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Deviations from power-law scaling in river networks¹ GEOFFREY POORE, Department of Physics, University of Illinois at Urbana-Champaign, SUSAN KIEFFER, Department of Geology, University of Illinois at Urbana-Champaign — We investigate the origin of power-law scaling in river networks, using simulations of an erosion model. Sloped initial conditions produce river networks that exhibit deviations from simple power-law scaling. Deviations result from a scale-dependent effect of initial slope on network structure, reinforced by network topology. The largest streams are more regular and are more influenced by the initial slope. As scale decreases, streams become more irregular and less determined by initial gradient. This may explain some scaling deviations observed in nature. Since dynamics and initial conditions do not guarantee simple scaling, we suggest that perturbations over time are necessary to explain power laws in river networks.

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