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RESULTS FROM ONGOING MAPPING OF V14, THE GANIKI PLANITIA (FORMERLY CALLED NEMESIS TESSERAE) QUADRANGLE, VENUS. Eric B. Grosfils & Sylvan M. Long, Geology Department, Pomona College, Claremont, CA 91711 (egrosfils@pomona.edu).

Introduction: The Ganiki Planitia quadrangle[1] (25-50°N, 180-210°E) is located north of Atla Regio, south of Vinmara Planitia, and southeast of Atalanta Planitia. The region contains a diverse array of volcanic-, tectonic- and impact-derived features, and the objectives for the ongoing mapping effort are fivefold: 1) explore the formation and evolution of radiating dike swarms within the region, 2) use the diverse array of volcanic deposits to further test the neutral buoyancy hypothesis proposed to explain the origin of reservoir-derived features, 3&4) unravel the volcanic and tectonic evolution in this area, and 5) explore the implications of 1-4 for resurfacing mechanisms. Previous reports focused on progress with objectives 1 and 2; the current report focuses on efforts to decipher the quadrangle's complex material unit stratigraphy.

Approach: Ongoing mapping and analysis of the geology within the Ganiki Planitia quadrangle builds upon integrated interpretation of multiple datasets. The primary mapping base is a single, 250 m/pixel[2], georeferenced, Lambert Conformal Conic-projected Magellan radar image, co-registered in ArcGIS 8.3 with topography and remote sensing (e.g., emissivity, etc.) datasets. Complementing this mapping configuration, similar resolution synthetic stereo images (at 10x vertical exaggeration) viewed on an adjacent screen provide powerful topographic insight into material unit boundary locations and stratigraphy. Finally, georeferenced FMAP resolution (75 m/pixel) radar data, sinusoidally projected to a central meridian of 195 E and then digitally mosaicked within ArcGIS, are also employed; all units defined during mapping on the lower resolution Lambert base can be reprojected "on the fly" through a simple cut-and-paste operation in ArcGIS so that they co-register with the sinusoidally projected FMAP images, yielding a quick and efficient way to use high resolution data to refine problematic unit boundaries and stratigraphic relationships.

Undergraduate Involvement in '03-'04. Extensive work by six undergraduates[3] during the 2003-2004 academic year yielded new insight into the stratigraphy of the quadrangle. Five of the students were assigned different material and structural units and each was asked to create notes within ArcGIS regarding the stratigraphic relationships observed with all adjacent units, thereby ensuring in nearly all instances that at least two students examined the stratigraphy of every contact Grosfils had defined previously. These data, presented on the poster, were compiled to complement Grosfils' quadrangle-wide work interpreting the stratigraphy; they also help ensure that the final results are more robust and internally self-consistent. The sixth student collected statistical data using ArcGIS for all of the material units defined to date, providing information that is allowing us to carefully compare the bulk quantitative characteristics of the units. All six students will remain involved during the coming fall as the mapping concludes. In a new effort during this final stage one student, a math major performing his senior thesis, will explore classification techniques using the integrated suite of datasets in order to define material units on a purely mathematical basis. This will allow for direct comparison with the quantitative (and other) properties of the existing material units, which were defined by Grosfils on the basis of backscatter and topography data alone.

Overview of Material Unit Stratigraphy: The stratigraphy within the quadrangle unfortunately cannot be organized into a single comprehensive sequence due to the presence and extent of (1) a morphologically and temporally diverse "garbage bag" plains unit that cuts several broad swaths across the quadrangle, and (2) a few extensive, crater-related, radar-dark deposits—most notably from the crater Yablochkina—which almost completely obscure stratigraphic details within the affected areas. In spite of these challenges, several local stratigraphic sequences can be defined, each covering ~1/10 to ~1/6 of the quadrangle. In total they cover approximately half of the quadrangle.

Each of the local stratigraphic regions is characterized by a common sequence of transitions from one predominant style of geological activity to another. This could suggest that each local region records a similar sequence of transitions occurring at different times and/or rates, or that some/all of the local regions went through a general coarse sequence of geologic style transitions at about the same time and rate. In the text that follows we present the general stratigraphic sequence characteristics observed; however, because of the ambiguities imposed by the presence of the "garbage bag" units and crater-related dark deposits which separate the local stratigraphic regions, we have observed no compelling evidence to test the hypotheses for if/how the local region stratigraphies are related.

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[1] The quadrangle name was changed this year by the USGS; hence, previous reports describe work in **Nemesis Tessera (V14)**.

[2] This translates, when viewed at full resolution, to an effective mapping scale of approximately 1:1M.

[3] Thanks to (listed alphabetically): Dorothy Drury; Debra Hurwitz; Brian Kastl; Sylvan Long; Joey Richards; and, Lisa Venechuk.

Tessera. Tessera is consistently the oldest material unit where it is observed as part of a local stratigraphic sequence. Tessera blocks are embayed or crosscut by all surrounding units, and in no location do we observe tessera forming at the expense of any other unit. Within individual tessera blocks it is clear that a rich and complex deformational history is preserved; however, it is not yet clear if major blocks/areas of tessera preserve similar histories.

Transition 1. In each local region the preserved stratigraphy suggests that a complex era of intermingled plains emplacement and deformation dominated for some interval following tessera formation. This era yielded three distinct units which locally are older than everything but the tessera; however, they do not occur in a consistent sequence relative to one another, exhibiting variable temporal relationships in different areas of the quadrangle. In some cases deformed belts—either elevated and clearly constructed from a distinct material unit or so heavily deformed that the precursor unit failed to survive—are locally the oldest unit preserved. In other areas, plains characterized by pervasive extensional deformation and preserved as elevated kipukas are locally the oldest unit. Finally, in many areas a local contact indicates that the “garbage bag” plains are the oldest feature other than tessera. These plains have, relative to other plains in the quadrangle, an intermediate radar backscatter and a highly blotchy appearance. They are distinctive yet have frustratingly defied further subdivision, and they display stratigraphic contact relationships which are often ambiguous locally but, when taken as a whole, indicate clearly a prolonged history of spatially and temporally patchy emplacement and modification for the unit.

Transition 2. In each local stratigraphic sequence, the next interval is characterized predominantly by extensive plains volcanism. The plains have a darker backscatter than the other plains units in the quadrangle, and the embayment observed with other material units as well as the superposition locally on different lineament sets both hint at a fairly thin, low viscosity material. Emplacement of this unit appears to have occurred over a prolonged interval, and though younger than the “garbage bag” plains in the majority of areas it is clearly contemporaneous in some locations. The dark plains are never older than the lineated plains or deformed belts, but locally they predate all other units with which they are in contact.

Transition 3. The final distinct era of geological activity within the quadrangle is characterized predominantly by edifice-related volcanism and emplacement of a final regional plains unit with a distinctly brighter radar backscatter than the other plains in the quadrangle. The majority of the bright regional plains occurs in a single continuous and spatially extensive unit with no evident source. Onlap relationships reveal the unit is thicker in the middle and thin at the edges, and unlike the older plains it appears to define a brief (possibly single) emplacement event. Other bright plains units generally appear to have local sources (a volcano, etc.) but are similar in stratigraphic position. Complementing the bright plains, several large (>100 km diameter) edifices formed and the lobate surface flows from these constructs are everywhere superimposed on the surrounding materials, including the major bright plains unit. Similarly, there are several extensive plains units characterized by overlapping small shield deposits. The duration of time over which the small shields were emplaced is almost by definition unconstrained, but like the major edifices these small edifice plains are everywhere younger than the materials against which they abut; in no location are the small edifice plains and a major volcanic edifice in stratigraphic contact.

Other Selected Observations. There are four other brief observations we choose to note here. [1] Continued mapping of three giant radiating dike swarms reveals that two were emplaced over a stratigraphically lengthy period; the third falls within the deposits from Yablochkina and is thus stratigraphically ambiguous. On the older end, dikes both cut and are buried by the dark regional plains; at the younger end, other dikes and localized edifice volcanism at the same centers are the most recent features observed locally, in some cases across *quite* extensive areas. [2] Corona and related deposits, mostly in a relict state (highly modified remnants are all that remain) appear to have formed predominantly prior to the era characterized by extensive regional plains emplacement. Lineated plains and the “garbage bag” plains unit occur upon the elevated rims which have been preserved, and the rims are embayed by the dark plains and younger deposits. [3] Continued study of a potential pyroclastic deposit has revealed that the combination of remote sensing, backscatter and morphological characteristics is inconsistent with an eolian or lava flow origin, but consistent with pyroclastic emplacement[4]. Study of this enigmatic deposit is continuing. One major impact crater in V14 is older than surrounding units, but deposits from most are clearly younger than their surroundings. There are insufficient craters to date the surface.

Major Work Remaining: We are in the process of: finalizing unit definition, contact types and stratigraphic interpretation sequences; performing several quantitative analyses as part of the unit finalization process; and, analyzing the complex tectonic history preserved in the quadrangle.

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[4] *Long and Grosfils*, Potential pyroclastic deposit in the Nemesis Tessera (V14) quadrangle of Venus, #1194, *LPSC XXXV*, 2004.