

**Mosaic of Valles Marineris: A system of canyons on Mars**  
**Nirmala Jain and Prakash Chauhan**  
**PSD/BPSG/EPISA,**  
**Space Applications Centre, ISRO Ahmedabad**

Mars Orbiter Mission (MOM) is an interplanetary mission of Indian Space Research Organisation (ISRO), which was launched on November 5, 2013. The mission has a highly elliptical Martian orbit imaging from 372 km (Periareion) to 80,000 km (Apoareion). Life of mission is designed for six months after insertion in orbit of Mars. MOM inserted in orbit of Mars on September 24, 2014. Mars Color Camera (MCC) is important payload of MOM which operates in visible range (0.4 to 0.7  $\mu\text{m}$ ) with spatial resolution from 19.5 m to 4 km. Remote sensing image data for Mars are collected from Mars Color Camera (MCC) onboard Mars Orbiter Mission (MOM). Photometric correction is done on images collected from MCC and mosaic of Valles Marineris is prepared (figure 1). The photometric correction is needed to avoid apparent color variations due to the scattering behavior of the atmosphere and different surface materials. Therefore, the photometric corrections have been done on six MCC images. They have collected at different altitude and at different spatial resolution.

MCC has acquired many high and low resolution images for Valles Marineris. The datasets from MCC for the study area were geo corrected by using MOLA data. During photometric correction total six images of the surface of Valles Marineris were processed. Purpose of such photometric functions is to normalize the images taken from MCC at different times and under different observation geometries by correcting these datasets to a common reference geometry and observation conditions. These normalized data are important to study the geomorphological analysis of surface of Valles Marineris at regional extent. Mosaic of Valles Marineris (figure 1) was prepared at spatial resolution at 1.2 km. It has covered the 1003 km by 3599 km area of Valles Marineris. Figure 2 is the 3D view of Valles Marineris prepared at 3.6 km spatial resolution.

Valles Marineris is a system of canyons, shown in this image. It is 4000 km long and up to 8 kilometers deep present near the equator of Mars. It was first captured by Mariner 9 mission in 1971. The Image Below (centered at: latitude  $10^{\circ} 18' 45''$  S, longitude  $72^{\circ} 3' 45''$ ) shows the complete part of canyon system. Valles Marineris extends from Noctis Labyrinthus (the arcuate system of grabens) to the west, to chaotic terrain to the east. To the south are the highlands, the ancient terrain, containing impact craters. Chaotic terrain to the east of Valles Marineris contains mainly the impressions of ancient river channels. Mosaic of MOM-MCC allow analysis of this canyon system. On Earth, the layered rocks are form from sedimentary (sedimentary layers) and volcanic (lava flows) processes. Valles Marineris also contains such type of layers. Both origins are possible for the layered rocks seen in Valles Marineris. Different canyons in the Valles Marineris were seen in MCC mosaic, such as Ophir Chasma, Ius Chasma and Melas Chasma. Ophir Chasma is the northern most depression of central Valles Marineris. It extends approximately 270 km in East–West direction and 90 km in North–South direction. Ius Chasma is a linear trough in western Valles Marineris, formed by horst and graben structures and mass wasting processes. Melas Chasma is located in the center of this canyon system on Mars.

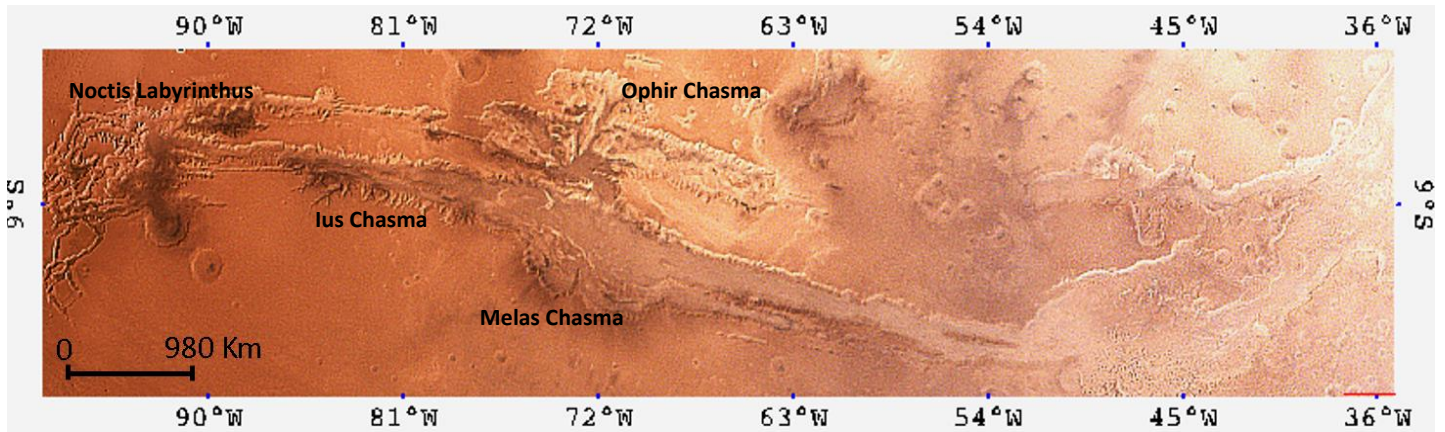


Figure 1: Mosaic of Valles Marineris at special resolution 1.2 Km

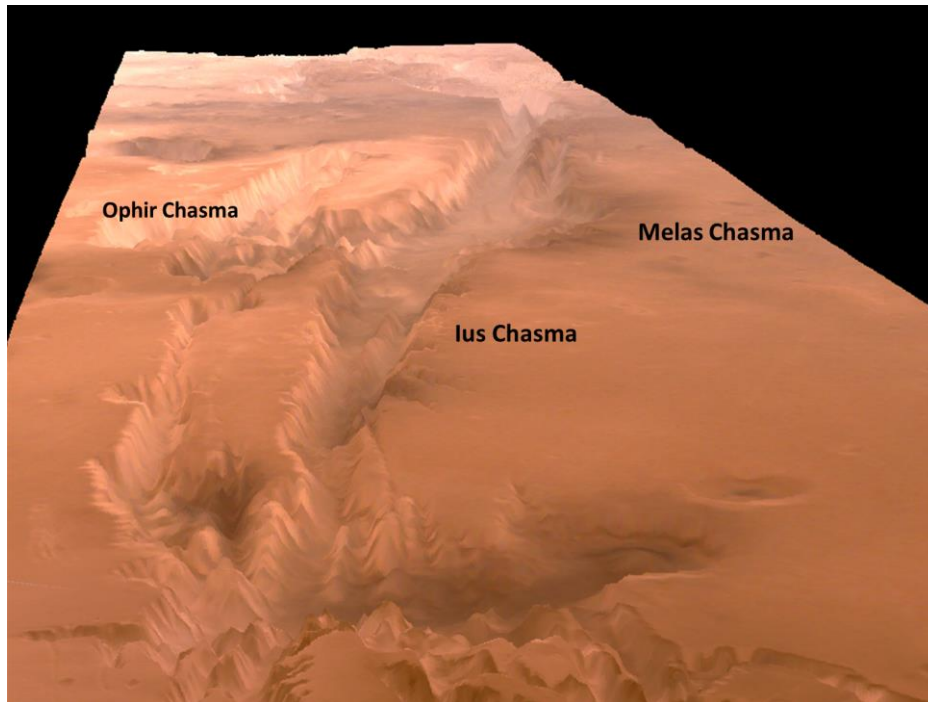


Figure 2: 3D view of Valles Marineris shows locations of number of canyons such as Ophir Chasma, Ius Chasma and Melas Chasma