

Figure S1: Effect of grid size and model size. Note that the horizontal axis is reversed for both $\Delta\chi$ and ΔH . Color scale indicates basin area. Red dashed lines correspond to the linear fits obtained for the reference model (see figure 6). (a) to (c) Basins of seven class area from 1-128 km² over the time period 2.5-5 Myr for a model with a grid size equal to 30m. (d) to (f) Same as Fig. S1a-c, with a four time bigger than the reference model (100x100 km vs. 50x50 km).

Willett et al., 2014
Whipple et al., 2017
Forte and Whipple, 2018

Willett et al., 2014 Supp. Material
This study

Cross divide contrasts

Direction of migration (1D)



Aggressivity metrics

Integrated on basin scale (2D)

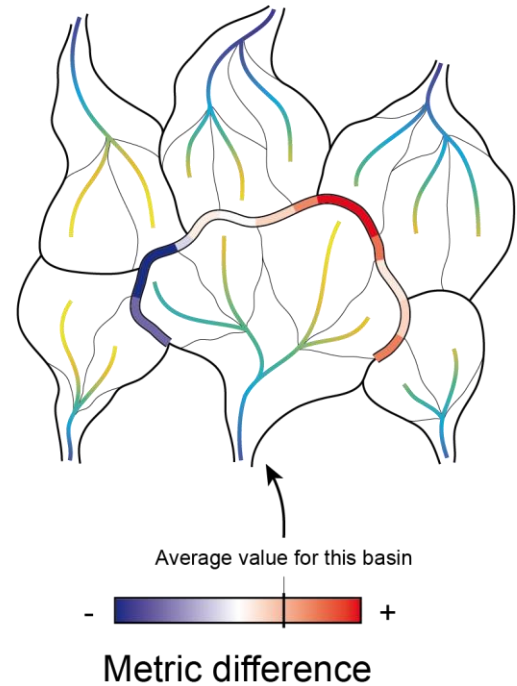
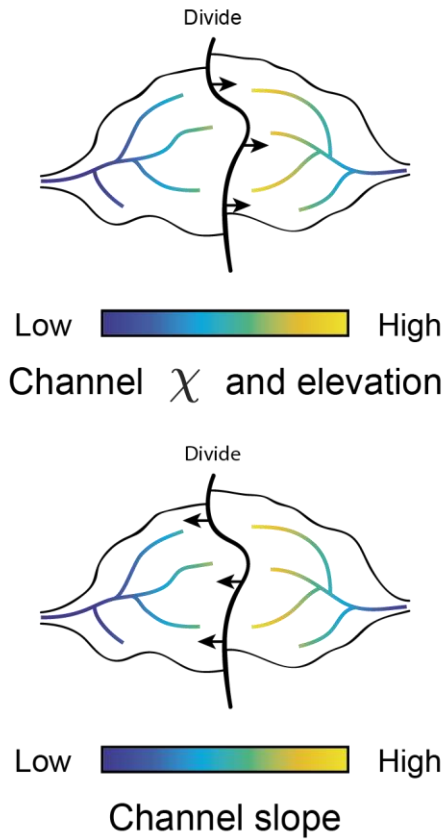


Figure S2: Schematics of cross-divide metrics and aggressivity metrics. Thick Black lines show the basins boundaries. Thin black lines in the schematic figure describing aggressivity metrics show first-order basins boundaries. Drainage network is colored with respect to channel χ , elevation or slope value.

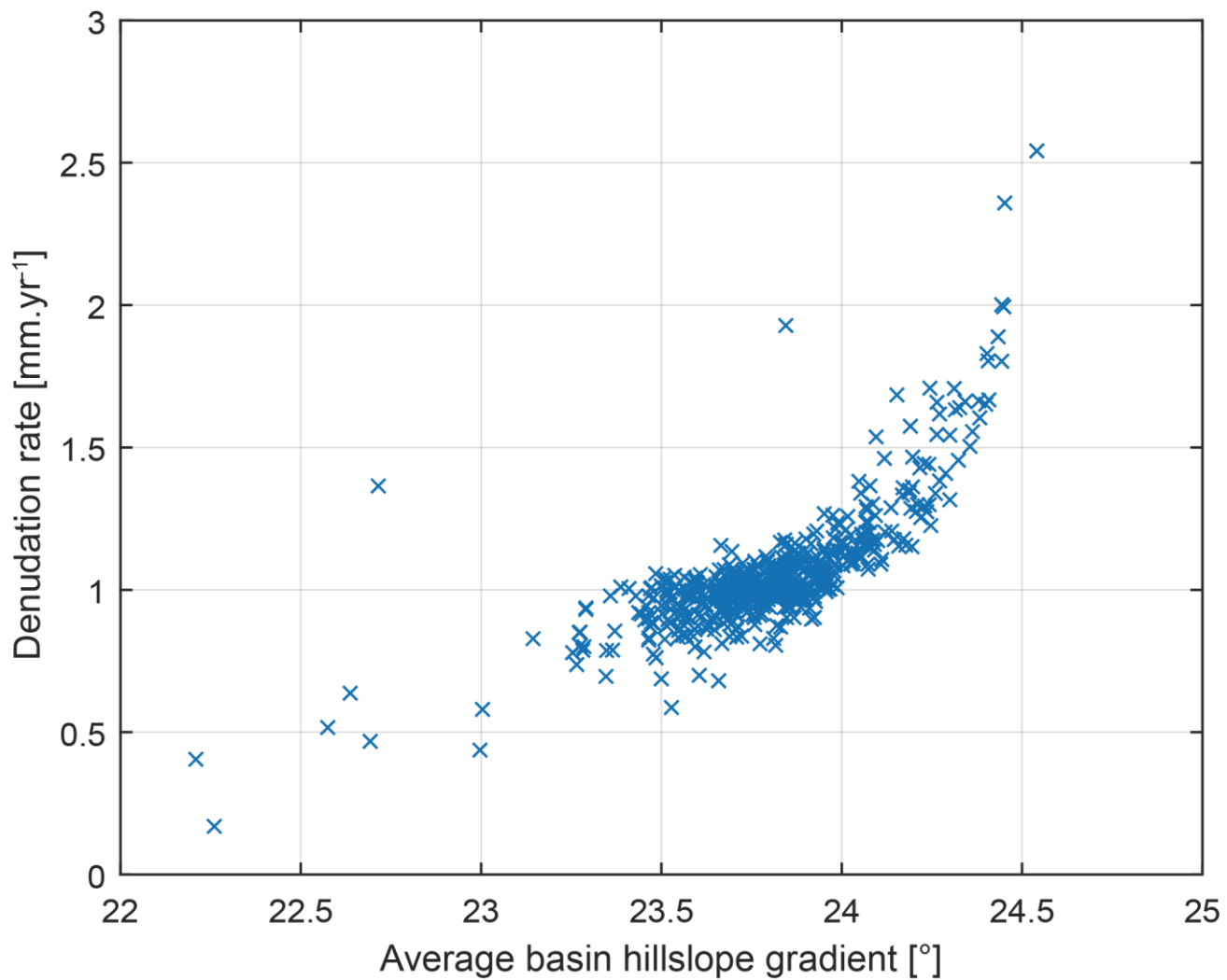


Figure S3: Basin average slope in reference model. Results for ~600 basins with an area of 1-2 km² for reference model after 5 Myr of simulation.

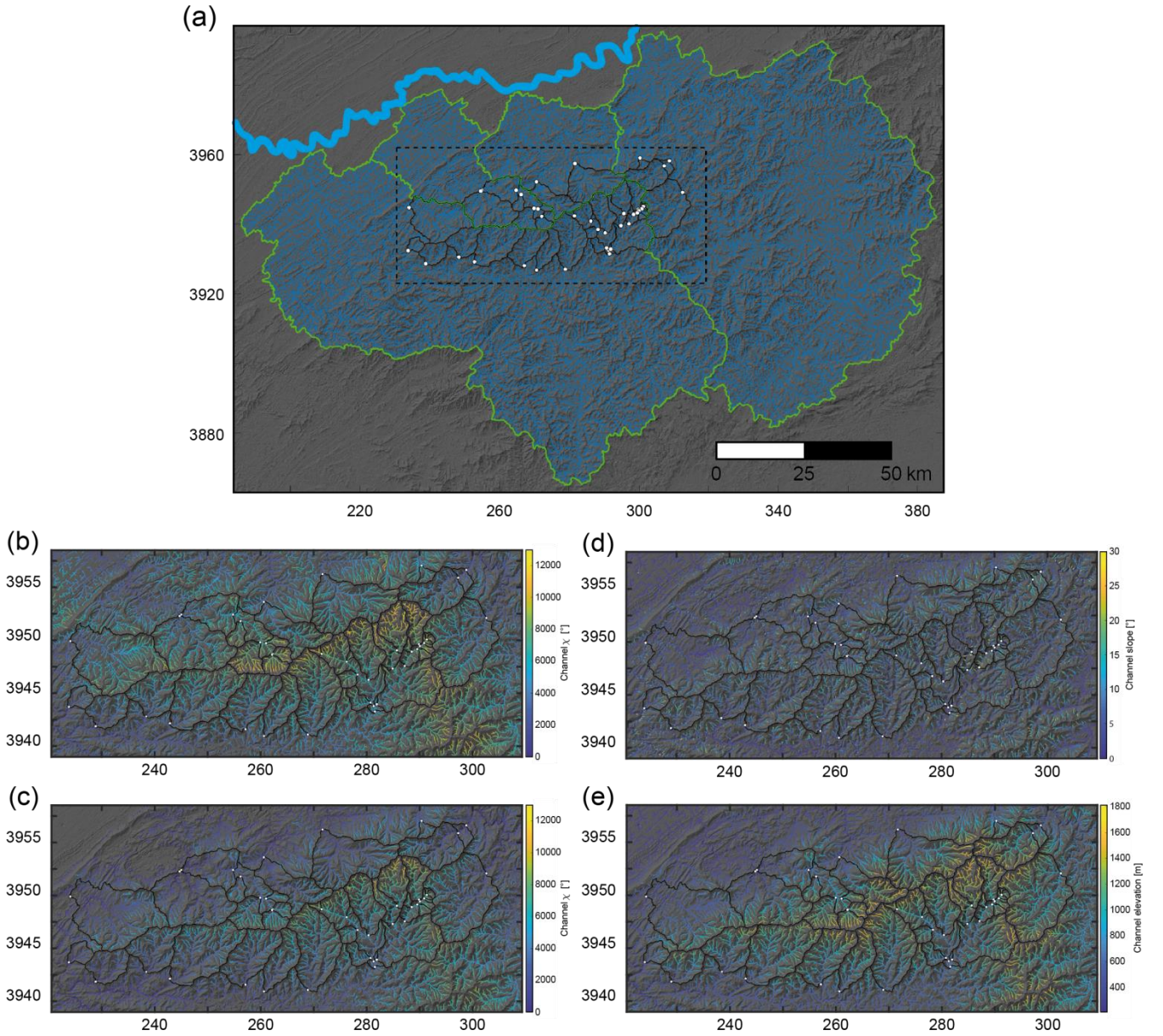


Figure S4: Maps of basins sampled by Matmon et al., 2003a in the Great Smoky Mountains. Black lines and white circles show the limits and the outlets of the basins sampled by Matmon et al., 2003a, respectively. (a) Regional map of the southern Appalachian range (UTM17 grid). Thick blue line represents the Tennessee river. Thin blue lines correspond to the drainage networks that drain water down to the Tennessee river. Green lines show the limits of the watersheds associated with these drainage networks. The extended view of the Great Smoky Mountains (area enclosed by the dashed line in (a)) show : (b) a map of χ integrated from the confluence with the Tennessee river ; (c) a map of χ integrated from a constant elevation $H_b = 400$ m ; (d) a channel slope map ; (e) a channel elevation map.