DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF MARS
1:5,000,000 TOPOGRAPHIC SERIES
LUNAE PALUS QUADRANGLE
M 5M 15/68 RMC, 1976
I-971 (MC-10)

NOTES ON BASE

This is one map in a series of topographic map sheets covering the entire surface of Mars at nominal scales of 1:25,000,000 and 1:5,000,000 (Batson, 1973). The major source of map data was the Mariner 9 television experiment (Masursky and others, 1970).

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 3393.4 km and a polar radius of 3375.7 km.

PROJECTION

The Mercator projection is used for this sheet, with a scale of 1:5,000,000 at the equator and 1:4,336,000 at lat 30°. Longitudes increase to the west in accordance with usage of the International Astronomical Union (IAU, 1971). Latitudes are areographic (de Vaucouleurs and others, 1973).

CONTROL

Planimetric control is provided by photogrammetric triangulation using Mariner 9 pictures (Davies, 1973; Davies and Arthur, 1973) and the radio-tracked position of the spacecraft. The first meridian passes through the crater Airy-O (lat 5.19° S) within the crater Airy. No simple statement is possible for the precision, but local consistency is 5-15 km.

MAPPING TECHNIQUE

A series of mosaics of Mercator projections of Mariner 9 pictures was assembled at 1:5,000,000.

Shaded relief was copied from the mosaics and portrayed with uniform illumination with the sun to the west. Many Mariner 9 pictures besides those in the base mosaic were examined to improve the portrayal (Levinthal and others, 1973). The shading is not generalized and may be interpreted with photographic reliability (Inge, 1972).

Shaded relief analysis and representation were made by Susan L. Davis.

ALBEDO MARKINGS

The markings superimposed on the shaded relief were hand copied from pictures that were computer enhanced especially to show low frequency tone variation (Batson and Inge, 1976). The surface in these pictures is illuminated from a variety of angles from the camera line of sight. The markings therefore delineate boundaries of local brightness variations only and should not be considered as a true measure of albedo. No attempt was made to use Earth based telescopic albedo data.

Airbrush portrayal of albedo markings was done by Patricia M. Bridges.

CONTOURS

Since Mars has no seas and hence no sea level, the datum (the 0 km contour line) for altitudes is defined by a gravity field described by spherical harmonics of fourth order and fourth degree (Jordan and Lorell, 1973) combined with a 6.1 millibar atmospheric pressure surface derived from radio-occultation data (Kliore and others, 1973; Christensen 1975). This datum is a triaxial ellipsoid with semi-major axes of A=3394.6 km, B=3393.3 km, and a semi-minor axis of C=3376.3 km. The semi-major axis A intersects the Martian surface at long 105°.

The contour lines (Wu, 1975) were compiled from Earth-based radar determinations (Downs and others, 1971; Pettengill and others, 1971) and measurements made by Mariner 9 instrumentation, including the ultraviolet spectrometer (Hord and others, 1974), infrared interferometer spectrometer (Conrath and others, 1973), and stereoscopic Mariner 9 television pictures (Wu and others, 1973).

Formal analysis of contour-line accuracy has not been made. The estimated vertical accuracy of each source of data indicates a probable error of 1-2 km.

COLOR

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

NOMENCLATURE

All names on this sheet are approved by the International Astronomical Union (IAU, 1974; Millman, written communication, 1975), except the following name which is provisional: Sacra Fossa. Double and triple letter designations for craters refer to position on the map. Some craters have commemorative names; letter designations for these craters are shown in parentheses. Where craters lie mostly on an adjoining map, their letters are derived from the other map; where craters lie exactly on the boundary of two maps, their letters are derived from the eastern or southern map.

MC-10: Abbreviation for Mars Chart 10.
M 5M 15/68 RMC: Abbreviation for Mars 1:5,000,000 series; center of sheet, 15° latitude, 68° longitude; shaded relief map, R, with albedo markings, M, and contours, C.

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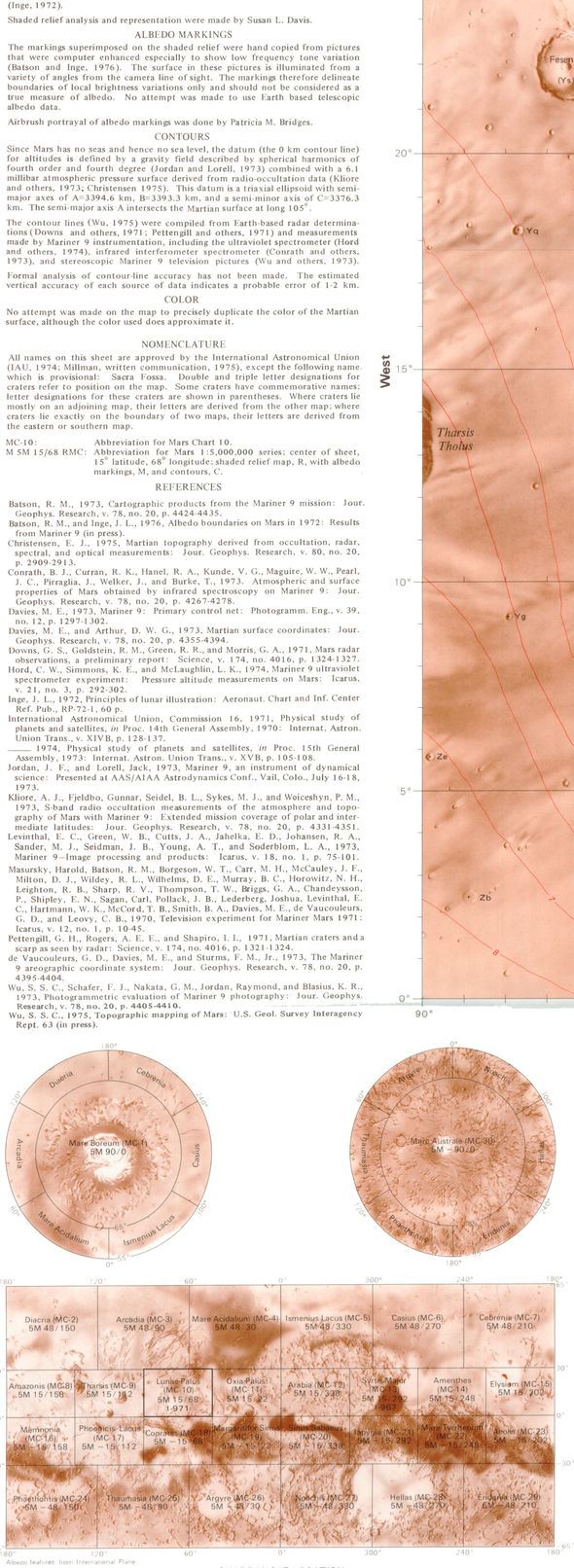
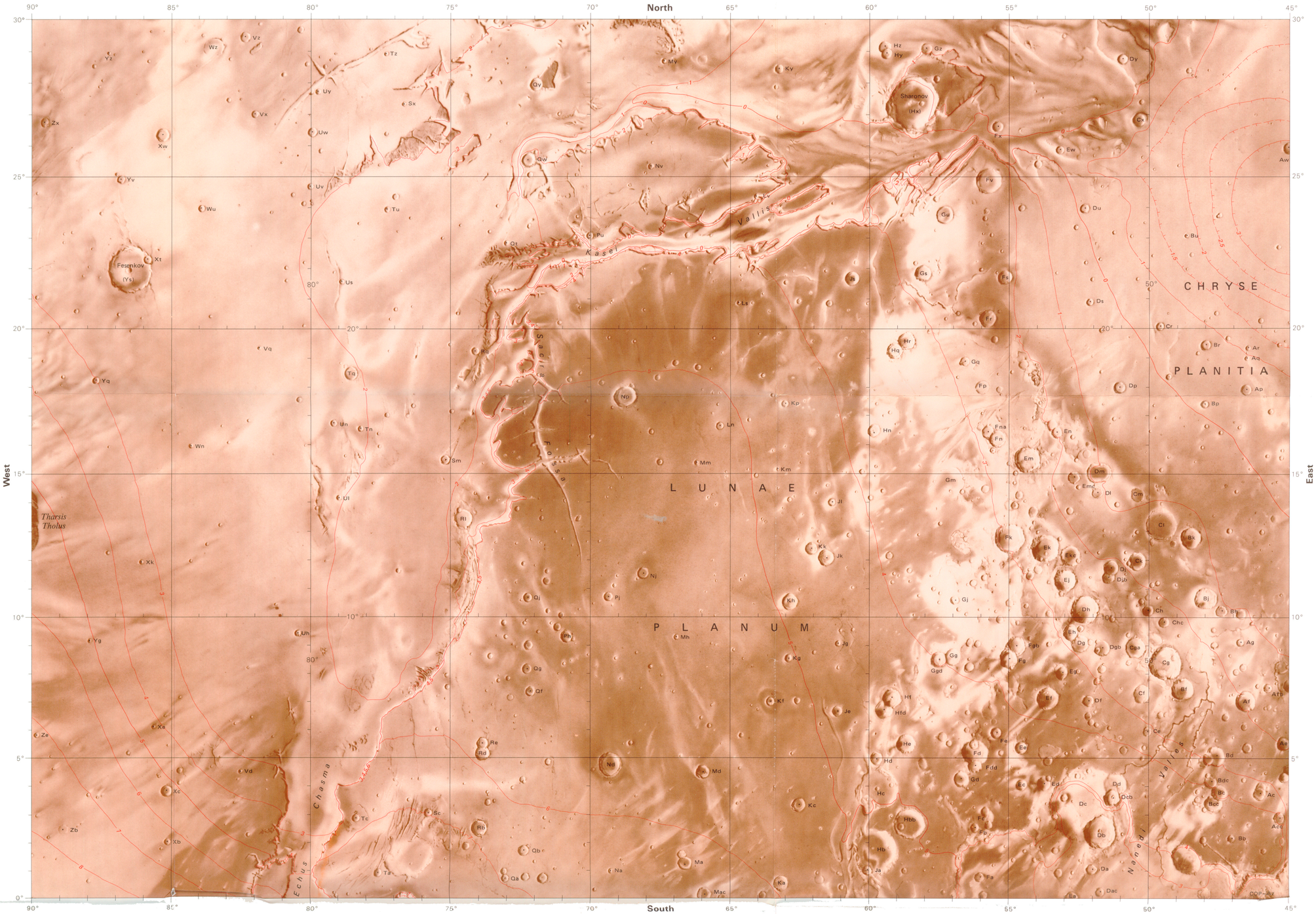


Albedo features from International Planetary Patrol photographs: Lowell Observatory, Flagstaff, Ariz.

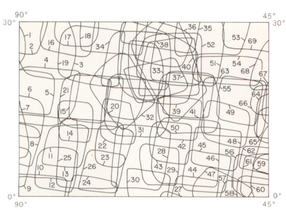
QUADRANGLE LOCATION
Number preceded by I refers to published topographic map



SCALE 1:5 000 000 AT 0° LATITUDE
MERCATOR PROJECTION

100 50 0 KILOMETRES 100 200 300 400 500 600 700 800 900 1000

CONTOUR INTERVAL 1 KILOMETRE
DASHED LINES REPRESENT 0.5 KM INTERVALS



Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.
1	7183923	24	7399103	47	6283513
2	8586869	25	7327638	48	7543093
3	7255813	26	7399173	49	7543163
4	7255743	27	6139733	50	7471623
5	7255463	28	7399593	51	7471693
6	7255393	29	7471132	52	10277439
7	8657849	30	7471063	53	8874779
8	7255323	31	7399663	54	7543583
9	7255253	32	8873799	55	7543233
10	7327143	33	7327843	56	7614913
11	7327213	34	7399733	57	7614843
12	7255673	35	8802819	58	10492689
13	7327283	36	5996373	59	10492829
14	7327353	37	12866028	60	7615333
15	7327423	38	10133519	61	10492759
16	8658829	39	13313925	62	7614983
17	7255953	40	8945689	63	7543518
18	8730859	41	7471343	64	9089819
19	7327713	42	7471273	65	7615053
20	7399383	43	7471203	66	7615403
21	7327703	44	7542953	67	7615123
22	7399313	45	7543023	68	7615473
23	7399243	46	7471558	69	8946669

INDEX TO MARINER 9 PICTURES USED TO MAKE
THE ALBEDO MARKINGS OVERPRINT

Most of the pictures indexed above were specially processed to accentuate albedo markings. Only the useful image areas of the pictures are outlined.

A-camera pictures				High-resolution B-camera pictures			
Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.
1	07255813	24	07471343	*1*	*13313450*	*15*	*06068368*
2	07255463	25	07471273	*2*	*07255778*		*12866063*
3	07255393	26	07471203	*3*	*07255428*		*07327878*
4	07255673	27	07471133	*4*	*07255358*	*16*	*10133484*
5	07255253	28	07471063	*5*	*10492724*	*17*	*07399698*
6	07327143	29	08874779	*6*	*07327718*	*18*	*07399348*
7	07399953	30	07543583	*7*	*07327248*	*19*	*07399278*
8	07327773	31	07543233	*8*	*07327318*	*20*	*07399208*
9	07327422	32	07543163	*9*	*07327388*	*21*	*07399138*
10	07327353	33	07543093	*10*	*07327738*	*22*	*07471098*
11	07327283	34	07543023	*11*	*13313730*	*23*	*07471168*
12	07327212	35	07471558		*13313800*	*24*	*07471238*
13	05380798	36	07542953	*12*	*08873834*	*25*	*07471308*
14	08730859	37	06139738	*13*	*06067878*	*26*	*07471658*
15	07399733	38	08946669	*14*	*08945724*	*27*	*07543548*
16	07399383	39	07615473		*12866203*	*28*	*07543198*
17	07399313	40	07615053		*10277474*	*29*	*07543128*
18	07327638	41	07543518		*12866133*	*30*	*07543058*
19	07399243	42	07614983		*12011339*	*31*	*07542988*
20	07399173	43	07543448		*10277404*	*32*	*06283548*
21	07399103	44	07614913		*10133554*	*33*	*07614878*
22	08802819	45	07614843			*34*	*07614948*
23	07471693						

INDEX TO 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, identified by vertical numbers. Also shown (by solid black rectangles) are the high-resolution B-camera pictures, identified by italic numbers.

TOPOGRAPHIC MAP OF THE LUNAE PALUS QUADRANGLE OF MARS

MC-10

M 5M 15/68 RMC

1976

Interior—Geological Survey, Reston Va.—1976—G76067

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