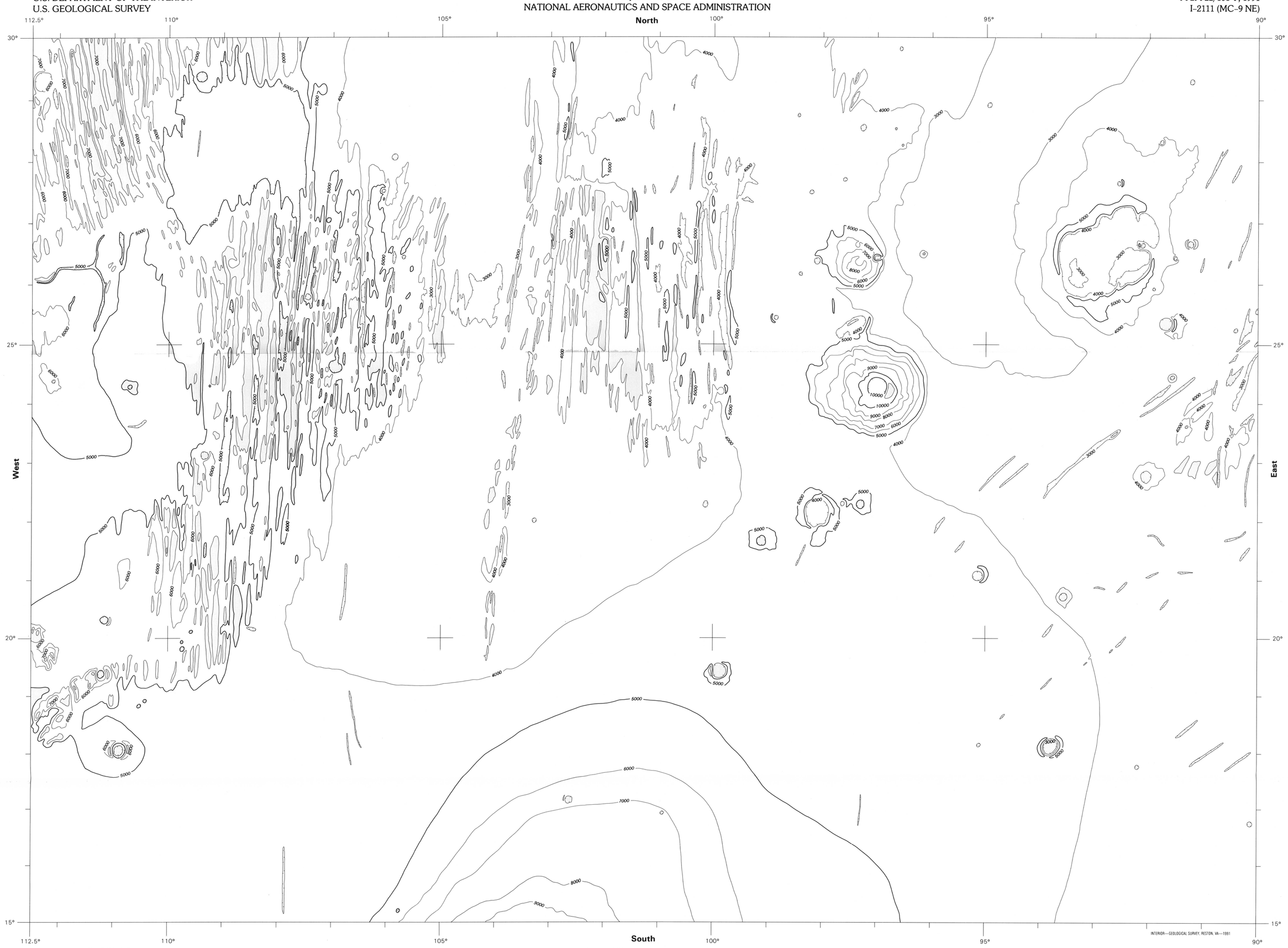
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF MARS
1:2,000,000 TOPOGRAPHIC SERIES
THARSIS NORTHEAST
M 2M 22/101 T, 1991
I–2111 (MC–9 NE)



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1991

NOTES ON BASE

This quadrangle is part of a series of topographic maps made from stereoscopic Viking Orbiter images.

ADOPTED FIGURE

The figure of Mars used for computation of the map projection is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3,393.4 km and a polar radius of 3,375.7 km.

PROJECTION

Mercator, Lambert Conformal Conic, and Polar Stereographic projections are used for this map series. The scale of the series is 1:2,000,000 at lat ±27.476° (Mercator), lat ±35.83° and ±59.17° (Lambert), and lat ±75.008° (Polar Stereographic). The projections have common scales of 1:1,952,947 at lat ±30° and 1:1,939,394 at lat ±65°.

CONTOURS

Contours were compiled on analytical stereoplotters that use stereoscopic Viking Orbiter pictures. The parameters for stereomodels were computed analytically, based on the adjusted positions and orientations of the spacecraft cameras (Wu and others, 1982). Horizontal and vertical controls were established by analytical photogrammetric aerotriangulation (Wu and Schafer, 1984), using the General Integral Analytical Triangulation (GIANT) program of the U.S. Geological Survey. Primary controls used in the control network include the Viking Orbiter Secondary Experiment Data Record, radio occultation measurements from Mariner 9 and Viking Missions (Kliore and others, 1973; Lindal and others, 1979), Earth-based radar observations (Downs and others, 1975), and the Mars primary control network of the Rand Corporation (Davies and others, 1978).

Elevation values (expressed in meters) are given with respect to the adopted Mars topographic datum. This datum is defined by a gravity field described in terms of fourth-order and fourth-degree spherical harmonics combined with a 6.1-millibar atmospheric pressure surface derived from Mariner 9 radio-occultation data (Lorell and others, 1972; Kliore and others, 1973; Wu, 1978, 1981).

Local mismatches between contour lines shown here and images on controlled photomosiacs are the result of improvements in control nets during the course of compilation. Estimated elevation accuracy is approximately 1 km (one contour interval).

REFERENCES

Davies, M.E., Katayama, F.Y., and Roth, J.A., 1978, Control net of Mars: February 1978: The Rand Corporation, R-2309-NASA, 91 p.

Downs, G.S., Reichley, P.E., and Green, R.R., 1975, Radar measurements of Martian topography and surface properties: Icarus, v. 26, no. 3, p. 273–312.

Kliore, A.J., Fjeldbo, Gunnar, Seidel, B.L., Sykes, M.J., and Woiceshyn, P.M., 1973, S band radio occultation measurements of the atmosphere and topography of Mars with Mariner 9: Extended mission coverage of polar and intermediate latitudes: Journal of Geophysical Research, v. 78, no. 20, p. 4331–4351.

Lindal, G.F., Hotz, H.B., Sweetnam, D.N., Shippony, Zvi, Brenkle, J.P., Hartsell, G.V., and Spear, R.T., 1979, Viking radio occultation measurements of the atmosphere and topography of Mars: Journal of Geophysical Research, v. 84, no. B14, p. 8443–8456.

Lorell, Jack, Born, G.H., Jordan, J.F., Laing, P.A., Martin, W.L., Sjogren, W.J., Shapiro, I.I., Reasenberg, R.D., and Slater, G.L., 1972, Mariner 9 celestial mechanics experiment: Gravity field and pole direction of Mars: Science, v. 175, no. 4019, p. 317–320.

Wu, S.S.C., 1978, Mars synthetic topographic mapping: Icarus, v. 33, no. 3, p. 417–440.

_____1981, A method of defining topographic datums of planetary bodies: Annales de Géophysique, AGEPA 7, tome 37, fascicule 1, p. 147–160.

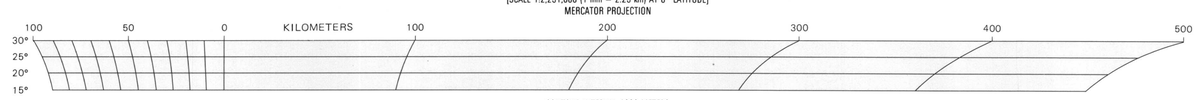
Wu, S.S.C., Elassal, A.A., Jordan, Raymond, and Schafer, F.J., 1982, Photogrammetric applications of Viking orbital photography: Planetary and Space Science, v. 30, no. 1, p. 45–55.

Wu, S.S.C., and Schafer, F.J., 1984, Mars control network, *in* Technical papers of the 50th annual meeting of the American Society of Photogrammetry, v. 2, Washington, D.C., March 11–16, 1984, p. 456–463.

NOTE TO USERS

Users noting errors or omissions are urged to indicate them on the map and to forward it to U.S. Geological Survey, Building 4, Room 412, 2255 North Gemini Drive, Flagstaff, AZ 86001. A replacement copy will be returned.

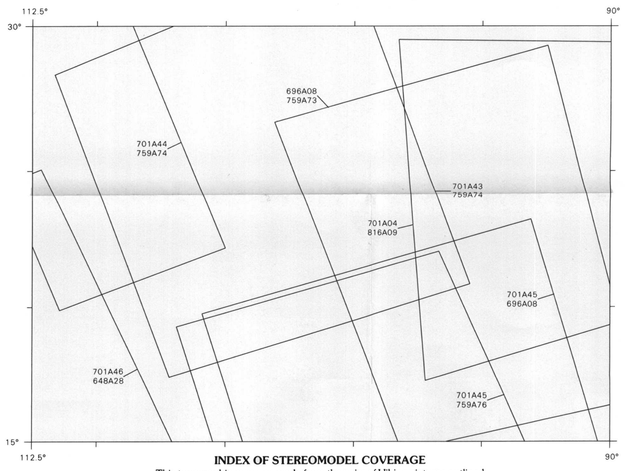
SCALE 1:2,000,000 (1 mm = 2 km) AT 27.476° LATITUDE
(SCALE 1:2,251,800 (1 mm = 2.25 km) AT 0° LATITUDE)
MERCATOR PROJECTION



CONTOUR INTERVAL 1000 METERS

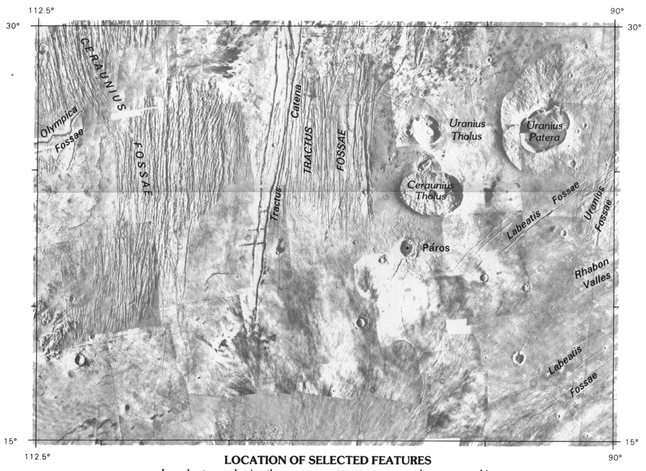
Prepared on behalf of the Planetary Geology Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration, under contract W–15,814

Manuscript approved for publication, November 3, 1989



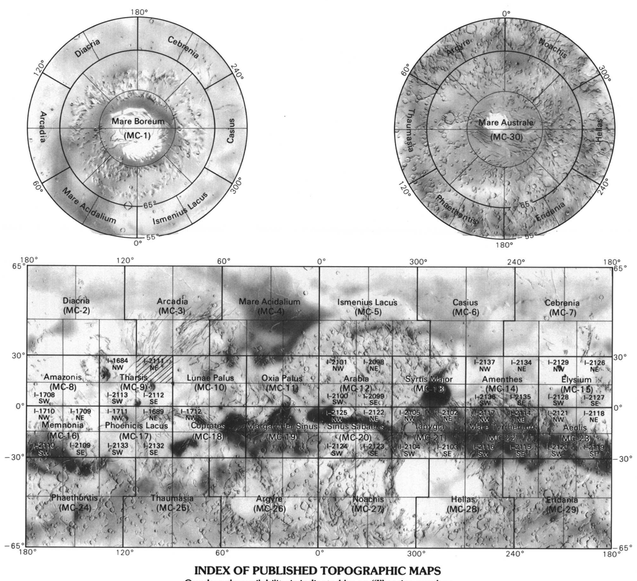
INDEX OF STEREOMODEL COVERAGE

This topographic map was made from the pairs of Viking pictures outlined above. Copies of various enhancements of these pictures are available from National Space Science Data Center, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771.



LOCATION OF SELECTED FEATURES

In order to emphasize the names, contrast was purposely suppressed in this reduced copy of the controlled photomosaic (I–1258) of this quadrangle. All names are approved by the International Astronomical Union.



INDEX OF PUBLISHED TOPOGRAPHIC MAPS

Quadrangle availability is indicated by an "I" series number

TOPOGRAPHIC MAP OF THE THARSIS NORTHEAST QUADRANGLE (MC–9 NE) OF MARS

1991

For sale by U.S. Geological Survey, Map Distribution, Box 25286, Federal Center, Denver, CO 80225