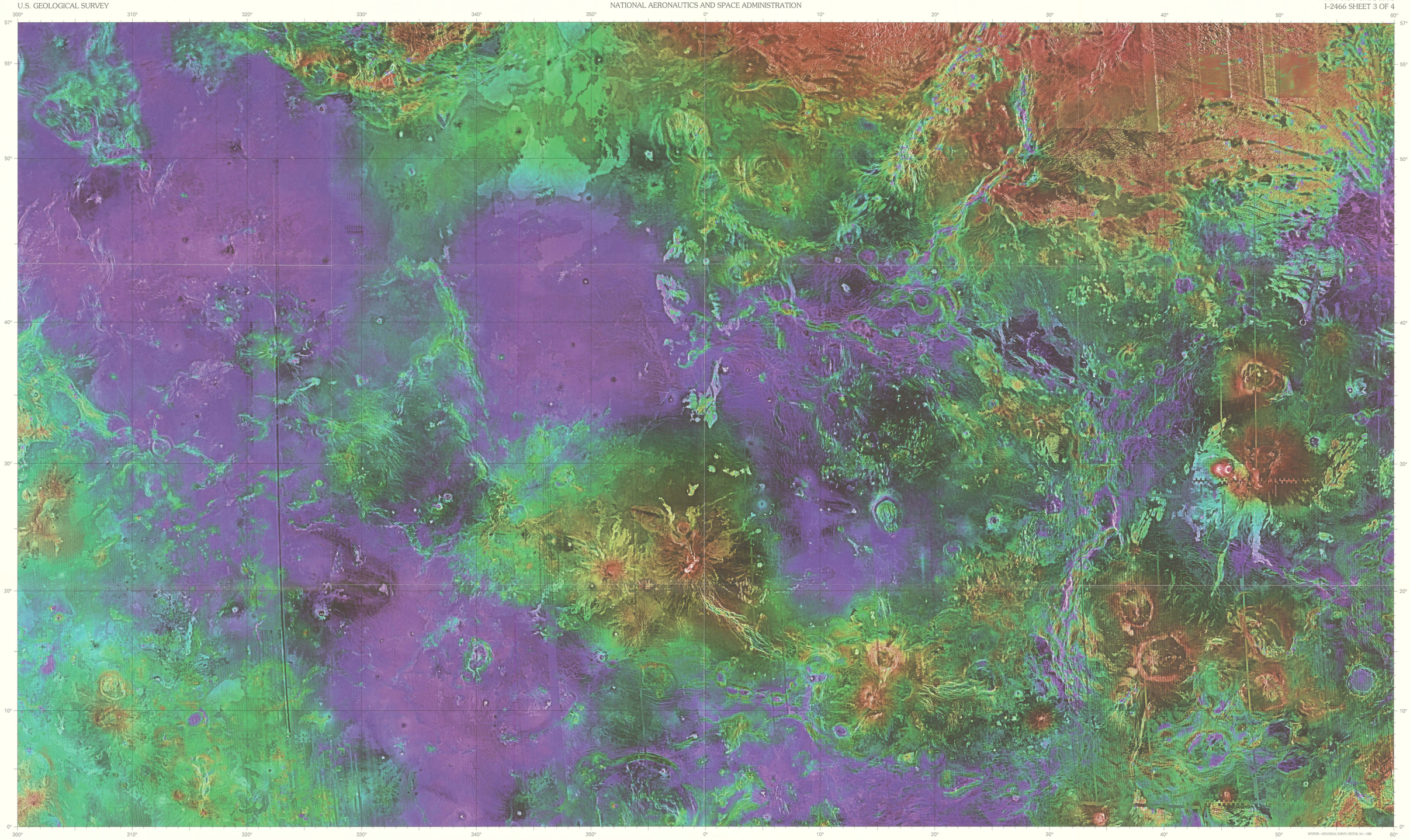
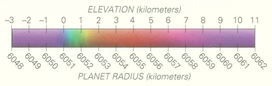
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF VENUS
1:10,000,000 SERIES
V 10M 30/0 CMK, 1998
I–2466 SHEET 3 OF 4



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1998



SCALE 1:16 354 349 (1 mm = 16.35 km) AT 0° LATITUDE
1:10 000 000 AT 52.305° LATITUDE
MERCATOR PROJECTION

Prepared on behalf of the NASA Planetary Geology and Geophysics program and the Magellan Project Office of the Jet Propulsion Laboratory

Edited by Derrick Hirsch; cartography by Roger D. Carroll and Darlene A. Casebier

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NOTES ON BASE

This sheet is one in a series of maps of Venus at nominal scales of 1:50,000,000 and 1:10,000,000 (Planetary Cartography Working Group, 1984, 1993; Batson and others, 1994). It is based primarily on data from the Magellan Synthetic Aperture Radar (SAR) and radar altimetry instruments. The Magellan Mission was described by Saunders and Pettengill (1991). Magellan radar characteristics were described by Pettengill and others (1991).

ADOPTED FIGURE

The figure of Venus used for the computation of the map projection is a sphere with a mean radius of 6,051.0 km, consistent with the preliminary gravity figure reported by Phillips and others (1979) that was used for previous maps of Venus. Slightly larger values of the mean radius of Venus have subsequently been reported based on Pioneer Venus (Pettengill and others, 1980) and Magellan altimetry (Ford and Pettengill, 1992).

PROJECTION

The Mercator projection is used for this sheet. The scale is 1:16,354,349 at 0° latitude; it is 1:9,145,190 at ±56.0° latitude, as is the scale at this latitude in the polar stereographic projection. Due to the retrograde rotation of Venus, longitude increases from west to east in accordance with usage of the International Astronomical Union (1971).

CONTROL

Planimetric control is derived from the radio-tracked position of the spacecraft. The first meridian passes through the central peak of the crater Ariadne, at lat 43.8° N., according to current International Astronomical Union convention. (Ariadne replaces the feature "Eve," which, at the same longitude, originally fixed the location of the prime meridian (Davies and others, 1986).) The venusian cartographic coordinate system was described by Davies and others (1992).

MAPPING TECHNIQUES

This sheet summarizing the knowledge of the venusian surface obtained through intensive radar investigations between 1977 and 1994 was created by combining Magellan and pre-Magellan image and altimetry data. The map base consists of a mosaic of radar images with approximately 98% of the planet covered by Magellan synthetic aperture radar data. The mosaic of the images appears alone on sheet 1 and its processing is described there. Most of the area imaged by Magellan is illuminated from the west, but some areas are illuminated from the east. Gaps in the Magellan coverage were filled with data from the Soviet Venera 15 and 16 spacecraft (north of 30° latitude) or from the ground-based Arecibo radar telescope (for the hemisphere centered roughly on 0° latitude and 330° longitude). The 1– to 2–kilometer spatial resolutions of the Venera images (Alexandrov and others, 1988) and Arecibo images (Campbell and others, 1989) are considerably poorer than that of the Magellan data but are adequate for the scale of this map. The Venera images are illuminated from the east; the effective illumination direction in the Arecibo data is outward from the center of the imaged hemisphere. A small number of remaining gaps near the south pole were filled with a neutral tone. The composite mosaic of image data was digitally filtered to enhance small details and stretched for optimum contrast.

A global, composite digital terrain model was constructed in the same manner as the image base. The Magellan altimeter provided data for over 90% of Venus; gaps were filled with lower resolution Venera 15/16 and Pioneer Venus altimetry data, or by smooth interpolation near the south pole. False colors were assigned to elevation values, and the elevation-derived color map was merged with the radar-image base as described by Edwards and Davis (1994). The color table is a continuous spectrum, from violet for low elevations to red for high. The relation between elevation and color is non-linear, chosen based on the statistics of the altimetry data so that equal areas of each hue appear on the global map. Violet has also been used to identify the highest elevations, which occur only on a few isolated mountain peaks (for example, Maxwell, Akna, Freyja, and Maat Montes), which comprise less than 1% of the surface area. The color bar shows both planetary radii and elevations relative to a reference radius of 6051.0 km.

Cartographic processing was done by Randolph L. Kirk.

NOMENCLATURE

V 10M 30/0 CMK: Abbreviation for Venus; 1:10,000,000 series; center of map, lat 30° N., long 0°; controlled mosaic (CM) with color altimetry (K).

REFERENCES CITED

Alexandrov, Y.N., Basilevsky, A.T., Kotel'nikov, V.A., Petrov, G.M., Rzhiga, O.N., and Sidorenko, A.I., 1988, A planet rediscovered: Results of Venus radar imaging from the Venera 15 and Venera 16 spacecraft: Soviet Science Rev. B. Astrophysics and Space Physics, v. 6., p. 61–101.

Batson, R.M., Kirk, R.L., Edwards, K.F., and Morgan, H.F., 1994, Venus cartography: Journal of Geophysical Research, v. 99, p. 21,173–21,182.

Campbell, D.B., Head, J.W., Hine, A.A., Harmon, J.K., Senske, D.A. and Fisher, P.C., 1989, Styles of volcanism on Venus: New Arecibo high-resolution radar data: Science, v. 246, p. 373–376.

Davies, M.E., and nine others, 1986, Report of the IAU/IAG/COSPAR Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: Celestial Mechanics, no. 39, p. 103–113.

Davies, M.E., and eight others, 1992, The rotation period, direction of the north pole, and geodetic control network of Venus: Journal of Geophysical Research, v. 97, no. E8, p. 13,141–13,151.

Edwards, K.F., and Davis, P.A., 1994, The use of intensity-hue-saturation transformation for producing color shaded-relief images: Photogrammetric Engineering and Remote Sensing, v. 60, p. 1369–1374.

Ford, P.G., and Pettengill, G.H., 1992, Venus topography and kilometer-scale slopes: Journal of Geophysical Research, v. 97, p. 13,103–13,114.

International Astronomical Union, 1971, Commission 16: Physical study of planets and satellites, *in* Proceedings of the 14th General Assembly, Brighton, 1970: Transactions of the International Astronomical Union, v. 14B, p. 128–137.

Pettengill, G.H., and five others, 1980, Pioneer Venus radar results: Altimetry and surface properties: Journal of Geophysical Research, v. 85, no. A13, p. 82,261–82,270.

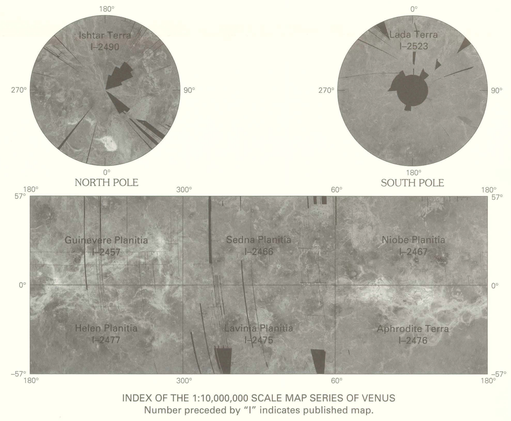
Pettengill, G.H., and four others, 1991, Magellan: Radar performance and data products: Science, v. 252, no. 5003, p. 260–265.

Phillips, R.J., and five others, 1979, The gravity field of Venus: A preliminary analysis: Science, v. 205, no. 4401, p. 93–96.

Planetary Cartography Working Group (Strom, R.G., and ten others), 1984, Planetary cartography in the next decade (1984-1994): National Aeronautics and Space Administration Special Publication 475, 71 p.

Planetary Cartography Working Group (Zimbleman, J.R., and sixteen others), 1993, Planetary cartography 1993–2003: National Aeronautics and Space Administration, Planetary Cartography Working Group, 50 p.

Saunders, R.S., and Pettengill, G.H., 1991, Magellan: Mission summary: Science, v. 252, no. 5003, p. 247–249.



INDEX OF THE 1:10,000,000 SCALE MAP SERIES OF VENUS
Number preceded by "I" indicates published map.

ALTIMETRIC RADAR IMAGE MAP OF THE SEDNA PLANITIA REGION OF VENUS

V 10M 30/0 CMK

1998

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 451, 2255 N. Gemini Drive, Flagstaff, AZ 86001. A replacement copy will be returned.

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver CO 80225