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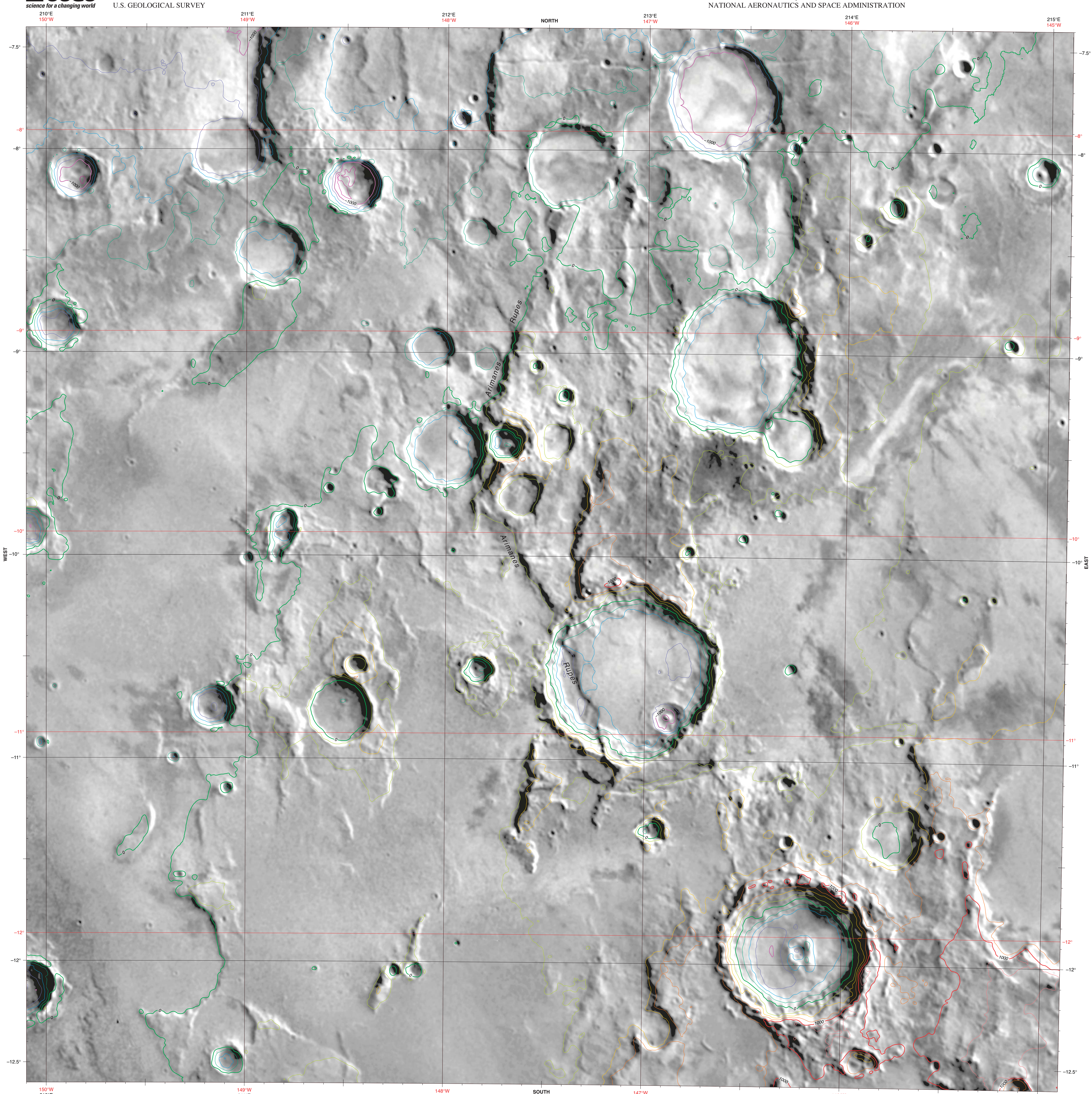
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SCIENTIFIC INVESTIGATIONS MAP 2906



NOTES ON BASE

This map, compiled photogrammetrically from Viking Orbiter stereo image pairs, is part of a series of topographic maps of areas of special scientific interest on Mars.

MTM 500k –10/212E OMKT

The map code identifies the Mars topographic maps:

MTM 500k –10/212E OMKT: Mars transverse Mercator projection (MTM); 1:500,000 series; center of sheet lat 10° S., long 212.5° E. in planetocentric coordinate system (this corresponds to –10/147; lat 10° S., long 147.5° W. in planetographic coordinate system); orthophotomosaic (OM) with color-coded (K) topographic contours and nomenclature (T) (Greeley and Batson, 1990)

ADOPTED FIGURE

The figure of Mars used for the computation of the map projection is an oblate spheroid (flattening of 1/176.875) with an equatorial radius of 3,396.19 km and a polar radius of 3,376.2 km (Seidelmann and others, 2002). The datum (the 0-km contour line) for elevations is defined as the equipotential surface (gravitational plus rotational) whose average value at the equator is equal to the mean radius as determined by Mars Orbiter Laser Altimeter (MOLA; Smith and others, 2001).

PROJECTION

The projection is part of a Mars transverse Mercator (MTM) system with 20°-wide zones. For the area covered by this map, the central meridian is at 210° E. (150° W.). The scale factor at the central meridian of the zone containing this quadrangle is 0.9960 relative to a nominal scale of 1:500,000.

COORDINATE SYSTEM

Longitude increases to the east and latitude is planetocentric (black) as allowed by International Astronomical Union/International Association of Geodesy (IAU/IAG) standards (Seidelmann and others, 2002) and in accordance with current National Aeronautics and Space Administration (NASA) and U.S. Geological Survey (USGS) standards (Duxbury and others, 2002). A secondary grid (red) has been added to the map as a reference to the west longitude/planetographic latitude system that is also allowed by IAU/IAG standards (Seidelmann and others, 2002) and has been used for previous Mars maps. Planetocentric latitude is defined as the angle between the equitorial plane and body to a given point. Planetographic latitude is defined as the angle between the equitorial plane and the normal to the oblate spheroid reference surface at the given point (Duxbury and others, 2002).

CONTROL

Horizontal and vertical control was established using the Mosaicked Digital Image Model 2.0 (MDIM 2.0; Kirk and others, 2000) and MOLA data. A portion of MDIM 2.0 covering the map area was extracted in simple cylindrical projection. This MDIM image was georeferenced to the MOLA data with an affine transformation. The MDIM image and georeferencing information were imported into a digital photogrammetric workstation (Miller and Walker, 1993) and used as an orthophoto to provide horizontal control to stereopairs of Viking imagery. The horizontal information was used to extract vertical control from the MOLA data. Note that the distribution of Viking Orbiter images suitable for mapping at a scale of 1:500,000 is uneven. Areas mapped in this series are chosen, often in blocks of two or more adjacent quadrangles, based on scientific interest as well as on the availability of suitable data for accurate mapping.

CONTOURS

Contours were derived from a digital terrain model (DTM) compiled on a digital photogrammetric workstation using Viking Orbiter stereo image pairs with orientation parameters derived from an analytic aerotriangulation. Contours were drawn automatically using a commercial geographic information system (GIS) software package (Environmental Systems Research Institute, 1994). For stereomodels based on images from orbits 639 and 034, the local expected vertical precision based on image resolutions, parallax-to-height ratio (that is, convergence angle), and a matching accuracy of 0.2 pixel ranges from 81 m to 132 m with a mean of 99 m. Elevation (in meters) is given with respect to the adopted Mars topographic datum (see section named "Adopted Figure"). A comparison of the DTM with the MOLA grid shows that the DTM is on average 4.4 m lower than the MOLA points ($n=362{,}879$; $\mu=-1.2$ m; $\sigma=17.1$ m). Contour lines were generated automatically using GIS software and were not edited. Because the contour lines were not edited, small closed contour lines, contour lines that intersect, and contour lines that do not match features are present. The post spacing for most of the DTM is 600 m; features that are less than 600 m in size will not be resolved, and features that are smaller than 1,800 m in size may only have four elevation measurements associated with them. This lack of elevation measurements may result in contour lines that do not adequately represent some features. The purpose of this mapping project is to produce the digital orthophoto and DTM. This map provides a graphical representation of the digital products that are available.

IMAGE BASE

The image base for this map employs Viking Orbiter images from orbit 639. An orthophotomosaic was created on the digital photogrammetric workstation using the DTM compiled from stereo models. Integrated Software for Imagers and Spectrometers (ISIS; Torson and Becker, 1997) provided the software to project the orthophotomosaic into the transverse Mercator projection.

NOMENCLATURE

Names on this map are approved by the IAU. For a complete list of IAU-approved names, see the Gazetteer of Planetary Nomenclature at http://planetarynames.wr.usgs.gov.

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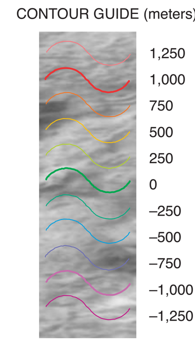
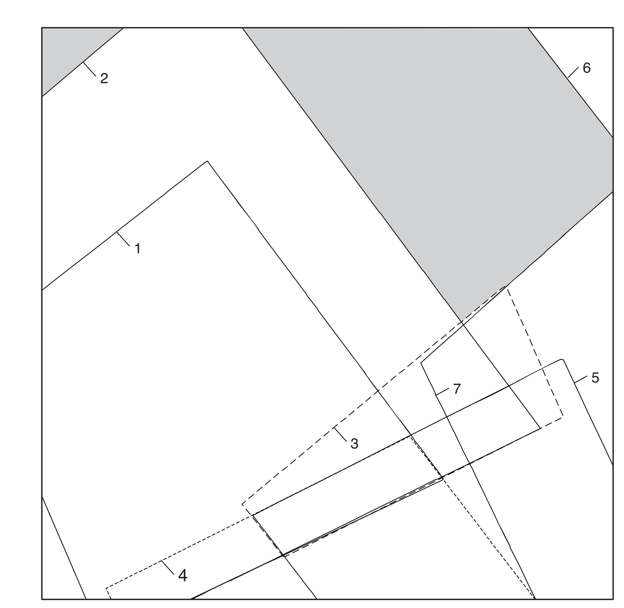
CONTOUR GUIDE (meters)

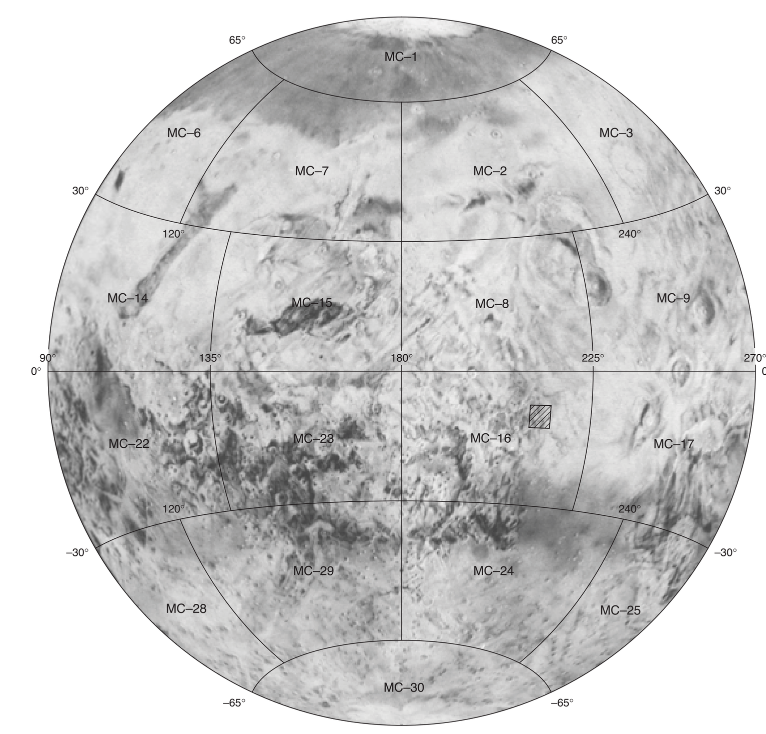




MTM –10/212E QUADRANGLE VIKING STEREOMODEL COVERAGE

Diagram of map area showing locations of stereo-image pairs used to produce the topographic information. Numbers on the diagram correspond to numbered stereo-image pairs listed below. Shaded area indicates MOLA data.

No.	IMAGE PAIR
1	639A10/034A52
2	639A10/034A56
3	639A10/034A58
4	639A12/034A52
5	639A12/034A58
6	639A31/608A82
7	639A33/034A58



QUADRANGLE LOCATION

Photomosaic showing location of map area. An outline of 1:5,000,000-scale quadrangles is provided for reference.

Prepared on behalf of the Planetary Geology and Geophysics Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration.

SCALE 1:502 000 (1 mm = 502 m) AT 210° E (150° W) LONGITUDE
TRANSVERSE MERCATOR PROJECTION

10 0 10 20 30 40 50 60 70 80 90 100 KILOMETERS

CONTOUR INTERVAL 250 METERS

Planetocentric latitude and east longitude coordinate system shown in black.
Planetographic latitude and west longitude coordinate system shown in red.

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Map compilation by M.R. Rosiek and B.L. Redding
Digital terrain model review by B.L. Redding and D.M. Galuszka
Nomenclature by J.S. Blue
Technical review by J. Zimbelmen and E. Howington-Kraus
Editing by J.L. Zigler
Cartography by D.A. Ryan
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Topographic Map of the Arimanes Rupes Region of Mars

MTM 500k –10/212E OMKT

By

Mark R. Rosiek, Bonnie L. Redding, and Donna M. Galuszka

2005

Available on World Wide Web at http://pubs.usgs.gov/sim/2005/2906