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
CEBRENIA QUADRANGLE
M 5M 48/210 RN, 1999
I–2577 (MC–7) 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 based on Viking Orbiter data were made by Patricia M. Bridges; revisions were made by Barbara J. Hall.

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, 1980, 1983, 1986, 1992).

MC–7: Abbreviation for Mars Chart 7.

M 5M 48/210 RN: Abbreviation for Mars; 1:5,000,000 series; center of sheet, lat 48° N., long 210°; 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.

———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.

———1983, Working Group for Planetary System Nomenclature, *in* Proceedings of the 18th General Assembly, Patras, 1982: Transactions of the International Astronomical Union, v. 18B, p. 331–346.

———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.

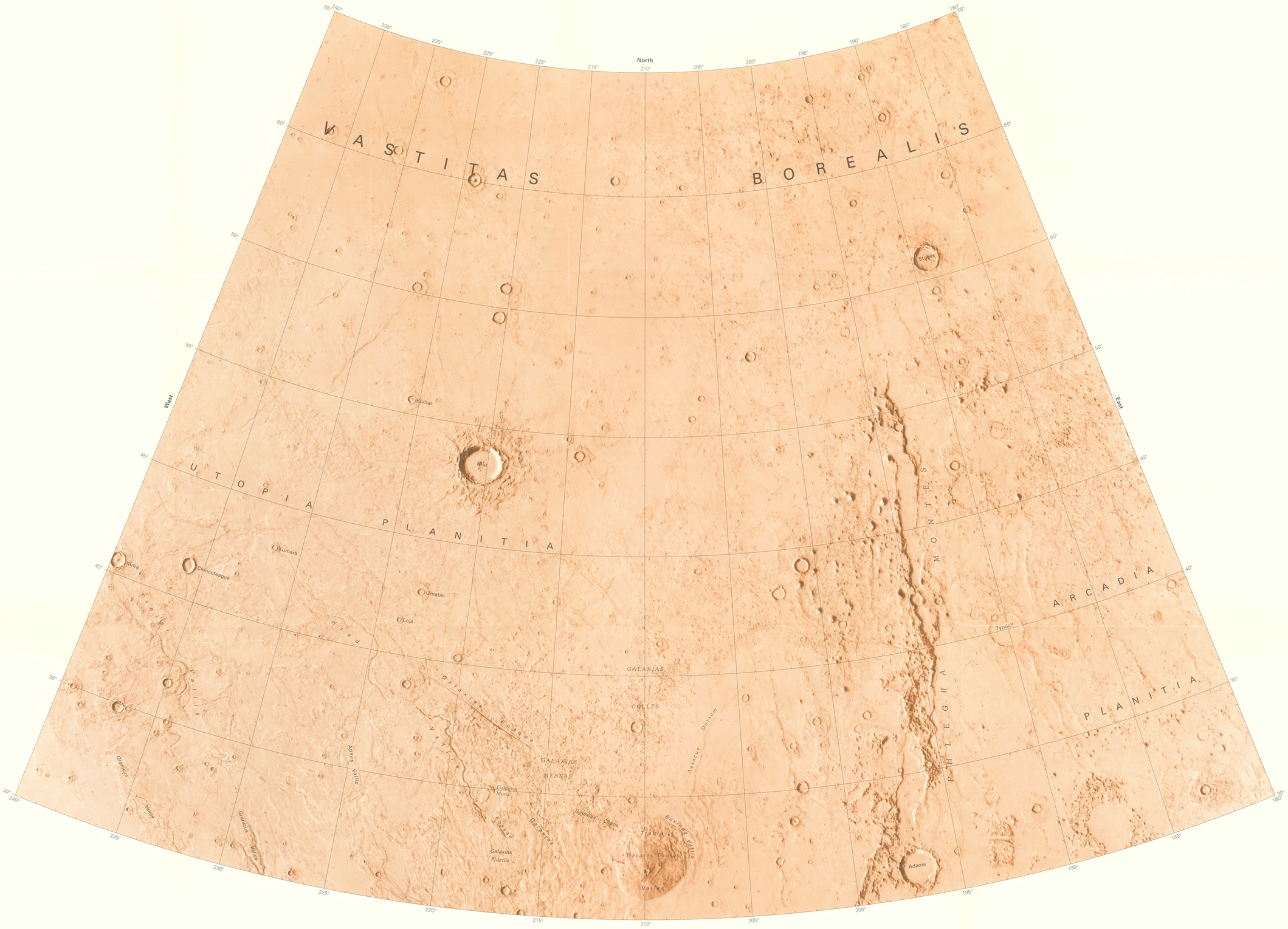
———1992, Working Group for Planetary System Nomenclature, *in* Proceedings of the 21st General Assembly, Buenos Aires, 1991: Transactions of the International Astronomical Union, v. 21B, p. 357–363.

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.



SCALE 1 : 4 336 000 (1 mm = 4.336 km) AT 30° LATITUDE
LAMBERT CONFORMAL CONIC PROJECTION

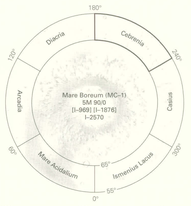
INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1999

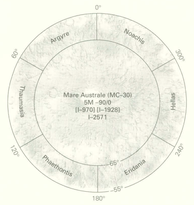
Shaded relief revised in May 1991 on behalf of the Planetary Geology Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration.

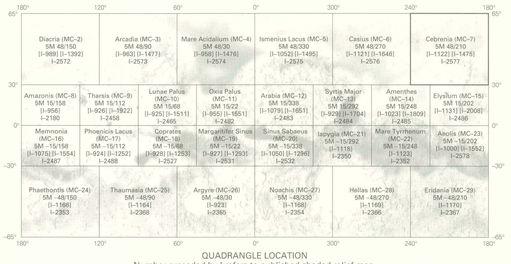
This map supersedes I–1475

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

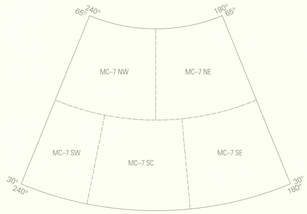
Manuscript approved for publication April 11, 1996





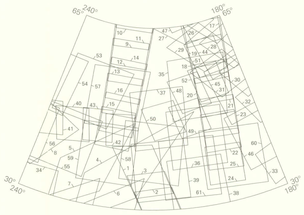


QUADRANGLE LOCATION
Number preceded by I refers to published shaded relief map.
(Number in brackets refers to earlier map superseded by revised version.)



1:2,000,000-SCALE CONTROLLED PHOTOMOSAICS

I–Series	Quadrangle
I–1521	MC–7 NW
I–1397	MC–7 NE
I–1564	MC–7 SW
I–1398	MC–7 SC
I–1399	MC–7 SE



VIKING 1

Index No.	Picture No.	Index No.	Picture No.	Index No.	Picture No.
1	470A06	22	771A33	43	807A34
2	470A08	23	771A34	44	808A24
3	470A09	24	771A35	45	808A26
4	704A81	25	771A36	46	808A28
5	704A62	26	776A25	47	810A03
6	704A63	27	776A26	48	810A09
7	704A64	28	776A27	49	810A11
8	723A78	29	776A28	50	810A12
9	768A09	30	776A29	51	810A28
10	768A10	31	776A30	52	810A30
11	768A11	32	776A31	53	838A05
12	768A12	33	776A35	54	838A06
13	768A13	34	802A01	55	838A07
14	768A14	35	805A03	56	838A08
15	768A15	36	805A05	57	840A18
16	768A16	37	805A06	58	840A19
17	771A27	38	805A07	59	840A20
18	771A29	39	805A08	60	842A07
19	771A30	40	807A13	61	842A08
20	771A31	41	807A14		
21	771A32	42	807A33		

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.
1	9270214	14	8838944
2	9198334	15	9198694
3	9126434	16	12152807
4	9054544	17	12152467
5	8982658	18	8982934
6	8910694	19	11976729
7	8838694	20	8609694
8	9270354	21	8767126
9	9198464	22	9198464
10	9126574	23	12152897
11	9054694	24	11973009
12	8982794	25	11800151
13	8910834	26	11976589

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 454, 2255 North Gemini Drive, Flagstaff, Arizona 86001. A replacement copy will be returned.

REVISED SHADED RELIEF MAP OF THE CEBRENIA QUADRANGLE (MC–7) OF MARS

1999

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