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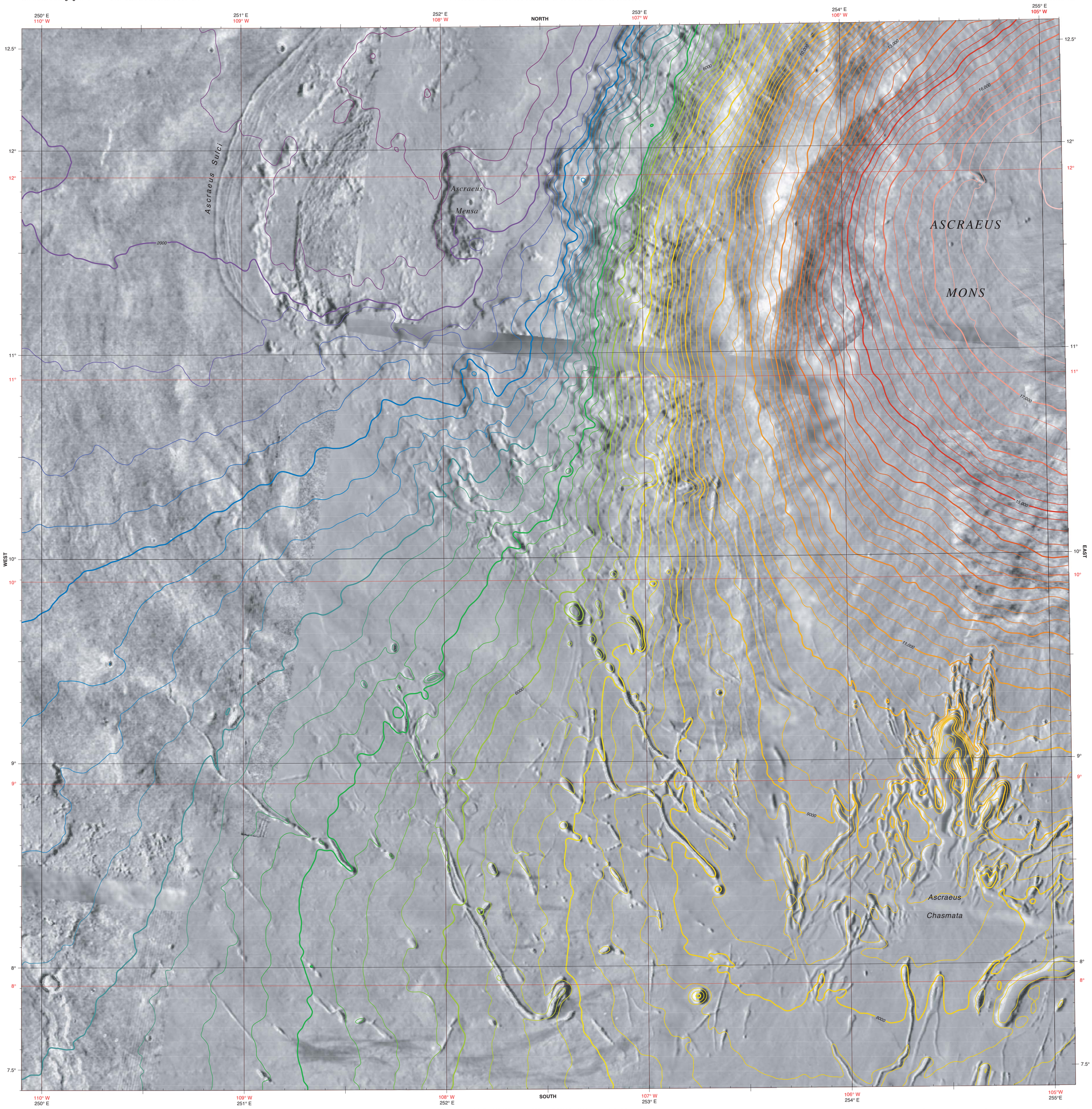

SCALE 1:502 000 (1 mm = 502 m) AT 250° E. (110° W.) LONGITUDE
TRANSVERSE MERCATOR PROJECTION

10 0 10 20 30 40 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.

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

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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 10/252E OMKT: Abbreviation for Mars Transverse Mercator; 1:500,000 series; center of sheet latitude 10° N., longitude 252.5° E. in planetocentric coordinate system (this corresponds to 10/107; latitude 10° N., longitude 107.5° 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 3396.0 km and a polar radius of 3376.8 km (Kirk and others, 2000). 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 sheet the central meridian is at 250° E. (110° 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 as allowed by IAU/IAG standards (Seidelmann and others, 2002) and in accordance with current NASA and USGS standards (Duxbury and others, 2002). A secondary grid (printed in 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.

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 mapping 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 the stereomodels, 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 32 m to 80 m, with a mean of 49 m. Elevation (in meters) is given with respect to the adopted Mars topographic datum (see "Adopted Figure" section). A comparison of the DTM values at the MOLA point locations shows that the DTM is on average 0.6 m lower than the MOLA points (n=242,913; μ=-0.6 m; σ=22 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 the DTM is 600 m; features that are less than 600 m in size will not be resolved and features that are smaller than 1800 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 orbits 090, 055, 892, 643, and 210. 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.

REFERENCES

Duxbury, T.C., Kirk, R.L., Archinal, B.A., and Neumann, G.A., 2002, Mars Geodesy/Cartography Working Group Recommendations on Mars Cartographic Constants and Coordinate Systems, *in* Joint International Symposium on Geospatial Theory, Processing and Applications, Ottawa, Canada, 2002, Commission IV, Working Group 9—Extraterrestrial Mapping, Proceedings: Ottawa, Canada, International Society for Photogrammetry and Remote Sensing [http://www.isprs.org/commission4/proceedings/paper.html].

Environmental Systems Research Institute, 1994, Arc commands: Redlands, Calif., Environmental Systems Research Institute, Inc.

Greeley, Ronald, and Batson, R.M., 1990, Planetary mapping: New York, Cambridge University Press, p. 261–276.

Kirk, R.L., Lee, E.M., Sucharski, R.M., Richie, J., Grecu, A., and Castro, S.K., 2000, MDIM 2.0—A revised global digital image mosaic of Mars, *in* Lunar and Planetary Science XXXI: Houston, Lunar and Planetary Institute, abstract 2011 [CD–ROM].

Miller, S.B., and Walker, A.S., 1993, Further developments of Leica Digital Photogrammetric Systems by Helava, ACSM/ASPRS Annual Convention and Exposition, Technical Papers, v. 3, p. 256–263.

Seidelmann, P.K. (chair), Abalakin, V.K., Bursa, M., Davies, M.E., De Bergh, C., Lieske, J.H., Oberst, J., Simon, J.L., Standish, E.M., Stooke, P., and Thomas, P.C., 2002, Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 2000: Celestial Mechanics and Dynamical Astronomy, v. 82, p. 83–110.

Smith, D.E., Zuber, M.T., Frey, H.V., Garvin, J.B., Head, J.W., Muhleman, D.O., Pettengill, G.H., Phillips, R.J., Solomon, S.C., Zwally, H.J., Banerdt, W.B., Duxbury, T.C., Golombek, M.P., Lemoine, F.G., Neumann, G.A., Rowlands, D.D., Aharonson, O., Ford, P.G., Ivanov, A.B., McGovern, P.J., Abshire, J.B., Afzal, R.S., and Sun, X., 2001, Mars Orbiter Laser Altimeter (MOLA)—Experiment summary after the first year of global mapping of Mars: Journal of Geophysical Research, v. 106, p. 23,689–23,722.

Torson, J.M., and Becker, K.J., 1997, ISIS—A software architecture for processing planetary images (abs.), *in* Lunar and Planetary Science Conference XXVIII: Houston, Lunar and Planetary Institute, p. 1443.

Contour Guide, in meters

18,000	9500
17,750	9250
17,500	9000
17,250	8750
17,000	8500
16,750	8250
16,500	8000
16,250	7750
16,000	7500
15,750	7250
15,500	7000
15,250	6750
15,000	6500
14,750	6250
14,500	6000
14,250	5750
14,000	5500
13,750	5250
13,500	5000
13,250	4750
13,000	4500
12,750	4250
12,500	4000
12,250	3750
12,000	3500
11,750	3250
11,500	3000
11,250	2750
11,000	2500
10,750	2250
10,500	2000
10,250	1750
10,000	1500
9750	1250

MTM 10/252E QUADRANGLE VIKING STEREOMODEL COVERAGE

The following is a list of image pairs used to produce the topographic information for this map. Numbers below correspond to the numbers on the diagram above. Shaded area indicates MOLA data.

ID	IMAGE PAIR	ID	IMAGE PAIR
1	090A42/055A22	23	210A56/210A08
2	090A42/055A23	24	210A57/210A07
3	090A43/055A23	25	210A57/210A09
4	090A44/055A22	26	210A58/210A08
5	090A44/055A23	27	210A58/210A10
6	090A45/055A23	28	210A59/210A09
7	090A45/055A25	29	210A59/210A11
8	090A46/055A23	30	210A60/210A10
9	090A46/055A25	31	210A60/210A12
10	090A48/055A24	32	210A61/210A11
11	090A48/055A25	33	210A63/210A13
12	090A50/055A25	34	892A07/643A49
13	210A02/210A52	35	892A09/643A76
14	210A04/210A52	36	892A09/643A78
15	210A04/210A54	37	892A11/643A75
16	210A06/210A54	38	892A27/643A51
17	210A06/210A56	39	892A28/643A49
18	210A12/210A62	40	892A28/643A51
19	210A53/210A03	41	892A29/643A51
20	210A53/210A05	42	892A30/643A78
21	210A55/210A05	43	892A31/643A78
22	210A55/210A07	44	892A32/643A78

QUADRANGLE LOCATION

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

Topographic Map of the Southwest Ascraeus Mons Region of Mars

MTM 500k 10/252E OMKT

By

U.S. Geological Survey

2004

Digital files available on World Wide Web at *http://geopubs.wr.usgs.gov/i-map/i2798*