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# Morphodynamics of Lowland River Networks Modeled as Simple Binary Trees

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River networks are ubiquitous in nature. The example of the Amazon River, South America, is shown below.

Typically, channel branches farther upstream tend to be steeper than branches farther downstream. Here we explain this tendency via a simple model of lowland sand-bed stream networks. Any given downstream branch bifurcates into two branches upstream, here each assumed to have discharges equal to half of the downstream branch. . Each branch satisfies (at bankfull flow) a relation each for flow resistance, sand transport and sediment mobility Shields number. We show that if the transport rate of sand increases downstream in proportion to the water discharge, the river slope must be the same everywhere, so that the long profile following any path shows no upward concavity. When the sand load increases downstream at a lower rate than the water discharge, on the other hand, upward concavity is manifested. The bifurcations are allowed to continue upstream until a specified drainage density is reached. The inverse of drainage density scales the distance from any channel to the nearest ridge; at an appropriately low value, it is assumed that sediment can be delivered to the nearest stream solely through overland processes. We use the above conditions to determine the extent of the spatial network, and also the spatial variation of network denudation rate.

Amazon River Network:
https://daac.ornl.gov/LBA/guides/CD06_CAMREX.h