



## Ice-clad beauty on the 'Silver Island' of Mars

04 October 2012

On 8 June 2012, the High Resolution Stereo Camera (HRSC), operated by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) on board ESA's Mars Express spacecraft, acquired images of a region inside the Argyre Impact Basin, which is 1800 kilometres across and five kilometres deep. This basin was formed as a result of a gigantic meteorite impact during the early lifetime of Mars and is the second largest impact basin on the planet; the Hellas Impact Basin, is the largest.

The name is derived from the Greek word for silver (argyros). The renowned Italian astronomer Giovanni Schiaparelli named this bright region on Mars in 1877, adding it to the detailed map he was producing at that time. The name alludes to the 'Silver Island' at the mouth of the River Ganges in Greek mythology.

### **Wind as a formative force on the surface of Mars**

The images presented here all show part of the northern floor of the Argyre Impact Basin; the floor of the basin is referred to as Argyre Planitia. It is easy to identify Hooke Crater, 138 kilometres wide and named after the English physicist and astronomer Robert Hooke (1635–1703).

Large areas of Argyre Planitia have been modified by wind erosion and by the influence of water and ice. This gives rise to the rounded appearance of the landscape surrounding Hooke Crater.

Inside Hooke Crater, constant wind activity has formed dunes, whereas the linear structures lying to the south of the crater, known as 'yardangs', are the result of wind erosion. These are readily identifiable in the colour plan view (image 1/5).

### **Ground frost and snow clouds on Mars**

The most striking feature in these images is the thin layer of carbon dioxide ice (dry ice) that extends across the southern part of the crater, as though it were dusted with icing sugar (to the left in image 1/5). Carbon dioxide ice occurs frequently on the surface of Mars. For a long time, it was assumed that it only formed as frost at ground level, as depicted here.

However, NASA's Mars Reconnaissance Orbiter recently discovered clouds made of carbon dioxide 'snow' that can deposit this snow on the Martian surface. Some years earlier, Mars Express had already detected clouds of carbon dioxide ice crystals.

### **Time at which the images were acquired provides an explanation**

It is striking that, in contrast to the plain south of Hooke Crater (left in the colour plan view, 1/5) and some places inside the crater, which are clad in a thin layer of ice, this ice covering is absent from the crater wall facing northwards. The ice here was probably melted by the Sun; this view is supported by the time of day when these images were acquired.

The images were acquired at about 16:30 local time during the winter solstice on the southern hemisphere of Mars. At this time, the Sun would have been only some 20 degrees above the horizon and would therefore only have had the time and energy to heat the northern slopes sufficiently to melt the ice there. It would not have been able to melt the ice located on lower-lying horizontal surfaces.

Schiaparelli would undoubtedly have enjoyed the extraordinary images acquired by the Mars Express spacecraft, which continue to provide modern-day scientists with spectacular data.

## Image processing and the HRSC experiment on Mars Express

The images acquired with the HRSC were captured during Mars Express' orbit 10,743. The image resolution is about 22 metres per pixel. The images show a section at 45 degrees south and 314 degrees east.

The colour image was acquired using the nadir channel, which is directed vertically down onto the surface of Mars, and the colour channels of the HRSC; the perspective oblique view was computed from the HRSC stereo channels. The anaglyph image, which creates a three-dimensional impression of the landscape when viewed with red/blue or red/green glasses, was derived from the nadir channel and one stereo channel. The colour coded plan view is based on a digital terrain model of the region, from which the topography of the landscape can be derived.

The HRSC camera experiment on board the European Space Agency's Mars Express mission is headed by Principal Investigator (PI) Professor Gerhard Neukum (Freie Universität Berlin), who was also responsible for the technical design of the camera. The science team consists of 40 co-investigators from 33 institutions in 10 nations. The camera was developed at DLR under the leadership of the PI and it was built in cooperation with industrial partners EADS Astrium, Lewicki Microelectronic GmbH and Jena-Optronik GmbH. The instrument is operated by the DLR Institute of Planetary Research in Berlin-Adlershof. The systematic processing of the HRSC image data is carried out at DLR. The images shown here were created by the Institute of Geological Sciences at Freie Universität Berlin.

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### Contacts

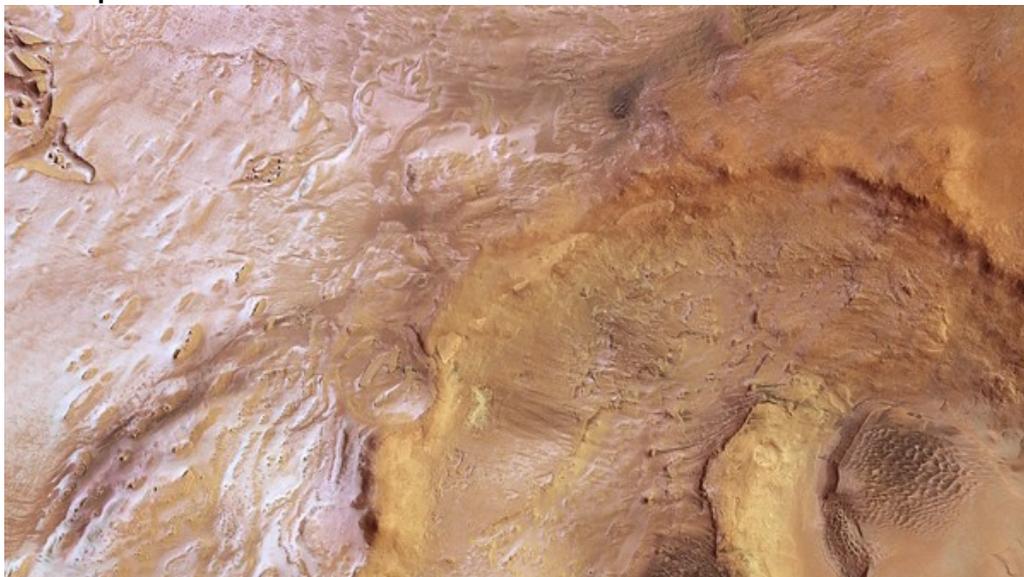
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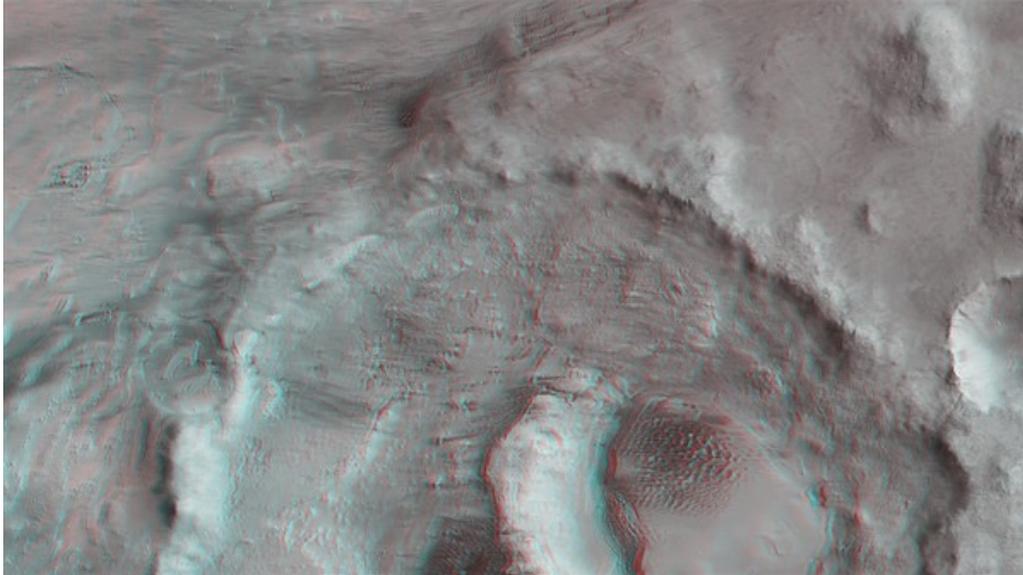
### Colour plan view of Hooke Crater



This colour plan view was created using the nadir channel, which is directed vertically down onto the Martian surface, and the colour channels of the High Resolution Stereo Camera (HRSC) on board ESA's Mars Express spacecraft; north is to the right in the image. The image resolution is 22 metres per pixel. Hooke Crater is located in the Argyre Planitia region – an extensive circular plain on the southern hemisphere of Mars. Copyright note: As a joint undertaking by DLR, ESA and FU Berlin, the Mars Express HRSC images are published under a Creative Commons licence since December 2014: ESA/DLR/FU Berlin, CC BY-SA 3.0 IGO. This licence will also apply to all HRSC images released to date.

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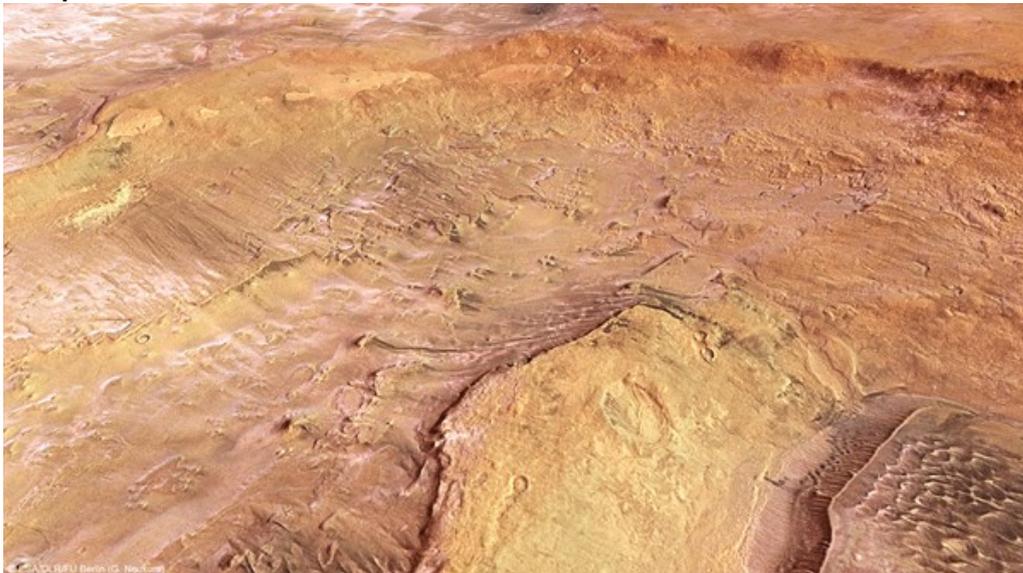
### **Anaglyph image of Hooke Crater**



Anaglyph images can be created from the nadir channel of the High Resolution Stereo Camera (HRSC), which looks vertically down at Mars, and one of the four stereo channels, which are directed obliquely towards the surface. Using red/blue (cyan) or red/green glasses gives a three-dimensional impression of the landscape; north is to the right in the image. This image was acquired during Mars Express orbit 10,743 and shows an area at 45 degrees south and 314 degrees east, in which part of the Argyre Planitia region with Hooke Crater can be seen. Copyright note: As a joint undertaking by DLR, ESA and FU Berlin, the Mars Express HRSC images are published under a Creative Commons licence since December 2014: ESA/DLR/FU Berlin, CC BY-SA 3.0 IGO. This licence will also apply to all HRSC images released to date.

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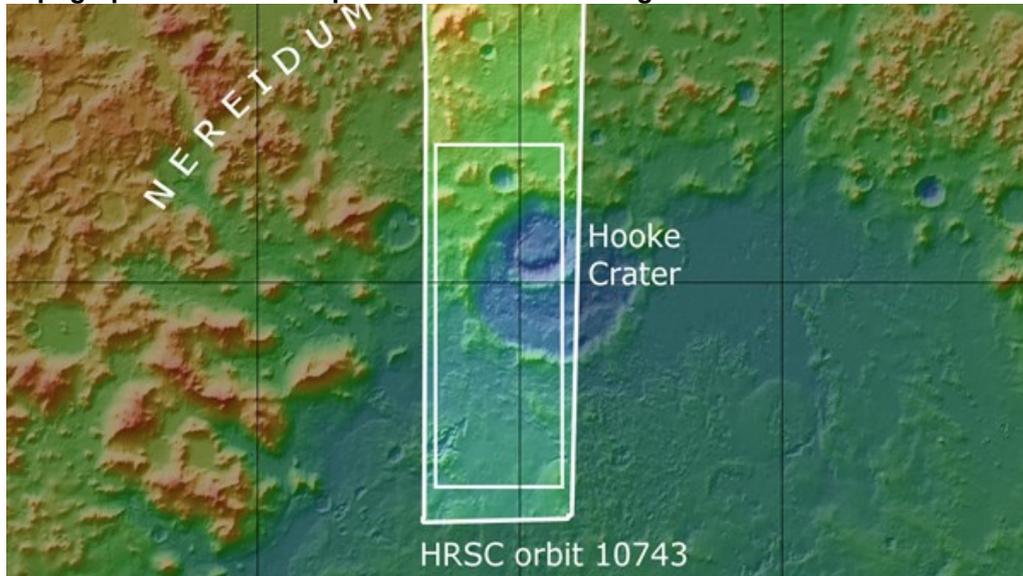
### **Perspective view of Hooke Crater**



Realistic perspective views of the surface of Mars can be generated from data acquired by the stereo and colour channels of the High Resolution Stereo Camera (HRSC) on board ESA's Mars Express spacecraft, which are oriented at an oblique angle with respect to the planet's surface. This image shows a view into Hooke Crater, located in the Argyre Planitia region, an extensive circular, low-lying plain on the southern hemisphere of Mars. Copyright note: As a joint undertaking by DLR, ESA and FU Berlin, the Mars Express HRSC images are published under a Creative Commons licence since December 2014: ESA/DLR/FU Berlin, CC BY-SA 3.0 IGO. This licence will also apply to all HRSC images released to date.

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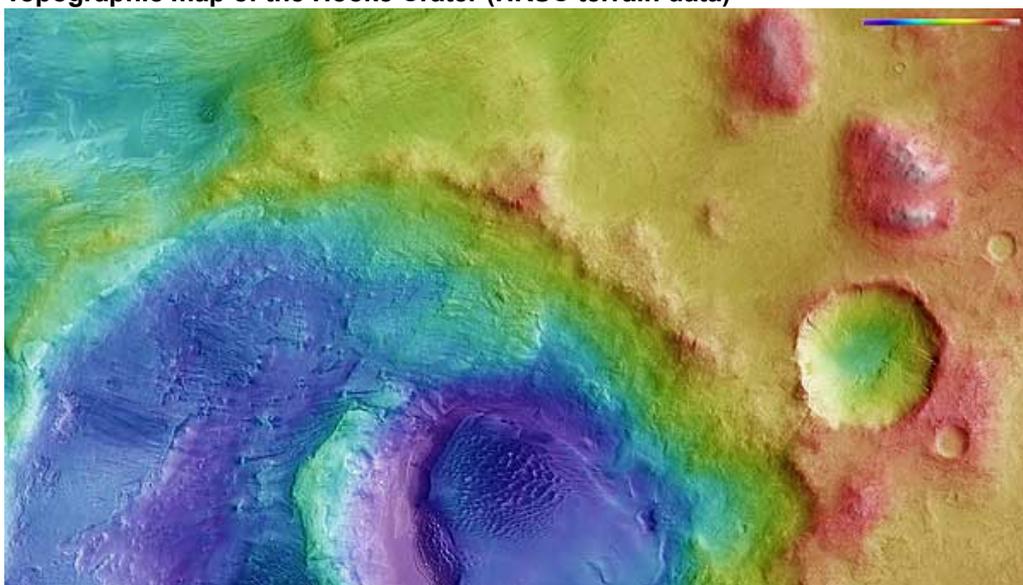
### Topographic overview map of the area surrounding Hooke Crater



After Hellas Planitia, Argyre Planitia is the second largest impact basin on Mars. On 8 June 2012 the High Resolution Stereo Camera (HRSC), operated by DLR on board ESA's Mars Express spacecraft, acquired images of Hooke Crater during orbit 10,743. The images shown here originate from the small, inner rectangle in the HRSC imagery strip. Hooke Crater lies in the Argyre Planitia region, an extensive circular, low-lying plain on the southern hemisphere of Mars.

Credit: NASA/JPL (MOLA); FU Berlin.

### Topographic map of the Hooke Crater (HRSC terrain data)



Using the High Resolution Stereo Camera (HRSC), digital terrain models can be derived that illustrate the topography of the region using false colours. The altitudes can be read from the coloured scale at the top right of the full image (blue: low-lying regions; red: regions at higher altitude). In the absence of 'sea level', the elevation data is referenced to an areoid – a modelled equipotential surface on which everything experiences the same gravitational attraction towards

the centre of the planet. Hooke Crater is located in the Argyre Planitia region – an extensive circular, low-lying plain on the southern hemisphere of Mars. Copyright note: As a joint undertaking by DLR, ESA and FU Berlin, the Mars Express HRSC images are published under a Creative Commons licence since December 2014: ESA/DLR/FU Berlin, CC BY-SA 3.0 IGO. This licence will also apply to all HRSC images released to date.

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