**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.

**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 Claritas 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°S, 106°W) is one of three extensional centers (Tempe, and Uranus 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°N, 81°W- 488 (5.4%) of total western hemisphere extensional features) and Uranius (24°N, 90°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° to 10°); 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° to 330°). 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.](image)

*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 topography) used for the 3-Sigma Kamb statistics.*

**References:**