



NOTES ON BASE

This map is one of a three-sheet set that shows combined surface markings, shaded relief, and topographic contours of Mars. Shaded relief was taken from published maps (U.S. Geological Survey, 1980). Surface markings (shaded) in the western and eastern regions are also those of existing maps (U.S. Geological Survey, 1980a); surface markings have been added in the polar regions and in areas not covered by the original set of Viking images used to compile the existing maps. Contours were taken from topographic maps of the U.S. Geological Survey (1989).

PROJECTIONS

The figure of Mars used for computing the map projections is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3,393.4 km and a polar radius of 3,273.7 km. This figure is less complex than the topographic figure (described below) on which the contour lines are based. The Mercator projection is used between lat ±27° and the Polar Stereographic projection is used for the polar regions north and south of the 55° parallels. The projections have a common scale of 1:8,418,000 at lat ±56°. Longitude increases to the west in accordance with astronomical convention for Mars. Latitudes are geographic.

CONTROL

Horizontal and vertical controls were established by analytical photogrammetry: areostereogram (Wu and Schaler, 1984), by using the General Analytical Triangulation (GIANT) program of the U.S. Geological Survey. Primary controls used in the control network include the Viking Orbiter Secondary Experiment Data Record, radio-occultation measurements from both Mariner 9 and Viking Missions (Lorell and others, 1972; Klose and others, 1973; Lindal and others, 1979). Earth-based radar observations (Pettingill and others, 1971; Downs and others, 1975), and the Mars primary control network of the Rand Corporation (Davies and others, 1978).

ALBEDO

Original maps of the surface albedo were compiled from a selected set of Viking Orbiter 1 images acquired through red or clear filters when the solar plane-to-centric longitude (Ls) with respect to Mars was 65° to 89° and when the solar zenith angle was small. Complete coverage of the western and eastern regions could not be obtained during the period. Therefore, Viking Orbiter images acquired at different times, Mariner 9 images (Bateson and Inge, 1978), maps made with the Viking Infrared Thermal Mapper (Peters and Miner, 1981), and a map compiled from Earth-based pictures (Inge and others, 1976) were used as necessary to complete the mapping. These sources are not necessarily consistent with the seasonal constraints of the first dataset. Details of the albedo markings were drawn on photographic copies of the original shaded relief maps. The overall albedo balance was maintained by reference to the low resolution, solar albedo map and to the Earth-based source.

Analysis and portrayal of albedo markings were by Susan L. Davis and Joe L. Inge.

PLANIMETRY

The mapping bases used for these three sheets (U.S. Geological Survey, 1980a) were assembled from 15,000,000-scale shaded relief maps (Bateson and others, 1979), reduced and digitally transformed to the projections described above. These bases were used to produce details taken from Viking Orbiter pictures during shaded relief portrayal. Shaded relief is shown as illuminated from the west. Airbrush portrayals of both the relief and albedo were done according to interpretive techniques described by Inge and Bridges (1976).

Shaded relief analysis and portrayal were by Barbara J. Hall.

CONTOURS

Because Mars has no surface water and hence no sea level, the datum (the 0 km contour line) for elevations 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 (Klose and others, 1973; Christensen, 1975). This datum can be approximated by a triaxial ellipsoid with semi-major axes of A=3,394.6 km and B=3,293.3 km and semi-minor axes of C=3,276.3 km. Semi-major axis A intersects the Martian surface at long 105° (Wu, 1978, 1981).

Contour lines between the ±30° parallels were transferred from the images on analytical stereopairs from Viking Orbiter (1979). Contour lines north and south of lat ±30° were compiled from measurements made by both Viking and Mariner 9 experiments, which employed the ultraviolet spectrometer (Hord and others, 1974) and the infrared interferometer spectrometer (Conrad and others, 1973), and from elevation data of both the Mars primary control network (Davies and others, 1978) and the Mars planimetric control network (Wu and Schaler, 1984).

COLOR

No attempt was made to duplicate 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, 1983, 1986, and in press), except for provisional names, which are indicated by an asterisk. The positions of named features are taken from published maps of Mars.

M 15M 0/270 2AT: Abbreviation for Mars; 1:15,000,000 series; center of map, lat 0°, long 270°; 2nd edition, shaded relief with albedo markings (A), topographic contours and nomenclature (T).

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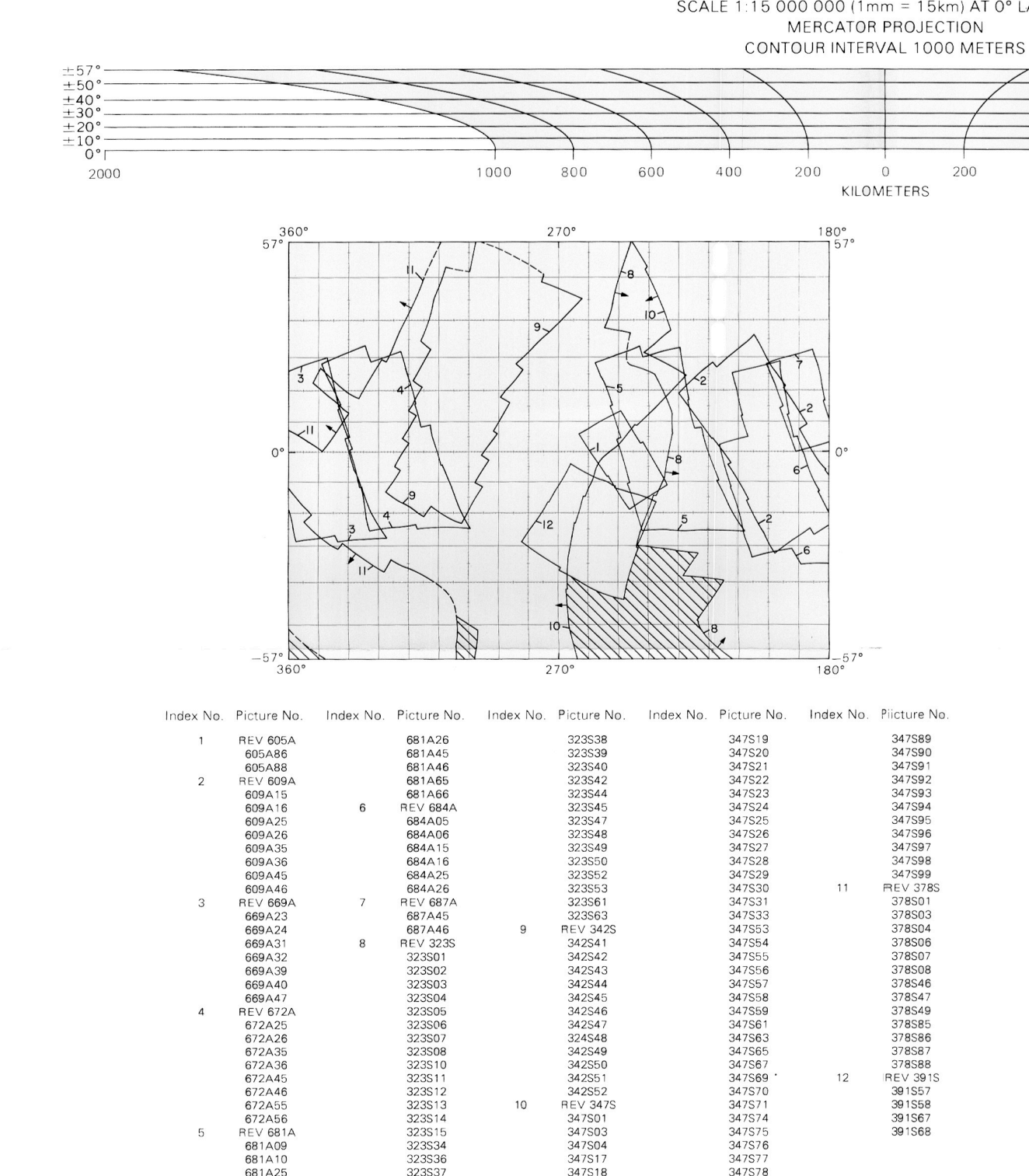
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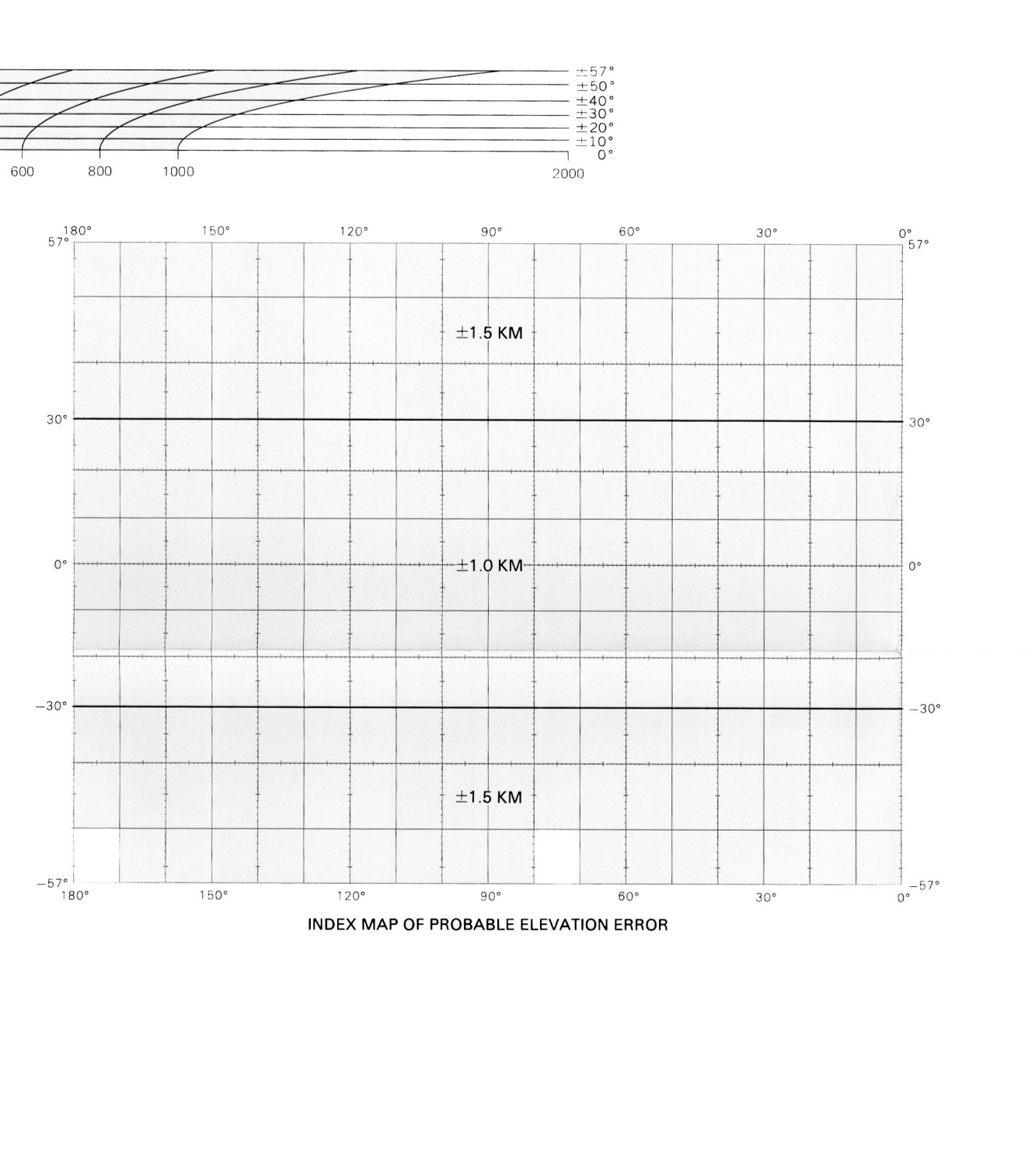
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INDEX OF PRIMARY MAPPING SOURCES

The rendition of most of the surface markings on this map was controlled by reference to the pictures outlined above. Picture numbers consist of an orbital revolution number, a spacecraft designation number, and a frame number. For example, 658AR was the 86th picture taken by Voyager 1 (A) during revolution number 605. Pictures taken by Voyager 1 after revolution 589 are sometimes designated without the leading digit of the revolution number and with an "S" for the spacecraft number. Thus, 1378AB is the same picture as 378BS. Dashed lines indicate areas of limit. Useful coverage is not available in cross-hatched areas. Copies of various enhancements of these pictures are available from National Space Science Data Center, Code 801, Goddard Space Flight Center, Greenbelt, MD 20771.



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.

TOPOGRAPHIC MAP OF THE EASTERN REGION OF MARS

M 15M 0/270 2AT