

Analyses of linear structures, Pit chains and rifting in Noctis Labyrinthus (Mars) based on Data derived from HRSC and MOLA

Monday 1st July, 2019 (4 PM)

2nd Planetary Mapping and Virtual Observatory Workshop

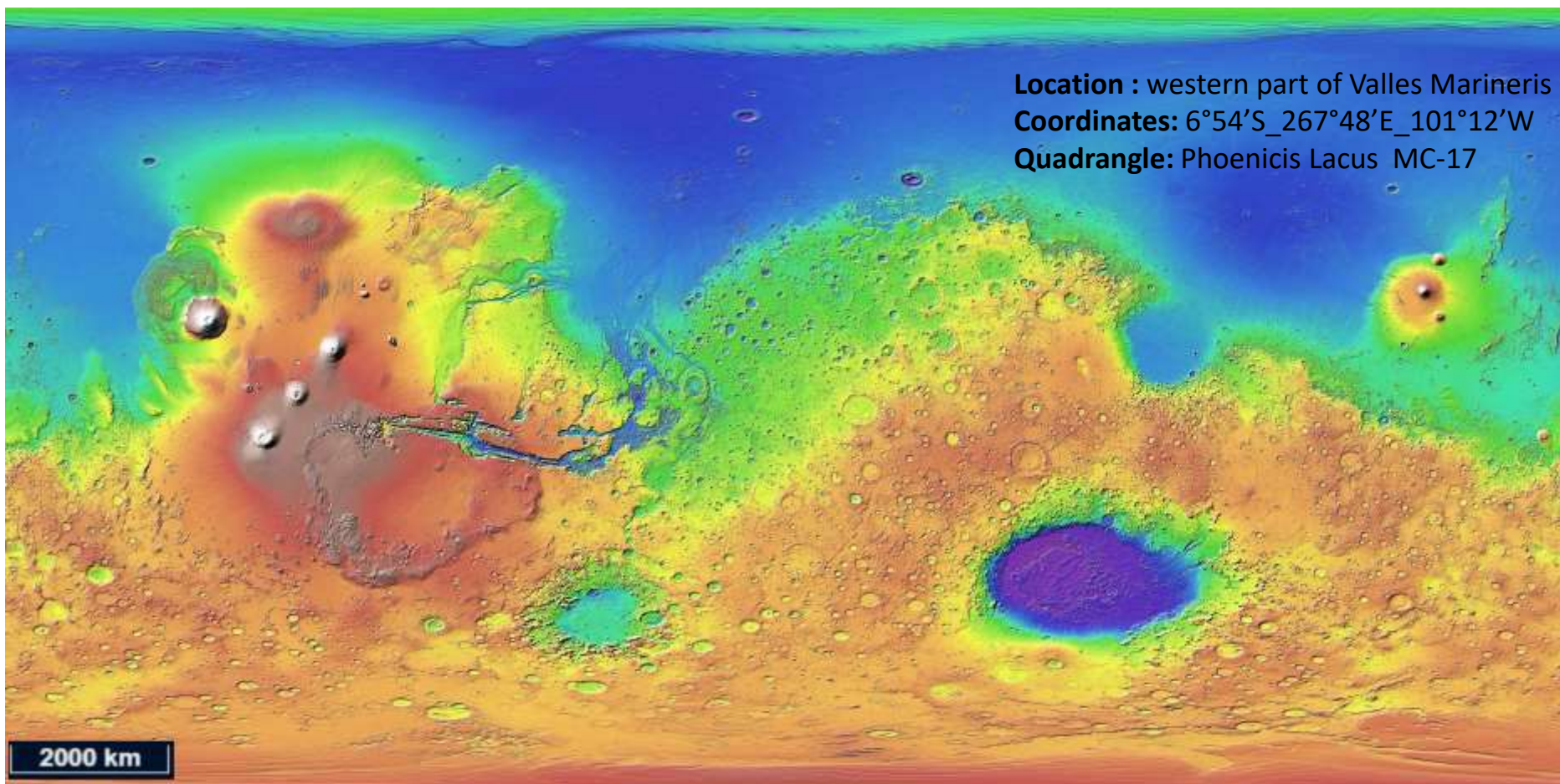
1-3 July 2019,

Domaine de St. Paul, Saint-Rémy-lès-Chevreuse, France

Supervisor : Matteo Massironi

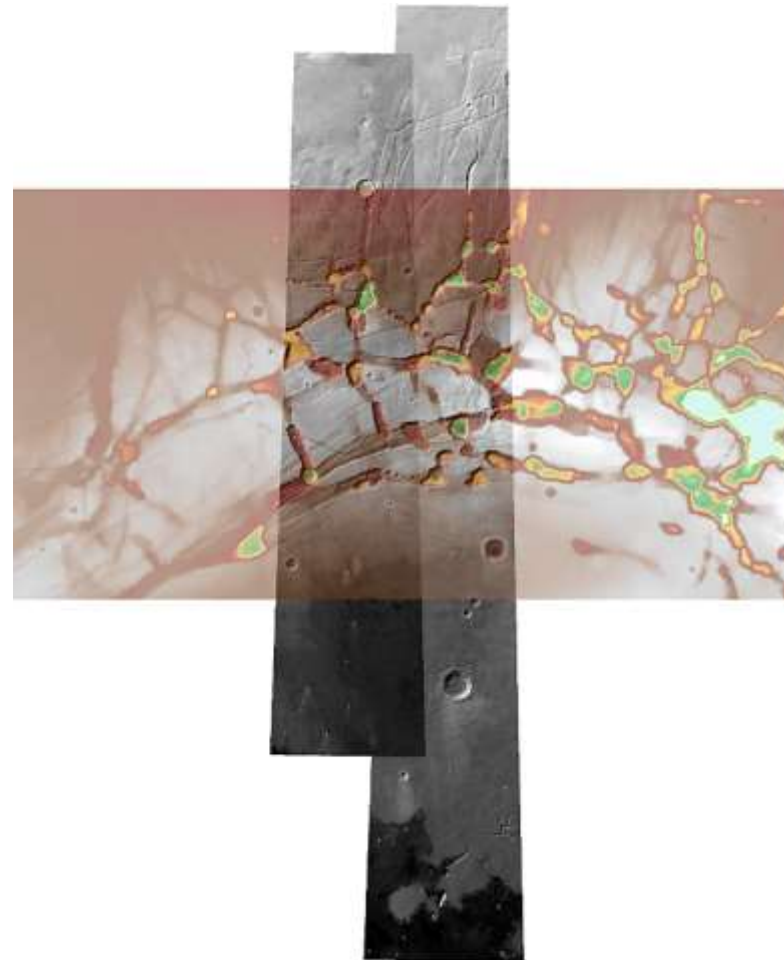
PhD student : EL Yazidi Mayssa

1- General view



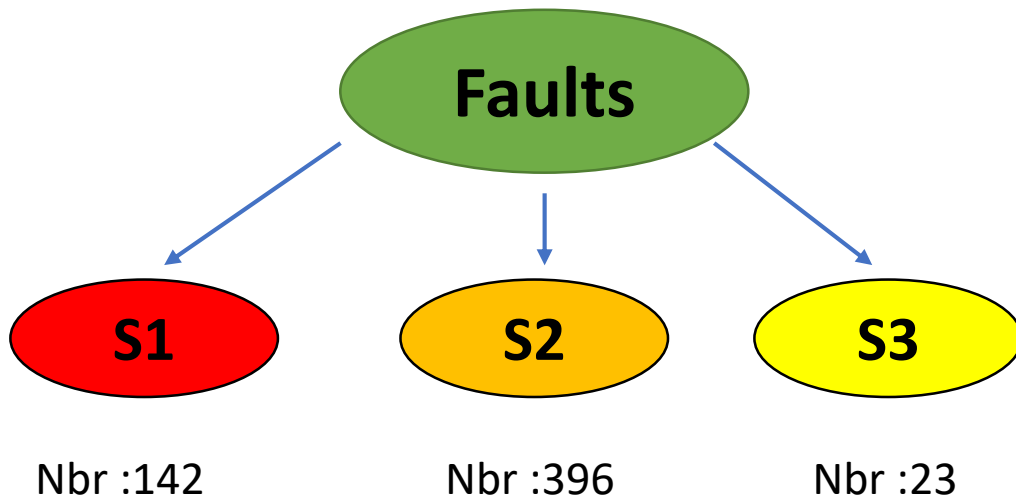
2- Data

- 2 Orthoimages derived from HRSC of h3210_0000_ND2 and h3221_0000_ND2 orbits (12.5 m/pixel)
- DEM from MOLA (~460 m/pixel)



3- Methods and measurements

Fractures population :



S1: D =>200m and L => 4 km

S2: D =>40m and L => 4 km

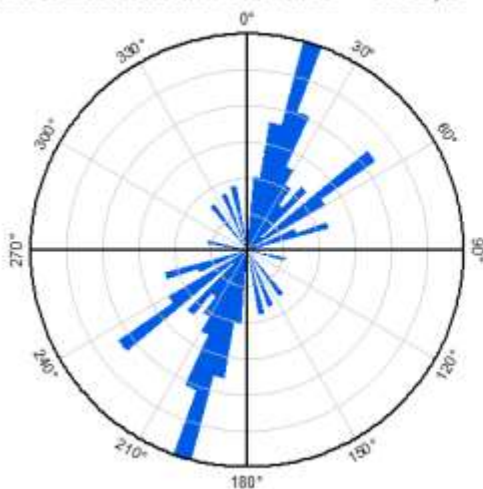
S3: D =>40m and L => 800 m



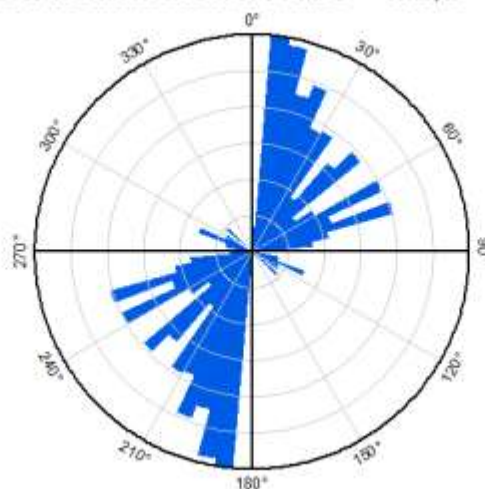
3- Methods and measurements

Evolution to the NS direction

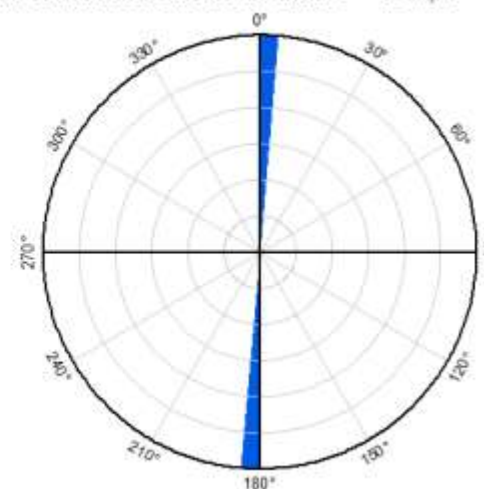
Number of measurements: 142 with $D \Rightarrow 200$ m, $L \Rightarrow 4$ km



Number of measurements: 396 with $D \Rightarrow 40$ m, $L \Rightarrow 4$ km



Number of measurements: 23 with $D \Rightarrow 40$ m, $L \Rightarrow 800$ m

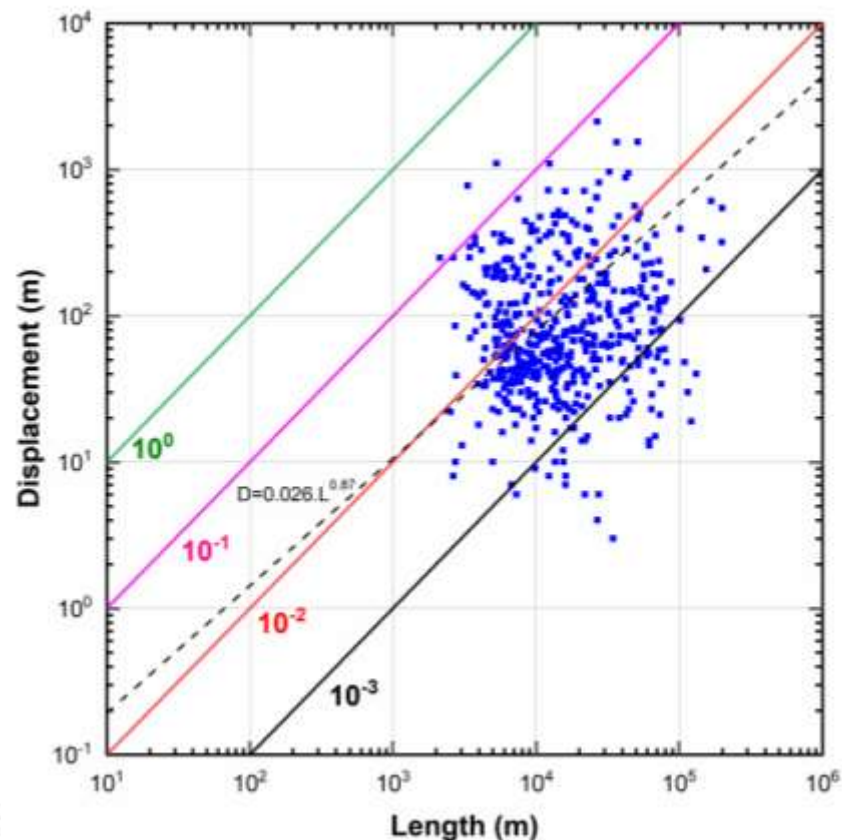
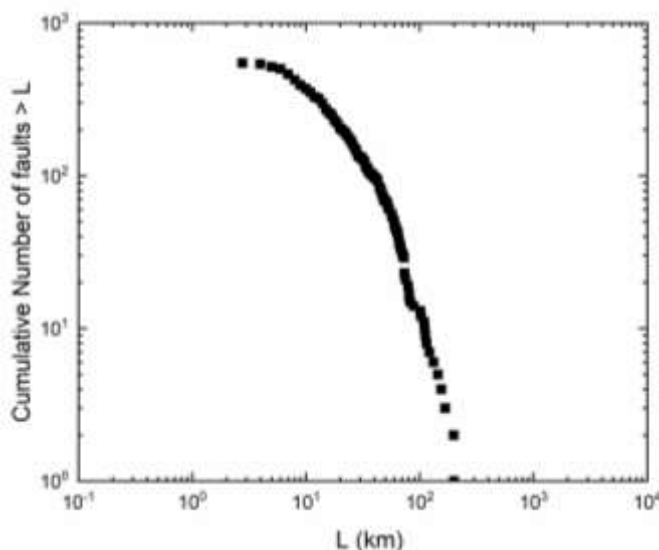


Increase of the size

3- Methods and measurements

Displacement-Length Scaling relationship

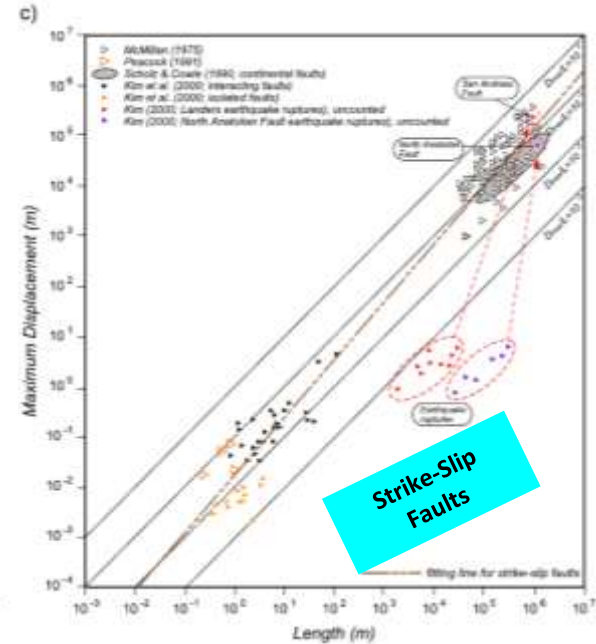
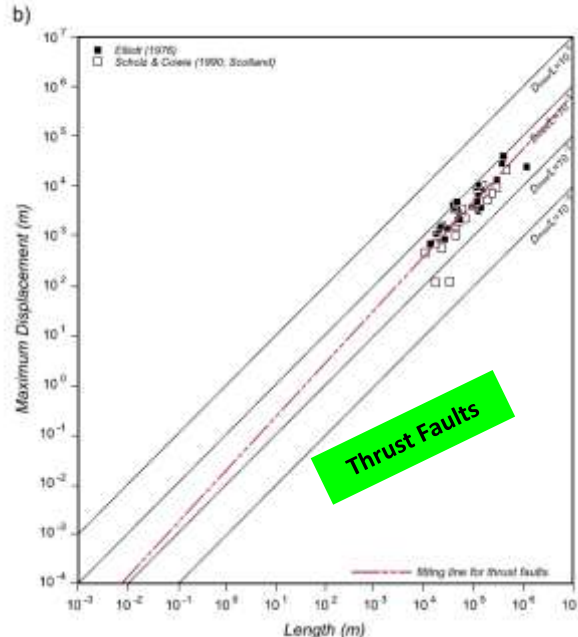
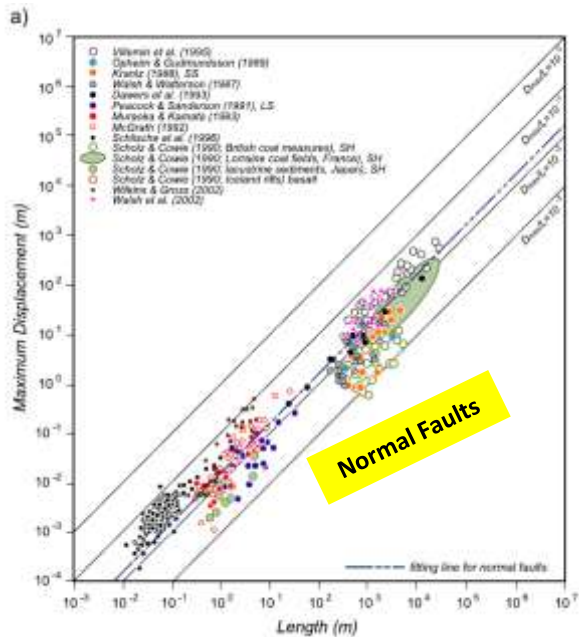
The values of γ ranges between 10^{-3} and 10^{-1} , in which is higher for faults related to grabens, compared with single faults with the same length. That might be related to the coalescent pit chain mechanism that seems to drive the graben formation and has been previously attributed to volcano-tectonic processes.



3- Methods and measurements

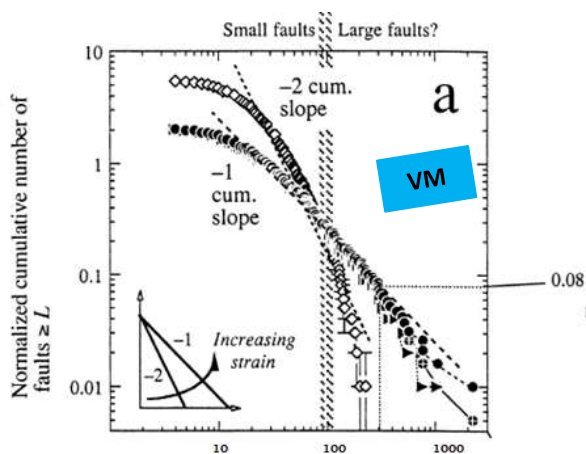
Previous Compared measurements ?

Yup !

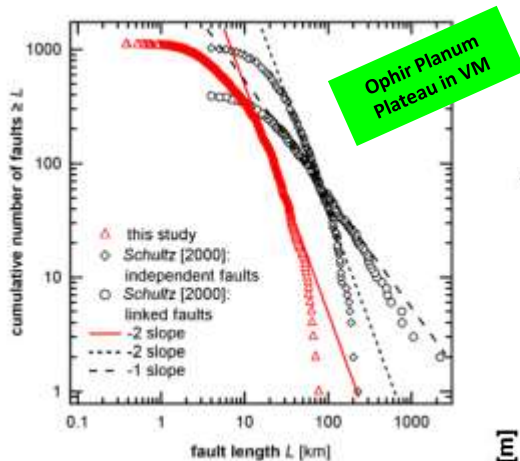


(Y.Kima and D.Sandersonb, 2004)

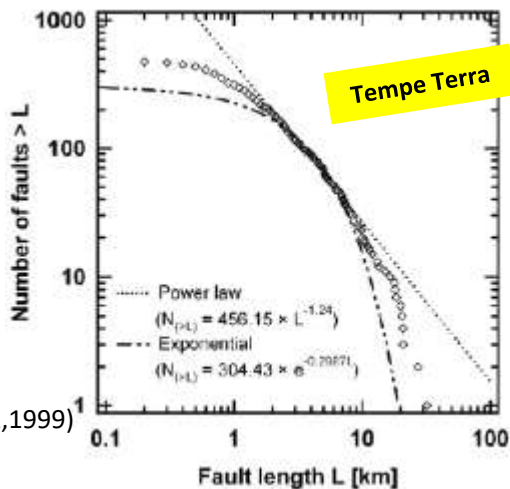
3- Methods and measurements



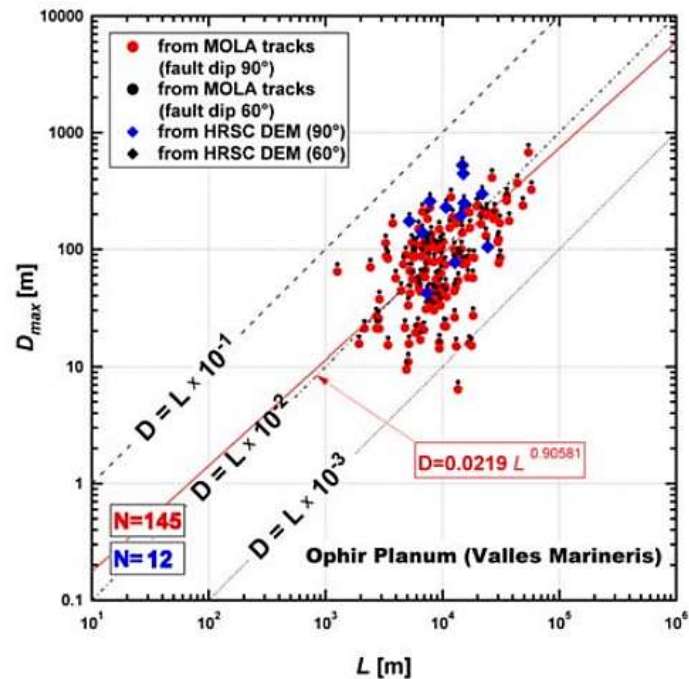
(R.Schultz,1999)



(Hauber, E., et al. 2007)



(R.Schultz,1999)

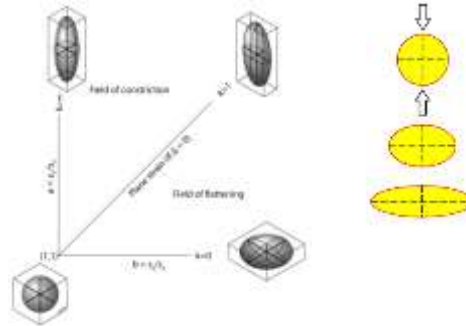


(Hauber, E., et al. 2013 and 2014)

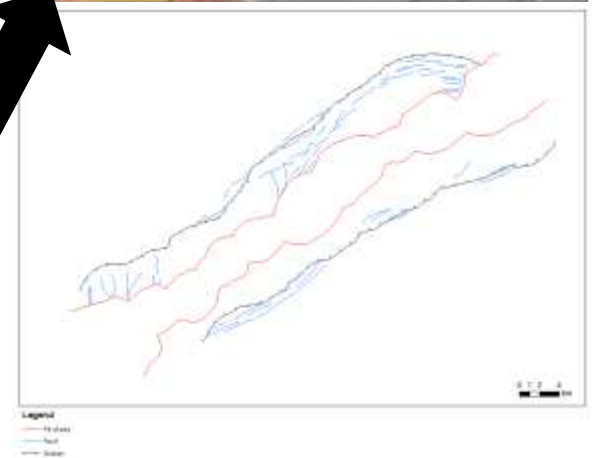
4- Interpretations and conclusions



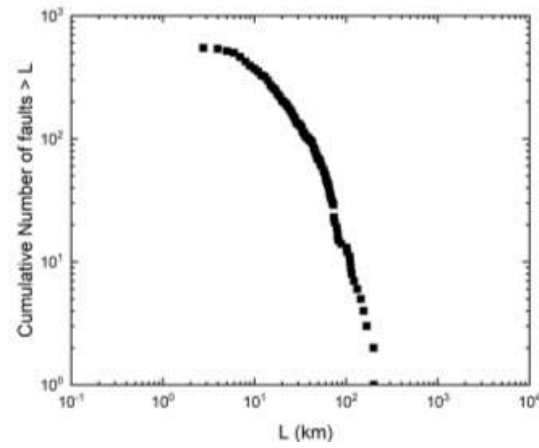
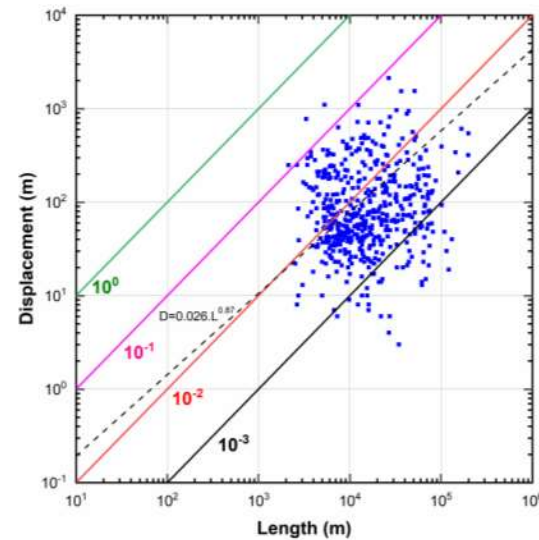
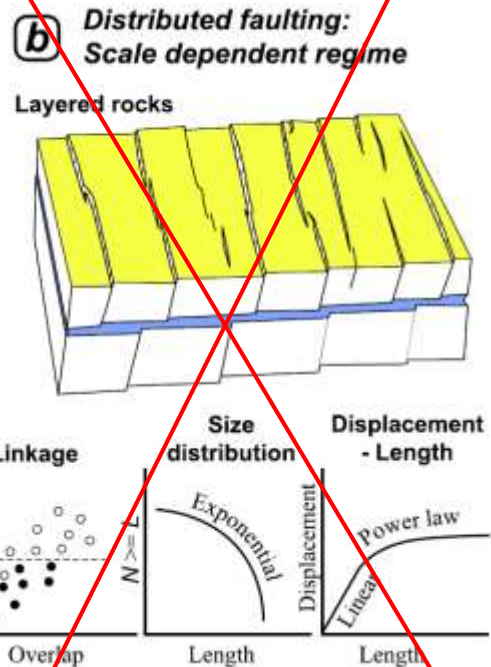
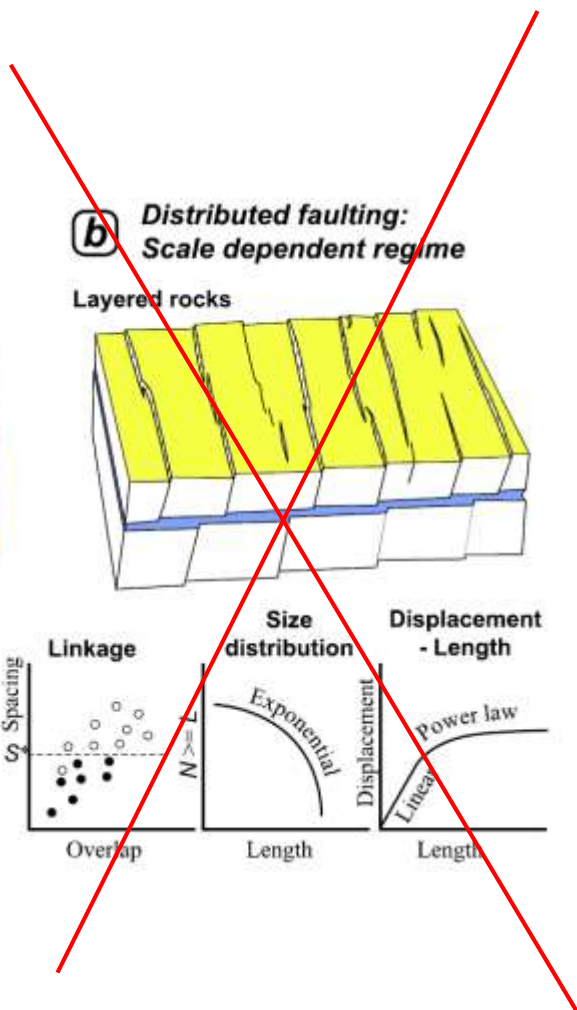
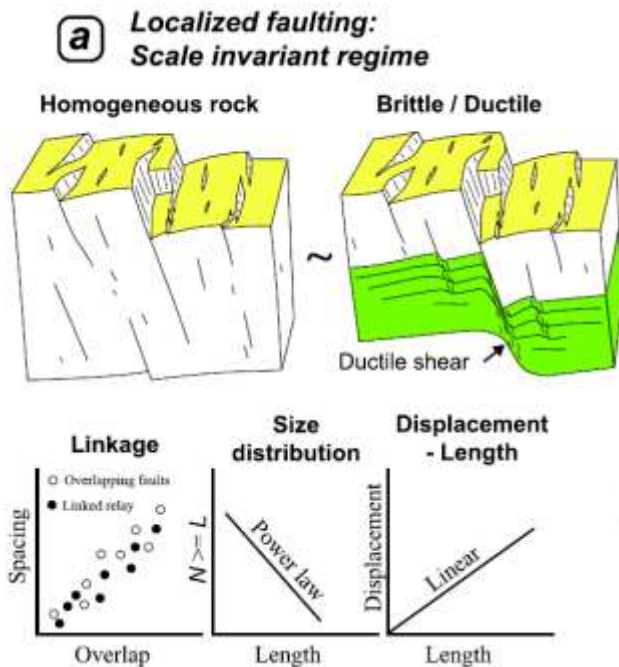
Cross cutting relationship suggest a bidirectional or radial extension, under an oblate strain field.



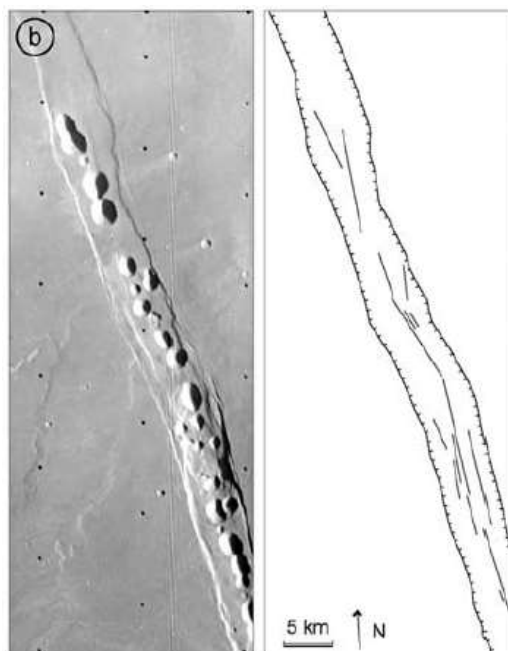
The surface interconnection between grabens and Pits chain provide a useful information about regional tectonism probably driven by volcanic activity.





4- Interpretations and conclusions

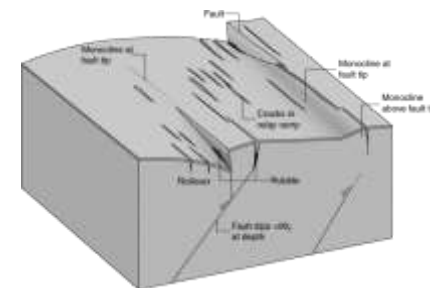
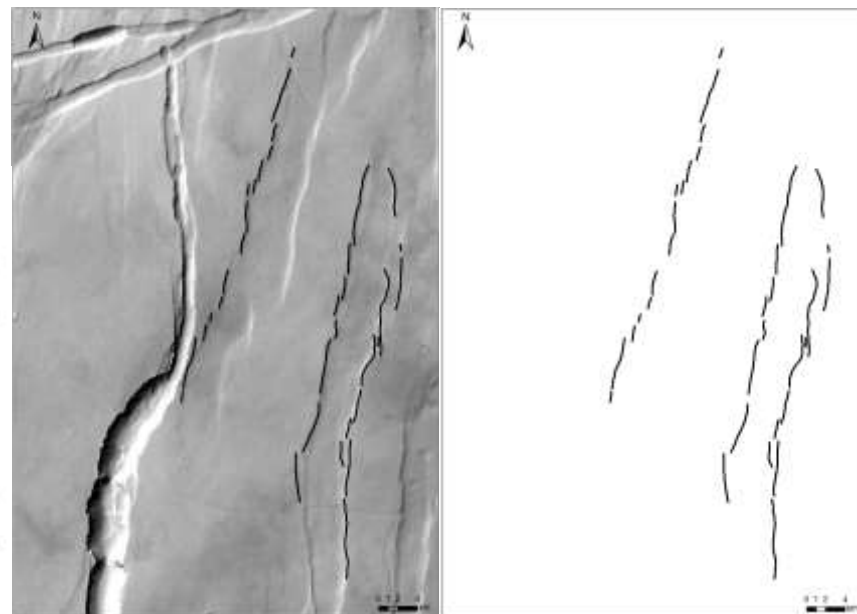
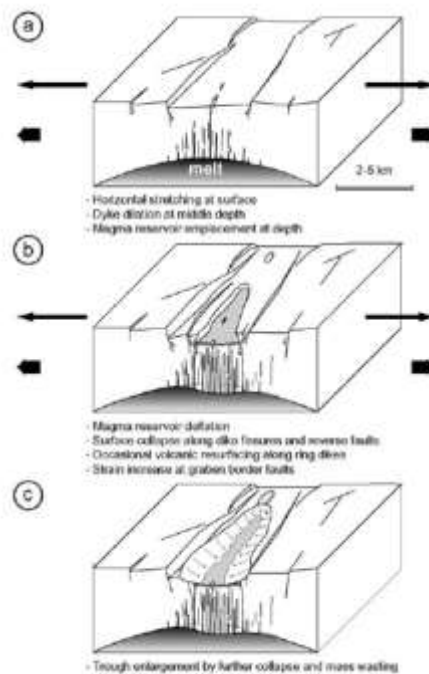


4- Interpretations and conclusions

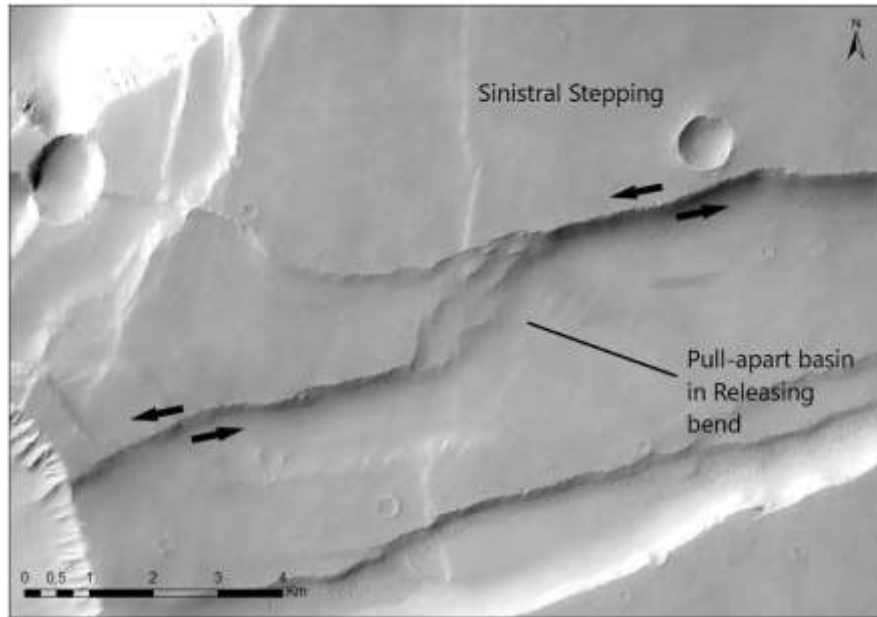


 Dike trend inferred from pit crater trend
 Approximate graben boundary

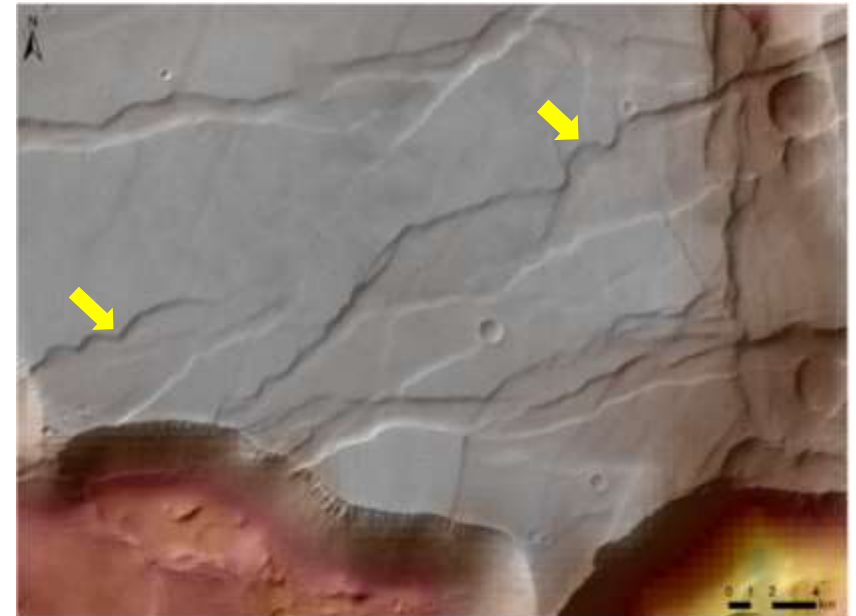
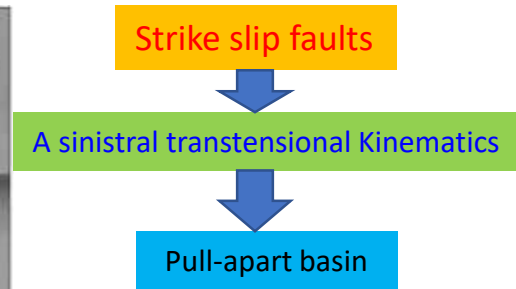
(Mège et al, 2003)



4- Interpretations and conclusions



Shear zone represented by left lateral strike slip fault that generate the apparition of transtensional Pull-apart basin in releasing bend.



Future work ?!

- Our results seems to support an earlier extensional stress field and magmatic processes which are likely the main driving processes of grabens evolution and Pit chains.
- Since this work is a part of PLANMAP projects, so we are going to continue our study and a HRSC DEMs are required in order to accomplish the structural analysis of the driving processes in Noctis Labyrinthus.

Thank you for your Attention

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