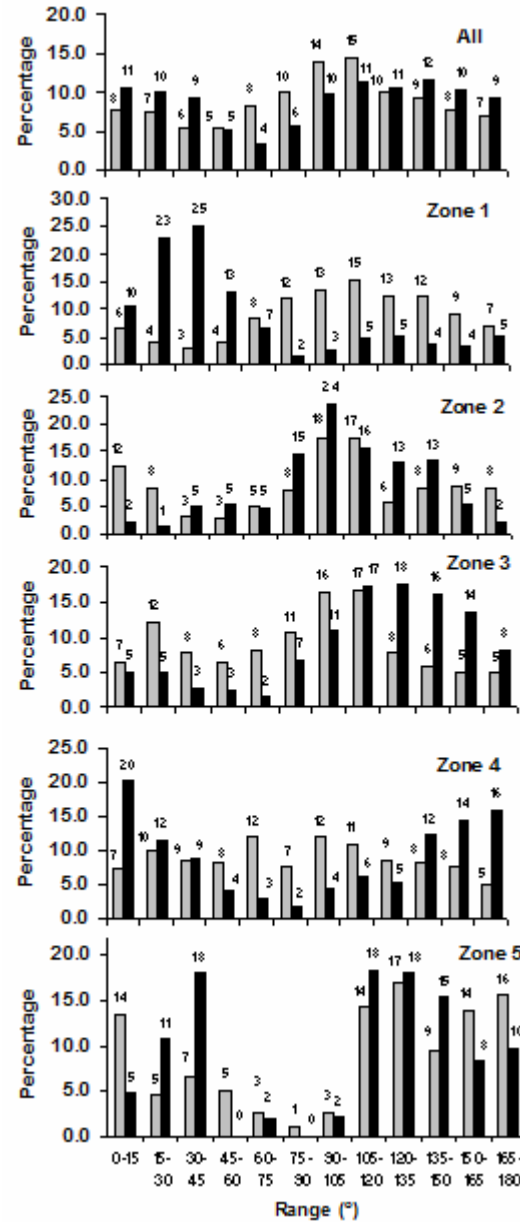


**ANALYSIS OF TECTONIC LINEAMENTS IN THE GANIKI PLANITIA (V14) QUADRANGLE, VENUS.**  
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**Introduction:** The Ganiki Planitia quadrangle, located between the Atla Regio highland to the south and the Atalanta Planitia lowland to the north, is deformed by many tectonic lineaments which have been mapped previously [e.g., 1] but have not yet been assessed in detail. As a result, neither the characteristics of these lineaments nor their relationship to material unit stratigraphy is well constrained. In this study we analyze the orientation of extensional and compressional lineaments in all non-tessera areas in order to begin characterizing the dominant tectonic stresses that have affected the region.

**Methods:** Before quantifying the regional trends using ArcGIS 9, we identified and removed tectonic lineaments whose geometry appears to be locally rather than regionally governed. For instance, lineaments associated with two large dike swarms and several annular features (e.g., coronae) were eliminated where their geometry clearly reflects only reservoir inflation- or uplift-related stress fields; distal dikes associated with the radial centers, whose alignment is clearly no longer governed by the stresses at their focus, were retained. Tests conducted with and without inclusion of the local lineaments indicate that the fundamental patterns we report below are not affected, though in some instances existing trends and patterns are exaggerated.

After removal of the lineaments controlled by local stresses, we gathered data on the number, length and alignment of all remaining extensional and compressional lineaments. Many small fractures dominate the surface, but these features each represent a small amount of tectonic strain, whereas longer tectonic lineaments are inferred to be more useful for understanding the regional stresses; a small lineament and a large lineament should not be weighted equally in our analysis. We therefore examined lineament orientations as a function of net length to gain insight into trends throughout the quadrangle. Fifteen-degree bins were used here because bins this size are sufficient to depict the trends we observe.



**Figure 1.** Trends of extensional (black) and compressional (gray) lineaments for the entire quadrangle and each zone (see text), where 0° is north and 90° is east. Notice that some zones appear to record a single dominant stress field (e.g., zones 1 and 4) where extensional and compressional lineaments are orthogonal, while the deformation patterns in others are clearly more complex.

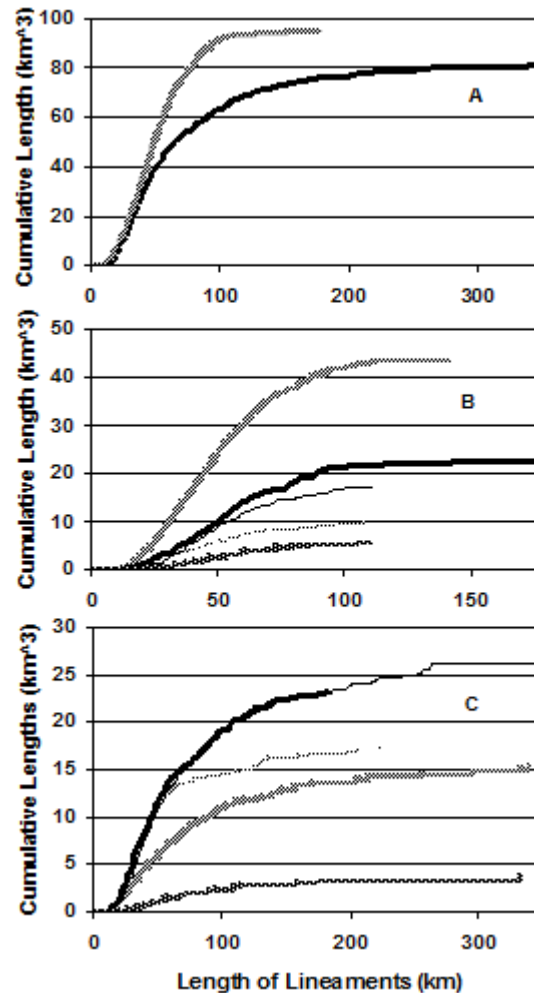
**Results and Discussion:** For the quadrangle as a whole (Figure 1A) the compressional lineaments have a preferred azimuthal strike of 90-120°; however, the extensional lineaments occur almost equally at all alignments, with the exception of a deficit in the 45-90° range that could in part reflect bias due to the alignment of the radar instrument. In spite of these quadrangle-wide patterns, which suggest little relationship between the sets of compressional and extensional lineaments, compressional lineaments often intersect extensional lineaments at right angles, indicating that they may often form as a result of a single stress orientation. We thus chose to examine specific regions within the quadrangle in more detail.

Five regional zones of varying size were called out for further analysis: zone 1, north,  $\approx 2 \times 10^{12}$  km<sup>2</sup>; zone 2, west central,  $\approx 1.2 \times 10^{12}$  km<sup>2</sup>; zone 3, southeast,  $\approx 2 \times 10^{12}$  km<sup>2</sup>; zone 4, southwest,  $\approx 1.8 \times 10^{12}$  km<sup>2</sup>; and zone 5 northeast,  $\approx 0.3 \times 10^{12}$  km<sup>2</sup>. Each exhibits major tectonic patterns of interest, and together they cover the majority of the quadrangle.

In zones 1 and 4 (Figure 1), extensional and compressional lineaments occur predominantly with strikes that are 90° apart, suggesting that the lineaments in these areas formed as a result of a single stress alignment; we are seeking evidence to test whether they formed coevally or at different times. It is also interesting to note that the alignments in these two zones, which cover the majority of the western half of the quadrangle, are fairly similar, introducing the possibility of a broader regional tectonic stress across this area. In the other three zones, observed trends were not as clear, which suggests that their stress histories could be more complex but which also may result in part from the fact that these areas did not have significant numbers of both lineament types.

Examination of cumulative length plots for the quadrangle (Figure 2A) reveals that, while extensional lineaments reach significantly greater individual lengths, the net length of compressional lineaments mapped exceeds that of the extensional lineaments by ~25%. Indeed, lineaments less than 100 km in length account for nearly all of the compressional structures whereas this same range accounts for only 75% of the extensional lineaments' net length.

The cumulative length graphs (Figure 2) indicate the zones from which the tectonic lengths derive, and thus upon which zones stresses act most strongly; if net length of lineament can be considered a rough proxy for strain, then zone 1 has accommodated a disproportionately large share of the compressional strain within the quadrangle while zones 3 and 4 are where much of the extensional strain has been accommodated.



**Figure 2.** Cumulative lengths for (A) the compressional and extensional lineaments in the quadrangle, (B) the compressional and (C) the extensional lineaments by zone. In A, the black line = extensional lineaments and the gray line = compressional lineaments. In B and C, the thick light gray line = zone 1, the thin light gray line = zone 2, the thick solid black line = zone 3, the thin solid black line = zone 4, and the thick dark gray line (at bottom) = zone 5.

**Further Work:** The trends identified thus far will be used to help formulate a tectonic history of the quadrangle. The association of trends with units, and a unit-unit stratigraphy column [e.g., 2], may provide timing information which, when connected with stress state analysis of the trends, will yield a stress-state history of the region. Neighboring quadrangles will also be examined to look for continuation of possible trends and sources of the stresses recorded in V14.

**References:** [1] T.C. Doggett and E.B. Grosfils, Abstract #1004, *LPSC XXXIII*, 2002. [2] E.B. Grosfils *et al.*, this volume, *LPSC XXXVI*, 2005.

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