DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF MARS
1:5,000,000 GEOLOGIC SERIES
MARE ACIDALIUM QUADRANGLE
M 5M 48/30 G, 1978
I-1048 (MC-4)

NOTES ON BASE

This map sheet is one in a series covering the entire surface of Mars at nominal scales of 1:25,000,000 and 1:5,000,000 (Batson, 1973; 1976). 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. This is not the height datum which is defined below under the heading "contours".

PROJECTION

The Lambert conformal conic projection is used for this sheet with standard parallels at 35.8° and 59.2°. A scale of 1:4,336,000 at lat 30° was chosen to match the scale at lat 30° of the adjacent Mercator projections. Longitudes increase to the west in accordance with usage of the International Astronomical Union (IAU, 1971). Latitudes are areographic (de Vacouleurs 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 about 10 km.

MAPPING TECHNIQUE

A series of mosaics of Lambert conformal conic 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; Green and others, 1975; Inge and Bridges, 1976). The shading is not generalized and may be interpreted with nearly photographic reliability (Inge, 1972).

Shaded relief analysis and representation were made by Jay L. Inge.

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; Wu, 1975).

The contour lines on most of the Mars maps (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 the accuracy of topographic elevation information has not been made. The estimated vertical accuracy of each source of data indicates a probably error of 1-2 km.

NOMENCLATURE

All names on this sheet are approved by the International Astronomical Union (IAU, 1974; 1977).

MC-4: Abbreviation for Mars Chart 4.
M 5M 48/30 G: Abbreviation for Mars 1:5,000,000 series; center of sheet, 48° N latitude, 30° longitude; geologic map, G.

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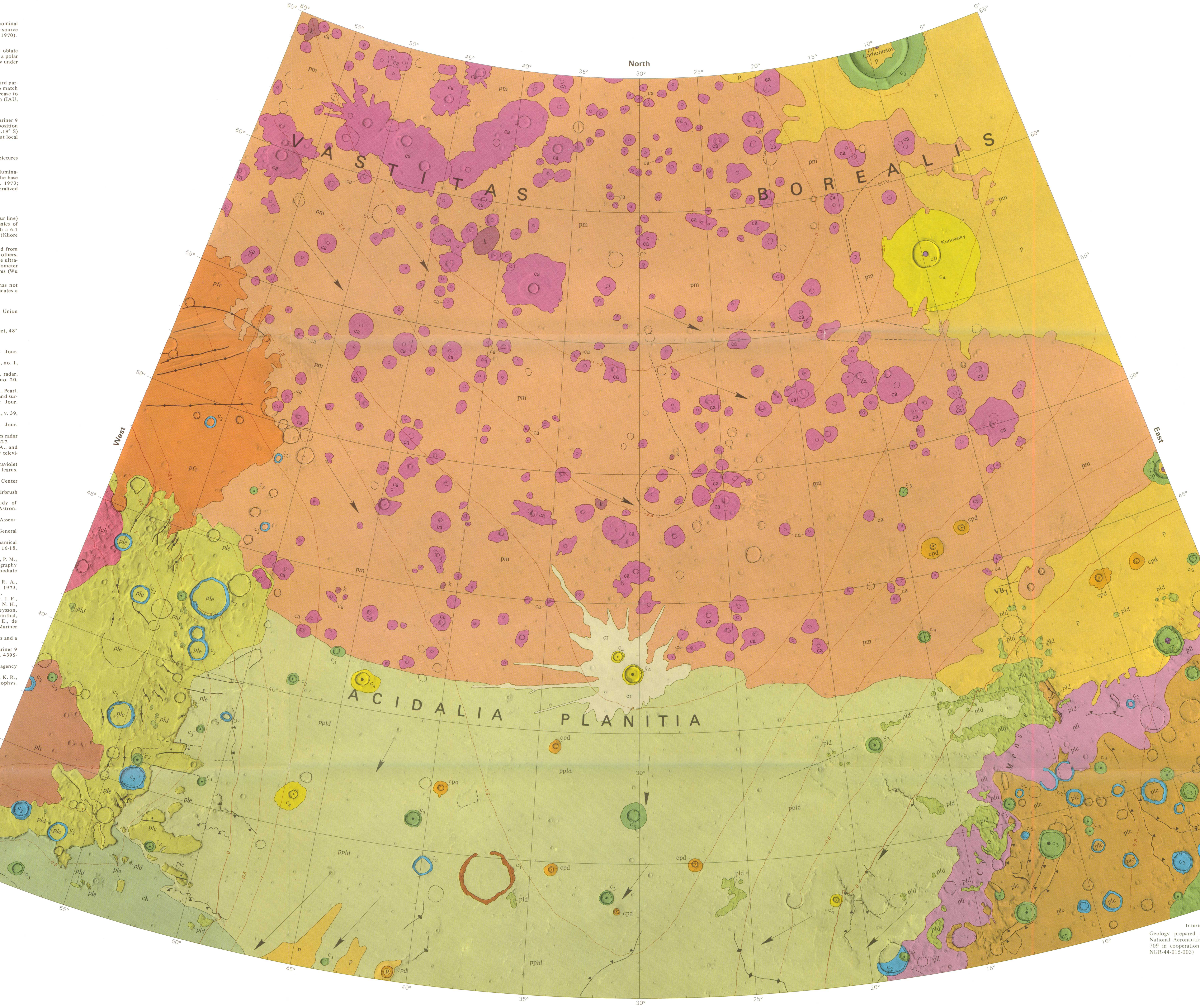

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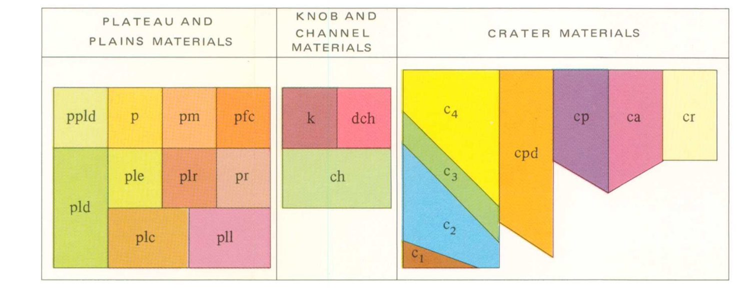
CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

PLATEAU AND PLAINS MATERIALS

ppld PLAINS AND DISSECTED PLATEAU MATERIAL, UNDIVIDED—Forms relatively smooth surfaces with scattered craters, most with rim diameter <40 km. High-albedo wind plumes common, most extending southwest from source craters; some mare-like ridges; scattered small hills. Representative area: lat 30°-40° N, long 20°-50° W. *Interpretation:* Plains of lava mantled by eolian debris of varied thickness. Hills represent erosional remnants of plateaus

p PLAINS MATERIAL—Relatively smooth and featureless; low lying; very few craters. To southwest part of material of Chryse Planitia. Representative area: plains of Chryse Planitia near lat 30° N, long 45° W. *Interpretation:* Eolian sediment or, especially to southwest, alluvium and eolian sediment

pm MOTTLED PLAINS MATERIAL—Flat to gently rolling terrain with distinctive circular, high-albedo zones surrounding numerous craters in range 1-10 km in diameter. Pedestal craters common; many craters filled or partly filled with bright material. Southeast-trending high-albedo wind plumes emanate from many craters in northwest part of mapped area. Distinct northwest-southeast erosional grain visible on high-resolution images. Representative area: typical high-albedo crater aprons at lat 50° N, long 30° W. (see also nearby B frame, DAS 12012739). Exhumed terrain well shown in B frames DAS 12188407 and DAS 13460593 approximately centered about lat 47.5° N, long 25° W. *Interpretation:* Plains lowered by wind erosion, creating pedestal craters and exhuming ancient terrain. Windblown material fills or partly fills many craters. Interaction of probably thin, shifting eolian mantle and ejecta blankets surrounding craters produces distinctive mottled appearance. Northwest-southeast erosional grain produced by prevailing northwest wind

pfc FRACTURED AND CHANNELED PLAINS MATERIAL—Very few craters; relatively smooth except where interrupted by northeast-trending sinuous and linear depressions and by fractures. Representative area: fractures and depressions of Tempe Fossae near lat 50° N, long 60° W. *Interpretation:* Volcanic rock, possibly covered with thin veneer of eolian sediment, incised by channels and cut by faults extending northeast from Tempe plateau

pld DISSECTED PLATEAU MATERIAL—Consists of closely spaced to scattered hills, buttes, and mesas, mostly marginal to plateaus. Representative area: lat 40° N, long 10° W. *Interpretation:* Eroded remnants of volcanic rock plateau. May be surrounded and partially buried by material of adjoining plains

ple ETCHED PLATEAU MATERIAL—Contains numerous rimless, flat-floored craters, rim diameter to 90 km; inter-crater areas generally smooth but contain some northwest-to north trending linear rimless depressions and low ridges. Representative area: southwest part of quadrangle centered at lat 37° N, long 55° W. *Interpretation:* Plateau of volcanic rock with depressions possibly produced by eolian erosion following the decay of ground ice. Intervening ridges remnants of plateau surface

plr RIDGED PLATEAU MATERIAL—Sparsely cratered plateau with mare-like ridges. Representative area: Lunae Palus quadrangle (MC-10), where unit originally mapped and defined. *Interpretation:* Volcanic rock with eolian mantle partly obscuring large rimless craters

pr RIBBED PLAINS MATERIAL—Smooth plains with few small craters. High-resolution images show closely spaced ridges and furrows of varied orientations. Representative area: Lunae Palus quadrangle (MC-10), where unit originally mapped and defined. *Interpretation:* An eroded volcanic plain probably stripped to resistant level. Final erosion process was wind scour, which etched surface along joints

plc CRATERED PLATEAU MATERIAL—Forms relatively smooth high surface with abundant craters <50 km diameter; craters characteristically flat-floored and rimless; some mare-like ridges in intercrater areas. Surface material appears to fill, and thus is younger than, many flat-floored craters. Representative area: southeast plateau, centered around lat 35° N, long 5° W. *Interpretation:* Lava rock which has flooded the interiors of many craters

pll LOWER PLATEAU MATERIAL—Marginal to southeast cratered plateau; albedo lower than unit plc; slopes gently toward Acidalium Planitia; characterized by scattered buttes, mesas, and hills (unit pld). Very few superposed craters; embays breached craters. Representative area: lat 32° N, long 16° W. B frame (DAS 9162379). *Interpretation:* Volcanic rock; in places a depositional surface, in other places an erosional surface. Partly covered by eolian material

KNOB AND CHANNEL MATERIALS

k KNOBBY MATERIAL—Isolated hills or groups of hills occurring in region of mottled plains material. Representative area: north part of quadrangle covered by mottled plains material. Groups of hills occur at: lat 58.5° N, long 41° W, and at lat 64.5° N, long 58.5° W. *Interpretation:* Isolated erosional remnants of higher surface, crater rim remnants, and possibly volcanoes

dch CHANNELED DOME MATERIAL—Dome, approximately 180 km in diameter, with radial channels incised into gently sloping flanks; several distinct to vague near-summit craters approximately 15 km in diameter outside mapped area (in Arcadia quadrangle, MC-3). Representative area: at lat 43.5° N, long 60° W, extension eastward of dome centered in MC-3 at lat 44° N, long 61.5° W. *Interpretation:* Volcanic shield with radial lava channels and summit calderas of varied ages

ch CHANNEL MATERIAL—Fills elongate depressions surrounding small butte and mesa outliers. Very few craters in depressions. Representative area: northeast extension of Kasei Vallis at lat 30° N, long 50°-60° W. *Interpretation:* Stream channel containing alluvium which surrounds erosional remnants of nearby plateaus

CRATER MATERIALS

All craters mapped in the quadrangle are believed to be of impact origin. Craters <10 km diameter not mapped except for craters with high-albedo aprons in the region of mottled plains material. Craters are classified on the basis of morphologic characteristics believed to reflect their relative age (c_4, youngest).

c_4 CRATER MATERIAL—Rim crest sharp, high, complete; rim rough and extends ≥1 crater radius; wall steep; floor deep and texturally distinct; central peak

cpd PEDESTAL CRATER MATERIAL—Craters surrounded, or partly surrounded, by an outward-facing irregular escarpment at the margin of the ejecta blanket or crater apron. *Interpretation:* Relatively young impact crater (c_4 and c_3); ejecta blankets and fields of secondary craters more resistant to erosion than the intercrater areas, that have been preferentially lowered, probably by wind erosion

cp CENTRAL PEAK MATERIAL—Peaks centrally located in c_4 and most c_3 craters. *Interpretation:* Formed by rebound following impact

ca CRATER APRON MATERIAL—Bond (>2 crater radii) high-albedo material that surrounds many craters on mottled plains (unit pm); characteristically higher than intercrater terrain and bordered by outward-facing, commonly digitate escarpment; central crater shown by small circle. *Interpretation:* Light-colored dust trapped on impact crater ejecta blanket. Differential erosion has lowered intercrater terrain. Best shown on B frames DAS 12012739 and 12013019

cr CRATER RAY MATERIAL—High-albedo material extending outward from two young (c_4) craters near center of quadrangle. *Interpretation:* Light-colored primary and secondary crater ejecta, and dust trapped thereon, thrown outward as far as 350 km at time of creation of craters

c_3 CRATER MATERIAL—Rim crest high, complete; texturally distinct rim extends <1 crater radius; wall steep to gently sloping; floor uneven and lower than adjacent terrain; may have central peak

c_2 CRATER MATERIAL—Rim crest low, rounded, complete or incomplete; rim narrow, smooth; wall steep to gently sloping; flat floor; no central peak

c_1 CRATER MATERIAL—Rim crest low, incomplete, or absent; rim narrow to absent; wall steep to gently sloping; shallow floor may be same level as surrounding terrain; no central peak

—?— Contact—Queried where uncertain or transitional

Probable fault—Bar and ball on downthrown side

Narrow depression—Graben, channel, trough

Gentle scarp—Barb points downslope; line marks base of slope

Steep scarp—Line marks top of scarp; hachures point downslope

Low ridge

Lineament—Topographic or tonal

Wind plume—Shaft shows orientation of plume; head indicates wind direction; may be representative of many closely spaced plumes in any specific area

Crater rim crest—May represent contact in places; hachures point down crater wall; dot within crater illustrates central peak too small to show as a material unit

Partly buried or highly degraded rim crest

Rim crest of small crater surrounded by high-albedo crater apron

Rimless depression

VB1 Proposed Viking B prime landing site (lat 44° N, long 10° W.)

INTRODUCTION

Acidalia Planitia, for which the Mare Acidalium quadrangle is named, is the largest area of low albedo in the northern hemisphere of Mars and lies just west of the prime meridian. Occultation data indicate that its central elevation is about 3 km below the zero or 6.1 millibar datum. The low albedo of Acidalia Planitia is in striking contrast to the very high albedo of Hellas Planitia, another large region of very low elevation on Mars. Presumably this reflects a real difference in surface material, although part of the contrast may be produced by differences in atmospheric haze and dust between the two areas. The nearly circular outline of Hellas Planitia strongly suggests that it is the result of a major impact (Potter, 1976). Acidalia Planitia, though much less circular in outline and without an ejecta blanket recognizable at the resolution of the available imagery, also may have been created by impact during the early history of the planet. Alternatively, it may represent crustal subsidence related in some way to the uplift and volcanism of Tharsis Montes to the southwest (Carr, 1974; Phillips and Saunders, 1975).

The Mare Acidalium quadrangle includes a vast area of mottled plains in the northern half, an area of topographically subdued plains and dissected plains in the south central part, a cratered plateau in the southeast corner and an etched plateau in the southwest corner. Part of the volcanic rocks and the complex fracture system of the Tempe plateau extend into the western part of the quadrangle; the southwesternmost part is occupied by channel materials of Kasei Vallis and plains material of Chryse Planitia.

No major channels or chaotic terrain are recognized in the quadrangle; few faults have been recognized. Although in a few places in the eastern part of the subdued and dissected plateaus there appear to be scattered volcanoes of ≤1 km in diameter, there are no major volcanoes of the size of Olympus Mons or those of Tharsis Montes.

The major geologic processes operating in the region today, with the probable exception of occasional meteorite impacts, are eolian erosion and deposition. Because a large part of the quadrangle lies north of 45° lat, there may be seasonal processes related to ground-ice decay that alter the surface.

Life, as it exists on Earth, is dependent on the presence of water, and thus the search for life on Mars is being directed to those areas where there is the greatest prospect for the existence of water. A mathematical model of the Martian atmosphere suggests that free water may occur in the pore spaces of the regolith in the 40° to 50° N lat belt in those places where the planetary surface is sufficiently low to provide atmospheric pressure in excess of the vapor pressure of water. Within this latitude belt, Acidalia Planitia is sufficiently low. This latitude belt also lies south of the frigid zone, where temperatures never exceed -6.7° C and where life as known on Earth cannot exist. More important, ground-based and Mariner 9 observations which recorded the highest water content on the planet in Acidalia Planitia at lat 44° N, long 10° W, were the determining factors in the selection of that site, designated Cydonia, as the location of the second Viking landing in late summer, 1976 (Masursky and Strobell, 1975, p. 1).

Geologic mapping was done on a controlled mosaic of 26 Mariner 9 wide-angle (A-frame) images with a resolution of 2 to 4 km; detailed interpretations were based, in part, on 32 scattered narrow-angle (B-frame) images with a resolution of 200 to 400 m. As the northern half of the quadrangle was covered by dust or by clouds during much of the mission, coverage of that region is poor. Moreover, the pictures were taken at high sun angles, and this presents difficulties in interpretation when compared with images throughout the rest of the quadrangle, taken at relatively low sun angles. The combination of high sun angle and the relatively low resolution of frames covering the northern part of the quadrangle has resulted in some interpretive differences between the geologic map and the shaded relief base.

GEOLOGIC SUMMARY

Most of the northern part of the quadrangle is mottled plains material, the mottling deriving from the presence there of numerous craters with bright crater aprons up to 130 km in diameter. The aprons are unusual because characteristically they extend outward for a distance of two to three crater diameters and because they are unusually light colored. The mottled plains material is bordered on the east by plains material and on the west by fractured and channeled plains material. The young crater Lomonosov, 250 km in diameter, at lat 65° N, and long 9° W, lies athwart the boundary between Mare Boreum (MC-1) and Mare Acidalium (MC-4).

Part, or perhaps most, of the distinctive appearance of the mottled plains may result from the images being obtained late in the mission when the high sun angle emphasized albedo difference. Images for the rest of the quadrangle were obtained earlier in the mission when the sun angle was low.

An east-west boundary at approximately lat 45° N is indicated in some of the late frames; the boundary may represent a difference in material or texture, or both, between the mottled plains material to the north and plains and dissected plateau material to the south. A late A frame, DAS 13460423, clearly shows the strikingly bright ray material extending from the two young craters near the center of the quadrangle as well as a distinct boundary between the zone to the north of craters with surrounding high albedo aprons and the zone to the south where the distinctive, high-albedo aprons are absent.

Pedestal craters are common, suggesting that the ejecta blankets and perhaps the secondary crater fields resist erosion as the intercrater surface is lowered, probably by wind. Many of the craters clearly are filled or partly filled by windblown debris, interpreted by Soderblom and others (1974) to have originated from the eolian erosion and transport southward of north polar material. Because some B frames, for example DAS 12188407 and 13460593, suggest that an older channeled, fractured, and cratered landscape is being exhumed, both eolian erosional and depositional processes may characterize the area today.

In the northwest part of the quadrangle wind plumes indicate flow to the southeast; southward, the plumes indicate a more southerly flow and toward the southern part of the quadrangle a southwesterly flow. In places the southeast windflow has strongly etched and fluted the surface, as shown by the northwest-southeast erosional grain on B frames DAS 12188407 and 12013019.

A field of very dark circular and semicircular hills, on some of which small summit craters can be recognized, occupies part of the area covered by B-frame DAS 12188827 centered at lat 59° N, long 8° W. The hills, 1 to 3 km in diameter, are interpreted as cinder cones and volcanic necks.

Topographically subdued plains material and plains and dissected plateau material occupy the southern part of the quadrangle south of lat 42° N, and lie between plateaus to the southeast and southwest. Crater density is markedly less than on the flanking plateaus, and the large, essentially rimless flat-floored craters so characteristic of the plateau areas do not exist. Class c_3 and c_4 craters in the 25 to 40 km diameter range with prominent central peaks are common; two of these (lat 42.5° N, long 31° W) have rays up to 350 km long. These craters are the only strikingly rayed craters recognized in the quadrangle, indeed on the entire planet. The rays are seen only on one image A frame (DAS 13460423) obtained very late in the mission. An earlier image of the craters does not show the rays, suggesting that atmospheric dust may have obscured them.

The largest crater in the plains and dissected plateau material, diameter 110 km (lat 34° N, long 37° W), topographically is very subdued. It is either severely eroded or almost buried beneath a blanket of lava or eolian material, or both; whether it is being buried or exhumed is uncertain. The striking array of high albedo wind plumes in the southern part of the quadrangle suggests, however, that eolian processes are important, and the presence of aerodynamically shaped hills, pedestal craters, and etched surfaces suggest that eolian erosion exceeds eolian deposition. The plumes record a significant shift in wind direction from south to southwest. A few lobate features, interpreted as flow fronts, and a few mare-like ridges suggest that the plains are formed of lava rock overlain in places by a relatively thin eolian mantle.

Northeastward and southwestward the plains and dissected plateau material grades into plains material, whose surface is relatively smooth and featureless except for small craters. On these plains, at lat 44° N, long 10° W, the second of two Viking unmanned spacecraft is scheduled to land in the late summer of 1976. This site was selected because: (1) a mathematical model of the Martian atmosphere suggests that water, if it exists on Mars, is most likely to occur at this latitude and elevation, nearly a kilometer below the mean Martian surface elevation; (2) temperature is sufficiently mild to permit existence of life; (3) greater atmospheric pressure in the topographically low area will allow a safer descent stage; and (4) the surface appears to be sufficiently smooth to minimize danger to the spacecraft during the landing. Although no B frames include the proposed Viking "B" prime landing site, the center of one B frame (DAS 9162654), 185 km north-northeast of the landing site lies in the 600-km-long landing ellipse. The A and B frames of the region record a subdued topography.

Three B frames, DAS 9090624 centered at lat 38° N, and long 21° W, DAS 9162514 centered at lat 38° N and long 12° W, and DAS 9162654 centered at lat 45° N and long 6° W, cover areas which contain several circular hills (diameters ≤1 km) with convex upward slopes and with summit craters whose diameter is small relative to the diameter of the hill. These hills are interpreted as volcanoes. Those in DAS 9090624 are less than 1 km in diameter and have a distinctively higher albedo than the surrounding terrain, suggesting a difference in texture or composition, or both. Although the area shown in B-frame DAS 9162654 is approximately 150 km from the center of the Viking "B" landing ellipse, the similarity of the two areas on A-frame DAS 9162624 suggests that scattered small volcanoes and impact craters (rim diameter ≤0.5 km) also may exist at the landing site in similar numbers, about 1 per 325 km^2 (Underwood and others, 1974).

The relatively high area in the southeast corner of the quadrangle is composed largely of cratered plateau material with craters in the 10-to 50-km size range the most numerous; marginal to the high plateau is lower plateau material and dissected plateau material. This plateau contains the large crater, Sklodowska, 120 km in diameter and much degraded. Many of the craters clearly are superimposed on the plateau surface; others are flat floored with narrow or no rims; possibly the result of partial filling by lava. This is suggested also by the occurrence in the intercrater areas of a few mare-like ridges. The intercrater areas, essentially smooth on A frames, range from smooth to very uneven on B frames, e.g. DAS 9234264. Small-scale topographic features include scattered small craters (<10 km diameter), ejecta blankets, and hills and depressions which typically are elongate but without noticeable regional alinement.

An indistinct regional structural grain trending north-northwest on the plateau is expressed by the parallel to subparallel alinement of: (1) the relatively straight west rim of Sklodowska crater; (2) the prominent northeast-facing scarp at lat 39° N, long 9° W, interpreted as a fault scarp; (3) a 160 km-long elongate depression at lat 37° N, long 0°; (4) a smaller elongate depression just north of the large depression; and (5) the northeast and southwest rims of some of the polygonal craters.

Floors of the 10-to 50-km-diameter craters on the plateau have irregular areas of low albedo, produced perhaps by exposed bedrock or by eolian material. At lat 30.5° N, long 11.5° W, a distinctive, compound high- and low-albedo wind plume extends southwestward from a 25-km crater. The broadly tapering high-albedo plume has a narrower, low-albedo plume along its axis. This is the only distinct plume identified on the cratered plateau.

The north-northwest trending elongate depression along the east margin of the quadrangle between lat 35° and lat 37° appears to have been formed by the erosional integration of two or more overlapping rimless, flat-floored craters, the erosion being controlled by the north-northwest structural grain of this province.

Along the margin of the old cratered plateau, the surface has been lowered an undetermined amount: a prominent escarpment has developed only at the northwest margin of the plateau. The lower plateau material embays some craters and no doubt has filled and covered others. The hills of dissected plateau material, whose summit elevations become lower as distance increases from the prominent escarpment of the plateau, appear to have some surfaces that have been aerodynamically planed.

The discovery on Mars of channels that resemble fluvial channels on Earth presents the intriguing possibility that the planet once may have had large bodies of water. If it did, the basin-like character of Acidalia Planitia would have made it a likely site of an ancient gulf or ocean. Although the series of gentle steps and escarpments along the west margin of the southeastern plateau, together with the marginal lower plateau, could be remnants of wave-cut surfaces, there is insufficient evidence on available imagery for this interpretation to be other than conjectural.

The relatively high plateau in the southwest corner of the quadrangle is composed largely of etched plateau material and is characterized, especially along its eastern and southern margins, by a relatively high density of flat-floored craters as much as 90 km in diameter. A restricted area of ridged plateau materials is coextensive with a large occurrence of ridged plateau material westward in the adjoining quadrangle (Arcadia). The southern and southeastern margins of the plateau are marked by prominent escarpments estimated to be 1 to 2 km high. Unlike the southeast plateau, retreat of the southwest plateau has resulted in the development of few isolated hills. Northward retreat of the southern escarpment, partly the result of fluid flow and accompanying erosion in Kasei Vallis, has resulted, however, in the development of isolated mesas. The distinctively rectangular mesa at lat 31° N, long 53° W (B-frame DAS 8874819) probably represents control of scarp retreat by joints or faults; the east-west orientation also emphasized there may be expressed to the north in nearly east-west faults that cut the plateau and to the northeast where normal faults cut two of the outliers of etched plateau material.

Intercrater areas are etched, most likely by wind erosion or by ground ice decay, or both. Northward on the southwest plateau the orientation of the elongate, etched depressions changes from north-northwest to north-northeast. Because both of these trends, as well as the east-west trend of faults, differ from the northeast to east-northeast structural grain of the adjoining Tempe plateau, the conditions that produced the striking linear depressions there have little affected the southwest plateau of Mare Acidalium quadrangle.

At lat 43° N, long 60° W, the easternmost part of a radially channeled dome, 180 km in diameter and probably volcanic, extends into the quadrangle from Arcadia quadrangle (MC-3) to the west. Northward, fractured and channeled plains material records the northeast extension into the area of some of the prominent fractures and channels of Tempe Fossae to the west.

Both the southeast and southwest plateau surfaces appear to be erosional, but the etched character of the southwestern plateau suggests that erosion has been more active or has persisted over a longer period of time there than it has to the southeast. As it has been exposed more deeply by erosion, the etched plateau material of the southwest plateau may be older than the cratered plateau material of the southeast plateau. The surface of the etched plateau material has fewer young craters and is much more uneven than that of the cratered plateau material. Further, to the southwest there is a somewhat higher density of old, large flat-floored craters, presumably in the process of being exhumed, than occur on the southeast plateau. Thus it seems possible that the southwest plateau may expose material that remains buried in the southeast corner of the quadrangle. Stated another way, the surface of the southeast plateau appears to have been more stable in later geologic time than has the surface of the southwest plateau.

GEOLOGIC HISTORY

The period of planetary accretion and intensive bombardment by meteoroids is not recorded in the quadrangle by surface rocks, although ancient, hilly, cratered terrain does occur in some of the adjacent quadrangles. The oldest surface in the mapped area, as indicated by density of impact craters (<10 km), forms the southeast plateau; the surface is a plains unit created by deposition of an ancient flow of lava that partially filled or covered the craters on the old surface.

Erosion, probably largely eolian but perhaps in part fluvial, produced the marginal lower plateau and the relatively low Acidalia Planitia. Seemingly, erosion has been more active on the southwest plateau than on the southeast plateau. Thus, to the southwest the erosional surface is younger and the exposed rocks older than on the southeast plateau. The channel and the deposits of Kasei Vallis, which extend into the southwestern part of the quadrangle, record a period of fluvial activity which may have resulted from sudden melting of permafrost and subsequent catastrophic flooding (Baker and Milton, 1974).

Subsidence of the central part of the Mare Acidalium quadrangle may have accompanied the episode of flooding, and both may have been triggered by the uplift, volcanism, and fracturing that accompanied the development of Tharsis Montes. Local volcanic eruption may have accompanied the major eruptions of the Tharsis area, or the small-scale volcanic activity may have been much younger.

Eolian activity has continued to lower much of the surface of the quadrangle and has produced plains characterized by pedestal craters, crater scars, prominent wind plumes, and aerodynamically shaped hills similar to terrestrial yardangs. Eolian debris probably mantles much of the quadrangle (Soderblom and others, 1974).

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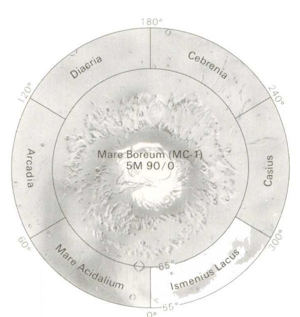
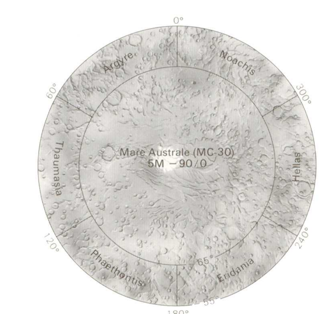
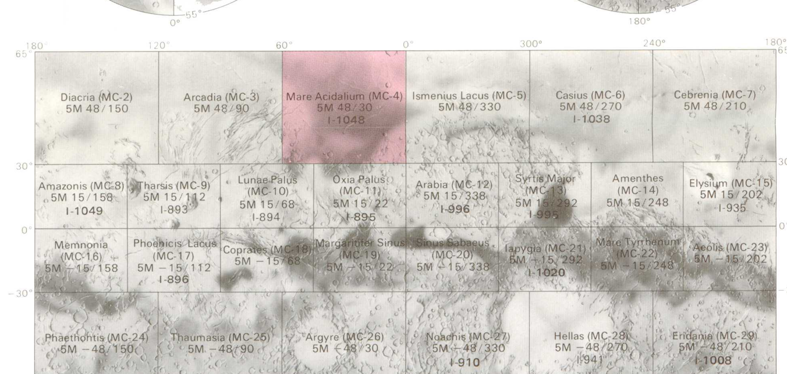


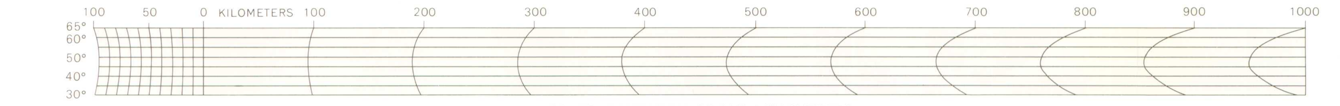




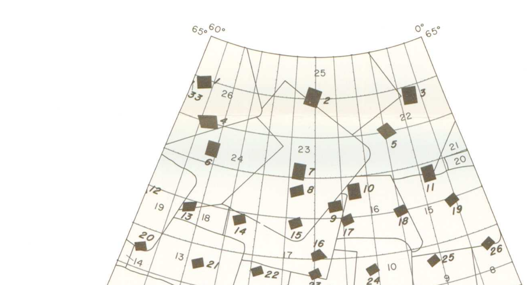
Albedo features from International Planetary Patrol photographs. Lowell Observatory, Flagstaff, Ariz.

QUADRANGLE LOCATION
Number preceded by I refers to published geologic map

SCALE 1:4 336 000 AT 30° LATITUDE
LAMBERT CONFORMAL PROJECTION



CONTOUR INTERVAL 0.5 AND 1 KILOMETERS



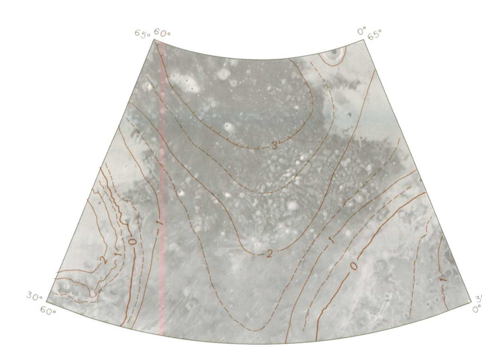
A-camera pictures

Index No.	DAS No.	Index No.	DAS No.
1	9306124	14	8802964
2	9234234	15	9162624
3	9162344	16	9020734
4	9090454	17	8946954
5	9018564	18	8875064
6	8946674	19	8731144
7	8874784	20	9234514
8	9234374	21	12363896
9	9162484	22	12188797
10	9090594	23	12012709
11	9018704	24	12012569
12	8946814	25	12012989
13	8874924	26	11835991

High-resolution B-camera pictures

Index No.	DAS No.	Index No.	DAS No.
1	8803414	*17*	9018874
2	12013019	*18*	7759428
3	12188827	*19*	9162654
4	7543758	*20*	8802994
5	7903208	*21*	8874954
6	12012599	*22*	8946844
7	12012739	*23*	9018734
8	10277824	*24*	9090624
9	13460593	*25*	9162514
10	12188407	*26*	9234404
11	12188547	*27*	8874814
12	8731174	*28*	8946704
13	8803134	*29*	9018594
14	8875094	*30*	9090484
15	8946984	*31*	9162374
16	7687538	*32*	9234264
		33	11836021

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. The DAS numbers may differ slightly (usually by 5) among various versions of the same picture.



CONTOURS
Contour interval 0.5 and 1 kilometers. Surface markings derived from selected Mariner 9 photographs

GEOLOGIC MAP OF THE MARE ACIDALIUM QUADRANGLE OF MARS
(INCLUDING THE POTENTIAL VIKING LANDING SITE CYDONIA)

By
James R. Underwood, Jr. and Newell J. Trask
1978

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