

**DESCRIPTION OF MAP UNITS**

**HEAVILY DEFORMED UNITS**

**Deformation belt material**—Smooth material of low to intermediate radar backscatter (−15.24 dB mean) covering 55.1 × 10<sup>6</sup> km<sup>2</sup>, largely located in the north-central and northeastern parts of the quadrangle. Characterized by high degrees of contractional (early phase) deformation, plus later extensional deformation, aligned subparallel to the trend of an elongated topographic rise (±250 m mean elevation). Embayed by all other materials with which it is in contact. *Type locality:* lat 44.3° N, long 195.5° E. *Interpretation:* Old plains material heavily deformed by compressive stress, presumed volcanic in origin, preserved as elevated kipukas within younger, less deformed units.

**Tessera terrain**—High (−12.31 dB mean) radar backscatter coefficient material covering 0.39 × 10<sup>6</sup> km<sup>2</sup>, includes parts or all of Nemesis, Athena, and Labchev. Deformed by at least two intersecting sets of short-wavelength, ridge-and-trough style lineaments, to the extent that precursor materials can no longer be identified. Deformation is uniform locally and sometimes regionally. Commonly crossed by longer lineaments, and interior may contain younger volcanic flows. High standing, with a mean elevation of +400 m relative to quadrangle mean. Older than all other materials with which it is in contact. *Type locality:* lat 41.0° N, long 186.0° E. *Interpretation:* Old, complexly deformed material that largely records strain pre-dating development of regional plains and other materials.

**LOCAL PLAINS UNITS**

**Homogeneous plains material**—Very low backscatter material (−19.45 dB mean) covering 14.8 × 10<sup>6</sup> km<sup>2</sup>, at a single location on the flanks of a large domical rise in the north-central part of the quadrangle. Characterized by feather margins, a lack of internal texture, and unusually high RMS slope for a unit that shows minimal to no surface deformation. Emplaced at a mean elevation of +340 m, intersection with older units and structures, which it appears to either embay or mantle, indicates variable thickness within the unit. Embays units pl<sub>2</sub> and pl<sub>3</sub>, and occupies the youngest stratigraphic position within the quadrangle. *Type locality:* lat 44.5° N, long 193.5° E. *Interpretation:* Possible pyroclastic flow deposit.

**Shield plains material**—Mottled material with highly variable but generally low radar backscatter (−16.56 dB mean), covering 0.5 × 10<sup>6</sup> km<sup>2</sup> at locations throughout the quadrangle. Characterized by a high density of small (<20 km) edifices, largely with shield morphology, and overlapping areas of eroded material. Minimally deformed, the smooth material occurs most often within coronae or as large isolated patches. With a mean elevation of +40 m, the unit's mean topography is indistinguishable from that of the quadrangle as a whole. Unit pl<sub>2</sub> materials are superimposed upon units pl<sub>1</sub>, pl<sub>2</sub>, pl<sub>3</sub>, pl<sub>4</sub>, pl<sub>5</sub>, and pl<sub>6</sub>, and they are in turn embayed by units pl<sub>7</sub> and pl<sub>8</sub>. *Type locality:* lat 44.3° N, long 197.3° E. *Interpretation:* Young volcanic plains formed largely of overlapping lava erupted from locally dense concentrations of small shield volcanoes.

**Labchev hummocky plains material**—Narrow zone of material with very high radar backscatter (−12.21 dB mean) covering 12.5 × 10<sup>6</sup> km<sup>2</sup> in the southeastern corner of the quadrangle. Material is characterized by hummocky topography, with elongate peaks and troughs at ~10 km wavelength, and has been cut by a dense network of extensional lineaments. The hummocks and the lineaments are parallel to the long dimension of the unit as a whole, co-aligned with those in unit pl<sub>1</sub> and are generally orthogonal to extensional lineaments in adjacent tessera. Patches of late-stage volcanic material occupies lower areas. With a mean elevation of −50 m, the material lies 500–700 m below the surrounding tessera. Superimposed on unit l, synchronous (based on cross cutting and superposition relationships) with unit pl<sub>1</sub>, and embayed by unit pl<sub>2</sub>. *Type locality:* lat 28.3° N, long 187.5° E. *Interpretation:* Material is the end product of a localized sequence of volcanic eruption and oligae extension that has rifted apart a major block of Labchev Tessera.

**Labchev lineated plains materials**—Material with very high radar backscatter (−12.41 dB mean) covering 0.15 × 10<sup>6</sup> km<sup>2</sup> in the southeastern corner of the quadrangle. Characterized by expanses of smooth plains cut by locally dense concentrations of extensional lineaments, often organized into sinuous bands tens to hundreds of kilometers long that are co-aligned with the lineaments in pl<sub>1</sub>. The mean elevation, +400 m, is similar to but slightly lower than the adjacent tessera. Superimposed on unit l, synchronous (based on crosscutting and superposition relationships) with units pl<sub>1</sub> and pl<sub>2</sub>, and embayed by unit

**HEAVILY DEFORMED UNITS**

**Ganix Chasma material**—Smooth material with high radar backscatter (−12.08 dB mean) covering 0.16 × 10<sup>6</sup> km<sup>2</sup> in the southwestern part of the quadrangle. Largely predates extensional deformation defining Ganix Chasma rifting, but materials are younger in small patches. Locally the oldest unit, occurs at very high elevations (+620 m mean elevation). High standing, +400 m, is embayed by units pl<sub>1</sub> and pl<sub>2</sub>. *Type locality:* lat 26.5° N, long 182.0° E. *Interpretation:* Old plains material, presumably volcanic in origin, that predates the structural deformation and uplift characterizing Ganix Chasma.

**Lineated plains material**—Smooth material of variable but generally high radar backscatter (−14.28 dB mean) covering 0.33 × 10<sup>6</sup> km<sup>2</sup>, largely located in the central and southern parts of the quadrangle. Deformed by numerous short, subparallel extensional lineaments, generally aligned E-W; occasionally deformation also cuts adjacent tessera or occurs in association with corona topography. Often contains numerous small (<20 km) shield volcanoes. Mean elevation is +110 m. Superimposed on units l and pl<sub>1</sub>, and embayed by units pl<sub>1</sub>, pl<sub>2</sub>, pl<sub>3</sub>, and pl<sub>4</sub>. *Type locality:* lat 31.6° N, long 181.6° E. *Interpretation:* Old plains material, densely fractured and presumed volcanic in origin, preserved as elevated kipukas within younger, less deformed units.

**REGIONAL PLAINS UNITS**

**Regional plains material, 3**—Material with intermediate backscatter (−15.46 dB mean), covering 0.1 × 10<sup>6</sup> km<sup>2</sup> of the quadrangle, largely in the northeast corner. Characterized by a distinctly uniform, featureless texture. Extensively deformed by contractional lineaments but by very few extensional lineaments. Mean elevation, at +450 m, is the lowest in the quadrangle. Superimposed on units bl, pl, col, and pl<sub>2</sub>, and embayed by unit pl<sub>6</sub> and unit pl<sub>7</sub> (a basins except Xob Mons). *Type locality:* lat 44.0° N, long 203.3° E. *Interpretation:* Younger episode of regional volcanic plains, which occupies lowest areas and predominantly deformed by contractional deformation.

**Regional plains material, 2**—Material with very low radar backscatter (−17.84 dB mean), covering 2.66 × 10<sup>6</sup> km<sup>2</sup> (40 percent) of the map region, most extensive plains unit in the quadrangle. Characterized by a smooth, lightly mottled to featureless appearance. Areas of higher topographic relief exhibit clear-cut contacts with other units, but in areas of low slopes the edge of the unit is characterized by indistinct gradational contacts, with faint lobate margins occurring in some areas. Preserves both extensional and contractional deformation to varying degrees in different areas. Mean elevation is +110 m. Superimposed upon units bl, pl, pl<sub>1</sub>, pl<sub>2</sub>, and pl<sub>3</sub>, and embayed by units pl<sub>4</sub>, pl<sub>5</sub>, and pl<sub>6</sub>. Cut by Batius Vallis channel. *Type locality:* lat 40.5° N, long 199.0° E. *Interpretation:* Smooth, locally thin, possibly low viscosity volcanic plains subsequently deformed by both extensional and contractional deformation.

**Regional plains material, 1**—Material with high radar backscatter (−13.62 dB mean), covering 0.86 × 10<sup>6</sup> km<sup>2</sup> in the southern half of the quadrangle. Characterized by a highly mottled appearance, with individual patches sometimes displaying lobate margins. Preserves a higher than usual concentration, per unit area, of both extensional and contractional deformation, and in some locations numerous small shield volcanoes occur. Mean elevation is 180 m. Stratiigraphic contact relationships suggest a prolonged history of spatially and temporally variable emplacement, but pl<sub>2</sub> is generally superimposed on pl<sub>1</sub> and pl<sub>3</sub>, synchronous with pl<sub>1</sub> and embayed by pl<sub>4</sub>, pl<sub>5</sub>, and pl<sub>6</sub>. *Type locality:* lat 33.0° N, long 192.0° E. *Interpretation:* An early sequence of regionally extensive volcanic plains, subsequently deformed by both extensional and contractional deformation, that are preserved as elevated islands embayed by younger plains.

**EDIFICE AND CORONA UNITS**

**Volcanic edifice flow material**—Intermediate to high radar backscatter (−14.69 dB mean) materials, covering 0.66 × 10<sup>6</sup> km<sup>2</sup> across the quadrangle. Characterized by sheeted and digital materials with lobate boundaries and, in many instances, topographically controlled contacts. Contains many small- and intermediate-size volcanic edifices. Largely undeformed, with exceptions including regional contractional deformation in some areas and radiating extensional lineaments in others. Mean elevation of ~30 m, indistinguishable from that of the quadrangle as a whole. While local exceptions exist, particularly at long-lived centers such as Durinea Patera, unit pl<sub>1</sub> is generally superimposed on units pl<sub>1</sub>, pl<sub>2</sub>, pl<sub>3</sub>, l, bl, pl, and pl<sub>5</sub>. *Type locality:* lat 28.0° N, long 207.5° E. *Interpretation:* Young volcanic flows originating from a local volcanic center, often a major edifice.

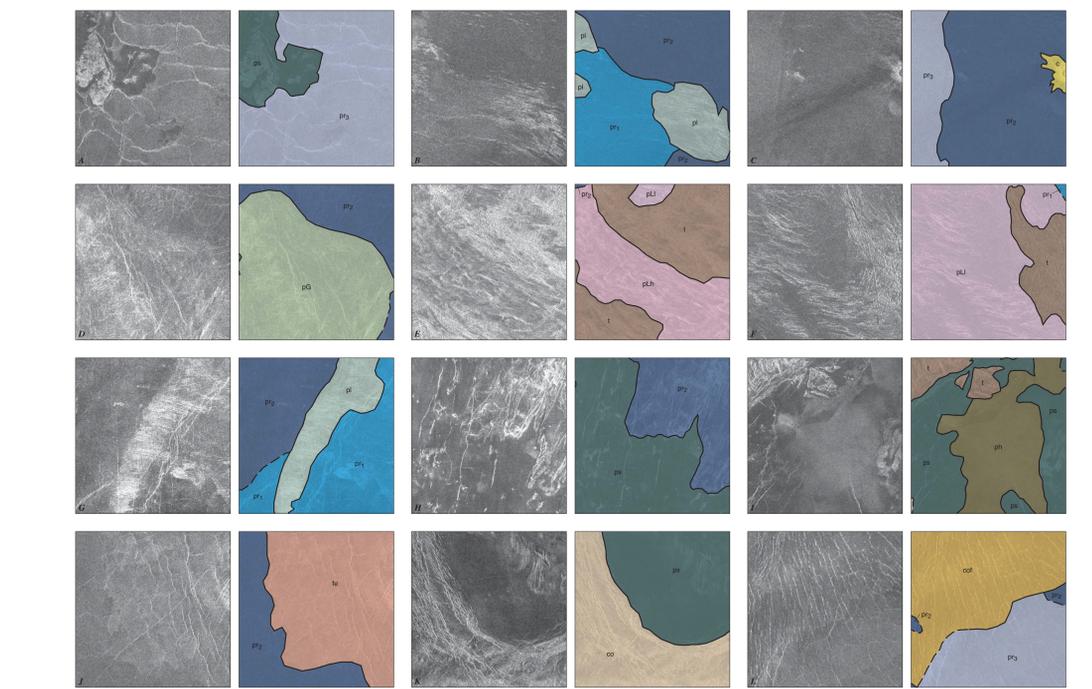
**Corona flow material**—Material with intermediate radar backscatter (−15.85 dB mean), covering 58.4 × 10<sup>6</sup> km<sup>2</sup> at two locations in the western part of the quadrangle. Characterized by a lightly mottled texture at small scales, and tends to be more heavily deformed than adjacent plains materials, largely by extensional deformation. Mean elevation is +180 m. Embayed by units pl<sub>1</sub>, pl<sub>2</sub>, and pl<sub>3</sub>. *Type locality:* lat 48.0° N, long 205.0° E. *Interpretation:* Older volcanic material that appears to originate from a nearby corona, largely preserved as kipukas within younger plains materials.

**Corona rim material**—Material with intermediate radar backscatter (−15.69 dB mean), covering 34.1 × 10<sup>6</sup> km<sup>2</sup> in the northeastern part of the quadrangle. Characterized by highly mottled texture at small scales. Deformed by both extensional and contractional deformation. Mean elevation of +80 m, but relief extends up to 1 km or more above adjacent areas. Embayed by units pl<sub>1</sub>, pl<sub>2</sub>, and pl<sub>3</sub>. *Type locality:* lat 49.0° N, long 205.5° E. *Interpretation:* Older volcanic plains, preserved only along the uplifted rim of the younger Cerriwren and Neperleah Coronae. Based on deformation and physical characteristics, may be similar in age to units pl<sub>1</sub> and pl<sub>2</sub>.

**IMPACT UNITS**

**Crater material, undifferentiated**—Material with high radar backscatter (−13.24 dB mean), covering 20.2 × 10<sup>6</sup> km<sup>2</sup> at numerous locations across the quadrangle. Characterized by hummocky textures and irregular margins that together define the crater rim, interior walls and floor, and cincta. Often associated with low radar backscatter materials that mantle the surrounding region. Mean elevation of ~340 m. Largely superimposed upon units pl<sub>2</sub> and pl<sub>3</sub>. *Type locality:* lat 48.3° N, long 195.3° E. *Interpretation:* Deposits and structures created by hypervelocity meteorite impact.

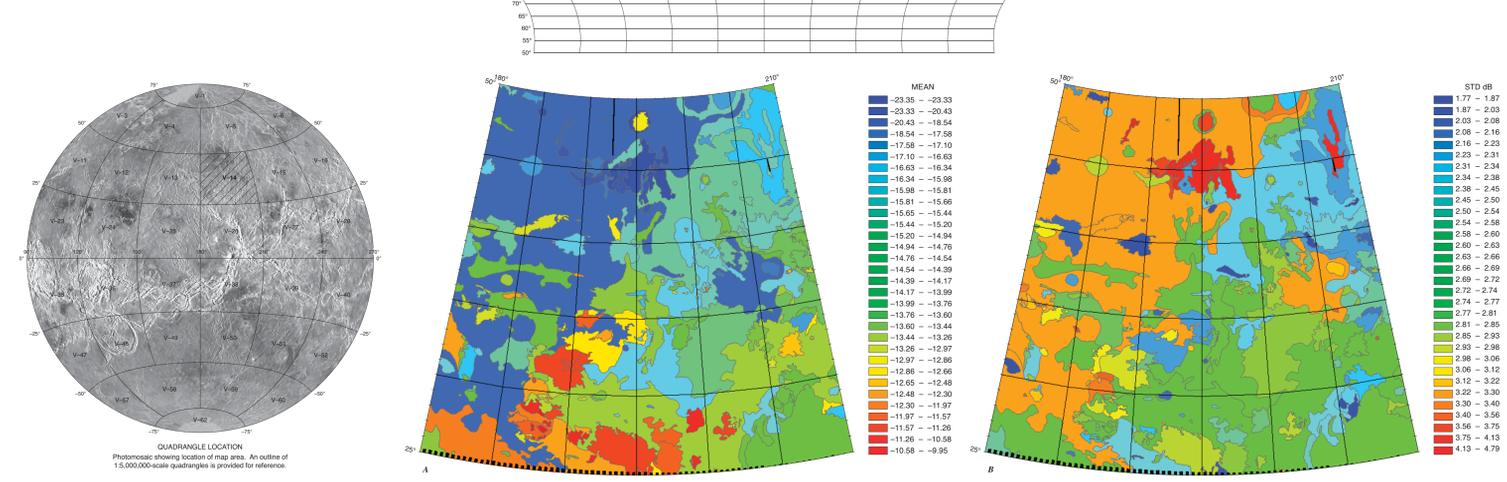
**Crater flow material**—Material with very low radar backscatter (−20.52 dB mean); lowest of all material units in V-14, covering 9.86 × 10<sup>6</sup> km<sup>2</sup> at one location within the quadrangle. Characterized by a sheet-like geometry and anomalously sharply defined margins; surrounds unit c. Mean elevation of ~130 m. May mantle unit pl<sub>2</sub>. *Type locality:* lat 44.3° N, long 193.3° E. *Interpretation:* Fine grained flow deposits associated with the formation of crater Yabbechima.



Descriptions of nomenclature used on map are listed at <http://planetarynames.wr.usgs.gov/>

SCALE 1:4 711 866 (1 mm = 4.712 km) AT 25° LATITUDE  
1:5 000 000 AT 50° LATITUDE  
LAMBERT PROJECTION

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**Figure 1.** Graphical depiction of latitudinally adjusted radar backscatter values for individual map units within V-14 (derived from table 1, in pamphlet). **A.** Mean values. Cooler colors indicate lower radar backscatter values, warmer colors indicate higher radar backscatter values. **B.** Standard deviations (10% of mean values). Cooler colors indicate lower standard deviation values (less variance in backscatter values), while warmer colors indicate higher standard deviation values.

**Figure 2.** Representative examples of all plains materials and map units derived from volcanic edifices or coronae. All figures are shown at the same scale (approximately 1° × 1°), and each figure box is ~110 km across, and all latitude and longitude values provided are for the center of given box. **A.** Unit pl<sub>2</sub>, depicting wrinkles ridges that have structurally controlled the emplacement of younger unit pl<sub>3</sub> materials. Lat 43.0° N, long 198.6° E. **B.** Unit pl<sub>1</sub> embays an elevated area of unit pl<sub>1</sub>. Both units are in turn embayed by unit pl<sub>2</sub>, which occupies lower elevations to the north and east. Lat 52.7° N, long 182.0° E. **C.** Unit pl<sub>2</sub>, preserved at elevation and embayed by younger unit pl<sub>3</sub> materials. Crater Uinkak provides an example of unit pl<sub>2</sub> and unit pl<sub>3</sub> materials to the southwest. Lat 40.8° N, long 198.8° E. **D.** Unit pl<sub>2</sub>, preserved at higher elevations. Contacts between this unit and adjacent ones are most easily seen in the pseudo-stereo data; here the sinuous contact with unit pl<sub>3</sub> is best seen owing to the transition from intermediate to darker radar backscatter. Lat 27.8° N, long 184.4° E. **E.** Unit pl<sub>1</sub> occurs at a single location, and it is characterized by hummocky topography and a high concentration of

fractures. Lineament trends in the adjacent elevated tessera terrains do not cut across the boundary, suggesting that unit pl<sub>1</sub> postdates the tessera. Lat 28.6° N, long 187.0° E. **F.** Unit pl<sub>1</sub> occurs at numerous locations, and its expression is variable. It closely resembles unit pl<sub>1</sub> but is geographically associated with Labchev Tessera. It lacks the hummocky texture of unit pl<sub>1</sub>, but local structural trends and deformation are similar. Unit pl<sub>1</sub> embays the adjacent tessera, and structural features cutting the tessera do not continue into unit pl<sub>1</sub>, and these relations indicate that it is younger. Lat 27.5° N, long 189.7° E. **G.** Unit pl<sub>1</sub> is characterized by intense local fracturing, generally in a single orientation. As shown here, it is embayed by unit pl<sub>1</sub> and unit pl<sub>2</sub>; young north-south fractures cut unit pl<sub>1</sub> but become increasingly faint within unit pl<sub>2</sub>, which indicates unit pl<sub>2</sub> is younger and likely quite thin in this area. Note that radar-dark materials seen in the southeast corner of the frame are halo-deposits from crater Yabbechima. Lat 33.4° N, long 208.6° E. **H.** Unit pl<sub>1</sub> is characterized by overlapping small shield deposits, which here clearly embay the structure cutting older unit pl<sub>2</sub> materials. Lat 46.3° N, long 196.4° E. **I.** Unit pl<sub>1</sub> occurs at a single location. Unit pl<sub>1</sub> is characterized by wispy margins, distinctive

radar properties (for example, high RMS slope), and it appears to mantle or flow around all other units in the area; we interpret it as a potential pyroclastic deposit. Deformation cutting young unit pl<sub>2</sub> materials quickly vanishes as it crosses the contact with unit pl<sub>1</sub>, establishing unit pl<sub>1</sub> as the older material, and both materials embay the adjacent tessera terrains. Lat 45.8° N, long 193.5° E. **J.** Unit pl<sub>1</sub>, here derived from Xob Mons, is shown flowing downslope from the east onto unit pl<sub>2</sub> materials that occupy the lowlands to the west. This unit is characterized by distinct lobate flow geometries. Lat 39.3° N, long 193.1° E. **K.** Unit pl<sub>1</sub> occurs as plains materials that have been uplifted and preserved along the rim of Cerriwren and Neperleah Coronae. They commonly preserve structures aligned parallel to the local trend of the sinuous, and here the corona interior is shown flooded by younger unit pl<sub>2</sub> materials. Lat 49.2° N, long 203.7° E. **L.** Unit pl<sub>1</sub> appears to originate from a nearby corona, and it is commonly preserved only as kipukas within younger plains material. Here embayments by unit pl<sub>2</sub> is clearly evident by the rapid transition of structures as they pass across the contact from unit pl<sub>1</sub> into unit pl<sub>2</sub>. Lat 47.2° N, long 203.3° E.