LOCAL TRIPLE-JUNCTION RIFTING ALONG PARGA CHASMA ON VENUS. J.R. Graff[1], R.E. Ernst[1,2], C. Samson[1], [1]Department of Earth Sciences, Carleton University, Ottawa, ON, Canada (JamieGraff@cmail.carleton.ca), [2]Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia.

Introduction: Parga Chasma is a discontinuous rift system marking the southern boundary of the Beta-Atla-Themis (BAT) region on Venus [1, 2]. Along its ~10,000 km length between Atla and Themis Regiones, Parga Chasma displays a complex regional morphology [2] and features an abundance of local tectono-magmatic structures (i.e. coronae, large volcanoes, and graben-fissure systems) [cf. 2-7]. Detailed mapping along a 1,500 km portion of Parga Chasma (*Figure 1*; 260 – 275°E and 25 – 33°S) was focussed on graben-fissure systems (interpreted to be the surficial expression of underlying dyke swarms), and rift faults (grouped into a regional system and local rift zones). We propose that Parga Chasma developed as a series of local triple-junction rifting events focussed on individual magmatic centres, along a zone of regional extension between the major volcanic rises (Atla and Themis Regiones) at the ends of the Parga rift system. This rifting model can also be applied to all parts of Parga Chasma and also to Hecate Chasma (two major rift systems of the BAT region), and to the Atlantic Rift System which serves as a terrestrial analogue.

Detailed Mapping: Within the study area over 1,600 rift-related extensional lineaments were systematically mapped on Synthetic Aperture Radar (SAR) images (~75 m/pixel) from the Magellan mission. They were grouped into 633 regional rift faults and 1,016 local rift faults (*Figure 1*). Regional rift faults (catalogued as *RF01* in *Figure 1*) have a NW-SE orientation and are interpreted to have resulted from large-scale NE-SW extension of the Parga Chasma region. Distinct from the regional pattern, local rift faults are observed as collections of lineaments comprising separate rift zones extending from individual magmatic centres. Eleven local rift zones (catalogued as *RF02 – RF12* in *Figure 1*) are observed within the study area, each of which is associated with one of five specific magmatic centres [7, 8, 9]. These centres are Ts'an Nu Mons, Xmukane Corona, Kulimina Corona, and two cryptic magmatic centres – both of which are recognized by a major radiating graben-fissure system.

Local Rifting Model: A summary map of the study area displays the distribution of the five magmatic centres interpreted as the loci of associated triple-junction rifting (*Figure* 2). All local rift zones identified in this study are interpreted (via cross-cutting relationships) to have postdated the formation of the regional extension pattern along Parga Chasma (*RF01; Figure 1*), implying two distinct stages of rifting – in this case, regional followed by local.

Discussion: Parga and Hecate Chasmata extend from major volcanic rises located at the ends of each respective rift system. These rift systems also include numerous local rift zones along their full extents. Excluding the triple-junction rifting focussed on the major volcanic rises at the ends of the chasmata (which may be linked with the regional stage of extension), we observe that Hecate Chasma is composed of 11 local rift zones, while Parga Chasma is composed of as many as 44 local rift zones. These individual rift zones were grouped (and colour-coded) to link them with the particular magmatic centre (e.g. corona, large volcano, or graben-fissure system) from which they extend.

On Earth, the pre-spreading configuration of the ~15,000 km long Atlantic Rift System exhibits discontinuities along its full extent that are similar to those observed along both Parga and Hecate Chasmata (*Figure 3*). The rifting of the Atlantic Rift System (lasting over 150 Myr) is understood to have formed primarily from the arrival of four large mantle plumes (at 130, 130, 200, and 65 Ma, from south to north) and >14 smaller triple-junction rifting events [10, 11].

Our local rifting model explains the discontinuous pattern of rifting observed along the full extents of Parga and Hecate Chasmata. Similarities with terrestrial rift systems, such as the Atlantic Rift System (*Figure 3*), imply that major Venusian rift systems can include both regional rifting and numerous local triple-junction rifting events extending from individual magmatic centres, which develop over a range of time (potentially measured in tens of millions of years).

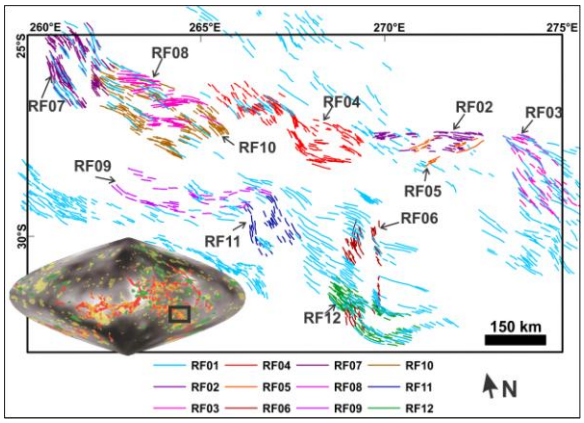

Figure 1. Distribution of rift-related lineaments within the study area, indicated by the black square on the bottom-left inset image of Venus in sinusoidal projection (after [9]).

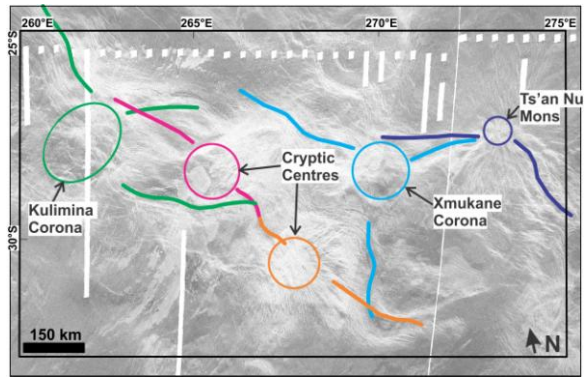

Figure 2. Local rifting model superimposed onto Magellan SAR image of the study area. Rift segments (lines) and magmatic centres (circles) are coloured based on genetic association.

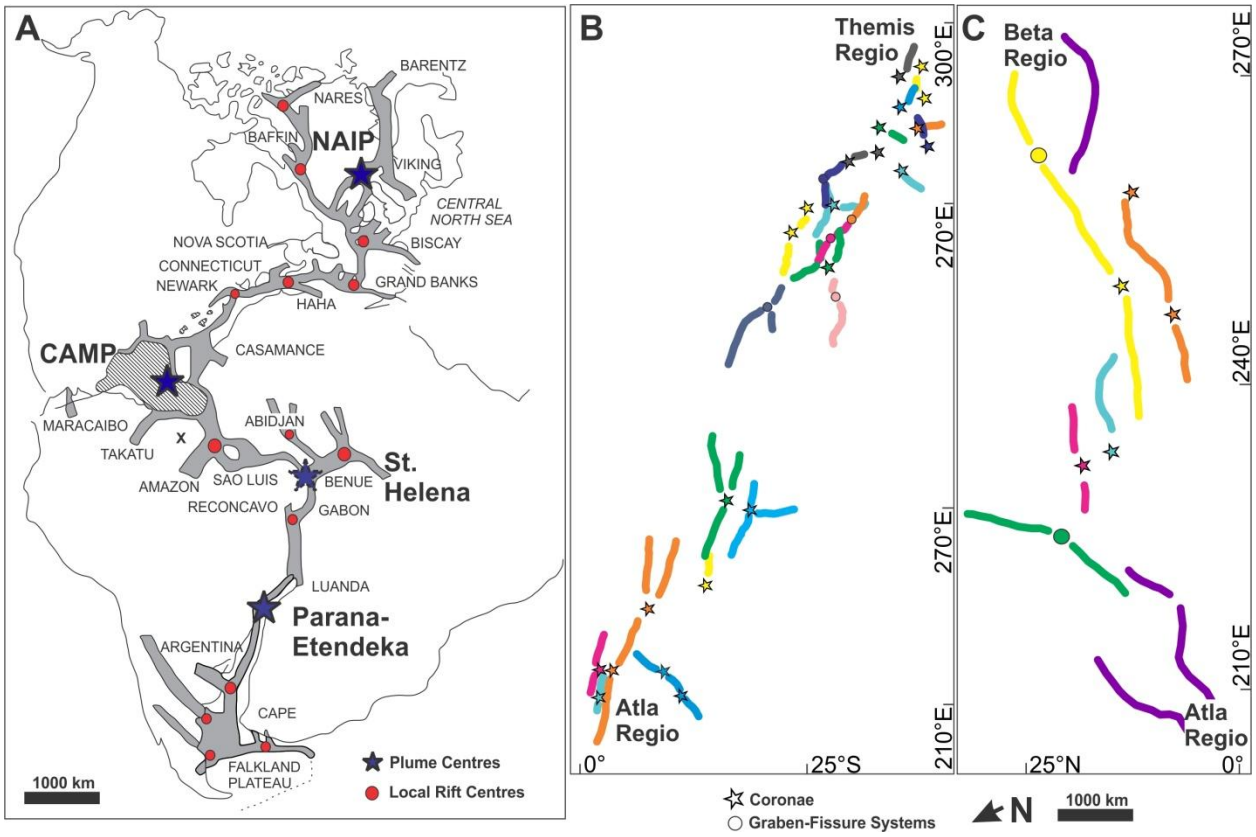

Figure 3. Schematic comparison of the Atlantic Rift System (A) with Parga (B) and Hecate (C) Chasmata. Atlantic Rift System diagram modified from Figure 11.2 in Ernst (2014) [10]. St. Helena plume centre is proposed after Hollanda et al. (2016) [11].

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