U.S. DEPARTMENT OF THE INTERIOR
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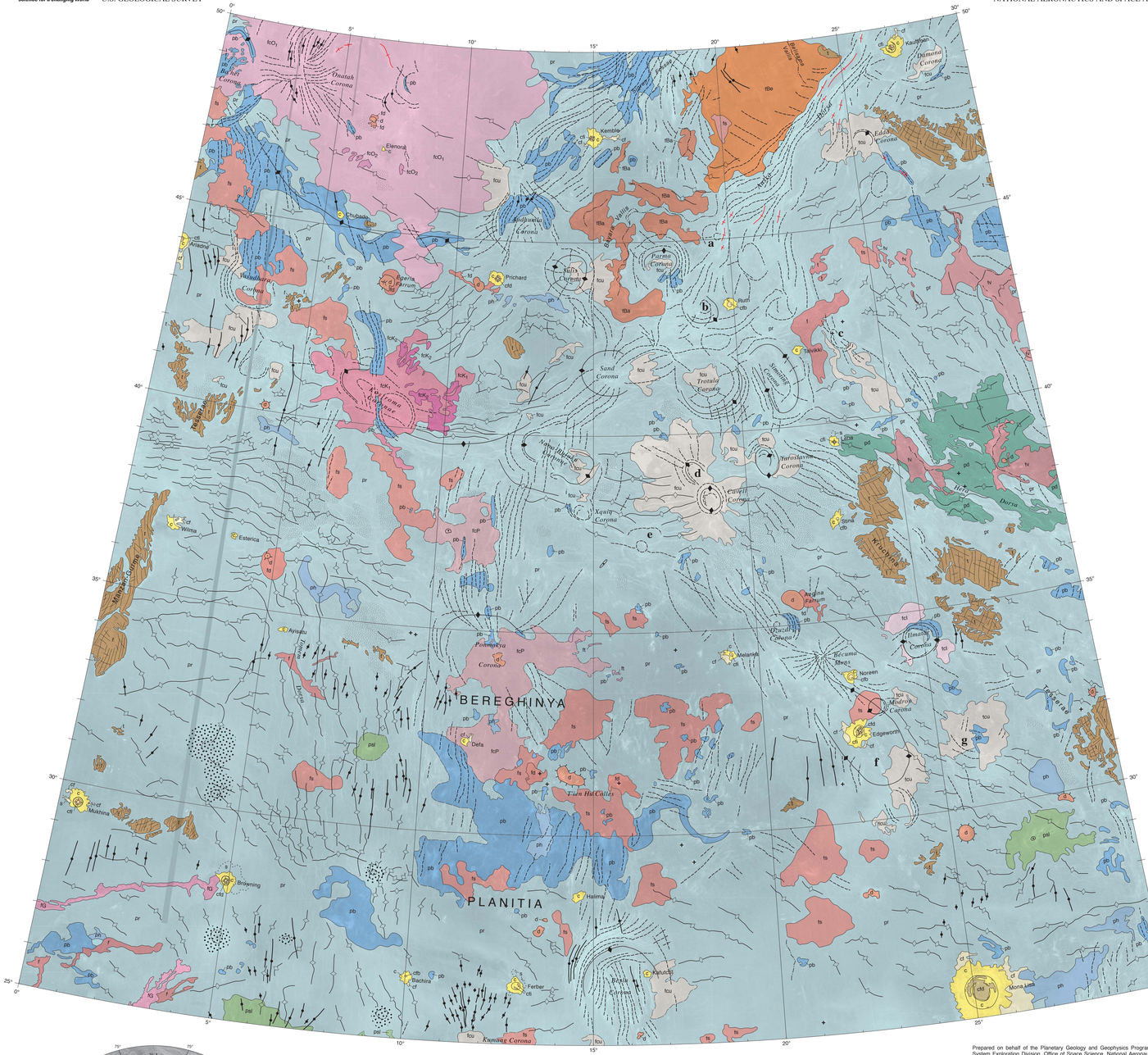
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GEOLOGIC INVESTIGATIONS SERIES I–2794
ATLAS OF VENUS: BEREGHINYA PLANITIA QUADRANGLE (V–8)
Pamphlet accompanies map



SCALE 1:4 711 886 (1 mm = 4.712 km) AT 25° LATITUDE
1:5 000 000 AT 34° and 73° LATITUDES
LAMBERT PROJECTION

Prepared on behalf of the Planetary Geology and Geophysics Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration

Edited by Derrick D. Hirsch and Jan Zigler; cartography by Darlene A. Ryan and Beatrice C. Landavazo

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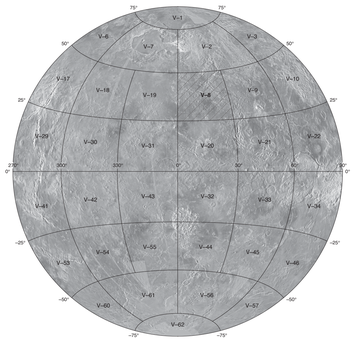


QUADRANGLE LOCATION
Photomosaic showing location of map area. An outline of 1:5,000,000-scale quadrangles is provided for reference.

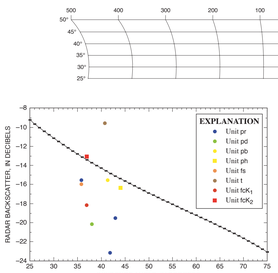


Figure 1. Plot of radar backscatter versus radar incidence angle. Black curve represents backscatter values on Venus according to Muhleman law. Note significant overlap of values for regional plains material and values for other plains and flow materials.

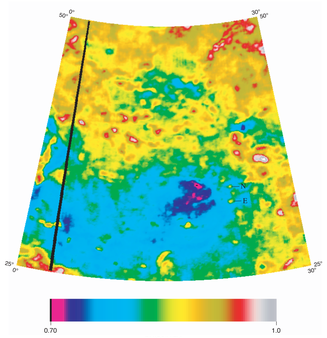


Figure 2. Map showing emissivity values for Bereghinya Planitia quadrangle. Irregular area of low emissivity just below center corresponds to combined streaks from crater Noreen (N) and parabola from crater Edgeworth (E).

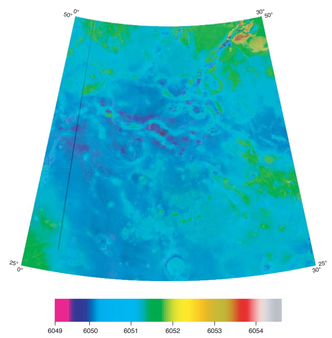


Figure 3. Map showing topography (in color) on a SAR background. Note that topography of ridges, corona rims, and corona floors is generally clear even at this small scale.

Table 1. Radar properties of selected map units.

[Two values for dielectric constant represent extreme possibilities for smooth (low value) and rough (high value) surfaces]

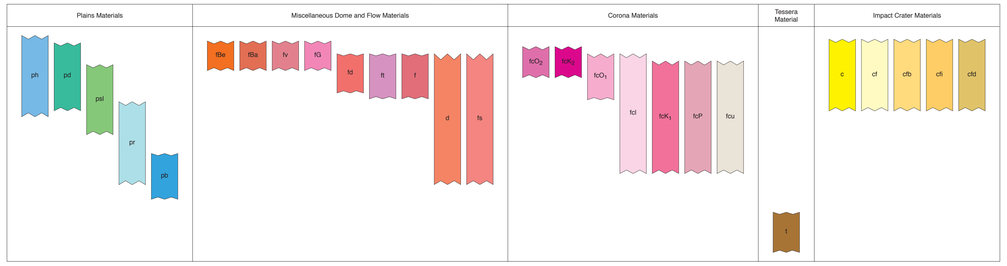
Unit	Latitude (° N.)	Longitude (° E.)	Number of pixels	Incidence angle (°)	Radius (km)	σ_0 (dB)	Root mean square slope (°)	Reflectivity	Emissivity	Dielectric constant
pr	29.724–29.903	8.194–8.322	4420	42	6050.862	–21.240	2.24	0.12	0.815	3.9, 6.1
pr	25.553–25.621	6.612–6.749	1914	43	6051.230	–19.517	2.07	0.114	0.820	3.7, 5.9
pr	42.586–42.697	26.922–27.122	3551	36	6051.448	–15.607	1.96	0.102	0.868	3.3, 4.5
pd	39.906–40.017	28.262–28.44	3339	38	6051.057	–20.082	0.97	0.117	0.859	3.4, 4.7
fs	43.201–43.262	4.176–4.329	1530	36	6051.977	–15.970	2.60	0.133	0.857	3.5, 4.8
t	33.566–33.741	0.241–0.398	4565	41	6050.933	–9.711	8.41	0.111	0.880	2.9, 4.1
fcK1	41.234–41.288	10.444–10.544	936	37	6051.137	–18.155	2.47	0.107	0.842	3.8, 5.2
fcK2	40.843–40.919	10.233–10.343	1480	37	6050.857	–13.221	3.33	0.11	0.855	3.5, 4.8
pb	29.077–29.092	24.454–24.482	96	42	6051.812	–13.502	1.10	0.105	0.844	3.4, 5.1
ph	25.099–25.197	27.106–27.236	2632	44	6051.387	–16.313	1.64	0.062	0.880	2.7, 4.0

GEOLOGIC MAP OF THE BEREGHINYA PLANITIA QUADRANGLE (V–8), VENUS

By
George E. McGill

2004

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

PLAINS MATERIALS

ph — **Homogeneous plains material**—Moderately bright on SAR images; emissivity higher than for other plains materials; homogeneous texture; wrinkle ridges sparse to moderately abundant; contacts commonly diffuse and wispy. *Interpretation*: Lava or eolian deposits superposed on regional plains; local wispy contacts due to modification by wind

pd — **Dark plains material**—Very dark on SAR images; radar backscatter coefficient and root mean square slope angle very low; texture generally homogeneous; wrinkle ridges abundant; superposed on regional plains material, and apparently filling very shallow depressions in the plains. *Interpretation*: Lava or pyroclastic material with very smooth surfaces at both decimeter and tens of meters scales

psl — **Low-relief shield plains material**—Moderately bright on SAR images; characterized by subdued digitate flow shapes; commonly with an apparent source caldera; slightly elevated above surrounding regional plains; wrinkle ridge abundance the same as for surrounding plains. *Interpretation*: Lava flows forming barely perceptible rises on the plains

pr — **Regional plains material**—Moderately bright to dark on SAR images, with brightness variations commonly on a scale of scores to hundreds of kilometers; texture generally homogeneous, but locally characterized by intricate fabric of sinuous to straight, bright lineations down to limit of resolution; small volcanic edifices locally very abundant; superposed wrinkle ridges, bright lineations, and grabens generally abundant; apparently older than all impact craters; most widespread unit in the quadrangle. *Interpretation*: Lava flows

pb — **Bright plains material**—Bright to very bright on SAR images; radar backscatter coefficient higher than for other plains materials; texture homogeneous to mottled at sub-kilometer scale; generally deformed by superposed closely spaced bright lineaments with a single dominant trend; materials and related structures embayed and sharply truncated at contacts with surrounding plains and corona materials; occurs as isolated inliers within younger materials throughout the quadrangle. *Interpretation*: Relatively old, deformed plains volcanic rocks

MISCELLANEOUS DOME AND FLOW MATERIALS

flbe — **Belisama Vallis flow material**—Moderately bright to moderately dark on SAR images; mottled texture; forms lobate and digitate forms associated with a 1- to 3-km-wide lava channel; superposed on regional plains material, Sigrun Fossae and Auisrà Dorsa structures, but deformed by some radial structures from Sulis Corona; wrinkle ridges sparse. *Interpretation*: Flows, probably basaltic, derived from lava channel

flba — **Bayara Vallis flow material**—Similar to material of Belisama Vallis flows but derived from a different lava channel. *Interpretation*: Flows, probably basaltic, derived from lava channel

fv — **Vallis flow material**—Moderately bright to bright on SAR images; similar to material from Belisama and Bayara Valles except associated with narrower, unnamed lava channels; superposed on regional plains and dark plains materials; wrinkle ridges generally as abundant as on surrounding plains materials. *Interpretation*: Flows derived from lava channels

fG — **Gula Mons flow material**—Moderately bright to bright on SAR images; mottled texture; occurs as long, digitate flow forms emanating from Gula Mons; superposed on regional plains material, north-trending grabens and lineations, and some wrinkle ridges; wrinkle ridges sparse. *Interpretation*: Flows of low viscosity, probably basaltic, lava derived from Gula Mons

fd — **Dome and shield flow material**—Moderately bright to dark on SAR images; texture generally homogeneous; forms lobate flow forms adjacent to or surrounding domes; superposed on regional plains material, shield flow material, and corona flows; wrinkle ridges sparse. *Interpretation*: Lava flows erupted from domes

ft — **Textured flow material**—Very bright on SAR images; vermiform texture at sub-kilometer scale; forms small, isolated digitate flow forms superposed on regional plains material. *Interpretation*: Lava flows, more silicic than other flow units in the quadrangle

f — **Flow material, undifferentiated**—Dark to bright on SAR images; digitate flow forms not associated with an apparent source; superposed on regional plains material; wrinkle ridges as abundant as on surrounding plains. *Interpretation*: Lava flows

d — **Dome and shield flow material**—Moderately bright on SAR images; texture homogeneous; generally superposed on regional plains material and on corona flows; wrinkle ridges commonly diverted but generally sparse. *Interpretation*: Lava constructional forms

fs — **Shield flow material**—Moderately bright to dark on SAR images; texture mottled at kilometer scale due to abundant small shields, but homogeneous at smaller scale; lobate and digitate flows derived from and commonly surrounding clusters of small shields and domes (shield fields); superposition and crosscutting relations suggest a wide range of ages for individual isolated areas of this material. *Interpretation*: Lava flows, probably basaltic

CORONA MATERIALS

[Note detailed discussion in pamphlet and table 3]

fcO_2 — **Onatah Corona flow material, member 2**—Moderately bright to bright on SAR images; texture generally homogeneous; digitate and lobate flow forms emanating from corona structure; superposed on Onatah Corona flow material, member 1; consistently brighter on SAR images than member 1; wrinkle ridges less abundant than on member 1. *Interpretation*: Lava flows, probably basaltic

fcK_2 — **Kostroma Coronae flow material, member 2**—Bright on SAR images; texture homogeneous; digitate flow forms emanating from Kostroma Coronae; superposed on Kostroma Coronae flow material, member 1, and on regional plains material. *Interpretation*: Lava flows, probably basaltic

fcO_1 — **Onatah Corona flow material, member 1**—Moderately dark to moderately bright on SAR images; texture generally homogeneous; flows emanating from corona structure and superposed on regional plains material and on Audhumla Corona flows; wrinkle ridges somewhat less abundant than on surrounding regional plains material. *Interpretation*: Lava flows, probably basaltic

fcl — **Ilmatar Corona flow material**—Digitate and lobate flows; digitate flows similar to Onatah Corona flows; superposed on regional plains; lobate flow superposed on concentric fracture ring of corona. *Interpretation*: Digitate flows probably basaltic, lobate flow more evolved

fcK_1 — **Kostroma Coronae flow material, member 1**—Flows derived from Kostroma Coronae; moderately bright on SAR images; texture generally homogeneous; superposed on regional plains material but superposed by shield flow material. *Interpretation*: Lava flows, probably basaltic

fcP — **Ponmakya Corona flow material**—Areally extensive flows derived from Ponmakya Corona; texture mottled to homogeneous; superposed on regional and bright plains materials, but superposed by shield flow material. *Interpretation*: Lava flows, probably basaltic

fcu — **Corona flow material, undifferentiated**—Flows from all coronae not described above; texture and brightness variable; generally of limited areal extent. *Interpretation*: Lava flows, probably basaltic

TESSERA MATERIAL

t — **Tessera material**—Bright on SAR images; radar backscatter coefficient and root mean square slope angle higher than for other materials; deformed by grabens, ridges, and penetrative lineations with at least two dominant trends at high angles to each other; structural features dominate texture down to resolution scale; unit and related structures embayed and sharply truncated at all contacts with surrounding materials; occurs as large massifs and as isolated inliers within younger materials throughout the quadrangle. *Interpretation*: Old, highly deformed terrain of unknown origin

IMPACT CRATER MATERIALS

c — **Crater material, undifferentiated**—Generally bright to very bright on SAR images; includes central peak, wall, rim, and ejecta materials of all craters, and also floor material of small craters; texture hummocky to granular. *Interpretation*: Deposits and structures created by hypervelocity meteorite impact

cf — **Crater flow material**—Bright to moderately dark on SAR images; homogeneous texture; forms lobate and digitate flow forms emanating from some impact craters. *Interpretation*: Impact melt or fluidized impact ejecta

cfb — **Bright crater floor material**—Very bright on SAR images; hummocky texture. *Interpretation*: Fresh impact fall-back and melt material

cfi — **Intermediate crater floor material**—Moderately bright to moderately dark on SAR images; homogeneous texture. *Interpretation*: Somewhat modified impact fall-back and melt material

cfd — **Dark crater floor material**—Dark on SAR images; homogeneous texture. *Interpretation*: Floor material either highly modified or covered by younger lava

Contact—Dashed where approximate

Graben

Wrinkle ridge

Large ridge

Ridge belt ridges

Channel

Dome or shield—Diameter >10 km

Dome or shield—Diameter <10 km

Depression or caldera

Crater rim—Diameter >10 km; dashed where rim is missing

Crater rim—Diameter between 5 and 10 km

Central peak

Airburst spot

Penetrative lineations—Within tessera terrain

Radar-bright lineament—Schematic

Secondary crater chain or cluster

Reticulate pattern on plains

a — **Unnamed coronae and coronalike features**—Designated on map by lower-case letters, a–g (from north to south)

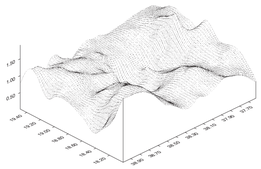


Figure 4. Topographic mesh plot of Cavell Corona. Topography of interior depression is relatively simple. View is to northwest. Vertical exaggeration approximately 15:1.

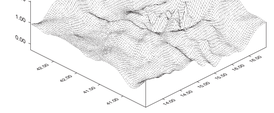


Figure 5. Topographic mesh plot of Sand Corona. Topography of interior depression is complex. View is to northeast. Vertical exaggeration approximately 15:1.

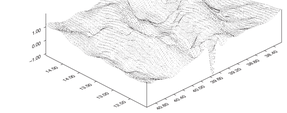


Figure 6. Topographic mesh plot of Kostroma Coronae. View is to northwest, aligned with long axis of the pair. Vertical exaggeration approximately 15:1.

Table 2. Locations and properties of impact craters.

[Crater freshness numbers represent a qualitative assessment of degree of degradation of crater rims, ejecta, and outflows: 1 is no noticeable degradation, 2 is moderate degradation, 3 is severe degradation. No severely degraded craters are present in this quadrangle. Floor entries record radar backscatter in decibels and mapping category: b, bright; i, intermediate; d, dark]

Crater	Latitude (° N.)	Longitude (° E.)	Diameter (km)	Freshness	Floor brightness (dB)	Peak	Outflow	Comments
Kauffman	49.40	27.10	26.30	1	i (–14.2)	Yes	Yes	
Kemble	47.75	14.85	23.10	1	i (–13.5)	Yes	Yes	
Elenora	47.10	6.90	3.5	1, halo	?	?	Yes?	
Chubado	45.25	5.60	8.30	2	b (–10.2)	No	No	Cut by Kostroma Coronae graben
Prichard	44.00	11.50	22.50	1	d (–18.0)	Yes	?	
Ariadne	43.90	0.00	19.60	1	i (–14.3)	Yes	Yes	
Ruth	43.29	19.90	17.30	1, parabola	b (–11.4)	Yes	No	
Talvikki	41.85	22.00	11.80	1, halo	i (–16.3)	Yes	Yes	
Lena	39.50	23.00	15.30	1	i (–13.4)	Yes	?	Secondary craters
Stina	37.55	22.80	10.20	1	b (–8.8)	No	Yes	
Esterica	36.75	3.60	3.6; 4.0	1, halo	i (–13.4)	No	Yes	Doublet
Wilma	36.70	1.70	12.80	1	b (–7.5)	No	Yes	
Ayisatu	34.60	5.50	7.40	1, halo	i (–12.9)	?	No	
Melanka	34.37	19.19	10.5; 9.4	1	i (–13.8)	No	Yes	Doublet
Noreen	33.57	22.79	19.30	1, parabola	b (–8.5)	Yes	No	
Edgeworth	32.20	22.75	30.20	1, parabola?	d (–17.7)	Yes	Yes	
Defa	32.20	11.30	6.50	1	b (–11.1)	No	Yes	
Mukhina	29.55	0.55	24.00	1, parabola	i (–15.2)	Yes	Yes	Secondary craters
Halima	28.49	14.60	9.20	1	i (–12.5)	No	No	
Browning	28.30	4.94	23.10	1, halo	d (–17.5)	Yes	No	Secondary craters
Kafutchi	26.70	16.40	7.0; 3.2	2	i (–14.1)	No	No	Doublet within Beyla Corona
Bachira	26.48	10.03	7.30	1	b (–10.4)	?	?	
Ferber	26.37	12.95	22.90	1, parabola	i (–13.0)	Yes	No	Secondary craters
Mona Lisa	25.55	25.10	81.70	2	d (–21.1)	Ring	Yes	Inner ring diameter = 43.2 km

Table 3. Locations and properties of coronae and coronalike features.

Corona or coronae	Lat (° N.)	Long (° E.)	Ridge diameter km)	Fracture diameter (km)	Concentric ridge	Concentric structure	Radial structure	Comments
Onatah	49.1	5.4	N/A	250	No	Poor; west edge only	To west only	Flows very extensive
Dumona	48.9	28.5	N/A	90 x 138	Partial	Partial	Northeast, southwest only	
Ba'het	48.4	0.3	N/A	133 x 277	Partial	Nearly complete	All directions	May be older than unit prb
Edda	47.2	25.5	51	51	About half way around	About half way around	Northeast, southwest	
Audhumla	45.3	12.5	N/A	158	No	Strong north, absent south	?Within Sigrun Fossae	
a	45.1	19.4	N/A	65	No	Poor	None	Deformed by Auisrà Dorsa ridges
Parma	44.4	17.4	87	102	About half way around	About half way around	Weak northwest, southeast	
Sulis	44.1	14.2	90	137	Complete	Narrow, but complete	Northwest, southeast only	
Vasudhara	43.2	2.8	N/A	158	No	About half way around	Strong north, south only	
b	43.2	18.8	74	N/A	Complete	None	Within Auisrà Dorsa	Stealth corona
c	43.1	23.9	N/A	30 x 72	No	Partial	Strong north-northwest, south-southeast	
Sand	41.6	15.6	122	173	Complete	Narrow and partial	Strong southwest, east	
Trotula	41.3	18.8	105	173 x 218	Complete	Nearly complete	West, northeast	May be twin with Simoting Corona
Simoting	41.2	21.0	113 x 210	N/A	Nearly complete	West side only	None	Stealth corona
Kostroma	40.7	7.8	N/A	98 x 250	North twin only	Complete	Strong east, west	Twin corona
Nana-Buluku	39.4	13.9	141 x 204	87 x 204	Nearly complete	Nearly complete	Strong east-southeast	Twin corona
Yaroslavna	39.3	20.6	68 x 89	68 x 89	Two concentric; partial	About half way around	North, west	Evolved lava?
d	39.0	18.3	63	N/A	Nearly complete	Poor	Strong all directions	Stealth corona
Cavell	38.3	18.8	60 x 66	60 x 66	Complete	Complete	Strong all directions	May be twin with corona d; extensive flows
Xquiq	38.0	14.6	N/A	51	Partial	About half way around	All directions	
e	37.2	16.5	N/A	101	No	Poor	East, west	Center is a mound
Druzdi	35.0	20.7	41	72	Complete	About half way around	?In a north-northwest belt	
Ilmatar	34.3	24.8	83 x 104	83 x 104	Nearly complete	Complete	All directions but east	Evolved lava?
Ponmakya	34.3	12.0	N/A	220	No	About half way around	Strong northwest, southeast	Extensive flows
Medrun	32.8	23.4	50	50	Nearly complete	Nearly complete	East, southeast	
f	32.0	23.0	141 x 255	141 x 255	Open to north	Partial	?In a belt	
g	32.0	26.0	N/A	180 x 225	No	Poor	Northwest, southeast	Very subtle feature
Beyla	26.2	15.8	208 wide	236 x 326	North only	Complete	North	
Kumang	25.0	11.8	41	41	East and west sides only	East and west sides only	North, south	

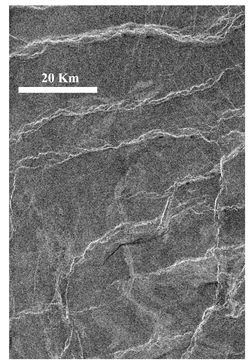


Figure 7. Example of complex wrinkle ridges having broad arches surmounted by narrow, sinuous ridges. Wrinkle ridges having these characteristics are apparently rare on Venus, but common on Mars and the Moon. Part of FMAP 42N018, tile 45N023.

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