The effect of grid resolution on a landscape evolution model

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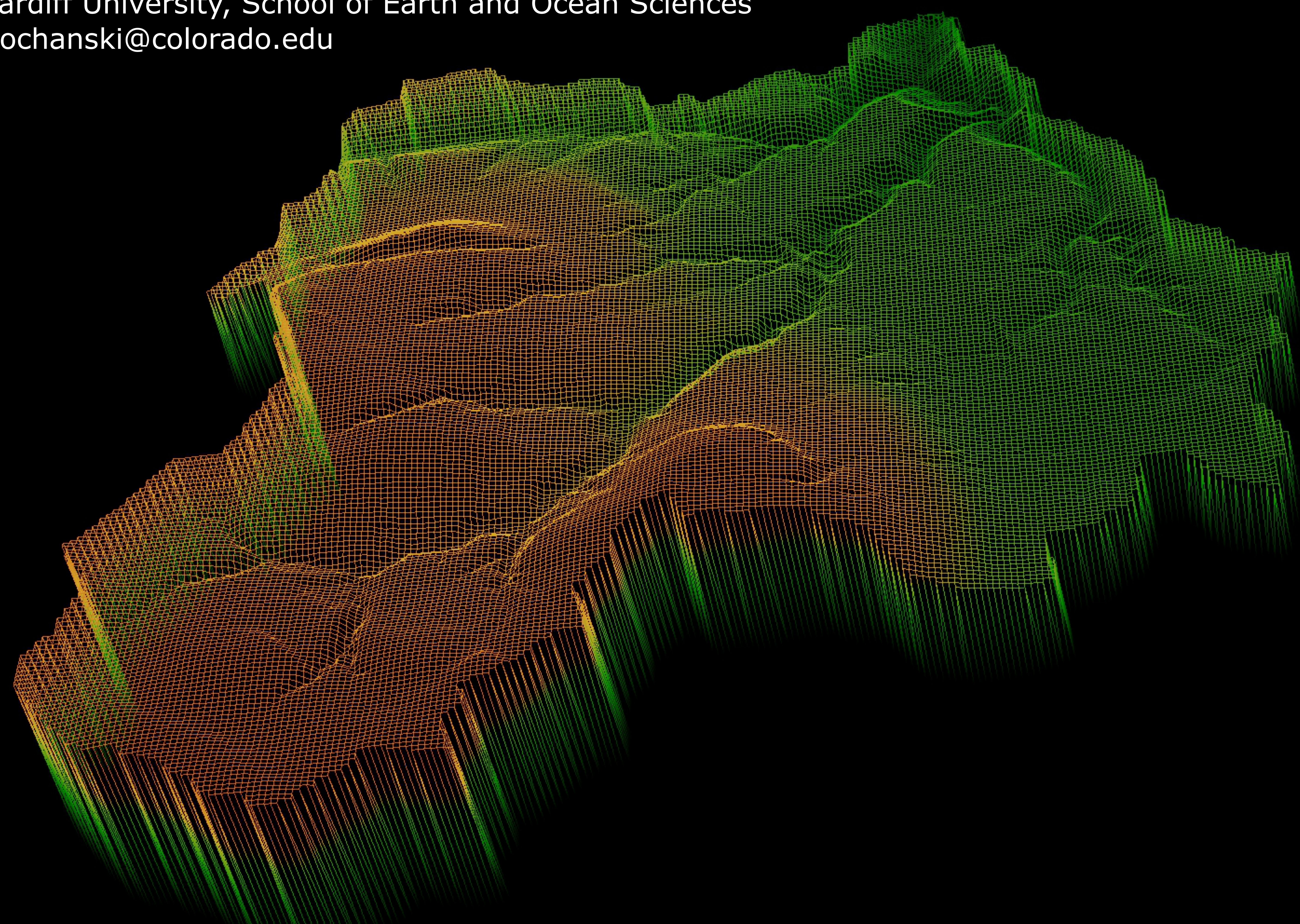
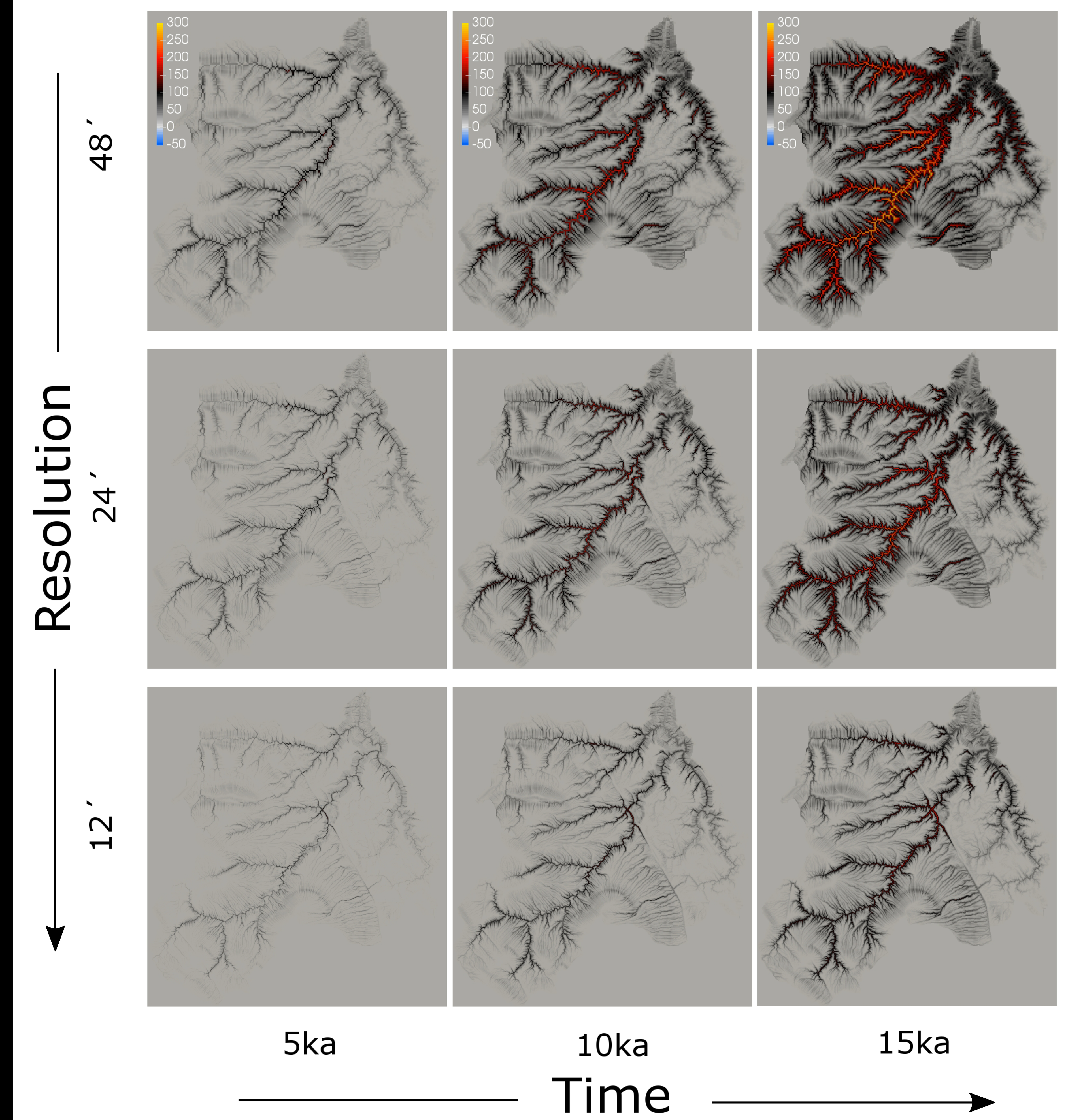


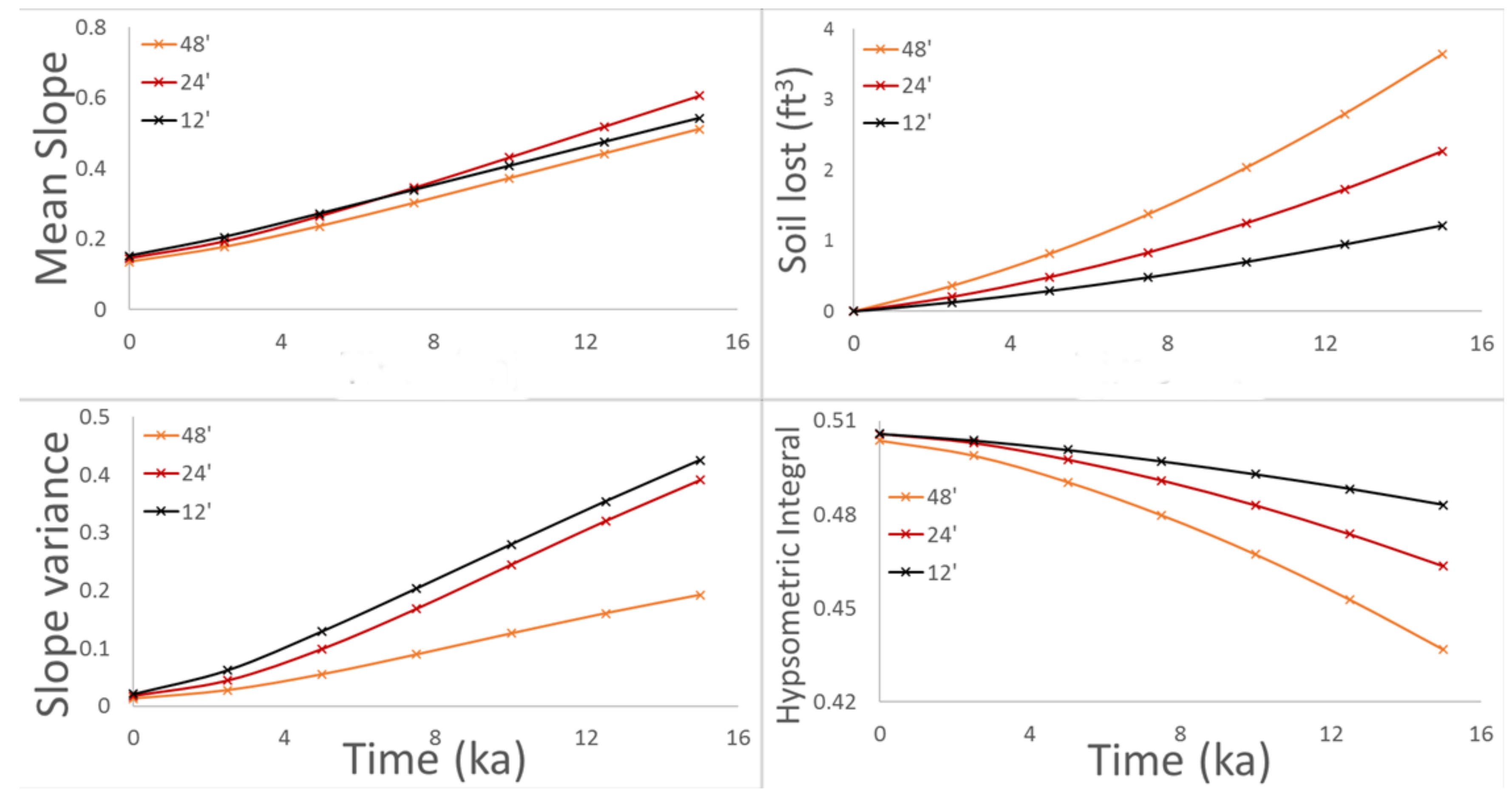
- We modeled the evolution of a 622ha watershed in West Valley, NY, at three grid resolutions: 12, 24 and 48 feet.
- Coarse DEMs do not capture the full variability of the topographic slope, and they increase the apparent width of the channels.
- We found that model runs on the 48-foot grid produced three times as much soil loss from the watershed as the same run on the 12-foot grid.
- Landscape evolution models return different results for grids of different resolutions. They must be tested and calibrated at each resolution.



The model was run in Landlab. We used a slope-area model for channel incision, and a linear diffusion law for the hillslopes. Topographic elevation, z, evolves by:

$$\frac{\partial z}{\partial t} = U - KA^{\frac{1}{2}}S + D\nabla^2 z$$

where U is the baselevel lowering rate (1.2 mm/yr); K is the stream power constant (10^{-4} yr^{-1}); and D is the diffusivity of the hillslopes (10^{-3} m^{2}yr^{-1}).



Thanks

Refs

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