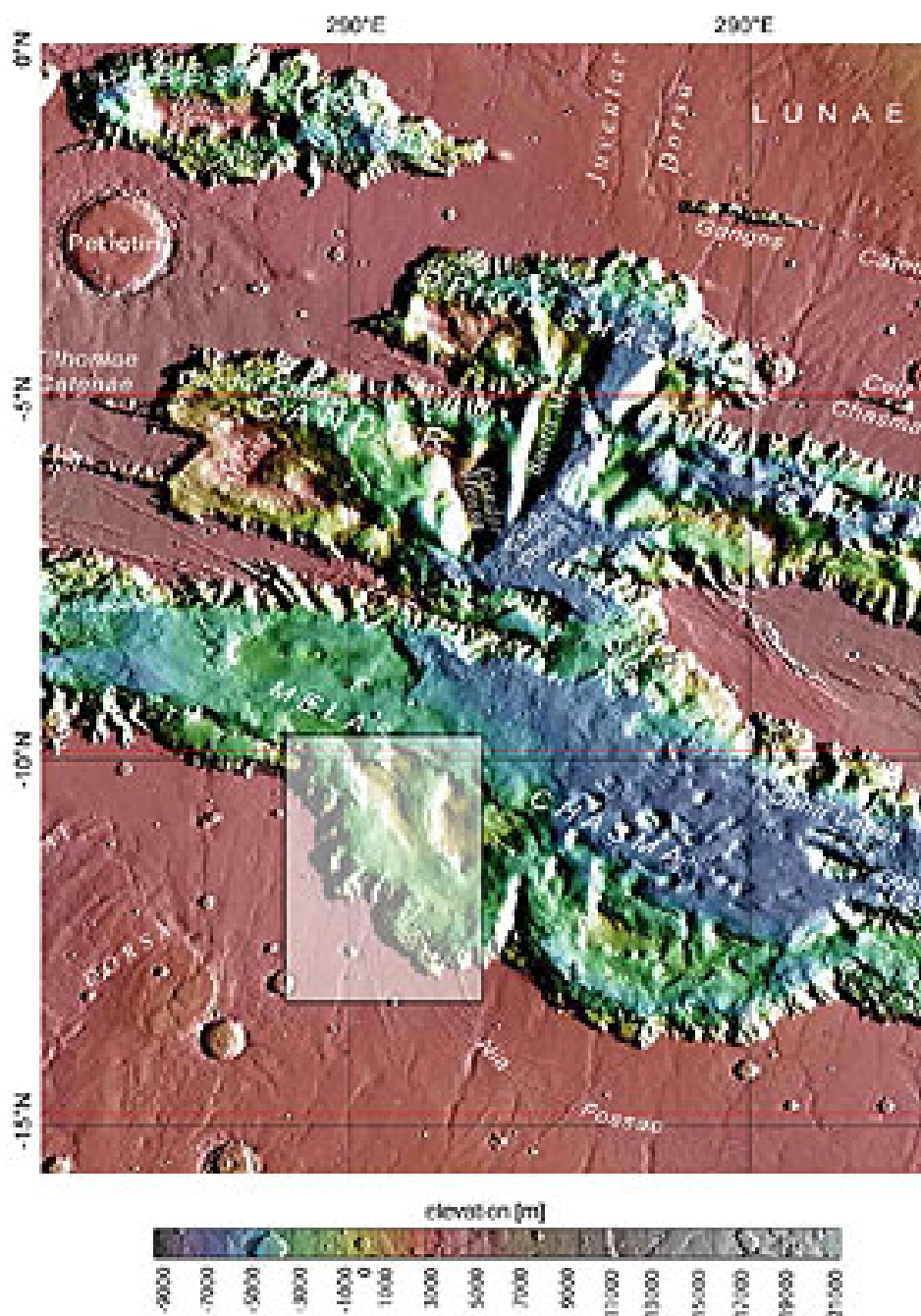


CHASMA

MELAS CHASMA

Localisation



Images taken: on 2nd May 2004, during orbit 360 of Mars Express - resolution of approximately 16 metres per pixel

Localisation: central area of the Martian canyon VALLES MARINERIS, called MELAS CHASMA. On the map above, the region “MELAS CHASMA” can be seen as the light rectangle in the lower left corner. The displayed region is located at the southern rim of the Melas Chasma at latitude 12°S and longitude 285°E. 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).

In which altitude range do you think “MELAS CHASMA” is?

Colour Image

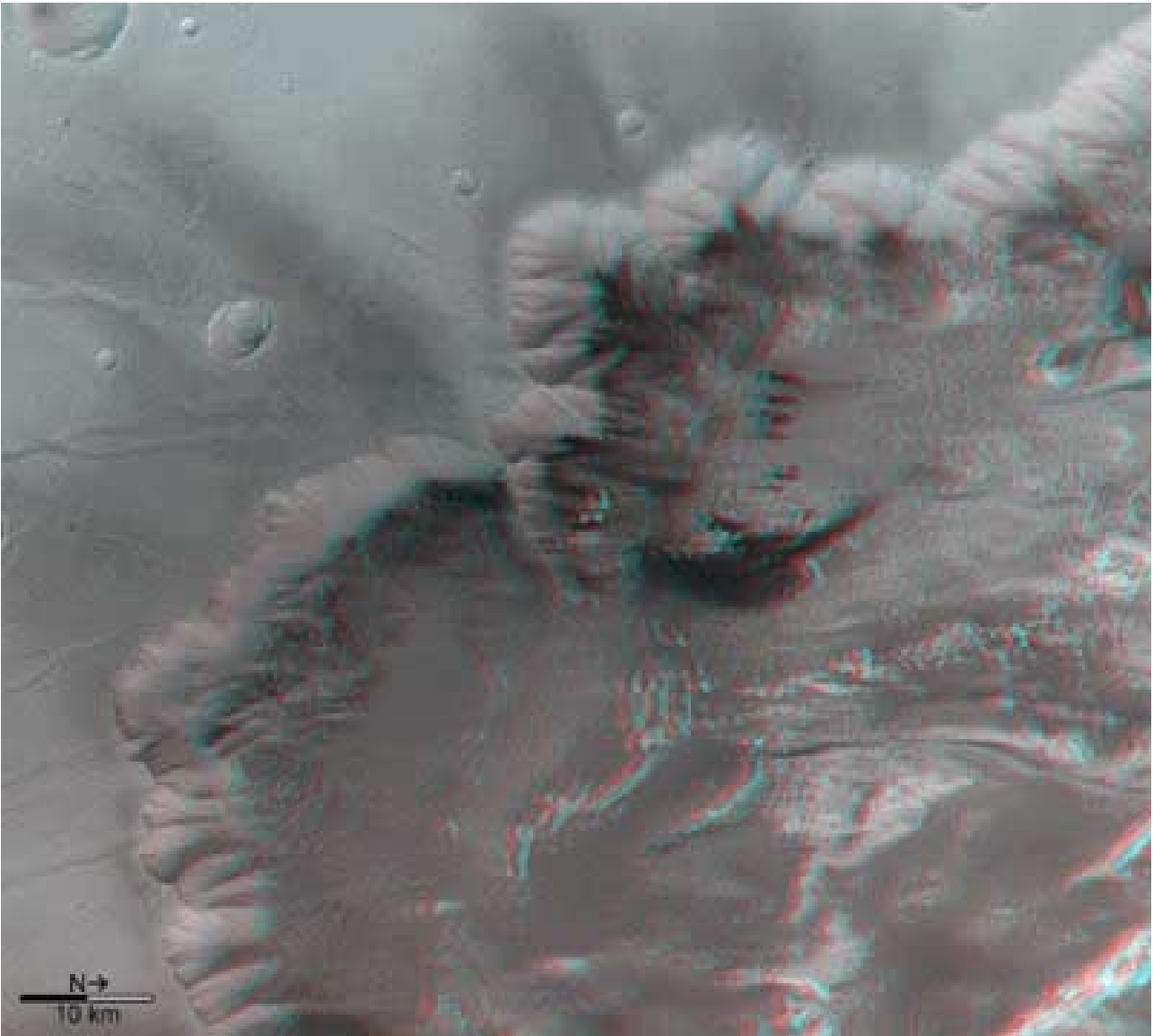


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This region of MELAS CHASMA shows several clues to the morphological and geological development of the VALLES MARINERIS.

The images show many traces of volcanic activity and possibly water-related activity. However, a lot of the surface has been altered by subsequent geological processes, such as wind erosion and quakes.

Anaglyph (3D) Image

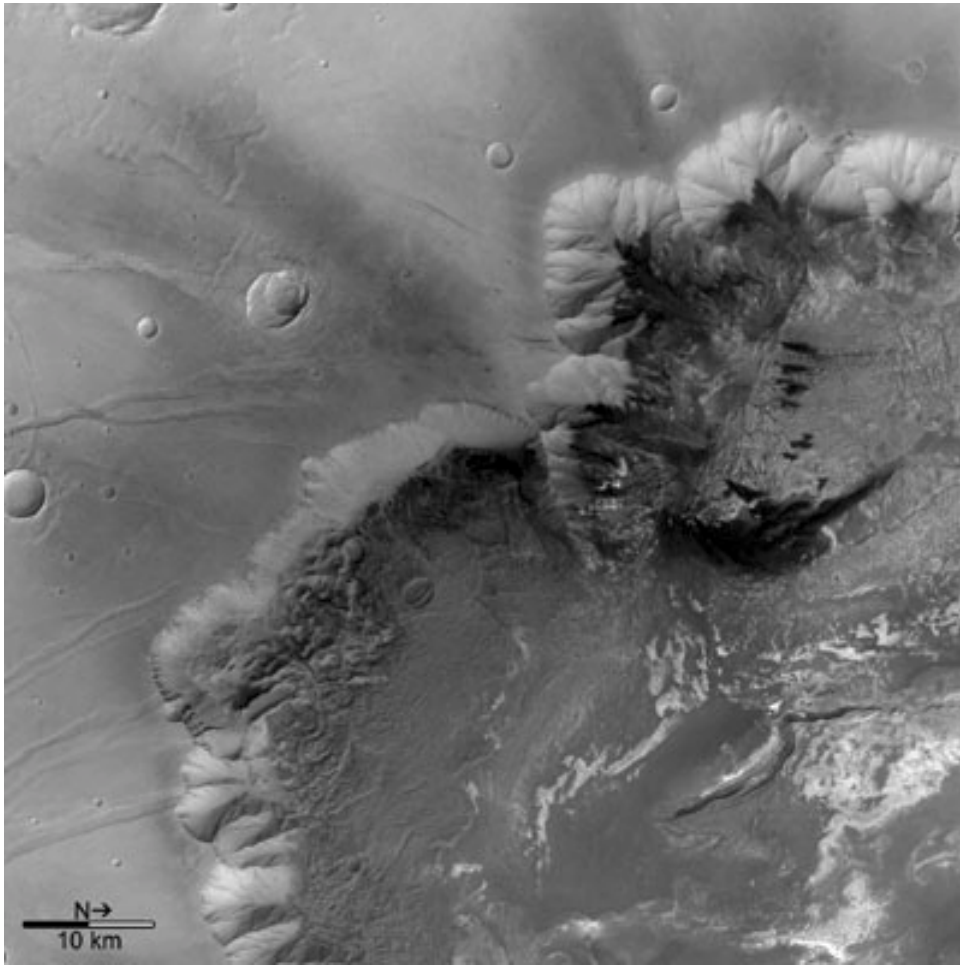


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Although many questions about the geological development of the VALLES MARINERIS canyon have remained unanswered until now, the detailed HRSC image data may help to find some answers.

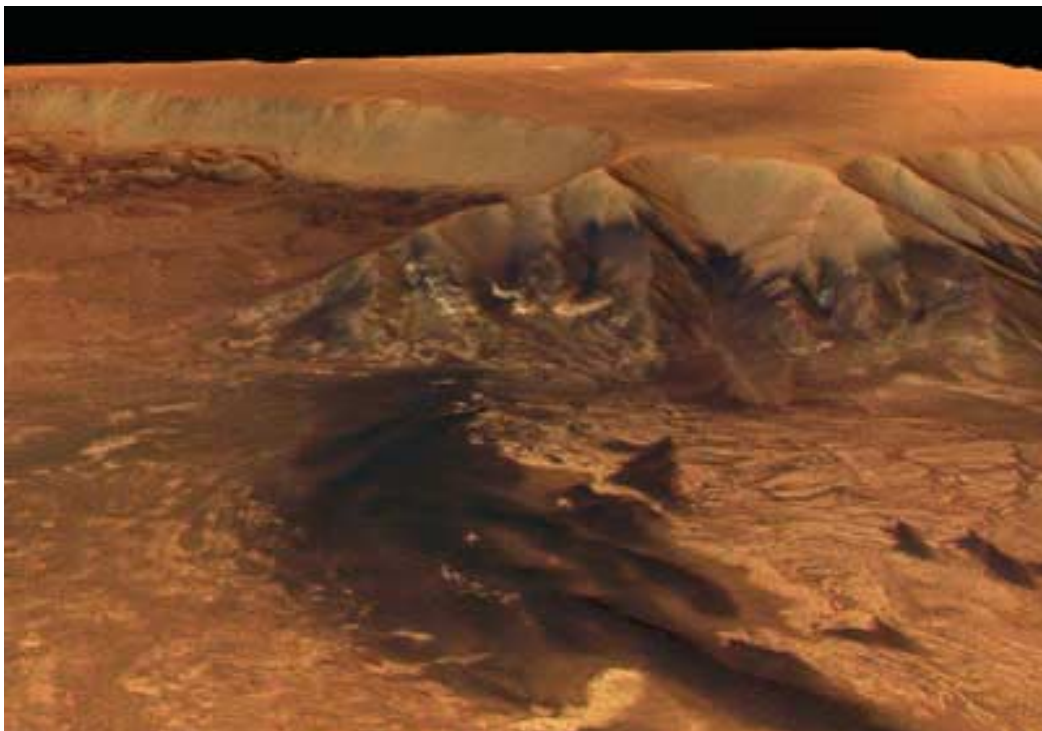
Using HRSC data, scientists can focus on morphology - the evolution of rocks and landforms. They can also analyse the light reflected by the canyon to understand which type of rocks it is made from.

Black & White Image



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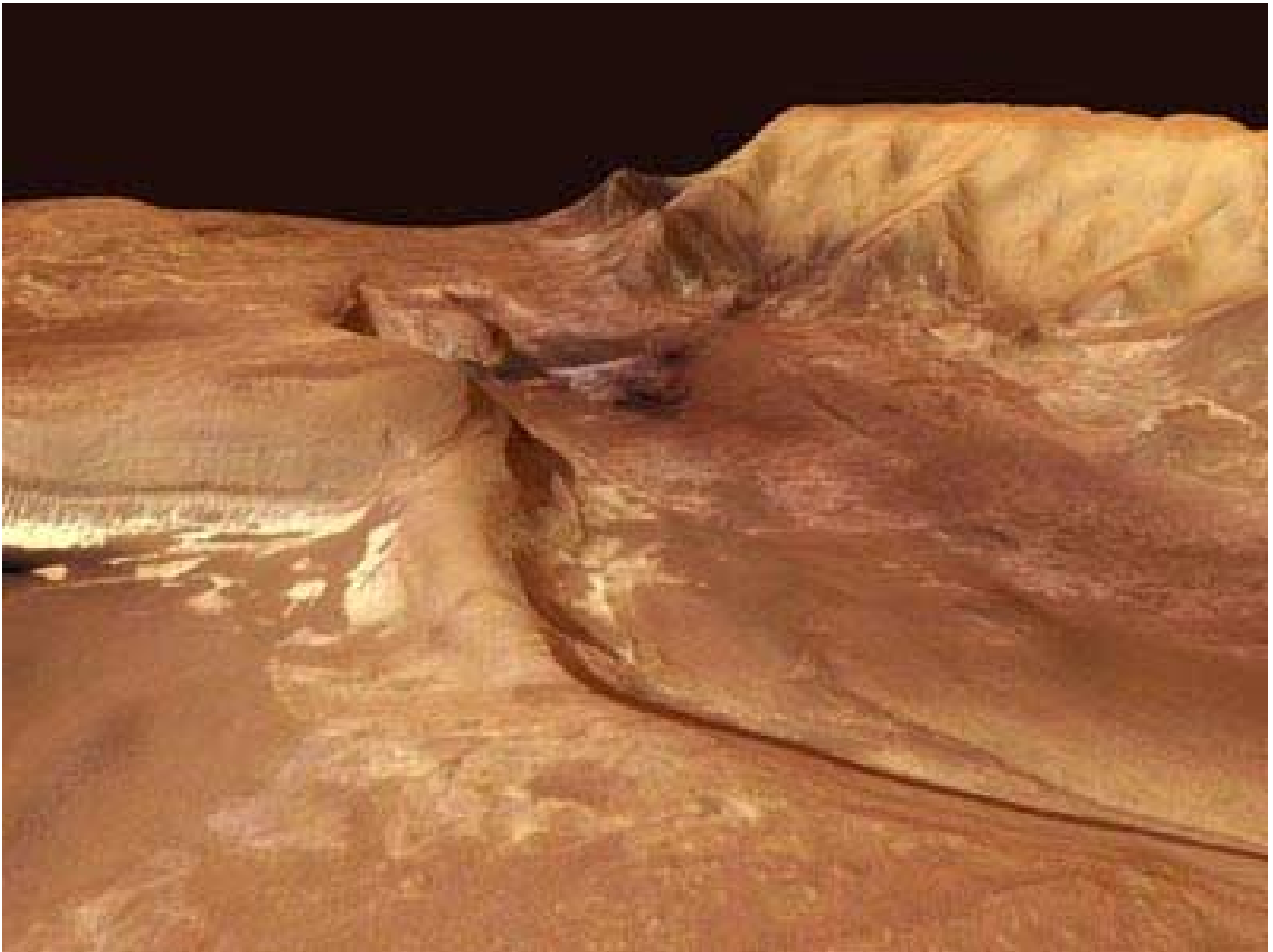
Perspective View



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MELAS CHASMA – Deposits

Perspective View



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The displayed region is located at the southern rim of the MELAS CHASMA, centred at Mars latitude 11° S and Mars longitude 286° E, and the image was taken on the orbit 360 of Mars Express.

This colour perspective view shows deposits in MELAS CHASMA, with a resolution of approximately 30 metres per pixel.

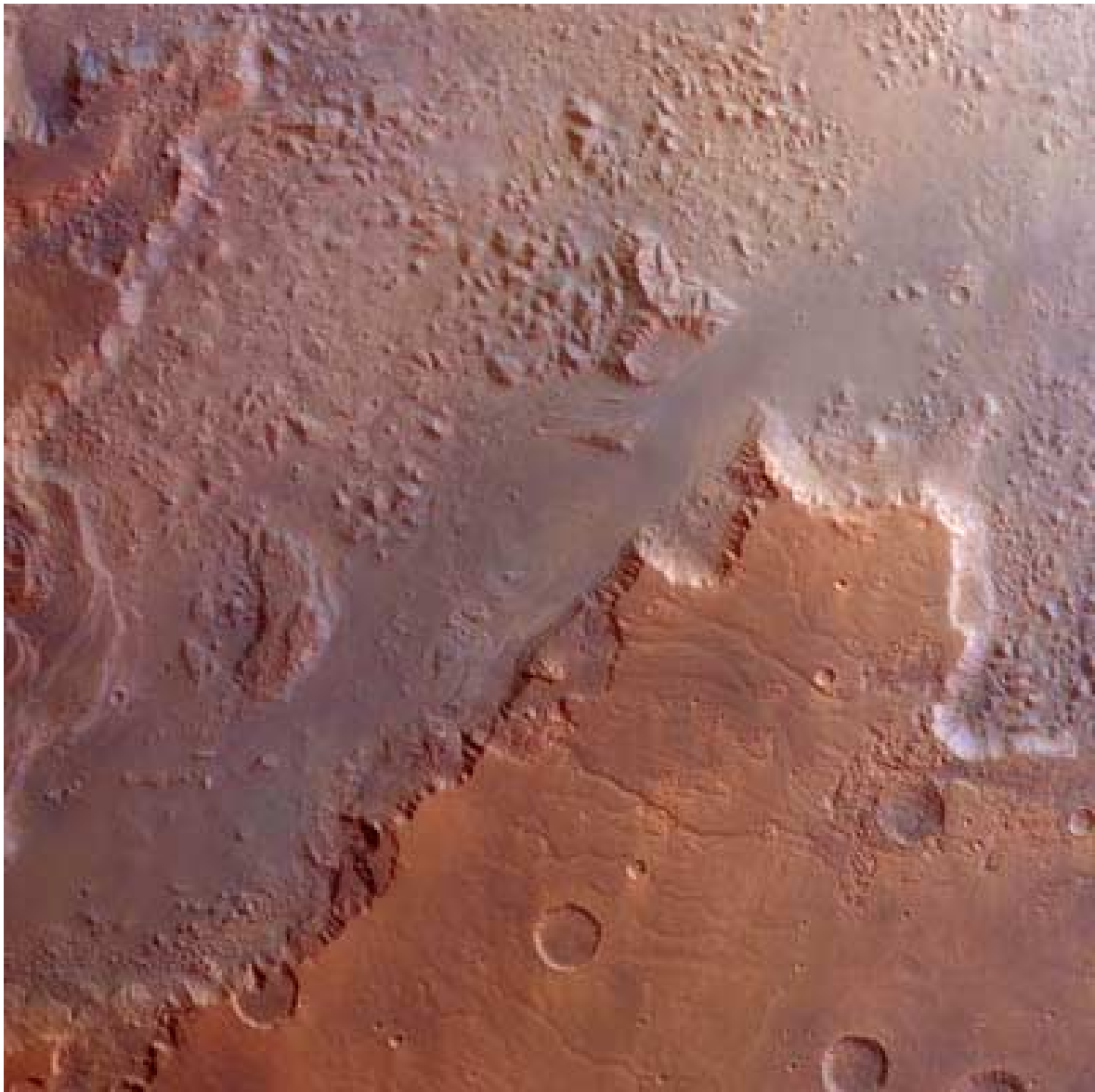
It has been turned in such a way that the observer has a view of the southern scarp, almost 5000 metres high.

The basin on the floor of the valley is on the opposite side, bordered by a ridge.

On its flanks it is possible to make out some layering. However, the nature of the bright material, possibly some kind of deposit, is still unknown.

EOS CHASMA – PART OF VALLES MARINERIS

Colour View



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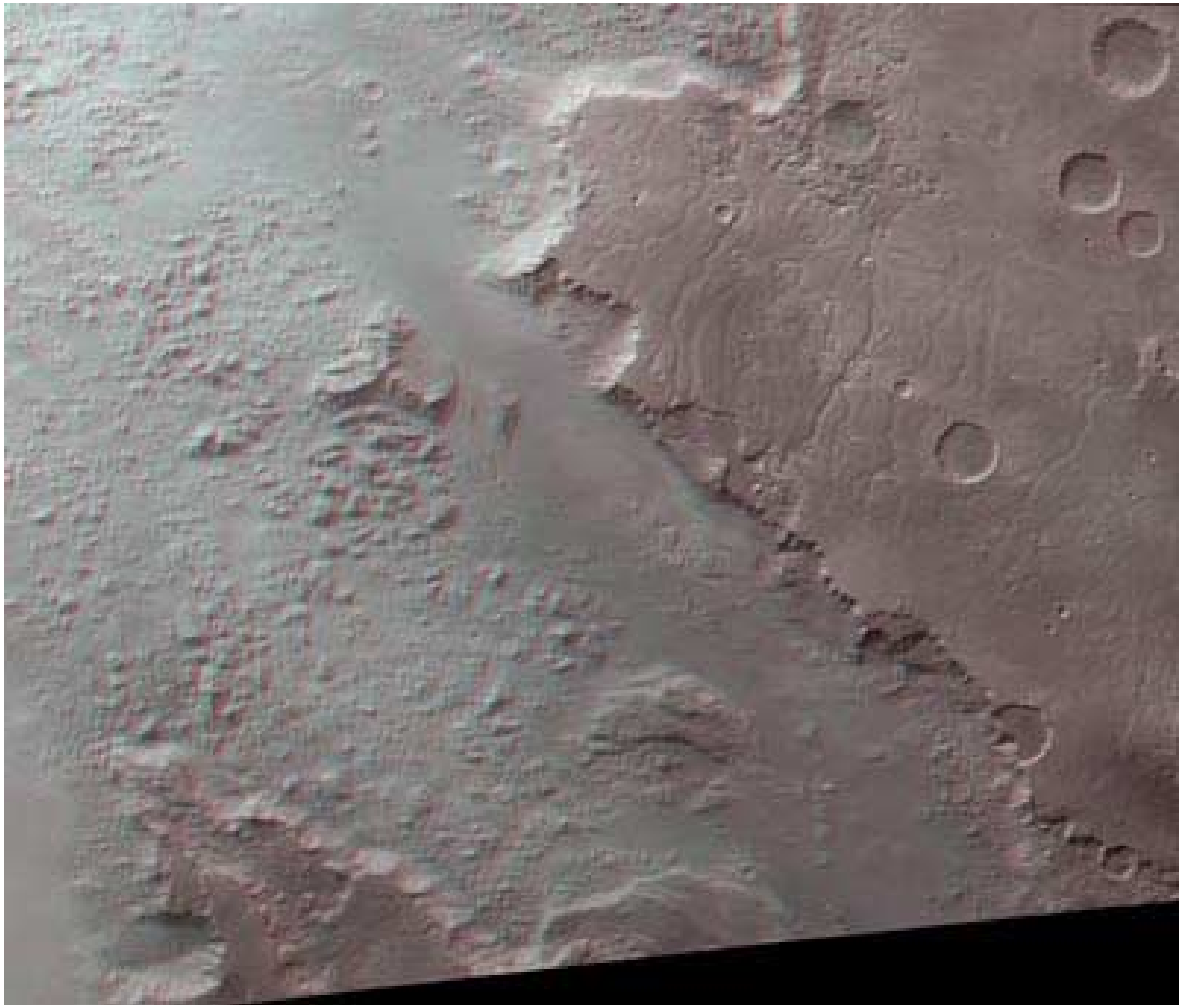
The images, showing the southern part of VALLES MARINERIS, called EOS CHASMA, were taken during orbit 533 in June 2004.

They are centred at longitude 322° East and latitude 11° South. The image resolution is approximately 80 metres per pixel.

North is on the top.

Between surrounding plains and the smooth valley floor, a height difference of about 5000 metres has been measured.

« 3 D » View (Anaglyph)



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To the east on this plain, isolated regions with cracked surfaces become more prominent.

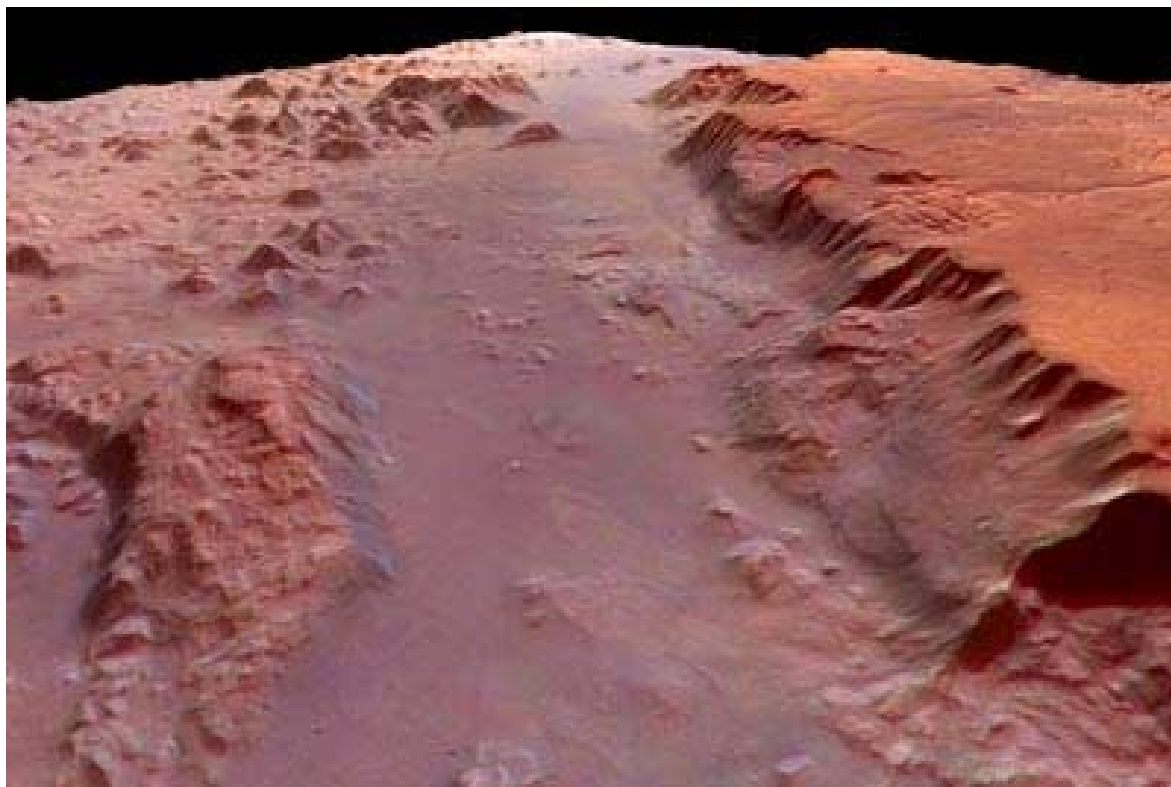
The direction of flow of the drainage channels in this area of the plain is ambiguous, as the channels to the North-east drain towards the South-east, and those in the South-west normally flow to the North-west.

The northern part of EOS CHASMAS's valley floor is a rough area with angular hills reaching almost 1000 metres. In contrast, the southern part reveals a smooth topography with distinct flow structures.

In some areas of the southern slope, at least two terrace levels can be observed.

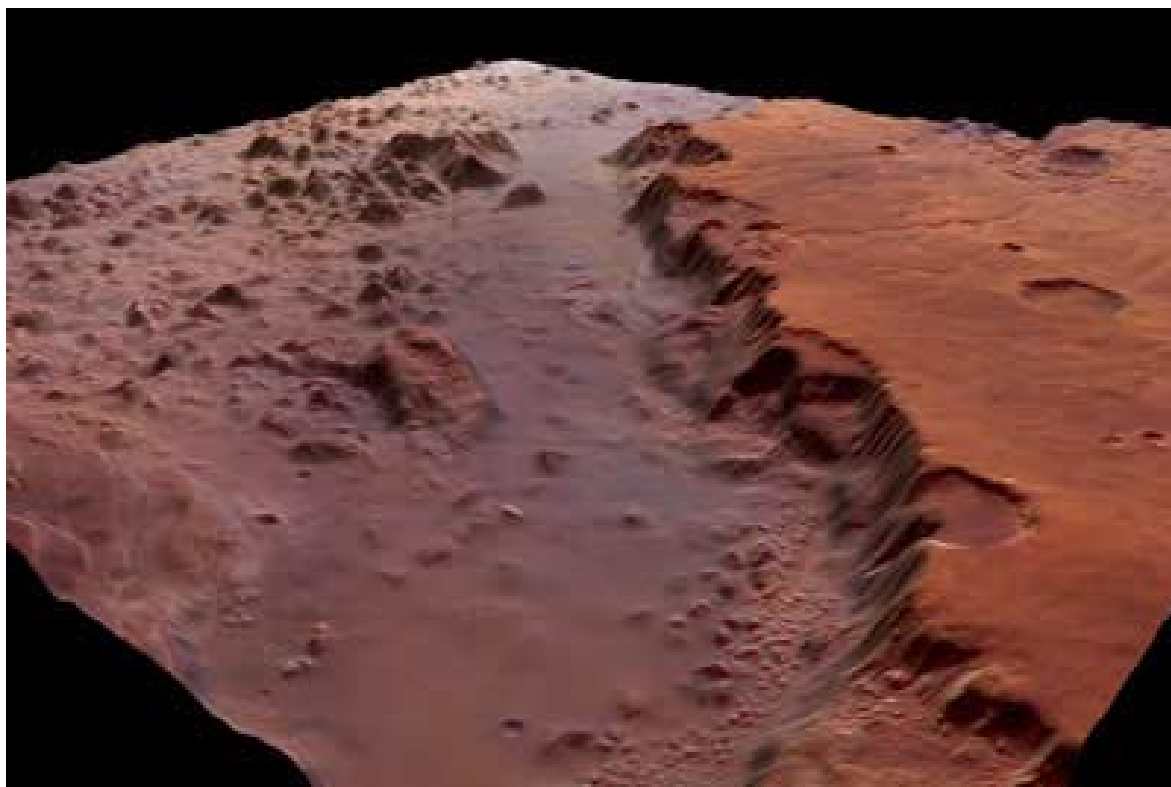
Some haze in the valley hints at the presence of aerosols (airborne microscopic dust or liquid droplets).

Perspective Views



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For these perspective views, the height has been exaggerated by a factor of four.



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OPHIR CHASMA – Part of VALLES MARINERIS

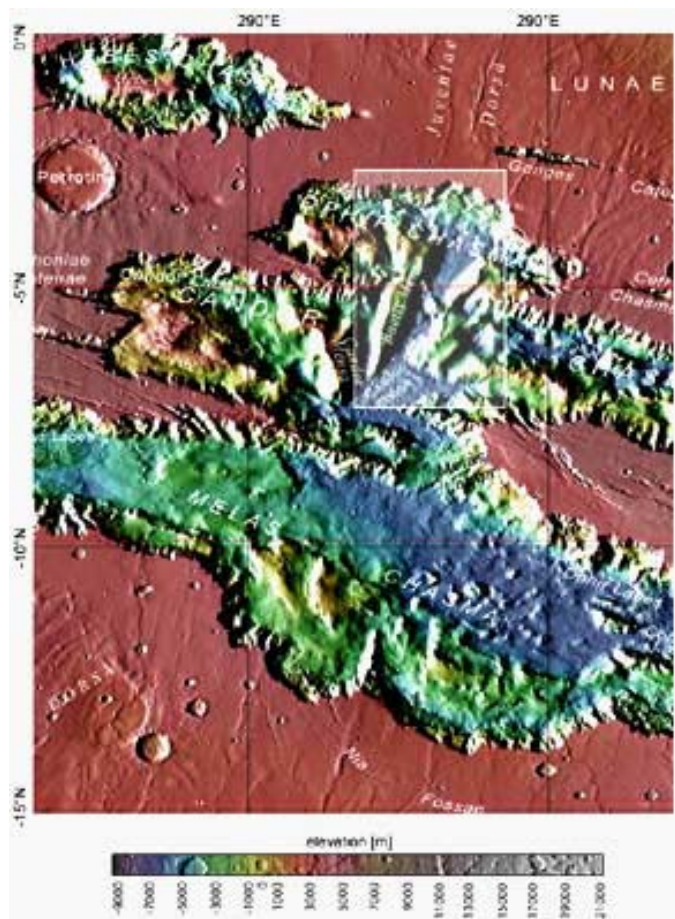
COLOUR IMAGE



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These images, taken in April 2004 during orbit 334, show the OPHIR CHASMA, a northern part of the VALLES MARINERIS canyon. The ground resolution is approximately 36 metres per pixel.

LOCALISATION



The displayed region is located, on the map, by the small light pink rectangle, in the upper right part.

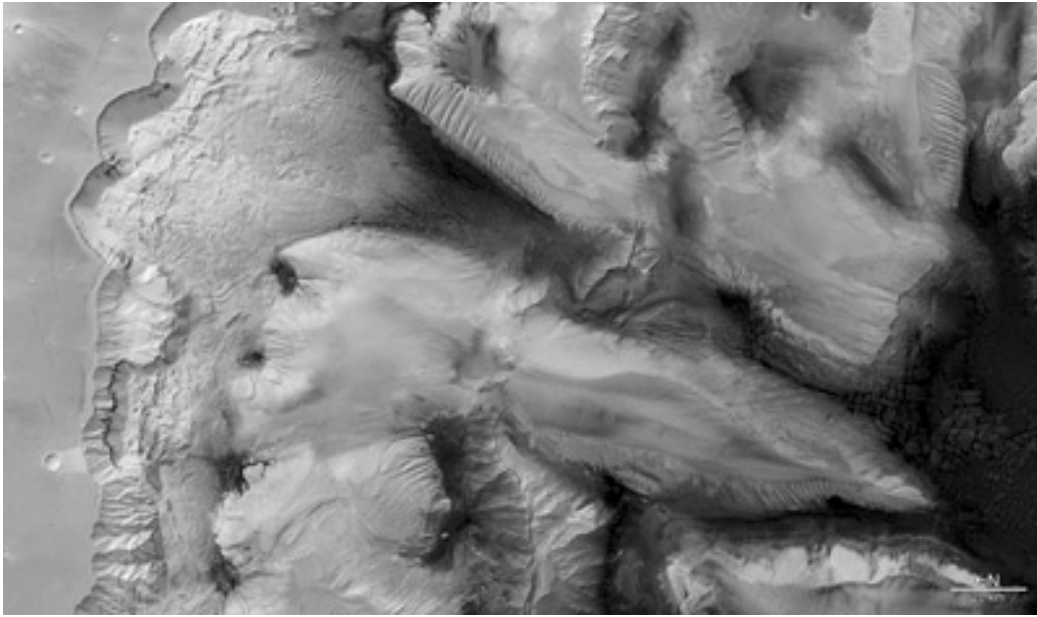
The centre of the image is situated approximately at longitude 288° East and latitude 4° South.

Looking at the legend showing altitudes, one can see that OPHIR CHASMA has altitudes ranging from – 6000 (blue parts) to – 1000 metres (light green parts).

Although the region has been mapped in detail during several missions, many secrets of the geological history of VALLES MARINERIS still remain a mystery.

VALLES MARINERIS is a huge canyon system around 4000 kilometres long, up to 240 kilometres wide and up to 6.5 kilometres deep.

Black & White Image



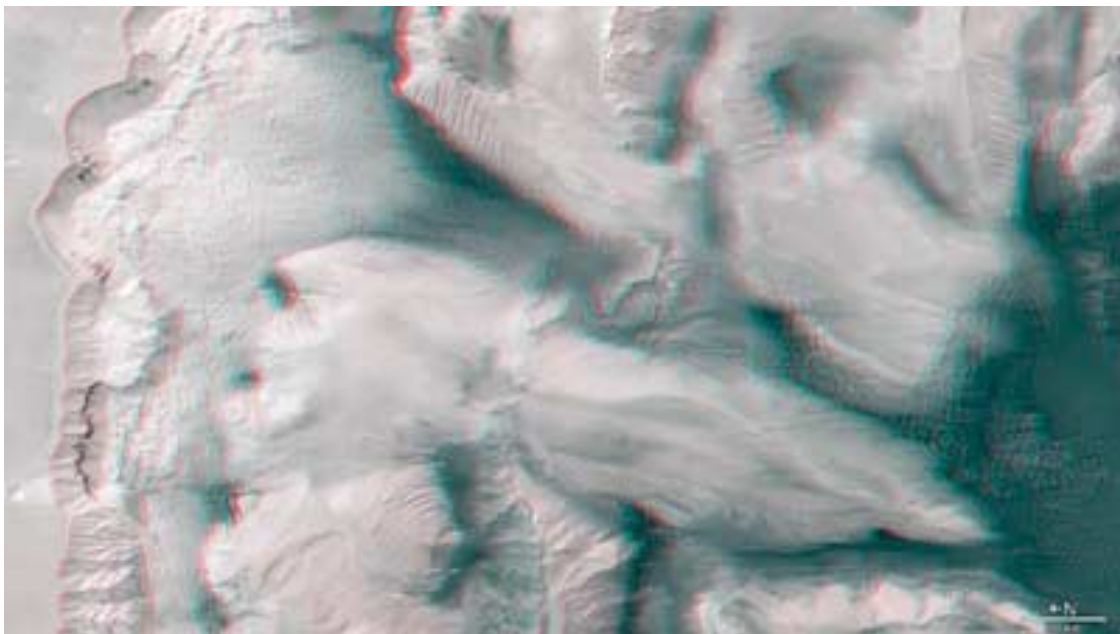
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Its connected ‘chasma’ or valleys may have formed from a combination of erosion and tectonic activity. The floor of the canyon shows morphological evidence of volcanic, fluvial or even glacial activity.

The northern scarp of OPHIR CHASMA, towards the left in these images, has an elevation of up to 5000 metres. Several slopes of collapsed material, indicating slope instabilities, can be seen at the base of the scarp and can be traced southwards along the valley floor for more than 70 kilometres.

In the South (right side of the images), east of the rounded and apparently smooth BAETIS MENSA ridge, the dark chaotic terrain of CANDOR CHAOS can be seen.

« 3 D » View

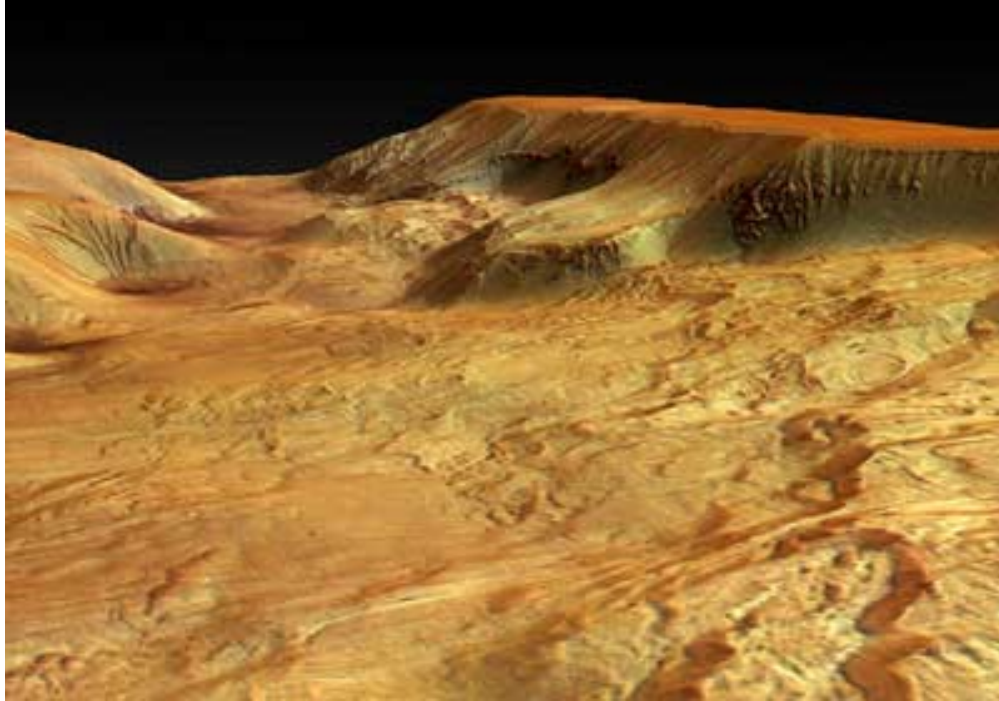


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This terrain is characterised by polygonal blocks that suggest material movements in north-south and east-west directions. Chaotic terrain on Mars is often connected to outflow channels, indicating the catastrophic release of large subsurface water reservoirs, and the subsequent collapse of the above-lying rock.

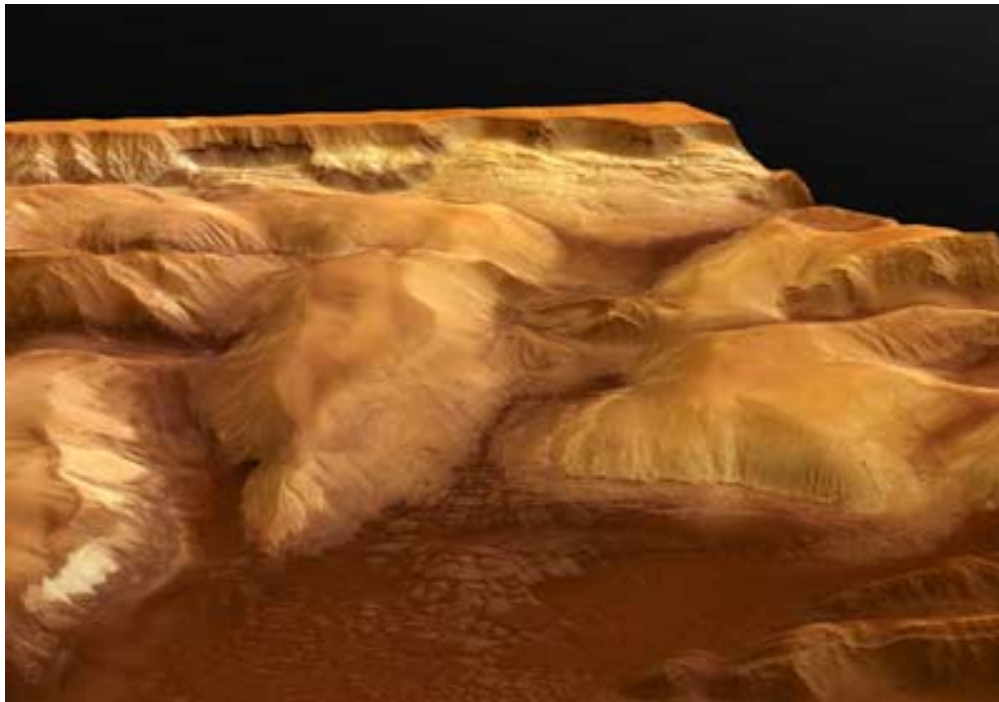
To better understand the 4 perspective colour views of OPHIR CHASMA that follow, one should imagine one is in the centre of the chasma and ones looks successively in different directions.

« Close-up » View looking from East to West



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Perspective View looking to the North-east



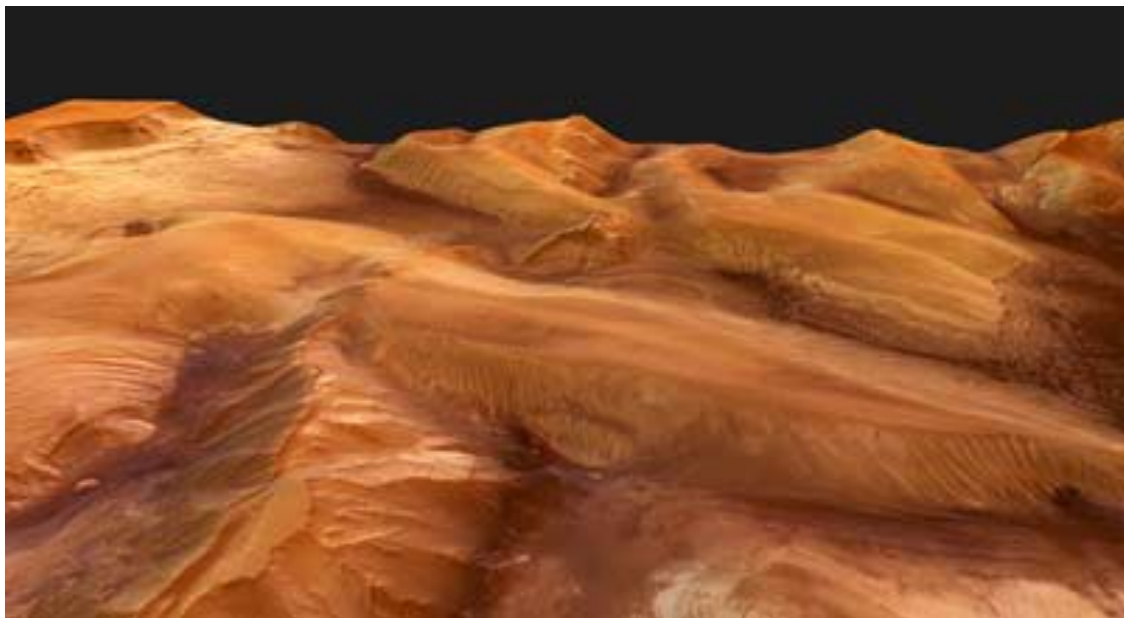
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« Close-up » View looking to the North



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Perspective View looking from West to East



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With the help of HRSC stereo and colour data, it is possible to map distinct geological features in more detail in order to reconstruct the history of a region.

TITHONIUM CHASMA

Colour View

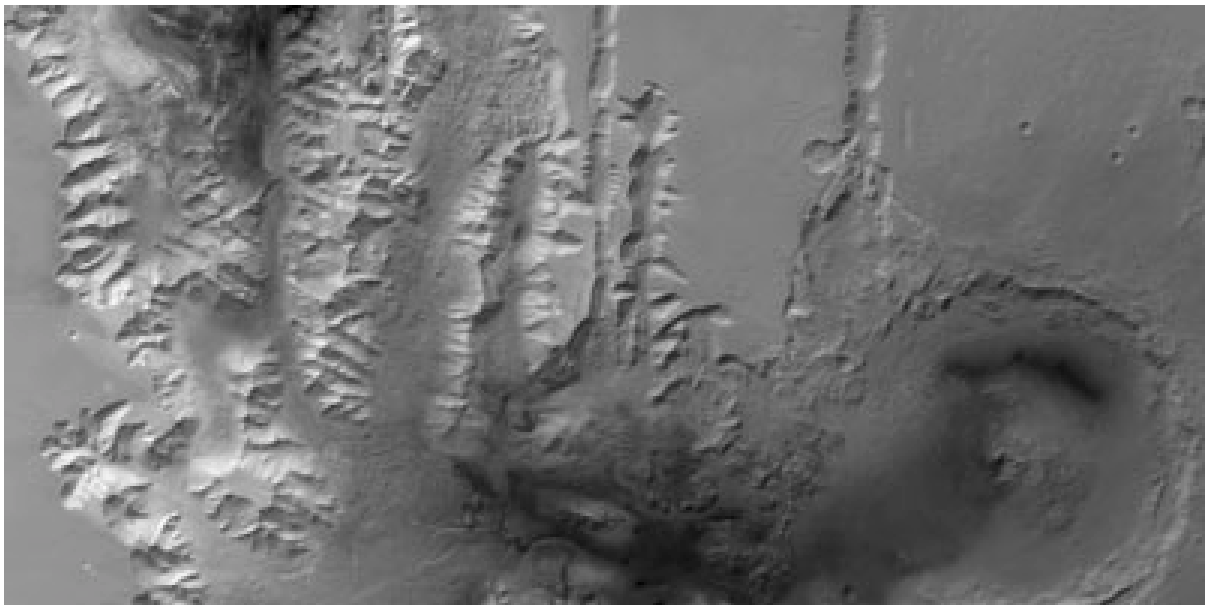


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Images taken on 26 May 2004 during orbit 442 with a ground resolution of approximately 52 metres per pixel. Localisation: at the beginning of the canyon system at about latitude 7° South and longitude 269° East. The North is to the left.

TITHONIUM CHASMA is at the western end of the canyon system of VALLES MARINERIS. What one can see on the images is the western end of TITHONIUM CHASMA and IUS CHASMA, which are up to 5.5 kilometres deep.

Black & White View



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This whole canyon system is the result of diverse geological processes. Tectonic faults, wind and water effects, volcanic and ice activities, have all taken part in this geological formation and its evolution.

“3D” Anaglyph View



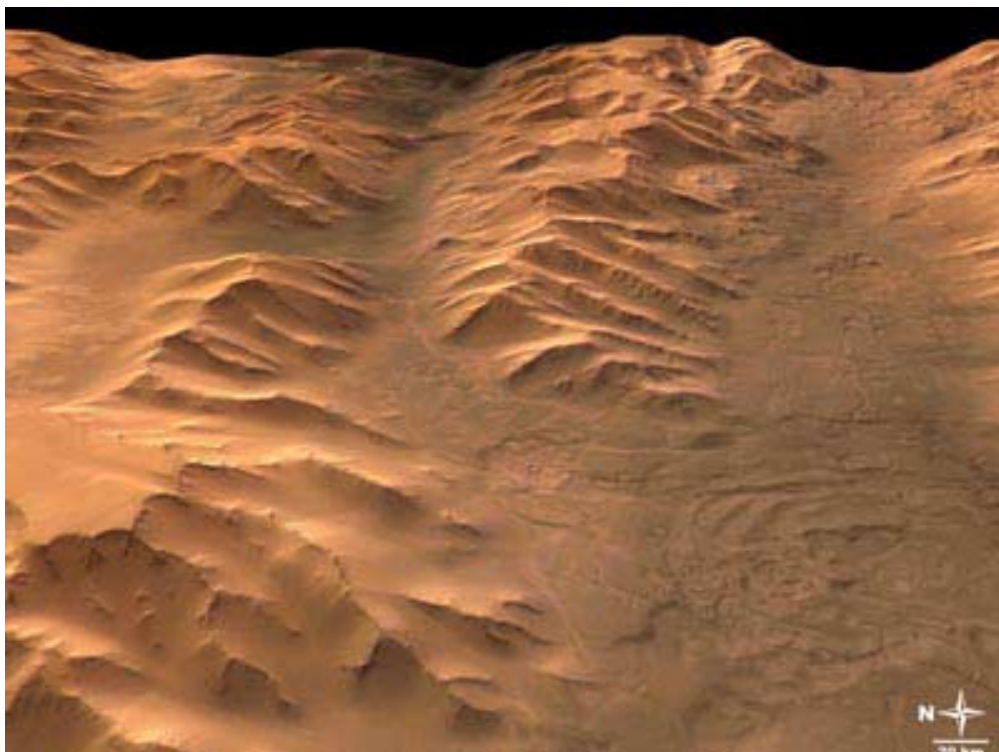
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The dark, layered material, the so-called ‘Interior Layered Deposits’ covering the canyon floors, can clearly be seen. These deposits are marked by a system of polygonal cracks through which the underlying, lighter-coloured rock can be seen.

The Interior Layered Deposits are still a major topic of research. Parts of the deposits are most probably volcanic, while in other areas a sedimentary origin has been proposed.

The morphology of the valley flanks has been modified by ‘slumping’ and rockfalls. Slumping is when a substantial part of a mountain, cliff or hill ‘breaks away’ and slides more or less intact to the bottom of the slope.

Perspective View, Looking East

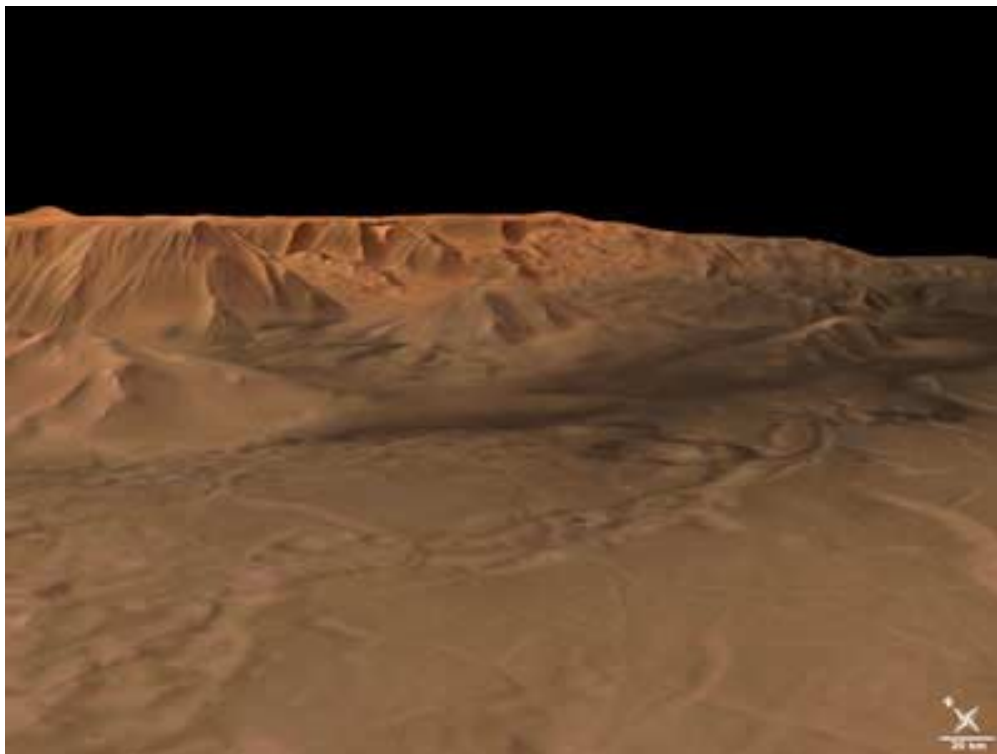


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Some of the major slumps here are more than thirty kilometres wide. The flanks are often covered to a large extent by their own 'talus', or rock debris that has fallen from the sides of a cliff or steep slope.

The large, deeply eroded CRATER OUDEMANS in the south of the area (bottom of the image) has a diameter of about 120 kilometres.

Perspective View, Looking North-East



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Around the central mount of the crater, large plains composed of dark rock can be seen. These plains are covered by lighter sediments, deposited through the action of the wind. Several systems of tectonic faults can be seen in the imaged area.

The most prominent is the system of VALLES MARINERIS itself, running east-west. South of CRATER OUDEMANS, smaller tectonic 'grabens' running from the South-west to the North-east can be seen. To the north of the large canyons, there are more fault systems.

The VALLES MARINERIS region is one of the most studied areas on Mars. The canyon system is one of the major keys to the tectonic and volcanic history of this planet. Research on the sedimentary rocks and the products of erosion can also provide major insights into its climatic evolution.

Due to the stereo capability of the HRSC, the new image data gained can provide new insights into the geology of Mars. This will lead to a new, more precise reconstruction of Martian geological history.