CLARITAS RISE: THE OLDEST RECORD OF MAGMATIC ACTIVITY IDENTIFIED FOR MARS**,**

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Introduction: An ancient magmatic-driven center of activity in the western hemisphere of Mars, Claritas rise (**Fig. 1**), was revealed through Viking-based geological investigations [1-4], largely based on stratigraphic, topographic, and paleotectonic information. In this study, we have taken an in-depth examination of the faults associated with this center to better understand the tectonic evolution of the early Noachian period prior to the formation of Tharsis.

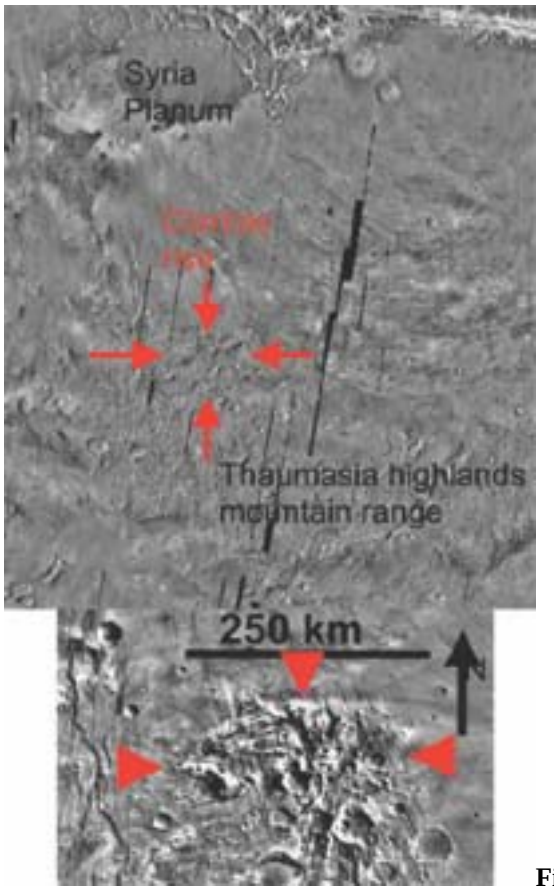

Fig. 1. Themis IR-day time image mosaic (top) showing location of the Claritas rise (red arrows) with respect to Syria Planum and Thaumasia highlands mountain range. Viking MDIM showing a different perspective of the Claritas rise

***Physiographic and Geologic Setting*:** Claritas rise is a distinct promontory located to the south of Syria Planum (**Fig. 1**). The greatest percentage of faults preserved in Noachian materials of the western hemisphere (e.g., within the ancient rocks of the Thaumasia highlands mountain range [3,4] originate near the central part of the Claritas rise. This region is marked by an enormous rift system and highly-deformed mountainous materials interpreted to be ancient basement crust. The Claritas rise is a center of activity representing a region of broad magmatic-driven uplift and associated tectonism [2, 3]. Because it spatially registers with a magnetic signature, the activity is interpreted to mark either incipient Tharsis development, or more likely, pre-Tharsis activity [2, 3].

Methodology: Structural mapping is key to unraveling geologic histories at local to global scales on Earth and Mars [e.g. 2]. For example, maps delineating structures of various ages can be used to characterize potential stress sources, strain magnitudes and history, and pre-existing structural controls that may relate to episodes of local or regional tectonism. We have compiled a comprehensive global paleotectonic map of Mars, first presented in [2], to determine local and regional centers of tectonic activity by tracing the geographic distribution of fault and ridge systems as they formed during successive stages of major geologic activity [2,3] and by performing analysis of their spatial distribution to determine whether they are radial or concentric about a center through the Vector Analysis (VA) method of [1]. One prominent center of tectonic activity identified is Clartias rise.

Noachian Centers of Tectonism:

In the recent western hemisphere mapping study [2], half of the mapped extensional features identified within the western hemisphere region were formed in the Noachian (Stage 1) period. Claritas (27^{o}S, 106^{o}W) is one of three extensional centers (Tempe, and Uranius are the other two centers) identified within the Noachian Period with a total of 815 (9.1% of

total western hemisphere extensional features) faults tracing back to the center (**Fig. 2**). The Claritas center was interpreted to represent the oldest identifiable center of magmatic-driven tectonic activity for the western hemisphere of Mars [2,3], consistent with a magnetic anomaly that spatially registers to the center based on the Mars Global Surveyor magnetic data [e.g., 5]. The Claritas center indicates that the rise formed during a period of an active magnetosphere, whereas the Tempe (33^{o}N, 81^{o}W- 488 (5.4%) of total western hemisphere extensional features) and Uranius (24^{o}N, 90^{o}W - 419 (4.7%) of total western hemisphere extensional features) centers show no evidence of a magnetic signature, though such a signature could be obscured by subsequent geologic activity.

Preliminary Results: Three major fault trends have been identified for the Claritas center: 1) a strong NS trending set (ranging in azimuth direction 350^{o} to 10^{o}); 2) a set of EW trending faults located to far the east of the center; and 3) a dominate NNW set of trending faults (ranging in azimuth direction 310^{o} to 330^{o}). For this presentation, the paleotectonic and magnetic data will be discussed as well as a review of whether the Claritas rise formed pre- or incipient-development of Tharsis..

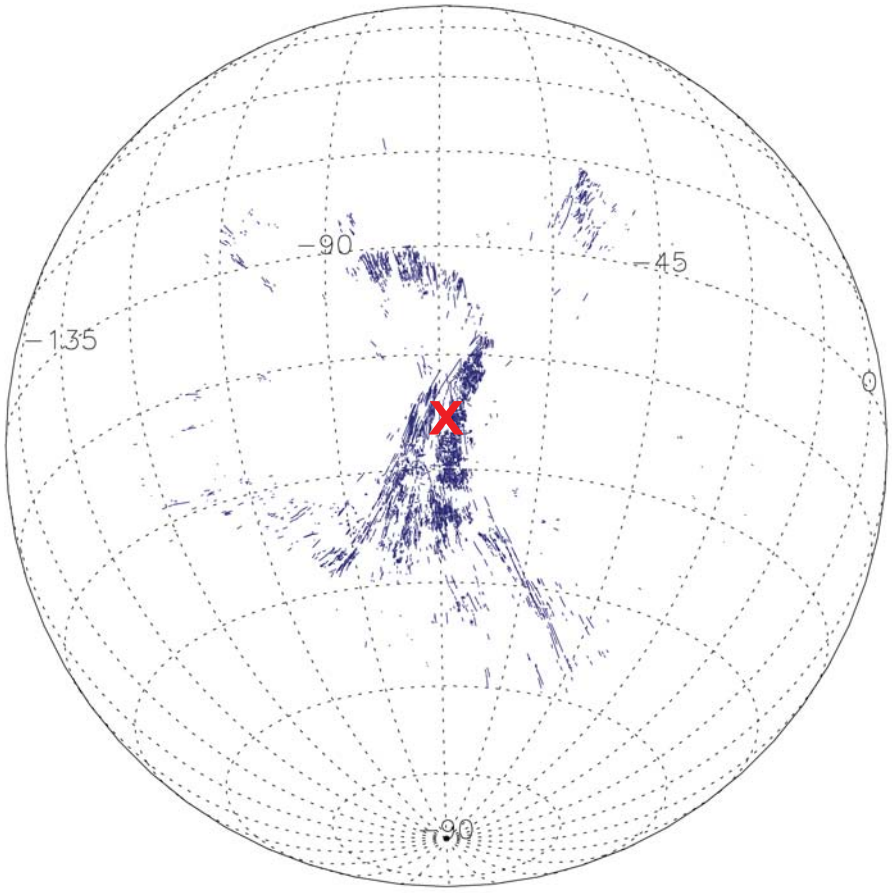

Figure 2 Tectonic features identified for the Claritas Center of Mars. *Radius based on 90-degree radius circle (note different from [1] where the radius was based on180-degree western region). Red X represents a seven-degree sampling window (based on MOLA topograghy) used for the 3-Sigma Kamb statistics.

References: [1] Scott, D.H., and Tanaka, K.L., 1986, *USGS I-Map 1802A*. [2] Anderson R.C., et al., 2001, *J. Geophys. Res.*, 106, 20,563-20,585. [3] Dohm, J.M., et al., 2001b, *J. Geophys. Res.*, 106, 32 943-32 958. [4] Dohm J. M. et al., 2001a, *USGS I-Map 2650*. [5] Arkani-Hamed, J., 2004, *J. Geophys. Res.*, *109*, doi:10.1029/2003JE002195.