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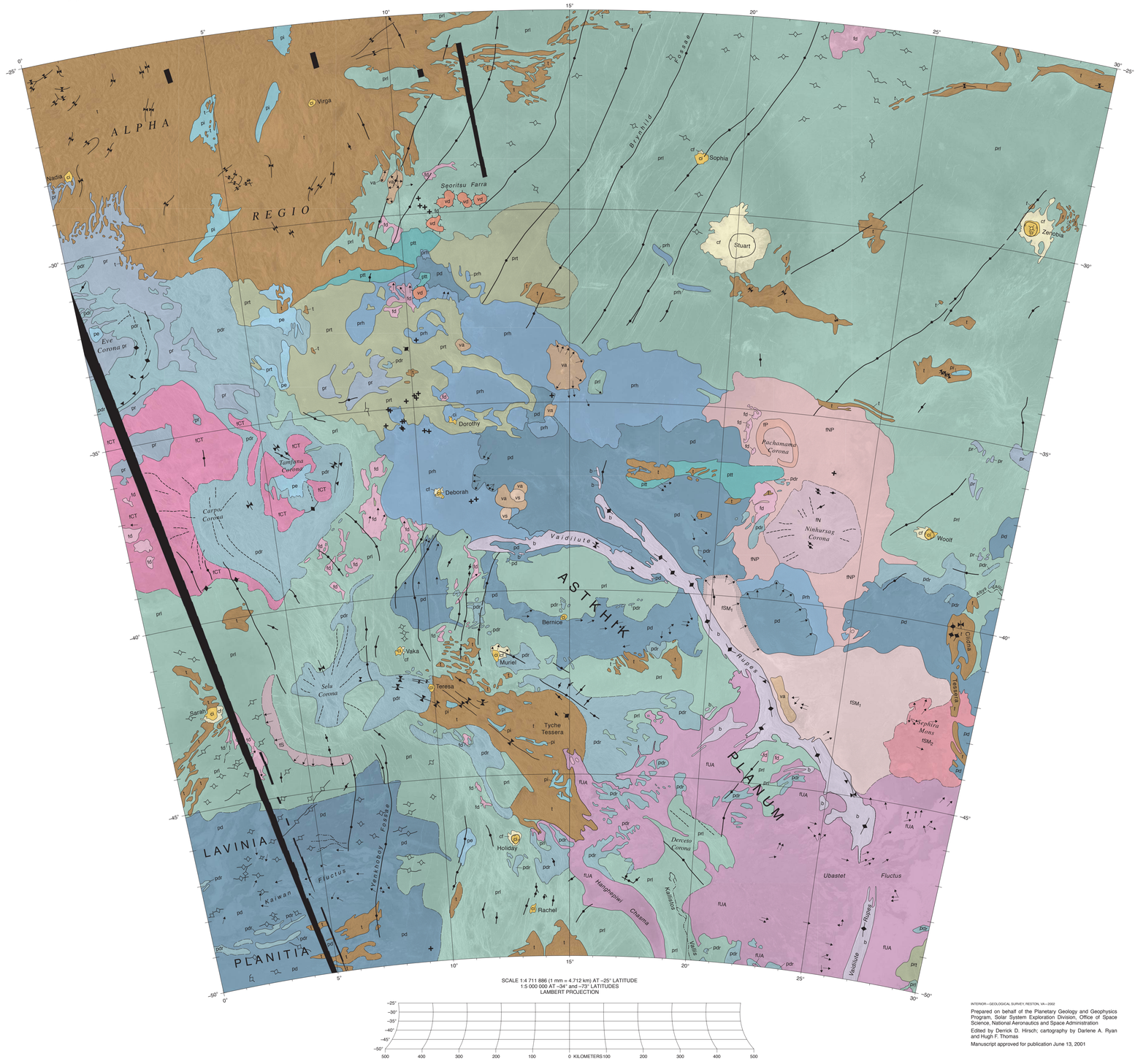
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GEOLOGIC INVESTIGATIONS SERIES I–2747
ATLAS OF VENUS: KAIWAN FLUCTUS QUADRANGLE (V–44)
SHEET 1 OF 2



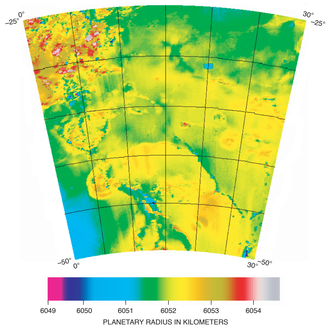


Figure 1. Topography of V–44. Note Alpha Regio highlands in upper left and margin of Astkhik Planum at center right.

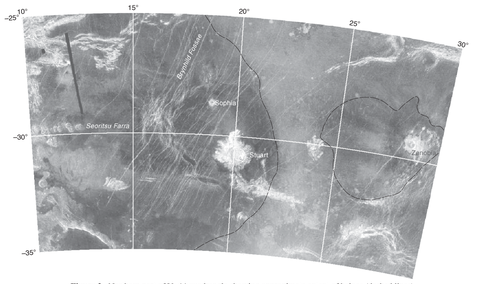


Figure 2. Northern part of V–44 quadrangle showing approximate extent of haloes (dashed lines) around Stuart and Zenobia craters.

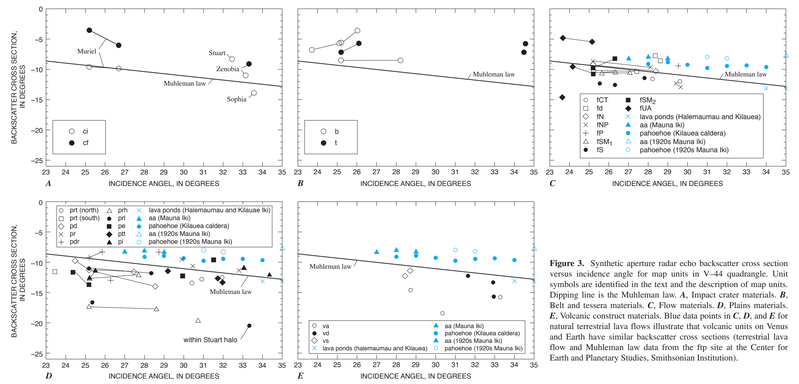


Figure 3. Synthetic aperture radar echo backscatter cross section versus incidence angle for map units in V–44 quadrangle. Unit symbols are identified in the text and the description of map units. Dipping line is the Muhleman law. ***A***, Impact crater materials. ***B***, Belt and tessera materials. ***C***, Flow materials. ***D***, Plains materials. ***E***, Volcanic construct materials. Blue data points in ***C***, ***D***, and ***E*** for natural terrestrial lava flows illustrate that volcanic units on Venus and Earth have similar backscatter cross sections (terrestrial lava flow and Muhleman law data from the ftp site at the Center for Earth and Planetary Studies, Smithsonian Institution).

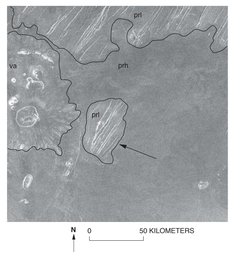


Figure 4. Distinct boundary between lineated regional plains material (unit prl), which contains a strong fabric of grabens and lineaments, and homogeneous regional plains material (unit prh). Arrow points to a kipuka of unit prl within unit prh (also see fig. 5). Unit va is anemone material. Image is centered at 34° S., 16° E.

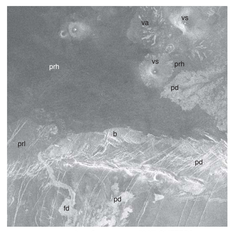


Figure 5. Contact between homogeneous regional plains material (unit prh) and lineated regional plains material (unit prl) south and west of Vaidilute Rupes (unit b, belt material). Unit prl is overlain by digitate plains material (unit pd) and digitate and lobate flow material (unit fd). Unit prh is overlain by units fd, vs (shield material), and va (anemone material). Grabens and lineaments in unit prl have the same orientation as those in the northern exposure of unit prl shown in figure 4.

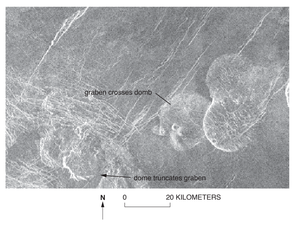


Figure 6. Possible evidence for domes having a range of ages. Lower arrow points to dome material that has truncated a graben. To the northeast, this graben, in turn, crosscuts a larger dome of Seoritsu Farra. These grabens are associated with Fatua Corona, ~1,500 km to the north.

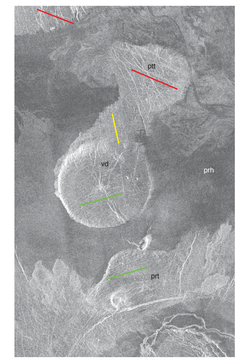


Figure 7. Image of "dome 105° (catalog number in Pavri and others [1992]), at 32.0° S., 10.5° E. East-northeast-trending lineaments (green lines) are present on the dome and textured regional plains material (unit prt), but are absent on surrounding homogeneous regional plains material (unit prh). Similarly, north-northwest-trending lineaments (yellow lines) are present on tessera-adjacent textured plains material (unit ptt) and the dome, but not on unit prh. Other lineament trends on unit ptt (red lines) show that the tongue north of the dome and the exposure in northwest corner of the frame represent the same unit. These observations indicate that "dome 105° was formed and modified before emplacement of homogeneous regional plains material.

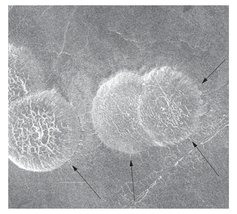


Figure 8. Domes of eastern Seoritsu Farra. Arrows point to radar-bright lineaments radiating from domes onto adjacent regional lineated plains.

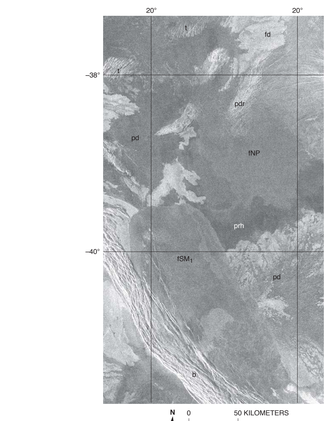


Figure 9. Enigmatic tongue of material on eastward margin of Vaidilute Rupes (~41° S., 21° E.). Note synthetic aperture radar brightness boundaries within the tongue are continuous with more distinct outlines outside, suggesting that the tongue may be surficial. fSM$_1$, member 1 of Sephira Mons flow material; t, tessera material; b, belt material; pdr, densely ridged plains material; prh, homogeneous regional plains material; pd, digitate plains material; fNP, Ninhursag and Pachamama Coronae flow material; fd, digitate and lobate flow material.

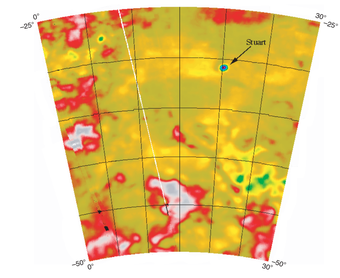


Figure 10. Microwave (12.6 cm) emissivity of V–44 quadrangle. Area of low emissivity in northeast is associated with crater Stuart.

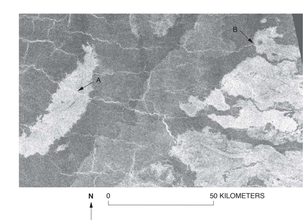
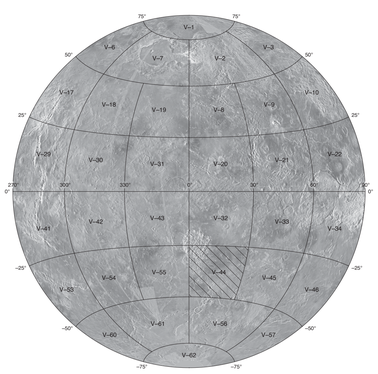


Figure 11. Wrinkle ridges within Kaiwan Fluctus in Lavinia Planitia that exhibit a range of ages relative to flows. At arrow labeled A, a wrinkle ridge crosscuts a flow, indicating it is younger. In contrast, at B, a flow truncates a wrinkle ridge.



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

CORRELATION OF MAP UNITS

STAGE	STRUCTURES	FLOW MATERIALS	VOLCANIC CONSTRUCT MATERIALS	PLAINS MATERIALS	BELT MATERIAL	TESSERA MATERIAL	IMPACT CRATER MATERIALS	IMPACT CRATERS
3	TESSERA: tessera uplift; tessera structures. BELTS: Alpha-Lada Extensional Belt; Vaidilute Rupes; Astkhik Planum; Derceto-Quetzalpetlatl Extensional Belt. CORONAE: Nihursag, Pachamama, Derceto; Eve; Carpo; Tamfana; Selu; Bryhnild Fossae; wrinkle ridges	fSM$_2$; fSM$_1$; fS; fCT; fd; fUA; fNP; fN; fP	va; vs; vd	pd; prh; pi; prl; prt; ptt; pr; pdr; pe	b	t	ci; cf	Muriel; Bernice; Sophia, Stuart; Holiday, Rachel, Sarah, Woolf, Zenobia; Deborah; Dorothy; Vaka; Nadia; Teresa, Virga
2								
1								

DESCRIPTION OF MAP UNITS

FLOW MATERIALS

[Where flows are dense, overlap in clusters, and have no apparent source, they are designated as digitate plains material (unit pd)]

fSM$_2$ Member 2 of Sephira Mons flow material—Digitate, radar bright; radiates from a central region. *Type locality*: 43° S., 28.5° E. *Interpretation*: Assemblage of flows resulting from flank and summit eruptions in late stage of shield volcanism

fSM$_1$ Member 1 of Sephira Mons flow material—Fairly homogeneous, radar bright; adjacent to unit fSM$_2$. *Type locality*: 37° S., 25° E. *Interpretation*: Lava flows resulting from flank volcanism on shield volcano. Stipple pattern near lat 40° S., long 21° E. indicates area interpreted to be surficial deposit instead of flow

fS Selu Corona flow material—Digitate to lobate shaped; radar brightness varies; emanates from southwest annulus of Selu Corona. *Type locality*: 44.2° S., 5° E. *Interpretation*: Lava flows erupted from flank and edges of Selu Corona

fd Digitate and lobate flow material—Radar bright; digitate and lobate pattern; commonly radiates from central source. *Type locality*: 37.5° S., 8° E. *Interpretation*: Young lava flows

fNP Ninhursag and Pachamama Coronae flow material—Radar bright, fairly homogeneous; surrounds both Ninhursag and Pachamama Coronae. *Type locality*: 36° S., 23° E. *Interpretation*: Lava flows erupted from flank and edges of Ninhursag and Pachamama Coronae

fUA Ubastet Fluctus and Astkhik Planum flow material—Digitate to lobate, generally radar bright; makes up Ubastet Fluctus and emanates from Astkhik Planum. *Type locality*: 48° S., 25° E. *Interpretation*: Lava flows erupted from vicinity of Derceto Corona

fCT Carpo and Tamfana Coronae flow material—Digitate to lobate shaped; radar brightness varies; emanates from vicinity of Carpo and Tamfana Coronae; exact vent location uncertain. *Type locality*: 37° S., 1° E. *Interpretation*: Lava flows erupted from flank and edges of Carpo and Tamfana Coronae

fN Ninhursag Corona flow material—Radar bright, fairly homogeneous; surrounds central region of Ninhursag Corona. *Type locality*: 37° S., 24° E. *Interpretation*: Lava flows erupted from flanks of Ninhursag Corona

fP Pachamama Corona flow material—Radar bright, fairly homogeneous; surrounds central region of Pachamama Corona. *Type locality*: 35.5° S., 22° E. *Interpretation*: Lava flows erupted from flanks of Pachamama Corona

VOLCANIC CONSTRUCT MATERIALS

vs Shield material—Moderately radar bright; forms circular to semi-circular cone having shallow slopes. *Type locality*: 37.3° S., 13.4° E. *Interpretation*: Exogenous lava flows atop a shield-shaped volcano

va Anemone material—Radar bright, lobate to digitate; radiates from a fracture or ring structure. *Type locality*: 29° S., 10° E. *Interpretation*: Lava flows from fissure eruptions

vd Dome material—Moderately radar bright; forms a circular to semi-circular mound having steep sides and a flat top. *Type locality*: 32° S., 10.5° E. *Interpretation*: Lava flows radially extruded by a combination of exogenous and endogenous episodes

PLAINS MATERIALS

pd Digitate plains material—Forms interlocking networks of digitate to lobate-shaped radar-bright regions. Long axis of digitate pattern generally radiates from a defined region but not from a recognizable source. Where digitate material is isolated, unit is referred to as digitate and lobate flow material (unit fd). *Type locality*: 47° S., 3° E. *Interpretation*: Young plains of low viscosity lava

prh Homogeneous regional plains material—Uniform texture, radar dark. *Type locality*: 35° S., 16° E. *Interpretation*: Young flood basalt, moderately smooth at centimeter scale

prl Lineated regional plains material—Appears generally radar bright; contains superposed linear features and fractures; wrinkle ridges are common. May grade into surfaces of darker appearance or region containing a lower density of structures. *Type locality*: 30° S., 17° E. *Interpretation*: Old plains material with superposed deformation from evolution of Fatua Corona and regional compression

prt Textured regional plains material—Appears generally radar bright; superposed by fine, lineated textures that generally trend northwest-southeast in northern exposures and west-northwest to east-southeast, east-northeast to west-southwest, and north to south in southeastern exposures. Type locality: 32° S., 7.5° E. *Interpretation*: Old plains material deformed by regional stresses

ptt Tessera-adjacent textured plains material—Radar bright; has fine north-south texture consisting of radar-bright linear features. Adjacent to Alpha Regio and other tessera. *Type locality*: 31.3° S., 9° E. *Interpretation*: Old, somewhat deformed plains material possibly related to tessera

pe Edifice plains material—Contains abundant small edifices and associated flows; commonly truncated by other plains units. *Type locality*: 32.3° S., 5.9° E. *Interpretation*: Lava flows and edifice structures formed by eruption through small vents

pr Ridged plains material—Variable radar brightness; dissected by generally unidirectional structural features such as ridges, grabens, and linear features of undetermined origin. May grade into surfaces having structural features of greater or lesser density. *Type locality*: 31.4° S., 5.2° E. *Interpretation*: Old plains material that was fractured or deformed before being truncated by more homogeneous plains material

pi Intratessera plains material—Moderately homogeneous, radar bright or radar dark; surrounded by and truncates tessera material. *Type locality*: 27.1° S., 4.7° E. *Interpretation*: Lava flows of variable centimeter-scale roughness covering tessera

pdr Densely ridged plains material—Variable radar brightness; strongly dissected by structural features such as ridges, grabens, and linear features of undetermined origin. Structures are aligned approximately orthogonally or radially to circumferentially, with one direction generally stronger than the other. Commonly present near coronae and tessera and is truncated by other plains materials. May grade into a more homogeneous surface that has fewer structures. *Type locality*: 43.4° S. 16.5° E. *Interpretation*: Old plains material that was fractured or deformed before being truncated by more homogeneous plains materials or coronal flows

BELT AND TESSERA MATERIALS

b Belt material—Radar bright; confined to the Vaidilute Rupes belt and nearby inliers. Deformed into ridges and troughs; long axes are parallel to the belt trend; structures are truncated by adjacent plains and flow materials. *Type locality*: 43.1° S., 22.3° E. *Interpretation*: Old material deformed by approximately uniaxial stresses associated with the formation of Astkhik Planum

t Tessera material—Radar bright; dominated by approximately orthogonal linear features, fractures, grabens, and ridges, which are truncated by adjacent plains materials. Exposed in Alpha Regio and Tyche Tessera and as isolated inliers throughout the map area. *Type locality*: 27° S., 7° E. *Interpretation*: Old material deformed by stresses that changed orientation with time

MATERIALS OF IMPACT CRATERS

ci Crater interior, rim, and ejecta materials—Radar-bright to radar-dark floor material with or without radar-bright central peak; surrounding rim is radar bright; hummocky, generally radial, radar-bright ejecta is common outside of rim. *Type locality*: 41.7° S., 12.4° E. *Interpretation*: Structures and deposits resulting from high-velocity meteorite impact

cf Crater flow material—Radar bright; digitate to lobate; generally external to and radiating from crater; in places, present within crater. *Type locality*: 30.6° S., 20.2° E. *Interpretation*: Material melted by high-velocity meteorite impact

SYMBOLS FOR GEOLOGIC MAP

Contact—Dashed where approximately located; dotted where buried

Fault or lineament—Origin uncertain or representation of general fabric trend

Graben

Thrust fault or ramp—Sawteeth on upper plate

Ridge crest

Wrinkle ridge

Trough or narrow depression

Crater rim—Showing crest

Central peak on crater floor

Channel or sinuous rille

Flow direction

Large dome—More than 15 km across

Small volcano—Less than 20 km across

GEOLOGIC MAP OF THE KAIWAN FLUCTUS QUADRANGLE (V–44), VENUS

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2002

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