LINEAMENT ANALYSIS AND TECTONIC INTERPRETATION FOR THE THARSIS REGION, MARS; Robert Anderson, University of Pittsburgh, Pittsburgh, PA 15260

The Tharsis region of Mars is critical to any study of Martian tectonics. This region (65°N and 65°S latitude; 45°W to 157.5°W longitude) is characterized by an asymmetrical dome-shaped topographic high approximately 8000 km across. Affecting over 25% of the surface area, this region has been the center of most of the major tectonic and volcanic activity that has taken place on the Martian surface. Lineament studies are the primary tool available for studying tectonic processes on terrestrial planets such as Mars. At least three major lineament systems can be delineated in the Tharsis region; north-south and east-west trending lineament systems are superimposed on an older northwest trending lineament system. Four centers of uplift have been identified based on the occurrence of radial fracture patterns. Preliminary results indicate that the formation of the Tharsis Dome may not have resulted from a single uplift event, but may instead have resulted from as many as four uplift events. The northwest trending fracture may represent a pre-existing zone of weakness which contributed to the early formation of the Tharsis Dome.

1:2,000,000 scale photomosaic maps of Mars were examined and lineaments were identified. The end points of each lineament were measured and recorded in an X-Y reference coordinate frame. Curved segments of otherwise non-rectilinear lineaments were broken into standardized length segments. The study area was divided into a predetermined matrix of cells; the length and the orientation of each lineament segment was tabulated for each cell. The lineaments were then divided into 5 degree azimuthal intervals within their respective grid cells. Each grid cell was then numerically analyzed and the frequency of each interval calculated. Density distribution plots were constructed for the region. Each contour plot was then examined for major trends or regions of high concentration of lineaments. Fourteen dominant trend directions were identified from the density plots. Assuming that uplift events result in a radial lineament pattern, four projected centers emerged. 95% of the lineaments mapped for the Tharsis region could be attributed to the four centers.