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Emergence in geomorphic scaling laws

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Allometric scaling laws in geomorphology are quantitative relationships that describe how one geometric attribute of a landform (e.g., length, width, depth, perimeter, area, volume) changes with respect to another (e.g., length relative to area). Geomorphic scaling laws are typically constructed from well-developed, steady-state topography, or from a broad sample of representative but isolated landforms. Opportunities to record stages of allometric growth, from initial to "equilibrium" morphologic states, in a given landform are rare. So are opportunities to observe how a scaling law may develop in time, as an emergent pattern in the collective allometry of many individual but spatially related landforms. Here, I use results from an experimental coastal barrier to demonstrate the development of allometric change in individual morphologic features (e.g., washover lobes), and also the emergence of collective allometric scaling relationships from spatially related morphologic features (e.g., an alongshore series of washover lobes). Geomorphic scaling laws can capture quantitative signatures of landscape dynamics in a variety of environments, even when the physical processes behind those dynamics are difficult to measure directly, or are otherwise unclear. This work emphasises the utility of morphometric scaling as a tool for dynamical insight, especially in morphodynamic experiments in which exact scaling of physical forces is impossible.