REGIONAL LINEAMENT PATTERNS IN RUSALKA PLANITIA D. A Young, Department of Geological Sciences, Southern Methodist University, Dallas TX 75275, USA (dyoung@mail.smu.edu)

Introduction: A fabric of lineaments (probably tensional fractures [1]) pervades Western Rusalka Planitia, Venus. Understanding the timing and influence of such distributed strain within the context of a planitia can constrain models of regional geodynamic processes and temporal evolution. Other expressions of strain within the plains include the localized deformation represented by coronae and ridge belts, and the distributed contractional deformation represented by wrinkle ridges. A large-scale lineament suite is the focus of this study as large-scale fracture patterns may be assumed to have formed under specific conditions (i.e. a very strong but very thin mechanical layer) within a single episode of geological history; therefore they can form an important constraint on geological sequencing. If reactivation is taken into account, the lineament suite represents a useful datum if it is assumed that the suite formed at a single point in time; the fabric's influence on subsequent strain is also of great interest.

Observations: We have mapped Rusalka Planitia (00˚N 165˚E) in detail as part of the USGS VMAP program [2, 3]. The planitia can be divided into western and eastern basins ~1500 km across; the Western Rusalka Basin (WRB) is the focus of this study.

Lineaments: Within the WRB a northeast to east-northeast trending pattern of radiating lineaments is exposed in a number of locations (Figure 1):

I. a dense (>3 km spacing) series of open fractures within kipukas surrounded by flows emanating from Diana-Dali chasmata coronae [4];

II. subtle, >3 km spaced, lineaments acting as a controlling fabric on volcanic flows within a shield field complex in the middle of the WRB;

III. short, subtle, >3 km spaced, dark lineaments exposed in various umbrae ('splotches') and as serrations on the margins of large crater outflows;

IV. sharp, ~10 km spaced lineaments within an elevated, moderately deformed complex of small shields with relief of 800 m);

V. sharp, ~40 km spaced lineaments within the i n-tra-tessera basins (ITBs) of Nuahine Tesssera (which has relief of 2600 m).

The changing lineament spacing with relief may represents variations in the thickness of the brittle layer relating to crustal type.

Wrinkle Ridges: Wrinkle ridge predictions based on inverting the swell push force of the geoid to strain, while successful elsewhere, fail in Rusalka Planitia[5]. One solution is that wrinkle ridges represent a phase of deformation that predated the modern form of the local geoid [6]. This conflicts with the volcanological evidence [3]. Another explanation is that locally the assumptions of the swell-push model fail, i.e. the lithosphere is not isotropic.

The lineament suite have two effects on the wrinkle ridges: in areas where the lineaments have been shallowly buried, they appear to have been reactivated contractionally, forming a crossing set of ridges [4]; and the main wrinkle ridge set appears locally orthogonal to the lineament trend, an effect that disappears where flows are deep enough to hide any trace of lineaments, suggesting near-surface strain partitioning.

Canali: The canali channels in some places clearly postdate the lineament set, (e.g. in the vicinity of location IV) although to the south (location I) relationships are less clear. Here canali clearly predate the opening of the fractures [4], however given the proximately of the Diana-Dali chasmata, these open fractures may represent the extensional reactivation of buried lower strain features similar to those seen at (III). Even in that scenario the intervening layer should be relatively thin. At larger scales there is no correlation between canali flow directions and lineament orientations—therefore if the fracture pattern were driven by circumferential hoop stresses related to large scale topographic doming, for example, such topography was not present at times of canali formation.

Conclusions:

1. Lineament spacing varies depending on geology—this may represent variations in mechanical layer thickness (c.f.. [1])

a. within high-standing ITBs the spacing is ~40 km

b. within elevated shield-dominated terrain the spacing is ~10 km

c. within plains the spacing is ~3 to 2 km

2. Lineament sets acts as a controlling fabric for later deformation, reactivated extensionally adjacent to Diana Chasma, and contractionally reactivates at the center of the western basin [4]; strain partitioning may affect later forming wrinkle ridge orientations.

3. The canali probably form after the fractures, in a different topographic regime.

References: [1] Banerdt, W. B. and Sammis, C. G.(1992) *JGR 97,* 16149-16166; [2] DeShon H. R. and Hansen V. L (1998) *LPSC 29*, #1438; [3] Young D. A. and Hansen V. L. (2000) *LPSC 31* #1622.[4] DeShon et al. (2000), *JGR 105*, 6983-6995; [5] Sandwell D. T. et al.(1997); *Icarus 129*, 232-244; [6] Billoti F. and Suppe, J. (1999) *Icarus 139*, 137–157

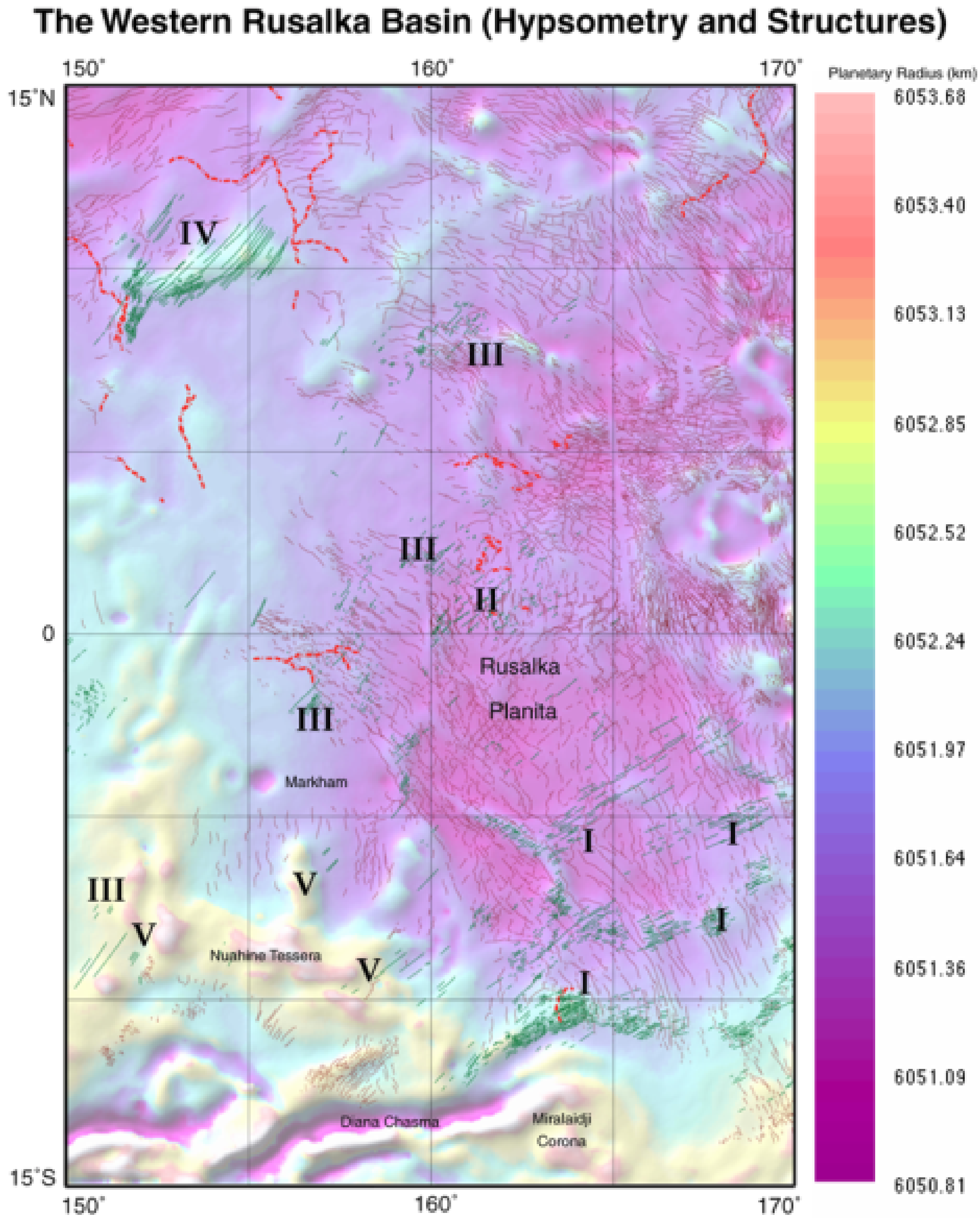

Figure 1: Map of the area of interest. Green lines are the lineament discussed in this abstract, thin brick-red lines are wrinkle ridges, and thick, dashed, red lines are canali. Map is 2112 km wide. Data from V25 [5] and by permission from V37 [4]