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The "normal" elongation of river basins

Sebastien Castelltort
University of Geneva, Section of Earth and Environmental Sciences, Geneva, Switzerland (sebastien.castelltort@unige.ch)

The spacing between major transverse rivers at the front of Earth's linear mountain belts consistently scales with about half of the mountain half-width [1], despite strong differences in climate and rock uplift rates. Like other empirical measures describing drainage network geometry this result seems to indicate that the form of river basins, among other properties of landscapes, is invariant. Paradoxically, in many current landscape evolution models, the patterns of drainage network organization, as seen for example in drainage density and channel spacing, seem to depend on both climate [2-4] and tectonics [5]. Hovius' observation [1] is one of several unexplained "laws" in geomorphology that still sheds mystery on how water, and rivers in particular, shape the Earth's landscapes.
This narrow range of drainage network shapes found in the Earth's orogens is classicaly regarded as an optimal catchment geometry that embodies a "most probable state" in the uplift-erosion system of a linear mountain belt. River basins currently having an aspect away from this geometry are usually considered unstable and expected to re-equilibrate over geological time-scales.
Here I show that the Length/Width$\sim$2 aspect ratio of drainage basins in linear mountain belts is the natural expectation of sampling a uniform or normal distribution of basin shapes, and bears no information on the geomorphic processes responsible for landscape development. This finding also applies to Hack's [6] law of river basins areas and lengths, a close parent of Hovius' law.

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