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## Inverting fluvial network topology to understand landscape dynamics

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The topology of fluvial networks has long been studied, with Horton's laws describing relationships between stream order, stream density, and stream length often cited as fundamental governing principles of drainage basin development. Building upon these principles, small scale studies have identified patterns of self-similarity in drainage networks in the continental USA, suggesting that to some extent, river networks self-organise in a scale invariant manner. More stringent measures of self-similarity have also been developed, which quantify the fractal nature of side branching structures in fluvial networks. Using such metrics, studies have identified similarities between leaf vein structures and fluvial networks, and have identified a potential climatic signature in North American river topology.

The appeal of such techniques over traditional methods of channel analysis using topographic data is that in self-similar networks, the precise location of channel heads is unimportant, allowing analysis to be performed at unprecedented scales, and in locations where data quality is limited. Here, we attempt to reconcile these two suites of techniques to understand the potential and limitations of network topology as an indicator of broader landscape dynamics. We achieve this through the analysis of fluvial networks extracted at a global scale from the Shuttle Radar Topography Mission dataset alongside other global earth observation data.