

GEOLOGY OF THE V31 SIF AND GULA QUADRANGLE OF VENUS; Duncan L.Copp and John E. Guest, University of London Observatory NW7 2QS, UK. e-mail dlc@star.ucl.ac.uk

The area was mapped as part of the Venus Geological Mapping Project (VMAP) designed to produce a global set of geological maps providing a meaningful interpretation of the geology Venus. The Sif and Gula quadrangle (0° N - 25° N, 330° E - 0° E) includes a section of Western Eistla Regio dominated by Sif and Gula, two large constructs with associated flow units analogous to terrestrial shield volcanoes (1,2). The remainder of the quadrangle is composed of a variety of plains materials and other volcano-tectonic units (Fig 1). The area has been a prime target for ground based Goldstone and Arecibo radar investigation (3) and the improved resolution of Magellan SAR enables a more detailed analysis of stratigraphic relationships.

The Geologic Units

Units are defined from the radiometric information provided by the Magellan data sets. Six major units are identified; *Sif Mons unit*, *Gula Mons unit*, *Smooth plains unit*, *Mottled plains unit*, *Homogeneous plains unit* and *Coronae units*. Minor units include *Edifice fields*, *Crater units*, *Volcanic centres* along with other volcanic and tectonic features that constitute a small percentage of the quadrangle but have stratigraphic importance.

Plains Units

These constitute the most extensive units. The *Smooth plains* exhibit a low radar return modified locally by surficial crater deposits and have a distinctive bidirectional tectonic fabric analogous to wrinkle ridges e.g. 14° N, 348° E. On a broad scale these ridges display a circular pattern around Sif and Gula and may owe their existence to domical rising as these constructs were formed (4). The *Smooth plains* display an undulating topography and although the unit appears to lack small edifices, closer inspection of individual framlets show that numerous areas display small constructs analogous to shields, having almost identical radar properties to the *Smooth plains* themselves. This raises the question as to whether these vents and pits are the previously undetected sources of these plains.

The *Mottled plains* are characterised by variable backscatter, indicative of relatively local variations in surficial morphology, and by a plethora of edifices dominantly analogous to small terrestrial shields <15 km in diameter e.g at 9°N, 348.5°E. The *Mottled plains* unit have undergone considerable tectonic deformation at various scales. *Homogeneous plains* have a bright uniform radar return and lack edifices.

Volcanic Centres

These include intermediate volcanic centres, coronae, edifice fields and large shield volcanoes (Sif and Gula). The *Intermediate volcanic centres* delineate flow aprons < 200 km in length emanating from central edifices > 15 km in diameter. *Coronae units* include Benton (14.2° N, 340° E), Heng-O (in the south-east of the quadrangle, almost 900 km in diameter) and part of Idem-kuva (25° N, 358° E). Benton and Idem-kuva display large lobate flow fields of variable backscatter radiating from a series of arcuate graben. Superimposed on the plains and more commonly associated with the *Mottled plains* are the *Edifice field units*. This unit delineates concentrations of edifices, typically less than 15 km in diameter, believed to be magmatically related. The edifice fields are dominated by constructs analogous to small shield volcanoes, although cones are present too. The edifice field located at 18.5° N, 345° E is the largest within the quadrangle and has a number of associated flows.

Large shield volcanoes are represented by Sif and Gula both having basal diameters of 300 km or more. Both constructs are surrounded by a series of flow units having variable radar returns which emanate from summit regions; Sif has a nested caldera complex while Gula's summit is represented by a radar bright fracture zone 155 km in length. The constructs are thought to represent magma extruded from an upwelling plume that resulted in lateral stress, crustal thinning and rifting (5).

Stratigraphical Relationships

Synthetic Stereo images aid in constructing a Stratigraphical sequence. Small isolated outcrops of complex ridged terrain represent the oldest unit which have been embayed by *Smooth plains* materials. The *Smooth plains* are seen to embay the upstanding *Mottled plains*, hence post-dating them. The oldest plains unit appears to be the *Homogeneous plains* unit.

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Edifice fields and volcanic centres are seen superimposed on both mottled and smooth plains as are the coronae. The youngest major units are the constructs of Sif and Gula which clearly post-date the plains units. 25 impact related features are recorded in the quadrangle over an area of 8.6 million km² and hence is similar to the mean global density of 483,950 km² (6). The conclusion drawn from this is that the area has a similar average age to that predicted by crater densities for the globe, ~ 500 Ma (7).

References: (1) Head, et al. (1992) JGR, Vol. 97, No. 8, 13,153-13,197. (2) Senske, et al. (1992) JGR, Vol. 97, No. 8, 13,395-13,420. (3) Campbell, et al. (1990) JGR, Vol.17, No. 9, 1353-1356. (4) Basilevsky. (1993) LPSC XXV, abstracts 63-64. (5) Grimm et al. (1992) JGR, Vol. 97, No. 10, 16,035-16,054. (6,7) Strom, et al. (1994) JGR, Vol. 99, No. 5, 10, 889-10,926.

25° N

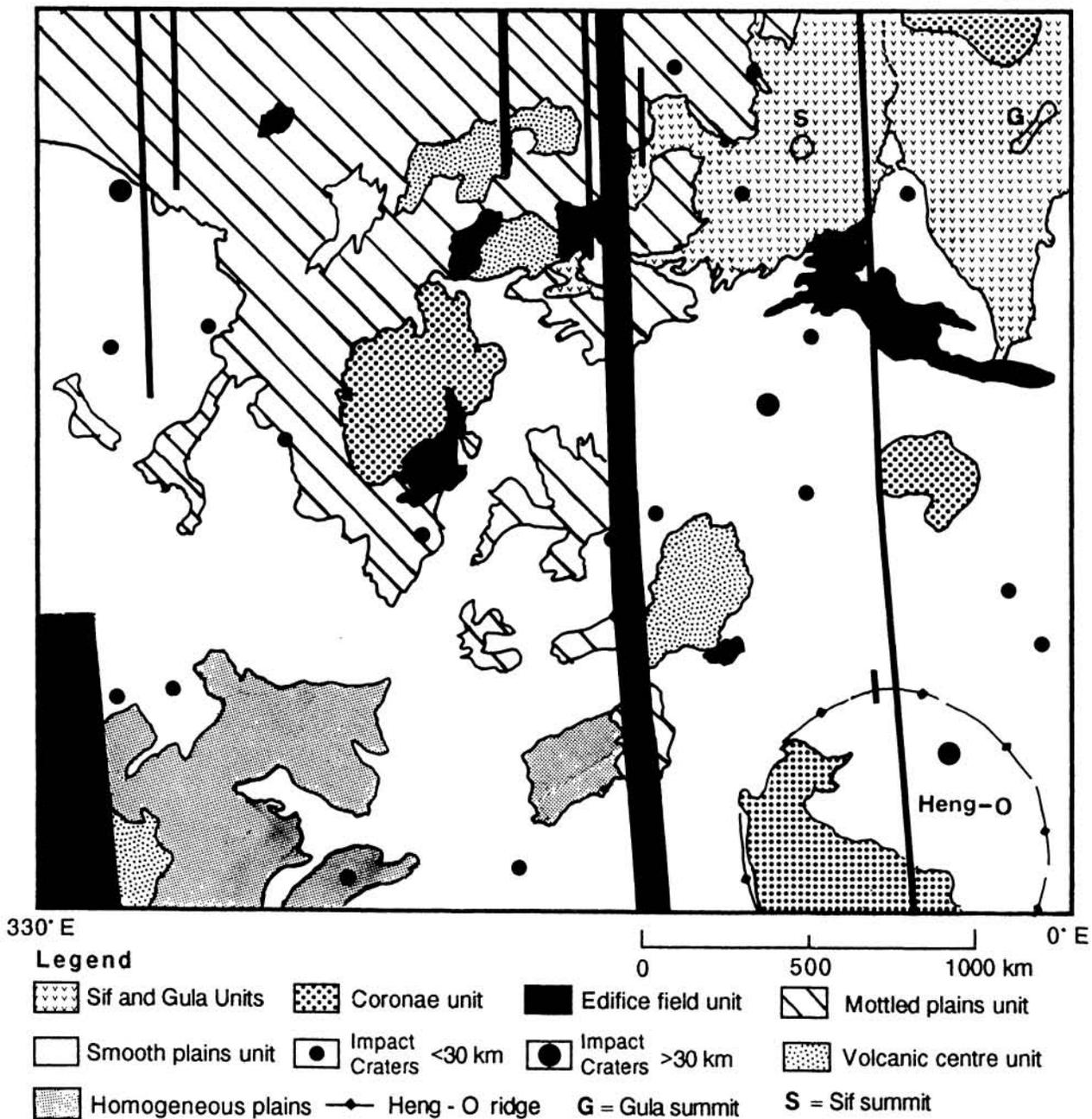


Figure 1. Simplified sketch map of the V 31 Sif and Gula quadrangle.