COMPARATIVE INVESTIGATION OF THE GEOLOGICAL HISTORIES AMONG ALBA PATERA AND SYRIA PLANUM, MARS, R. C. Anderson[1], J. M. Dohm[2], A. F. C. Haldemann[1], and T. Hare[3], [1]Jet Propulsion Laboratory, Pasadena, CA 91109, [2]University of Arizona, [3]U.S.G.S., Flagstaff, AZ. robert.c.anderson@jpl.nasa.gov.

Introduction and Objective : The comprehensive investigation [1] and geological mapping investigation of the Thaumasia region [2] resulted in: (1) an improved understanding of the evolution of the Tharsis magmatic complex [3] (recently proposed as the Tharsis superplume [4-6]), including the development (and in many cases interactions) of previously identified Alba Patera [1-3,7-8], Tempe and Thaumasia igneous plateaus [1-3,7-11], Tharsis Montes volcanoes [e.g.,7], Olympus Mons [7,12], Syria Planum [2-3,7,13], and Valles Marineris [1-3,7,14-15], (2) newly defined centers of magmatic-driven activity, including pre-Tharsis-Montes Ceraunius Fossae, Claritas, Ulysses, central Valles, western Valles, Warrego, Arsia, and Ascraeus-south rises [1-3,16], and (3) volcanic constructs of varying sizes and extensive lava flow fields [e.g.,7], fault and rift systems of varying extent and relative age of formation [1-2,17], gigantic outflow channel systems [18-24], and an enormous (approximately the size of the United States) Noachian drainage basin/aquifer system [3]. Our objective is to perform a comparative investigation of the geological histories among two of the largest centers of post-heavy bombardment magmatic-driven tectonic activity observed for Tharsis, Syria Planum and Alba Patera, including their lateral extent, relative age of formation, intensity of magmatic/tectonic activity through time (e.g., strain history).

Syria Planum: Syria Planum is the site of long-lived (Noachian to Late Hesperian) magmatic-driven activity with distinct episodes of intensive early magmatic/tectonic activity that declined in tectonic intensity by an order of magnitude from the Late Noachian to Late Hesperian [2,25], transitioning mainly into a dominantly volcanic setting during the Late Hesperian [2]. Some of the dominant characteristics of Syria include: (1) local and regional uplifts, (2) extensional and contractional tectonism, (3) dike emplacement, including the formation of Late Hesperian and possibly younger pit crater chains, (4) volcanism including the formation of shield fields [26] and the emplacement of voluminous sheet lavas that may range in relative age from the Late Noachian to the Late Hesperian [2], (5) a central region that (a) exhibits a topographic low to the west (possibly marking a former caldera) and (b) shield fields to the east and that is surrounded by a prominent annulus of concentric faults, and (6) potential hydrothermal activity. Local concentric and radial faulting, pit crater formation, extensive lava flow fields, and local shield fields [26] mark late-stage activity of the corona-like center of activity [27].

Alba Patera: One of the largest shield volcanoes found on the martian surface, the Alba Patera regional center of magmatic-driven tectonism, is located in the northern region of the Tharsis magmatic complex. Alba displays many of the characteristics of Syria Planum, including concentric and radial fault systems of varying relative ages, pit crater chains, and lava flow fields. Distinctions include: (1) magmatic-driven activity from at least the Early Hesperian extending into the Amazonian [1,7-8], (2) a prominent shield volcano marked by summit calderas [e.g., 7] central to the concentric and radial fault systems (perhaps marking a central vent), (3) a paucity of shield fields, and (4) wrinkle ridges that transect the summit [7].

Procedures and preliminary analysis: Anderson et al. [1] identified five primary centers of tectonic activity based on the radial distribution of tectonic features, including the Alba Patera and Syria Planum centers. Their investigation included the mapping, relative-age determination, and comparative spatial and temporal analyses of more than 24,000 tectonic structures in the western hemisphere of Mars. Prominent secondary concentrations of activity were also identified by Anderson et al. However, no attempt was made to identify secondary concentrations of activity that might be masked/subdued by activity associated with the primary center development (e.g., radial fault systems centered

about the centers). Our main objective is to determine the lateral extent, relative age of formation, and intensity of magmatic/tectonic activity through time (e.g., strain histories) for the two primary centers, Syria Planum and Alba Patera. For example, we hope to determine whether secondary concentrations of magmatic-driven activity (e.g., parasitic vents and/or uplifts) associated with the development of the centers exist. To achieve this objective, extensional and contractional structures associated with the development of each of the centers were isolated from the rest of the plateotectonic dataset (including from one another) and reran for each major stage of development as well as for the total duration of formation (combining all of the stages) using the vector analysis procedure at very high spatial resolution [see 1]. Second step was to determine the lateral extent of each center. This was a two-stage process. The first step was to identify all faults associated with each center (**Figure 1**). Next, MOLA-based investigations of both centers were performed to compare the lateral extent of the centers, including isolating fault populations. We produced topographic profiles and geological cross sections that transect the two features in order to further document there stratigraphic and structural histories and lateral extents. Finally, in order to quantify their geological and strain histories, which includes magmatic-driven intensities, we will determine the fault and fault-length densities for each of the centers of activity similar to the procedure that was used for the Thaumasia region [2]. Preliminary results indicate that Syria had a greater impact on the evolution of the Tharsis magmatic complex than Alba.

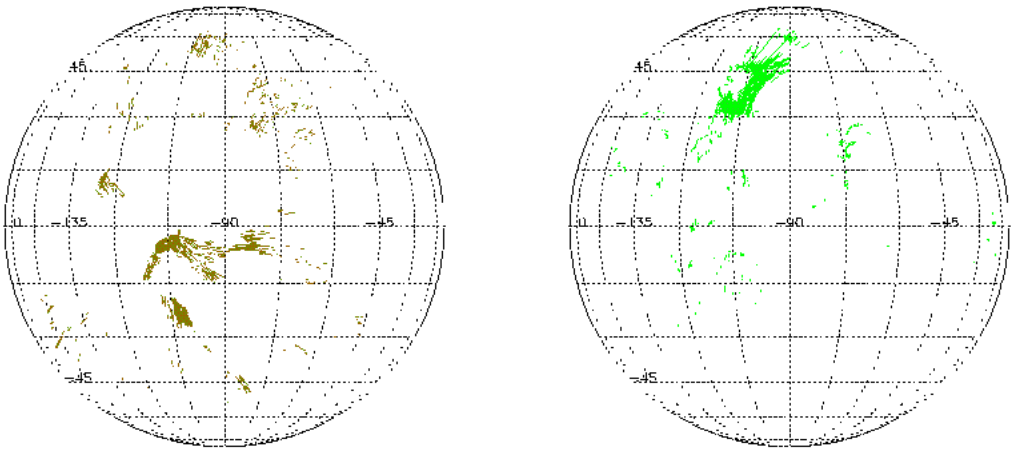

Figure 1 Isolated faults for Syria and Alba centers based on *Anderson et al., 2001 [1]*.

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