DYKE SWARMS (BASED ON OVERLYING GRABEN SETS) OF EASTERN OVDA REGIO, VENUS N. Hannour[1], H. El Bilali[2], R.E. Ernst[2], K.L. Buchan[3], N. Youbi[1] [1]Department of Geology, Faculty of Sciences-Semlalia, Cadi Ayyad University, Marrakesh, Morocco; hannournaima83@gmail.com, youbi@uca.ac.ma, [2]Department of Earth Sciences, Carleton University, Ottawa, Ontario, Canada; hafidaelbilali@cunet.carleton.ca ; richard.ernst@carleton.ca, [3]273 Fifth Ave., Ottawa, Ontario, Canada; kbuchan33@gmail.com

Introduction: Tesserae represent ~8% of Venus surface and are characterized by having multiple intersecting sets of tectonic landforms (wrinkle ridges, graben, fractures, folds etc.) which contribute to high radar backscatter; they are also stratigraphically the oldest units and typically have high elevations relative to local plains (e.g., [1, 2, 3, 4, 5]). Their origin and formation processes remain under debate. A key question is whether they record a short duration geological history (because of crater count ages similar to the post tesserae units) [4]. There is a possibility that they have a protracted geological history and capture the transition (the proposed Great Climate Transition) from a more habitable climate that may have included oceans and plate tectonics to the current hyper greenhouse conditions with no water cycle and no erosion (e.g., [6, 7]). Detailed mapping of tesserae can help assess whether a protracted history is present and help characterize that geological and tectonic history.

Overview of dyke swarms in the Eastern Ovda: In this study we focus on Eastern Ovda Regio, which is characterized by a complex tectonic evolution (e.g., [3, 8, 9, 10, 11]). It includes a large tessera terrain with intra-tessera basins, fracture (shear) zones, fold belts and extensional linear features. The latter type of feature had previously been considered a result of deformation (e.g. [3]), but we interpret as graben overlying dykes (based on the analysis by [12]. Our detailed mapping of >76,000 lineaments (*Fig. 1A*) using the full resolution of Magellan SAR images has resulted in the recognition of six distinct graben sets that we interpret to overlie dyke swarms (except possibly for the oldest set in (*Fig. 1D*) (see discussion below). To show the trend patterns more clearly, the line work is generalized in (*Fig. 1E*). The interpreted dyke swarms are widespread on the tessera, but not observed in the surrounding smooth volcanic plains to the north and south, indicating that they were emplaced syn- or post-tessera development, but prior to flooding of the adjacent plains. In the study area, the dense dyke swarms exhibit broadly linear geometries (although future mapping to the north and south of the study area could reveal more complex swarm geometries). The different swarms intersect, demonstrating that they are of different age and not part of a single event. We have also mapped pits and pit chains in association with the dyke swarms.

Detailed mapping of graben sets in the central region of eastern Ovda Regio: We have identified six distinct graben sets (with individual grabens spaced ~600 m apart), whose relative ages are determined from crosscutting relationships. From youngest to oldest they are:

NE-SW (red) grabens *(Figs. 1B, E):* This set is the most widespread in the study area and is characterized by thin, straight lineaments. The dykes seem to swing slightly in trend, and there is one portion of this trend that seems to slightly converge to the north.

NW-SE (green) grabens *(Figs. 1C, E)*: The set is parallel to blind dykes (based on mapped pit chains).

E-W (dark blue) grabens (Figs. 1A, E): This linear set is restricted to the eastern side of the area, and crosscuts the N-S (light blue) set.

N-S (light blue) grabens (Figs. 1A, E): This set displays minor deformation; some of the graben are wiggly compared to the graben sets discussed above. This set is crosscut by the E-W dark blue set.

NNE (dark purple) grabens (Figs. 1A, E): These grabens are shorter and thinner than the younger grabens previously discussed, which are crossed by the NNW trending light blue colour grabens.

NNW (purple) grabens *(Figs. 1D, E):* This is the oldest set and is limited to the central region. The grabens are very radar-bright, and are very irregular in trend, which might indicate some minor tectonic deformation and even strike slip movement. Short-wavelength folds that are parallel to this set suggest contraction of a complex layered crust [9]. The NE-trending red graben lines are perpendicular to the folds crests of this set.

Potential Erosion: In some local areas (*Fig. 1F*), some graben sets appear to be missing. This could reflect erosion of the grabens, or geological or tectonic constraints on the graben set distributions. Further studies are needed to better understand the full distribution and geometry of the different graben systems that are interpreted as dyke swarms in Eastern Ovda Regio.

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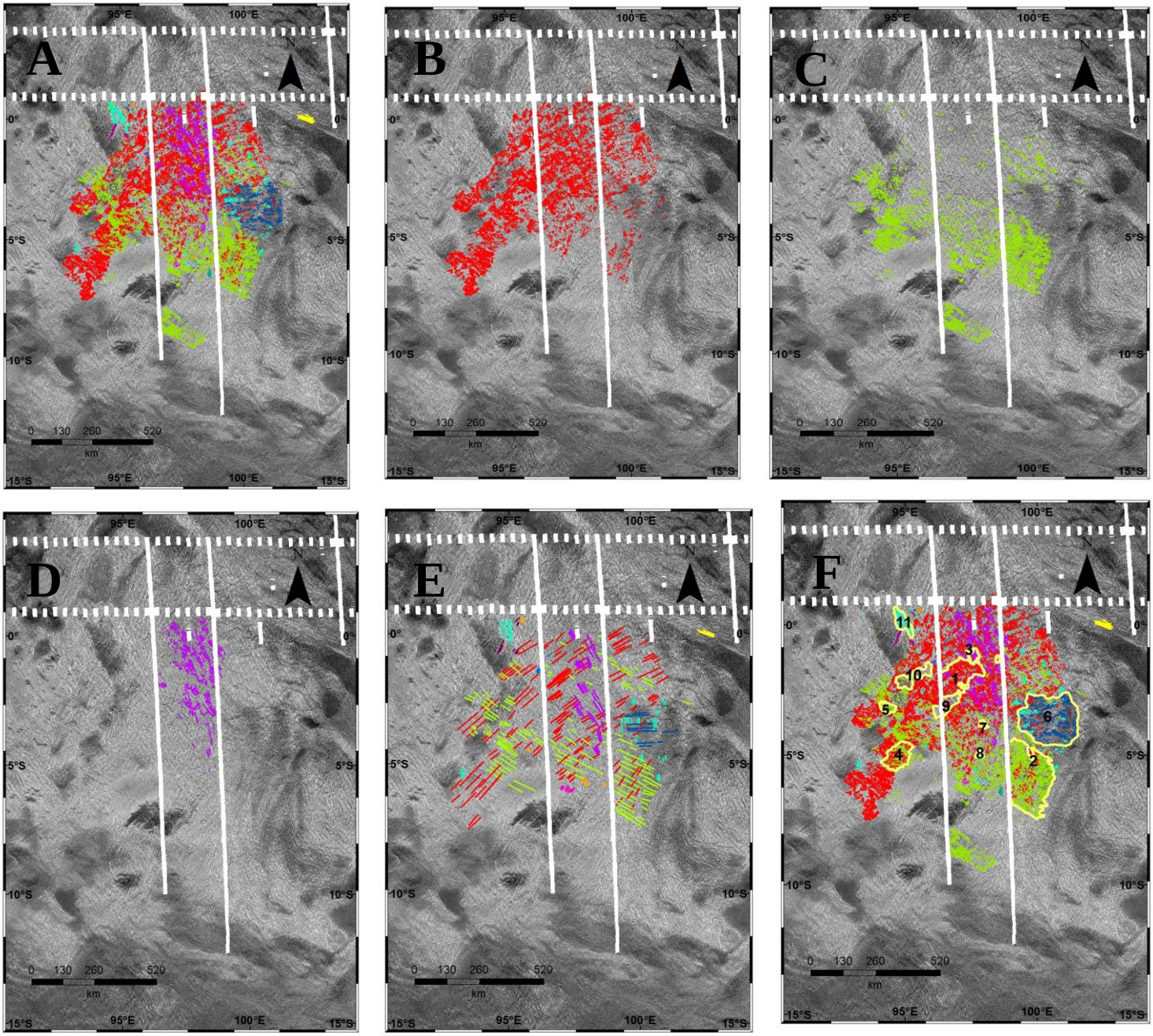

Figure 1: *Detailed mapping of graben sets in Eastern Ovda Regio. A) Distribution of 76,178 graben, distinguished using different colours (**B**, **C**, **D**) Separate maps for different graben sets (based on trend), (**E**) Generalized trends of the graben sets. (**F**) Different domains (labelled by number) where there is a dominance of one trend over the other, as well as the areas where there are no grabens, **1** abundance of red set with some purple lineaments, **2** the dominance of green set with a few red lineaments, **3** the oldest set (mapped in purple), **4** the presence of both green and red sets, **5** only green set, **6** dark and light blue sets with some red lines and near absence of green set, **7, 8** the dominance of complicated tectonic structures that are part of the deformation associated with the tessera, **9, 10** absence of lineaments that may represent an erosion process, **11** the dominance of the light blue set.*