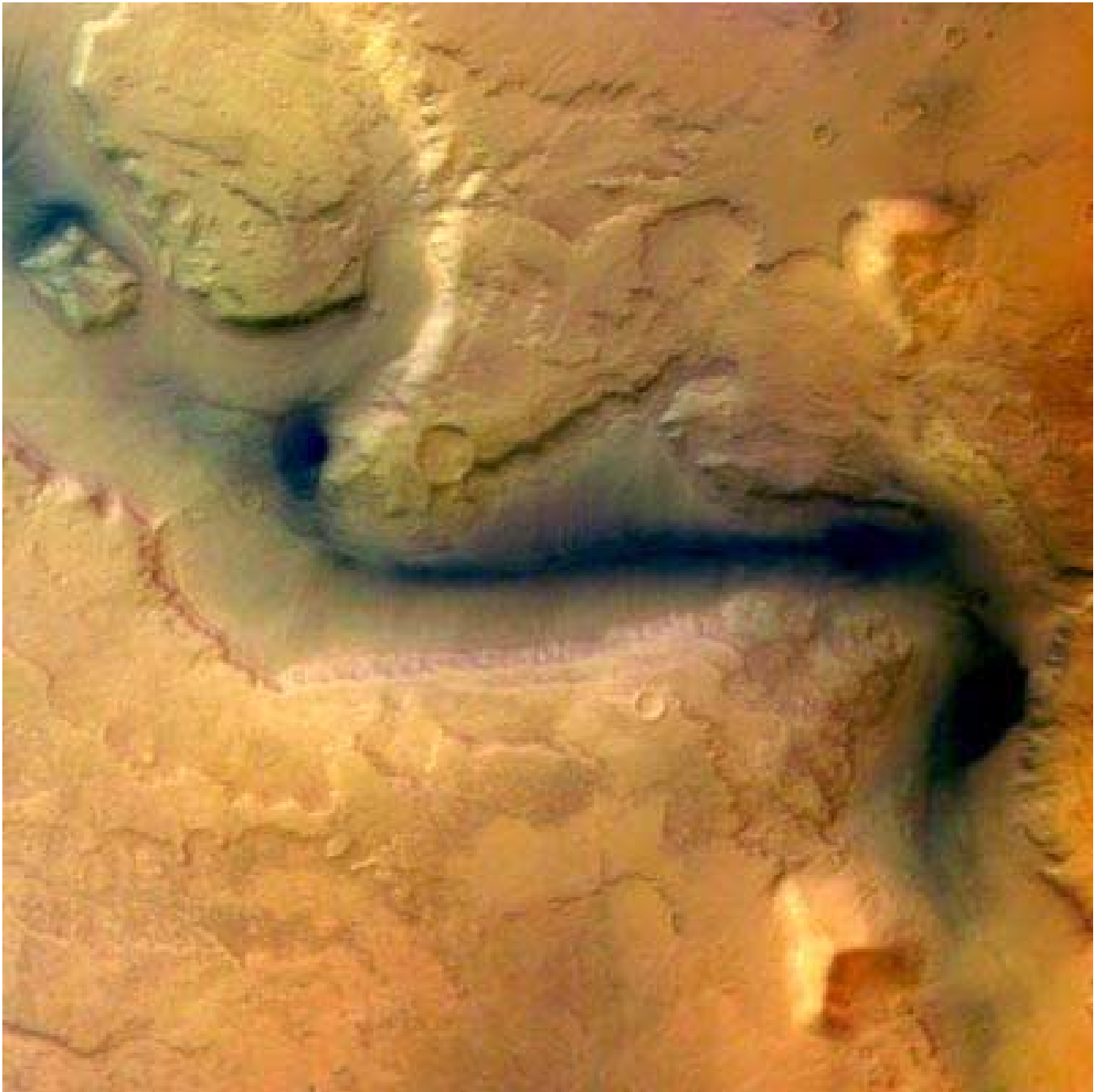
On the valley floor, brighter layers are exposed, which could be material of the same composition as seen in other parts of VALLES MARINERIS, where sulphates have been measured by the OMEGA spectrometer instrument on board Mars Express.

Black & White View



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REULL VALLIS



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Picture taken: on 15th January 2004, during the 18th Martian orbit.

Localisation : East of « HELLAS BASIN » - latitude : 41° South - longitude : 101° East.

This colour image, in « 3 D », was taken from the vertical, the North being on the top of the image. The surface covered is a square of 100 km per side, representing an area of 10 000 km².

It shows a channel, « REULL VALLIS », which was formed by once-flowing water.

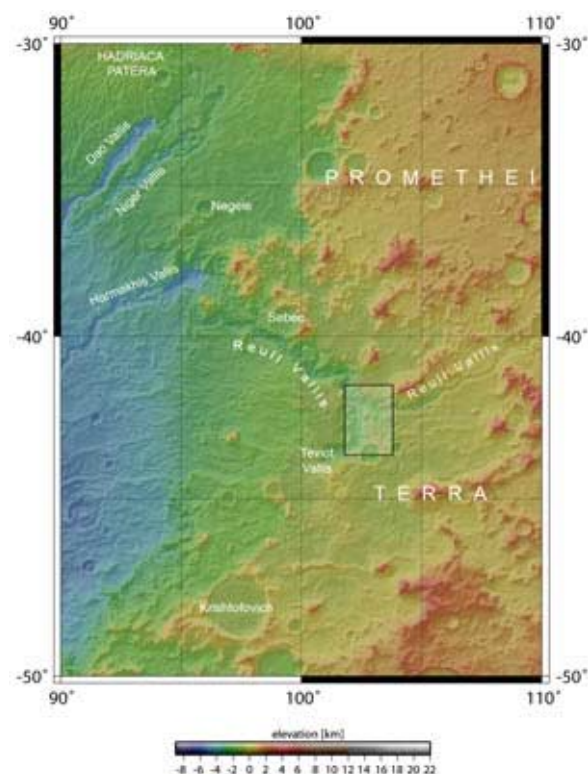
REULL VALLIS - Channels

Perspective View looking South - East



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Localisation



These images, taken by the Mars Express spacecraft, show a region of Reull Vallis in the southern hemisphere of Mars.

The images show an area located at about latitude 42° South and longitude 102° East. The image was taken with a ground resolution of about 21 metres per pixel during Mars Express orbit 451 in May 2004.

On the images, North is towards the left.

REULL VALLIS is an outflow channel that extends 1500 kilometres across PROMETHEI TERRA in the direction of HELLAS BASIN. It is approximately 20 kilometres wide and has cut into the surrounding plain to a depth of 1800 metres. It is the major outflow channel in the region and exhibits a high degree of surface modification, suggesting a complex evolution.

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Colour View

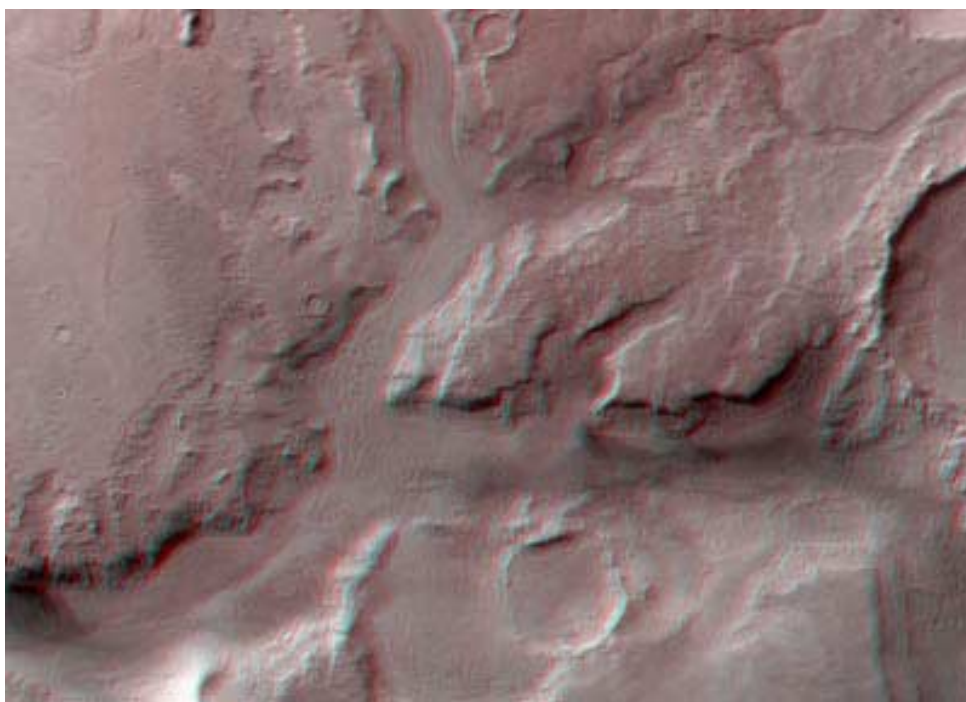


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In these images, REULL VALLIS extends from the east (top of the image) to the north-west (lower left corner) and is connected to a tributary in the south (Teviot Vallis). Distinct parallel structures (geological meaning) are visible in the channels, possibly caused by glacial flow of loose debris mixed with ice. Small depressions, located on the flow features, are probably caused by the sublimation of ice.

Numerous impact craters, visible on the flanks of the valley, have been filled with material from these flows. Distinct flow features can be recognised within impact craters, for example, the 15-kilometre wide crater in the west (bottom) of the image.

“3D” anaglyph view



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There is a clear morphological distinction between the heavily eroded South-West and the plains of the North-East, which have experienced much less erosion. While most landforms throughout the image have a rounded, softened appearance, younger structures have a distinctly sharp and raised morphology.

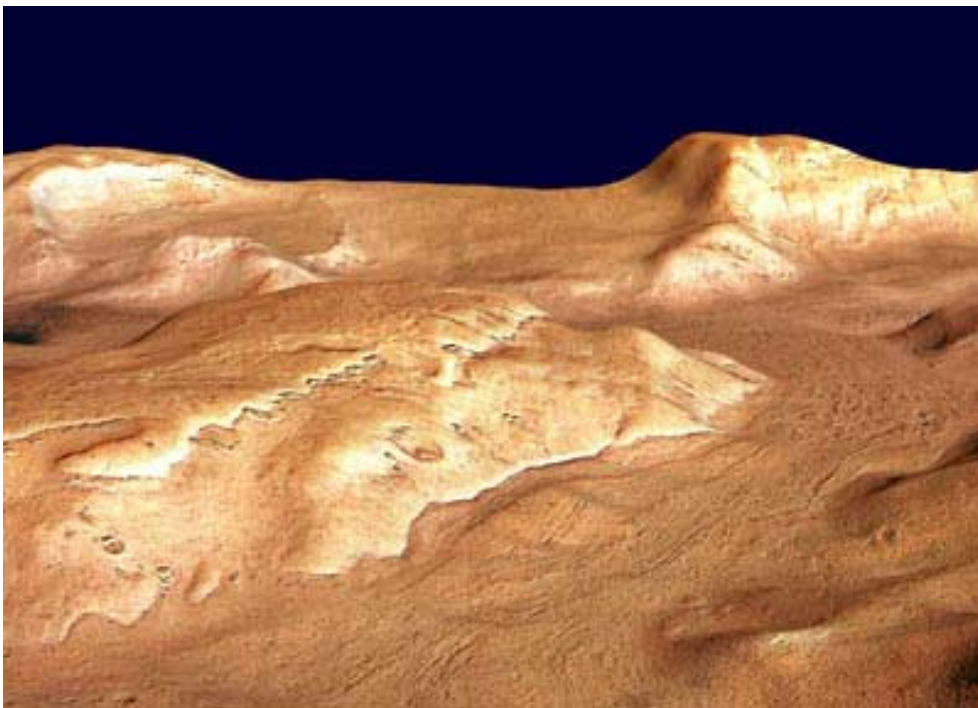
Detail in Black & White



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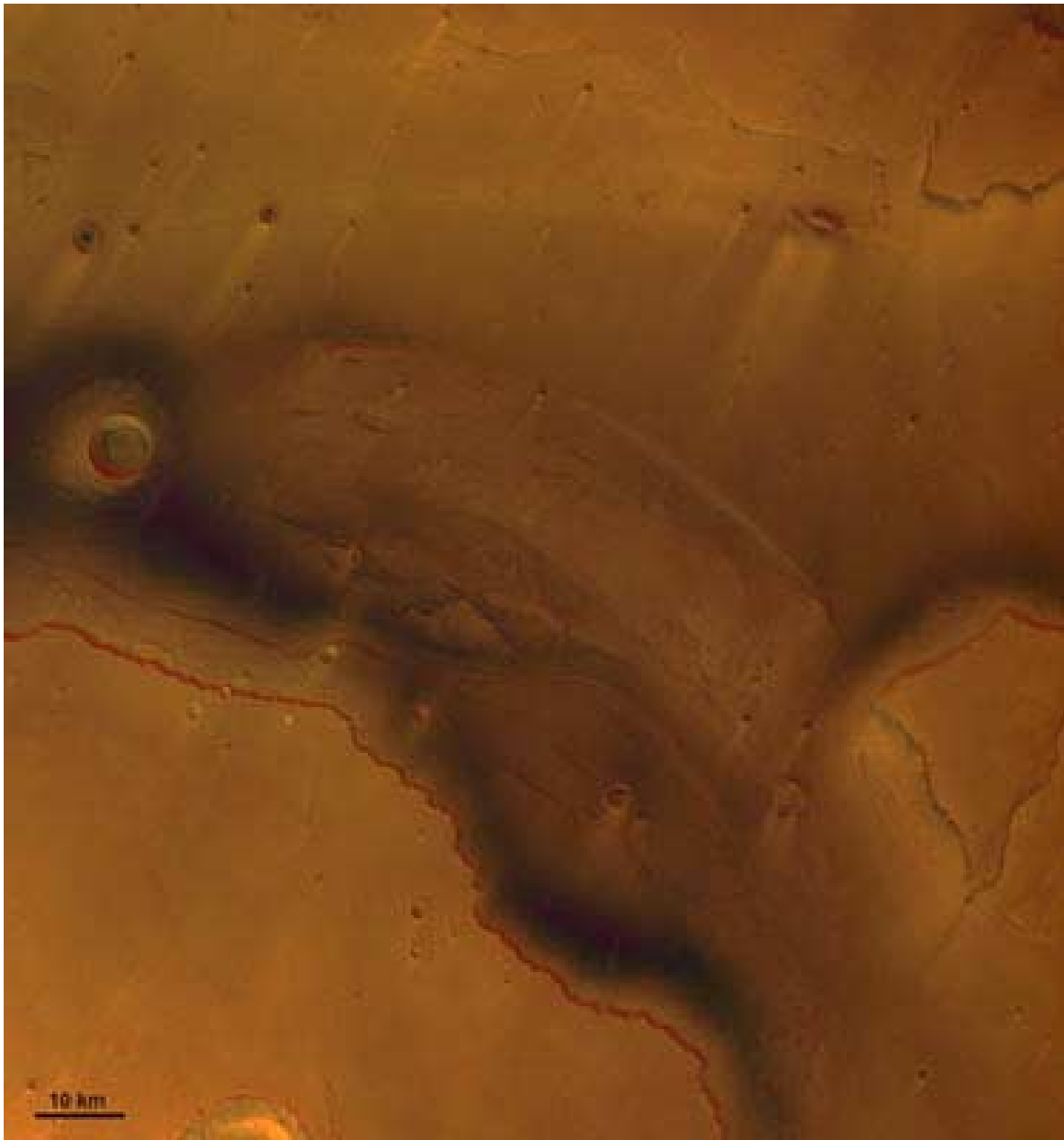
On the southern and western edges of the colour image, large impact craters are visible. Their diameters range from 15 to 35 kilometres. These craters have heavily eroded rims and are partly filled with material. Erosion has left distinct, branched gully systems at the edge of the large crater that is located on the southern edge of the image.

Perspective View Looking West



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KASEI VALLIS



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Image taken: on 18th February 2004, during the 61st Martian orbit.

Localisation: Latitude 29° 8 North – Longitude 309° East. The image width is 130 km.

This vertical view shows the mouth of « VALLIS KASEI », one of the largest outflow channels on Mars.

The part of the outflow channel seen in this image has most probably been carved by glaciers or gigantic water-related outflows known from terrestrial sub-glacial lakes. The blackish-blue colour is related to sediments. The bright streaks oriented NE-SW are related to wind forces.

This image shows various details which give an insight into the erosional history of the outflow channel. The image also illustrates how difficult it is to achieve near-true colour in images of Mars when atmospheric dust and haze have a major disturbing influence on the scene.

LOUROS VALLES, South of « IUS CHASMAS »

Colour Image



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These images show a system of sapping channels, called Louros Valles (named in 1982 after river in Greece), south of the Ius Chasma canyon which runs east to west on Mars.

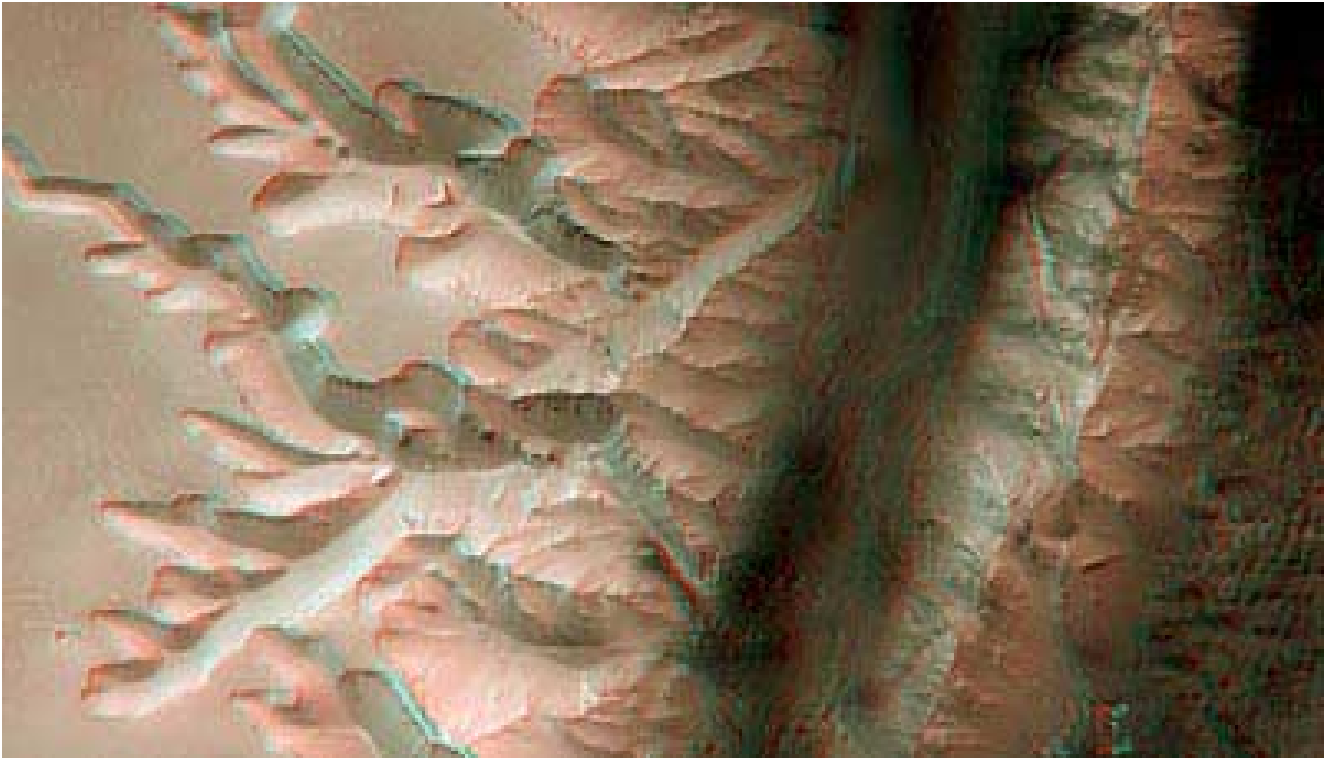
These images were taken by the High Resolution Stereo Camera (HRSC) on board ESA's Mars Express during orbit 97 from an altitude of 269 kilometres on 8th April 2004. The images have a resolution of about 13 metres per pixel and are centred at 278.8° East and 8.3° South. North is at the right.

The Ius Chasma belongs to the giant Valles Marineris canyon system on Mars. The Geryon Montes, visible at the right of this image, is a mountain range, which divides the Ius Chasma into two parallel trenches. The dark deposits at the bottom of the Ius Chasma are possibly related to water and wind erosion.

'Sapping' is erosion by water that emerges from the ground as a spring or seeps from between layers of rock in a wall of a cliff, crater or other type of depression. The channel forms from water and debris running down the slope from the seepage area.

This is known from similar features on Earth, but on Mars it is thought that most of the water had probably either evaporated or frozen by the time it reached the bottom of the slope.

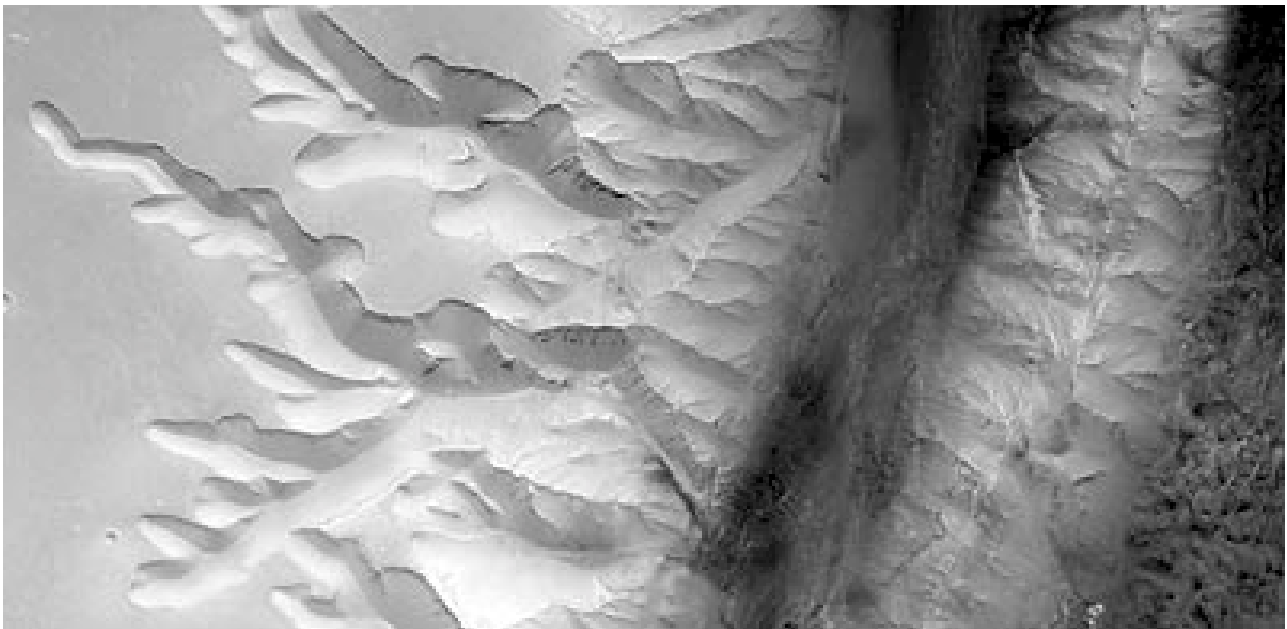
« 3 D » Anaglyph IMAGE (2 colours stereoscopic)



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North is on the right.

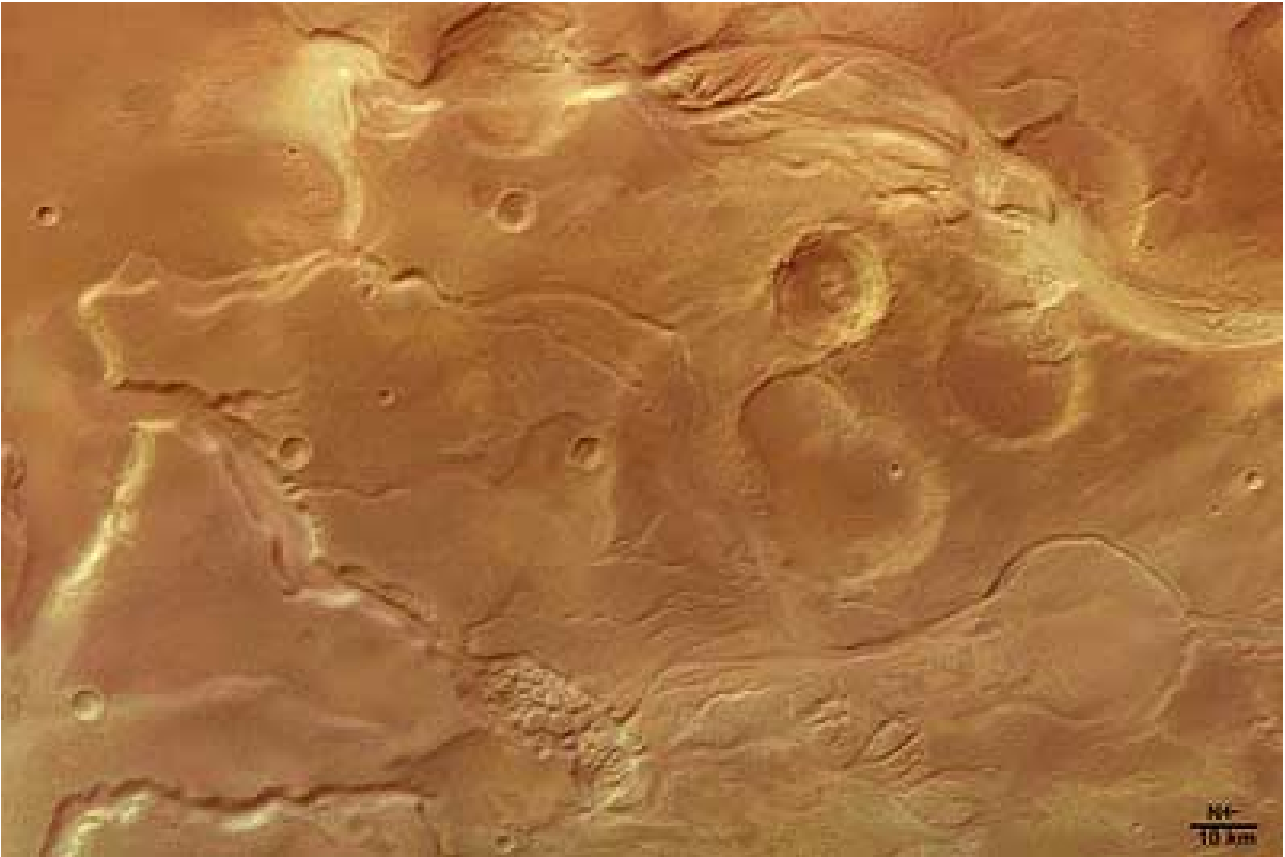
Black & White Image



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MANGALA VALLES - Evidence Of Flooding

Colour image



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The images were taken on 9th June 2004 during orbit 299 with a resolution of 28 metres per pixel. For practical use on the Internet, the images have been reduced in resolution.

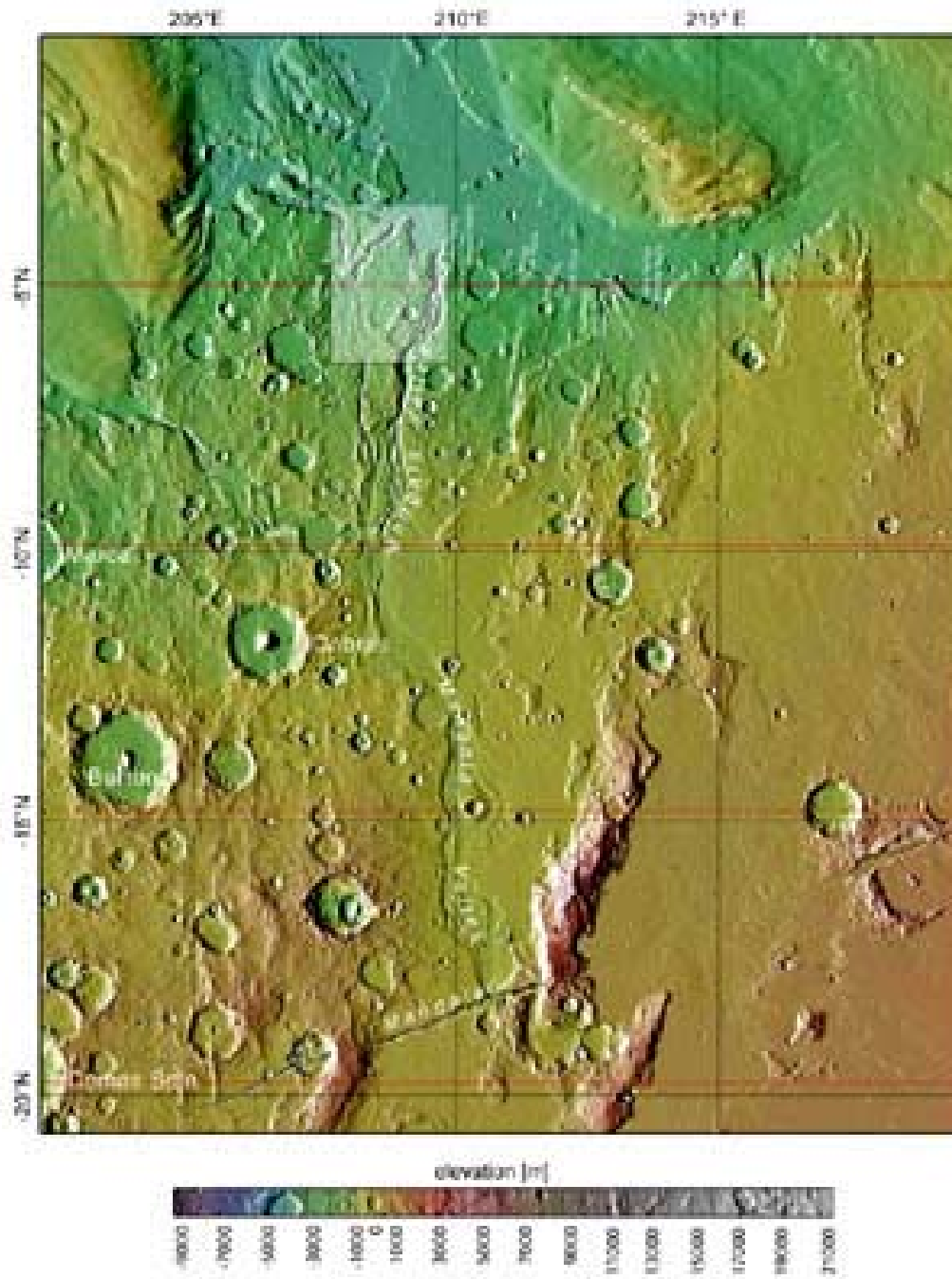
The HRSC has imaged structures several times which are related to fluvial events in the past on Mars. The region seen here is situated on the south-western Tharsis bulge and shows the mouth of the MANGALA VALLES and MINIO VALLIS outflow channels.

The source of the outflow channel is related to the MANGALA FOSSA, a fissure running East-West for several hundred kilometres.

One theory about its formation is related to a process known on Earth as ‘dyke emplacement’. This is when hot molten rock finds its way to the surface through a fissure, releasing large amounts of water by the melting of subsurface ice.

It is still unclear for how long and to what extent water, mud or even ice masses and wind have carved the channel here.

Localisation

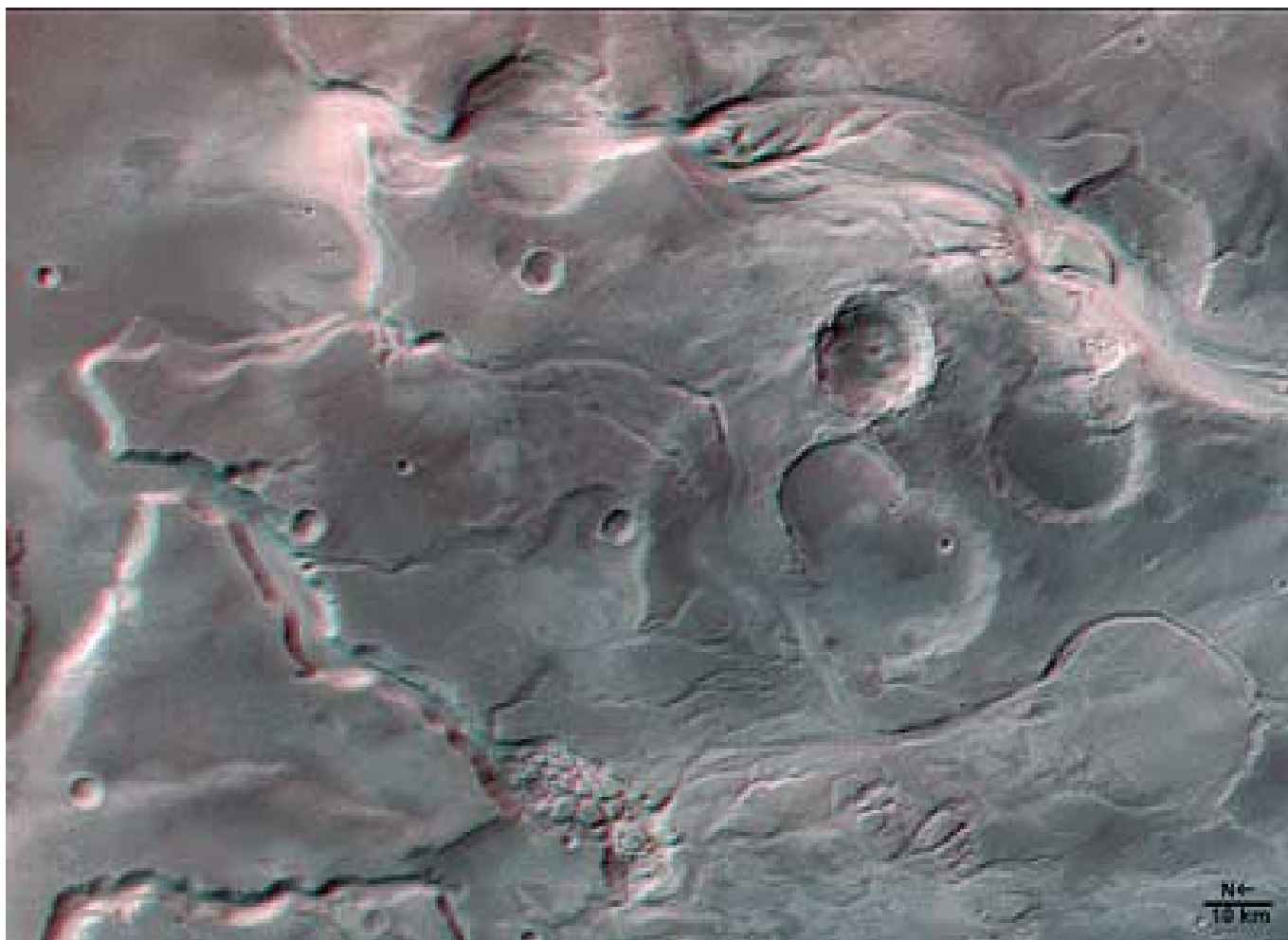


As one can see on the map above (light green rectangle in the top left quarter), the image centre is located at 209° E longitude and 5° S latitude.

The figures on the X-axis (top of the map) show the longitude, those on the Y-axis, on the left of the map, show the latitude.

The small coloured rectangle (ranging from purple to grey), under the map, shows the legend for the altitude. It reads from left to right: **Dark purple** = - 9 000 m (below sea level). **Sienna** = 0 m (sea level). **Light grey** = + 21 000 m (above sea level).

« 3D » Image



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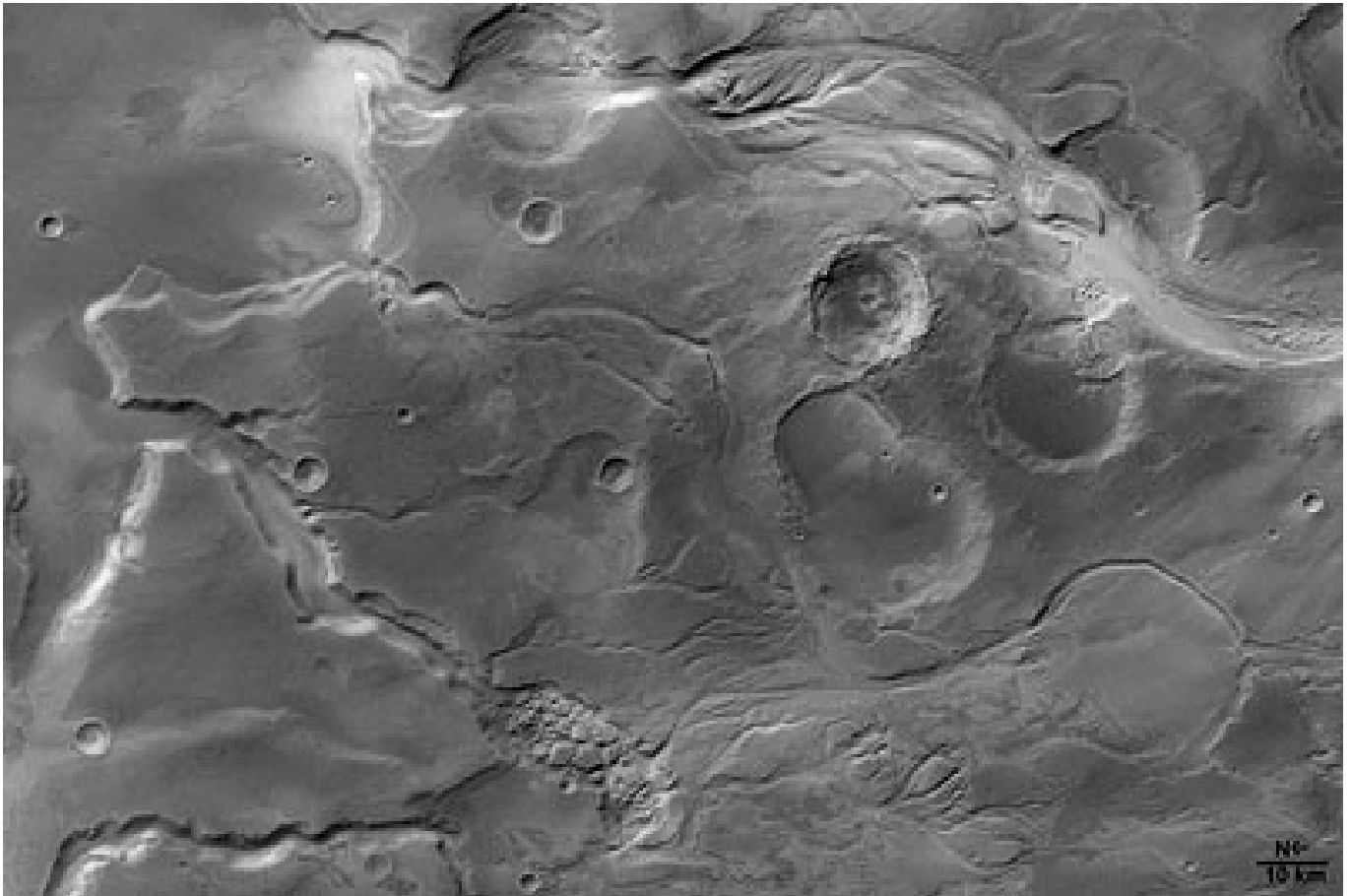
The theory on its formation has several analogues on Earth. Events like the one proposed for MANGALA VALLES occur on Earth, for example in Iceland, where volcanic activity causes episodic releases of water from subsurface reservoirs, causing catastrophic floods.

Along the channel troughs, areas with so-called ‘chaotic terrain’ features favour the idea of the existence of subsurface ice.

The small-scale chaotic terrain is characterised by isolated blocks of surface material, which have been randomly arranged during the release of subsurface water and subsequent collapse of the surface. Huge areas of chaotic terrain can be found near the source areas of the outflow channels around Chryse Planitia, such as Kasei, Maja and Ares Valles.

Beside the large outflow channels, a variety of smaller ‘dendritic’ valley networks with a number of tributary valleys can be seen near the main channels. This indicates possible precipitation.

Black & White Image



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Perspective View



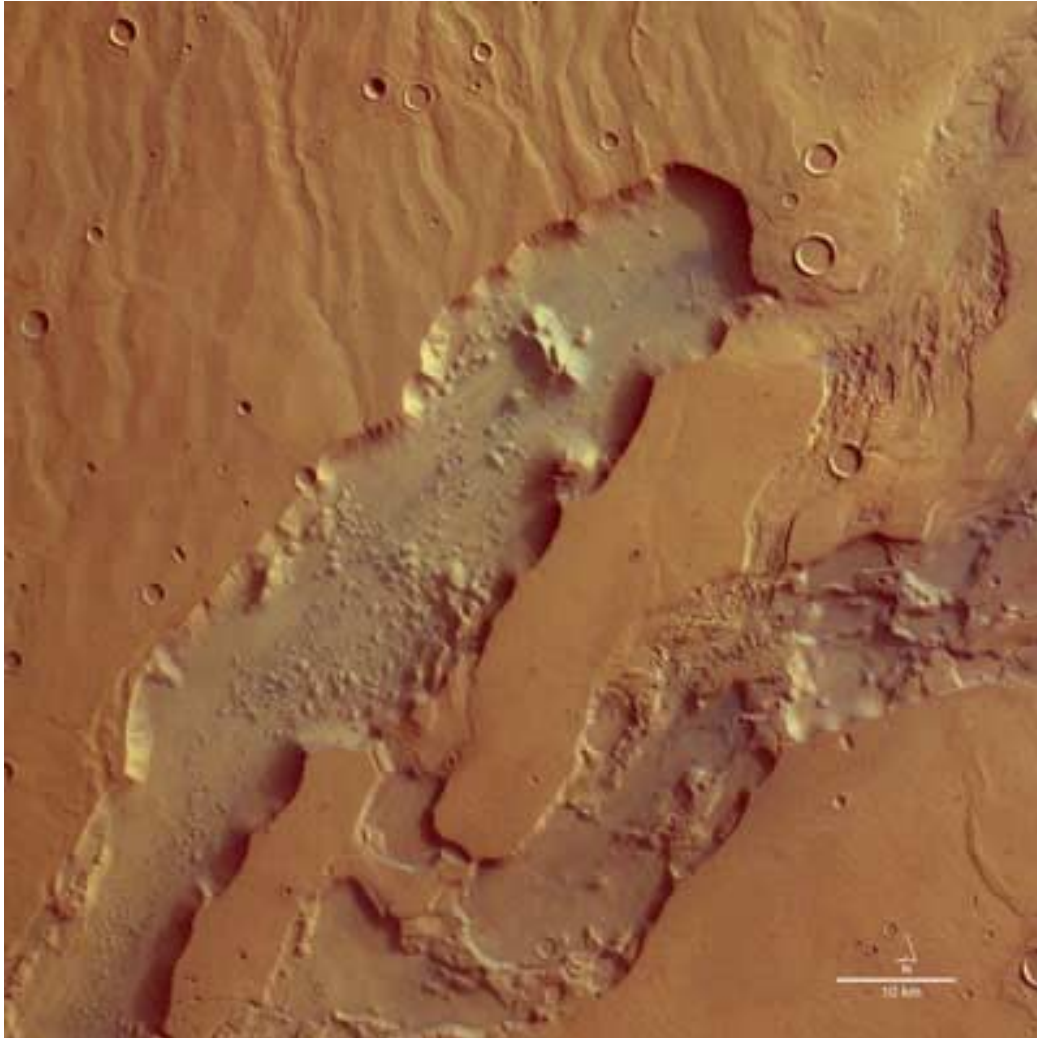
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This perspective view of MANGALA VALLES has been created from the digital model terrain obtained with colour and stereoscopic information of the raw image.

DAO and NIGER VALLES - Eroded Valleys

The images were taken during orbit 528 in June 2004, and show the DAO VALLES and NIGER VALLES areas (a system of outflow channels) at a point where the North-eastern HELLAS impact crater basin and the HESPERIA PLANUM volcanic region meet.

Colour Image

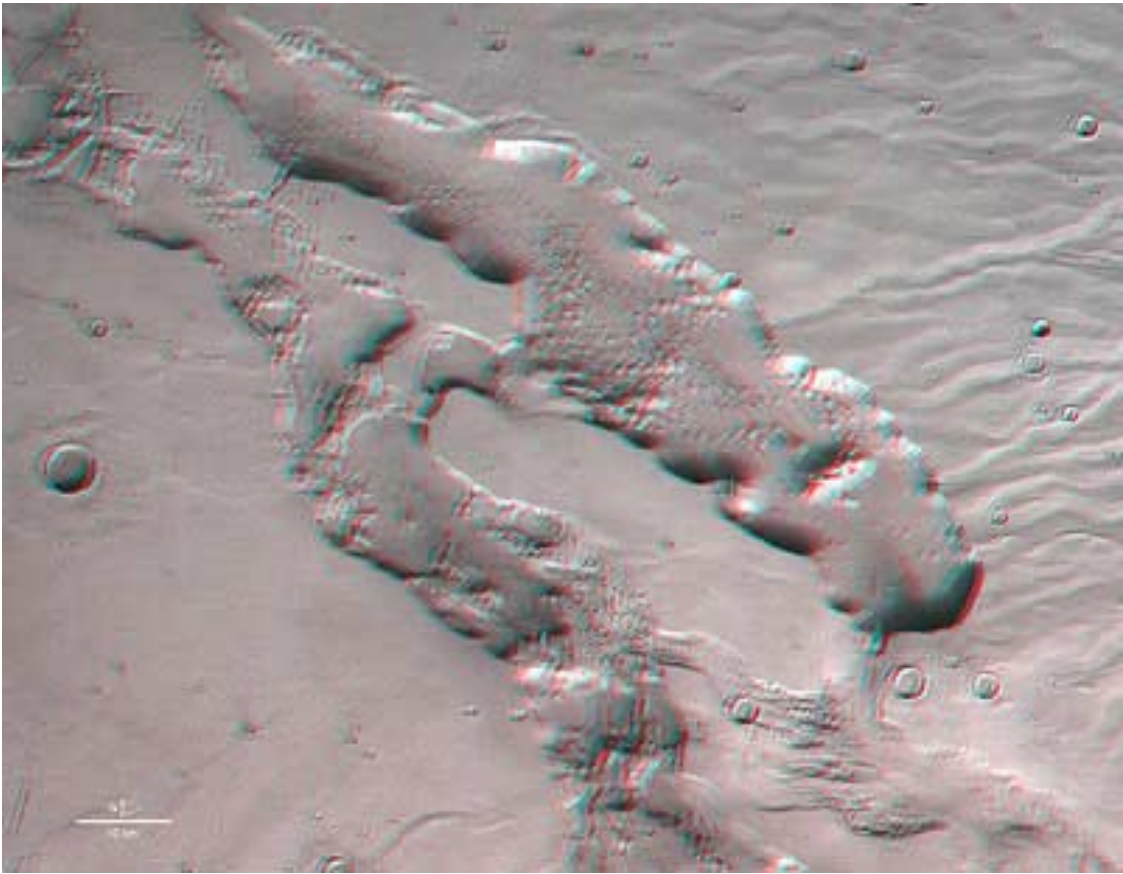


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Localisation: Latitude: 32° South – Longitude: 93° East. North is on the top of the image.

Resolution: 40 metres per pixel.

3D View (Anaglyph)



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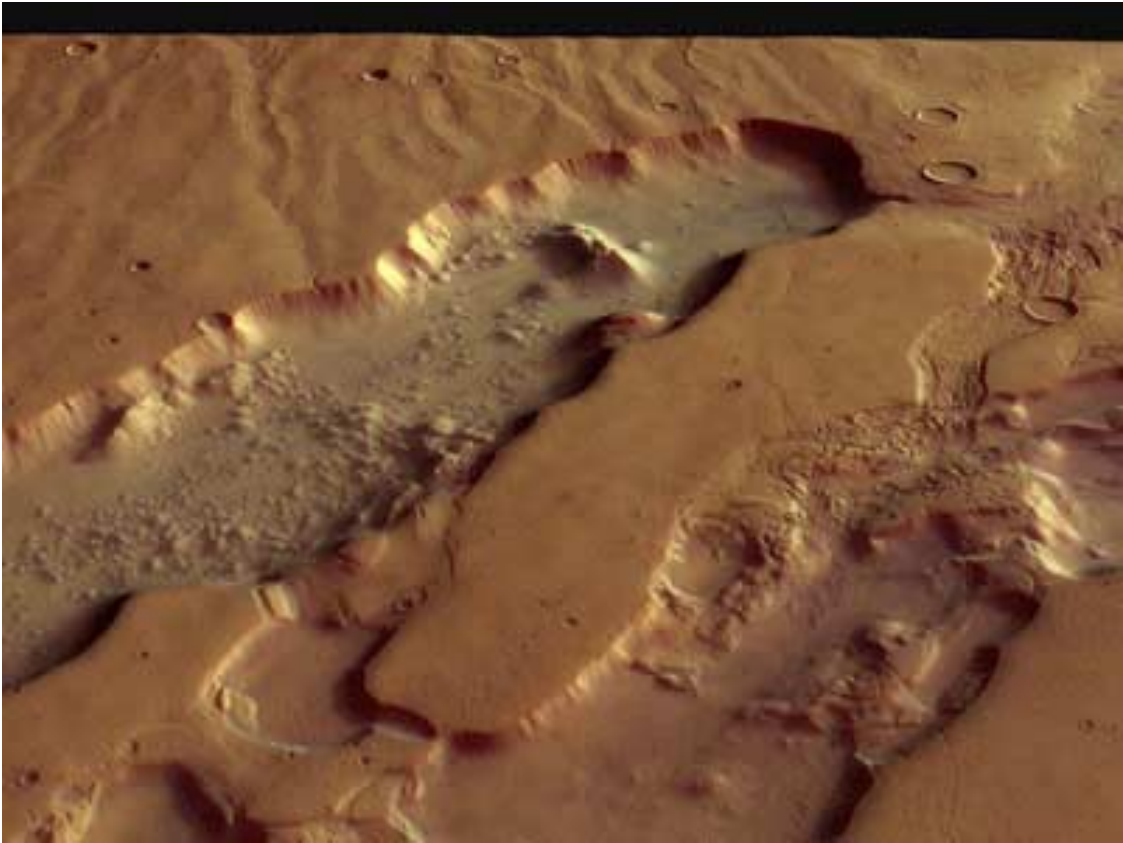
The outflow channel system is, in some areas, 40 kilometres wide. The North-eastern ends of the two valleys are almost 200 metres deeper than the South-western regions which are also shown here. The northern DAO VALLES, 2400 metres deep, is about 1000 metres deeper than the more southern NIGER VALLES.

The structure of the valley floor of the NIGER VALLES is characterised by terraced basins and chaotic fractures. The floor of the DAO VALLES is much smoother, but covered with strongly eroded remnants.

These eroded valleys are in a region that is part of the southern flank of the HADRIACA PATERA volcano.

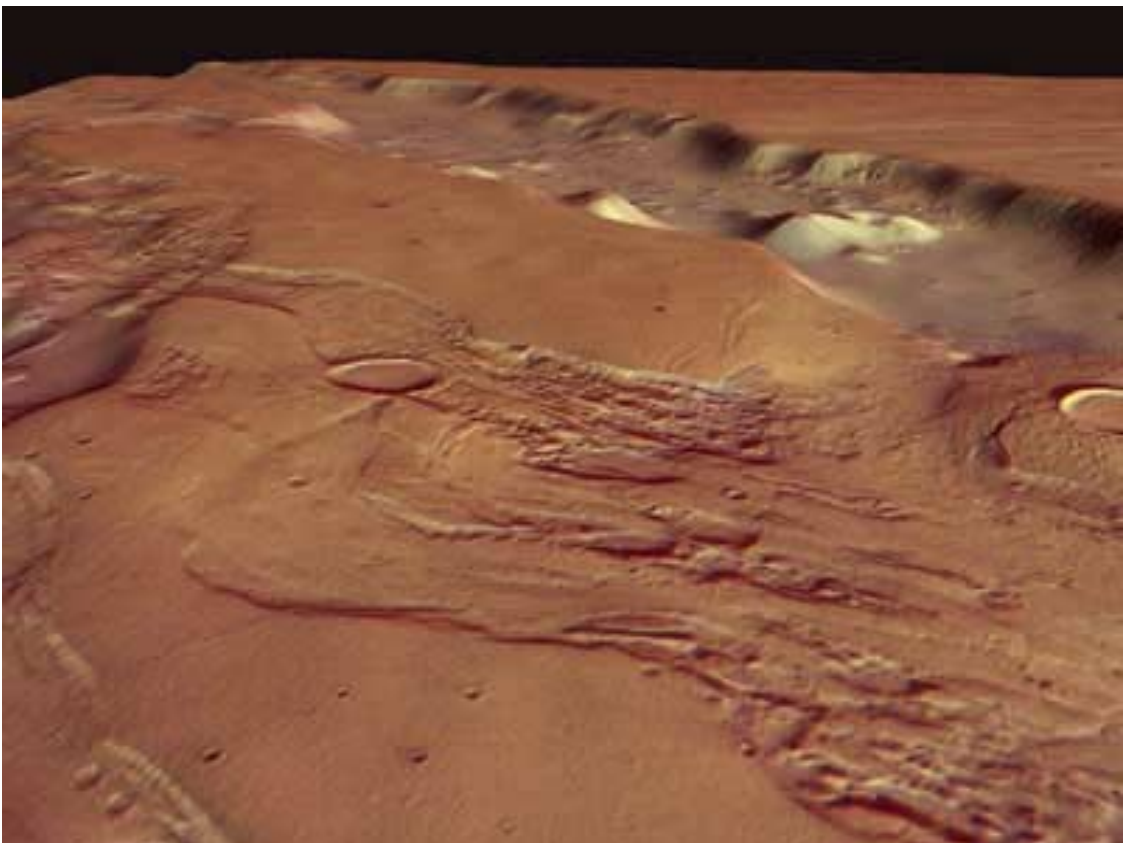
The surrounding surface is formed by lava streams, probably in a 'runoff' process.

Perspective View – Looking North



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Perspective View – Looking South



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