

NOTE ON SCALE
The 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 (Barnes and others, 1976). The original shaded relief base was revised and augmented with image data from Viking Orbiter. See feature positions were not shifted to coincide around from Viking.

ADOPTED COLOR
The colors of Mars used for the compilation of this map projection are an average spectral radiance of 0.1700 with an equivalent value of 3,293.4 km and a color index of 3.275.7 km.

PROJECTION
The Mariner, Landmark Geocentric Cone, and Polar Stereographic projections are used for this map series. The scale of the series is 1:5,000,000 at the equator. The projection has constant scales of 1:4,536,000 at 10° N and 1:4,306,000 at 90° N. Standard parallels for the Landmark Geocentric Cone projection are at 10° N and 100° E. Longitude increases by the use of a coordinate with astronomical convention for Mars. Latitude is a geocentric coordinate.

CONTROL
Photometric control of the shaded relief is provided by photometric stereo images using Mariner 9 images (Barnes, 1973; Barnes and others, 1976) and the radiometric positions of the Viking 9 network. The first coordinate system through the center of a small circle, Ray 0 to 5.19° N, long 91° W, within the study area. Primary control used in the series include the Viking Orbiter Secondary Experiment Data Record, radio-occultation traverse tracks from both Mariner 9 and Viking Marsens Land and others, 1973; Barnes and others, 1973; Linder and others, 1978; Earth-based radio observations (Petrovich and others, 1977; Doser and others, 1978); and the Mars primary control network of the Mars Geodesy Experiment and others, 1978.

MAPPING TECHNIQUE
Shaded relief was produced by photostereographic methods described by Sage and Bridges (1976). Uniformity in illumination from the sun was used throughout. The original positions of feature positions, size, and shape was taken from a controlled base image of Mariner 9 images. Various computer algorithms of many Mariner 9 and Viking Orbiter images provide those in the base image were corrected in an attempt to portray the surface as accurately as possible.

Total shaded relief analysis and representation based on Viking Orbiter data were made by Patricia M. Bridges; contours were made by Barbara J. Hall.

COLOR
The color was made on the map to duplicate accurately the color of the Martian surface, although the color used may approximate it.

NOMENCLATURE
Names on this map are approved by the International Astronomical Union (IAU), 1976, 1977, 1980, 1986, 1992, 1996, except for provisional names which is noted by an asterisk.

SCALE
M 5M -90/0 REV. Abbreviation for Mars, 1:5,000,000 series, scale of sheet, 1:5,000,000. Long 91° W, shaded in red and 90° W, unshaded.

REFERENCES
Barnes, R.W., Bridges, P.M., and Sage, J.L., 1976, Atlas of Mars: The 1:5,000,000 map series. National Aeronautics and Space Administration Special Publication 418, 144 p.

Doser, G.L., 1973, Mariner 9 stereo control net. Photogrammetric Engineering, v. 39, no. 12, p. 1291-1292.

Doser, G.L., and others, 1973, Mariner 9 stereo control net. Journal of Geophysical Research, v. 78, no. 20, p. 4232-4236.

Doser, G.L., Kuznetsov, T.V., and Roth, J.A., 1978, Control net of Mars. February 1987, The Rand Corporation, R-2808-NASA, 92 p.

Doser, G.L., Rastbury, P.L., and Green, R.R., 1975, Radar cross sections of Martian topography and surface properties. Science, v. 20, no. 3, p. 273-275.

Hart, J.L., and Bridges, P.M., 1976, Applied photogrammetry for aerial topography. Photogrammetric Engineering and Remote Sensing, v. 42, no. 8, p. 1487-1491.

International Astronomical Union, 1974, Convention 16: Physical study of planets and satellites of Mars and other inner planets. In Proceedings of the 15th General Assembly, Sydney, 1973. Transactions of the International Astronomical Union, v. 108, p. 300-308, 307-321.

1975, Working Group for Planetary System Nomenclature. In Proceedings of the 14th General Assembly, Geneva, 1974. Transactions of the International Astronomical Union, v. 104, p. 301-305, 311-316, 323-326.

1976, Working Group for Planetary System Nomenclature. In Proceedings of the 15th General Assembly, New Delhi, 1975. Transactions of the International Astronomical Union, v. 106, p. 329-333.

1978, Working Group for Planetary System Nomenclature. In Proceedings of the 16th General Assembly, Buenos Aires, 1977. Transactions of the International Astronomical Union, v. 110, p. 357-361.

1979, Working Group for Planetary System Nomenclature. In Proceedings of the 17th General Assembly, Moscow, 1978. Transactions of the International Astronomical Union, v. 114, p. 387-391.

1980, Working Group for Planetary System Nomenclature. In Proceedings of the 18th General Assembly, Prague, 1979. Transactions of the International Astronomical Union, v. 118, p. 405-411.

1981, Working Group for Planetary System Nomenclature. In Proceedings of the 19th General Assembly, Bonn, 1980. Transactions of the International Astronomical Union, v. 122, p. 431-435.

1982, Working Group for Planetary System Nomenclature. In Proceedings of the 20th General Assembly, Baltimore, 1981. Transactions of the International Astronomical Union, v. 126, p. 467-471.

1983, Working Group for Planetary System Nomenclature. In Proceedings of the 21st General Assembly, Buenos Aires, 1982. Transactions of the International Astronomical Union, v. 130, p. 497-501.

1984, Working Group for Planetary System Nomenclature. In Proceedings of the 22nd General Assembly, Toronto, 1983. Transactions of the International Astronomical Union, v. 134, p. 531-535.

1985, Working Group for Planetary System Nomenclature. In Proceedings of the 23rd General Assembly, Moscow, 1984. Transactions of the International Astronomical Union, v. 138, p. 561-565.

1986, Working Group for Planetary System Nomenclature. In Proceedings of the 24th General Assembly, Beijing, 1985. Transactions of the International Astronomical Union, v. 142, p. 591-595.

1987, Working Group for Planetary System Nomenclature. In Proceedings of the 25th General Assembly, Kyoto, 1986. Transactions of the International Astronomical Union, v. 146, p. 617-621.

1988, Working Group for Planetary System Nomenclature. In Proceedings of the 26th General Assembly, Moscow, 1987. Transactions of the International Astronomical Union, v. 150, p. 643-647.

1989, Working Group for Planetary System Nomenclature. In Proceedings of the 27th General Assembly, Beijing, 1988. Transactions of the International Astronomical Union, v. 154, p. 675-679.

1990, Working Group for Planetary System Nomenclature. In Proceedings of the 28th General Assembly, Moscow, 1989. Transactions of the International Astronomical Union, v. 158, p. 701-705.

1991, Working Group for Planetary System Nomenclature. In Proceedings of the 29th General Assembly, Moscow, 1990. Transactions of the International Astronomical Union, v. 162, p. 727-731.

1992, Working Group for Planetary System Nomenclature. In Proceedings of the 30th General Assembly, Moscow, 1991. Transactions of the International Astronomical Union, v. 166, p. 759-763.

1993, Working Group for Planetary System Nomenclature. In Proceedings of the 31st General Assembly, Moscow, 1992. Transactions of the International Astronomical Union, v. 170, p. 791-795.

1994, Working Group for Planetary System Nomenclature. In Proceedings of the 32nd General Assembly, Moscow, 1993. Transactions of the International Astronomical Union, v. 174, p. 823-827.

1995, Working Group for Planetary System Nomenclature. In Proceedings of the 33rd General Assembly, Moscow, 1994. Transactions of the International Astronomical Union, v. 178, p. 855-859.

1996, Working Group for Planetary System Nomenclature. In Proceedings of the 34th General Assembly, Moscow, 1995. Transactions of the International Astronomical Union, v. 182, p. 887-891.

1997, Working Group for Planetary System Nomenclature. In Proceedings of the 35th General Assembly, Moscow, 1996. Transactions of the International Astronomical Union, v. 186, p. 919-923.

1998, Working Group for Planetary System Nomenclature. In Proceedings of the 36th General Assembly, Moscow, 1997. Transactions of the International Astronomical Union, v. 190, p. 951-955.

1999, Working Group for Planetary System Nomenclature. In Proceedings of the 37th General Assembly, Moscow, 1998. Transactions of the International Astronomical Union, v. 194, p. 983-987.

2000, Working Group for Planetary System Nomenclature. In Proceedings of the 38th General Assembly, Moscow, 1999. Transactions of the International Astronomical Union, v. 198, p. 1015-1019.

2001, Working Group for Planetary System Nomenclature. In Proceedings of the 39th General Assembly, Moscow, 2000. Transactions of the International Astronomical Union, v. 202, p. 1047-1051.

2002, Working Group for Planetary System Nomenclature. In Proceedings of the 40th General Assembly, Moscow, 2001. Transactions of the International Astronomical Union, v. 206, p. 1079-1083.

2003, Working Group for Planetary System Nomenclature. In Proceedings of the 41st General Assembly, Moscow, 2002. Transactions of the International Astronomical Union, v. 210, p. 1111-1115.

2004, Working Group for Planetary System Nomenclature. In Proceedings of the 42nd General Assembly, Moscow, 2003. Transactions of the International Astronomical Union, v. 214, p. 1143-1147.

2005, Working Group for Planetary System Nomenclature. In Proceedings of the 43rd General Assembly, Moscow, 2004. Transactions of the International Astronomical Union, v. 218, p. 1175-1179.

2006, Working Group for Planetary System Nomenclature. In Proceedings of the 44th General Assembly, Moscow, 2005. Transactions of the International Astronomical Union, v. 222, p. 1207-1211.

2007, Working Group for Planetary System Nomenclature. In Proceedings of the 45th General Assembly, Moscow, 2006. Transactions of the International Astronomical Union, v. 226, p. 1239-1243.

2008, Working Group for Planetary System Nomenclature. In Proceedings of the 46th General Assembly, Moscow, 2007. Transactions of the International Astronomical Union, v. 230, p. 1271-1275.

2009, Working Group for Planetary System Nomenclature. In Proceedings of the 47th General Assembly, Moscow, 2008. Transactions of the International Astronomical Union, v. 234, p. 1303-1307.

2010, Working Group for Planetary System Nomenclature. In Proceedings of the 48th General Assembly, Moscow, 2009. Transactions of the International Astronomical Union, v. 238, p. 1335-1339.

2011, Working Group for Planetary System Nomenclature. In Proceedings of the 49th General Assembly, Moscow, 2010. Transactions of the International Astronomical Union, v. 242, p. 1367-1371.

2012, Working Group for Planetary System Nomenclature. In Proceedings of the 50th General Assembly, Moscow, 2011. Transactions of the International Astronomical Union, v. 246, p. 1399-1403.

2013, Working Group for Planetary System Nomenclature. In Proceedings of the 51st General Assembly, Moscow, 2012. Transactions of the International Astronomical Union, v. 250, p. 1431-1435.

2014, Working Group for Planetary System Nomenclature. In Proceedings of the 52nd General Assembly, Moscow, 2013. Transactions of the International Astronomical Union, v. 254, p. 1463-1467.

2015, Working Group for Planetary System Nomenclature. In Proceedings of the 53rd General Assembly, Moscow, 2014. Transactions of the International Astronomical Union, v. 258, p. 1495-1499.

2016, Working Group for Planetary System Nomenclature. In Proceedings of the 54th General Assembly, Moscow, 2015. Transactions of the International Astronomical Union, v. 262, p. 1527-1531.

2017, Working Group for Planetary System Nomenclature. In Proceedings of the 55th General Assembly, Moscow, 2016. Transactions of the International Astronomical Union, v. 266, p. 1559-1563.

2018, Working Group for Planetary System Nomenclature. In Proceedings of the 56th General Assembly, Moscow, 2017. Transactions of the International Astronomical Union, v. 270, p. 1591-1595.

2019, Working Group for Planetary System Nomenclature. In Proceedings of the 57th General Assembly, Moscow, 2018. Transactions of the International Astronomical Union, v. 274, p. 1623-1627.

2020, Working Group for Planetary System Nomenclature. In Proceedings of the 58th General Assembly, Moscow, 2019. Transactions of the International Astronomical Union, v. 278, p. 1655-1659.

2021, Working Group for Planetary System Nomenclature. In Proceedings of the 59th General Assembly, Moscow, 2020. Transactions of the International Astronomical Union, v. 282, p. 1687-1691.

2022, Working Group for Planetary System Nomenclature. In Proceedings of the 60th General Assembly, Moscow, 2021. Transactions of the International Astronomical Union, v. 286, p. 1719-1723.

2023, Working Group for Planetary System Nomenclature. In Proceedings of the 61st General Assembly, Moscow, 2022. Transactions of the International Astronomical Union, v. 290, p. 1751-1755.

2024, Working Group for Planetary System Nomenclature. In Proceedings of the 62nd General Assembly, Moscow, 2023. Transactions of the International Astronomical Union, v. 294, p. 1783-1787.

2025, Working Group for Planetary System Nomenclature. In Proceedings of the 63rd General Assembly, Moscow, 2024. Transactions of the International Astronomical Union, v. 298, p. 1815-1819.

2026, Working Group for Planetary System Nomenclature. In Proceedings of the 64th General Assembly, Moscow, 2025. Transactions of the International Astronomical Union, v. 302, p. 1847-1851.

2027, Working Group for Planetary System Nomenclature. In Proceedings of the 65th General Assembly, Moscow, 2026. Transactions of the International Astronomical Union, v. 306, p. 1879-1883.

2028, Working Group for Planetary System Nomenclature. In Proceedings of the 66th General Assembly, Moscow, 2027. Transactions of the International Astronomical Union, v. 310, p. 1911-1915.

2029, Working Group for Planetary System Nomenclature. In Proceedings of the 67th General Assembly, Moscow, 2028. Transactions of the International Astronomical Union, v. 314, p. 1943-1947.

2030, Working Group for Planetary System Nomenclature. In Proceedings of the 68th General Assembly, Moscow, 2029. Transactions of the International Astronomical Union, v. 318, p. 1975-1979.

2031, Working Group for Planetary System Nomenclature. In Proceedings of the 69th General Assembly, Moscow, 2030. Transactions of the International Astronomical Union, v. 322, p. 2007-2011.

2032, Working Group for Planetary System Nomenclature. In Proceedings of the 70th General Assembly, Moscow, 2031. Transactions of the International Astronomical Union, v. 326, p. 2039-2043.

2033, Working Group for Planetary System Nomenclature. In Proceedings of the 71st General Assembly, Moscow, 2032. Transactions of the International Astronomical Union, v. 330, p. 2071-2075.

2034, Working Group for Planetary System Nomenclature. In Proceedings of the 72nd General Assembly, Moscow, 2033. Transactions of the International Astronomical Union, v. 334, p. 2103-2107.

2035, Working Group for Planetary System Nomenclature. In Proceedings of the 73rd General Assembly, Moscow, 2034. Transactions of the International Astronomical Union, v. 338, p. 2135-2139.

QUADRANGLE LOCATION
Number preceded by 1 refers to published shaded relief map. Number in brackets refers to earlier map superseded by revised version.

NOTE TO USERS
Users using areas on this map are advised to indicate Mars on the map and to forward it to U.S. Geological Survey, Building 4, Reston, VA 20192. Users should indicate the map series, sheet, and revision number on the map.

A reproduction copy will be returned.

1999

1999

INDEX OF MARINER 9 PICTURES
The mosaic used to correct the positions of features on this map was made with the Mariner 9 A-camera pictures outlined above. The SAS number may vary slightly locally by 51 among different versions of the same picture.

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.

For more U.S. Geological Survey information contact the National Center for Earthquake Information Service, Reston, VA 20192.

1999

1999

1999

INDEX OF VIKING SOURCES
This shaded relief map has been revised by utilizing 1,200,000 bytes corrected photostereograms and supplementary Viking pictures outlined above. Copies of new data enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD, 20771.