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

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF MARS
1:5,000,000 TOPOGRAPHIC SERIES
AEOLIS QUADRANGLE
M 5M –15/202 RN, 1999
I–2578 (MC–23) SHEET 1 OF 2

NOTES ON BASE

This map is one in a series covering the entire surface of Mars at a nominal scale of 1:5,000,000. The series was originally compiled from Mariner 9 data (Batson and others, 1979). The original shaded relief base was revised and augmented with image data from Viking Orbiter, but feature positions were not shifted to fit controls derived from Viking.

ADOPTED FIGURE

The figure of Mars used for the 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

The Mercator, Lambert Conformal Conic, and Polar Stereographic projections are used for this map series. The scale of the series is 1:5,000,000 at the equator. The projections have common scales of 1:4,336,000 at lat ±30° and 1:4,306,000 at lat ±65°. Standard parallels for the Lambert Conformal Conic projection are at lat ±35.8° and ±59.2°. Longitude increases to the west in accordance with astronomical convention for Mars. Latitude is planetographic.

CONTROL

Planimetric control of the shaded relief is provided by photogrammetric triangulation using Mariner 9 images (Davies, 1973; Davies and Arthur, 1973) and the radio-tracked position of the Mariner 9 spacecraft. The first meridian passes through the center of a small crater, Airy-O (lat 5.19° S., long 0°), within the crater Airy.

Primary controls used in the network include the Viking Orbiter Secondary Experiment Data Record, radio-occultation measurements from both Mariner 9 and Viking Missions (Lorell and others, 1972; Kliore and others, 1973; Lindal and others, 1979), Earth-based radar observations (Pettengill and others, 1971; Downs and others, 1975), and the Mars primary control network of the Rand Corporation (Davies and others, 1978).

MAPPING TECHNIQUE

Shaded relief was portrayed by photointerpretive methods described by Inge and Bridges (1976). Uniform sun illumination from the west was used throughout. The original rendition of feature positions, sizes, and shapes was taken from a controlled base mosaic of Mariner 9 images. Various computer enhancements of many Mariner 9 and Viking Orbiter images besides those in the base mosaic were examined in an attempt to portray the surface as accurately as possible.

Initial shaded relief analysis and representation were made by Jay L. Inge; revisions were made by Patricia G. Hagerty.

COLOR

No attempt was made on the map to duplicate precisely the color of the martian surface, although the color used may approximate it.

NOMENCLATURE

Names on this sheet are approved by the International Astronomical Union (IAU, 1974, 1977, 1980, 1986, 1992, 1999), except for provisional name, which is marked by an asterisk.

MC–23: Abbreviation for Mars Chart 23.

M 5M –15/202 RN: Abbreviation for Mars; 1:5,000,000 series; center of sheet, lat 15° S., long 202°; shaded relief map (R) with nomenclature (N).

REFERENCES

Batson, R.M., Bridges, P.M., and Inge, J.L., 1979, Atlas of Mars—The 1:5,000,000 map series: National Aeronautics and Space Administration Special Publication 438, 146 p.

Davies, M.E., 1973, Mariner 9—Primary control net: Photogrammetric Engineering, v. 39, no. 12, p. 1297–1302.

Davies, M.E., and Arthur, D.W.G., 1973, Martian surface coordinates: Journal of Geophysical Research, v. 78, no. 20, p. 4355–4394.

Davies, M.E., Katayama, F.Y., and Roth, J.A., 1978, Control net of Mars: February 1987: 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.

Inge, J.L., and Bridges, P.M., 1976, Applied photointerpretation for airbrush cartography: Photogrammetric Engineering and Remote Sensing, v. 42, no. 6, p. 749–760.

International Astronomical Union, 1974, Commission 16: Physical study of planets and satellites *and* Lunar and martian nomenclature, *in* Proceedings of the 15th General Assembly, Sydney, 1973: Transactions of the International Astronomical Union, v. 15B, p. 105–108, 207–221.

———1977, Working Group for Planetary System Nomenclature, *in* Proceedings of the 16th General Assembly, Grenoble, 1976: Transactions of the International Astronomical Union, v. 16B, p. 321–369.

———1980, Working Group for Planetary System Nomenclature, *in* Proceedings of the 17th General Assembly, Montreal, 1979: Transactions of the International Astronomical Union, v. 17B, p. 285–304.

———1986, Working Group for Planetary System Nomenclature, *in* Proceedings of the 19th General Assembly, New Delhi, 1985: Transactions of the International Astronomical Union, v. 19B, p. 339–353.

———1992, Working Group for Planetary System Nomenclature, *in* Proceedings of the 21st General Assembly, Buenos Aires, 1991: Transactions of the International Astronomical Union, v. 21B, p. 357–363.

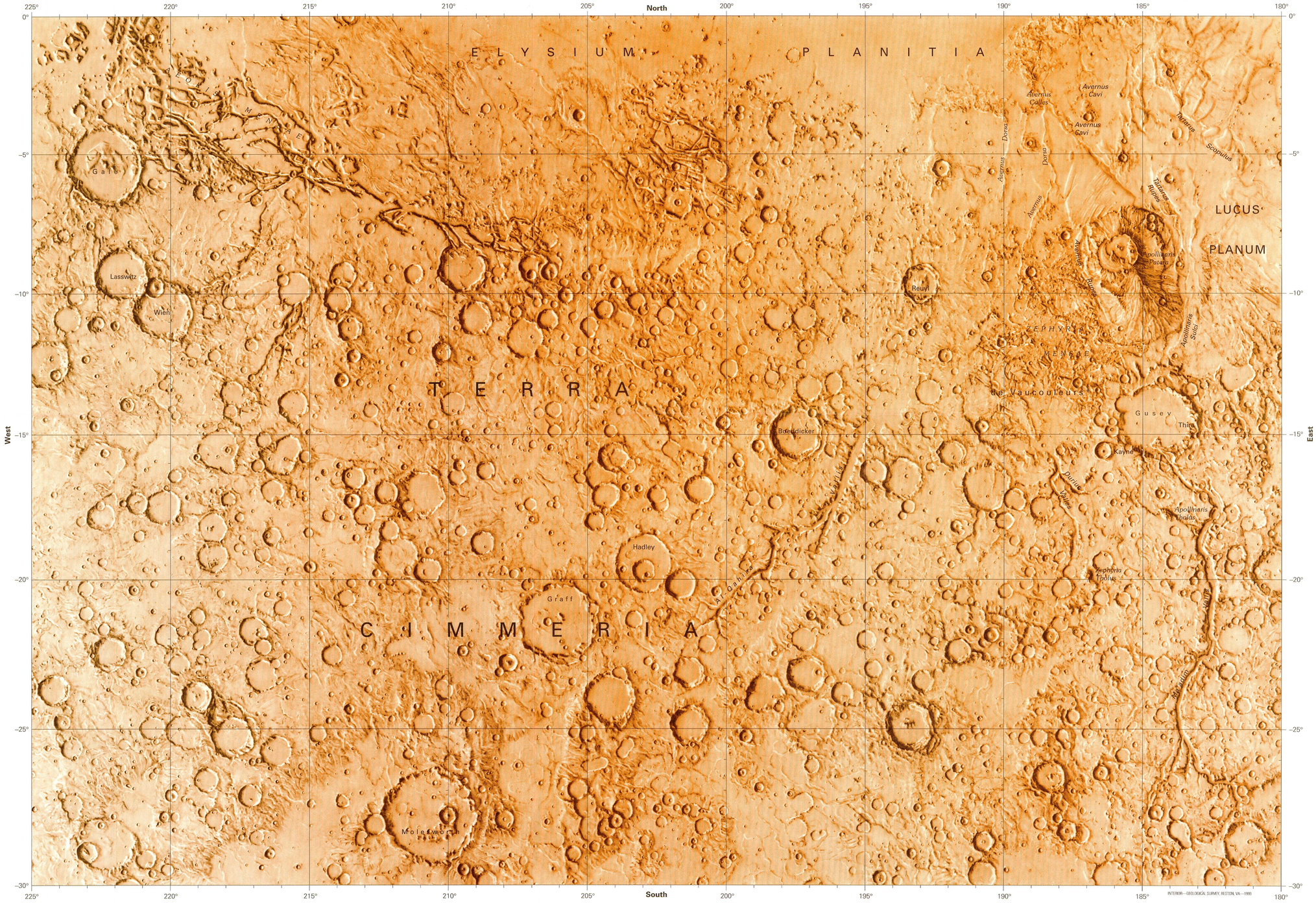
———1999, Working Group for Planetary System Nomenclature, *in* Proceedings of the 23rd General Assembly, Kyoto, 1997: Transactions of the International Astronomical Union, v. 23B, p. 231–251.

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.

Pettengill, G.H., Rogers, A.E.E., and Shapiro, I.I., 1971, Martian craters and a scarp as seen by radar: Science, v. 174, no. 4016, p. 1321–1324.



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1999

Shaded relief revised in January 1987 on behalf of the Planetary Geology Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration

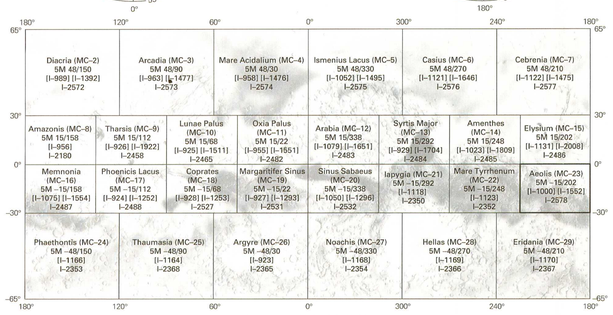
This map supersedes map I–1552

Edited by Derrick D. Hirsch; cartography by Darlene A. Casebier

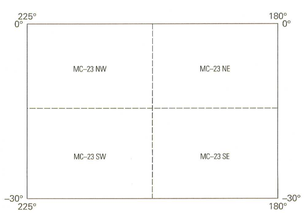
Manuscript approved for publication May 1, 1996

SCALE 1:5 000 000 (1 mm = 5 km) AT 0° LATITUDE
MERCATOR PROJECTION

0°
–10°
–20°
–30°
100 50 0 KILOMETERS 100 200 300 400 500 600 700 800 900 1000



QUADRANGLE LOCATION
Number preceded by I refers to published shaded relief map.
(Number in brackets refers to earlier map superseded by revised version.)



1:2,000,000-SCALE CONTROLLED PHOTOMOSAICS

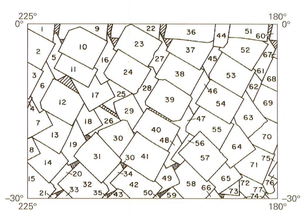
I–Series	Quadrangle
I–1213	MC–23 NW
I–1497	MC–23 NE
I–1214	MC–23 SW
I–1215	MC–23 SE

VIKING 1

Index No.	Picture No.	Index No.	Picture No.	Index No.	Picture No.
1	332A02	17	629A46	33	631A57
2	459A21	18	631A19	34	631A58
3	470A18	19	631A20	35	631A59
4	506A34	20	631A37	36	631A60
5	506A43	21	631A38	37	639A83
6	506A63	22	631A39	38	639A84
7	506A64	23	631A40	39	639A85
8	506A73	24	631A45	40	639A86
9	506A74	25	631A47	41	639A87
10	506A75	26	631A49	42	639A88
11	601A02	27	631A50	43	639A89
12	602A01	28	631A51	44	639A90
13	602A02	29	631A52	45	639A91
14	603A41	30	631A53	46	639A92
15	603A42	31	631A55	47	687A11
16	629A44	32	631A56		

INDEX OF VIKING SOURCES

This shaded relief map has been revised by utilizing 1:2,000,000-scale controlled photomosaics and supplementary 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.



A-camera pictures

Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.
1	7650823	21	9196709	41	7865863	61	8009783
2	7650473	22	7794603	42	6462713	62	8009793
3	7650403	23	7794753	43	6462643	63	8009843
4	7650333	24	7794183	44	12326301	64	8009573
5	9125169	25	7794113	45	9340639	65	8009503
6	9125099	26	7794043	46	9340769	66	8009433
7	9125029	27	9268949	47	9340699	67	6606983
8	9124959	28	9268879	48	9340629	68	6606913
9	7722713	29	9268809	49	9340559	69	6606843
10	7722383	30	9268739	50	9340489	70	6606773
11	7722293	31	6390893	51	7938383	71	6606703
12	7722223	32	6390823	52	7938033	72	5203483
13	7752153	33	6390753	53	7937963	73	9494199
14	6318003	34	9268669	54	7937893	74	9412726
15	6318933	35	9268599	55	7937823	75	8881393
16	9197059	36	7866493	56	7937753	76	6678593
17	9196989	37	7866143	57	6534673	77	5275373
18	9196919	38	7866073	58	6534603		
19	9196849	39	7866003	59	6534533		
20	9196779	40	7865933	60	6607333		

INDEX OF MARINER 9 PICTURES

The mosaic used to control the positioning of features on this map was made with the Mariner 9 A-camera pictures outlined above. Useful coverage is not available in the crosshatched areas. The DAS number may vary slightly (usually by 5) among different versions of the same picture.

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 450, 2255 North Gemini Drive, Flagstaff, Arizona 86001. A replacement copy will be returned.

REVISED SHADED RELIEF MAP OF THE AEOLIS QUADRANGLE (MC–23) OF MARS

1999

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

ISBN 0-607-93230-9

20%
TOTAL RECOVERED FIBER