Meander Properties of Canali - Presentation of Results

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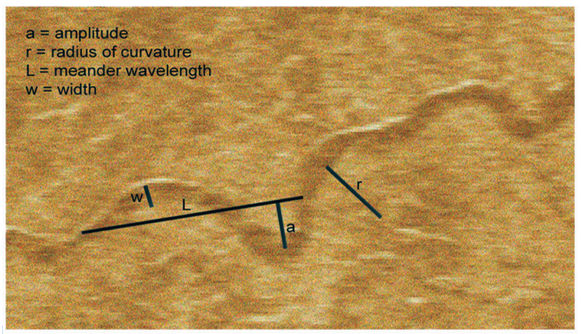
Background

Canali are simple Venusian channels, similar in apperance to terrestrial river channels. They are currently accepted to be of volcanic origin as present Venusian surface conditions are inhospitable to water. However, their great length (up to 7312 km) and near-constant widths (~0.5 - 3.0 km) make them unlike any other solar system lava channel. The 49 canali discovered to date tend to be concentrated on the Venusian lowland plains where cross-cutting relations imply an age of up to 500 Ma. This makes them one of the oldest plains features.

Figure 1. Venusian Canali Section [1]



Low numbers of data points have previously limited the opportunity for quantitative assesment of formation theories. During this work over 6600 data points were collected from 15 lowland canali, recording their meander properties as indicated in figure 1. Data for volcanic and aqueous solar system channels were obtained for graphical comparison with the canali data. It was important to include comparison with submarine channels as this had not been undertaken previously.

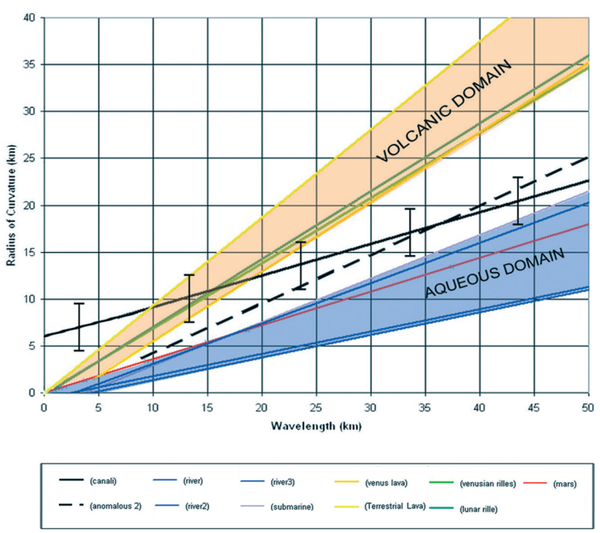
Results

CARVED BY FLUID OF WATER-LIKE RHEOLOGY

Volcanic and aqueous channels show different variation in radius of curvature with wavelength. Surface slope and fluid rheology affect this relationship. Further investigation of local gradient at the time of canali formation is needed for precise interpretation of figure 2. If the surface slope plays a minor role, the gradients of the trend lines in figure 2 will reflect viscosity variations.

Graphs of all data were constructed as in figure 2, to show the canali trend and likeness to other solar system channels. Peak discharge rate was estimated from the obtained relationships and found to be an order of magnitude larger than terrestrial rivers [4].

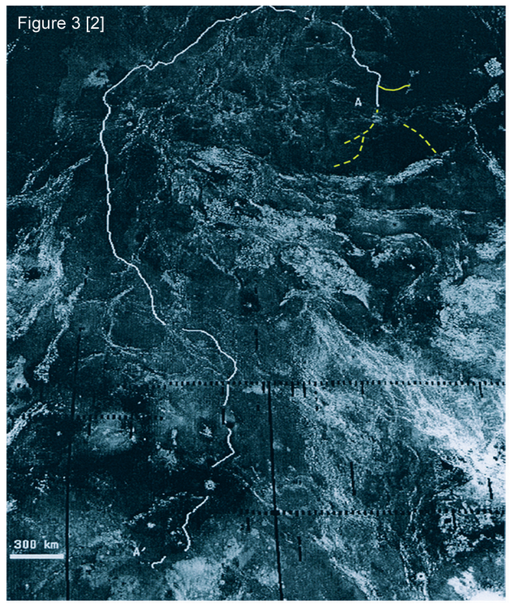
Figure 2. Radius of Curvature Variation with Wavelength



NEW BALTIS VALLIS LENGTH

The longest discovered channel in the solar system, the canale Baltis Vallis, has been recorded as 6800 km. The extension (coloured yellow in figure 3) discovered during this work increases the length of Baltis Vallis to 7312.25 ± 10.3 km. This continuation reveals that the canale in question has no defined source or terminus, as both ends are interupted by younger features.

Figure 3 [2]

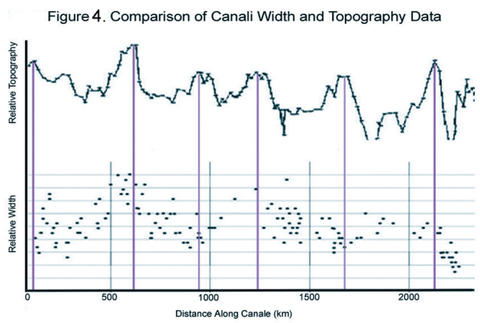


References:
[1] http:/www.solarviews.com/cap/venus/channel .html [2] Komatsu, G. & Baker, V. R. (1994), Icarus 110, 275 - 286 [3] William-jones et al. (1998), JGR 103, E4, 8545 - 8555 [4] Leopold, L. B. & Wolman, M. G. (1960), Bulletin of the Geol. Soc. of America

FORMATION DURING PLAINS TECTONISM

Canali are known for their near-constant width along their great lengths. Results confirm a minimal change in width with distance from the channel source. However, a cyclic variation was also evident in all sampled canali. Comparison with altitude data [3] suggests a possible topographic control. This trend is particularly prominent in the canale of figure 4 in which topographic highs coincide with width maxima and minima alternately. This implies that canali formation was still active at the time of plains tectonism.

Figure 4. Comparison of Canali Width and Topography Data



Contact

Although some key results are presented here, I hope to use the full data set in future work. If you would be interested in collaboration please email:

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