YEAR TWO PROGRESS REPORT ON GEOLOGIC MAPPING OF THE MAHUEA THOLUS (V-49) QUADRANGLE, VENUS. N.P. Lang[1] ,C. Nypaver[1], E. Baker[1], and B.J. Thomson[2]; [1]Department of Geology, Mercyhurst University, Erie, PA 16546 (colenythegeoguy@gmail.com, nlang@mercyhurst.edu, ebaker37@lakers.mercyhurst.edu), [2]Boston Univ. Center for Remote Sensing, Boston, MA 02215 (bjt@bu.edu).

Introduction: The Mahuea Tholus quadrangle (V-49; **Figure 1**) extends from 25° to 50° S to 150° to 180° E and encompasses $>7\times10^6$ km^2 of the Venusian surface. Moving clockwise from due north, the Mahuea Tholus quadrangle is bounded by the Diana Chasma, Thetis Regio, Artemis Chasma, Henie, Barrymore, Isabella, and Stanton quadrangles; together with Stanton, Mahuea Tholus is one of two remaining quadrangles to be geologically mapped in this part of Venus. Here we report on our initial mapping results for this quadrangle.

Map overview: The map area is characterized predominantly by lowlands (Zhibek and Nsomeka planitiae) that have an overall north-northeast trend ~1000 kilometers wide and ~2000 km long. They appear to have served as a depocenter for numerous volcanic flows sourced from the northern and southern rims of the basin as well as from localized sources from within the basin itself [e.g., 1].

The southern edge of the lowlands gently rises into Dsonkwa Regio, an apparent volcanic center that extends south into the V-58 quadrangle (Henie) where it is hosts two coronae and $>>10^3$ small shield edifices [e.g., 2] that comprise Mena Colles, a shield field that stretches between V-49 and V-58; these coronae and shields are the sources of volcanic material flowing north into Zhibek and Nsomeka planitiae.

The northwestern rim of the basin is noted by the presence of the Diana-Dali Chasmata system, which cuts across the northwest corner of the map as it extends from near Artemis Corona in V-48 to the west [3] to Atla Regio to the northeast (V-26). This rift system is ~500 km wide here and has an overall north-northeast trend that parallels the basin, but has two southeast trending arms that extend a few hundred kilometers into the quadrangle.

Volcanic structures and units: The dominant features in the map area include volcanic edifices and associated deposits. Volcanic features within the basin include $>10^3$ small shield edifices and domes [*2*], coronae, and Mahuea Tholus: a 0.5-1.1 kilometer tall and nearly 100 km diameter volcano characterized by relatively thick (~10s of meters), overlapping, high-backscatter lava flows that emanate from a central edifice. These high backscatter flow materials preserve distinct flow structures including lobate and digitate flow fronts, constructional levees, and flow ridges. Surrounding Mahuea Tholus is an intermediate backscatter material that locally contains lobate fronts; because this material surrounds Mahuea Tholus, it is interpreted as sourced from the volcano, though the nature of emplacement (i.e., lava flow vs. air fall) is unconstrained [*1*]. *Moore et al.* [1] suggested that the volcano's flows may be highly siliceous due to the volcano being positioned in a planar region, the seemingly high viscosity of the volcano's flows, and the flows' unusual relief. Four double-rimmed coronae [*4*] have formed within the Diana-Dali rift within V-49 and have sourced extensive lava flows south into Zhibek Planitia; several flows have also been sourced directly from fractures in the rift itself as well as from numerous small shield edifices that have also formed along segments of the rift.

Seven E-W-trending channels also occur within this quadrangle, which is one of the largest single concentrations of channels in an individual quadrangle [5]. The channels occur along the northern and southern edges of the basin. Channel sources are indeterminable, but formation of the northern channels was likely associated with Diana-Dali-sourced flows; longitudinal profiles suggest all channels have been deformed by long-wavelength warping since formation.

Basement materials: Two groupings of 'tessera terrain' also outcrop in the map area. Urd Terrsera outcrops as a couple northerly-trending kipuka along the eastern edge of the topographic basin where they approximately mark the boundary between Zhibek and Nsomeka planitiae. Nortia Tesserae outcrops as a larger grouping of smaller kipuka along the northern edge of Donskwa Regio. Initial mapping of these features, however, indicates that they are not likely not true tessera terrain, but rather represent outcrops of deformed local basement materials of undeterminable origin.

Tectonic structures: Besides the rift zone, other tectonic structures in the map area include a northeast-trending suite of wrinkle ridges. These ridges also parallel the basin and have wavelengths ranging between 20 to 30 kilometers [6] and are part of a broad circum-Aphrodite Terra wrinkle ridge system described by [7]. These ridges deform most of the materials emplaced within the basin including the moderate backscatter materials surrounding Mahuea Tholus, but they are, in turn, buried by the relatively thick, high backscatter flow materials of the volcano [1, 6].

Impact craters: Thirteen identified and named impact craters also dot this map area and range from 12-100 km in diameter. All craters are associated with

ejecta blankets, but two craters also host fluidized ejecta materials. Seven craters also exhibit radar-dark floors.

Possible aeolian features: Multiple moderately radar-bright 'whispy' patches occur in the SE portion of the quadrangle. These features have a NW-SE trend and broadly resemble yardangs in their shape. They may represent tectonic structures or even local outcroppings of bedrock, but their shape and 'whispy' appearance makes us wonder if they could be aeolian.

Preliminary geologic history: Our initial mapping is consistent with relations identified in surrounding quadrangles and indicates a geologic history for V-49 punctuated by multiple, overlapping periods of volcanism and tectonism that occurred at both large and small scales and seemingly erased much of the earlier history for this part of Venus (**Figure 2**). Future mapping here should further constrain the relative timing of these events, specifically the stratigraphy of coronae flows in the NW section of the map area.

References: [1] Moore, H.J., et al. (1992), *JGR*, 97, E8, 13,479-13,493. [2] Guest, J.E., et al. (1992), JGR, 97, 15949. [3] Bannister, R.A. and V.L. Hansen (2010), USGS SIM 3099 – Geologic Map. [4] Stofan, E.R., et al. (1997), Venus II, 931-968. [5] Komatsu, G. (1993), Icarus, 102, 1-25. [6] Pierce, N.P. and Lang, N.P. (2012), LPSC Abstract 1682.pdf. [7] Bilotti, F. and J. Suppe (1999), Icaurs, 139(1), 137-157.

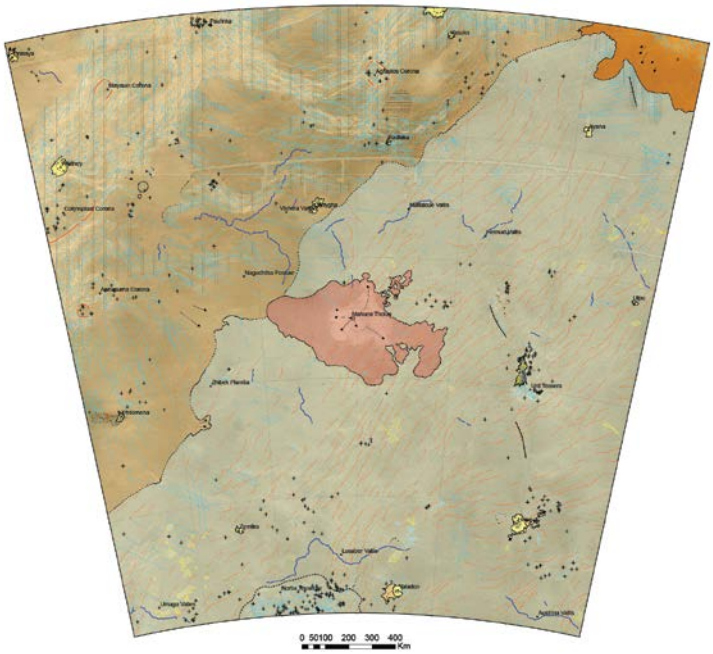

Figure 1: Initial geologic map of the Mahuea Tholus (V-49) quadrangle, Venus.

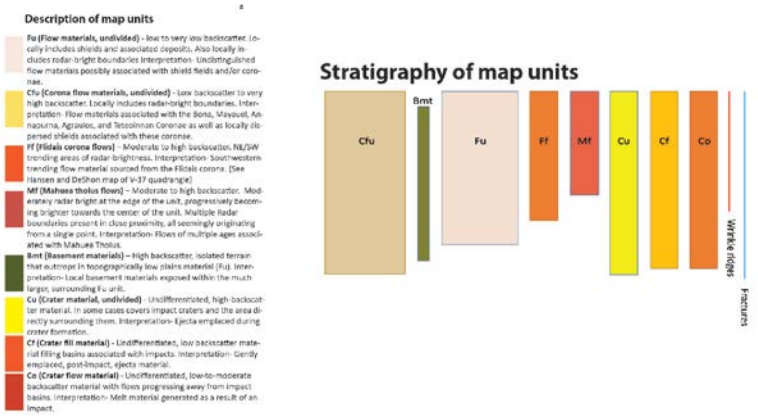

Figure 2: Initial description of map units and stratigraphy of the Mahuea Tholus (V-49) quadrangle, Venus.