GEOLOGICAL MAPPING OF THE LADA TERRA (V-56) QUADRANGLE, VENUS. P. Senthil Kumar[1,2] and James W. Head III[2], [1]National Geophysical Research Institute, Hyderabad 500007, India, senthilngri@yahoo.com; [2]Department of Geological Sciences, Brown University, Providence, RI 02912, USA, james_head@brown.edu.

Introduction: Geological mapping of the V-56 quadrangle (Fig. 1) reveals various tectonic and volcanic features and processes in Lada Terra that consist of tesserae, regional extensional belts, coronae, volcanic plains and impact craters. This study aims to map the spatial distribution of different material units, deformational features or lineament patterns and impact crater materials. In addition, we also establish the relative age relationships (e.g., overlapping or cross-cutting relationship) between them, in order to reconstruct the geologic history. Basically, this quadrangle addresses how coronae evolved in association with regional extensional belts, in addition to evolution of tesserae, regional plains and impact craters, which are also significant geological units of Lada Terra.

Geologic mapping: We used 250-m-per-pixel Magellan SAR images to prepare a geologic map at a scale of 1:5,000,000. Full-resolution (75-m-per-pixel) images were used for fine details of the mapped units and relationships. We used ArcGIS software for carrying out geological mapping. This quadrangle is bordered by Kaiwan Fluctus (V-44) [1] and Agnesi (V-45) [2] quadrangles in the north; Mylitta Fluctus (V-61) [3,4], Fredegonde (V-57) [5] and Hurston (V-62) [2] quadrangles in the west, east, and south, respectively. From the geologic mapping, we report on the distribution of the following material and structural units, and reconstruct the geologic history.

Material and structural units: Table 1 summarizes the material units and their relative age relationships. The oldest known material units are tesserae, radar bright areas characterized by multiple orientations of lineaments; two sets are dominant: NNW-SSE and ESE-WNW oriented lineaments. Tightly spaced ridges and troughs generally characterize tessera. The third dominant lineaments are NNE-SSW and NNW-SSE oriented along rift zones, namely, Chang Xi Chasmata and Seo-Ne Chasma; but these are apparently restricted to Cocomama Tessera. In the northeastern part of the quadrangle, terrains (tlt, Fig. 1) similar to tessera are found. They have NNE-SSW to NE-SW oriented ridges, which are cut by ESE-SNW to NW-SE oriented troughs. The spacing of these structures is greater than the structures of the tessera. The tessera units contain intra-tessera basins, which are filled by lava flows of different ages; most of them are derived from the units outside the tessera, and a few are from intra-tessera volcanism.

Regional plains units embay the tessera terrain; they have wrinkle ridges and a few young fracture systems. The oldest known plains (but younger than tessera) are densely lineated (pdl, Fig. 1), and are closely associated with shield plains and the tessera. The pdl is characterized by tightly spaced, NNW-SSE oriented fractures, which are also common in the tessera. Two types of shield plains are present: a few occur in the regional plains areas, while others occur in the core of coronae and adjoining areas. The youngest material units are lobate plains that are related to corona volcanism.

The older regional plains are cut by two regional extensional belts [6]: (1) NNW-SSE trending, 6000-km long and 50-200 km wide, Alpha-Lada (AL) belt, and (2) NNE-SSW trending, 2000 km long and 300 km wide, Derceto-Quetzalpetlatl (DQ) belt. These two belts are composed of fractures, rift basins and strike-slip zones. The DQ belt is punctured by Sarpanitum, Eithinoha and Quetzalpetlatl Coronae, while the Otygen, Demvamvit and Okhin-Tengri Coronae occur along the AL belt. A few coronae have a circular central dome and an outer concentric depression; they are defined by fractures, rift basins and ridge belts. Asymmetric and multiple coronae also occur in the southern part of the AL belt. Two other extensional belts branch from the AL belt. Coronae (Dyamenyuo and Toyo-uke Coronae and Loo-wit and Kshumay Montes) puncture these extensional belts. In many places, corona structures cut across the regional extensional belts, while in other places, the extensional belts cross the coronae structures. There is a clear overlapping time relationship, as one affects the formation of the other. Corona volcanism and tectonics are also closely related to one another. Lava flows erupt along the corona fractures, for example, in the Eithinoha Corona. Lava flows emanating from coronae travel several hundred kilometers across regional plains. Volcanism is also related to shield volcanoes in many places.

The DQ and AL belts separate the plains units of Lavinia Planitia, Aibarchin Planitia and Mugazo Planitia, where lava flows are abundant; principally there are four plain units, of which the oldest one appears to be common to all the planitia units. Most of the younger units are locally derived from the coronae. The regional plains occurring to the east of Otygen Corona have undergone intense fracturing and emplacement of graben (interpreted as dykes) after post corona-extensional belt deformation. These fractures occur in two directions: ENE-WSW and NW-SE. It appears that they represent the latest deformation, and could probably be related to terrain uplift, as is evident in many terrestrial examples.

Impact craters are the youngest geologic units, except for one that is affected by the extensional belt deformation and the other embayed by regional plains. Most impact craters show a complex geometry and a few are bowl-shaped. Many complex craters show asymmetric run-out flows that are characteristic of oblique impacts.

Correlation of material units: Older tessera units are postdated by numerous plains units; areally, regional plains with wrinkle ridges are the most extensive, with shield plains generally predating these and some corona volcanism postdating them. Final detailed mapping is underway to document the spatial and temporal evolution of the material units and deformation events. We are also linking this geologic history to the geodyamic processes implied by this surface evolution.

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References: [1] Bridges, N.T., and McGill, M.E., *USGS Scientific Investigations Map I-2747*, 2002. [2] http://astrogeology.usgs.gov/Projects/PlanetaryMapping/MapStatus/VenusStatus/Venus_Status.html. [3] Ivanov, M.A., and Head, J.W., *USGS Scientific Investigations Map 2920,* 2006. [4] Ivanov, M.A., and Head, J.W., this volume. [5] Ivanov, M.A., et al., this volume. [6] Baer, G., et al., *J. Geophys. Res.*, 99, 8335-8369, 1994.

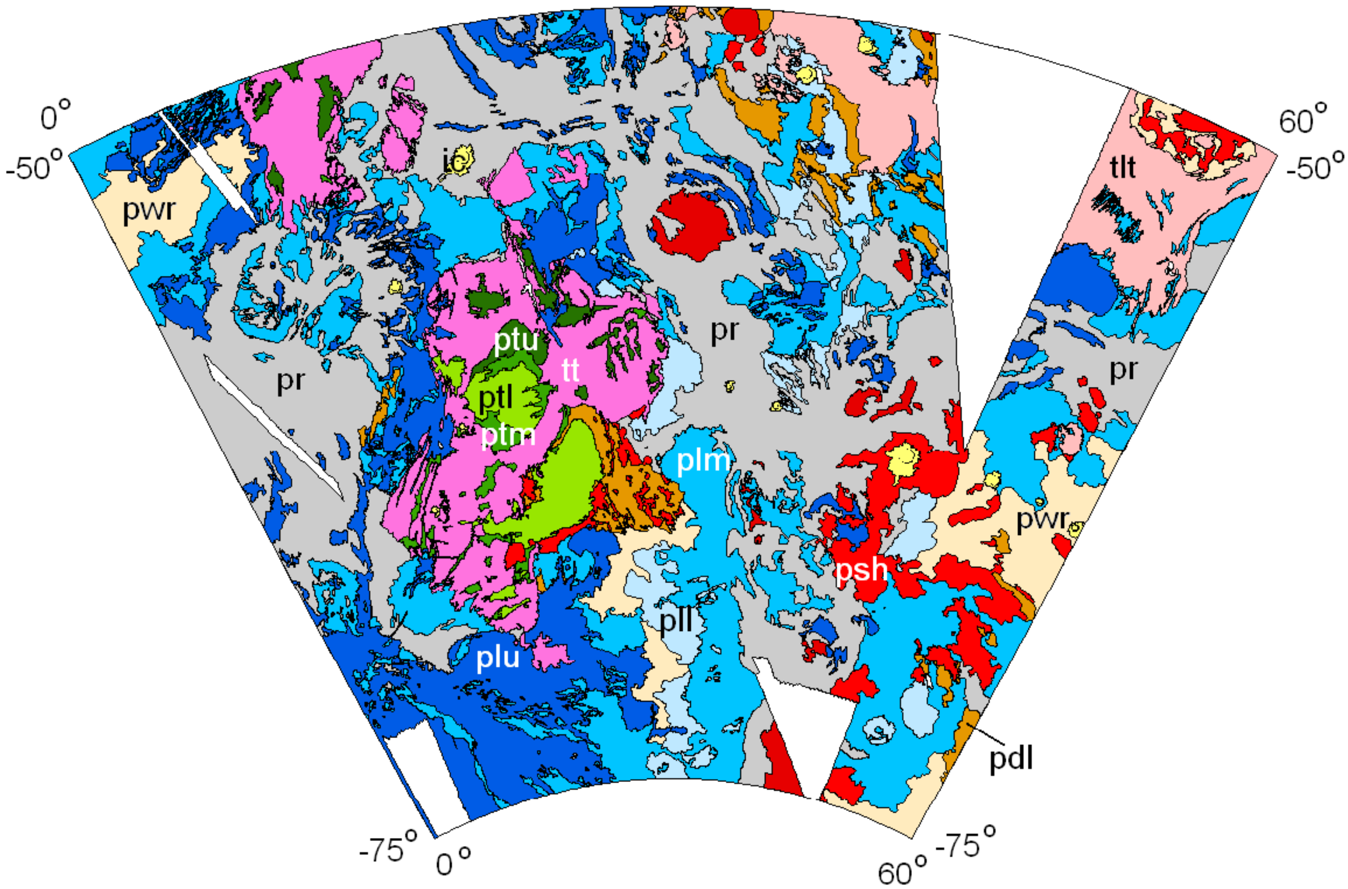

Fig. 1. Geological map of V-56 Lada Terra quadrangle. See table 1 for names of material units. Deformational structures are not shown here; these are currently being drawn on a separate map.

Table 1: Materials relative age relationships.

MATERIALS	RELATIVE AGES
Impact craters (ic)	---
Lobate plains upper (plu)	--------------
Lobate plains middle (plm)	-------------
Lobate plains lower (pll)	-----------
Wrinkle ridged plains (pwr)	----------------------------
Shield plains (psh)	-------------
Densely lineated plains	----------------
Tessera-like terrain (tlt)	------------------
Tessera (tt)	-----------------