UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Theorie-Kolloquium WS 2022/23
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MC 351 & online (URL in E-Mail)

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A flow through scales: From seepage networks in Florida to valley networks on Mars

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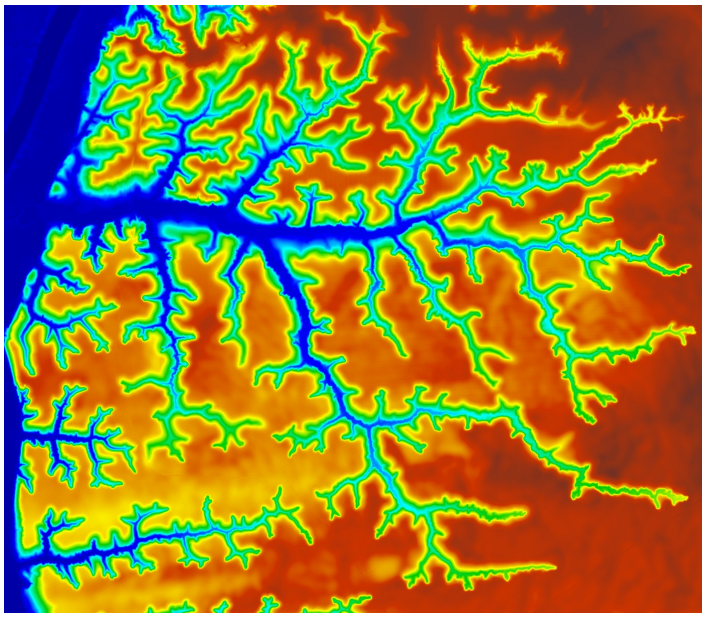

Figure: LIDAR map of the Florida network

The shapes of stream networks have been the source of fascination since centuries. Yet, little is known about the underlying processes that lead to such ramified geometries.
The talk will walk through the different scales of stream networks growth, starting from a small scale network growing in response diffusive fluxes of groundwater.
Here, theory of singular Laplacian growth also know as Löwner Evolution suggests a characteristic bifurcation angle of 2π/5, which agrees well with field measurements at places where the diffusive fluxes, here groundwater, are known.
On the continental scale, where the underlying controlling mechanisms are not known, we observe a systematic relation between a network's mean branching angle and climatic aridity. This observation hints to a climatic control in the relative dominance of diffusive and other processes for shaping the geometry of stream networks.
Applying these findings to the valley networks on Mars, finally allows to speculate about the climatic conditions on ancient Mars that once formed these structures.